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The Adoption of Digital Health Self-Monitoring Devices among Sub-healthy Chinese Groups

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The Adoption of Digital Health Self-Monitoring Devices among Sub-healthy Chinese Groups

BY

Xinwen Zhang

April 2023

Coventry University

The Adoption of Digital Health Self-Monitoring Devices among Sub-healthy Chinese Groups

BY

Xinwen Zhang

A thesis submitted in partial fulfilment of Coventry University's requirements for the Degree of Doctor of Philosophy

April 2023

Certificate of Ethical Approval

Applicant:

Xinwen Zhang

Project Title:

The adoption of digital health self-monitoring application among Chinese sub-healthy group:
the integration of the unified theory of acceptance and use of technology(UTAUT) and health belief model(HBM)

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

16 December 2019

Project Reference Number:

P94859

DECLARATION

I hereby declare that this project represents the culmination of my individual efforts, and all written work and survey data contained herein are solely my own unless explicitly credited or referenced otherwise. This thesis has not been previously accepted or submitted for any similar academic recognition elsewhere.

I have given consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organizations.

Xinwen Zhang

April 2023

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ABSTRACT

In today's technologically advanced world, digital health monitoring devices are becoming increasingly popular in China for managing chronic diseases and sub-healthy conditions. This trend marks a crucial shift in the healthcare sector, showcasing technology's importance in disease management and prevention. Understanding the behavioral intentions and perceptions of the Chinese, particularly those in sub-healthy groups, towards these technologies is essential for creating effective marketing strategies and health policies that meet user needs. This thesis thoroughly analyses factors influencing the intention to use and adopt digital health self-monitoring devices among the Chinese sub-healthy population. It examines the impact of individual attitudes and behavioral intentions on these devices, integrating the Technology Acceptance Model (TAM) with the Health Belief Model (HBM) and incorporating Social Cognitive Theory (SCT), reflecting Chinese collectivist culture. A comprehensive mixed-methods approach, including Structural Equation Modeling (SEM) for quantitative analysis and interpretive qualitative methods, supports this research. The study engaged 1200 Chinese sub-healthy participants, with 694 usable datasets remaining after data cleaning, indicating a 57.8% response rate. SEM results provide insights into the model, particularly regarding the intentions of the Chinese sub-health group toward health self-monitoring devices, with the theoretical model explaining 67.8% of the total variance. Thematic analysis offers a deeper understanding of underlying motivations and perceptions. This study significantly contributes to health technology adoption research by integrating TAM, HBM, and socio-cultural factors within the Chinese context. It emphasizes the need for robust policy frameworks to ensure the quality and safety of health monitoring devices, advocating for stringent enforcement strategies, including inspections, testing, and stakeholder collaboration. Key recommendations include implementing educational programs tailored to Chinese cultural values to enhance public awareness and knowledge and establishing a regulatory framework for ensuring device quality, safety, and data privacy, encompassing manufacturing, testing, and ongoing monitoring standards.

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
AVE	Average Variance Extracted
BCG	Ballistocar Diogram
CA	Cues to Action
CGM	Continual Glucose monitoring
CVD	Cardiovascular Disease
ECG	Electrocardiogram
EHR	Electronic Health records
GoF	Goodness of Fit
GP	General Practitioner
HBM	Health Belief Model
HIT	Health Information Technology
ICT	Information Communication Technology
IoT	Internet of Things
IS	Information System
IU	Intention to Use
NCDs	Non-Communicable Diseases
PEU	Perceived Ease of Use
PLS-SEM	Partial Least Squares-Structural Equation Modelling
PS	Perceived Severity
PU	Perceived Usefulness
SC	Social Conformity
SCT	Social Cognitive Theory
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
TSM	Trust in social media
UTAUT	Unified Theory of Acceptance and Use of Technology
VIF	Variance Inflation Factors
WHO	World Health Organization

CHAPTER 1 INTRODUCTION

1.1 Overview of Healthcare in China

China, the world's most populous country, faces numerous challenges in its healthcare industry. The increasing prevalence of chronic health issues among its vast population places severe strains on the relatively scarce resources and an already stretched health service. Furthermore, recent experiences, such as the COVID-19 pandemic, have exposed the current system's inadequacy in meeting the significant demands of a major health disaster (Hu, 2020). Amid these challenges, the Chinese healthcare system must meet unique requirements due to the country's large size, population, complexity, economic background, and particularly its social and cultural context (Tao et al., 2020). In 2009, the Chinese government launched a new round of comprehensive, nationwide healthcare reforms to address issues commonly summarized as medical access being difficult and expensive. These reforms must consider numerous factors to operate efficiently and effectively within such a context and against the challenges (Zhai & Goss, 2020). Despite significant reforms over the past few decades aimed at addressing these issues, the healthcare system in China still faces many specific challenges besides the more overarching ones already mentioned. These include inefficient workforce allocation, adverse provider incentives, substantial inequities, and an increasing need for privatization (Jakovljevic et al., 2023).

These challenges are compounded by the healthcare system likely coming under even greater pressure in the future due to an aging population, increasing privatization, and growing expectations about the quality of healthcare (Figueroa, Harrison, Chauhan, & Meyer, 2019). Additionally, the general health of the Chinese population presents a range of specific challenges, with various diseases emerging from underlying conditions of major concern, such as cardiovascular disease (CVD) and diabetes. CVD, in particular, poses a significant challenge for the Chinese healthcare system. According to data from the Chinese Centre for Disease Control and Prevention, approximately 290 million Chinese citizens have been diagnosed with CVD, and about 3.5 million citizens lose their lives each year due to this disease, accounting for 40% of all deaths in China (Wang et al., 2016). Diabetes is another major concern, with more than 110 million Chinese citizens diagnosed with the disease, representing approximately 25% of the global diabetic population (Chen et al., 2018). Furthermore, about 150 million Chinese citizens are diagnosed as pre-diabetic, and nearly 60% of diabetics have difficulty maintaining their blood glucose levels within safe limits due to a lack of effective monitoring and reluctance to prescribe combination drug therapies (Tian et al., 2018). Moreover, China, along with countries worldwide, has recently faced a major healthcare disaster unprecedented in contemporary times.

The Corona Virus (COVID-19), identified in December 2019 in Wuhan among patients with severe pneumonia, spread rapidly (ChinaLi and De Clercq, 2020). As of 28 February 2020, the virus had spread to 36 countries with over 82,000 confirmed cases and an estimated mortality risk of about 2% (National Health Commission of the People's Republic of China, 2020). By the time of this publication, 2747 patients had died in China from this virus. The World Health Organization (WHO) stated that older people and those with pre-existing medical conditions, such as diabetes and heart disease, are more at risk of developing severe illness from COVID-19 (WHO, 2020). Patients without pre-existing 'comorbid' medical conditions had a case fatality rate of 0.9%. Table 1.1 shows the death rate of patients with different pre-existing conditions (which are also chronic diseases), indicating that these individuals are more likely to have higher death rates due to COVID-19. As Table 1 shows, the death rate for patients with chronic disease conditions is 5–10 times higher than for patients without chronic diseases (National Health Commission of the People's Republic of China, 2020). This is particularly relevant to China, given the increasing prevalence of chronic disease patients.

Table 1.1: COVID-19 Fatality Rate by Comorbidity

PRE-EXISTING CONDITION	DEATH RATE
CARDIOVASCULAR DISEASE	10.5%
DIABETES	7.3%
CHRONIC RESPIRATORY DISEASE	6.3%
HYPERTENSION	6.0%
CANCER	5.6%
NO PRE-EXISTING CONDITIONS	0.9%

On health more generally besides aspects concerned with COVID-19, the most intractable challenge faced by the health sector globally is the death rate. Chronic diseases such as heart disease, chronic respiratory illness, and diabetes are by far the leading cause of death, topping most all-cause morbidity lists globally, and a recent estimate is that 70% of adults have been diagnosed with at least one chronic condition

(WHO, 2020), which is a remarkable and extremely concerning statistic. The perhaps obvious solution is that people prevent chronic disease in advance, but this has not been happening. A key response that has emerged in this regard, though, concerns the phenomenon of digital health self-monitoring devices (Alam et al., 2020). As these devices can enhance health promotion and bring positive behavioral changes, much support has emerged for the self-management of chronic diseases via these means (Shan et al., 2019). For example, diabetes mellitus – a particularly prevalent disease in China – has been difficult to manage as it has required high levels of health literacy and numeracy along with frequent contact with clinicians. Also, diabetes can, if not optimally controlled, lead to kidney failure, blindness, and cardiovascular complications, which, in turn, further stretch services and contribute to increasing healthcare costs (Shan et al., 2019).

More specifically in China, more than one-third of Chinese adults suffer from high blood pressure, and more than 40% of the adult populace is unaware of their condition, further highlighting the need for improved monitoring and management of chronic diseases in China (Wang et al., 2018). The challenges posed by chronic diseases are further compounded by the scarcity of medical resources and the unbalanced economic status among different cities in China, which makes it difficult to obtain adequate medical services. The efficiency of patient diagnosis, treatment, and monitoring is also often suboptimal, leading to poor healthcare outcomes and patient dissatisfaction. The aging population, as noted, is also a significant challenge generally but especially as the morbidity and mortality of various types of chronic diseases are increasing in China, with most of these conditions being aggravated by a lack of monitoring – a shortcoming that also plays a significant role in lack of prevention. There are significant issues within the Chinese healthcare system, and these have had and are still having severe implications for China's populace and the country. Nevertheless, a major response to all this has recently emerged, as noted above, in the form of technology-driven health self-monitoring devices – the development of which is important background information (see 1.2), which comes under more general technology aspects of e-health.

1.2 Challenges in Adopting Digital Health Devices in China

The development of digital health services, which remains at "the first era of experimental proliferation" (Labrique, Vasudevan, 2013), has already encountered many difficulties and challenges. For example, as a new application of mobile information technology within the health industry, mobile health services have encountered the various difficulties and barriers innovation theory alludes to, including ‘uncertainty’ (e.g. technological, resource, competitive, supplier, consumer and political) as well as ‘bounded rationality’, which notes limited abilities of key decision makers regarding gathering and processing information, and there are limitations resulting from narrow focuses on technological R&D and policy shortcomings (ICEPT, 2012). To provide initial specific examples of the various implementation challenges health technology adoption faces, Table 1.2 summarises major common but very broad research examples.

Table 1.2: Practical Barriers to Health Technology Adoption

<table>
<tr><th>Barriers</th><th>Issues</th><th>References</th></tr>
<tr><td>Reliability of the technology</td><td>1. Reliability is of utmost importance, particularly concerning technology within the healthcare sector.
2. Users have concerns regarding the quality and safety of health-related technologies.
3. The system faces challenges related to data security and privacy issues.
4. There is a lack of adequate training and explanation regarding various advanced health technologies.</td><td>(Fang, 2016)
(Lin, et al.,2011)
Iyanna et al., 2022
(Kang & Exworthy, 2022)
(Govindan et al., 2023)</td></tr>
<tr><td>Difficulty in using the technology</td><td rowspan="2">1. New health technology systems should undergo testing by faculty members before installation.
2. Health technology should be standardized as much as possible.
3. Variations in technologies tailored for different types of diseases must be thoroughly documented.</td><td rowspan="2">(Zakerabasali, et al., 2021) (Hung et al., 2022)
(Rouidi et al., 2022)</td></tr>
<tr><td>Difficulty in learning to use the technology</td></tr>
<tr><td>Believe the technology improves or enhances</td><td rowspan="2">1. Determine if the health technology will enhance the user's health status or condition.
2. Assess whether the health technologies align with the individual's specific needs.</td><td rowspan="2">(Assadullah, 2019)
(Geber & Friemel, 2022)
(Tabatabaee et al., 2022)</td></tr>
<tr><td>The expectation of the technologies</td></tr>
<tr><td>The function of the technologies</td><td>Whether or not the functions of the technology can meet user’s needs.</td><td>(Tegegne & Wubante, 2022)
(Madrid et al., 2022)</td></tr>
</table>

In order to improve the acceptance rate of health self-monitoring devices in China, the most essential factor is for devices to attract and retain users, precipitating the understanding of users' mobile health service adoption behavior. Table 1.2 presents a comprehensive overview of the practical barriers to the adoption of health technology in China, highlighting several critical issues impeding its widespread acceptance. A primary concern, as indicated by Fang (2016) and Lin et al. (2011), is the reliability of these technologies. The healthcare sector demands utmost dependability in technology, with user concerns often centered around the quality, safety, and data security of health-related technologies. Govindan et al. (2023) and Kang & Exworthy (2022) underscore the challenges related to data security and privacy, which are paramount in the healthcare domain. Furthermore, as Iyanna et al. (2022) point out, there is a noticeable gap in providing adequate training and explanation about the operation and benefits of advanced health technologies. This lack of understanding and trust in the technology's reliability and security poses significant obstacles to its adoption. This is particularly true in a society where traditional healthcare practices are deeply ingrained and where the adoption of technology may be met with skepticism.

Undoubtedly, the adoption of Information and Communication Technology (ICT) in healthcare is fraught with numerous challenges (Zhou, 2021). Another set of barriers relates to the usability and functionality of health technologies, as documented by Zakerabasali et al. (2021), Hung et al. (2022), and Rouidi et al. (2022). Issues include the difficulty in using the technology, which can be exacerbated by a lack of standardization and insufficient documentation for disease-specific technologies. The challenge is not just in learning to use these technologies but also in understanding their relevance and efficacy in enhancing health outcomes, as discussed by Assadullah (2019), Geber & Friemel (2022), and Tabatabaee et al. (2022). Moreover, Tegegne & Wubante (2022) and Madrid et al. (2022) highlight the critical need for these technologies to align with the specific needs of users. This disconnects between the technology's functionality and the user's expectations and needs further contributes to the hesitancy in adopting digital health devices in China.

Amidst these challenges, health self-monitoring devices have emerged as a potential panacea, operating on dual fronts. Primarily, these devices empower individuals by providing them with the capability to regularly monitor their health status, health parameters, and vital signs in the comfort of their homes, thereby mitigating the necessity for frequent visits to healthcare facilities (Kavandi & Jaana, 2020). Additionally, these devices have the potential to alleviate the strain on the Chinese healthcare system, assuming a pivotal role in enhancing its quality and efficiency through advancements in patient diagnosis, treatment, monitoring, and overall outcomes (Fox & Connolly, 2018). It is imperative to acknowledge and address the prevailing challenges and concerns associated with the integration of health self-monitoring devices (Zhu, Ma, & Leng, 2020). Despite the current gradual uptake in the adoption of these devices in China, there exists a notable opportunity to surmount these challenges and enhance healthcare outcomes (Zhu, Z., Ma, W., & Leng, C. 2020). The measured growth in the utilization of health self-monitoring devices in the Chinese context presents a significant avenue for addressing these issues comprehensively (Zhong, et.al., 2023).

1.3 Transformative Role of Health Self-Monitoring Devices in Tackling China's Healthcare Challenges

It is becoming increasingly important to address the above challenges, and key means of doing this include optimising the allocation of healthcare resources, enhancing patient diagnosis, treatment and monitoring, and improving the self-monitoring of health in China. In this study’s endeavour to help address the significant challenges currently facing the Chinese healthcare system, its central strand concerns how improved adoption of health self-monitoring devices can potentially transform healthcare outcomes for patients with chronic diseases in China, bringing many deep benefits for the country and its citizens alike. There has in fact been a growing focus on the adoption of health self-monitoring devices (e.g., wearable sensors, mobile health apps and remote monitoring systems) in China's healthcare system, as these allow patients to monitor their health status and vital signs regularly without the need for frequent hospital visits. As noted, this can not only help patients better manage their chronic conditions but also reduce the burden on the healthcare system by minimising unnecessary hospital visits and allowing a more efficient allocation of healthcare resources (Landon, 2022). According to a report by Frost and Sullivan, the market for wearable medical devices in China is expected to reach $5.5 billion by 2022, driven by factors such as increasing healthcare awareness, rising healthcare costs and technological advancements (Frost and Sullivan, 2018), and there has indeed been a rapid rise in the adoption of health self-monitoring devices in China in recent years, though this is akin more to an initial spike in new technology rather than the long-term widespread use required to address China’s healthcare challenges via this means. The Chinese government has thus also been promoting the use of health self-monitoring devices as part of its efforts to promote digital health and improve the efficiency of the healthcare system. For example, the National Health Commission of China (2020) recently issued guidelines on the use of remote health monitoring systems for chronic disease management, and these emphasised the importance of using digital technologies to improve the quality of healthcare services and reduce healthcare costs.

The basic premise is that health self-monitoring devices can help individuals manage their health more effectively, reducing their risk of developing chronic diseases and alleviating the ill-health of those who currently have them (hence helping healthcare overall). This is particularly important in China, where the high prevalence of chronic diseases is a significant concern. Another important factor is China’s cultural and social background, which significantly shapes China’s healthcare system and its challenges (see Table 1.3). For example, in Chinese culture, the traditional approach to healthcare emphasises the prevention of disease and maintaining overall wellness rather than treating illnesses only after they occur. As such, self-monitoring devices that allow individuals to track and manage their health align well with this cultural approach to healthcare. This may explain why some of the Chinese sub-healthy participants in the study demonstrated a greater interest in and willingness to use smart health technology compared to participants from other cultures with different healthcare beliefs and practices.

Additionally, the noted social and economic disparities in China have also contributed to the need for further take-up of health self-monitoring devices. Despite China's rapid economic growth over the past few decades (see Table 1.2), there is still a significant income gap between urban and rural areas, and this has even further implications for healthcare and related resources (also see Table 1.2), which poses further obvious challenges regarding health self-monitoring devices and their adoption. Owing to their potential benefits in terms of generally improving personal health, specifically monitoring the health of sub-healthy groups (see Table 1.3) and ultimately reducing both the number of patients with chronic diseases and healthcare costs, these health self-monitoring devices, as noted, have become increasingly popular in recent years but, as yet, far from the extent the government deems is required to address China's health crisis (hence its desire to increase take-up). Ways these devices bring such benefits include tracking people's health status, evaluating trends and providing timely treatment. Furthermore, mobile health services can save time and money on diagnoses while also improving the efficiency and quality of medical resources. To give an initial indication of the importance and advantages of health self-monitoring technologies before proceeding, Table 1.2 below shows what some researchers (and, for this work, the Chinese Government) have identified regarding specific benefits of such health technology adoption.

Table 1.3: Benefits of Digital Health Self-Monitoring Technology Adoption

Year	Author	Evidence
2008	Masters	Chronic disease increased, increasing pressure on the healthcare delivery system, cost increased, it is likely to decrease because of the ageing process.
2008	McGeady and Kujala	Information and communication technology can help to solve healthcare problems.
2009	Topacan and Daim	The devices can increase life expectancies.
2010	Ekeland and Flottorp	The healthcare supply side is affected by an ageing population (nurse and doctor shortage can be the main challenges), and these devices can relieve the burden on this side and facilitate more efficient and effective practice.
2005	Gezindeheidaraad	This health technology can support the patient outside the hospital, which can strongly reduce the risk of professional shortages.
2011	WHO	Sometimes patients and doctors are separated over a distance and information communication technology enables and supports communication between the two groups.
2006	Dutch National Think	Self-monitoring devices can be offered to support chronically ill patients and the elderly via self-management of them.
2007	Naess et al.	Evidence shows that patients with chronic obstructive pulmonary disease can improve

		their health condition if they use e-health devices.
2018	Chinese Government Website	Health delivery and patients' life quality are improved via these devices.
2021	Li and Chen	The adoption of digital health technologies can lead to substantial cost savings in healthcare.
2022	Wang & Liu	Digital health technologies have been shown to significantly improve access to healthcare in remote areas
2022	Zhang and Huang	Digital health data can provide crucial insights for improving healthcare services.
2023	Zhao et al.	Effectiveness of digital self-monitoring tools in managing chronic diseases like diabetes.

The integration of digital health self-monitoring technologies in China's healthcare system represents a substantial transformation, particularly relevant given China's unique social, cultural, and economic contexts. These technologies have been instrumental in enhancing healthcare access, especially in remote areas, as highlighted by studies from Wang and Liu (2022) and Zhao et al. (2023). This improvement is crucial for reducing geographical disparities in healthcare provision and is particularly vital in managing chronic diseases such as diabetes, which empowers patients through more personalized care.

In the economic realm, Li and Chen (2021) emphasize the cost-effectiveness of digital health interventions. By reducing healthcare costs, these technologies make healthcare more affordable and sustainable. This is particularly critical in China, where economic considerations play a significant role in healthcare decisions. The ability of digital health solutions to provide high-quality care at reduced costs aligns with the broader goal of making healthcare more accessible and sustainable. The use of data-driven insights from digital health technologies, as discussed by Zhang and Huang (2022), marks another significant benefit. These insights are instrumental in enhancing the quality of healthcare services and informing strategic planning and decision-making in health services. This approach reflects a shift towards evidence-based healthcare, where decisions are informed by real-time data and analytics, leading to more effective and efficient healthcare delivery.

Furthermore, the adoption of these technologies helps alleviate pressures on the healthcare system, a challenge accentuated by an aging population and the increasing prevalence of chronic diseases. As noted by Masters (2008) and Ekeland and Flottorp (2010), these technologies facilitate home-based health monitoring and enhance patient autonomy, thereby reducing the burden on healthcare facilities and addressing professional shortages. The ability to manage health conditions outside the traditional hospital setting is a critical step towards a more resilient healthcare system.

To be more specific, the adoption of digital health self-monitoring technologies in China is not just an enhancement of existing healthcare practices but represents a transformative approach that addresses the multifaceted demands of modern healthcare. This shift towards a more patient-centered and preventive healthcare paradigm aligns with global trends, adapting to the specific needs and challenges of the Chinese healthcare landscape. While numerous studies have highlighted the advantages of digital health technologies, much of this research has been conducted in diverse contexts without fully considering the unique aspects specific to China. This oversight is particularly relevant when evaluating these technologies concerning China’s distinct social and cultural contexts, as detailed in Table 1.3. Moreover, the economic background of China, which plays a crucial role in the adoption and efficacy of these devices, also warrants thorough consideration. Addressing these unique factors is essential for a comprehensive understanding of the impact of digital health technologies in the Chinese healthcare landscape.

1.4 China’s Economic Background

This disparity in healthcare access is particularly pronounced in rural areas, where healthcare resources are even more scarce. As a result, individuals in these areas may have to travel long distances to reach the nearest medical facility, leading to delayed treatment and increased healthcare costs. Moreover, a lack of trained medical professionals in rural areas can also pose a challenge, as doctors and nurses are often concentrated in urban areas. These issues underscore the need for innovative healthcare solutions that can help bridge the gap in healthcare access between rural and urban areas in China.

A resultant and yet another significant challenge facing the Chinese healthcare system from this economic background that influences the adoption of devices (e.g., different levels among different economic statuses and city concentration versus rural poverty) is that huge inequities exist within an already troubled healthcare system and there are significant implications of these regarding resources and overall healthcare for particular people. Indeed, the noted economic disparity in China extends to healthcare access and quality, with rural areas often lacking the necessary resources and infrastructure for quality healthcare services, which can make it difficult for individuals in these areas to receive regular check-ups and medical treatment. Besides being inaccessible or of limited quality, healthcare services are often unaffordable for many Chinese citizens, especially for those living in rural areas or on low incomes (Liu et al., 2017). The noted significant disparity in healthcare access, quality, and resources has led to a likewise disparity in healthcare outcomes, with those in rural areas often experiencing poorer health outcomes (Zhang et al., 2020). Interestingly, a key factor in this may be evidence of how important health self-monitoring devices are in this regard. Specifically, while the adoption of health self-monitoring devices has been growing rapidly in urban areas, this is not so in rural areas where people – perhaps consequently – are experiencing poorer health outcomes. An infrastructural contributing factor here is the internet, as a significant digital divide lingers between urban and rural areas in China. According to a report by the China Internet Network Information Centre (2021), the internet penetration rate in rural areas was only 38.4% in 2020 compared with 74.5% in urban areas (China Internet Network Information Center, 2021). This digital divide can limit the accessibility of health self-monitoring devices for patients from rural areas, who may not have access to the necessary technology or infrastructure to use these devices. Nevertheless, it would be naïve to focus on such access and infrastructural factors only as take-up also needs to increase where these are not an issue, which indicates other factors are also at play.

The devices themselves represent an important economic trend in the global healthcare industry, with the Chinese medical device industry being the second largest of its kind in the world where it has grown by 20.1% since 2015, indicating significant demand for and an early spike in the usage of these medical devices. However, this growth in health self-monitoring devices has not yet sufficed to address the myriad healthcare challenges faced by China, particularly in terms of penetration across its vast population, most notably in rural areas (Wang & Li, 2021). Consequently, broader adoption is imperative if the entire Chinese populace and the nation at large are to benefit from the capabilities of these devices, which empower individuals to monitor their health autonomously and take proactive measures against potential health deteriorations. Nonetheless, there remains a gap in understanding the nuanced strategies required to foster widespread adoption beyond the conventional approaches of improving access and infrastructure (Zhang et al., 2022). This is a prevalent issue both in general terms and in specific contexts, with China's unique social and cultural dynamics playing a pivotal role (Liu & Chen, 2023).

1.5 Chinese Sub-healthy Group

The sub-healthy (also named Suboptimal health status) group consists of individuals who do not have a specific disease but have a health status that is not optimal. The people within this overarching sub-healthy group represent a significant portion of China's very large population, and managing the health effects of these people can have significant benefits for both individuals and society, ultimately potentially reducing the number of chronic disease sufferers in China. Specifically, the term 'Chinese sub-healthy group' refers to a population of individuals who have physical, psychological, and/or social conditions that are not severe enough to be considered a disease or illness but are significant enough to cause discomfort or impair their daily functioning (Xu et al., 2020). The concept is often used in traditional Chinese medicine and health practices, where it is believed that identifying and addressing such sub-healthy conditions can prevent the development of more serious health issues in the future, which indicates a potentially massively significant opportunity in the prevention of many chronic diseases that are problematic both for individuals and for the country. This sub-healthy group includes, for example, individuals with conditions such as fatigue, digestive problems, mild hypertension and/or abnormal blood sugar levels, among others. These people are especially relevant in China because of the country's large population and the high prevalence of risk factors such as smoking, lack of sleep, unhealthy diets and air pollution besides sociocultural factors such as long working hours.

Indeed, work is a particularly pertinent factor in the healthy or otherwise lifestyles of Chinese people. In China, because of excessive working hours people often face the problem of not having enough free time to seek medical treatment, even if they fall ill. The pressure of work and lack of time off can make it difficult for people to prioritise their health, which is especially problematic in the case of chronic diseases as these require regular medical monitoring and attention. Furthermore, the annual leave regulation in China is not as generous as that in the UK, with many workers receiving only 4–10 days of leave per year. This lack of time off can cause or aggravate certain illnesses and make it even more difficult for people to seek medical treatment or to take care of their health in other ways, such as by exercise or relaxation, and they struggle to monitor a whole range of factors that could help them improve their health and/or avoid illness. Health self-monitoring devices can therefore facilitate this. Also, the medical journal noted that more than 70% of Chinese workers experience high levels of stress at work, with job insecurity and long working hours being major contributors. This stress can lead to a variety of health problems, including cardiovascular disease, high blood pressure, and diabetes. In addition, the prevalence of obesity and related health problems is increasing in China, with unhealthy diets and sedentary lifestyles being major factors. All these thus affect not only physical health but also mental health, leading to increased stress, anxiety and other psychological problems. The social uniqueness in China concerns this high prevalence of risk factors as well as the country’s significant socioeconomic disparities.

The sub-healthy group is a challenge for China because it represents a high proportion of the population, and its impact on the country's economy and healthcare system is extremely profound. According to some estimates, as much as 80% of China's very large population falls into the sub-healthy category (Ma et al., 2018), which can put a substantial strain on the healthcare system as well as the economy, as workers may miss more days of work because of illness and their medical costs can become a severe burden for families. Furthermore, addressing the needs of the sub-healthy group requires a shift in focus from treating illness to promoting wellness and preventive care, which has already been alluded to means the vast number of current chronic disease patients can be greatly managed while future numbers of these can be greatly reduced. This requires changes in lifestyle habits, such as exercise and diet, which can be difficult to implement on a large scale. Overall, the challenge regarding the overarching sub-healthy group in China requires a multi-pronged approach, including education, public health campaigns, and policy changes to address both the underlying social, economic, and environmental factors that contribute to these conditions and the factors that influence individual and even group adoption of self-monitoring health devices. By empowering individuals to take control of their health, these devices can – to stress the point – help improve individuals’ overall health outcomes and alleviate the burden on the healthcare system, but take-up needs to be encouraged.

However, this subject requires significantly more attention and research, and there is a need to generate innovative solutions. One possible general response is to promote self-monitoring of health through the use of wearable devices and health apps. These technologies can provide individuals with real-time data on their health status, allowing them to make informed decisions about their lifestyle and health behaviors. For example, a wearable device that tracks physical activity can help individuals set goals for increasing their daily activity levels and monitor their progress over time. Another possible means is to promote healthy work practices, such as reducing working hours and promoting work-life balance, to help reduce stress and improve mental and physical health outcomes. Providing education and information about the importance of regular medical check-ups, as well as the benefits of healthy eating and stress management, can also help China's public health drives. In addition, promoting physical activity behaviors can help individuals maintain a healthy weight and reduce the risk of chronic diseases, and health self-monitoring devices can be useful aids in terms of all such goals as well.

To address all these issues, it is important to encourage people to take better care of their health, both through lifestyle changes and the use of self-monitoring devices. These devices can help people keep track of their vital signs, such as heart rate and blood pressure, as well as other health metrics such as sleep quality and physical activity levels. By monitoring these metrics regularly, people can identify potential health issues before they become serious and take proactive steps to address them. This can also be important for people with existing chronic conditions, who may need to monitor their health more closely to manage their symptoms and avoid complications. Focusing on sub-healthy individuals herein and providing solutions to prevalent problems can therefore offer much to China and its citizens.

1.6 Research Aims, Questions, and Objectives

This thesis aims to critically analyse the factors affecting the acceptance and adoption of digital health self-monitoring devices from the perspective of a Chinese sub-health group.

As such, this study proposes the following research questions:

Q1: What factors impact customers' intention to use digital health self-monitoring applications among the Chinese sub-healthy group?

Q2: What are the relationships among the factors that determine the usage and intention to use?

Q3: How significant are the key factors, identified from quantitative surveys and qualitative interviews, to influence China's sub-healthy population in choosing to use digital health self-monitoring tools, and why?

Accordingly, the research objectives are as follows:

1. To critically review the literature on health technology adoption models among the Chinese sub-healthy group and explore the factors that influence their user behavior.

2. To implement a survey and interviews to gather primary quantitative and qualitative data on investigating the factors that impact health self-monitoring device adoption among Chinese sub-healthy groups.

3. To apply the primary data to identify the technical and psychological influences on user behavior towards health self-monitoring devices among Chinese sub-healthy groups.

4. To apply the primary data to evaluate the relationship between Chinese social characteristics and use behavior.

5. To identify factors and determinants that influence use behavior towards intention to use and explore the moderating effect that influences the relationship between user behavior and intention to use.

6. To propose a comprehensive model for understanding health self-monitoring device acceptance in China.

Considering all that has hitherto been outlined, the study proposes the following set of research hypotheses:

Table 1.4. Research Hypotheses

Hypothesis one (H1a)	Perceived Severity (PS) has a beneficial effect on Perceived usefulness (PU) towards self-monitoring digital health equipment.

Hypothesis two (H1b)	Perceived Severity (PS) has a beneficial effect on Perceived ease of use (PEU) towards self-monitoring digital health equipment.
Hypothesis three (H2a)	Cues to Action (CA) has a beneficial effect on Perceived usefulness (PU) towards self-monitoring digital health equipment.
Hypothesis four (H2b)	Cues to Action (CA) has a beneficial effect on Perceived ease of use (PEU) towards self-monitoring digital health equipment.
Hypothesis five (H3a)	Social Conformity (SC) positively impacts Perceived Usefulness (PU) towards digital health self-monitoring devices.
Hypothesis Six (H3b)	Social Conformity (SC) positively impacts Perceived Ease of Use (PEU) towards digital health self-monitoring devices.
Hypothesis Seven (H4a)	Trust in social media (TS) positively impacts Perceived Usefulness (PU) towards digital health self-monitoring devices.
Hypothesis Eight (H4b)	Trust in social media (TS) positively impacts Perceived Ease of Use (PEU) towards digital health self-monitoring devices.
Hypothesis Nine (H5)	The perceived usefulness (PU) of digital health self-monitoring devices has a positive impact on an individual's behavior and intention to use (IU) digital health self-monitoring devices.
Hypothesis Ten (H6a)	Perceived ease of use (PEU) of digital health self-monitoring devices has a positive impact on an individual's behavior and intention to use (IU) digital health self-monitoring devices.
Hypothesis Eleven (H6b)	Perceived ease of use (PEU) of digital health self-monitoring devices has a positive impact on the Perceived usefulness (PU) of digital health self-monitoring devices.
Hypothesis Twelve (H7a)	Age successfully moderates the relationship between perceived usefulness (PU) to behavioral intention to use (IU) health digital self-monitoring technologies.
Hypothesis Thirteen (H7b)	Age successfully moderates the relationship between perceived ease of use (PEU) to behavioral intention to use (IU) of health digital self-monitoring technologies.
Hypothesis Fourteen (H8)	The influence of Perceived Severity (PS) on behavioral intention to use (IU) is mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.
Hypothesis Fifteen (H9)	The influence of Cues to Action (CA) on behavioral intention to use (IU) is mediated by the perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.
Hypothesis Sixteen (H10)	The influence of social conformity (SC) on behavioral intention to use (IU) is mediated by the perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

Hypothesis Seventeen (H11)	The influence of trust in social media (TS) on behavioral intention to use (IU) is mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

Despite increasing interest in these devices and various researchers having identified benefits of these (see Table 1.2 above), there are limited studies on their adoption in China, which is a significant shortcoming regarding the intended goals of these devices and for understanding related important areas of concern. This research thus aims to address this gap by devising and employing an integrated research model to explore the technological adoption of health self-monitoring devices, especially among specific sub-healthy groups in China, but also, more importantly, to examine the impact factors on take-up and to identify ways this adoption rate can be improved among these sub-healthy groups in China. By developing an appropriate framework for assessing the adoption of health self-monitoring devices and showing but also proposing ways the take-up of these devices can be enhanced, this research can provide valuable insights into the factors that influence the adoption of these devices in China and provide ways to increase this and thereby help China overcome its serious dual health crisis.

1.7 Research Framework

This research explores and investigates the potential of health technology such as health self-monitoring devices (HSDs) and mobile applications to address the ongoing challenges in the Chinese healthcare system – including its need to monitor the daily health of sub-healthy groups and subsequently reduce the prevalence of chronic diseases and improve the overall health and well-being of society. Additionally, it addresses resource scarcity issues and the inefficiency of healthcare delivery institutions. To achieve these goals, it is essential to develop a comprehensive framework for increasing technology acceptance rates.

The famous model relating to this is the Technology Acceptance Model (TAM), which has been established as a useful tool for analysing the factors that influence technology adoption and behavior intention to use, though previous studies on this (e.g. Zhang et al. 2019) have primarily focused on user attitudes rather than exploring user intentions and the impact of various factors on adoption. Extant research has thus not focused on user intentions and the impact of various factors on user adoption, particularly in the healthcare sector and even more specifically regarding the adoption of HSDs among sub-healthy people China. There is therefore a significant research gap in terms of comprehensively examining the impact variables that contribute to technology adoption and their relationships using the Technology Acceptance Model (TAM) in this specific context. This study addresses this literature gap by developing a comprehensive framework for technology adoption that considers the impact of various factors on the adoption of HSDs among sub-healthy people in China and proposes ways to overcome inadequate take-up of the said devices. By analysing the impact variables and various related aspects accordingly, the ultimate intention is to further the understanding of individuals, service providers, medical health device suppliers, and the Chinese government on this subject and help them all respond accordingly and thereby contribute to addressing China's dual health crisis.

Following the aims, objectives, and hypotheses of this research, the research program has the following different phases depicted in Figure 1.1.

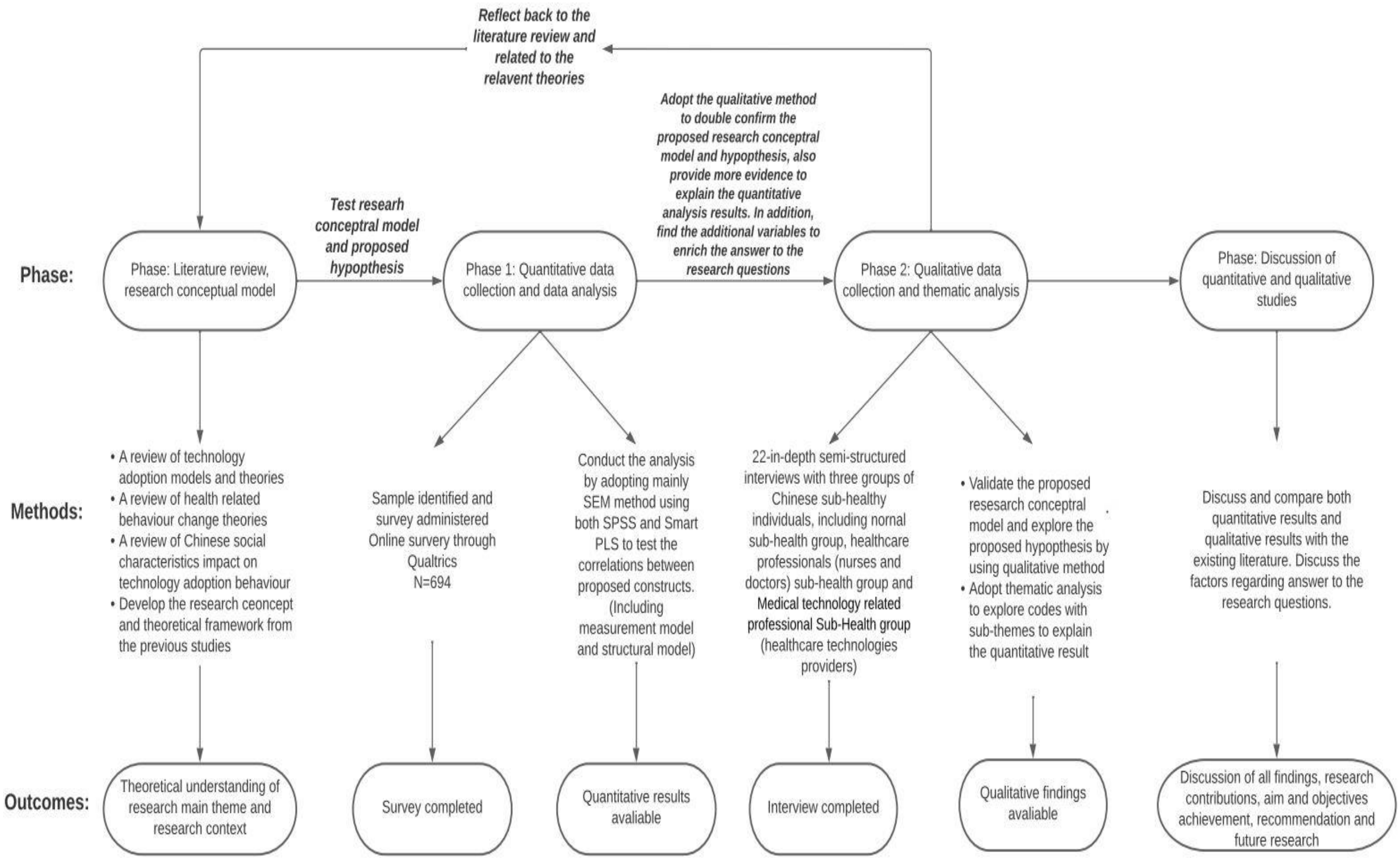

Figure1.1 Research Framework

In the first phase of this study, the researcher conducted a literature review to explore theories relating to health technology acceptance. The review covered a range of topics, including methods for technology adoption, theories of health-related behavior change, and the impact of Chinese social characteristics on technology adoption behavior. By examining previous research in these areas and generating ideas accordingly, the study sought to develop a research concept and theoretical framework for the current investigation.

The second phase involved a two-phase data collection approach. The first part of this adopted a quantitative method, whereby an online survey was administered to 694 participants. The survey was designed based on the proposed research conceptual model, and the data were analysed using the structural equation modeling (SEM) method. Both SPSS and Smart PLS software were used to test the correlations between the proposed constructs, including the measurement model and structural model. The main outcome of this phase was the availability of quantitative results.

The other part of the data collection process involved a qualitative approach, whereby in-depth, semi-structured interviews were conducted with three groups of Chinese sub-healthy individuals. The intention was to confirm the proposed research conceptual model and hypotheses while providing additional evidence to explain the quantitative analysis results and generate specific results via this particular process. The collected interview results were analysed using a thematic analysis, which involved identifying codes, themes, and sub-themes to explain the quantitative results. The main outcome of this phase was the availability of qualitative results, which were also used to evaluate the research conceptual model.

The third and final phase of the study involved analysing and discussing the quantitative and qualitative findings in themselves but also concerning existing literature. The intention here was to identify the factors that answered the research questions and to use the results to encapsulate the research contributions, make recommendations, and give directions for future research. This phase highlighted and discussed key elements that emerged from the study, including new insights, new theoretical frameworks, and new methodological approaches.

1.8 The Significance of this Research

The significance of this research is twofold. First, it will contribute to the existing body of literature on technology adoption by exploring the impact of various factors on the adoption of HSDs among sub-healthy people in China. This will help fill the noted research gap in this area via a comprehensive framework that considers the impact of various factors on technology adoption specifically in the form of health self-monitoring devices in China. Second, this study has significant practical implications. The healthcare sector in China is facing serious challenges relating to various factors, including an aging population, the prevalence of chronic diseases, and limited healthcare resources. Sub-healthy people’s adoption of HSDs in China can help address these challenges by reducing the burden on the healthcare system and improving the population’s overall health outcomes. By developing a comprehensive framework for the adoption of HSDs (see 1.7), this study will provide individuals, healthcare providers, medical device suppliers, and the government with a better understanding of the factors that impact technology adoption in this context and offer them means of implementing effective changes in practice. This can help to inform the development of policies, programs and interventions aimed at promoting the adoption of HSDs among sub-healthy people in China, ultimately contributing to improved health outcomes and a more efficient healthcare system.

This research endeavor is fundamentally justified by its potential to bridge critical knowledge gaps in the domain of digital health technology adoption within the Chinese context, particularly targeting the sub-healthy demographic. Amidst escalating chronic disease prevalence and pervasive healthcare disparities in China, this investigation emerges as both pertinent and timely. The study's emphasis on the sub-healthy group, a demographic segment that frequently remains underrepresented in health research, endows it with distinctive value. By scrutinizing the myriad factors influencing this group's engagement with health self-monitoring devices, the study is poised to make substantial contributions to both scholarly discourse and practical applications. It stands to inform policymaking in healthcare and guide technological innovation, ultimately striving to elevate health outcomes and operational efficacy within the Chinese healthcare milieu. The study's outcomes are anticipated to be instrumental in shaping public health strategies and fostering a more patient-centric, preventative healthcare framework.

1.9 Thesis Structure

Figure 1.2 above illustrates the four major phases in this thesis that evolve over eight chapters. The first of these, the introductory chapter, gives an overview of the research background, motivations, and objectives. Chapter 2 reviews the literature on technology adoption frameworks and the adoption of health self-monitoring devices in China as well as related research. Chapter 3 covers the development of health self-monitoring devices in China, while in Chapter 4 the research methodology, which includes the survey and interview procedures, is presented. Chapters 5 and 6 deliver the results of the quantitative and qualitative data analysis, respectively, and Chapter 7 discusses the findings, including the identification and analyses of impact factors and the development of the research model. Chapter 8 is the final chapter and provides recommendations for promoting the adoption and utilization of health self-monitoring devices in China but also concludes the thesis by summarising the research findings and suggesting future research directions.

1.10 Chapter Summary

This introductory chapter has established the background to and the importance of this research, which aims to examine the impact factors of technology adoption regarding health self-monitoring devices in China but also make research contributions as well as significant contributions in practice that can help China overcome its dual health crisis. By addressing the noted gap in the literature, this study can provide valuable insights into the adoption of these devices and inform the development of policies and strategies to promote their take-up and utilisation, which can have significant implications for improving individual health outcomes and reducing healthcare costs as well as helping Chinese healthcare overall. The next chapter will review the relevant literature on technology adoption frameworks and the adoption of health self-monitoring devices in China.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This chapter embarks on a comprehensive and detailed examination of scholarly literature focusing on technology adoption, with special attention to health-related technologies within the specific context of China. Additionally, before delving into the theoretical underpinnings of technology adoption, this chapter will provide an overview of the implementation of health self-monitoring devices in China. It will explore the evolution of these monitoring devices, detailing the types of products available and their functionalities.

The central theme of this chapter revolves around health self-monitoring devices, analyzing their development, user acceptance, and the challenges faced by the sub-healthy population in China regarding the adoption of these technologies. This analysis will be enriched by incorporating a multifaceted perspective that spans technical, cognitive, behavioral, and social dimensions. At the core of this literature review lies an in-depth exploration of seminal theories of technology acceptance, examined through the lens of behavioral science. This includes a comprehensive analysis of the Technology Acceptance Model (TAM) and its various extensions, as well as the Unified Theory of Acceptance and Use of Technology (UTAUT), critically appraising their applicability and relevance in the health technology domain, particularly within the unique socio-cultural landscape of China.

In addition, the chapter integrates complementary theoretical frameworks, such as the Health Belief Model (HBM) and Social Cognitive Theory (SCT), to offer a holistic understanding. These models are crucial in unraveling the complex factors influencing the adoption of health technologies by Chinese users, particularly from a cognitive perspective. This literature review not only assesses the relevant academic literature critically but also integrates insights detailing the evolution and current state of healthcare technology in China.

By merging theoretical discussions with the contextual backdrop of China's healthcare technology landscape, this chapter aims to establish a robust platform for the integrated conceptual framework used in this study. This framework is meticulously designed to examine the behaviors of Chinese users conceptually and empirically in embracing new health technologies. Through this integrated approach, the chapter seeks to make a significant contribution to the academic discourse on technology acceptance, particularly in the context of health-related innovations in China. It aims to bridge the gap between theoretical models of technology acceptance and the practical, developmental aspects of health self-monitoring devices in the Chinese setting. This approach paves the way for a comprehensive and nuanced understanding of the dynamics of technology adoption in this unique context.

2.2 Technology-Induced Healthcare System in China

Amid a massive $1.5 trillion investment plan as part of the 'Healthy China 2030' initiative, China aims to revolutionize its healthcare system through technological innovation. This unprecedented investment reflects China's commitment to achieving health equity and improving healthcare across its vast and diverse population. Despite its status as the world's most populous nation, China grapples with healthcare disparities, notably in resource allocation and availability, particularly outside major urban centres. Recognizing these challenges, there is a concerted push towards enhancing the market for health self-monitoring devices. Valued at around $2.2 billion in 2020 and expected to grow at a CAGR of 29.5% through 2028, this sector epitomizes China's response to its healthcare challenges. Key drivers include the rising prevalence of chronic diseases, heightened healthcare awareness, budget constraints, and the demand for home healthcare solutions, supported by government policies fostering healthcare industry innovation.

China's healthcare landscape is undergoing transformative changes, driven by an aging population, evolving lifestyles, and urbanization. Chronic diseases now affect over 300 million Chinese, necessitating a strategic reallocation of medical resources to manage this burgeoning issue. Key strategies include enhancing the hierarchical medical system, fortifying disease prevention and control, accelerating decentralization, and promoting comprehensive lifecycle medical services. Technology plays a pivotal role in realizing these goals, offering self-monitoring tools and professional guidance to foster disease prevention and support healthy lifestyles.

2.3 Overview of Digital Health Technologies in China

China's digital health technology landscape encompasses a broad spectrum of tools, from wearable health technologies to mobile apps. Recent advances include sophisticated wearable devices integrating health monitoring functions, ranging from simple wristwatches to high-end solutions like sensor-equipped contact lenses for tear glucose monitoring. The emergence of 'Internet Plus' healthcare in China symbolizes the intersection of technology with healthcare, propelled by mobile internet, cloud computing, big data, and AI. The market for digital health is on an upward trajectory, with increased adoption anticipated in coming years. This chapter delves into the nuances of wearable technologies, smartwatches, fitness trackers, medical devices, and skin patches, highlighting their advantages in the context of China's unique healthcare setting.

In China, the so-called Internet Plus health care is an emerging health service model with a cross-industry integration and application of information technologies, such as mobile internet, cloud computing, big data, and artificial intelligence. As we can see from Figure 2.1 the market size for digital health has been continuously increasing and expected to increase into 2025. It is expected that in China more people will be using digital health services and devices in the coming years.

Figure. 2.1 Digital health devices development

This research examines the attitudes of Chinese individuals towards sub-optimal health conditions, a term coined by the World Health Organization to describe a liminal state where individuals, despite negative medical tests, still experience various discomforts and pains. The research aims to explore the reception and adaptation of new digital health technologies among these individuals. Current studies indicate a preference among 80% of younger demographics for cutting-edge devices like smartwatches (Klonoff, D. C., 2015), whereas older demographics show a tendency to trust and use doctor-recommended health products (Steinhubl, S. R., Muse, E. D., & Topol, E. J., 2015). Furthermore, a significant preference for user-friendly technology is observed in the older population. This study includes Table 2.1, which outlines the prevalent wearable technologies within the scope of our research.

Table 2.1 Categories of health self-monitoring apps, digital wearables, and medical devices in China

Type	Properties	Capabilities	Application	Products
Online health apps	Easy to carry. On time health consultant Reduce the travel cost	1.Gives patients faster access to providers and care. 2.Improves medication adherence. 3.Makes remote patient monitoring possible and easy. 4.Increases medication reconciliation accuracy, which improves patient safety.	Operate an accelerometer, GPS, microphone, speaker, or phone camera to measure a user's wellbeing.	Ping A Good Doctor ; SoYoung; Chunyu Yisheng

		5.Improves provider communication and coordination		
Smart watch	Low operating power User friendly interface with both touch and voice commands	1.Fitness /activity tracking / sleeping monitoring 2.momunication Navigation Displays specific information	Business, administration Health monitoring Education Communication Sport recording	Apple; Huawei; Xiaomi; Samsung; Fitbit and other wearable devices
Fitness tracker	High accuracy Waterproof Easy to carry. Wireless communication	1.Physiological wellness 2.Navigation 3.fitness/activity tracking 4.Heart rate monitor 5.Bad habit warning 6.Gps	Fitness, healthcare, professional sport, outdoor/indoor sport, health condition monitor	Fitbit; Huawei; Oppo; Xiaomi, Amazon, Honor and Others
Medical device	Pain management Physiological tracking Glucose monitoring Sleep monitoring Brain activity monitoring	1.cardiovascular diseases 2.Physiological disorders 3.Chronic diseases 4.Diabetes 5.Surgery 6.Neuroscience 7.Dermatology 8.Rehabilitation	Fitness, cardiovascular medicine, psychiatry, surgery, oncology, dermatology and respirology	Glucometer; Apple watch; Fitbit; Blood pressure monitor

Skin Patches	Convenience: small and discreet Non-invasive Do not require needles or other invasive method.	1.cardiovascular diseases 2.Physiological disorders 3.Chronic diseases 4. Diabetes 5.Neuroscience 6.Dermatology 7.Rehabilitation 8.Others chronic diseases	Wound management, fixation of medical devices, and simple drug release.	iRhythm; Huinno; Samsung

Online health apps and health self-monitoring devices offer several advantages for users. Here are some of the key benefits:

Convenience: Online health apps and self-monitoring devices allow users to monitor their health from the comfort of their own homes. This eliminates the need to visit a doctor's office or hospital for routine health checks, which can be time-consuming and costly.

Cost-effectiveness: Online health apps and self-monitoring devices can be more cost-effective than traditional healthcare services, particularly for people with chronic conditions who require frequent monitoring.

Real-time feedback: Online health apps and self-monitoring devices can provide users with real-time feedback on their health metrics, such as blood pressure, heart rate, and glucose levels. This can enable users to make more informed decisions about their health and make adjustments to their lifestyle as needed.

Increased patient engagement: Online health apps and self-monitoring devices can increase patient engagement and empowerment by enabling users to take a more active role in managing their own health.

Data collection and analysis: Online health apps and self-monitoring devices can collect and analyse large amounts of health data, which can be used to identify patterns and trends in health metrics over time. This can help healthcare providers make more informed decisions about treatment and care.

Overall, online health apps and health self-monitoring devices offer several advantages for users, including convenience, cost-effectiveness, real-time feedback, increased patient engagement, and data collection and analysis. As such, they have the potential to revolutionize the way that healthcare services are delivered and improve health outcomes for individuals and populations.

Smartwatches are a popular type of health self-monitoring device that have several advantages, including:

Convenience: Smartwatches are worn on the wrist and are easy to carry around, making them a convenient option for health monitoring. They can be used to track various health metrics, such as heart rate, exercise, and sleep, without the need for additional equipment.

Accessibility: Smartwatches are becoming increasingly affordable and widely available, making them accessible to a large population. This has the potential to improve health outcomes for individuals who may not have had access to healthcare services previously.

Integration with mobile apps: Many smartwatches can be paired with mobile apps to provide users with a more comprehensive view of their health data. These apps can help users set goals, track progress, and receive reminders to stay on track.

Personalization: Smartwatches can provide users with personalized health insights based on their individual data. For example, they can suggest personalized exercise routines based on heart rate and fitness levels.

Early detection: Smartwatches can monitor health metrics in real time, enabling early detection of health issues. This can be particularly important for individuals with chronic conditions or those at risk for certain health problems.

Motivation: Smartwatches can provide users with motivation to adopt healthy behaviors by providing feedback and rewards for achieving goals. This can help to improve adherence to health programs and promote positive lifestyle changes.

Overall, smartwatches have the potential to be a valuable tool for health self-monitoring, providing users with convenient, accessible, and personalized health insights that can improve health outcomes and promote healthy behaviors.

Fitness trackers are a popular type of health self-monitoring device that can provide several advantages, including:

Monitoring physical activity: Fitness trackers can track various physical activities, including steps taken, calories burned, and distance covered. This information can help users set and achieve fitness goals, improve their overall physical health, and reduce their risk of developing chronic diseases such as diabetes and cardiovascular disease.
Monitoring sleep: Many fitness trackers can also track sleep, including the duration and quality of sleep. This can help users identify any issues with their sleep patterns and make adjustments to improve their sleep quality, which is important for overall health and well-being.

Providing motivation: Fitness trackers can provide motivation to users by setting daily goals and providing feedback on progress. This can help users stay on track with their fitness goals and make positive changes to their overall health and lifestyle.
Providing insights: Fitness trackers can provide insights into the user's overall health and fitness level, including heart rate, blood pressure, and other vital signs. This information can help users identify any potential health issues and take proactive steps to improve their health.

Supporting social connections: Many fitness trackers have social features that allow users to connect with friends and family members who also use the device. This can provide support and motivation to users and help them stay on track with their fitness goals.

Overall, fitness trackers can be a useful tool for people looking to improve their overall health and fitness. They provide valuable information and insights into the user's physical activity, sleep patterns, and overall health, which can help users make positive changes to their lifestyle and improve their well-being.

Medical device types of health self-monitoring devices have several advantages for individuals who are looking to monitor and manage their health. Some of these advantages include:
Accuracy: Medical device types of health self-monitoring devices are designed to be highly accurate and provide reliable data on various health metrics, such as blood pressure, blood glucose levels, heart rate, and body composition. This can be particularly important for individuals with chronic conditions who need to monitor their health metrics regularly.

Convenience: Many medical device types of health self-monitoring devices are designed to be portable and easy to use, which can make it more convenient for individuals to monitor their health on a regular basis. For example, a blood glucose monitor can be easily carried in a bag and used at home or on-the-go.
Customizability: Medical device types of health self-monitoring devices can often be customized to meet the needs of the individual user. For example, a blood pressure monitor can be programmed to take readings at specific times of the day or to provide alerts if readings fall outside a certain range.

Data tracking: Many medical device types of health self-monitoring devices come with mobile apps or other software that allow users to track their health data over time. This can be useful for identifying patterns and trends in health metrics, as well as for sharing data with healthcare providers.

Cost-effectiveness: In some cases, using medical device types of health self-monitoring devices can be more cost-effective than visiting a healthcare provider for regular check-ups. For example, a blood glucose monitor can be a one-time purchase, while regular visits to a healthcare provider can be expensive.

Overall, medical device types of health self-monitoring devices have several advantages that can make it easier and more convenient for individuals to monitor and manage their health. However, it is important to use these devices in conjunction with healthcare providers to ensure accurate and effective management of health conditions.

Skin patches have become increasingly popular as a type of health self-monitoring device due to their many advantages, including:

Non-invasive: Skin patches are non-invasive and do not require needles or other invasive methods to monitor health metrics. This can make them a more attractive option for people who are uncomfortable with needles or who have a fear of medical procedures.

Continuous monitoring: Skin patches can provide continuous monitoring of health metrics such as heart rate, blood pressure, and glucose levels, providing a more comprehensive and accurate picture of the user's health over time.

Convenience: Skin patches are small and discreet and can be worn on the skin for extended periods of time without causing discomfort or interfering with daily activities. This makes them a convenient option for people who want to monitor their health metrics while going about their daily lives.

Real-time data: Skin patches can provide real-time data on health metrics, which can be useful for people who need to make immediate changes to their behavior or medication based on their health readings.

Wireless connectivity: Many skin patches are equipped with wireless connectivity, allowing users to sync their data with mobile apps or other digital health platforms. This can help users track their progress over time and provide valuable insights into their health trends and patterns.

Overall, skin patches have many advantages as a type of health self-monitoring device, making them a promising option for people who want to monitor their health metrics in a non-invasive and convenient way. Telemedicine: Telemedicine has become increasingly popular in China over the past 10 years, particularly in rural areas where access to healthcare services is limited. According to a report by research, the telemedicine market in China grew from CNY 1.8 billion in 2014 to CNY 5.5 billion in 2018.

Artificial Intelligence (AI): AI has been used in China's healthcare system to improve the accuracy of medical diagnoses, develop personalized treatment plans, and automate administrative tasks. In 2018, the Chinese government launched an AI development plan that included a focus on healthcare. According to a report by Frost & Sullivan, the AI market in China's healthcare industry is expected to reach CNY 15 billion by 2022.

Wearable Devices: Wearable devices that monitor patients' vital signs, activity levels, and other health indicators have become increasingly popular in China over the past 10 years. According to a report by iResearch, the wearable device market in China grew from CNY 6.8 billion in 2014 to CNY 20.2 billion in 2018.

Electronic Health Records (EHRs): The Chinese government has launched a national EHR system that enables healthcare providers to access patients' medical records from anywhere in the country. According to a report by Frost & Sullivan, the EHR market in China is expected to reach CNY 11.6 billion by 2022. Big Data Analytics: China's healthcare system generates vast amounts of data, which can be used to identify patterns and trends in disease, treatment, and healthcare outcomes. Big data analytics has been used to improve the efficiency and effectiveness of healthcare services in China. According to a report by iResearch, the big data market in China's healthcare industry grew from CNY 9.7 billion in 2014 to CNY 26.5 billion in 2018.

Overall, digital health technologies have seen significant growth and development in China over the past 10 years, with a range of new technologies and applications emerging in the healthcare industry. The Chinese government has played a key role in supporting the development and adoption of these technologies, with the aim of improving the efficiency, quality, and accessibility of healthcare services in the country.

In session 2.2 and 2.3 provides a comprehensive overview of the context for the adoption of health self-monitoring devices in China. This includes a detailed discussion on the development of Chinese health self-monitoring devices and an exploration of the different types of devices available in the market. Moreover, this chapter also highlighted the advantages and disadvantages of using such devices in China's unique healthcare landscape. This will aid in scoping the target group for our study and designing suitable questionnaires and interview questions that can capture the nuanced factors that influence the adoption of these devices in the Chinese context. By providing this contextual background, we aim to contribute to the existing literature on health self-monitoring devices adoption in China and enhance our understanding of the factors that drive or hinder their uptake. These two sessions reviews different types of health self-monitoring technologies in China, which can greatly support sub-healthy and even healthy individuals in monitoring their daily health, and doctors encourage patients, especially those with chronic diseases, to use their home monitoring devices to control their ailments and improve their general health. Although these products can be used remotely and support the doctor's treatment, they cannot be used as an independent treatment method. Therefore, many individuals will not treat these technologies as necessary devices, but they may nevertheless be attracted to these devices for other reasons such as multi-functionality and social factors. (Yang Meier et al., 2020; Rehman et al., 2021)

2.4 New Technology: Intention to Use

Organisations often implement new technologies to optimise the performance and effectiveness of various work processes. Unfortunately, many technology-based devices and services never realise their full potential, while others get rejected bluntly (Burton-Jones and Hubona, 2006). Among the various implications of these failures and rejections are that failed investments in technology adoption can lead to not just financial losses but also stakeholder unhappiness (Venkatesh and Davis, 2000). As such, explaining and forecasting consumer acceptance of new technologies is critical. Researchers within the field of information systems therefore conduct much research into user acceptance of and intention to use such technologies, and within this they tend to focus on finding key drivers of technology adoption. In this regard, several theories and methodologies have been proposed over recent decades to hypothesise the causes of technology adoption (King and He, 2006; Venkatesh and Zhang, 2010), as will be explored.

The intention to use a new technology – that is, a user's desire to use technology in the future – has been deemed the endpoint in technology adoption models (Davis, 1989; Venkatesh and Davis, 2000; Venkatesh and Bala, 2008). Indeed, it has been used as the outcome variable in research because researchers have deemed it a reliable predictor of actual technology usage (Ajzen 1991; Turner et al. 2010). This intention to use a technology is thus a vital consideration for researchers. Hence, while TAM models incorporate intention to use as a mediating factor within the model from behavior intention to use to actual use (Davis, 1989; Venkatesh and Davis, 2000; Venkatesh and Bala, 2008), researchers' focus is sometimes only on the final decision to use. While this is understandably so in one regard, Jackson et al. (1997) argue that certain personal traits of users are significant, and these can be considered as important as or at least to relate to behavioral intention. For them, these traits should attract more attention, for this focus actually allows intention to be better understood, and it nevertheless relates to actual use anyway. Gaining a complete understanding is what helps predict intention to use, so focusing merely on this end outcome (intention) does not lend itself to such insight and could render efforts to do so as random, misguided and haphazard. While these authors investigate particulars of the relationship between personality traits and intention to use in the context of information systems technologies, this is missing for health technologies.

Nevertheless, Adams et al. (1992) define technology as the intention for a certain technology adoption. They also emphasise the importance of research on this intention, which perhaps suggests a similar focus on this end aspect. However, the authors add that it is necessary to gain more knowledge on the relevant factors that may foster or hinder the extent to which individuals *willingly* accept and adopt the technology in, for example, healthcare settings, which likewise advises careful study of other pertinent factors. In the noted context, specifically information and communication technologies in healthcare, technologies such as telemedicine, medical informatics and E-health themselves need more research, which suggests a lack of understanding both on these and how they can actually bring about desired results prevails. Intent as an outcome thus has many causal factors and complex, interlinked aspects.

From a user perspective, Wilson et al. (2014) note, also within the healthcare context, that intention to use is a positive movement towards a new health technology that usually relates to users deeming it to improve traditional routines, which is thus a related conception about intention. For these researchers, as an example, nurse and doctor shortages present difficult challenges that can drive the push towards a new means of health technology adoption in the future which can help address or at least alleviate the pressures from such circumstances. Specifically, health technology can support patients outside the hospital, which can significantly obviate problems with and risks from professional shortages. Even more specifically for this study’s focus, this can be important for disease prevention and to help individuals become aware of changes and benefits resulting from healthy lifestyles and behavior but also how to use technology to actually bring about such positive changes. What the authors illustrate is that having users conceive a practical or other real benefit encourages intention to use, which seems a perhaps obvious idea, but it is fundamental to intention.

2.5 Technology Adoption Models and Theories

As the previous section demonstrated, understanding technology users’ *process* for adopting technology and not merely focusing on the end outcome of this process is critical for innovators, especially given the uncertainty around the research and development of new technology and because a new technology’s unsuccessful market penetration can cause substantial wastes in human capitals and investments (UNCTAD, 2021). A prominent means of avoiding these severe consequences or at least alleviating them concerns Technology Adoption Models, which as the name suggests looks at such processes of user adoption and can thereby provide much required answers to key questions about how users accept new and uncertain technologies but also how they intend and decide to use them (Davis, 1989; Venkatesh and Davis, 2000; Venkatesh and Bala, 2008). In recent years, many other confounding factors have been studied in empirical research on technology adoption – for example, social norm, facility condition and technical privacy– and these have helped researchers improve descriptive theories (Doulani, 2019; Szajna, 1996; King and He, 2006; Atiquil Islam, 2011).

Substantial research has been conducted on understanding users' acceptance of, intention for and usage of new technologies, and numerous models have been established to these. Such models have been developed within multiple disciplines, including psychology, sociology and information systems. From all this, three major theories now pervade such research and practice have resulted: the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1990); the Technology Acceptance Model (TAM) (David, 1989); and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003). As, unlike with its two counterparts, in TRA the predictive or perceived behavior of users is not based on specific technologies (Madden et al., 1992) TRA is not suitable for this research. Therefore, the below sections present, explicate and analyse two major theories here: TAM, including its extension models, and UTAUT.

2.5.1 The Technology Acceptance Model (TAM)

The fundamental theory pertaining to users' acceptance of technology is the Technology Acceptance Model (TAM). While diverse models have been proposed, TAM is not merely the most popular in this area (Ha and Stoel, 2009; Taylor and Todd, 1995) but also, according to Bagozzi (2007), the gold standard in technology acceptance research. This is so because the original TAM proved to be robust in various applications that investigated users' use and acceptance of novel and risky technology specifically for computer use and predicted real use of information communication technology (Davis, 1989).

2.5.1.1 Defining TAM

The Technology Adoption Model (TAM), a theoretical model for predicting users' acceptance of technology, was originally developed by Davis (1989) and initially earmarked for use in the business and information technology sectors. In particular, the early model specification was based on Fred Davis's Theory of Rational Action (TRA) (1989), which been used in the field of psychology to explain and predict human behavior towards technology adoption. It was first introduced by Fred Davis in 1989 and is based on the assumption that individuals will adopt a new technology if they believe it will help them achieve their goals more efficiently than existing technologies or methods. The TRA model includes constructs such as perceived usefulness, perceived ease of use, and attitude towards technology, which are used to predict the likelihood of an individual adopting a new technology. The TRA model has been widely used in research on technology adoption and has been expanded upon and modified over time to better fit different contexts and technologies. TAM is therefore about forecasting and evaluating actual usage of an innovative technology in order to determine various effect variables that contribute to service users' acceptance or rejection of a technology, as portrayed in Figure 1 (Davis, 1989; Davis et al., 1989). According to this model, service users' perceptions of perceived ease of use (PEU) and perceived usefulness (PU) influence their behavioral intention to use the technology, and these in turn influence their decision of acceptance (or rejection). Unlike previous behavioral models in the field that initially utilise attitude in their model, in TAM this is replaced with behavioral intention variables to obtain a direct effect of PU on actual usage.

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Figure 2.2 The Technology Acceptance Model of Davis (1989)

Perceived Usefulness (PU)

Perceived usefulness is generally considered the most significant indicator of a user's intention when they are interacting with a particular technology and concerns "the degree to which a person believes that applying a certain system would enhance his or her job performance" (Davis, 1989: 320). Perceived usefulness actually refers to a range of benefits and favourable effects individuals perceive they gain as a result of using a technology, and such perceptions may be a strong predictor of intentions and actual use. Giving a specific case, Davis (1989) says that service customers are encouraged to achieve exceptional performance through different types of promotions, bonuses and other incentives. For example, if a technology application is implemented inside an organisation, the most compelling motivation may be an increase in job performance or a pay boost. In the healthcare context, PU concerns the degree to which a person feels that adopting digital healthcare services will benefit the service user in the m-Health theoretical idea. If patients and doctors feel that m-Health services will benefit their lives, work performance and productivity, then this will increase their intention to use. Overall, then, when consumers perceive a system as simple to use, helpful in performing their duties and activities, efficacious in terms of processes and results, and positive in terms of an enjoyable experience while using it, then they will more likely adopt it.

Perceived Ease of Use (PEU)

Davis (1989) investigated the variables and concluded that perceived ease of use, which is the user's perception of whether the revolutionary technology is simple to employ, is also a significant influencing factor on intentions to use and technology acceptance. As Figure 2.1 above shows, perceived ease of use may have a direct effect on a user's attitude. Specifically, if a person has difficulty in operating a new technology, this may generate a significant negative effect on the individual's behavioral intention (and vice versa). Moreover, for Davis, perceived ease of use may have an immediate effect on perceived usefulness. Recent research on TAM by Ma Ying-jeou and Liu (2004) corroborates this early conclusion, although they discovered a larger association between perceived usefulness and actual usage than Davis did. Basically, as one might expect, the easier its use is perceived then the more likely it is to be accepted, and the negative inverse similarly prevails. In King and He’s (2006) meta-analysis of 88 TAM applications, which includes 12,000 observations, perceived usefulness strongly influences behavioral intention and thus likely plays a significant role in predicting the ultimate acceptance rate.

Shroff et al.’s (2011) results verified TAM’s original contributions noted above but also partly substantiated perceived usefulness and perceived ease of use as key drivers of predicting the IS system implementation which may support technology developers in directing users’ views about the system. Consequently, these metrics (i.e. perceived usefulness and perceived ease of use) can forecast behavioral intentions and actual use of a certain technology. On another aspect, one of the study’s primary features is that the determinants of attitude may directly influence behavior but are unrelated to actual use, which can be modified afterwards. Although attitude influences future behavior or serves as a cause of intention that ultimately results in certain behaviors, it actually refers to the evaluative effect of an individuals' positive or negative feelings when performing a particular behavior. As such, it can have an effect only on the user's behavior and not actual use (Shroff et al., 2011).

Overall, most scholars acknowledge the TAM model as the most popular model in this area (e.g. Horton et al., 2001; Taylor and Todd, 2001; Bogozzi, 2007; Chandel, 2013), but despite such consensus these authors nevertheless differ on certain approaches to and specifics on TAM, even regarding criticisms of it within such general overall acceptance. While certain previous research focused only on specific obstacles associated with certain technologies (Taylor and Todd, 2001), for example, Bogozzi (2007) somewhat passionately makes the point that the TAM is oversimplified and hence incapable of analysing empirical factors, doing so by citing other work that covers specific examples of this including system acceptability (Handy et al., 2001); job relevance (Liang, Xue and Byrd, 2003), training (Escobar-Rodríguez, Monge-Lozano and Romero-Alonso, 2012), social influence (Holden et al., 2016), and perceived service level and trust (Hong, Zhang and Liu, 2021). The absence of critical factors may have a detrimental effect on the accuracy of the TAM implementation outcome. As LaMorte (2017: 122-125) argues, "TAM was established outside of healthcare, and so some of its fundamental principles and metrics may look irrelevant to healthcare investigators." However, academics acknowledge it as a legitimate and highly reliable prediction model, which can be broadly applied across many real-life scenarios (Legris et al., 2003; Sharma and Chandel, 2013). This research also contributes by developing scale measures to quantify factors relevant to healthcare.

Overall, the burgeoning body of research on the usage of information systems adopts a range of theoretical viewpoints. Among all the theories, the TAM has emerged as the most frequently used model for examining the variables that determine consumers' adoption of innovative technological solutions, but it is not infallible. Hence, it is useful to examine its disadvantages and advantages.

2.5.1.2 Critiques on TAM: Disadvantages and Advantages

Numerous studies have shown the usefulness of technology acceptance models (e.g. Holden et. Al.2003). This modelling strategy, however, has certain drawbacks. Firstly, Legris et al. (2003) argue that the TAM effect can be extended to neither perceived usefulness nor perceived ease of use, and the causes for the perceived usefulness and perceived ease of use prediction effects are difficult to identify. Secondly, the same authors argue that TAM focuses only on voluntary situations and ignores obligatory settings, yet no factors in the model might/can be used to predict the impact of required or voluntary usage. The primary complaint is that methods on testing users' technology acceptability rely too much on self-reported data (Wang and Goh, 2017; Malatji et al., 2020). According to Legris et al. (2003), self-reported data is subjective and unreliable for assessing a system. Additionally, the authors advocate that technology adoption is applied to business operations in real-world company contexts rather than to laboratory settings or to students. Acceptance studies of technology conducted on participants in controlled situations, such as with students or other small closed and supervised groups, cannot be generalised to the actual world (Lee et al. 2003).

Bagozzi (2007) raises concerns about the lack of theoretical connections among the TAM's many elements. The author additionally criticises the strength of the connection between desire to use a system and actual usage, implying that behavior cannot be regarded as a genuine objective. Also, for Bagozzi (2007), an intention may not be indicative of actual usage, since the linkage between intention and adoption might be uncertain and other variables influence a user's choice to utilise a technology.

Hong et.al., (2015) redefined research instruments in the form of structured questionnaires are often used in testing technology acceptance models, with the objective of measuring the targeted population's attitudes. While this technique enables the collection of uniform data and the drawing of conclusions, by including open-ended questions in the model additional information about users may be gathered.

Despite the TAM's broad acceptance and frequent use, it has also been broadly criticised, and this has led the founders to try to re-explain it. Criticisms to the original TAM as a 'theory' include it having contentious heuristic value, restricted descriptive and foretelling capability and a certain triviality, besides being short of any practical value. Owing to these concerns, various researchers have independently endeavoured to extend TAM so that it can adapt to continually changing information technology environments, which bring a state of theoretical uncertainty. Some researchers have gone through the limitations of TAM implementation in an organisational setting and indicated that better predictive capability can be reached even with the easy, simply applicable model when exact first screening methods are implemented (Venkatesh and Davis, 2000). As a result, the basic TAM model needs extending, and the next section shows various research on extended TAM models in conjunction with their own contributions.

2.5.2 Extension Models to TAM: TAM2 and TAM3

Venkatesh and Davis (2000) developed an extension model of TAM called TAM2, which is depicted in Figure 2.2. TAM2 comprises social influence, which is also known as the subjective norm, voluntariness and image, and the cognitive instrumental factors of job relevance, output quality, result demonstrability and perceived ease of use as determinants of perceived 56 usefulness and usage intentions. TAM2 explains between 37% and 52% of variance in usage intentions, while TAM3 adds more explanatory variables such as anchor indicators relating to the technology and perceptions about enjoying the use of the technology to TAM2 as shown in Figure 2.3.

TAM2 was tested with the data collected from four different systems at four organisations, with a sample of 156 respondents employing an approach: two of these organisations have longitudinally studies and use of the systems is voluntary, while this is mandatory in the remaining two systems. This extended model is strongly supported for all four organisations, with 40%–60% of the variance in usefulness perceptions explained and 34%–52% of the variance in usage intentions explained. In TAM2, social influence, cognitive instrumental and perceived ease of use significantly influence user acceptance. These findings have provided a foundation for future research in understanding user adoption behavior. However, the sample sizes are less than 50, which may reduce the power of significance tests (Venkatesh and Davis, 2000).

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Figure 2.3 Technology Acceptance Model 2 (TAM2) (Venkatesh and Davis, 2000)

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Figure 2.4 Technology Acceptance Model 3 (TAM3) Venkatesh and Bala (2008)

TAM2 and TAM 3 consider that other factors besides perceived ease of use and perceived usefulness influence user behavior. Specifically, the models suggest that subjective norm, image, job relevance, output quality, result demonstrability and technology specifications are also important factors in determining usage behavior with a new technology. Moreover, these are moderated by experience and voluntariness. Notably, TAM2 and TAM 3 are complex models that put the emphasis mostly on the use and acceptance of a new technology in the context of an organisation whereas the current research investigates ordinary users for their acceptance of new health technologies. Therefore, this research is interested in users' beliefs and social environment rather than the organisational context that surrounds them. Hence, this research will integrate the original TAM with UTAUT borrowing social influence element of the model and health belief model to achieve this aim.

2.5.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

Within TAM and TAM2 certain variables and technical predictors can usually be applied to certain technologies instead of all. Both also provide a broad framework, so additional extension technology acceptance factors may be added to the model as long as they are theoretically appropriate and represent evidence-based judgements. In recent years, though, technology adoption has encompassed alternate models and provided more powerful ones. One of these models, namely UTAUT, is explored in the following sections.

Venkatesh et al. (2003) argues, based on analyses of alternative models as discussed above, that researchers were confronted with many similar constructs offered by numerous theories, and the authors set about picking and choosing constructs from certain models or selecting commonly used models to explore and analyse, meaning that, consequently, some other models were ignored. As a result, the propositions several acceptance models advanced were consolidated (e.g. TRA, TAM and TPB) (Venkatesh et al 2003) and new information on technology acceptance-and-use models resulted, with the authors having the once perhaps lofty goal of unifying eight key but often conflicting information technology acceptance and usage models. The resultant paradigm has been named the Unified Theory of Technology Acceptance and

Use (UTAUT). This effectively incorporates the main features of most (but not all) prior models, and it accounts for far more diversity in IT behavioral intention and user behavior than other models alone. More specifically, the UTAUT can account for 69% of intentions to utilise IT (technology acceptance), while earlier models accounted for around 40% of technology adoption (Venkatesh et al., 2003; Venkatesh et al., 2012).

The UTAUT model was established in the corporate settings (banking, accountancy, entertainment and telecommunications services) of a Western industrialised nation (the United States of America). The basic UTAUT model (Fig. 2.4) is composed of various components and constructs that relate to an individual's desire to utilise information technology, which in turn can help predict actual usage of information technology. In this model, 'performance expectation' is defined as an individual's belief that using health information technology helps improve work performance. It also contains similar constructs to others. 'Effort expectation', for example, is the degree of ease with which health information technology may be used, and this is comparable to TAM's perceived ease of use construct. In fact, Venkatesh et al. (2003) did include actual concepts from several other models into their construct, including perceived usefulness, outcome expectation, relative benefit, job-fit and extrinsic motivation, though they also introduced novel constructs into it. The term 'social influence' is one, which refers to the degree to which an influencer influences others to adopt health information technology and concerns the idea that an individual's behavior is significantly influenced by how others perceive the usage of health information technology, though this has not remained a unique provision. Via this concept, Venkatesh et al. (2003) encouraged technology acceptance models to introduce subjective standards into their own models. Through this, the impact of social influence on intention to use technology has been shown to be substantial in multiple earlier acceptance studies. and it subsequently showed this to be particularly so for those involving professionals with a high degree of autonomy such as doctors, who in one study demonstrated a non-significant effect (Pai and Huang, 2011). One significant distinction between UTAUT and its predecessors is that the former offers four moderators (gender, age, experience and voluntariness) to increase the model's predictive power.

Since the introduction of UTAUT, individuals have often utilised this model to explain the uptake of technology. Generally, though, existing research does not use the whole

UTAUT model as described by Venkatesh et al (2003). Venkatesh et al. (2012) later made a similar conclusion, noting that most research used just a portion of the model and, in those that did use modifiers, many often omitted them. Among the studies that incorporated moderators, only a few integrated the original UTAUT model's four moderators (i.e., Fadel, 2007; Bhattarai et al., 2010; Venkatesh et al. 2011; Bandyopadhyay and Barnes, 2012). A possible reason for this is that the moderator may be unvarying across adoption and usage contexts. For example, firstly, the adoption and usage of a particular information system or information technology may have been required by the organisation, requiring all people to use the technology – a circumstance in which voluntariness as a moderator may be difficult to apply. Secondly, to increase the usage rate the linkages established in the original UTAUT model may be reviewed. Venkatesh et al. (2003) said that enabling environments should predict behavioral intention only if effort expectation is excluded from the model. This was in contrast to past theories of technological adoption, which clearly modelled the link between enabling factors and behavioral intention. Prior research indicates that enabling environments influence behavioral intention even when effort expectation is present (e.g. Yeow and Loo, 2009; Duyck et al., 2010; Foon and Fah, 2011). Finally, the original UTAUT model may be revisited in light of other dimensions, which may help explain people's adoption and use behaviors. The four constructs in the UTAUT model (gender, age, experience and voluntariness) can be interpreted as representing technology attributes (i.e. performance expectancy and effort expectancy) and contextual factors (i.e. facilitating conditions and social influence), even when interpreted as individual perceptions of the technology and context.

2.5.3.1 Defining UTAUT

UTAUT greatly differs from TAM and its derivatives as different indicators have been added to the former model (and some Tam indicators have been modified and renamed), but this is the main means by which it complements TAM and its extension models.

Performance Expectancy

Venkatesh et al. (2003: 447) define performance expectation as "the extent to which a person feels that using the system would enable him or her to improve work performance". Several scholars claim that the biggest predictor of intention is performance expectation (Davis, 1989; Davis et al., 1989; Venkatesh and Davis, 2000). Venkatesh et al. (2003), however, argue that this is not so and even that gender and age characteristics might decrease the influence of performance expectation on intentions. Specifically, the authors say that performance expectations have a modest impact on intentions but also that the effect is larger for men, especially younger male technology users. Morris and Venkatesh (2000) and Venkatesh and Morris (2002) also discovered gender and age disparities in technology acceptability in the sense that men often demonstrate a stronger inclination towards adopting new technologies based on perceived utility, whereas women tend to be more influenced by the perceived ease of use and social influences. Additionally, younger individuals are generally more receptive to adopting new technologies, driven by a curiosity and openness to change, while older users may exhibit reluctance, often due to a lack of familiarity or perceived complexity. As such, gender and age may act as moderators of the performance expectation construct, influencing how these demographic groups perceive and react to the anticipated benefits and functionalities of new technological solutions.

Effort Expectancy

For Venkatesh et al. (2003: 450), effort expectation is “the ease with which a system may be used”. The authors converted TAM’s perceived ease of use to UTAUT’s effort expectations using data from Venkatesh and Morris (2000), Venkatesh et al. (2000) and Morris and Venkatesh (2000). Smith & Johnson, (2018) also hypothesised that effort expectations would be a higher predictor among women, especially those who are older and have minimal work experience (with limited exposure to technology). Therefore, the effort expectation construct may be influenced by factors such as gender, age, and experience (Davis & Lee, 2019; Nguyen, 2020)."

Social Influence

Venkatesh et al. (2003) defines social influence as an employee's impression of whether others in positions of authority feel the employee should utilise the new system. TAM2 represents social impact as a direct driver of behavior as a subjective norm. Each of these constructs (social influence and social impact) is alluded to in various technology acceptance models but they represent the same idea: an individual's behavior is influenced/impacted by how they feel key individuals in the workplace will perceive them. This is strongest in compulsory contexts during the early phases of experience but diminishes over time (Hartwick and Barki, 1994; Agarval and Prasad, 1997; Venkatesh and Davis, 2000). Also, women have been observed to be more receptive to the thoughts of influential individuals (Morris and Venkatesh, 2000; Venkatesh et al., 2000; Venkatesh and Morris, 2000), and Venkatesh et al. (2003) say that social influence has a greater impact on intentions among older women. This impact is more pronounced in required situations and among less experienced personnel. As a result of complicated relationships, this social concept is influenced by gender, age, voluntariness and experience.

Facilitating Conditions

Morris and Venkatesh (2000) define enabling circumstances as employees' conviction that the organisation's technological and organisational infrastructure would support system utilisation. According to Venkatesh (2000), the influence of enabling environments on intentions is mediated by effort expectation and becomes greater over time. When performance and effort expectations are present, enabling factors have little influence on intentions. Facilitating circumstances are expected to have a greater influence with experience and age, implying that older employees place a higher premium on obtaining support and assistance on the job. As a result, age and experience act as moderators of the enabling circumstances variable. The authors' first experiments established substantial empirical support for the model, with the model accounting for 70% of variation in intentions and 50% in actual usage. UTAUT identifies direct drivers of the elements influencing people's intents to utilise the system (performance expectation, effort expectancy and social influence) as well as behavioral determinants (facilitating conditions and intentions). The original UTAUT model includes moderators such as gender, age, prior job experience and voluntariness.

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Figure 2.5 Unified Theory of Acceptance and Use of Technology (UTAUT) Venkatesh (2013)

2.5.3.2 Critiques to UTAUT: Advantages and Disadvantages

Although most researchers believe UTAUT reaches its practical limit in explaining individual technology adoption and usage choices in businesses (Venkatesh et al., 2003), UTAUT-based research persists (Venkatesh et al., 2012) as/so it still seems to offer much. Specifically, various studies use UTAUT by either combining it with other theories or expanding it to analyse diverse technologies in both organisational and non-organisational contexts. Also, the continued growth of UTAUT-based research can support the proliferation and diffusion of new ITs, such as enterprise systems (Sykes et al., 2014; Sykes, 2015), collaboration technology in knowledge-intensive firms (Brown et al., 2010) and mobile Internet for consumers (Thong et al., 2011; Venkatesh et al., 2014). In contemporary society, Information Technology (IT) permeates nearly every aspect of daily life, witnessing widespread utilization across a diverse array of circumstances. The past decade has marked a notable upsurge in the emergence of novel IT solutions, accompanied by an expansion of scholarly inquiries grounded in

the Unified Theory of Acceptance and Use of Technology (UTAUT) across multifarious domains. These investigations have traversed sectors such as healthcare technology adoption (Jones & Williams, 2016), the integration of educational technology (Anderson & Liu, 2017), and the digital transformation of workplace environments (Green et al., 2018). Consequently, the field of Information Systems (IS) finds itself at an inflection point, contemplating the prospective trajectory of UTAUT. Particularly, there is a burgeoning interest in discerning the potential theoretical advancements that could emanate from further explorations into the nuances of technology acceptance and utilization (Taylor & Smith, 2019; Patel & Patel, 2020)."
Systematically evaluating the contributions of existing UTAUT-based studies can reveal the utility of UTAUT as well as the limitations of existing UTAUT-based research, from which a new framework of technology acceptance and use can be developed with the goal of charting promising future research directions (Wilson & Johnson, 2021; Patel & Kumar, 2022).

2.6 The Health Belief Model (HBM)

2.6.1 Defining HBM

The Health Belief Model (HBM) was originally developed in the 1950s by Hochbaum (1958) to explain health behavior change, and it can be used to predict people's reactions and behavioral changes in relation to disease prevention. It is specifically about explaining the reason that health behaviors change or do not alter in response to medical developments at a certain time, with the original context for this being the USA (Rosenstock et al., 1988; Kirn 1991). HBM is thus a widely used theoretical framework for exploring health intervention uptakes and user behavior in a way that facilitates the planning and designing of prevention strategies (Vincenzo et al., 2022). In fact, HBM is the most widely used model in behavioral health research (Farajzadegan et al., 2016; Bay and Dönmez, 2017; Sari, 2018) and in the health-related technology adoption arena in particular, as it is also regularly used to forecast and explain health-promoting behavior in relation to various health-related digital technologies (Pai and Huang, 2011; Kim and Park, 2012; Abdul Razak Munir, 2013; Tsai, 2014; Ahadzadeh et al., 2015).

HBM formalises the relationship between health beliefs, attitudes and behaviors and has a guiding principle of rational decision-making (Balbach, 2006). While it is based on psychological theories concerning decision-making and is about accounting for individual choices among different behaviors (Maiman and Becker, 1974), it also recognises that choices must account for non-cognitive influences on attitude formation (Fishbein and Middlestadt, 1995). It therefore closely relates to the technology acceptance models, which serve as theoretical foundations for attitudes and subsequent behaviors explored in respective TAMs (Koch and Zhu, 2005). Comparably, HBM achieves an overall better fit in predicting health-related behavior (Rosenstock et al., 1988). Rosenstock (1974) used the concept of 'health belief model' to refer to a concept developed from 'stimulus response' and 'cognitive theory', which integrate classical and instrumental conditioning concepts in an attempt to characterise behavior in uncertain situations.

In the area of adopting health-related information technology, several researchers have integrated the Technology Acceptance Model (TAM) with the Health Belief Model (HBM) to predict individual intention to use (e.g. Tsai, 2014; Ahadzadeh et al., 2015; Cho et al., 2020; Silva et al., 2022). There is a certain complement to the two models, which perhaps indicates why many have used both together: while the TAM evaluates information technology users' behavior from the technology perspective in relation to good performance (e.g. perceived usefulness and perceived ease of use regarding intention to use a technology), the HBM also evaluates health-related behavior but does so in relation to how this changes from subjective assessment of an individual's perceived severity to a health risk and an individual's consciousness towards health. Using both can therefore give a more comprehensive picture and provide more accuracy in terms of explaining the user's adoption behavior.

According to Janz and Becker (1984), the main constructs in HBM are mainly based on the following: (1) perceived susceptibility towards an individual's health condition; (2) perceived severity of the health condition; (3) perceived benefits of implementing the recommended action; (4) perceived barriers to changing unhealthy behaviors; (5) cues to action to be taken in the preventive health behaviors; and (6) self-efficacy to engage in the prevention-health behavior. These are loose constructs, as they are modified by different researchers based on different health conditions and contexts; also, more integrated factors have been considered such as perceived health risk and health consciousness (Kwatubana and Kheswa, 2014; Ahadzadeh et al., 2015; Khumros et al., 2019). However, although these factors are modified according to the health condition and other aspects, the fundamental premise of HBM is that, in the absence of symptoms, people will generally not take their health or preventative measures that seriously unless they are mentally prepared to do this (e.g. they feel susceptible to a disease) (Herold, 1983). The HBM therefore implies that a belief in a health risk is predictive of health behavior (Kirscht, 1974). Individuals who perceive a potential health risk are more motivated to change and adopt a certain health-oriented behavior, such as wearing a device to control and monitor an actual health condition or merely a perceived health risk, with examples including health information technology, wearable devices and self-monitoring devices, to satisfy health-related information and communication requirements (Kasl, 1974; Potnis et al., 2017 Huarng et al., 2022). Two factors lead to such a perceived health risk: perceived illness susceptibility and perceived severity of sickness. The former concerns "beliefs on the possibility of contracting a disease or condition" (King, 1983: 263); the latter concerns "evaluations of both medical and clinical implications (e.g. mortality, disability, and pain) and potential social repercussions (e.g. the impact of the condition on employment, family, and social interactions)" (Herold, 1983: 21-24). Indeed, perceived severity is the most important and well implemented predictor on health behavior changes. This impact factor can therefore predict health behavior adoption from a physiological perspective. Cues to action can as well and, in the context of health-related technology adoption, cues to action also play an important role and are indications that impact an individual's desire to utilise a certain product or technology (Mattson, 1999). They might arise from social influence, personal experience or certain possibilities for change (Vincenzo et al., 2022). The HBM postulates that individuals need a signal to participate in a health behavior action (Yaoet al., 2021), so such cues may be a prerequisite for individual change (Kasl,1974).

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Figure 2.6 Health Belief Model (Rosenstock, I. M. (1974)

2.7 Social Cognitive Theory (SCT)

2.7.1 Defining SCT

Social cognitive theory (SCT) is a psychological perspective on human functioning that emphasises the critical role played by the social environment on motivation, learning and self-regulation (Schunk and Usher, 2019). This is another theory that also influences individual health behaviors, with pertinent factors here being individual experiences and cognitions, the actions of others and circumstances in the external environment. Social cognitive theory facilitates social support through setting expectancies and self-efficacy, and it uses observational learning and other forms of reward to effect behavior change. It demonstrates wide applicability within psychological disciplines and in other fields such as education, business and health, and the theory's predictions are tested in many research studies across diverse contexts.

Originating with Bandura (1986), social cognitive theory has become a fundamental resource in clinical, educational, social, developmental, health and personality psychology. It has been applied to diverse aspects such as school achievement, emotional disorders, mental and physical health, career choice and socio-political change. According to social cognitive theory, human motivation and action are extensively regulated by forethought. This anticipatory control mechanism involves expectations that might refer to outcomes in terms of undertaking a specific action. The theory outlines several crucial factors that influence behavior. For instance, perceived self-efficacy, as one of the factors, relates to people's beliefs in their capabilities to perform a specific action that is required to attain a desired outcome.

Indeed, the social cognitive model is regarded as one of the most widely used and robust health behavior change theories of contemporary times. It emerged from social learning theory, which postulates that people learn from their own experiences and by observing the experiences of others. Three major constructs in this theory interact with each other to influence behavior: personal factors (age, cognitions, previous experience with the behavior, etc.), environmental factors (access to resources, safety, support from family/friends, etc.) and aspects of the behavior itself (vigour of the behavior, outcomes achieved as a result of practising the behavior, competence with the behavior, etc.). Successful efforts to change behavior depend on identifying positive supports but also detractors in each of the three constructs. For example, if a therapist is managing the physical or occupational therapy services of a patient who has multiple sclerosis and this patient is motivated to be physically active but does not have a safe place to walk or be physically active near home, the patient will not likely be able to perform physical activity consistently. If the same patient works for an employer who provides an onsite gym, the patient could negotiate with his or her supervisor to utilise the gym and thus become physically active a few days a week.
Among the numerous additional constructs within Social Cognitive Theory, several stand out as particularly worthy of further exploration. Albert Bandura (1986) highlighted self-efficacy (Bandura, 1997) as a crucial factor, defining it as an individual's confidence in their ability to perform a specific behavior. This concept is instrumental in influencing behavioral change, as it has been shown to predict the level of effort an individual is willing to invest in learning and practicing a behavior, the persistence they display throughout the process, and their resilience in overcoming obstacles. Notably, self-efficacy is behavior-specific, which implies that an individual's confidence in their ability to perform one behavior does not necessarily translate to confidence in performing a different behavior (Smith & Taylor, 2020). This specificity is pivotal in understanding and fostering behavior change in various contexts.

In the realm of neurological rehabilitation, therapists deeply understand the importance of self-efficacy. Here, patients engage in learning or relearning movement strategies following neurological injuries, demonstrating how repetition, incremental steps, verbal persuasion, and observational learning collectively contribute to building confidence, and thereby competence, in movement (Johnson et al., 2019). These strategies not only foster self-efficacy in neurological rehabilitation but also enhance it for the behavioral changes essential to improving overall wellness. Crucially, self-efficacy is a cornerstone in the development of sustainable health habits, facilitating long-term commitment and adherence to health-promoting behaviors (Davis & Thompson, 2021).

Goal-setting and social support are two additional pivotal constructs within Social Cognitive Theory, situated under the umbrella of self-regulation—a crucial skill for adopting new health behaviors. The process of setting and achieving goals plays a significant role in facilitating the learning of new health behaviors. In contexts such as physical and occupational therapy, care plans that incorporate goal setting can have a markedly positive impact on patients' recovery journeys. This is especially true when the goals are optimally challenging yet achievable, leading to an enhancement in self-efficacy upon their attainment (Miller & Brown, 2021). Conversely, inadequately challenging goals, or those perceived as too difficult to achieve, can have a detrimental effect on self-efficacy, potentially exacerbating negative outcomes in extreme cases (Williams et al., 2022).

Social support, encompassing moral support, shared participation in behaviors, and accountability from others, is another crucial element in this framework. For specific demographics, the presence and quality of social support are strongly correlated with outcomes in physical and mental health, pain management, coping mechanisms, adjustment processes, and overall life satisfaction (Johnson & Anderson, 2023). This nexus between social support and health outcomes underscores the rationale behind incorporating these models in research. Understanding the dynamics of goal-setting and social support within the domain of health behavior change is vital for tailoring interventions that effectively harness these mechanisms, thereby fostering more positive health outcomes (Taylor & Nguyen, 2021).

Social cognitive theory is a generally acknowledged approach for establishing the validity of an individual's actions (Compeau, 1995). Within the model’s framework, personal characteristics, contextual influences and behavior are all interacting variables that have a bidirectional impact on each other (Wood and Bandura, 1989). The purpose of this research is to examine the effect of personal and environmental variables on individual behavior. Self-efficacy and result expectancies are considered predictors of personal variables since both are key determinants of behavior (Bandura, 1986; Bandura, 1997), while the organisational climate is a significant environmental element that influences human attributes and behavior in this research. The term ‘organisational environment’ refers to the characteristics that influence an organisation's capacity to mobilise its personnel in order to accomplish business objectives and optimise performance (Hart et al., 1996). Hence, based on social cognitive theory, the current research considers the organisational environment to influence individual characteristics and behaviors.

2.8 Research Gaps in Technology Acceptance on Adopting Health Self-Monitoring Devices

Most research in this area utilises the TAM to build the relationship between impact factors and technology adoption rates but rarely integrates this with the health belief model. It is significant to further understand the belief in self-monitoring technology and its impact. Furthermore, the direct correlation between impact factors and technology adoption are usually modelled. Most research works assumed that there is no correlation among the impact factors. However, the correlation and interaction among the impact factors can potentially influence the technology adoption rate, which is rarely research in previous research.

In addition to the theoretical research gaps, most research is at a conceptual stage so has not yet been applied in the real healthcare industry. Of the few research works that have conducted work in a real-life context and applied their results to a target group for applications, their quantitative models are mainly applied in India, the UK, etc. so there is a lack of research in technology adoption among Chinese target groups. There is thus a significant research gap here, and to fill this in such a particular context means that identifying the key impact factors in Chinese target groups within the healthcare sector is especially important (McQueen et al., 2016; Şehbenderoğlu, 2019; Liu and Han, 2020; Pancar and Ozkan Yildirim, 2021). As outlined at the outset of this work, China is experience significant problems within healthcare so research in technology adoption in China, a proposed solution for these issues, can have many real-life benefits, including supporting health monitoring remotely, diagnosing conditions in sub-healthy populations at early stages and, ultimately, potentially preventing or at least limiting chronic diseases (Kichloo et al., 2020; Monaghesh and Hajizadeh, 2020; NHS, 2020; Shen et al., 2021; Bitar and Alismail, 2021; Alduaij, 2022; Seshadri et al., 2022), with massive implications for individuals but also wider society and the country.

This research addresses two prominent gaps: empirical and theoretical. Empirically, the extant literature reveals a considerable body of work exploring the adoption of health technology, particularly in the realm of digital and information-based health technology (Smith & Lee, 2018). However, there is a discernible dearth of research focusing on innovative wearable and self-monitoring devices within the context of developing countries, notably China. The existing studies often overlook how the adoption of health self-monitoring technology, encompassing facets like intention to use, can manifest in significant real-life outcomes (Zhang et al., 2019). Theoretically, the potential of health self-monitoring technology in China to substantially enhance individual health outcomes, alleviate the burden on the existing healthcare system, and equip the country for effective response to serious health crises, such as the recent COVID-19 pandemic, remains underexplored (Wang & Zhao, 2020).

The potential impact of health self-monitoring technology in China is multifaceted, ranging from improving daily health management to providing critical support during health crises. Despite the burgeoning development of health technologies in China, a gap persists in understanding how these technologies can be effectively integrated into the healthcare system and everyday life to maximize benefits. This gap is particularly critical in light of the recent unprecedented health challenges posed by the COVID-19 pandemic, where the role of technology in managing public health emergencies has become increasingly evident (Liu & Yang, 2021).In particular for individuals, the adoption and use of these devices also give people the control of/for monitoring their own body health remotely besides potentially reducing their chronic diseases (Kichloo et al., 2020; NHS, 2020; Monaghesh and Hajizadeh, 2020; Shen et al., 2021; Bitar and Alismail, 2021; Alduaij, 2022; Seshadri et al., 2022). However, even though governments and supranational institutions highly encourage people to adopt these health monitoring devices, several researchers have highlighted that much more work on the factors that influence intention to use these devices is needed (e.g. McQueen et al., 2016; Şehbenderoğlu, 2019; Liu and Han, 2020; Pancar and Ozkan Yildirim, 2021). The need for such research is aggravated by there being many unanswered questions and because of newly emerging innovative technologies, not to mention impact factors and their relationship to different cultural and social characteristics and how predicting the intention use of health self-monitoring devices can provide empirical data for both health institutions and technology suppliers to improve the quality of technology and ultimately of healthcare. Therefore, the outcomes of this study will enable health institutions, suppliers and policy makers to consider measures and implement solutions on how to improve the effectiveness of health self-monitoring technologies to gain the many possible practical advantages available through such research.

In addressing the theoretical dimension, it becomes evident that the paradigms governing technology adoption and acceptance in healthcare markedly diverge from those applicable in other sectors, particularly with regards to fostering health-related behavior change. This necessitates the formulation of a context-specific model of technology adoption, tailored to the nuanced exigencies of the healthcare sector. Traditional models such as the Technology Acceptance Model (TAM) were initially conceptualized to address information technology adoption among the general populace. However, their direct application within the healthcare sphere is constrained by a lack of consideration for the distinct challenges and intricacies characteristic of health-related technologies and decisions (Holden and Karsh, 2010; Ketikidis et al., 2012; Rashid et al., 2018; Nadal et al., 2020). The healthcare environment is distinguished by unique user demographics, stringent regulatory frameworks, and heightened sensitivity to data privacy and ethical concerns, thereby necessitating a bespoke approach in understanding and facilitating technology acceptance.

The imperative for a healthcare-specific model is underscored by the necessity to navigate and mitigate the barriers to adoption, acceptance, and intention to utilize health self-monitoring technologies. These barriers encompass a range of factors, including but not limited to, the intricacies of handling medical data, the paramountcy of patient confidentiality, the critical nature of healthcare decision-making, and the unique dynamics underpinning trust and credibility in patient-provider interactions (Walter and Lopez, 2008; Romano and Stafford, 2011; Barhoumi, 2016).
The current research endeavor seeks to theoretically enrich this domain by proposing a model that integrally incorporates these healthcare-specific considerations. This proposed model aims to bridge the theoretical gap between extant general technology acceptance frameworks and the unique requirements of healthcare technology. By doing so, it strives to offer insightful pathways for the effective promotion and sustained utilization of health self-monitoring technologies, a task that gains increasing

significance in the current landscape where digital health technologies are progressively becoming indispensable in healthcare delivery and management.

The utilization of technology acceptance models in healthcare contexts, as previously explored in various studies (e.g., Davis et al., 1989; Venkatesh and Bala, 2008), has revealed a critical limitation in the scope of their application, particularly regarding health self-monitoring technologies. The comprehensive literature review undertaken in this study underscores a notable stagnation in user acceptance of these technologies, a situation that is particularly pronounced in the context of developing countries. This shortfall is further highlighted by the relative dearth of research specifically targeting these regions. In response to this identified gap, the ensuing section of this study is dedicated to the development of an innovative conceptual framework.

This framework is meticulously crafted to examine the intention to use digital health devices, drawing upon an integrative approach that amalgamates constructs from the Technology Acceptance Model, the Health Belief Model, and Social Cognitive Theory. Tailored explicitly for the developing country context, with a focus on China, this framework aims to offer a contextually nuanced understanding of technology acceptance dynamics in such settings.

The proposed framework represents a significant departure from conventional applications of technology acceptance models. It is a bespoke adaptation, designed to resonate with the unique socio-economic and cultural landscape of China, thereby providing a more holistic understanding of the myriad factors influencing the adoption of digital health technologies in a developing country. This approach recognizes the intricate interplay between technological, health-related, and socio-cultural elements, emphasizing the need for a culturally attuned perspective on technology acceptance behaviors in the context of China.

2.9 Chapter Summary

This chapter has systematically reviewed and critically analysed the existing literature on health technology adoption behaviors, with a particular emphasis on the

Technology Acceptance Model (TAM) and its extensions, the Health Belief Model (HBM), and Social Cognitive Theory (SCT). Building upon this foundation, the subsequent chapter will delve into the development of a conceptual framework. This framework is specifically designed to assess the technology adoption behaviors of Chinese users in the realm of digital health technologies, focusing on their adoption processes and anticipated uptake. This chapter has conducted a comprehensive exploration of the myriad factors influencing user acceptance behavior towards health self-monitoring devices, examining this through the lenses of technical, psychological, and social perspectives. Central to this review were various technology adoption theories, which have been meticulously analysed to discern what specifically impacts user behavior in the context of digital health technologies.

The analysis underscores the pivotal role of health self-monitoring devices as agents of health-related behavior change. It acknowledges the challenges and barriers faced by patients or individuals in sub-optimal health, who may be hesitant to alter detrimental habits such as smoking. Despite these obstacles, the chapter highlights the transformative potential inherent in the adoption of these innovative health technologies. As identified by Lancaster et al. (2018), these devices and systems are not just tools for health monitoring; they are instrumental in driving significant lifestyle changes and improvements.

The following chapter 3 will advance from the critical analysis presented previously, focusing on formulating a comprehensive theoretical conceptual model. This model is crafted to specifically address the intricate research questions central to our study, delving into the complexities of user acceptance of health self-monitoring devices. It represents a synthesis of the key findings from the examination of various technology adoption theories, incorporating technical, psychological, and social dimensions. This integrative approach aims to provide a multifaceted perspective on digital health technology adoption. The development of this model is a deliberate effort to bridge identified gaps in existing literature and to offer a robust framework that can elucidate the nuanced dynamics of health technology adoption. It is envisioned as a tool to not only decode the complexities of the subject at hand but also to serve as a guiding beacon for future research and innovation in the realm of digital health.

CHAPTER 3 THEORETICAL FRAMEWORK DEVELOPMENT

3.1 Introduction

This chapter lays out the development of our conceptual framework, highlighting the interplay between these models and their components. We also discuss the role of demographic factors, particularly age, as a moderating influence in the relationship between perceived usefulness, ease of use, and the intention to use health self-monitoring technologies. The integration of these theoretical perspectives aims to provide a robust understanding of the factors that drive user acceptance in the Chinese context, addressing a significant gap in current research and offering practical insights for the implementation and design of health technologies.

3.2 Conceptual Framework Development

The conceptual framework in this thesis is developed based on the original Technology Acceptance Model (TAM) and integrating this with the Health Belief Model (HBM) and Social Cognitive Theory (SCT) while considering related factors of Chinese social characteristics that impact on users' behavior and decision-making. In this study, TAM is the fundamental concept, and several researchers have confirmed and verified that TAM is a robust model in the area of predicting user acceptance/adoption of behavior towards information technology under different contexts (King and He, 2006; Merchant, 2007; Kashi and Zheng, 2013; Wang and Goh, 2017; Taherdoost, 2018), though not specifically the Chinese context. Also, TAM is established and can typically explain about 40% of the variance in intention to use of certain information technologies (David, 1989; Venkatesh and Davis, 2000). In the area of information technology acceptance, TAM provides the satisfactory and/but basic predictors from users' perspectives. As discussed in previous sections, researchers also found that TAM alone is not suitable in all healthcare applications, so they extended the TAM framework by integrating it with other relevant models or various constructs such as government policy (Pierce et al., 2014), culture (Oyibo and Vassileva, 2020), trust (Chauhan, 2015), experience (Rohman, 2020), social influence (Merchant, 2007; Choi and Chung, 2012; Rohman, 2020) and health habits (Block et al., 2010). Such research sought to establish a more comprehensive model that is more suitable for implemented technologies under specific contexts. Furthermore, some external variables have been integrated into the original TAM by Venkatesh and Davis (2000), including some demographic factors and context relevant factors, it is claimed that it is insufficient in explaining intention to use. The adoption of different types of technologies is insufficient in explaining outcome when used with/as generic models of TAM solely (Malatji et al., 2020). Therefore, as the objective of this research study is to investigate and deepen understanding of influencing predicting factors that may affect user acceptance of health self-monitoring technologies, it also integrates, as noted, relevant technology acceptance theory, the health belief model, social cognitive theory and relevant specific Chinese social characteristics factor have been sensibly measured. Figure 3.7 illustrates the proposed conceptual model for this thesis.

Figure 3.6 and Table 3.2 show that the conceptual model is divided into three main sections: (i) the Technology Acceptance Model; (ii) the Health Belief Model; and (iii) Chinese Social Characteristics comprising the factors of Perceived Severity (PS), Cues to Action (CA) from the HBM, and Social Conformity (SC) and Trust in Social Media (TS) from social cognitive theory, which are used to assess specific Chinese social factors (precursors which influence the key predicted factors of intention to use health self-monitoring technology). The model's factors are from the TAM, which are perceived usefulness (PU) and perceived ease of use (PEU), as Table 3.1 explains. The influencing factors of health self-monitoring technology acceptance, thus it may significantly influence the dependent variable outcome of users' intention to use health self-monitoring technologies. Furthermore, the demographic characteristics are age as the moderator impact on the relationship between PU with Intention to use (IU) and the relationship between PEU to IU.

The selection of the conceptual framework for this study was meticulously informed by the factors identified in prior health-related research, which have been instrumental in understanding the adoption of digital health technologies. This decision was grounded in the specific context of health self-monitoring technology and was particularly attentive to the unique social environment of China. The framework synthesizes insights from established models of innovation acceptance and health-related behavior change, tailoring these to the nuances of the Chinese context. The choice to integrate these models reflects a comprehensive understanding of the multifaceted nature of technology adoption in healthcare settings. It acknowledges that the dynamics of health technology acceptance are profoundly influenced by a confluence of technological, social, and behavioral factors. By incorporating elements from both innovation acceptance models and health behavior change theories, the framework aims to capture a holistic view of the factors driving the use of health self-monitoring technologies in China.

This approach recognizes the critical role of cultural and social norms in shaping technology acceptance behaviors and seeks to address the gaps in existing research by providing a more culturally sensitive and context-specific analysis. The integration of these theoretical perspectives is intended to offer a nuanced understanding of how health self-monitoring technologies are perceived and utilized within the Chinese healthcare landscape, thereby contributing to the broader discourse on digital health technology adoption in diverse cultural settings.

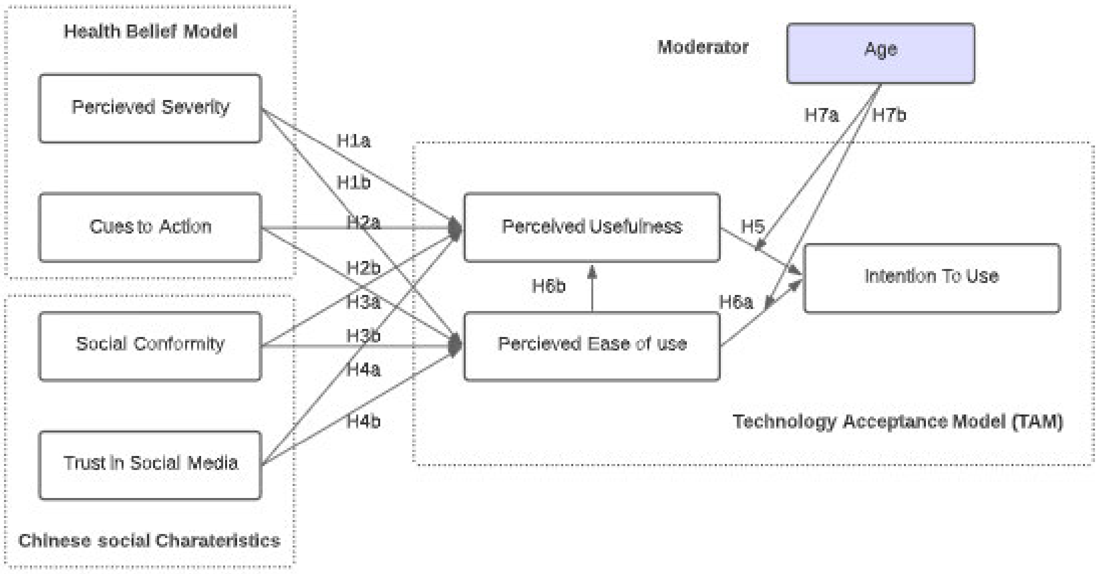

Figure 3.1 Proposed Conceptual Model of the Health-Related Technology Acceptance Model in China

Table 3.1 Model Constructs

Construct	Definition
Perceived Usefulness (PU)	The degree to which a person believes that using health self-monitoring devices would prevent chronic diseases.
Perceived Ease of Use (PEU)	The degree to which a person believes that using health self-monitoring devices would be free from effort.
Social Conformity (SC)	The degree of obedience from individuals towards their family, friends and society’s behaviors. For instance, if their family or

	friend buys the health self-monitoring technology, if the individual is likely to follow this behavior.
Trust in social media (TSM)	The measurement of the level of trust in social media, based on health self-monitoring devices and relevant information/advertisements.
Cues to Action (CA)	Cues to action can be internal or external. **Physiological cues** (e.g. pain, symptoms) are an example of internal cues to action. External cues include events or information from **close others, the media**, or **healthcare providers** promoting engagement in health-related behaviors, such as adopting health self-monitoring technologies.
Perceived Severity (PS)	Perceived severity indicates **degree of seriousness that people deem a disease or condition to cause**. Perceived severity includes how people perceive the deleterious consequences of a serious health event or outcome, such as a high blood pressure effect on diabetes. This severity can encourage or prompt individuals to adopt health self-monitoring technologies.
Intention to Use (IU)	User acceptance of health self-monitoring technologies, measured by a person's intention to use this technology.

In terms of developing the conceptual framework, the related factors came from those commonly used in user acceptance research regarding digital health technologies adoption and health self-monitoring technologies adoption in different countries, as identified in the extant literature on TAM, HBM and SCT along with the special Chinese social factors.

Table 3.2 Sources for the Proposed Conceptual Model: The Health-Related Technology Acceptance Model in China

Domain	Factors	Sources
Technological factors	Intention to Use (IU)	From the Technology Acceptance Model (TAM) (Davis, 1989; Venkatesh and Davis, 2000)
		From the Technology Acceptance Model (TAM)

	Perceived Usefulness (PU)	(Davis, 1989; Venkatesh and Davis, 2000)
	Perceived Ease of Use (PEU)	From the Technology Acceptance Model (TAM) (Davis, 1989; Venkatesh and Davis, 2000)
Social characteristics	Social Conformity (SC)	Modified from Social Cognitive theory (Albert ,1960)
	Trust in social media (TSM)	Modified from Social Cognitive theory (Albert ,1960)
Health-related factors	Cues to Action (CA)	From the Health Belief Model (HBM) (Kasl, 1974; Rosenstock, 1974; Tsai, 2014; Herold, 1983; Risker, 1996; Ahadzadeh et al., 2015; Xiang et al., 2020)
	Perceived Severity (PS)	From the Health Belief Model (HBM) (Kasl, 1974; Rosenstock, 1974; Herold, 1983; Tsai, 2014; Risker, 1996; Xiang et al., 2020; Ahadzadeh et al., 2015)

3.3 Hypotheses Development

3.3.1 Technological Factors

The HBM perspective explains health-related technology use via the subjective assessment of an individual's vulnerability, and vulnerability can lead to health risks and one's consciousness of health. In contrast, the TAM views health-related technology use behavior from the technology perspective and was developed to enable understanding of the use of technology. Indeed, TAM, which most studies on pertinent literature to focus on, is most commonly used for studying technology-related behavior, such as health technology use in different contexts, including health. The TAM has two dimensions: perceived usefulness and perceived ease of use toward technology use. The former concerns "the belief about using the technology that would bring benefits to the user," whereas the latter refers to "the belief about using the technology that involves little effort". Perceived usefulness and perceived ease of use both affect attitude to using the technology, which in turn influences behavioral intention to adopt the technology. Using the TAM framework, various studies show that perceived usefulness, perceived ease of use and attitude can all positively influence behavioral intention to use health information technologies such as the Technology and mobile phones. Furthermore, all studies that apply the TAM in the healthcare domain include behavioral intention to use health information technology (driven by health self-monitoring devices).

As has been noted and considering the research gaps exposed herein, this thesis aims to develop a research model to predict the actual intention to use health self-monitoring technologies in China, which can bring many benefits. It uses the original TAM and also proposes the following hypotheses:

> **H5: Perceived usefulness (PU) of the digital health self-monitoring devices has a positive impact on individual's behavioral intention to use (IU) digital health self-monitoring devices.**

The concept of Perceived Usefulness (PU), as defined in the Technology Acceptance Model (TAM), is a fundamental determinant of technology adoption. It refers to the degree to which a person believes that using a particular system or device will enhance their performance or provide benefits. In the context of digital health self-monitoring devices, PU can be viewed as the extent to which individuals believe these devices will effectively aid in managing their health conditions. This belief is likely to influence their behavioral intention to use the devices. Studies such as Davis (1989) have consistently shown that when users perceive a technology as useful, their intention to adopt it increases. This notion is particularly relevant in the healthcare sector, where the perceived effectiveness of a technology in improving health outcomes can significantly drive its acceptance (Holden & Karsh, 2010). In the context of digital health self-monitoring devices in China, Perceived Usefulness (PU) is a critical factor influencing user adoption. PU, in this scenario, is the belief that these devices will effectively assist in health management, such as monitoring sub-healthy conditions or maintaining overall wellness. This belief is pivotal in shaping behavioral intentions towards the use of such technologies. Consequently, the hypothesis H5 posits that the perceived usefulness of digital health self-monitoring devices positively impacts individuals' intentions to use them.

H6a: Perceived ease of use (PEU) of the digital health self-monitoring devices has a positive impact on individual's behavioral intention to use (IU) digital health self-monitoring devices.

Perceived Ease of Use (PEU), another key construct of TAM, that is expected to have significant implications for the adoption of digital health self-monitoring devices among the Chinese demographic. This concept delineates the degree to which potential users perceive the operation of these health devices as uncomplicated and effortless. According to TAM, as elucidated by Davis (1989), and corroborated by subsequent research including Venkatesh & Davis (2000), PEU is a fundamental impact factor of technology acceptance. In China's diverse and rapidly evolving digital healthcare ecosystem, the simplicity and intuitiveness of digital health devices are posited to be key factors influencing the decision to adopt these technologies, spanning across various user segments from technologically adept youths to the elderly.

H6b: Perceived ease of use (PEU) of the digital health self-monitoring devices has a positive impact on perceived usefulness (PU) of digital health self-monitoring devices.

In the Chinese context, where there is a burgeoning interest in digital health solutions, the operational simplicity of these devices can be a deciding factor in their acceptance, particularly among populations that might not have extensive experience with digital technologies. Research in this area, including studies by Venkatesh, Morris, Davis, & Davis (2003), has highlighted that PEU not only affects direct usage intentions but also indirectly influences these intentions through its impact on Perceived Usefulness (PU). Users are more likely to perceive a technology as beneficial if it is user-friendly and uncomplicated. This interrelation is critical in the health domain, where the perceived complexity of a device can deter its use, even if it offers substantial health monitoring benefits. In the specific context of China, with its unique socio-cultural dynamics and rapidly aging population, the role of PEU becomes even more pronounced. The demographic diversity, ranging from tech-savvy millennials to older adults who may be less familiar with digital technology, necessitates the development of health monitoring devices that are accessible and easy to use for all age groups. The integration of intuitive interfaces, straightforward functionalities, and clear instructions is vital in enhancing the PEU of these devices. Moreover, the recent push towards digital health solutions in China, fueled by government initiatives and a growing health-conscious population, further underscores the need for designing self-monitoring devices that prioritize ease of use. This approach not only facilitates wider adoption across diverse user groups but also ensures sustained engagement with the technology, ultimately contributing to better health outcomes and more efficient health management practices. Therefore, in alignment with the TAM framework, this thesis posits that the perceived ease of use of digital health self-monitoring devices will play a significant role in their adoption among the Chinese populace. H6a and H6b hypothesized that devices that are perceived as easy to use will not only attract more users but will also be perceived as more useful, thereby positively influencing the overall intention to adopt such health technologies.

3.3.2 Health Factors

Although previous research works on technology usage employs the TAM or HBM for health-related objectives, there is no theory that adequately explains health-seeking behavior via technology. While the TAM is used to predict an individual's technology usage, it is an insufficient model for health-related self-monitoring device use because of its high reliance on two variables: perceived usefulness and perceived ease of use technology. The HBM endeavours to explain the variables that influence health-related technology usage from a strictly health viewpoint. It does attempt to describe the mechanism or principle behind the behavior. Although the TAM has been frequently utilised to describe technology-related behavior, its influence on technology usage for health-related objectives may be completely understood only when components of the HMB are included in the model, as these helps explain people's health beliefs. Essentially, there is a need to evaluate health-related technology usage comprehensively, including cognition, attitude, behavior and the subjective assessment of people’s psychological states (their impression of their health condition). By incorporating constructs of technology acceptance based on the TAM and perceived health risk as well as health consciousness, this work devises an integrated model for explaining health-related technology use behavior and perceived usefulness of the technology, while attitude towards the technology regarding health purposes serves as a mediating factor in the relationship among factors, including perceived health risks, health consciousness and health-related technology use behavior. Individuals who view chronic illness as severe are driven to utilise devices because they feel these devices are valuable in terms of giving information about their own health, and health management is likely to generate a favourable attitude towards the use of technology for health purposes in this model. In other words, cognitive and emotional attitudes to technology become critical for a person who views chronic illness as harmful, and from this certain people may develop awareness of disease prevention. As a result, these users would be more reliant on technology.

The purpose of this study is also to determine the effect of factors including perceived severity and cues to action on health-related self-monitoring, which is analysed by using the HBM. The model for this research incorporates the TAM in order to provide a better understanding of the process, so technology is adopted for health objectives. As a result, this study also proposes the following hypotheses:

H1a: Perceived severity (PS) has a beneficial effect on perceived usefulness (PU) towards self-monitoring digital health equipment.

The hypothesis H1a posits a beneficial effect of Perceived Severity (PS) on the Perceived Usefulness (PU) of self-monitoring digital health equipment. Perceived Severity, a concept from the Health Belief Model (HBM), refers to an individual's assessment of the seriousness of a health condition and its potential consequences (Rosenstock, 1974). In the context of digital health technologies, this could relate to how the severity of a health condition or the risk of developing one is perceived by potential users. The hypothesis suggests that when individuals perceive a high severity in their health status or risks, they are more likely to see the usefulness of digital health equipment in monitoring and managing their health. This relationship is supported by Carpenter's (2010) study, which highlights how health perceptions influence the perceived benefits of health technologies. Thus, recognizing the severity of health conditions is expected to enhance the perceived utility of digital health self-monitoring tools among users, as it aligns with their health management goals.

H1b: Perceived severity (PS) has a beneficial effect on perceived ease of use (PEU) towards self-monitoring digital health equipment.

H1b hypothesizes a beneficial effect of Perceived Severity (PS) on the Perceived Ease of Use (PEU) of self-monitoring digital health equipment. This suggests that when individuals perceive a high severity or risk associated with their health conditions, they are more likely to find the technology easier to use or are more motivated to overcome usability challenges. This hypothesis aligns with the notion that motivation stemming from health concerns can influence technology acceptance, as indicated in Or and Karsh's (2009) study. When facing severe health risks, individuals are likely to invest more effort to understand and use health technologies, thereby perceiving these technologies as easier to use. This hypothesis emphasizes the role of health severity in not only perceiving the usefulness but also in influencing the ease of use of health monitoring devices.

H8: The influence of Perceived Severity (PS) on behavioral intention to use (IU) is mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

H8 explores the mediating role of Perceived Usefulness (PU) and Perceived Ease of Use (PEU) in the relationship between Perceived Severity (PS) and Behavioral Intention to Use (IU) health digital self-monitoring technologies. It posits that the impact of PS on IU is not direct but is mediated through PU and PEU. According to the Health Belief Model (Janz and Becker, 1984), perceived severity of a health condition influences health-related behaviors, but this study suggests that this influence is channeled through the perceived usefulness and ease of use of the technology. This aligns with Venkatesh et al.'s (2003) Unified Theory of Acceptance and Use of Technology (UTAUT), where performance expectancy (akin to PU) and effort expectancy (similar to PEU) mediate the relationship between external variables and behavioral intentions. Thus, the more severe the health risk is perceived, the more useful and easier to use the health technology is perceived, thereby influencing the intention to use the technology.

H2a: Cues to Action (CA) has a beneficial effect on Perceived usefulness (PU) towards self-monitoring digital health equipment.

H2a posits that Cues to Action (CA) have a beneficial effect on the Perceived Usefulness (PU) of self-monitoring digital health equipment. Cues to Action, a concept from the Health Belief Model (Rosenstock, 1974), are external events or information that prompt a person to take action regarding their health. This hypothesis suggests that exposure to health-related cues, such as media campaigns, doctor recommendations, or experiences of others, can enhance the perceived usefulness of digital health monitoring devices. This relationship is underlined in the study by Sheeran et al. (2016), which indicates that cues can significantly impact health behavior decisions by altering perceptions of benefits. Therefore, cues to action are expected to positively influence how users perceive the utility of health technologies in managing their health conditions.

H2b: Cues to Action (CA) has a beneficial effect on Perceived ease of use (PEU) towards self-monitoring digital health equipment.

This hypothesis posits that effective cues to action, such as educational content, demonstrations, or witnessing others using the technology, can positively influence how individuals perceive the ease of using digital health monitoring devices. Bandura's Social Cognitive Theory (1986) highlights the role of observational learning in shaping behavior, implying that witnessing successful use cases of health technologies can reduce apprehensions about their complexity. This is further corroborated by studies like that of Holden and Karsh (2010), which suggest that familiarity and exposure to technology, possibly through cues to action, can mitigate perceived difficulties in using new systems. In the context of digital health in China, where there is a varied level of technological literacy, cues to action can play a crucial role in simplifying perceived complexities associated with health monitoring devices. By providing clear, accessible information and demonstrations of use, these cues can make the technology appear more approachable and user-friendly, thereby increasing its perceived ease of use and potentially influencing adoption rates.

H9: The influence of Cues to Action (CA) on behavioral intention to use (IU) is mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

H9 explores the mediating role of Perceived Usefulness (PU) and Perceived Ease of Use (PEU) in the relationship between Cues to Action (CA) and Behavioral Intention to Use (IU) in health digital self-monitoring technologies. This hypothesis suggests that the influence of cues to action on the intention to use health technologies is not direct but occurs through the perceptions of usefulness and ease of use. As suggested in the Health Belief Model (Rosenstock, 1974), cues to action trigger health behavior change, but this study proposes that such cues primarily affect how users perceive the utility and usability of the technology, which in turn influences their intention to use it. This aligns with the findings in the technology acceptance literature (e.g., Venkatesh et al., 2003), where external factors like cues to action modify the perceived attributes of technology, subsequently affecting behavioral intentions. For example, health campaigns or doctor endorsements serving as cues can enhance the perceived

usefulness and ease of use of health monitoring technologies, thereby positively influencing the user's intention to adopt these devices.
H8 and H9 are not shown in Figure 3.7's Conceptual Model, as they related to the PU and PEU mediated relationship between PS and IU and the relationship between CA and IU. The results from these relationships will be reported in the analysis chapter (Chapter 5.3.3).

3.3.3 Social Factors

Social conformity can influence how individuals behave, and this thesis uses social cognitive theory (SCT) to examine aspects of social conformity and its role on health technologies adoption by Chinese users.

The concept of social conformity, initially delineated within the realm of social psychology, pertains to adherence to socially sanctioned norms and standards, representing a fundamental response to social influence (Asch, 1956). This concept posits that in the absence of restrictions, individuals may choose to align their behaviors with those observed in others, a phenomenon eloquently articulated by Hoffer (1955). Such conformity is particularly pronounced in social settings where individual actions are significantly swayed by the behaviors of surrounding peers (Asch, 1956).

Empirical research across various domains, including consumer purchasing and health behaviors, has substantiated the impact of conformity (Lindquist et al., 1985; Oh, Youl-Gun, 2016; Arnold et al., 2019; Monks et al., 2019). Reid et al. (2019) underscored this effect by demonstrating how peer behaviors, such as alcohol consumption and Laghi et al. (2019) explored the sway of conformity in adolescent drinking behaviors, revealing that adolescents are more likely to engage in drinking when they perceive it as a normative behavior among their peers. This study highlighted the strong influence of peer groups in shaping adolescent behavior, especially in contexts where alcohol consumption is viewed as a symbol of social acceptance or maturity.

Additionally, Constant et al. (2019) highlighted the pivotal role of social conformity in shaping human decision-making, particularly in the context of health-related technology adoption. They asserted that individuals are more inclined to use health technologies when they observe their adoption and endorsement within their social circles. The study found that this trend is particularly evident in societies with high social connectivity, where people look to their peers and social networks for cues on adopting new technologies and practices. While conformity can facilitate social integration and enhance decision-making accuracy (Cialdini and Trost, 1998; Chartrand and Lakin, 2013), its generalizability is moderated by cultural variations. As Meade and Barnard (1973) noted, individuals from diverse cultural backgrounds exhibit different susceptibilities to social conformity, influenced by the unique social dynamics of their respective environments. This cultural specificity is of paramount importance in understanding consumer behaviors, especially in a context as culturally distinctive as China. In the Chinese setting, social conformity markedly influences consumer behaviors (Qureshi and Malik, 2017), playing a crucial role in shaping decisions around health and consumer purchases.

In light of these considerations, this study focuses on examining the influence of social conformity on health-related behaviors and consumer purchasing decisions in China, particularly in the context of utilizing health self-monitoring products to foster healthier lifestyle choices and prevent chronic illnesses. Thus, the study posits the following hypotheses:

H3a: Social Conformity (SC) positively impacts on perceived usefulness (PU) towards digital health self-monitoring devices.

H3a hypothesizes that Social Conformity (SC) positively impacts the Perceived Usefulness (PU) of digital health self-monitoring devices. Social Conformity, rooted in Social Cognitive Theory (Bandura, 1986), refers to the influence that the attitudes and behaviors of others have on an individual's perceptions and actions. In the context of digital health technologies, this implies that individuals are likely to perceive these devices as more useful if they observe widespread acceptance and use within their social networks or community. This effect is particularly potent in collectivist cultures like China, where social influences play a significant role in shaping individual behaviors and attitudes. The concept aligns with findings from studies such as that by Cheung and Vogel (2013), which demonstrate that social factors significantly influence the perceived benefits and acceptance of technology. Therefore, in a society where digital health monitoring is socially endorsed, these devices are likely to be perceived as more beneficial and, consequently, more useful by potential users.

H3b: Social conformity (SC) positively impacts on perceived ease of use (PEU) towards digital health self-monitoring devices.

H3b proposes that Social Conformity (SC) positively impacts the Perceived Ease of Use (PEU) of digital health self-monitoring devices. This hypothesis suggests that the collective acceptance and use of these technologies in one's social environment can make the technology seem easier to use. When individuals observe their peers or influential figures successfully using health monitoring devices, it can reduce perceived complexities and increase their confidence in using the technology themselves. This phenomenon is supported by the notion of vicarious learning in Social Cognitive Theory (Bandura, 1986), where observing others can lead to learning and adoption of behaviors. This hypothesis is reinforced by studies such as Venkatesh et al. (2003), which indicate that social factors can influence perceptions of ease of use. Thus, in a context where digital health monitoring is widely adopted and endorsed, these technologies are likely to be perceived as more user-friendly.

H10: The influence of social conformity (SC) on behavioral intention to use (IU) is mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

H10 explores the mediating effect of Perceived Usefulness (PU) and Perceived Ease of Use (PEU) on the relationship between Social Conformity (SC) and Behavioral Intention to Use (IU) health digital self-monitoring technologies. This hypothesis posits that the impact of social conformity on usage intention is mediated through how useful and easy to use the technology is perceived to be. According to the Technology Acceptance Model (Davis, 1989), external social influences can modify individual perceptions of technology, thereby affecting their behavioral intentions. Studies such as those by Taylor and Todd (1995) provide empirical support for this mediation effect, demonstrating that social factors can influence technology adoption through altered perceptions of usefulness and ease of use. In the case of digital health self-monitoring devices, if these technologies are widely accepted and used within one’s social circle, it can enhance their perceived usefulness and ease of use, subsequently influencing the individual’s intention to adopt the technology.

H10 is not shown in Figure 3.7’s conceptual model, since they are related to the PU and PEU mediated relationship between SC and IU. The results from this relationship are reported in the analysis chapter. Secondly, trust in social media has been shown to be a significant predictor of online purchasing behavior as it can mitigate the perceived risks and costs associated with the dependability or usefulness of health-related self-monitoring gadgets (smartphone applications, glucometers, etc.) (Chen and Sharma, 2019). Existing research indicates that technology users' confidence in social media has a significant impact on consumer purchasing decisions (Serdamba and Erdenebileg, 2019), while academics observe that trust and a sense of security are important regarding health-related concerns (Zolowere et al., 2018), so in the context of this research confidence and trust seemingly relate somewhat. According to research conducted in rural China, trust is cited as the primary motivation for individuals to disclose sensitive information, followed by a sense of requiring assistance. Furthermore, as this often comes from information shares on social media by peers rather than medical specialists (because of lack of trustworthiness in them) (Pant et al., 2012), our research indicates that trust in social media-based information is a substantial predictor of subsequent health-related behavioral activities. Research also shows that peer-to-peer films are more successful in influencing people’s views and perceived relevance of issues (Paek et al. 2011), though Vraga and Tully (2019) claimed that research is not universally applicable (Hale et al., 2002). Furthermore, different nations have varying levels of trust in social media, owing to cultural variations, as demonstrated via the 2018 Edelman Trust Barometer Global Report, which compares various nations’ statistics regarding public trust in social media (Suanders et al., 2018). For China, 71% of people trust social media, while in the United Kingdom only 31% of the people have such trust. Hence, the authors’ research says that social media has a great impact on Chinese residents, so it seemingly plays a critical role in Chinese culture and influences client purchasing behavior.

On the basis of these considerations, this thesis also proposes the following hypotheses:

H4a: Trust in social media (TS) positively impacts on perceived usefulness (PU) towards digital health self-monitoring devices

H4a posits that Trust in Social Media (TS) positively impacts the Perceived Usefulness (PU) of digital health self-monitoring devices. This hypothesis is grounded in the understanding that social media is a powerful influencer in shaping public perceptions, particularly in the realm of health information dissemination. Trust in social media implies that users believe the health-related content shared on these platforms is credible and reliable. The rationale for this hypothesis is rooted in the Information Adoption Model, which suggests that the credibility of information sources significantly impacts the perceived value of the information (Sussman & Siegal, 2003). In the context of digital health technologies, when users trust the information regarding these devices shared on social media, they are more likely to perceive these devices as useful. This is especially pertinent in a digitally connected society where health decisions are increasingly influenced by online content. Thus, trust in the authenticity and accuracy of health information on social media can enhance the perceived benefits and usefulness of digital health self-monitoring devices.

H4b: Trust in social media (TS) positively impacts on perceived ease of use (PEU) towards digital health self-monitoring devices

H4b hypothesizes that Trust in Social Media (TS) positively impacts the Perceived Ease of Use (PEU) of digital health self-monitoring devices. This hypothesis stems from the premise that social media often serves as a platform for sharing user experiences and guidance regarding the use of various technologies. When individuals trust the content on social media, they are more likely to find user tutorials, reviews, and shared experiences credible, which can demystify the operation of digital health devices. This notion aligns with the Technology Acceptance Model (Davis, 1989), where external influences can shape perceptions of technology. Moreover, it resonates with findings from studies like Cheung, Lee, and Rabjohn (2008), which indicate that social media can play a critical role in reducing perceived barriers to technology usage. In essence, trust in social media can simplify the perceived complexities associated with health monitoring devices, making them appear more user-friendly and easier to operate.

H11: The influence of trust in social media (TS) on behavioral intention to use (IU) is mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

H11 explores how Trust in Social Media (TS) influences Behavioral Intention to Use (IU) digital health self-monitoring technologies, mediated by Perceived Usefulness (PU) and Perceived Ease of Use (PEU). The hypothesis is designed based on the understanding that while trust in social media can shape individual attitudes towards technology, its impact on usage intentions is likely mediated through perceptions of usefulness and ease of use. This is consistent with the extended Technology Acceptance Model, where external variables, such as trust, indirectly influence behavioral intentions through primary TAM constructs (Venkatesh & Davis, 2000). In the digital age, where social media is a key source of information, trust in this medium can enhance the perceived benefits (usefulness) and operability (ease of use) of health technologies. As a result, individuals who trust social media are more likely to perceive these technologies as both beneficial and easy to use, which in turn positively influences their intention to adopt them. This mediation effect underscores the complex interplay between trust in digital information sources and technology adoption behaviors in the health sector.

H11 is not shown in Figure 3.7 Conceptual Model since they are related to the PU and PEU mediated relationship between TS and IU. The results from this relationship are demonstrated in the Analysis Chapter.

3.3.4 Moderator Factors: Age

Age has been identified as a moderator factor that impacts the relationship between perceived usefulness and intention to use and the relationship between perceived ease of use and intention to use. Indeed, age is a critical factor that can influence an individual's adoption of health self-monitoring devices. For instance, older individuals may have different attitudes, beliefs and experiences with technology compared with younger individuals, so age can moderate the relationship between perceived usefulness and intention to use, as well as the relationship between perceived ease of use and intention to use. In the context of health self-monitoring devices adoption among this work's Chinese sub-healthy groups, age is considered a moderator factor for two main reasons. First, the sub-healthy group includes individuals of different ages, ranging from young adults to older adults. Second, previous research has shown that age can influence an individual's perception of technology and their intention to use new devices. For instance, Brauner et al. (2017) showed that younger individuals are generally more open to new technology and are more likely to adopt new devices compared with older individuals. Additionally, older individuals may experience more difficulty in learning how to use new devices, which in turn can impact their perceived ease of use and perceived usefulness of health self-monitoring devices. More specifically, previous studies have shown that perceived usefulness is positively associated with an individual's intention to use health self-monitoring devices. Therefore, age can impact the strength of the relationship between perceived usefulness and intention to use.

On the basis of these considerations, this thesis also proposes the following hypotheses:

> **H7a: Age successfully moderates the relationship between perceived usefulness (PU) to behavioral intention to use (IU) of health digital self-monitoring technologies.**

H7a proposes that age significantly moderates the relationship between Perceived Usefulness (PU) and Behavioral Intention to Use (IU) in the context of digital health self-monitoring technologies. This hypothesis is designed with the recognition that age-related factors can influence how individuals perceive and interact with technology. The rationale for this hypothesis stems from the idea that different age groups may have varying perceptions of what constitutes 'usefulness' in technology, particularly in health contexts. For instance, older adults might prioritize different features or benefits in health technologies compared to younger users. This aligns with the findings from studies like Czaja et al. (2006), which highlight that age differences can affect technology acceptance and usage patterns. The Technology Acceptance Model (TAM) posits that PU is a key predictor of technology use; however, this hypothesis suggests that the strength of this relationship is influenced by the user's age. Therefore, this hypothesis aims to explore how age variations might impact the degree to which perceived usefulness influences individuals' intentions to use digital health technologies.

> **H7b: Age successfully moderates the relationship between perceived ease of use (PEU) to behavioral intention to use (IU) of health digital self-monitoring technologies.**

H7b hypothesizes that age moderates the relationship between Perceived Ease of Use (PEU) and Behavioral Intention to Use (IU) of health digital self-monitoring technologies. The hypothesis is based on the premise that age can influence how ease of use is perceived and, consequently, how it affects the intention to use technology. Older users might find certain technological interfaces more challenging than younger users, affecting their perception of the technology's ease of use. This variation could then influence their intention to use the technology. This concept is supported by the work of Morris & Venkatesh (2000), who found that age differences impact technology acceptance and usage, particularly concerning ease of use. According to the Technology Acceptance Model, while PEU is a crucial factor for technology adoption, this hypothesis posits that its impact on behavioral intentions might vary across different age groups. Thus, this hypothesis seeks to examine whether the influence of perceived ease of use on the intention to use digital health self-monitoring technologies is stronger or weaker in different age cohorts.

3.4 Chapter Summary

This chapter has reviewed and critically appraised the current literature on health technology adoption behavior, especially regarding the original technology acceptance model (and its extensions), the health belief model and social cognitive theory, which have all been analysed to develop a conceptual framework for evaluating the technology adoption behavior of Chinese users – specifically for digital health technologies and their adoption processes and anticipated take-up. The adoption of these health self-monitoring devices can be regarded as a health-related behavior change, which shows that despite many barriers for patients or sub-healthy individuals to change their unhealthy behavior (e.g. smoking etc.), adoption of a product or a new system can change their lifestyles (Lancaster et al., 2018).

CHAPTER 4 METHODOLOGY

4.1 Introduction

Chapter 2 of the literature review highlights a research gap in the area of technology acceptance of innovative health self-monitoring adoption among Chinese sub-health groups. Despite advancements in healthcare systems, particularly in developing nations like China, the attitudes of certain sub-health groups towards health self-monitoring technologies remain unanswered. To address this research gap, this study aims to investigate the factors that influence technology acceptance among sub-health groups in developing countries, specifically in China. This chapter outlines the methodological approach adopted for this research.

It is essential to acknowledge that all research is based on underlying philosophical assumptions, which are necessary to constitute valid research and investigate knowledge in a given context (Arbnor and Bjerke, 2008). Methodology, as defined by Grix (2022), is the study of methods and assumptions about the ways in which knowledge is produced. Research methodology, as described by Miller (1983), is a body of knowledge that helps researchers examine and assess various research methods, including their limitations, alternatives, underlying assumptions, implications, and potential for advancing research. The selection of an appropriate research methodology, including research paradigm, data collection, and analysis methods, significantly impacts research findings (Limpanitgul, 2009).

This chapter provides an overview of various methodological paradigms and research instruments published in peer-reviewed literature. The purpose of this chapter is to scrutinize different approaches and techniques in detail to discern their strengths and weaknesses. This process aids in developing a suitable research design and instrument for the research. Furthermore, this chapter introduces research questions that are pertinent to the thesis. The chapter begins with a discussion of different methodological paradigms that can be used in research, including positivism, interpretivism, and critical theory. Each of these paradigms has its own set of philosophical assumptions and research methods, which are important to understand before selecting an appropriate paradigm for the study. The following session will present an examination of qualitative and quantitative methods, highlighting their respective strengths and limitations. This analysis will enable us to determine the most suitable approach for this research. Within this chapter, the different sampling techniques are discussed, and the methods which will assess the quality of the research will be discussed. Furthermore, the research's ethical consideration has aligned with the Coventry University regulation and will be introduced and explained.

4.2 Research Paradigms

Designing a study requires careful consideration of the best research paradigm to use. A research paradigm is a collection of shared assumptions and principles that scientists share regarding how to approach research challenges (Kuhn, 1962). As a result, it offers a framework that helps researchers to choose acceptable research methodologies and data-gathering processes, as well as create research topics and formulate hypotheses.

The choice of a research paradigm is influenced by several elements, including the research's design, theoretical underpinnings, and research goals. Depending on the sort of data they gather or the specifics of the study topic, some researchers may select a paradigm. A phenomenological paradigm, for instance, would be better suited for examining subjective experiences or perceptions than a positivist paradigm.

As noted by Patton (1990), a research paradigm is a tool for simplifying the complexities of the real world. Therefore, careful consideration of the underlying assumptions and beliefs of different paradigms is essential for ensuring the validity and reliability of research findings. Ultimately, the adoption of an appropriate research paradigm is critical for the development of a logical methodology that supports the research objectives.

Saunders et al. (2007) proposed a metaphorical representation of research methodology, likening it to an onion composed of several layers ranging from the outermost to the innermost. The seven layers (figure 4.1) identified were philosophy, approach, strategy, choices, time horizon, techniques, and procedures. This multi-layered approach facilitates a systematic and comprehensive consideration of the research problem at hand.

The outermost layer of the onion, philosophy, refers to the researcher's worldview and belief system that serves as the foundation of their research. This layer influences the researcher's selection of a research approach, which subsequently determines the general methodology to be employed for data collection and analysis and has been categorized as inductive, deductive, or abductive. The subsequent layer, strategy, encompasses the overarching plan for the research and encompasses decisions regarding research design, sampling, and data collection techniques.

The layer of choices refers to the specific decisions made by the researcher at various stages of the research process, such as the selection of research instruments or the determination of the data analysis method. The time horizon layer pertains to the duration of the research and may involve considerations such as the utilization of longitudinal or cross-sectional research designs.

The techniques layer comprises the specific tools and methods employed for data collection and analysis, while the procedures layer outlines the measures undertaken to guarantee the quality and rigor of the research. This multi-layered approach underscores the importance of evaluating each layer in the research process and emphasizes the interconnectedness of the various components of the research methodology.

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Figure 4.1 research onion

Source: Saunders et al. (2007)

4.2.1 Research Philosophies

Hudson and Ozanne (1988) define Ontology and epistemology as two philosophical ideas that fall under the research paradigm. Ontology pertains to the nature of reality and deals with the existence of things in the world, Meanwhile, epistemology, is about the relationship between the scientist and reality, particularly how it can be evaluated. Epistemology involves the methods of inquiry employed to acquire knowledge, according to Mingers (2001). One significant epistemological concern is whether the same principles can be utilized in studying both the social world and natural sciences. In essence, the principles of research provide researchers with direction on how to conduct their research and what goals to achieve through their findings. Fundamental concepts in this philosophy include the definition of truth (ontology) and the methods used to explore or discover truth (epistemology). Hudson and Ozanne (1988) proposed that there are three main predominant approaches to acquiring knowledge in social sciences research which are Positivism; Interpretivism, and Pragmatism.

Positivism:

Kaptchuk, T. J. (1998) noted that positivism is the oldest theory in the social sciences and is associated with the works of A. Comte and E. Durkheim. Comte believed that knowledge can be acquired through sensory experience, observation, and experimentation. The positivist theory holds that reality is objective, ordered, and governed by strict laws, and can be perceived through the senses. According to Campbell, D. T., & Stanley, J. C. (1963) positivist researchers assume that reality is independent of human consciousness and can be investigated through measurable means. Bagozzi (1980) and Morgan and Smircich (1980) have argued that reality is divisible and fragmented, indicating that precise and accurate measurements and observations of the world are feasible. Hudson and Ozanne (1998) describe the positivist approach as assuming that a single, objective reality exists independently of individuals' perceptions, and that the social world exists as a tangible, definite, and unchanging structure. The positivist approach aims to test hypotheses and measure properties in an objective manner through scientific protocols (Morgan, G., & Smircich, L. 1980). Positivism is commonly used in quantitative research, and its fixed structure allows for accurate answers to each question. Researchers using this approach aim to remain detached and emotionally neutral to maintain a distinction between reason and feeling.

In medical research, positivism is the main philosophical approach, providing a well-established scientific protocol for the research process (Campbell and Stanley, 1963). Myers, M. D. (1997) defines positivism as “an epistemological position that advocates the application of the methods of the natural sciences to the study of social reality.”

Interpretivism:

The interpretive paradigm challenges the application of natural science methods in social research and acknowledges the uniqueness of individuals (Bryman 2004). Unlike the positivist approach, interpretivism recognizes that social reality is subjective and internalized, and can be assessed through constructs such as language and consciousness (Myers 1997). Interpretive researchers seek to describe multiple perceived realities and develop cooperative data collection methods (Hudson and Ozanne, 1998). This approach is flexible and personal, allowing researchers to remain open to new ideas and receptive to the meanings in interactions with research participants. In the field of medical information systems adoption, Friedman and Wyatt

(2006) identified two main perspectives: the objective assumption associated with quantitative research and the subjective assumption associated with qualitative research. Myers (1997) suggests that both positivist and interpretive paradigms are appropriate for conducting research in this field. Researchers adopting the constructivist paradigm tend to focus on individual experience and use qualitative methods to demonstrate personal perceptions of a particular condition (Friedman and Wyatt 2006).

Psychology has traditionally been associated with quantitative research methods based on positivist or neo-positivist theories (Mason 2002). The quantitative approach emphasizes detachment from respondents and emotional neutrality to maintain a clear distinction between reason and emotion. This approach provides a fixed structure that allows for accurate answers to each question (Clark 1998). Quantitative methods rely on mathematics as a precise scientific tool (Sayer 1992).

Pragmatism:

Pragmatism in research methodology involves the use of a mixed methods approach that draws on both qualitative and quantitative research methods to address research questions (Tashakkori & Teddlie, 2003). This approach is grounded in the idea that different research methods have different strengths and weaknesses, and that combining methods can provide a more comprehensive and nuanced understanding of complex research questions (Creswell & Plano Clark, 2018).

Pragmatism also emphasizes the importance of using a flexible and iterative research design that can adapt to changing research questions and contexts (Creswell, 2013). This approach involves a cyclical process of data collection, analysis, and interpretation, where each phase informs the next and allows researchers to refine their research questions and methods as they proceed (Creswell & Plano Clark, 2018).

4.2.2 Research Approach

According to Saunder et al. (2007), research approach refers to the "systematic and structured way in which research is conducted in order to achieve a particular objective or answer a research question" (p. 123). They further elaborate that various research approaches exist, which include quantitative, qualitative, and mixed methods. They note that the selection of an appropriate approach relies on several factors, such as the research question, design, and resource availability.

There are different types of research approaches, including quantitative, qualitative, and mixed methods. Each approach has its own strengths and weaknesses, and the choice of approach depends on the research question, the type of data that needs to be collected, and the purpose of the study.

Quantitative research approach is based on the collection and analysis of numerical data using statistical methods. This approach is often used in natural sciences and engineering, as well as in social sciences when it is necessary to measure and quantify phenomena. Quantitative research often involves the use of experiments, surveys, and statistical analysis, and aims to establish cause-and-effect relationships between variables. Qualitative research approach is based on the collection and analysis of non-numerical data, such as words, images, and observations. This approach is often used in social sciences, humanities, and education, where the focus is on understanding the meaning and context of phenomena. Qualitative research often involves the use of interviews, focus groups, and ethnographic observation, and aims to generate rich and detailed descriptions of phenomena.

Mixed methods research approach combines both quantitative and qualitative methods in a single study. This approach is often used when the research question requires a more comprehensive and complex understanding of phenomena, and when the strengths of both quantitative and qualitative methods can be combined to provide a more complete picture. Mixed methods research often involves the use of surveys, experiments, interviews, and observation, and aims to triangulate data from different sources to validate findings. The choice of research approach depends on several factors, including the research question, the research design, and the availability of resources. Each approach has its own strengths and weaknesses, and the choice of approach should be based on the specific research question and the objectives of the study. It is also important to consider the ethical implications of the research approach, as well as the potential biases that may arise from the selection of a particular approach (Saunader, M., Brown, T., & Wang, X. 2007).

These approaches include deduction, induction, and abductive reasoning. Each approach has its own unique characteristics, advantages, and limitations.

Deductive reasoning is a top-down approach that begins with a theory or general principle and then moves down to a specific observation or conclusion. This approach involves testing a hypothesis against existing theoretical frameworks or established knowledge to determine its validity. Deductive reasoning is often used in quantitative research and experiments, where the goal is to establish cause-and-effect relationships between variables. This approach is considered more reliable as it starts from a well-established theory or principle and tests it against empirical evidence to confirm or refute the hypothesis Babbie, E. (2016).

Inductive reasoning, on the other hand, is a bottom-up approach that begins with specific observations or data and then moves up to a general conclusion or theory. This approach involves analysing and interpreting data to identify patterns and themes that can then be used to generate new hypotheses or theories. Inductive reasoning is often used in qualitative research, where the goal is to understand the meaning and context of phenomena. This approach is considered more exploratory and flexible, as it allows for the discovery of new insights and ideas (Strauss, A. L., & Corbin, J. 2014).

Abductive reasoning is a combination of deductive and inductive reasoning. It begins with an incomplete set of observations or data and then moves to a hypothesis or theory that explains these observations. This approach involves generating hypotheses that can be tested against empirical evidence to determine their validity. Abductive reasoning is often used in mixed methods research, where the goal is to combine both quantitative and qualitative data to gain a more complete understanding of phenomena. This approach is considered more pragmatic, as it allows for the generation of hypotheses that can be tested against empirical evidence while also being flexible enough to account for new insights and ideas (Alvesson, M., & Sandberg, J. 2011).

The choice of approach depends on several factors, including the research question, the type of data that needs to be collected, and the purpose of the study. Deductive reasoning is often used when the research question requires a specific hypothesis to be tested against established theories or principles. Inductive reasoning is often used when the research question requires a more exploratory approach to understand the meaning and context of phenomena. Abductive reasoning is often used when the research question requires a combination of deductive and inductive reasoning to generate hypotheses that can be tested against empirical evidence.

It is important to note that each approach has its own strengths and limitations. Deductive reasoning is often considered more reliable but may not be suitable for all research questions, as it relies on existing theoretical frameworks and may not account for new insights or ideas. Inductive reasoning is often considered more exploratory and flexible but may be less reliable as it relies on the interpretation of data and may be subject to researcher bias. Abductive reasoning is often considered more pragmatic but may be more challenging to apply as it requires both deductive and inductive reasoning skills.

Regardless of the research approach chosen, it is important to adhere to the principles of scientific inquiry and to ensure that the research is conducted in a rigorous and systematic manner. This involves selecting appropriate research methods and techniques, collecting and analyzing data in a transparent and unbiased manner, and reporting the findings in a clear and concise manner. It is also important to consider the limitations of the research approach, and to acknowledge any potential biases or limitations in the interpretation of the findings.

4.2.3 Research Strategies

Saunders et al. (2007) evaluate research can be approached using a variety of research strategies and methodologies, depending on the research questions being asked, the nature of the data being collected, and the resources available to the researcher. This session will critically investigate some common research strategies and methodologies used in business research, as well as their pros and cons.

1. Survey Research

Survey research is a commonly used research strategy in behavior science research, where data is collected from a large sample of respondents through the use of questionnaires. Survey research can be conducted using different modes such as face-to-face, online, and telephone. The survey method is useful for collecting data on opinions, attitudes, preferences, and behaviors of individuals or groups. However, survey research is limited by the quality of the questionnaire, the sample selection, and the response rate. Therefore, careful attention should be paid to the design of the questionnaire and the sampling strategy to ensure the validity and reliability of the results.

2. Case Study Research

Case study research is a research strategy that involves the in-depth study of a particular phenomenon within its real-life context. Case studies are used to investigate complex phenomena that cannot be easily generalized, such as organizational processes, managerial decision-making, and new product development. Case studies are usually conducted using multiple sources of data, such as interviews, documents, and observations. The strength of case study research lies in its ability to provide rich and detailed descriptions of the phenomenon under study. However, case studies are limited by the potential for researcher bias and the difficulty of generalizing the results to other contexts.

3. Experimental Research

Experimental research is a research strategy that involves the manipulation of one or more variables to determine the effects on another variable. Experimental research is commonly used in business research to test hypotheses related to cause-and-effect relationships. Experiments can be conducted in laboratory settings or in the field. The strength of experimental research lies in its ability to establish causality between variables. However, experimental research is limited by the potential for confounding variables and the difficulty of generalizing the results to real-life situations.

4. Action Research

Action research is a research strategy that involves collaboration between researchers and practitioners to address practical problems in real-life settings. Action research is used to improve the quality of practice and generate new knowledge about the phenomenon under study. The process of action research typically involves several stages, including problem identification, data collection, analysis, and reflection. The strength of action research lies in its ability to generate practical solutions to complex problems and engage stakeholders in the research process. However, action research is limited by the potential for researcher bias and the difficulty of generalizing the results to other contexts.

5. Grounded Theory Research

Grounded theory research is a research strategy that involves the development of a theory based on data collected from the field. Grounded theory research is used to generate new knowledge about the phenomenon under study, particularly in situations where little is known. The process of grounded theory research typically involves several stages, including data collection, analysis, and theory development. The strength of grounded theory research lies in its ability to generate new and innovative theories that are grounded in the data. However, grounded theory research is limited by the potential for researcher bias and the difficulty of generalizing the results to other contexts.

6. Phenomenology

Phenomenology is a research strategy that focuses on the subjective experiences of individuals. It aims to understand how individuals perceive and interpret the world around them (Moustakas, 1994). Phenomenology is commonly used in business research to investigate the subjective experiences of customers, employees, and managers. The process of phenomenological research typically involves several stages, including data collection, analysis, and interpretation (Creswell, 2013). The strength of phenomenological research lies in its ability to provide rich and detailed descriptions of subjective experiences (van Manen, 1997). However, phenomenological research is limited by the potential for researcher bias and the difficulty of generalizing the results to other contexts (Creswell, 2013).

7. Ethnography

Ethnography is a research strategy that involves the in-depth study of a particular culture or social group. Ethnography is used to investigate cultural norms, beliefs, and practices within a specific context (Spradley, 1980). Ethnography is commonly used in business research to investigate organizational culture, consumer behavior, and employee attitudes. The process of ethnographic research typically involves several stages, including participant observation, interviews, and analysis (Denzin & Lincoln, 2011). The strength of ethnographic research lies in its ability to provide a deep understanding of the cultural context under study (Hammersley & Atkinson, 2007). However, ethnographic research is limited by the potential for researcher bias and the difficulty of generalizing the results to other contexts (Denzin & Lincoln, 2011).

4.2.4 Research Choices and Techniques

This thesis will implement the pragmatism philosophy and conducted both quantitative and qualitative methods based on the abductive reasoning. The mixed method approach will be used to examine the research questions and hypotheses (Table 4.1). This approach is specifically chosen to leverage the distinct advantages of both quantitative and qualitative research, facilitating a multi-dimensional exploration of the research questions and hypotheses. The adoption of a mixed-methods approach is deliberate, aimed at achieving a multifaceted understanding of health self-monitoring device adoption within China's sub-healthy population.

Quantitative data will be gathered through surveys, a methodological choice informed by its effectiveness in collecting broad-scale data from a substantial participant pool. This approach is instrumental in identifying general patterns and trends regarding the adoption of health self-monitoring devices, alongside pinpointing prevalent issues and barriers encountered during the adoption phase, including device type preferences.

Conversely, qualitative insights will be solicited via interviews, a technique that promises an in-depth exploration of the individual experiences and viewpoints concerning the adoption of health self-monitoring devices among Chinese sub-healthy groups. This qualitative dimension is crucial for unearthing the underlying factors influencing adoption decisions, encompassing personal beliefs, attitudes toward the technology, and the socio-cultural dynamics at play.

The strategic combination of survey and interview methodologies enables a comprehensive exploration of device adoption patterns and individual narratives, thereby facilitating a robust analysis of both macro and micro-level influences on adoption behaviors. Such an integrated approach not only paints a holistic picture of the current adoption landscape but also sheds light on the nuanced interplay of individual, social, and cultural factors affecting the uptake of health self-monitoring devices among the sub-healthy demographic in China.

In sum, the mixed-methods approach adopted in this thesis stands to offer a nuanced and thorough understanding of the dynamics governing health self-monitoring device adoption among China's sub-healthy population. This, in turn, is expected to inform targeted strategies designed to enhance device adoption and utilization within this key demographic.

Table4 .1 Research Design

Philosophy	Research Design	Reasoning
Positivism	Quantitative research	Deductive reasoning
Interpretivism	Qualitative research	Inductive reasoning

Pragmatism	Quantitative and Qualitative research	Abductive reasoning

Source: theinnovidea.com

4.2.5 Time Horizons

Time horizons refer to the duration over which a research study is conducted, and the timeframe within which the research data is collected (Bryman & Bell, 2019). In research methodology, time horizons can be classified into three categories: cross-sectional, longitudinal, and sequential.

1. Cross-sectional studies: Cross-sectional studies are conducted at a single point in time and are designed to collect data on a specific population or sample. These studies are useful for investigating relationships between variables at a specific point in time and can be used to explore the prevalence of a particular phenomenon or to compare groups based on specific characteristics (Bryman & Bell, 2019).

For example, a cross-sectional study could be used to investigate the prevalence of health self-monitoring device adoption among Chinese sub-healthy group at a particular point in time.

2. Longitudinal studies: Longitudinal studies are conducted over an extended period of time and involve the collection of data at multiple time points. These studies are useful for investigating changes or developments in a particular phenomenon over time, and can be used to identify trends, patterns, and causal relationships (Bryman & Bell, 2019).

For example, a longitudinal study could be used to investigate the changes in health self-monitoring device adoption among Chinese sub-healthy group over a period of 5 years, by collecting data at multiple time points.

3. Sequential studies: Sequential studies combine both cross-sectional and longitudinal approaches and involve the collection of data at multiple time points from different cohorts. These studies are useful for investigating changes over time while also comparing different groups based on specific characteristics (Bryman & Bell, 2019).

For example, a sequential study could be used to investigate changes in health self-monitoring device adoption among Chinese sub-healthy group over a period of 5 years, while also comparing the adoption patterns of different age groups or gender groups.

The choice of time horizon in research methodology depends on the research question and the nature of the phenomenon being investigated. For example, cross-sectional studies are appropriate for investigating the prevalence of a particular phenomenon or for comparing groups based on specific characteristics. Longitudinal studies are appropriate for investigating changes or developments in a phenomenon over time, and sequential studies are appropriate for investigating both changes over time and differences among different groups.

4.3 The Design of the Study

4.3.1 Questionnaire

The quantitative approach is a widely accepted research method and has been applied by researchers for many years (Creswell 2003). Questionnaires are a popular research tool used in many fields, including social sciences, healthcare, marketing, and business. They are often used to collect large amounts of quantitative data from a sample population, making them an efficient and cost-effective research method.

Advantages of using questionnaires:

1. Efficient data collection: Questionnaires allow researchers to collect data from a large sample of participants in a relatively short amount of time. This is particularly useful when trying to gather data on a large population.

2. Easy to administer: Questionnaires are easy to administer to participants, either in-person or online, reducing the potential for researcher bias.

3. Standardized: Questionnaires provide standardized questions that are asked in the same way to all participants. This reduces the potential for response bias and increases the reliability of the data collected.

4. Anonymity: Participants can remain anonymous when completing a questionnaire, which can increase the likelihood of honest and accurate responses.

Disadvantages of using questionnaires:

1. Limited depth: Questionnaires are typically used to collect quantitative data, which can limit the depth of the information collected. They do not allow for the exploration of complex issues or provide a rich understanding of participants' perspectives.
2. Low response rates: Response rates to questionnaires can be low, particularly when participants are not incentivized to participate or when they are asked to complete the questionnaire in their free time.
3. Limited control over participant responses: Researchers have limited control over how participants respond to the questions in the questionnaire, potentially leading to incomplete or inaccurate responses.
4. Limited flexibility: Questionnaires are often inflexible, meaning that participants cannot ask questions or provide additional information beyond what is asked in the questionnaire.

Questionnaires are most appropriate when collecting quantitative data from a large sample population. They are particularly useful in situations where it is not feasible to collect data in-person, such as when the population is geographically dispersed or when the data collection needs to be done quickly and efficiently. They are also useful in situations where the research questions are well-defined, and the information needed can be collected using standardized questions (Denzin & Lincoln, 2011).

4.3.2 Interview

Denzin and Lincoln (2000) defined qualitative research as a set of material and interpretative practices, such as interviews, field notes, conversations, photographs, recordings, and memos, that make the world visible. The authors stressed the fact that qualitative researchers study things in their natural settings. Interviews are a popular method of data collection in the field of social science research. Interviews allow researchers to gather rich and detailed information from participants, which can be used to gain insights into their experiences, attitudes, beliefs, and behaviors.

There are several types of interviews that can be used in research, including structured interviews, semi-structured interviews, and unstructured interviews. Each type of interview has its own advantages and disadvantages and should be chosen based on the research questions, the participants, and the context of the study.

Structured interviews are highly standardized and are used to collect quantitative data. In structured interviews, the researcher asks a set of pre-determined questions to all participants in the same order and format. Structured interviews are useful when the researcher wants to compare responses across participants or when the researcher wants to measure specific attitudes or behaviors. However, structured interviews can limit the depth of information that can be gathered from participants.

Semi-structured interviews are less structured than structured interviews but still have a set of pre-determined questions. However, in semi-structured interviews, the researcher has more flexibility in the order and format of the questions and can ask follow-up questions or explore topics in more depth. Semi-structured interviews are useful when the researcher wants to gather rich and detailed information from participants while still maintaining some level of standardization. However, semi-structured interviews can be time-consuming and may require more resources than structured interviews. Unstructured interviews are highly flexible and allow the researcher to explore topics in-depth without a set of pre-determined questions. Unstructured interviews are useful when the researcher wants to gain a deep understanding of the participant's experiences, attitudes, or beliefs. However, unstructured interviews can be difficult to analyse and may require a skilled interviewer to manage the conversation effectively.

Advantages and Disadvantages of Interviews:

Interviews have several advantages over other data collection methods, such as surveys or questionnaires. Firstly, interviews allow the researcher to gather rich and detailed information from participants, which can provide valuable insights into their experiences, attitudes, and beliefs. Secondly, interviews allow the researcher to clarify any misunderstandings or ambiguities in the participant's responses. Thirdly, interviews can be used to establish rapport with the participant, which can improve the quality of the data collected.

However, interviews also have several disadvantages. Firstly, interviews can be time-consuming and may require more resources than other data collection methods. Secondly, interviews may be affected by social desirability bias, where participants may provide answers that they think are socially acceptable rather than their true opinions or experiences. Thirdly, interviews may be influenced by the interviewer's personal biases or opinions, which can affect the quality of the data collected.

The following steps should be followed when conducting an interview:

1. Determine the research questions and the purpose of the interview.
2. Determine the type of interview that is most appropriate for the research questions, the participants, and the context of the study.
3. Select the participants for the interview and obtain their consent to participate.
4. Develop a set of questions that are relevant to the research questions and the purpose of the interview.
5. Pilots test the questions with a small group of participants to ensure that they are clear and easy to understand.
6. Schedule a time and place for the interview that is convenient for the participant.
7. Conduct the interview, either in person, over the phone, or online, depending on the research questions and the context of the study.

To achieve transferability in qualitative research, theoretical sampling is employed to recruit essential, typical, and theoretically important units. Sample size may be small in the qualitative research, and representativeness is often considered less essential compared to quantitative research where findings can be generalized to the entire population. Although interviews are the most common method in qualitative research, data can also be collected through group discussions, observation, various texts, pictures, and other materials. Silverman (1993) argued that interviews can provide authentic insights into people's experiences, but he also acknowledged that interviewees sometimes fail to provide meaningful insights and respond with personal narrative constructs. Therefore, the quantitative and qualitative methodologies can be combined in a mixed methods approach, which is used within the post-positivist paradigm. This approach is still evolving in both form and substance, according to Bryman (2006).

4.3.3 Triangulation Method

Triangulation is a widely used research method that has been employed in various fields, including social sciences, psychology, and education (Creswell, 2014; Denzin, 1978). The term "triangulation" refers to the use of multiple methods, sources, or researchers to study a particular phenomenon in order to enhance the validity and reliability of the findings (Denzin, 1978; Jick, 1979).

One of the advantages of triangulation is that it can increase the validity and reliability of the findings by corroborating the results obtained from different sources or methods (Creswell, 2014; Jick, 1979). For example, if a researcher uses both interviews and surveys to collect data, the findings can be more trustworthy because the same phenomenon is being studied from two different perspectives (Creswell, 2014). Moreover, triangulation can help to overcome the limitations of individual methods by compensating for their weaknesses and biases (Denzin, 1978; Jick, 1979).

However, triangulation also has some disadvantages that should be taken into account. One of the challenges of triangulation is the potential for complexity and increased workload, as multiple methods may require more time and resources to implement (Creswell, 2014). In addition, the integration of data from different sources or methods may be difficult, as they may use different scales or measures, or produce conflicting results (Denzin, 1978).

The suitability of triangulation for a particular research project depends on the research question and design. Triangulation is most appropriate when the research question requires a comprehensive and multi-faceted understanding of the phenomenon under investigation (Creswell, 2014). In addition, triangulation is useful when the research design aims to minimize the limitations and biases of individual methods (Jick, 1979).

In the case of this research on the adoption of health self-monitoring devices among the Chinese sub-healthy group, triangulation could be a suitable method. By using both surveys and interviews, which can gain a more comprehensive understanding of the factors that influence the adoption of these devices and can validate your findings from multiple sources.

The aim of this section is to investigate the appropriate paradigm and selection of the right approach for this research. As showed in Figure 4.2, Triangulation research design for this study. Firstly, this research reviews the relevant literature and provide the research conceptual model for Chinese context. Phase 2 is using the deductive approach and conducting the quantitative research, design the research hypothesis and used the collected data to provide the statistical evaluation of the research conceptual Model. The subsequent section 4.3.4 will provide a detailed explanation, taking into account the advantages and disadvantages of various research methods. Additionally, this study used an inductive approach to design the relevant interview questions and interview among three sub-healthy groups (chapter 6.3). The qualitative approach double confirmed the research conceptual model and provided more understanding of the statistical results.

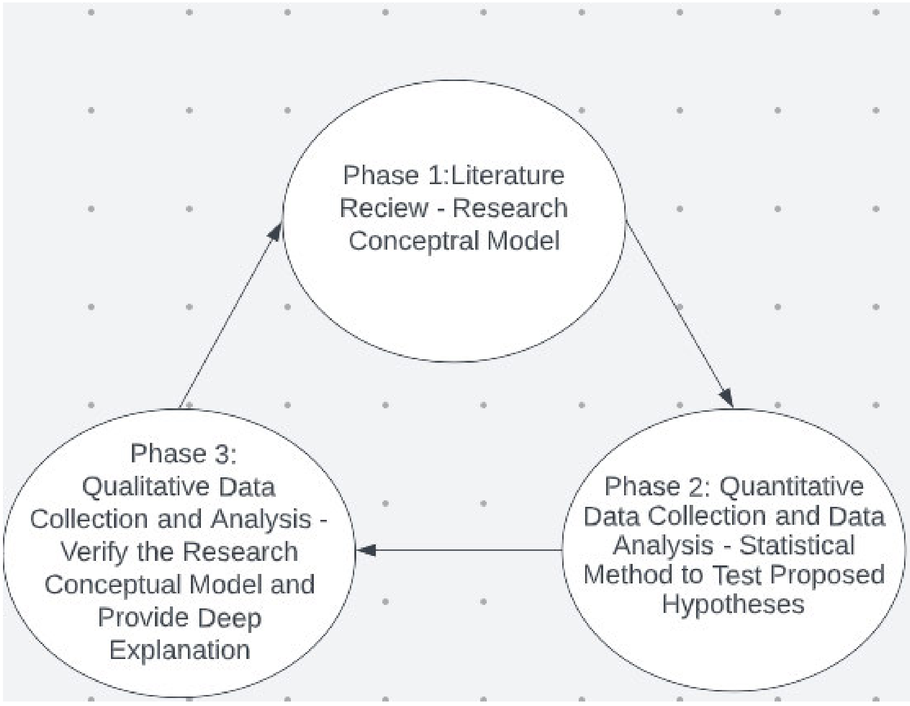


Figure 4.2. Triangulation research design for this study.

4.3.4 Advantages and Disadvantages

According to Thurmond (2001), triangulation offers several advantages, including increasing confidence in research data, providing a clearer understanding of the problem, revealing unique findings, and creating innovative ways of understanding a phenomenon. These benefits stem from the use of multiple and diverse sources of data for analysis. For instance, Burr (1998) used triangulation to gain a comprehensive view of family needs in critical care by combining questionnaires and selective participant interviews. This approach revealed that interviewees found the sessions therapeutic while non-interviewees could only express their frustrations on questionnaires. By incorporating both methods, the study achieved greater depth and validity in its findings.

However, triangulation also has potential drawbacks. It is often used in mixed methods research, which involves combining quantitative and qualitative methods to answer a specific research question. The results of such research may converge and lead to the same conclusions, or they may relate to different objects or phenomena but complement each other. Alternatively, the results may be divergent or contradictory. While converging results increase validity through verification, complementary results highlight different aspects of the phenomenon or illustrate different phenomena. Divergent findings, on the other hand, may lead to new and better explanations for the phenomenon under investigation.

The diagram indicates a three-phase research process for this thesis where each phase contributes distinctively to the development of the research.

Phase 1: Literature Review - Research Conceptual Model

This initial phase serves as the foundation of the research project. A thorough review of existing literature informs the creation of a research conceptual model, which maps the theoretical framework and constructs of study. This model is essential, as it directs the entire research process and provides a theoretical basis for developing research hypotheses. It will involve extensive reading of academic journals, books, and other scholarly materials to identify gaps in the current research and establish a rationale for the study.

Phase 2: Quantitative Data Collection and Data Analysis - Statistical Method to Test Proposed Hypotheses

The second phase involves the collection of quantitative data, likely through surveys, experiments, or existing data sets, to test the hypotheses derived from the research conceptual model. Quantitative data are characterized by their ability to be measured and quantified, which allows for statistical analysis. This phase is critical for testing the generalizability of the conceptual model and for obtaining empirical evidence that supports or refutes the initial hypotheses. Statistical methods will be applied to analyze the data, which might include descriptive statistics, correlation, regression analysis, or more complex statistical modeling, depending on the research questions.

Phase 3: Qualitative Data Collection and Analysis - Verify the Research Conceptual Model and Provide Deep Explanation

The third phase involves qualitative data collection and analysis. Methods such as interviews, focus groups, or case studies will be used to collect rich, detailed data that can provide a deeper understanding of the research conceptual model. This phase aims to verify the model and hypotheses by exploring the nuances and complexities of the phenomena that cannot be captured through quantitative methods alone. It is through this phase that the researcher can uncover the 'why' and 'how' behind the trends identified in the quantitative phase, offering a deep explanation and interpretation of the findings. Qualitative analysis may involve coding of data, thematic analysis, or other methods suitable for narrative data.

Upon completing all three phases, the researcher will integrate the findings to draw comprehensive conclusions. This integration, often referred to as triangulation, allows for cross-validation where findings from one method can be corroborated by another, enhancing the validity and reliability of the results. Triangulation also helps in resolving any discrepancies between the quantitative and qualitative findings. If quantitative results indicate a trend in the adoption of health self-monitoring devices among the sub-healthy population in China, qualitative insights could explain why certain groups adopt these devices more readily than others, uncovering motivational factors, cultural influences, or economic barriers.

The triangulation research design outlined in the diagram promises a rich, comprehensive, and credible approach to exploring the research questions. The three-phased approach allows for an iterative process where each phase builds on the previous one, creating a layered understanding of the research topic. It acknowledges the complexity of research phenomena by utilizing diverse methodologies, each offering a different lens through which to view the data. Through this methodological rigor, the study aims to make a substantial contribution to the existing body of knowledge on the adoption of health self-monitoring devices among China's sub-healthy population.

4.4 Population and Sampling

The purpose of this section is to emphasize the importance of using appropriate sampling techniques for research. Howard, G. (1985) stated that researchers must determine the specific population they are interested in for their scientific project. However, it is often impossible to collect data from the entire population, so researchers must select a representative sample. A representative sample accurately reflects the characteristics of the population, allowing researchers to generalize their findings. Biased samples can lead to erroneous conclusions. Sampling techniques include simple random sampling, stratified sampling, cluster sampling, multi-stage sampling, quota sampling, and systematic sampling. Simple random sampling uses random numbers to select individuals, while stratified sampling ensures proportional representation of all sub-groups in a population. Cluster sampling involves selecting a few clusters at random and collecting data from the entire population within the selected clusters. Multi-stage sampling is used when research is conducted over a wide geographical area, and quota sampling is used in qualitative research when accuracy is not required. Systematic sampling involves selecting a sample by means of a defined sample frame, and non-probability sampling does not rely on statistical calculations of the sample size. It is important to choose an appropriate sampling technique that will result in a representative sample and accurate research findings.

4.4.1 Study Population

The thesis focuses on a particular segment of the population identified as being in a "sub-healthy" or "Sub-Optimal health status," a term that captures individuals who, despite not suffering from a diagnosable disease, do not experience optimal health either. This concept, particularly within the context of China's vast population, opens up a critical avenue for understanding and potentially mitigating the pathway to chronic diseases. This thesis delineates the sub-healthy population into three distinct groups: the normal sub-healthy group, the health professional group, and the medical professional sub-healthy groups, aiming to capture a comprehensive view of sub-optimal health conditions across different strata of society.

a) Normal Sub-Healthy Group

This group represents the larger segment of the population that identifies with sub-optimal health status without having professional training in health or medical fields. Their inclusion is foundational to the study as they offer a glimpse into the general prevalence of sub-health conditions, influenced by everyday lifestyle choices, environmental factors, and potentially unrecognized psychological stressors. This group's experiences and perceptions provide a baseline understanding of sub-optimal health, highlighting commonalities in symptoms, triggers, and coping mechanisms employed by the average individual. Analyzing data from this group allows for the identification of widespread patterns and risk factors associated with sub-health, setting the stage for developing broad-based interventions aimed at lifestyle modifications, public health campaigns, and environmental changes to promote better health outcomes.

b) Health Professional Group

Incorporating health professionals who themselves identify as being in a sub-optimal health state offers a nuanced layer to the study. These individuals stand at the intersection of theoretical health knowledge and personal health practices, providing invaluable insights into the complexity of maintaining optimal health even with extensive health knowledge. This discrepancy between knowledge and practice underscores the challenges in health behavior change, highlighting barriers such as workplace stress, time constraints, and the pervasive nature of unhealthy societal norms. Furthermore, health professionals can critically evaluate existing health promotion strategies and healthcare policies from an insider's perspective, suggesting refinements and innovations that could make these approaches more effective and accessible for the sub-healthy population.

c) Medical Professional Sub-Healthy Groups

Medical professionals experiencing sub-optimal health conditions contribute a critical perspective to the thesis. Their participation not only mirrors the complexities seen in the health professional group but also adds a layer of clinical insight into the sub-health phenomenon. This group can offer perspectives on the diagnostic challenges of sub-optimal health conditions, the limitations of current medical training in addressing these issues, and the potential for integrating preventive medicine more thoroughly into clinical practice. Their experiences highlight the need for healthcare systems to evolve, incorporating a more holistic view of health that encompasses not just the absence of disease but the full spectrum of well-being, including mental and emotional health.

By targeting these specific groups, the study aims to capture a comprehensive understanding of sub-optimal health statuses across different segments of the population. This stratified approach allows for the identification of unique needs and intervention strategies that could be more effective for each group. For instance, lifestyle interventions might be more relevant for the normal sub-healthy group, while stress management and work-life balance strategies could be more applicable to health and medical professionals. The insights gained from this study have the potential to inform policymakers and healthcare providers about the necessary changes in healthcare delivery, education, and preventive measures to address sub-optimal health more effectively. For example, policies aimed at improving workplace wellness, particularly for health and medical professionals, could mitigate one of the risk factors for sub-health among these groups. Additionally, educational reforms that incorporate a more holistic view of health, emphasizing preventive measures and the importance of mental and emotional well-being, could prepare future health professionals to better address sub-optimal health conditions.

Understanding and improving the health status of these groups could have significant implications for public health in China. By addressing sub-optimal health conditions effectively, there is potential to reduce the burden of chronic diseases, enhance the quality of life for a large portion of the population, and decrease healthcare costs associated with managing long-term illnesses. Moreover, this study's findings could contribute to a shift in societal attitudes towards health, promoting a more proactive and preventive approach to health management. Therefore, the thesis's targeted exploration of sub-optimal health conditions among different groups within China's population provides a unique opportunity to understand and address this widespread health issue. By focusing on the normal sub-healthy group, health professionals, and medical professional sub-healthy groups, the study leverages a multi-faceted approach to uncover the nuances of sub-health conditions, paving the way for more effective interventions, policies, and practices that could significantly improve public health outcomes. This research not only contributes to the academic discourse on sub-optimal health but also offers practical insights that could benefit individuals and society at large, marking a critical step towards a healthier future for China.

4.5 Quality of the Research

This section provides a comprehensive discussion on the techniques used to assess the quality of a research project, with the primary objective of identifying the appropriate tools for ensuring the research's quality control. The reliability and validity of research are crucial, as the quality of a research study may be called into question due to factors such as theory generation and lack of researcher independence. In qualitative studies, researchers use the concepts of conformability, dependability, transferability, and credibility to evaluate the research's reliability and validity (Suander, 2007). External validity or generalizability, internal validity, external reliability, and internal reliability are addressed in quantitative studies. The relevant data regarding to the quality of the research can be found from Chapter 5, 5.2 and Chapter 6, 6.3.1.

4.6 Ethical Considerations: The Coventry University Research Ethics Policy

Coventry University's Research Ethics Policy (2019) outlines guidelines for conducting research involving human participants, personal data, and human tissue. Informed consent is required before any research study involving human participants can begin. Written consent is preferable for interview research, but oral consent can be used as an alternative. Interviews should be recorded or conducted in the presence of at least one witness. Implicit consent is acceptable for questionnaire surveys. Procedures involving personal data or human tissue require ethical review and approval before data collection. Collecting identifiable personal information should be minimized, and if necessary, it should be done only with consent. Data processing should be transparent and justifiable. Participants should not be exposed to more danger than they face in their normal lives, and any expected discomfort or harm should be explained and discussed during the ethics approval process. All personal information must be kept secure, not retained for longer than necessary, and the disclosure of identifiable personal information should be avoided unless with the participants' consent.

4.7 Chapter Summary

The research methodology used in this study involves a mixed-methods approach, combining qualitative and quantitative research techniques. The purpose of the research is to investigate the impact of technology on student learning outcomes in higher education. The study is guided by a conceptual framework that identifies the key variables and their relationships.

The research begins with a review of the literature to identify the relevant theories and empirical studies related to the research topic. A pilot study is conducted to test the research instruments and refine the research design.

Data collection involves a survey of Chinese sub-healthy group and semi-structured interviews with 3 different sub-healthy groups in China. The survey is designed to gather quantitative data on sub-healthy groups' intention to use of health self-monitoring devices and their perceptions of its impact on their health condition monitoring. The interviews are used to gather qualitative data on professionals' perceptions of the factors impact on user's intention to use. The data is analysed using statistical techniques for the quantitative data and thematic analysis for the qualitative data. The results of the analysis are presented in a descriptive and comparative format. Next chapter will start analysing the collected data from both chapter 5 and 6.

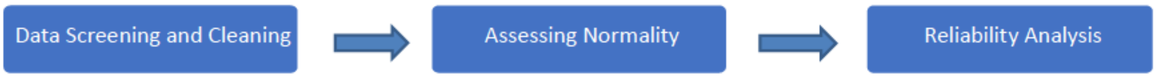
CHAPTER 5 QUANTITATIVE STUDY: FINDINGS FOR STATISTICAL ANALYSIS

5.1 Introduction

The framework, which explains users' intention to use of health self-monitoring devices, was further analysed using Partial Least Squares-Structural Equation Modelling (PLS-SEM) to obtain result. To conduct this analysis, this study utilises Smart PLS v3 (Ringle et al. 2015). PLS-SEM involves two stages of analysis: The first stage provides a descriptive analysis of survey responses and overall data screening. Secondly, the statistical results are discussed empirically by conducting a measurement model including reliability tests, discriminant validity, cross-loading and convergence. Additionally, the structural model, including R^2, effect size, and goodness of fit (GoF) for the overall model is presented. To provide a detailed analysis of the instrument's quality, the first step undertaken was to assess various aspects such as missing value analysis, outlier assessment, normality testing, and multicollinearity testing. The analysis of these measures aided in verifying the validity and reliability of the data, thereby justifying the robustness of the conceptual model. Specifically, this step aimed to evaluate the data quality of the instrument, which is crucial to ensuring the validity of subsequent analyses. The second stage of the analysis involves constructing a structural model to validate the developed framework and provide statistical evidence for predicted component relationships. The structural equation modelling is based on a correlation between predictors and dependent variables, which provides a more comprehensive exploration of interrelationship than that of single regression models. An overview of the hypothesis testing from the findings is presented.

The process, steps, and two stages of PLS-SEM conducted in this study are shown in Figure 5.1. Stage one aims to conduct preliminary statistical analysis such as data screening and cleaning, assessing normality, and establishing preliminary reliability for manifest indicators. In contrast, stage two aims to conduct more advanced statistical analyses utilising predictors and dependent variables of latent constructs (Hair et al., 2010).

Stage1 - Pre-analysis stage: Measurement analysis



Stage2 - Main analysis stage: Structural analysis

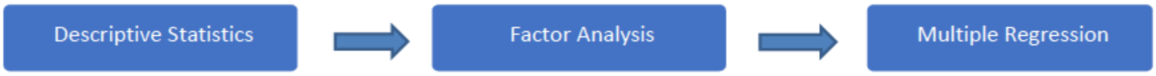


Figure 5.1. Stages of doing data analysis

5.2 Stage 1 – Measurement Analysis

5.2.1 Data Screening

The data evaluation process is essential to conduct as the validity of the collected dataset needs to be justified initially before the final assessment. The preliminary data screening and cleaning are key to ensuring the quality of the dataset. Issues include missing data, unfinished answers, repeating answers, non-meaningful answers and some unrelated answers. Fidell (2007) stated that these issues could be classified as missing values, outliers, unreliable responses, which can affect normality assumption, and multicollinearity assessment. These issues can potentially influence the research findings in an unreliable way if the data pre-processing is not conducted. According to the basic assumption of the usage of multivariate data analysis techniques, preliminary data screening is essential, as it can assure that the dataset is within the regulation (Hair et al., 1998). Data screening can assist the researchers in better understanding their collected dataset and enhance modelling accuracy, so the validity test of data can be conducted (Hair et al., 2010).

5.2.2 Handling Missing Data

The questionnaire was provided to both sub-healthy and healthy individuals, who are asked to respond to questions on health self-monitoring gadget adoption and use intention based on their prior experiences. The survey was sent out to 1200 individuals, and 800 questionnaires were returned. Due to the presence of some missing values during the stage of data screening, 106 responses with incomplete answers and any repetitive responses from the same IP address were discarded. The remaining 694 responses offered useful information for further research, and a response rate of 57.8% was achieved. According to Underwood and Daniel (2000), social science surveys should have a response rate of at least 35%. Furthermore, Simon (2011) suggested that a response rate of more than 35% be considered acceptable. The response rate statistics are summarised in Table 5.1.

Table 5.1 Response Rate

Response	Frequency
Distributed	1200
Returned	800
Excluded	106
Usable	694
Response Rate	**57.8%**

However, in the original dataset, there are still 5 missing cells that are missing randomly and account for 0.04% of the whole dataset. There is, however, no consensus on the proportion of acceptable missing data required to achieve a valid statistical result. Researchers agree that a missing value rate of less than 5% is regarded as acceptable and has a negligible impact on the findings (Schafer, 1999;

Tabachnick & Fidell, 2007). Therefore, 0.04% missing values are acceptable since it is below the threshold of 5%. Additional information about the number of missing values for individual constructs is provided in Table 5.2.

Table 5.2 Missing Values

Construct	Number of missing values
Social Conformity	1
Trust in social media	2
Intention to use	2
Total	5

5.2.3 Respondent's Demographic Statistics

Table 5.3 contains respondents' demographic characteristics such as gender, age, education level and health condition, respondents with and without serious sub-health symptoms were included in this survey. As shown in Table 5.3, 48.1% of the respondents were female, while 51.9% were male. Therefore, the gender distribution is nearly equal. According to the examination of respondents' age groups, respondents below the age of 30 accounted for about 45% of the sample, and the 30-50 age and over 50s group represented about 35% and 20%, respectively. Also, 81.2% of respondents experienced serious subhealth symptoms. The serious sub-health symptoms can be defined as having a high rate of blood glucose or blood pressure, etc. People, who have serious sub-health symptoms, are more likely to have chronic diseases if they are not monitoring their unhealthy levels. The remaining 18.7% of the participants have less serious sub-health symptoms, which include tiredness, headache, amnesia, hypomnesia and agitation, etc. Additionally, the education levels of respondents are about 65% with high-level of education and 35% with primary and secondary level degrees. Therefore, the samples are well distributed across age groups, gender types and education characteristics.

Table 5.3 Respondents' Demographic Characteristics

Variable and category		Frequency n	Frequency %
Age in Years	18-20	32	4.6%
	21-30	283	40.8%
	31-40	100	14.4%
	41-50	143	20.6%
	51-60	100	14.4%
	>60	36	5.2%
Gender	Male	334	48.1%
	Female	360	51.9%
Education	Doctorate	20	2.9%
	Master's degree	148	21.3%
	Bachelor's degree	297	42.8%
	Junior college	30	4.3%
	Senior high school	116	16.7%
	Junior high school	37	5.3%
	Other	46	6.6%
Health Condition	With serious subhealth symptoms	564	81.2%
	Not serious sub-health symptoms	130	18.7%

5.2.4 Normality Test

Hair et al. (2016) stated that correlation and regression tests should be conducted to ensure that data are normally distributed, especially when the latent variables show a linear relationship. Based on Ghasemi and Zahediasl (2012), the researcher in this study considers that data are normal if it has a bell-shaped distribution with no significant skewness. In addition, nourish (2000) stated that the residual histogram provides a simple criterion for establishing the normality of data. Due to the limits imposed during the sampling phase, it is essential to get a normally distributed dataset. Additionally, Hair et al. (2006) demonstrated that a normal probability plot might be used to determine the distribution of data, in addition to using a histogram to determine the normality of data. This study uses Skewness and Kurtosis to assess the normality of the data and the histogram to visualise it. Zhuang (2016) demonstrated that when the Skewness and Kurtosis values are between -2 and +2, the data are properly distributed. Additionally, Hair et al. (2011) claims that Skewness values greater than -1 imply a very skewed distribution (Hair et al., 2011). Table 5.4 displays the skewness and kurtosis values for each construct.

Table 5.4 Skewness and kurtosis results for each latent construct

Constructs	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis
Perceived usefulness (PU)	-0.487	0.093	0.797	0.185
Perceived ease of use (PEU)	-0.273	0.093	0.318	0.185
Perceived severity (PS)	-0.5675	0.093	0.174	0.185
Cues to action (CA)	-0.497	0.093	0.398	0.185
Trust in social media (TS)	-0.09	0.093	0.341	0.185
Social conformity (SC)	-0.355	0.093	0.368	0.185
Intention to use (IU)	-0.439	0.093	0.528	0.185
Age	0.472	0.093	-0.898	0.185

However, it is assumed and confirmed in previous studies that PLS-SEM is able to provide precise model estimations in situations where the data is highly non-normal, since it is a non-parametric method (Reinartz et al., 2009; Wetzels et al., 2012). Therefore, normality is not an issue in PLS-PM which can robustly deal with non-normal data (Ringle, Wetzels & Wilson, 2009).

5.2.5 Multicollinearity Analysis

Multicollinearity is defined by Hair et al. (2011) as the level of relationship between independent variables in a relationship model. There is evidence of multicollinearity between constructs if the correlation coefficient among the variables is high. This statistically significant correlation can lead to limitations in a regression analysis, which may further lead to misleading findings and make it difficult to comprehend the impacts of multiple variables. In addition, multicollinearity characterises the association among one or more exogenous latent variables in a model. Multicollinearity among exogenous latent variables may influence the estimation of regression coefficients and their statistical significance (Hair et al., 2006). It properly inflates the amount of the coefficients' standard errors, which lead to coefficients statistically insignificant (Tabachnick et al., 2007).

Multiple methods for identifying multicollinearity have been developed by researchers. Variance inflation factors (VIF) and the correlation matrix are often employed to evaluate multicollinearity among variables (Kumar, 2015). When the VIF value exceeds 5, multicollinearity can be regarded as a problem (Hair et al., 2006). The VIF values for the exogenous variables used in this investigation are shown in Table 6.5, along with the correlation matrix. The projected values for VIF are below the threshold values suggested by Hair et al. (2011). PLS-SEM requires VIF values for validation purposes before progressing to the next stage of analysis. Based on the VIF, collinearity can be identified among the variables in this research. The correlation matrix is also provided in Table 5.5, which shows that the eventual latent construct correlations do not exceed 0.90, which meets the requirement in structural equation analysis (Hair et al., 1998: 191)

Table: 5.5 VIF results and correlation matrix for latent constructs

Constructs	VIF	PU	PEU	PS	CA	SC	TS	IU
Perceived usefulness (PU)	3.112	**1**						
Perceived ease of use (PEU)	4.312	0.857	**1**					
Perceived severity (PS)	3.033	0.661	0.597	**1**				
Cues to action (CA)	2.613	0.756	0.698	0.923	**1**			
Social conformity (SC)	2.818	0.557	0.520	0.584	0.633	**1**		
Trust in social media (TS)	3.058	0.476	0.456	0.474	0.484	0.830	**1**	
Intention to use (IU)	2.872	0.810	0.739	0.798	0.831	0.646	0.531	**1**

5.2.6 Measurement Model Evaluation

Henseler et al. (2013) and Hair et al. (2014) state that the PLS-SEM findings are evaluated and reported using a two-step process. In the first phase, the researcher assesses the measurement model's validity and dependability. In the second phase, an evaluation of the structural model is conducted to evaluate the presented hypothesis. The evaluation processes are shown in Figure 5.2.

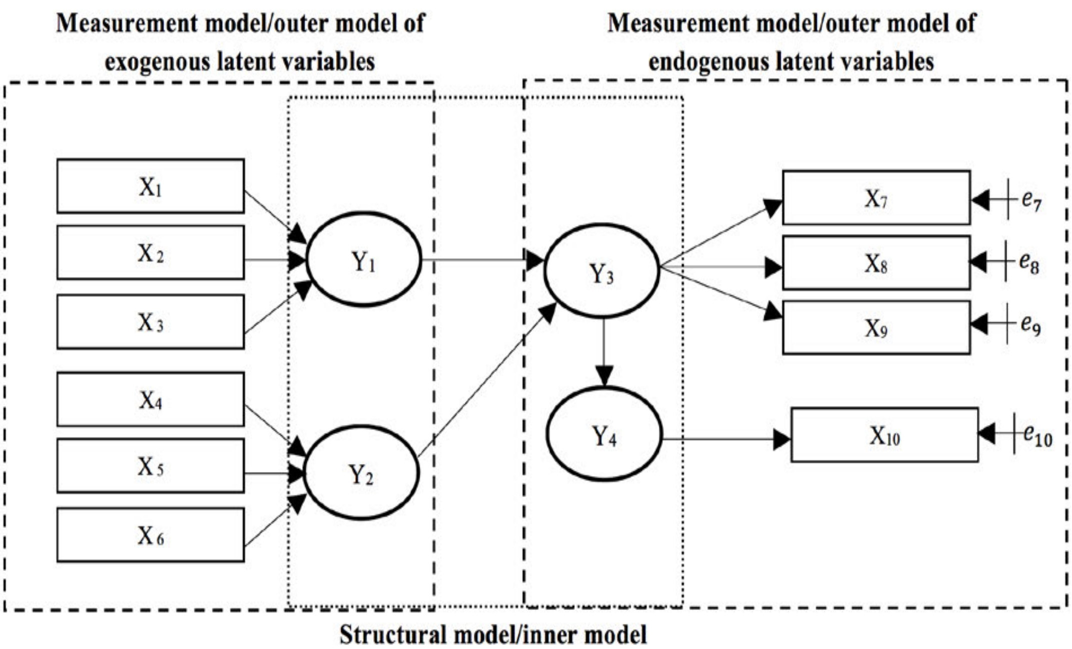


Figure 5.2: PLS path modelling assessment (Outer and Inner model) (Henseler et al., 2013)

The reliability and validity of constructs are the primary measurement methods to evaluate the research models, so the model's quality can be ensured. Sekaran & Bougie (2010) define reliability as 'a test of how consistently a measuring instrument measures whatever concept it is measuring, whereas validity is a test of how well an instrument, which is developed measurement of the particular concept to be measured'. Hair et al. (2009, 2011, 2014) emphasise that every researcher is required to evaluate item reliability or cross-loading internal consistency, content validity, convergent validity, and discriminant validity.

5.2.6.1 Reliability

(a) Indicator Reliability: Outer Loadings

According to Hair et al. (2012, 2014), observing the outer loadings of each item for each construct, in accordance with the statistical criteria, must be done in order to evaluate the items' dependability. The literature also provides a principle to determine whether to keep or discard objects. Hair et al. (2014) recommends maintaining the item with a loading score over 0.70. The model of the present research consists of 25 reflective measuring questions (manifest items or indicators) for 7 variables (latent constructs). The research covers 1 dependent variable (Intention to use) and 6 independent factors (Perceived usefulness, Perceived ease of use, Perceived severity, Cues to action, Trust in social media and social conformity). The findings of the measurement model indicate that all manifest items are in line with the outer loading criteria, with the score loadings between 0.719 and 0.934. Factor loadings are reported in Table 5.6.

Table 5.6 Factor loadings for manifest variables and descriptive statistics for latent variables

Variable (Latent and manifest)	Outer Loadings	Statistics of Measures			
		AVE	Composite Reliability	C-Alpha	Rho_A
Perceived usefulness (PU)		0.747	0.922	0.922	0.922
PU1	0.865				
PU2	0.863				
PU3	0.857				
PU4	0.871				
Perceived ease of use (PEU)		0.816	0.947	0.947	0.947
PEU1	0.902				
PEU2	0.876				
PEU3	0.924				
PEU4	0.911				
Perceived severity (PS)		0.658	0.885	0.885	0.887
PS1	0.875				
PS2	0.811				
PS3	0.794				
PS4	0.760				
Cues to action (CA)		0.723	0.887	0.887	0.887
CA1	0.858				
CA2	0.855				
CA3	0.838				
Trust in social media (TS)		0.697	0.901	0.901	0.908
TS1	0.934				
TS2	0.827				
TS3	0.875				
Social conformity (SC)		0.773	0.911	0.910	0.914
SC1	0.825				
SC2	0.719				
SC3	0.914				
SC4	0.868				
Intention to use (IU)		0.755	0.902	0.902	0.902
IU1	0.870				
IU2	0.879				
IU3	0.857				

(b) Internal Consistency

According to Bijttebier et al. (2000), composite reliability or internal consistency describes the extent to which all manifest items (e.g., CA1, CA2 and CA3 are manifest items under the CA category) in a particular dataset measure the same notion. In this study, Cronbach's alpha coefficient and composite reliability values are used to measure the internal consistency of the manifest items. Cronbach's alpha and composite reliability values should be more than 0.70 based on the suggestion from Hair et al. (2011) and Valerie et al. (2012), as shown in Table 5.6.

Cronbach's alpha may also overestimate or underestimate the dependability of the scale. In accordance with the procedure for composite reliability, Cronbach's alpha and internal consistency reliability coefficients greater than 0.70 indicate an acceptable level of internal consistency and reliability. In contrast values less than 0.60 indicate a lack of internal consistency and reliability. This study's composite reliability coefficients for each latent variable are shown in Table 5.6. The composite reliability coefficients for each latent variable, as shown in Table 5.6, varied from 0.882 to 0.947, indicating good internal consistency and dependability of the measurements (Hair et al., 2001).

5.2.6.2 Validity

(a) Convergent Validity

Hair et al. (2006) pointed out that convergent validity reveals the level of item accuracy, which reflects the underlying variables and corresponds with other measurements of the same latent variable. As suggested by Fornell and Larcker (1981), the Average Variance Extracted (AVE) is adopted to evaluate the convergent validity of each latent variable. According to Bagozzi and Yi (1998), the average variance recovered should be at least 0.50 for the convergent validity of an individual concept. As shown in Table 6.6, AVE for all latent constructs in this research meets the AVE standard, ranging from 0.658 to 0.816 (higher than 0.5).

(b) Discriminant Validity

Discriminant validity is the level of the difference between one latent construct and other latent variables (Duarte and Raposo 2010). Using the square root of AVE, Fornell and Larcker (1981) state, the researchers should use the square root of AVE to conduct the discriminant validity. The indicator loadings should be checked with other latent variables in the cross-loadings table. Consequently, the discriminant validity is evaluated in accordance with the criteria (Fornell and Larcker, 1981); the square root of the AVE must be greater than the correlations among the latent variables.

According to Table 5.7, the retrieved square roots of average variance are greater than the correlations among model components. All the measures conducted in this research have discriminant validity based on the regulations.

Table 5.7 Fornell-Larcker Criterion

Construct	CA	IU	PEU	PS	PU	SC	TS
CA	0.850						
IU	0.831	0.869					
PEU	0.698	0.739	0.903				
PS	0.900	0.798	0.597	0.811			
PU	0.756	0.810	0.857	0.661	0.864		
SC	0.633	0.646	0.520	0.584	0.557	0.835	
TS	0.484	0.531	0.456	0.474	0.476	0.830	0.879

Table 5.8 provide the discriminant validity of the constructs. Based on the Heterotrait-Monotrait Ratio (HTMT) criterion recommended by Henseler and Ringle (2015), the value should be below 0.900. As shown in Table 5.8, almost every value meets the rules, except 0.923, which is higher than the suggested value of 0.9. The exceptional value associated with the discriminant validity is between the perceived severity and cues to action, which is 0.923, which hints at a potential discriminant validity problem.

However, in this context, the confidence interval is between (2.5% and 97.5%), which shows that the two constructs have no significant issue with discriminant validity. Therefore, the discriminant validity of all constructs in this study is established within the standard (Henseler & Ringle, 2015).

Table 5.8 HTMT Results

	CA	IU	PEU	PS	PU	SC	TS
CA							
IU	0.831						0.831
PEU	0.698	0.739					0.698
PS	0.923	0.798	0.596				0.923
PU	0.756	0.810	0.857	0.660			0.756
SC	0.634	0.645	0.518	0.587	0.557		0.634
TS	0.483	0.530	0.456	0.477	0.476	0.838	0.483

5.3 Stage 2 – Structural Model Assessment

The above section provides the measurement analysis for the conceptual model, which demonstrates statistical validity and reliability for each construct. As a result, all the constructs are in line with the recommended regulations, which enables the conduction of the following structural model assessment. Therefore, this study evaluates the overall model fitness and reports results from PLS-SEM analysis.

5.3.1 Descriptive Statistics for the Model

Prior to the presentation of structural model results, descriptive statistics for latent variables are presented in Table 5.9, including the mean, standard error, standard deviation and variance of the constructs. The descriptive statistics reveal that latent constructs used in this research have a mean value of between 3 to 4 on a likely scale of 1 to 5. Perceived usefulness (PU) has had overall mean = 3.660 and SD = 0.0.641, Perceived ease of use has an overall mean = 3.627 and SD = 0.864, Perceived severity has an overall mean = 3.600 and SD = 0.978, Cues to action has an overall mean = 3.3633 and SD = 0.916, Trust in social media has an overall mean = 3.083 and SD = 10.905 and Social conformity has an overall mean = 3.302 and SD = 0.906, Intention to use has an overall mean = 3.646 and SD = 0.904.

Table 5.9: Descriptive statistics for latent variables (n=694)

Construct	Mean	Std. Error	Std. Deviation	Variance
PU	3.660	0.033	0.641	0.734
PEU	3.627	0.033	0.864	0.748
PS	3.600	0.037	0.978	0.959
CA	3.633	0.034	0.916	0.843
SC	3.302	0.034	0.906	0.822
TSM	3.083	0.034	0.905	0.819
IU	3.646	0.034	0.904	0.817

5.3.1 .1Assessment of Variance Explained (R^2)

The structural relationships and the model fit are examined through Smart PLS3; the following figures present the results of the algorithm tests and R square values for three different models (Baseline Model, Mediation Model and Moderator Model). The primary assessment criteria for a structural model are the R2 measurements and the degree and significance of the path coefficients (Hair et al., 2011). In areas of technology adoption, R2 values of 0.75, 0.50 and 0.25 for endogenous latent variables in the structural model are defined as considerable, moderate and weak, respectively.

Therefore, the quality of the model is determined by the resulting value of R2. In this study, 3 models are specified and tested: Model 1 baseline model, Model 2 Conceptual model with mediation effect and Model 3 Full Model with mediation and moderation effects. According to Figures 5.3,5.4 and 5.5, the interaction relationship explained

0.798, 0.664 and 0.678 of the variances, which is highly statistically significant. R2 values suggest that the models can accurately predict the users' intention to use. It is important to note that R2 values are expected to diminish if the model complexity increases. In this case, the most complex model, i.e., Model 3, has a higher R2 value than that of Model 2 with less complexity (Hair et al., 2016). Model 3 is the conceptualised framework in this thesis. The model fit is established, and it is favourable to conduct hypothesis testing.

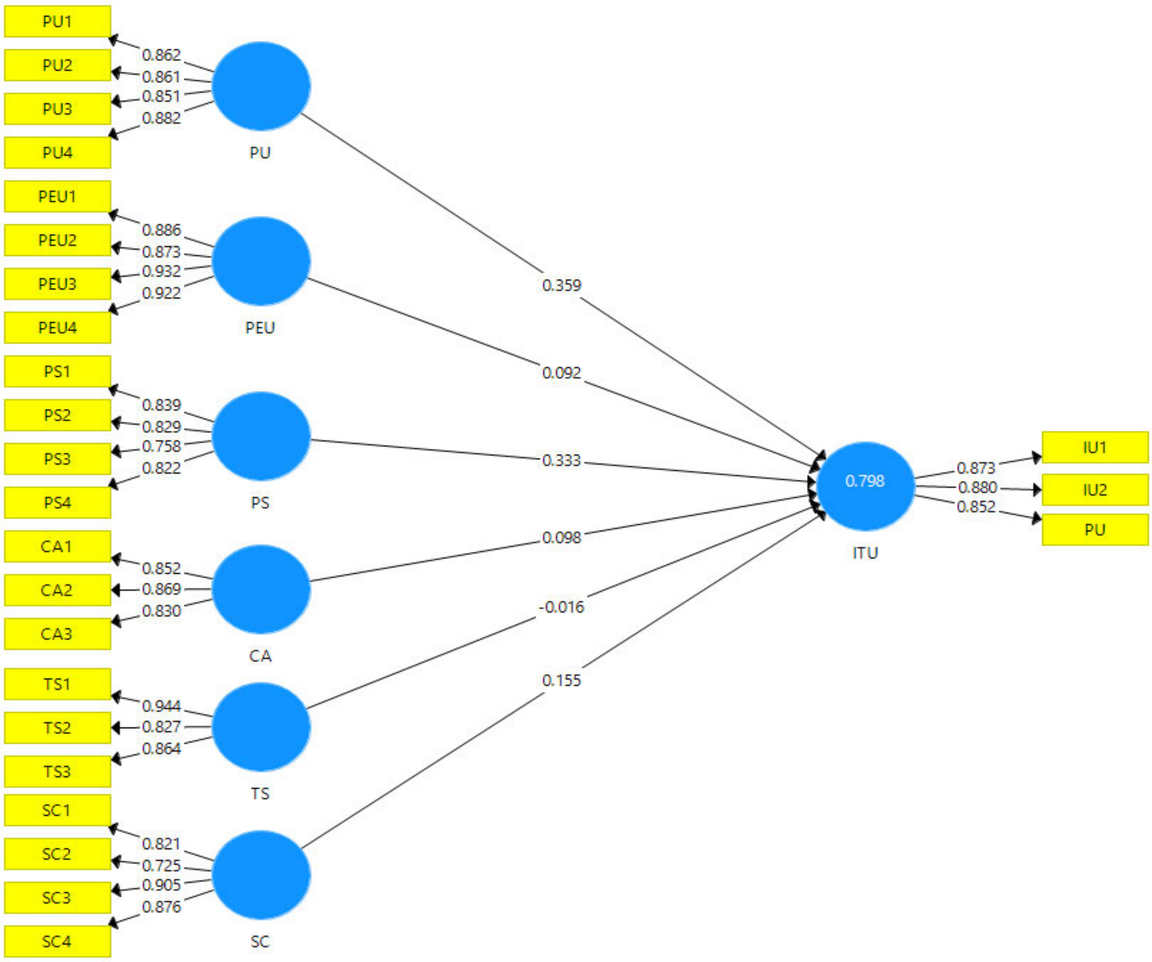


Figure 5.3 Variance explained through the direct relationship – Model 1 Baseline Model SmartPLS output of the algorithm test.

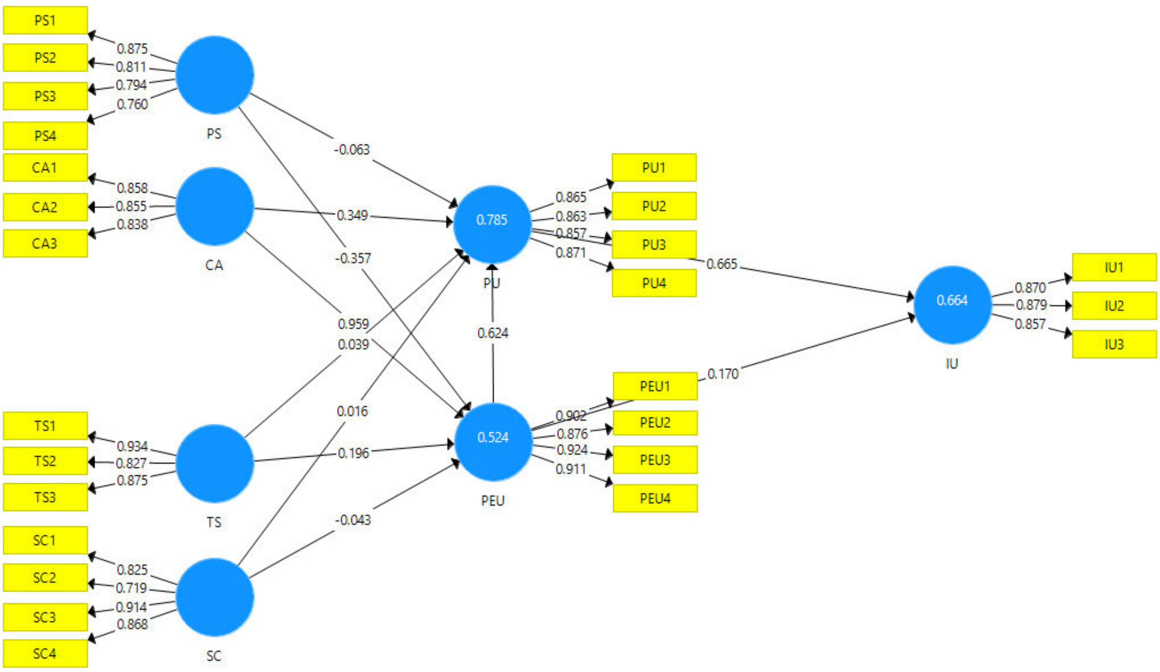


Figure 5.4 Variance explained through the mediation relationship – Model 2 Mediation Model. SmartPLS output of the algorithm test.

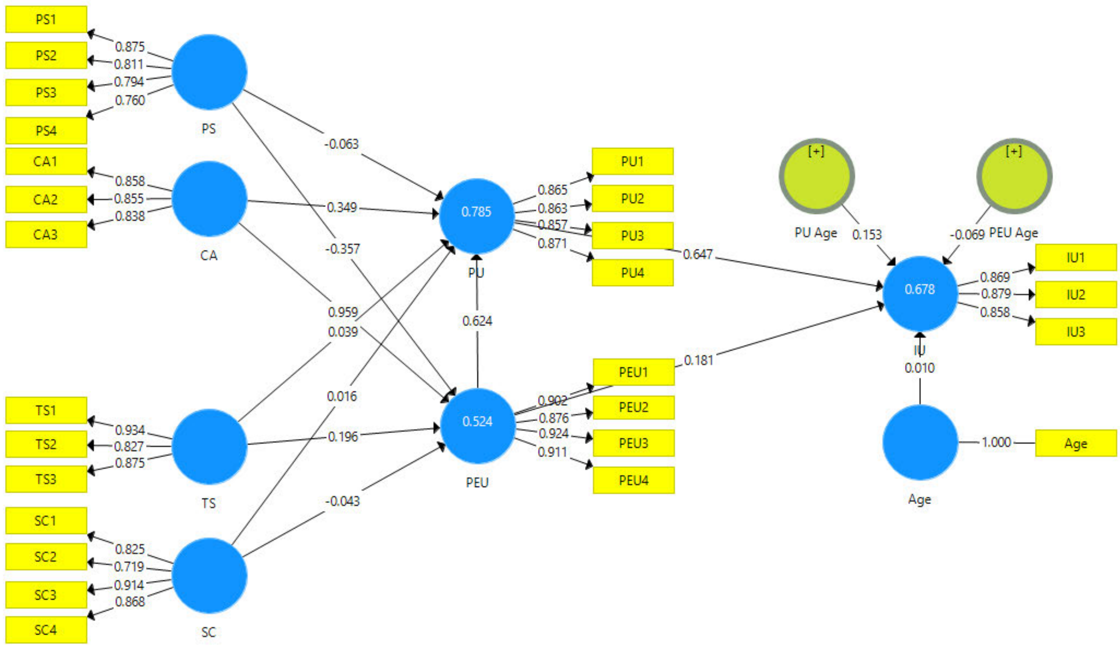


Figure 5.5 Variance explained through the moderator relationship – Model 3 Moderator Model SmartPLS output of the algorithm test

5.3.2 Structural Model Path Correlation Analysis

5.3.2.1. Model 1: Baseline Model

The baseline model indicates the direct relationships among the constructs. According to the baseline model, Figure 5.6 shows that PU has a positive direct and the highest impact on intention to use (0.359, $\rho < 0.001$). PU is defined as the Perceived usefulness of digital health self-monitoring devices. The result shows that the users believe the perceived usefulness of certain technology makes an impact on their intention to use behavioral directly. On the other hand, the findings demonstrate that the intention to use health self-monitoring technologies is not directly impacted by perceived ease of use (0.092, ρ value greater than 0.5, hence statistically not significant). To be more detailed, this study shows that the ease of operating the digital health self-monitoring devices does not directly influence users' adoption intention. However, the easiness of using this product will impact users 'adoption intention. In addition, there is a statistically significant and positive direct correlation between perceived severity and intention to use (0.333, ρ =0.025). Perceived severity can be defined as the severity of getting the diseases, which can arise from users' health conditions or family pressure. The users, who have a high intention of user behavior, are closely associated with the perception of the potential severity of getting chronic diseases. Therefore, they have a high intention to adopt digital health technologies. Neither cues to action (0.098, ρ = 0.596) nor trust in social media (-0.016, ρ =0.788) is found statistically significant predictors for intention to use. However, social conformity (0.155, ρ =0.034) shows a positive and statistically significant correlation with the intention to use health self-monitoring devices.

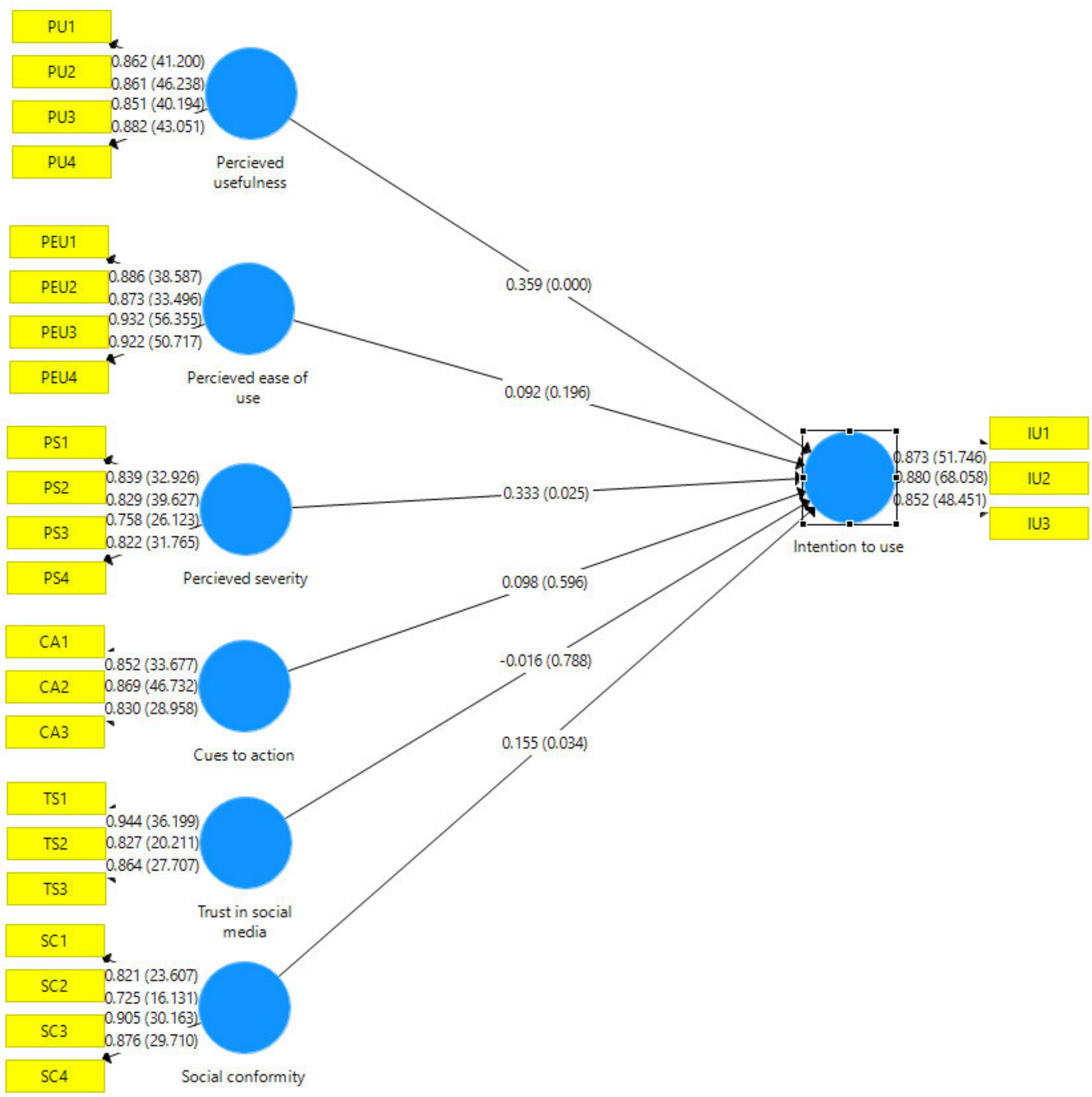


Figure 5.6 Path coefficients with significance values – Model 1 baseline model

5.3.2.2. Model 2: Mediation Model

Figure 5.7 presents the mediation model (Model 2); PU and PEU act as mediators between health belief factors and Chinese social characteristics, mediators influencing user intention to adopt digital health technologies. The model also shows significant ($p < 0.05$) and non-significant path coefficients and the variance explains the predicted construct. Tables 5.10 and 5.12 further elaborate on the parameter coefficients and significance statistics along with model fit statistics.

The mediation effect is modelled by using four hypotheses, namely H8, H9, H10 and H11. H8 evaluates how the relationship between PS to IU is mediated by PU and PEU. Model 1 (in Figure 5.6) presents PS directly and positively impacts the intention to use digital health self-monitoring technologies. However, compared with model 2, Table 4.10 shows that PS does not indirectly impact IU through PU and PEU. It suggests that they will have the intention of adopting the digital health technology to reduce the risk of getting these diseases when people perceive the severity of getting the chronic diseases, which will danger or change their daily life, regardless of perceived usefulness and ease of use. On the contrary, people will have the intention to adopt this product directly rather than thinking about its usefulness or ease to not. Therefore, H8 is supported in this study.

H9 evaluates how the relationship between CA to IU is mediated by PU and PEU. For the digital self-monitoring technologies, figure 5.7 shows the cues to action on the Chinese sub-healthy group's intention to use has indirect effects through PEU and PU ($p < 0.001$), so H9 is supported. This finding shows that the Chinese subhealth group thinks cues to action impacts on their intention to use when they also perceive the usefulness and ease of use for certain technologies. Therefore, when people have the cues to action, it does not directly impact on their intention to adopt this product; people will still consider their functionality, such as usefulness and ease of use. This is also confirmed by Model 1 in figure 5.6, which shows that there is not a positive relationship between CA to IU, as only cues to action are not significant factors to directly impact on people intention to use.

H10 evaluates how the relationship between SC to IU is mediated by PU and PEU. Social conformity is a special Chinese social characteristic; SC also directly impacts on Chinese users' intention, which can be proved by Model 1 in figure 5.6. In model 2, Tables 5.10 and table 5.12 show that there are no indirect effects between SC to IU through PU and PEU. Social conformity directly impacts on IU, as these are the Chinese social characteristics. When people from the same local society, they are more likely to follow their behavior. In this case, if people buy some digital self-monitoring technologies, people tend to follow similar behavior to buy the same product. People's intentions to use are directly impacted because of social conformity. Therefore, H10 is not supported in this study.

H11 evaluates how the relationship between TS to IU is mediated by PU and PEU. In Model 1, the result does not show any direct impact between TS to IU, but Model 2 shows that trust in social media indirectly impacts the intention to use through both PU and PEU ($p < 0.05$), hence H11 is supported. People, who trust in the information or advertisement for the digital health self-monitoring technologies from social media, do not have the intention of usage directly, as people also consider and check their product reviews regarding the usefulness and ease of use. Currently, due to a lot of false advertisements on social media, people tend to trust online information less. If feedback or comments provided by the buyers confirm or emphasise the benefit of the product's usefulness and ease of use, the Chinese sub-healthy group trusts social media, which impacts their intention to use.

Based on the reported results, Model 2 demonstrates that the relationship between PS, CA, TS, and SC to IU is influenced by the mediating effects of both PU and PEU. However, neither PS nor SC is affected by PU and PEU. Additionally, there is a direct impact of PU and PEU on IU. However, CA and TS show that whilst they do not directly impact IU, their relationship is mediated by PU and PEU. The mediation effect is stronger than the direct effects; the mediation effect of PU and PEU play mediating role in the relationships between CA and IU and the relationship between TS and IU.

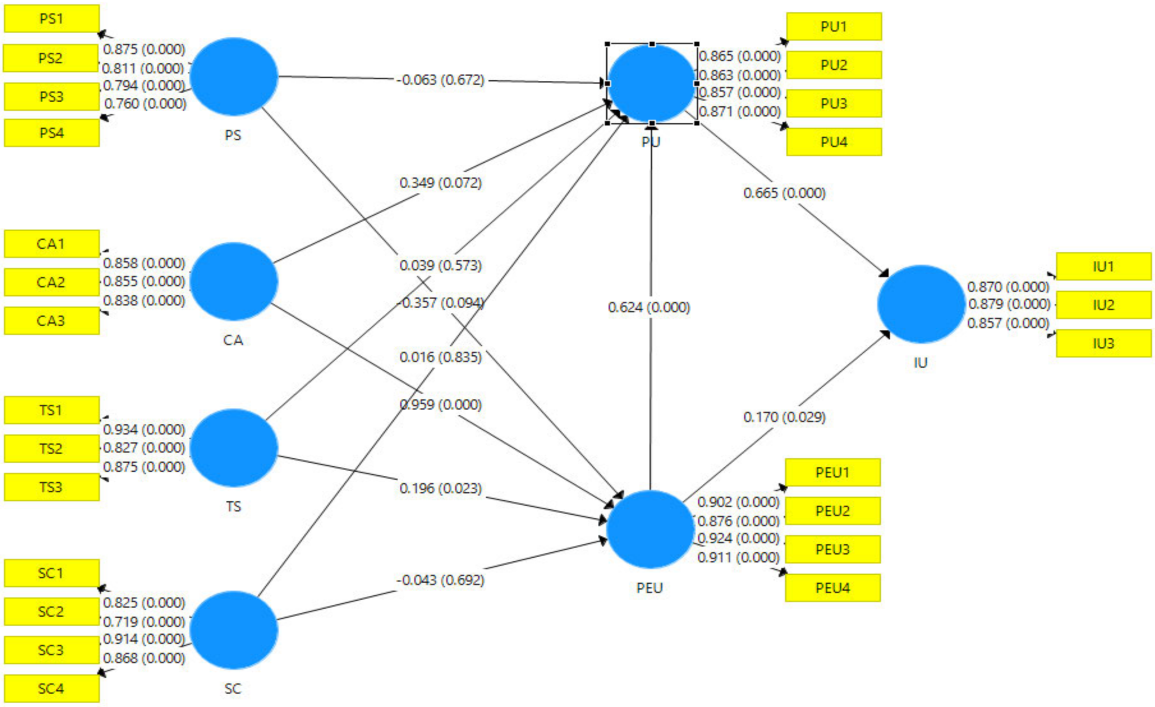


Figure 5.7 Path coefficients and significance values for Model 2 – Mediation model

Table 5.10 The mediating effect of PU and PEU on the relationship between PS, CA, SC and TS to IU

Mediation model through both PU and PEU	Coefficient	T-value	p-value	Support
H8: PS → IU	-0.249	1.560	0.119	No
H9: CA → IU	0.788	4.520	0.000	Yes
H10: SC → IU	-0.015	2.326	0.849	No
H11: TS → IU	0.140	0.190	0.020	Yes

5.3.2.3. Model 3: Mediation and Moderation Model

Model 3 is the conceptual model proposed in this research. In Model 3, all factors for their direct and total effects show the same results as in Model 2. However, this model also includes the moderating effect of age. The moderating effect of gender is also tested in Model 3. The results for direct and total effects are found to be the same as in Model 3, but the moderating effect of gender is not found to be statistically significant. Therefore, only moderating effect of age is reported in this research.

Figure 5.7, tables 5.11 and table 5.12 provide the results conducted from the smart PLS3, which also present the interaction effect among the independent and the moderator factors. The study collects the study from the Chinese sub-health group and categorises the age group into 18-20 years, 21-30 years, 31-40 years, 41-50 years, 51-60 years and older than 60 years. Results show that there is a significant moderating effect of age on the relationship between perceived usefulness and intention to use.

This study hypothesises that the perceived usefulness of the digital health self-monitoring devices has an effect on the Chinese sub-healthy group’s behavior and intention to use; it is also moderated by age. This hypothesis is developed to investigate whether age can moderate the relationship between perceived usefulness and behavioral intention to use. Table 5.10 presents the result from PLS3 bootstrapping tests, the coefficient of interaction is 0.153 and statistically significant at $P < 0.004$ with a T-value of 2.920, hence H7a is supported. The statistical result shows that the moderation effect is significant, and it moderates the relationship between the sub-healthy group’s perceived usefulness to their behavior and intention to use. This can be explained that digital health self-monitoring technologies can help people prevent chronic diseases if the users perceive the product as useful. However, different age groups of users still make different decisions on their intention to use. For example, if the users from both the elder group and the younger group think certain digital health self-monitoring technologies are useful, the perceived usefulness has a different effect source on their behavioral intention to use due to the age difference. Prior research also emphasises the role of age in stimulating users' users’ acceptance of technology; most of the results show that the effect of perceived usefulness on users' intention is moderated by different age groups, especially in health-related technology acceptance studies (Jokisch, 2020). This research also tests the effect of perceived ease of use on Chinese sub-healthy users' intention is moderated by age. The moderation result is R2 =-0.069, T-value =1.650 and p-value <0.109, thus, H7b was not supported. This shows that age may not necessarily affect all the constructs (based on TAM) relationships, especially PEU. Previous research shows that age is an important demographic variable; it has direct and moderating effects on behavioral intention, adoption, and acceptance of technology (Chung, Park, Wang, Fulk, & McLaughlin, 2010; Porter & Donthu, 2006; King & He, 2006; Venkatesh et al., 2003; Wang et al., 2009). A number of authors speculate that the inclusion of age as a moderator would increase the explanatory performance of a TAM (see Chung et al., 2010). However, according to Alsswey & Al-Samarraie (2019), the results are different under the different contexts of the studies. Therefore, findings for age as a moderator in technology acceptance models are ambiguous.

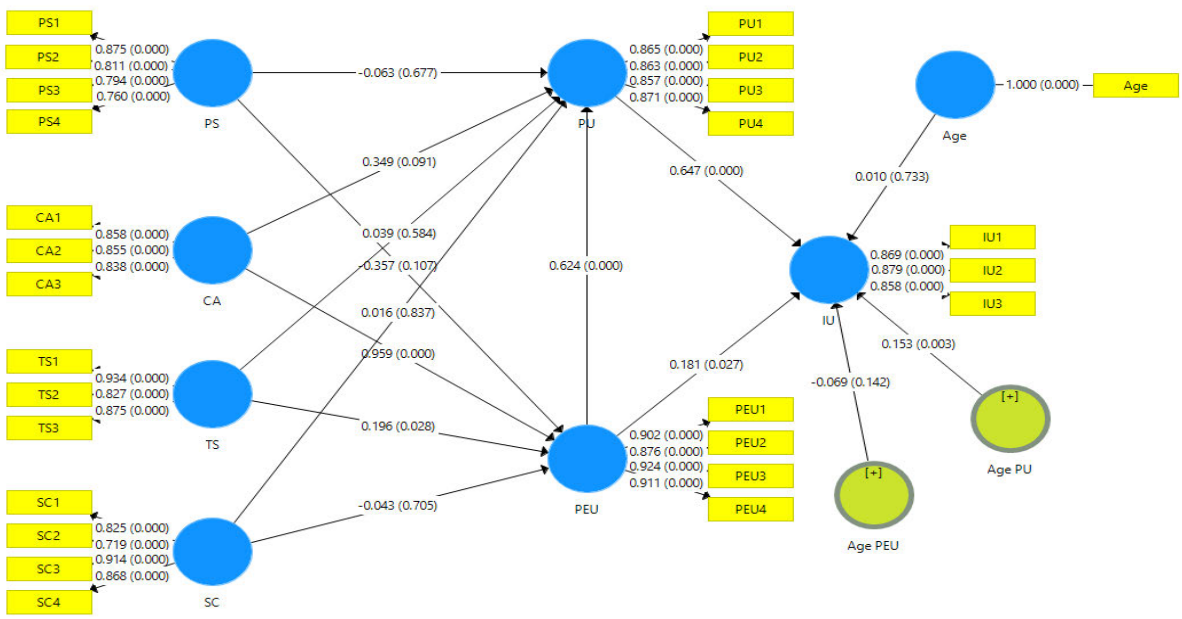


Figure 5.8 Path coefficients and significance values for Model 3 – Mediation and Moderation model

Table 5.11 The moderating effect of age on the relationship between PU, PEU and IU.

Hypothesis	Coefficient	T-value	p-value	Support
H7a: Age × PU → IU	0.153	2.920	0.004	Yes
H7b: Age × PEU → IU	-0.069	1.605	0.109	No

Table 5.12. Structural model path coefficients for direct, mediating, and moderating effects models and statistics

				Model 1 - Baseline			Model 2 - Mediation			Model 3 –Mediation & Moderation		
	Independent	**Path**	**Dependent**	**Coeff.**	**t-statistics**	**P-value**	**Coeff.**	**t-statistics**	**P-value**	**Coeff.**	**t-statistics**	**P-value**
Direct effects	PU	→	IU	**0.359**	**3.627**	**0.000**	**0.665**	**7.505**	**0.000**	**0.647**	**7.698**	**0.000**
	PEU	→	IU	0.092	1.240	0.196	**0.170**	**2.017**	**0.029**	**0.181**	**2.303**	**0.027**
	PS	→	IU	**0.333**	**3.640**	**0.025**						
	CA	→	IU	0.098	0.517	0.596						
	TS	→	IU	-0.016	0.017	0.788						
	SC	→	IU	**0.155**	**2.140**	**0.034**						
	PEU	→	PU				**0.624**	**7.830**	**0.000**	**0.624**	**7.830**	**0.000**
	PS	→	PU				-0.063	0.234	0.672	-0.063	0.464	0.677
	CA	→	PU				**0.349**	**1.103**	**0.072**	**0.349**	**1.948**	**0.091**
	TS	→	PU				0.039	0.514	0.573	0.039	0.577	0.584
	SC	→	PU				0.016	0.185	0.835	0.016	0.227	0.837
	PS	→	PEU				**-0.357**	**1.257**	**0.094**	-0.357	1.668	0.107
	CA	→	PEU				**0.959**	**3.151**	**0.000**	**0.959**	**4.158**	**0.000**
	TS	→	PEU				**0.196**	**2.198**	**0.023**	**0.196**	**2.334**	**0.029**
	SC	→	PEU				-0.043	0.375	0.692	-0.043	0.402	0.705
Total effects with mediation via PU and PEU	PS	→	IU				-0.250	1.431	0.153	-0.249	1.560	0.119
	CA	→	IU				**0.793**	**4.180**	**0.000**	**0.788**	**4.520**	**0.000**
	TS	→	IU				**0.140**	**2.115**	**0.035**	**0.140**	**2.326**	**0.020**
	SC	→	IU				-0.014	0.165	0.869	-0.015	0.190	0.849
Moderation effect: Age	PU	M-A	IU							**0.153**	**2.920**	**0.003**
	PEU	M-A	IU							-0.069	1.605	0.142
Goodness-of fit (R2)	IU				0.798			0.644			0.678	
	PU							0.785			0.785	
	PEU							0.524			0.524	

5.3.3 Hypothesis Testing Results

Based on the conceptual model (Model 3 with mediation and mediator effects) employed in this research, the summary of the hypothesis testing is provided in Table 5.10. This research utilises the consistent PLS bootstrapping procedure with samples of 694 cases to test the significance of the proposed hypothesis. Table 5.13 summarises the proposed hypothesis. Among 17 hypotheses, 9 hypothesis is statistically significant and supported, and 8 hypotheses is not statistically significant; hence they are not supported.

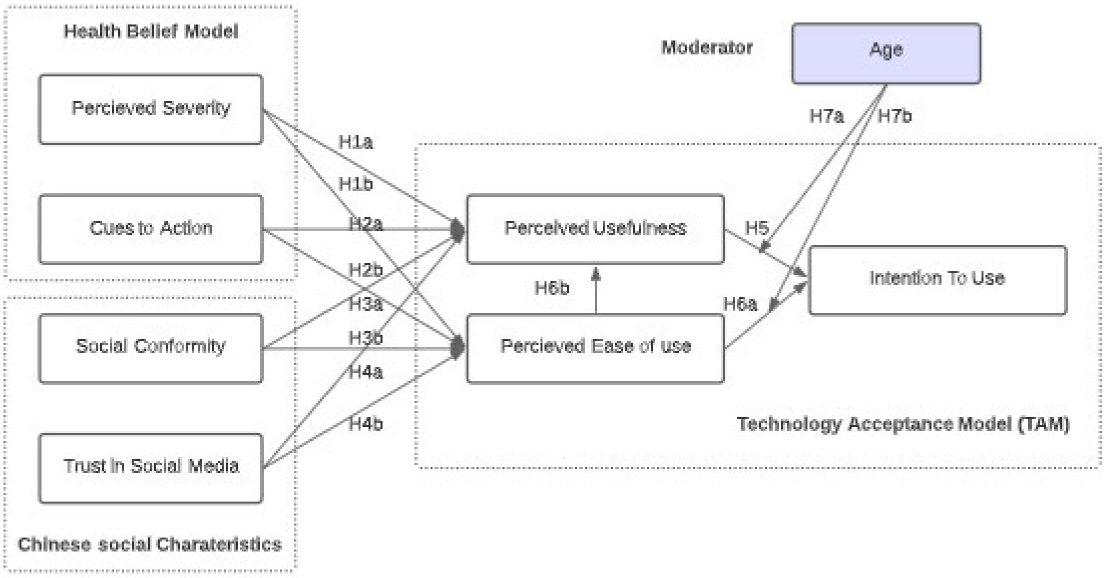


Figure 5.9 Conceptual Model

Table 5.13 Summary of the hypothesis testing

Hypothesis	Independent	Dependent	Coeff.	Sig. (p)	Support
H1a	PS	PU	-0.063	0.677	No
H1b	PS	PEU	-0.357	0.107	No
H2a	CA	PU	0.349	0.091	Yes
H2b	CA	PEU	0.959	0.000	Yes
H3a	SC	PU	0.016	0.837	No
H3b	SC	PEU	-0.043	0.705	No
H4a	TS	PU	0.039	0.584	No
H4b	TS	PEU	0.196	0.029	Yes
H5	PU	IU	0.647	0.000	Yes
H6a	PEU	IU	0.181	0.027	Yes
H6b	PEU	PU	0.624	0.000	Yes
H7a	Age*PU	IU	0.153	0.003	Yes
H7b	Age*PEU	IU	-0.069	0.142	No
H8	PS	IU	-0.249	0.119	No
H9	CA	IU	0.788	0.000	Yes
H10	SC	IU	-0.015	0.849	No
H11	TS	IU	0.140	0.020	Yes

5.4 Chapter Summary

This chapter provides the results of the data analysis using both SPSS and Smart PLS software. The data are collected from Chinese, both sub-healthy and healthy groups. The study is about the intention behavioral of health self-monitoring devise. Data screening and clearing are used to assess the quality and usability of the data. The data is analysed by using a two-step approach in SmartPLS (measurement model and structural model). The results of the measurement model confirm that the measurement is reliable and establishes an acceptable level of discriminant and convergent validity of constructs. The structural model results show some significant relationships among the study’s constructs, but there are relationships that are not statistically significant. The next chapter discusses the findings from the qualitative study and the interview explanation regarding the reasons for the unsupported hypothesis.

CHAPTER 6 MODEL EVALUATION: QUALITATIVE ANALYSIS TO SUPPORT THE CONCEPTUAL MODEL

6.1 Introduction

This chapter presents a qualitative analysis of interviews conducted with China's sub-healthy population to understand their usage of digital health self-monitoring tools. It seeks to uncover the key factors influencing their adoption decisions, aligning with the research question on what drives this population's use of such technologies. The analysis moves beyond statistics to capture personal experiences and motivations.

Themes like perceived usefulness, ease of use, and the severity of health conditions emerge as significant in shaping views on the practicality of these tools. Additionally, social and cultural factors, such as influence from peers and media, play a crucial role in forming attitudes towards health technology. The exploration extends to other determinants like trust in the technology, control over health outcomes, product involvement, personality traits, health habits, medical knowledge, economic status, and the impact of the COVID-19 pandemic on health behavior.

The qualitative data not only complement the quantitative findings but also aid in assessing the relevance of the research model within the context of China's sub-healthy population, providing a comprehensive understanding of their interaction with digital health self-monitoring tools. This study's philosophical approach (post-positivist paradigm) and methodological approach (mixed method) were explained earlier in Chapter 4. This thesis utilises both quantitative and qualitative research, with the previous chapter presenting and analysing the quantitative results from the questionnaire given to Chinese sub-healthy groups. The current chapter does likewise for the qualitative results obtained via interviews.

The qualitative facet of the study involved conducting semi-structured interviews between March and May 2020, which elicited specific results that also support the questionnaire findings further and provide additional explanations regarding the preceding quantitative results. Owing to the Covid-19 pandemic, all interviews were performed via Teams, Zoom or telephone. The interview guides consisted of open-ended questions that focused on describing participants' experiences of using health self-monitoring devices, which will help this study understand the impact factors on individuals' intention to adopt the health self-monitoring devices from three different perspectives: a) sub-healthy individuals' perspectives; b) professionals' advice based on their own consulting experiences; and c) medical technology professionals' perceptions (those involved with technical design). In total, 22 sub-healthy interviewees completed the interview from these three groups, which to clarify are the following:

- 'Normal' (sub-healthy group).
- Healthcare professionals (sub-healthy group).
- Technology-related related professional (sub-healthy group).

Interviewing these three groups of sub-healthy people was a careful but intentional choice to gain insights into various users' experiences and perceptions as each group offers something particular that helps form a more comprehensive understanding and address the research aims, objectives and questions more thoroughly.

Firstly, the individual sub-healthy people offers information regarding how personal factors impact their intention to use and ultimate possible adoption of health self-monitoring devices based on their previous experiences and personal efficacy. Also, such previous practical experiences provide a deep understanding of an individual's barriers to accessing this technology or issues that impact their health behavior change. Secondly, as to Yu-Huei et al. (2019) note healthcare professionals such as doctors and nurses have much knowledge regarding the psychological factors that impact patients' adoption behavior regarding health. Thirdly, the service providers' perspective provides information regarding the marketing perspective. Questions like satisfying the customer's need will help this study understand the target customer's profiling.

A top-down thematic analysis approach was employed to explore the qualitative results and answer the research questions. This method, known as a theoretical thematic analysis according to Braun and Clarke (2006), enables researchers to 'code' the data and generate themes, which are then used to evaluate the provided research model and explore deeper explanations from different perspectives. In this study, this approach is used to investigate and understand user intention and acceptance and to determine if their perceptions align with the factors from the proposed conceptual model (an integrated composite of the technology acceptance model, the health belief model and the social cognitive model). It is also about identifying any additional information that could be helpful to answer the research questions. The researcher followed the guidelines provided by Braun and Clarke (2006) to complete the thematic analysis, which consists of five stages (explained next).

6.2 Data analysis of Interview Data: The Processes of Thematic Analysis

Stage 1: Familiarising Yourself with your Data

This first stage of familiarisation involves transcribing data from the interview recordings, reading and re-reading the transcripts, and making notes on any initial ideas that emerge (Braun and Clarke 2006). The process of transcribing interviews is an essential process that can help researchers revise and enrich their understanding of the collected data, despite the time-consuming process involved that can prove tedious. The researcher in this study personally transcribed all interview recordings to ensure the accuracy of the data. By conducting the interviews themselves, they were able to link their notes to the interview content while transcribing. Additionally, as the researcher transcribed more interviews, the process became more efficient because strategies such as were learnt in the conducting of this process. This approach aligns with Ph.D. thesis standards and is a common practice in qualitative research, as it allows for a deep understanding of the data and can reduce potential errors in transcription.

Upon completion of transcribing all interview recordings, the researcher engaged in a thorough examination of the transcripts to gain a better understanding of the interview data and to formulate a plan for the subsequent stages of data analysis. During this process, the researcher identified and recorded initial observations of key themes and concepts that emerged from the interview content and were deemed potentially valuable for further examination during the data analysis.

Stage 2: Generating Initial Codes

The coding process in this study was conducted systematically to ensure a thorough and accurate analysis of the data. Initially, codes were created with brief descriptions, enabling the researcher to identify the meaning of each code and avoid the generation of repeated codes. The raw data was reviewed multiple times to identify emerging codes, and some initial codes were merged or deleted to ensure codes were specific and appropriate. Once the coding was completed on a word document, the researcher transferred all codes into a coding scheme in Microsoft Word, which included code name, definition, quotation, and reference. This allowed for easy review and comparison of codes during the thematic analysis.

In the second stage of thematic analysis, the researcher identified key points in the interview data and generated initial codes. The codes were then linked to relevant interview texts and checked for accuracy. According to Creswell, J. W. (2013), codes are a fundamental part of the original data as they allow for data evaluation and grouping into meaningful categories, and this process was evident in this study. The analysis of qualitative data in this study was conducted using Microsoft Word, a widely used application tool for qualitative data analysis. This tool was useful in managing and organizing codes and allowed for easy navigation and review of data (Braun, V. & Clarke, V. 2012).

Stage 3: Connecting Codes and Identifying Themes.

The third step of the theoretical thematic analysis involved searching for themes by reviewing all codes, finding codes with similar themes, organising them into potential themes and gathering related data extracts into emerging potential themes. Such a process begins by generating a long list of codes after initial coding and collation of all data (Miles, M. B., Huberman, A. M., & Saldaña, J. 2020). The focus of data analysis was changed to explore codes relating to different topics and to sort them into potentially specific themes at a broader level rather than at the level of codes (Patton, M. Q. 2015). To be more specific a theme is a type of pattern formed by a set of linked codes or even sub-categories; it is the significant point from the data set that relates to the research questions, and which is used to represent a particular meaning from the data set (Charmaz, K. 2006).

As this research established a theoretical framework based on the TAM, HBM and SCT and the relevant literature review, factors from the theoretical framework were used to drive the collation of the initial codes. After reviewing the identified codes and relevant interview texts, six potential sub-categories emerged: perceived usefulness, perceived ease of use, perceived severity, cues to action, trust in social media and social conformity. The main theme and sub-categories of acceptance were a priori themes and categories from the theoretical framework (TAM, HBM and SCT). Furthermore, three new sub-categories were identified from the literature review: product involvement, locus of control, personality, health habit, medical knowledge level, health insurance, Covid-19 and economic status.

The researcher began with collating several initial codes to form the main theme and sub-categories. However, a few codes were considered temporary sub-categories as they were not sorted into any pre-existing sub-categories. The researcher then revisited the rest of the initial open codes that had not been linked to the proposed categories and tried to find the relationship among those codes to identify whether they could be grouped into extra categories. The researcher carefully reviewed the data and observed that certain codes and their corresponding text were not relevant to the eight sub-categories. The researcher was attentive to the nuances of the data to ensure that only relevant codes were included in the final analysis. As these codes were relevant to user acceptance, the researcher generated another three potential sub-categories to fit them: familiarity with issues, utility data, and project management. The potential main theme and sub-categories were double-reviewed and checked with the relevant codes to ensure each code was collated in an appropriate theme or sub-category (Sandelowski, 1995).

This related to another purpose of this thematic analysis, which was to explore extra codes that were not included in the proposed model but were relevant to acceptance according to service providers' perspective. The additional codes should not be in the proposed research conceptual model but should instead be generated from interview data, and these must be deemed particularly significant in terms of individual/user intent to change their health-related behavior and adopt health-related digital devices. These three new potential sub-categories would be reviewed in the next stage to confirm them. Therefore, the main theme of intention to use consisted of several sub-categories that would be reviewed in the next stage.

During this third stage, then, the researcher used a thematic analysis approach to identify and organise themes by connecting with the initial codes. The initial codes were collated and grouped into main themes and sub-categories, and seven potential sub-categories were generated to fit codes relevant to intention to use health self-monitoring devices. The main theme of intention to use consisted of several sub-categories that would be further reviewed in the next stage of the analysis. The focus of this third stage was on identifying and organising themes by reviewing all codes, grouping them into potential themes and gathering related data extracts. The themes were defined as patterns formed by a set of linked codes or sub-categories that represented significant points in the data set and related to the research questions and captured the meaning of the data set.

Stage 4: Reviewing Themes

The researcher evaluated the suitability of the themes and sub-categories discovered in the fourth step of the thematic analysis, using both the sorted data extracts and the complete dataset. This study also created a concept map to clearly demonstrate the connections between the themes and codes (Braun and Clarke, 2006). This step involves two levels of analysis: evaluating and refining the identified themes. The first level involves reviewing all of the themes discovered and ensuring that all related data extracts create a logical pattern. Themes meeting this criterion move to the second level for further refinement. If a theme cannot progress to the second level, it indicates that it requires evaluation and replacement.

The researcher conducted an analysis of the discovered themes and sub-categories in the fourth step of the thematic analysis. This was done by utilizing both the sorted data extracts and the complete data set. Additionally, a concept map was produced to highlight the links between the themes and codes, as proposed by Braun and Clarke (2006). This step involved two levels of analysis, namely, evaluating and refining the discovered topics. The first stage required a thorough review of all the themes discovered, ensuring that all data extracts related to each topic formed a logical pattern. If the theme met this criterion, it would proceed to the second level for further refinement. However, if the theme could not proceed to the second level, it would require evaluation and replacement.

To refine and organize the themes and categories, the researcher created a clear thematic map and provided theme and sub-themes. This step involved naming and refining each theme and category with detailed explanations of their meanings and significance in the analysis. This process ensured that the descriptions aligned with the overall storyline of the qualitative data analysis, linked with the research questions, and had independent definitions without too much overlap with others (Braun and Clarke, 2006).

The researcher also defined the seven categories based on the literature review, with modifications made to the "trust in digital technology" category to "technical factors" based on the data. This change was made to align with the context of medical digital health technology.

Furthermore, the researcher examined each sub-category to confirm their relevance in answering the research questions and achieving the purpose of the qualitative research. The research question focused on how service providers consider user acceptance, and the data showed that interviewees' perceptions of STMA could be directly or indirectly influenced to encourage them to change their behavior towards using smart transportation technology. Direct influence referred to factors that highly affected interviewees' behavior intention and further use frequency. Indirect influence referred to contextual factors not considered by interviewees themselves. Therefore, the researcher confirmed that the "project management" category indirectly influenced user acceptance, while the other categories directly affected interviewees' acceptance.

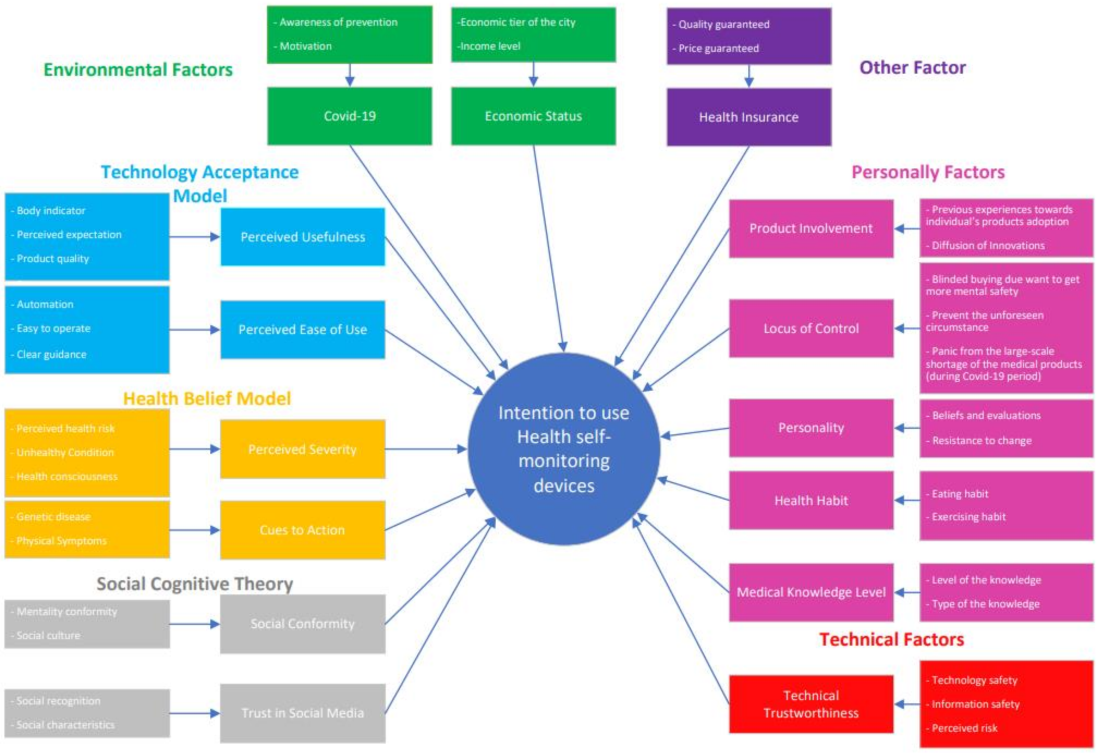


Figure 6.1 Stage 5: Reporting the Findings

In the final stage of the thematic analysis, the researcher constructed a detailed and coherent story of the qualitative data analysis. To make the story valuable, validating, and convincing for readers, Braun and Clarke (2006) advised the use of attractive quotes as examples in the final analysis. The analysis was expected to be concise and logical, with sufficient evidence supporting the identified themes from the entire data set and linking back to the research questions and literature. The qualitative findings were particularly significant in this research, as they formed the basis for extending and revising the survey instrument for the user population in the second research stage, by identifying the elements that influenced user acceptance as perceived by service providers.

It should be noted that all interviews with the Chinese sub-healthy group were conducted in China and using the Chinese language. Therefore, the researcher had to translate the interview data from Chinese to English to report the findings. Following a top-down theoretical thematic analysis approach, the researcher used a set of a priori categories for the interview data analysis. Throughout the analysis stages, the researcher followed a systematic and rigorous process to ensure the reliability and validity of the findings. For example, a pilot study has been done before the real interviews.

6.3 Qualitative Findings

6.3.1 Demographic Characteristics of Interviewees

This study has interviewed 22 sub-healthy individuals (details about whom are in Table 6.1 below): nine 'normal' sub-healthy individuals; eight healthcare professionals who are doctors or nurses; and five interviewees who are health professionals. Their ages range from 25 to 68 years old. Gender is split evenly as 11 are male and 11 are female, and their occupations vary.

Table 6.1 Demographic Characteristics of all Sub-Healthy Interviewees

Pseudonym	Age	Gender	Occupation	Group Type
NSHG1	25	Female	Student	Normal
NSHG2	26	Female	Student	Normal
NSHG3	27	Female	Accountant	Normal
NSHG4	28	Female	Researcher	Normal
NSHG5	29	Male	Investment Manager	Normal
NSHG6	30	Male	Lecturer	Normal
NSHG7	32	Female	Administration	Normal
HPSHG8	35	Male	Nurse	Healthcare professional
HPSHG9	36	Male	Medical devices technical developer	Healthcare professional
HPSHG10	36	Male	Doctor	Healthcare professional
HPSHG11	40	Male	Doctor	Healthcare professional
HPSHG12	41	Female	Nurse	Healthcare professional
HPSHG13	41	Female	Nurse	Healthcare professional
HPSHG14	42	Male	Doctor	Healthcare professional
HPSHG15	55	Female	Doctor	Healthcare professional
MTPSHG16	32	Female	Healthcare insurance salesman	Medical technology-related professional
MTPSHG17	47	Female	Medical devices company marketing manager	Medical technology-related professional
MTPSHG18	49	Male	Medical devices company marketing manager	Medical technology-related professional
MTPSHG19	57	Male	Health technology company technical developer	Medical technology-related professional

MTPSHG20	58	Male	Health technology company technical developer	Medical technology-related professional
MTPSHG21	60	Female	Health technology manufactory engineer	Medical technology-related professional
MTPSHG22	66	Male	Medical devices supplier	Medical technology-related professional

Table 5.2 gives more specifics of the overall sample's composition in relation to age, occupation and city tier. Most are younger adults, while in contrast the fewest interviewees are in the oldest age range. In the 'normal' sub-health group most are in the youngest age range and for healthcare professionals most are in the next-youngest age range, but for the medical–technology group this is dispersed, with at least one participant in each age range. As noted, overall gender is split evenly but there are slight variations across groups. The city tiers of Interviewees were allocated with tier 1 (n=8), tier 2 (n= 7), and tier 3 (n=8).

Table 6.2 Demographic Characteristics of Interviewees (Summarising Table)

Demographic Characteristics	Category	Frequency			
		Normal Sub-Health group	Healthcare professional Sub-Health group	Medical technology-related professional Sub-Health group	%
Age	24–34	7	0	1	36%
	35–44	0	6	1	32%
	45–54	0	0	2	9%
	55–64	0	1	3	18%
	Over 65	0	0	1	5%
Gender	Male	2	4	5	50%
	Female	5	3	3	50%
City Tiers	Tier 1	3	2	3	36%
	Tier 2	3	2	2	32%

Tier 3	2	3	2	32%

Source: Author's fieldwork

Table 6.3 below gives information on participants' medical knowledge. According to this, 23% of interviewees have poor medical knowledge and 23% have an average level of medical knowledge. Furthermore, 14% have good medical knowledge, which is the lowest percentage (representing three people), and interestingly 41% have a professional level of medical knowledge, which is the highest percentage (representing nine people).

Table 6.3 Different Groups based on the Different Medical Knowledge Levels

Medical Knowledge	Number	Percentage
Poor	5	23%
Average	5	23%
Good	3	14%
Professional	9	41%

Source: Author's fieldwork

On further specifics of medical knowledge as portrayed in Figure 6.1 below, most of the normal sub-healthy group (60%) have very poor medical knowledge, with only one of these having a professional level of medical knowledge, and one interviewee is a PG student in a Chinese medical school. Notably, all the healthcare professionals have professional medical knowledge skills and most of the medical technology-related professionals are technicians who show an average level of medical knowledge. To sum up, interviewees who have more relevant job or academic experiences more likely have a higher level of medical knowledge.

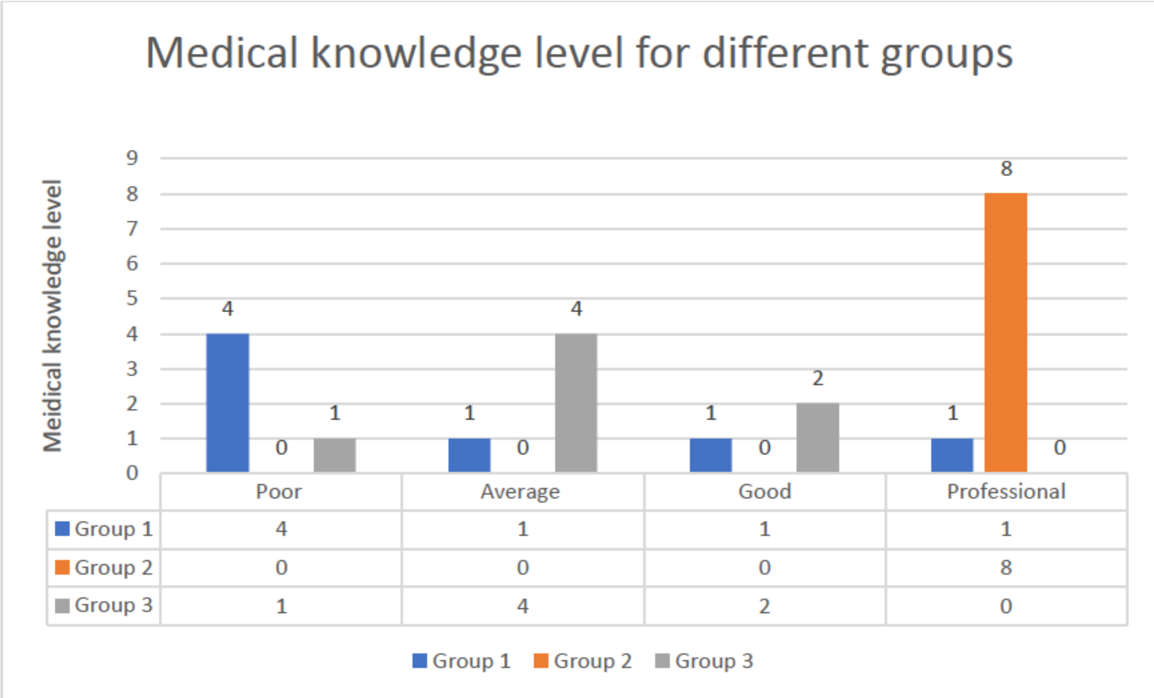


Figure 6.2 Medical knowledge level for Normal sub-health Group

Source: Author's fieldwork

Key:

Group 1 (blue) = 'normal';

Group 2 (red) = 'healthcare professionals';

Group 3 (grey) = 'medical–technology professionals';

6.3.2 Evaluation of the Study's Conceptual Model

The conceptual model is employed to evaluate the factors that impact on users' health self-monitoring devices acceptance behavior. The following bar chart, Figure 6.4, presents the statistical results from the interviewees on the agreement evaluation of each construct from the conceptual model.

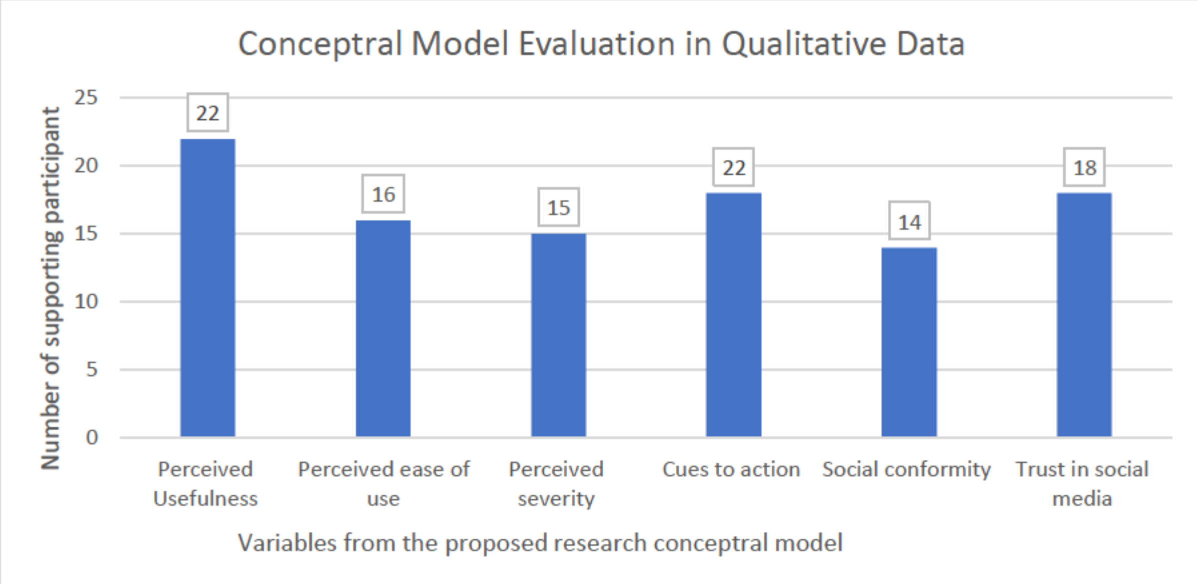


Figure 6.3 Evaluation towards the Conceptual Model from the Qualitative Data

According to the results of the thematic analysis in Table 5.4 below and Figure 5.5 on the study's core themes and corresponding sub-themes, the results show that the factors the conceptual model proposed are indeed the core themes that emerged from the thematic analysis. The theme maps verify the proposed integrated research model, as the proposed factors also emerged from the qualitative analysis with deep explanations of the proposed relationship. Besides the proposed factors, more factors like personally factors, technical factors, environmental factors and other factors have been found explored (shown in Figure 6.5). According to Table 6.4 below, the analysis has identified certain additional factors of technical trustworthiness, locus of control, product involvement, personality, health habit, medical knowledge level, health insurance, Covid-19 and Economic status that are outside the conceptual model and the following sub-themes have been listed.

Table 6.4 Themes and Sub-Themes for this Study

Themes (Final coding)	Sub-theme (Initial coding)
Perceived Usefulness	- Product function - Perceived expectation - Body indicators - Product quality - Data accuracy
Ease of Use	- Automation - Easy to operate - Clear guidance
Perceived Severity	- Perceived health risk - Unhealthy condition

		- Health consciousness
	Cues to Action	- Genetic disease - Physical symptoms
	Social Conformity	- Mentality conformity - Social culture
	Trust in Social Media	- Social recognition - Social characteristics
	Technical Trustworthiness	- Technology safety - Information safety - Perceived risk
	Locus of Control	- Blinded buying due want to get more mental safety - Prevent the unforeseen circumstance - Panic from the large-scale shortage of the medical products (during covid-19 period)
	Product Involvement	- Previous experiences towards individual's products adoption - Diffusion of innovations
	Personality	- Beliefs and evaluations - Resistance to change
	Health Habit	- Eating habit - Exercising habit
	Medical Knowledge Level	- Level of the knowledge - Type of the knowledge
	Health Insurance	- Quality guaranteed - Price guaranteed
	Covid-19	- Awareness of prevention - Motivation
	Economic Status	- Economic tier of the city - Income level

6.3.3 Factors from the Technology Acceptance Model

6.3.3.1 Perceived Usefulness

The qualitative data shows perceived usefulness as the major theme that impacts these sub-healthy individuals' intention to use health self-monitoring devices, as all 22 acknowledge it as a major impact determiner of their intention to use behavior for these devices and add that this factor plays an important role in understanding intention to use behavior. Indeed, all interviewees also specifically say this factor positively impacts their intention to adopt the digital health self-monitoring devices. In this context, perceived usefulness can refer to an individual's expectation that using the technology will help them improve their health or manage a specific health condition. For example, an individual may believe that using a wearable fitness tracker will help them track their physical activity levels and encourage them to be more active. The following analysis of this theme reveals five sub-themes, which directly derived from interviewees' responses and thus qualitative data: product function; perceived expectation; body indicators; product quality; and data accuracy.

Product Functionality

Product functionality is thus an emergent sub-theme of the abovementioned usefulness, and sub-healthy people with diabetes, for instance, may believe that using a continuous glucose monitoring device will help them better manage their blood sugar levels and reduce their risk of complications. In this study, 19 out of 22 interviewees across the three groups confirmed that product function is a major factor in their intent to use the health self-monitoring device, with specifics including whether the technology has multi-functions, what the functionality types are, whether the device includes innovative functions, and the various features and capabilities of the technology, such as its data accuracy, reliability, and the range of health metrics it can track. If an individual perceives a technology to have valuable and useful functions, they are more likely to adopt and use it. Inversely, if they perceive the technology as lacking in useful functions or being difficult to use, they are less likely to adopt it. When designing health self-monitoring technologies, then, it is thus important to consider which product functions will be most useful to the intended users. In participants' examples, a wearable fitness tracker that is designed for athletes may need to have advanced features such as GPS tracking and heart rate monitoring, while a tracker designed for older adults may need to have larger, easier-to-read displays and more simple, intuitive interfaces. In their words:

> *"The range of product functions offered by this wearable fitness tracker, such as GPS tracking and heart rate monitoring, make it a useful tool for athletes looking to track and improve their performance."*
>
> (NSHG1)

> *"The large, multi-functions, good looking intuitive interface of this wearable fitness tracker make it a useful tool for older adults looking to track their physical activity levels and maintain their health and willingness to use these devices."*
>
> (MTPSHG20)

Product function can greatly explain the perceived usefulness of certain health related devices regarding technology acceptance and adoption. It concerns the extent to which a technology is perceived as useful and effective in achieving its intended purpose. In the example below, the interviewee deems the discussed device a useful tool for individuals with diabetes looking to better manage their blood sugar levels, which is crucial for individuals with diabetes/sub-healthy individuals with abnormal indexes to avoid complications such as nerve damage, kidney disease and vision problems. Traditional methods of monitoring blood sugar levels involve finger pricking to obtain a drop of blood, which can be uncomfortable and inconvenient. Continual glucose monitoring devices (CGMs) offer an alternative solution by providing real-time blood sugar readings without the need for frequent finger pricks.

> *"The result [data] provided by this continual glucose monitoring device is highly accurate and reliable, which makes it a useful tool for individuals with diabetes looking to better manage their blood sugar levels."*
>
> (HPSHG12)

The functionality of CGMs depends on their accuracy and reliability, as noted in the quote. If the device produces inaccurate or unreliable readings, it can lead to incorrect dosing of insulin or other medications, which can have serious consequences for an individual's health. Inaccurate readings can also lead to unnecessary interventions, such as administering glucose when it is not needed. Hence, the accuracy and reliability of such devices are prerequisites for their functionality. Moreover, the quote also highlights the importance of functionality in the context of improving disease management. By providing accurate and reliable data, the CGM becomes a useful tool for individuals with diabetes to better manage their blood sugar levels and can thus help with this chronic condition. For instance, the device can alert them to changes in their blood sugar levels, enabling them to make adjustments to their diet, exercise and medication accordingly.

HPSHG12 also underscored the role of technology in enhancing medical care. CGMs represent a technological advancement in diabetes management, providing individuals with an easy-to-use and efficient method of monitoring their blood sugar levels. They reduce the need for frequent finger pricks and can provide data that is more comprehensive than traditional monitoring methods.

Indeed, interviewees highly value product functionality of health self-monitoring devices, as the following comments show.

> *"Functionality is the most important aspect of any product. Without it, a product is nothing."*
>
> HPSHG8)
>
> *"Personally, I think it should be functional. Before I have the intention to use it."*
>
> (NSHG114)
>
> *"The second is that the functionality of the instrument is also very important."*
>
> (MTPSHG20)
>
> *"The most important thing is function."*
>
> (NSHG3)

Regarding individuals' intents to use or adopt a certain device, the first and priority element they consider is whether the devices' functions will help them achieve their personal goals and whether this device has enough functionality to meet their personal needs. Technology today offers much in this regard. Today's digital wearables, converged products of smart sensors, artificial intelligence (AI), the Internet of Things (IoT), big data, robots and radar technologies can therefore facilitate the management and prevention of diseases. They can measure the heart rate, body temperature, blood pressure and respiration of the elderly living in homes and facilities, for example, and by detecting their risk indicators, such as worsening disease conditions, falls and other life-threatening situations, wearables and smartphone apps provide a wide range of healthcare services, and this trend is expected to accelerate.

Almost all interviewees stressed the importance of a technology's functions. As further examples,

> *"In my opinion, functionality is the foremost aspect of product design and its main purpose. A product that effectively satisfies consumers' needs and provides convenience should take precedence over any other drawbacks it may have, such as being difficult to operate. For me, the product's features are the most critical factor in determining its usefulness and directly influence my decision to use it. or not."*
>
> (NSHG1)

This participant confirms functionality as a priority ("*precedence*"), adding that this could compensate for various drawbacks. More pertinently in this section, this interviewee calls functionality "*the most critical factor in determining* [product] *usefulness*", which says so much. Another echoes such sentiments:

> *"Products function is very important for me…. if the data is accuracy or the products is in a professional standard, it will bring great help to my daily life, and will provide accurate result and better monitor my body."*
>
> (HPSHG15)

Others value functionality but suggest this relates to interactive aspects with hospital appointments/visits:

> *"Function is relatively important. Most people may still choose to go to the hospital for an ordinary physical examination. As far as the intention of using the product is concerned, we should focus on the function. Because now you have started to use the product or understand the impression of the product."*
>
> (NSHG9)

> *"It must be because there is a requirement. So, if the functionality is strong enough, this standard meets the demand. I want to know about my physical condition in advance. It may only be used intermittently, and the period of use may not be very long."*
>
> (NSHG1)

Half of the interviewees (11/22) more specifically said on this aspect that multi-functionality is very important, as various functions of the health self-monitoring devices seemingly indicate usefulness for them. Some even put multi-functions as the priority regarding their intent to adopt a health self-monitoring device. Overall, wearable technologies enable the continuous monitoring of human physical activity behaviorists, as well as physiological and biochemical parameters during daily life. The most measured data include vital signs such as heart rate, blood pressure, and body temperature, as well as blood oxygen saturation, posture, and physical activities using electrocardiogram (ECG), ballistocardiogram (BCG,) and other devices. Potentially, wearable devices with photo or video function could provide additional clinical information, especially as wearable devices with this function can be attached to shoes, eyeglasses, earrings, clothing, gloves and watches, and these may evolve to be skin-attachable devices and even as sensors that can be embedded into the environment, such as chairs, car seats and mattresses, opening possibilities to an array of further functions. Notably, 8 out of 8 health professionals said that if one device cannot monitor their whole-body condition, then they are willing to use more than one device to monitor their body health. This contrasts with NSHG6, who has low medical knowledge level, as this interviewee pointed out that multi-functionality is actually a means of avoiding numerous health devices, which seems especially important here given that people have various other technical devices (and the device must connect with these):

> *"I think that at my age, I am looking for a health monitoring device with multi-functions. This device must solve or monitor all my health problems/data. Otherwise, I will need more than one health device to monitor my health status. Beside this, I also require the device to connect with other smart devices, like smart watch or combine the functions of smart phone. If not, it is not valuable for me, and I don't think it worth that price."*

This seems logical, with a key point here being that "*it must solve all my health problems/data*". This seems optimal functionality for this person, and notably the abovementioned 8 out of 8 health professionals said they expect multi-functionality from health self-monitoring devices but qualified this by saying that the product's quality and whether it provides the right results and correct data besides meeting professional standards are more important for them. Also, although 11 out of 22 wanted multifunctionality the inverse is that half did not value it in this way. A caveat here is that although there has been rapid growth of healthcare wearable devices market and many products have appeared in the market, not all devices need comprehensive functionality. Although some monitoring devices do include multi-functions and this clearly pleases certain target audiences, some products have only one function or very limited functionality that are nevertheless at professional standards and this satisfies others. For example, to some diabetic patients their only need may be the monitoring their blood glucose, and arguably excessive functionality beyond this may be wasted or even problematic. On the other hand, if it is too basic for intended users then this is also an issue, for some may want albeit not excessive multifunctionality. As NSHG3 notes,

> *"The limited range of product functions offered by this health self-monitoring technology may make it less useful for individuals with specific health goals or needs."*

What emerges from all this is that devices must cater for user needs regarding functionality as best as possible, though this can be tricky as there may be variation within similar target users. Overall, product functions are a key factor in determining an individual's perceived usefulness of a health self-monitoring technology. By designing technologies with useful and easy-to-use product functions that suit target customer needs as best as one can, it may be possible to increase the likelihood that they will be adopted and used consistently, which can ultimately lead to improved health outcomes.

Perceived Expectation

The perceived usefulness of health self-monitoring devices also includes the sub-theme of perceived expectation about whether or not the devices meet personal needs such as reducing family pressure via the self-monitoring devices transferring the health index to your family’s phone or other devices, so they can monitor their family members on time. This will also reduce the transportation costs, as the devices monitor personal condition remotely instead of going to hospitals.

"What new information what exact benefits and to what extent could I get these from it? I think the perceived benefits can be the essential factor impacting on my user behavior."

(NSHG7)

Expectation thus relates to perceived benefits, and the importance of these have been demonstrated elsewhere:

"I have had heart diseases before; my heart index came to normal after the treatment. But my family members are worried about my heart condition. As I am 68 years old, I always go out walking alone, and my family members, especially my daughter, gets worried about me. The health monitoring devices provide the benefit for me as I can connect my devices to my daughter's. Also, the devices provide location sharing functions as well, so my daughter can monitor my health condition whenever she wants. These benefits directly impact on my intent behavior: when I choose to adopt a digital health self-monitoring device, I will check in advance of these perceived benefits."

(HPSHG9)

To address these concerns, the individual has decided to adopt a digital health self-monitoring device – specifically one that connects to their family members' devices and provides location sharing functions. This allows their family members to monitor their health condition and location at any time, providing family members with peace of mind and the ability to take action if necessary. This is an extremely useful perceived benefit for the old subhealth groups in China who are without a 24-7 carer.

This perceived benefit is particularly useful for those with chronic health conditions, especially those who may have limited mobility or are at higher risk of complications. By allowing family members to track an individual's health and location, these devices can provide a sense of security and support, especially for those who may be living independently or are far away from their loved ones. This can have a positive impact on an individual's overall well-being and quality of life.

In the above case, the perceived expectations of the digital health self-monitoring device connecting to family members' devices and providing location sharing functions, have directly influenced the individual's decision to adopt the device. This demonstrates the importance of understanding an individual's motivations and needs when it comes to adopting new technologies, particularly those related to health and wellbeing. By considering the perceived benefits of a technology, individuals can make more informed decisions about whether or not to adopt it, ensuring that they are able to get the most out of the technology and derive much value from it.

However, it is also important to consider potential limitations and drawbacks of digital health self-monitoring devices in this regard. For example, these devices may require a significant investment of time and resources to set up and maintain, and they may require individuals to learn how to use them effectively. Additionally, these devices may not be suitable for all individuals, particularly those who may have difficulty in using technology or who may be hesitant to share personal health information with others. It is important to consider these potential limitations and drawbacks carefully when deciding whether to adopt a digital health self-monitoring device.

As a specific example, the insurance manager HPSHG14 alluded to perceived benefits:

> *"Personally, quality of the product can decide the perceived usefulness of this product."*

Perceived usefulness is an existing factor in the TAM model that has been tested by various researchers in different contexts as a significant influence on user acceptance (Davis,1989). It relates to whether users can perceive the benefits for themselves in the performance of actions after using the new technology. From the service providers' perspective, making users realise the usefulness and specific perceived benefits of using a health self-monitoring devices was considered significant for improving user awareness and adoption of the new technology.

Service providers plan and design health self-monitoring devices, and thus must consider their usefulness and benefits. Most interviewees pointed out the necessity of having information on such benefits as these can determine perceived usefulness and ultimate adoption (or not) of devices, and these often relate to functions.

> *"The functions of the product will directly impact on my adoption behavior, as it decided the usefulness of certain devices."*
>
> (HPSHG11)

> *It depends on its functions. Because I think the multifunctional devices will provide more comprehensive analysis of my body health, which provided a clear and detailed report. Monthly monitoring is much more effective than annual physical monitoring, and problems can be discovered in time."*
>
> (MTPSHG 20)

Clear and specific perceived benefits are evident here via functions. Notably, 80% of interviewees across all three groups and at different health knowledge levels pointed out that if the devices can give notifications on body indicators, then this will be very useful; in turn, this will yield perceived benefits, though these may vary across individuals regarding how they see themselves as benefiting from such notifications. As some wearable devices provide body warning alarms, the devices could automatically monitor body indicators and/or conditions that are particular to various individual needs and warn people if abnormal indexes occur. Thus, if the devices monitor a user's daily health and they get a daily health record but also receive alerts for potential health issues, people can perceive particular personalised benefits and be more likely to adopt and use this device. Overall, a benefit is that these can help prevent various chronic diseases from which people suffer and generally help them keep a healthy body. In an example by HS4, during COVID-19 health wearable self-monitoring devices helped her track her daily health condition index and when this became abnormal it raised an alarm. It meant she adapted accordingly to realign with a healthy lifestyle during from a dangerous situation. Another interviewee said body indicators encourage perceived usefulness of the devices and increased their intention to use these.

> *"Self-monitoring devices give a body alarm to remind me to monitor my health condition. Daily life is very busy; therefore, I cannot remember all things which I need to do. If the technologies can give me the signal of my daily health condition, it would be better and useful for me. I intend to wear and use these monitoring devices."*
>
> (NSHG2)

Body Indicators

China is currently facing significant health challenges, especially given its ageing population. According to the United Nations, China's population is projected to peak at 1.44 billion in 2029 then decline. This demographic shift has put pressure on the younger generation to take care of their elderly family members, which can be time-consuming and emotionally demanding. Additionally, many young Chinese people are facing social pressure to succeed in their careers and make a better life for themselves, which can lead to long working hours and a lack of time for self-care as well, which increases stress, poor sleeping habits, unhealthy diets and neglect of physical exercise. Therefore, people under huge social pressures have limited time to take care of or monitor their own body health, though a body monitoring device can help users with these for both general health and specific conditions.

Wearable health devices are being increasingly used by people to better monitor their health status both at an activity/fitness level for self-health tracking and at a medical level to improve health and provide more data to clinicians with a potential for earlier diagnostic and guidance of treatment. People can become much more engaged with their health when they use wearable tech to monitor themselves, and by accessing the real-time data their device collects users can stay informed about their well-being and health conditions. They can thereby regain control of their own health by monitoring health indexes via wearables instead of relying on doctors' tests only. For instance, most fitness trackers monitor aspects of health such as activity levels, heart rate and sleep quality, and they collect data over time so users can view their metrics and detect issues and irregularities in their health. This can motivate people to improve their metrics by engaging in healthy behaviors such as getting more sleep and exercise. Furthermore, many trackers include features that track weight and calorie intake to promote a healthy diet as well. Having the ability to track personal health progress adds a whole new dimension to health and fitness that is unique to wearable devices. As an interviewee says,

> *"Self-monitoring devices can be regarded as a body alarm to remind me and monitor my health condition. This is very useful to monitor my sub-health condition. If I did not monitor or forgot to monitor these unhealthy conditions I might fall in a faint as I have an unhealthy index with my heart. The Apple watch will make an alarm when the index goes wrong, then I can take the relevant action. This is very useful for me."*
>
> (HPSHG10)

Self-monitoring devices such as the Apple watch provide a body alarm that reminds an individual to pay attention to their health condition. These devices can be particularly useful for monitoring sub-health conditions, or conditions that are not yet severe enough to be considered a full-blown illness but could potentially become one if left unchecked. In the case of the individual above, their unhealthy index with their heart could, if not monitored, lead to them fainting or experiencing something much more serious. The Apple watch serves as an alert system to let them know when their index is not in a healthy range, allowing them to take the necessary steps to address the issue before it becomes more serious.

The use of self-monitoring devices can be incredibly beneficial for individuals who are looking to take a proactive approach to their health. By keeping track of various health indicators such as heart rate, blood pressure and activity levels, individuals can identify patterns and trends that may indicate an underlying health issue. This can allow them to address this issue before it becomes more serious, potentially preventing long-term health problems and complications or even worse.

A key benefit of self-monitoring devices is the convenience they offer. With the rise of wearable technology, individuals can easily track their health indicators throughout the day without having to visit a healthcare professional or carrying around multiple healthy monitoring devices. This can be particularly useful for individuals who may have limited access to healthcare or who may find it difficult to find the time to visit a healthcare professional regularly. The ability to track their health on the go can give individuals more control over their own health and well-being.

The Chinese healthcare system is different from that of the UK in that it is primarily hospital based rather than community based. Patients in China can visit any hospital or clinic they choose, and they are not assigned to a particular general practitioner (GP) who maintains their medical records. Instead, patients tend to visit different GPs in different hospitals, which can lead to fragmented medical records and difficulty in tracking patients' health history. According to a study published in the *Journal of Medical Systems*, the lack of a standardised electronic health record system in China has created challenges in information sharing and continuity of care. The study found that even within the same hospital, medical records are often scattered across different departments and may not be accessible to all healthcare providers. Additionally, patients' health information is not always accurate or up to date, which can lead to errors in diagnoses and treatment. Another study published in *BMC Health Services Research* found that patients in China often have to repeat medical tests and procedures because their medical records are not easily accessible or transferable between hospitals, which can result in increased healthcare costs and delays in receiving appropriate treatment. In addition to convenience, self-monitoring devices can also address the potential challenges of and offer greater accuracy and consistency in tracking health indicators. Traditional methods of monitoring health, such as manual measurements or periodic visits to a healthcare professional, may be prone to error or inconsistency because of factors such as operator error or changes in an individual's health between visits. By using self-monitoring devices, individuals can get a more accurate and consistent picture of their own health, which can help them make more informed decisions about their health and well-being.

Self-monitoring devices can also be a useful tool for healthcare professionals. By providing individuals with the ability to track their health indicators on a regular basis, healthcare professionals can get a more comprehensive view of an individual's health and identify patterns or trends that may indicate an underlying issue. This can help healthcare professionals provide more targeted and personalised care to their patients, which can lead to better health outcomes.

Table 6.5 Summary of Perceived Usefulness Agreement

	Perceived Usefulness	**Percentage of total**
Evaluation of model	Agree	70%
	Partially Agree	30%
	Disagree	0%

China's healthcare system faced significant challenges during the COVID-19 pandemic and there were reports of medical staff shortages, equipment and supply shortages, and long wait times for COVID-19 testing and treatment. Despite this, the Chinese government's response to the COVID-19 pandemic has been widely praised for its speed and effectiveness in controlling the spread of the virus. As the virus rapidly spread across the country, hospitals and healthcare facilities were quickly overwhelmed, and medical supplies and resources were in short supply. To address these challenges, the Chinese government rapidly mobilised healthcare and implemented a range of measures to control the spread of the virus. In addition to these measures, China also implemented policies to promote social distancing and reduce the spread of the virus, such as city-wide lockdowns, travel restrictions and mandatory quarantine for those who had been in close contact with confirmed cases.

In China, health self-monitoring devices have also been used to monitor residents' health to reduce the chronic diseases people suffer from and solve the potential healthcare resource shortages challenges China has experienced, especially during Covid-19. However, self-monitoring devices should not be seen as a replacement for traditional healthcare. While these devices can be useful tools for tracking health indicators, they should not be relied on as the sole source of information about an individual's health. It is still important for individuals to visit a healthcare professional regularly and follow their recommendations for healthcare and treatment. During Covid-19, the online doctor played an important role of guiding residents to broadly adopt health self-monitoring devices.

In conclusion, self-monitoring devices can be a valuable tool for individuals looking to take a proactive approach to their health. By providing a convenient and accurate way to track health indicators, these devices can help individuals identify potential health issues and take the necessary steps to address them before they become more serious. While self-monitoring devices should not be seen as a replacement for traditional healthcare, they can be a useful complement to it, helping individuals to better understand and manage their own health and wellbeing.

5.3.3.2 Perceived Ease of Use

Perceived ease of use is another a priori category from the theoretical framework (established in the literature review) and concerns the effort required to complete a task after using the new technology evaluated by users. Users may have a negative view of using the health digital self-monitoring technologies if it requires them to put considerable effort into learning how to use it (and vice versa), as a few interviewees mentioned, but most interviewee emphasised the value of the product, if the product is useful and whether or not the product is easy to operate.

Automation

18/22 interviewees said a key factor in perceived ease of use with digital self-monitoring technology is automation. Automation here involves the device doing much of the work and thereby effort from the user being minimised, which also saves the latter time and usually makes the device very easy to operate (see next subsection) for them as complex operational processes are avoided. Interviewees said more automation makes devices easier to operate for them but also that this factor (automation) will not greatly impact their adoption behaviors. They added that devices which automatically monitor the person and analyse their health and their conditions are usually easy-to-use products. Furthermore, users who lack the medical knowledge and are not familiar with their health indexes can easily adopt these devices without learning or following particular guidance. For example, if you wish to monitor your blood pressure, the automotive devices can provide the full range of data through blood measurement:

> *"Self-monitoring devices should remind me to do exercises or give my body health information automatically. And I can monitor my health and my conditions whenever I want to see them, which is much better than checking them myself. If I need to check myself, it is too complicated, and I will forget to do it."*
>
> (HS17)

Easy to Operate

Easy to operate means the device's guidance is straightforward and the device is simple to use. As there are different types of digital health self-monitoring devices, the interviews covered common self-monitoring devices and interviewees were asked about their perspectives on these different types of the devices in this regard (the following table summarises these perspective).

On the different types of health self-monitoring devices, only single purposes devices like blood monitoring monitor devices, glucometers and oximeters usually require prior experience and medical knowledge, but most are relatively easy and their instructions are clear. Nevertheless, other aforementioned factors such as the function and needs being met influence perspectives on ease of use:

> *When I understand the function of this instrument and feel that the function is meeting my needs, Then I will start to consider whether or not the operation is simple or complicated."*
>
> (HS4)

Several interviewees did, however, allude to complexity in these devices being off-putting, and HPSHG8 specifically mentioned that.

> *"Extensive setup and maintenance required for this health self-monitoring technology may make it less useful for individuals who are looking for a convenient and easy-to-use solution".*

As noted, though, this is not generally applicable for most, but the devices mentioned above for specific purposes may not be best suitable for all in this regard. Notably, 22 out of 22 interviewees said that perceived ease of use generally and clear instructions specifically, the latter particularly facilitating easy operation, will positively influence their behavior intention. As most current self-monitoring devices are generally easy to learn and easy to operate anyway for most people, notwithstanding the noted exceptions mentioned above, this aspect should encourage adoption behavior. However, individual characteristics may be relevant with this aspect:

> *"For ease of operation, this may be limited by age. Maybe this is not important, but it should not be too complicated and will influence on my intention to use as well…."*
>
> (HS7)

What many young technically savvy users find easy may not be quite so for older generations then, so this is a variable to consider when targeting particular demographic groups. A similar one concerns interviewees' level of computer anxiety and computer self-efficacy.

There are further though perhaps albeit relatively minor considerations in this factor as well. Nonusers quickly identified UI design problems relating to font size and colours while viewing the mock portal. In addition to some design issues, portal users noted challenges with using the portal or follow-ups from using the portal system specifically relating to registering with the system, logging in and scheduling appointments. Several challenges were related to the back end of the system. For one, it was easy for patients to order their prescriptions on the Web, but in some cases, there were problems when interviewees went to the clinic to pick up the prescription. Interviewees who tried to use the appointment centre said that they could not figure out how to schedule a visit on the portal. Those that were able to schedule an appointment on the portal experienced back-end problems at the clinic when they arrived to check in for their visit. Despite some challenges in using the portal, many users thought My Health Manager was easy to use, and in some cases was easier to use than more traditional services.

According to a Chinese special government policy, professional devices only will be provided by the hospital for these chronic disease people with professional guidance. Another issue mentioned by the User Requirement Analyst was that if the mobile application had a complex interaction with users, such as asking users to operate too many steps to use it, the user might reject it. In fact, service providers consider this a main reason for users not accepting health self-monitoring devices.

> *“…If the product is difficult to operate or requires a lot of time to learn, I probably wouldn't use it. It's important to me that it's intuitive and user-friendly.”*
>
> (NSHG7)

> *“When it comes to technology, I'm not very good with complicated interfaces or confusing instructions. I need something that's straightforward and easy to use.”*
>
> (HPSHG12)

Rogers (2010) argued that the complexity of innovative technology might negatively influence the technology acceptance rate, and these comments clearly support this as difficult, non-user friendly and complex usage requirements and/or instructions can yield negative perceptions about devices. It is thus best to endeavour to ensure no or very few users have such perceptions (or at least mild forms of these only).

Table 6.6 Summary of Perceived Ease of Use Agreement

Evaluation	Perceived Ease of use	Percentage of total
Evaluation of model	Agree	50%
	Partially Agree	35%
	Disagree	15%

IntervieweesIntervieweesIntervieweesIntervieweesIntervieweesInterviewees

6.3.4 Factors form the Health Belief Model

6.3.4.1 Perceived Severity

Perceived severity derives from the perceived seriousness towards a situation or diseases in terms of the negative consequences an individual associates with an event or outcome, such as a diagnosis of cancer. These consequences can relate to an anticipated event that may occur in the future or to a current state such as a pre-existing health problem. For example, this study's general sub-health group have a very high risk of getting various chronic diseases because of their current health condition. An individual's perception of disease severity may be influenced by how the disease impacts their family, daily life and financial situation. If there is little to no such effect, the individual may not perceive it as severe. Hence, the perceived severity of a disease is based not solely on its clinical characteristics but also on its impact on individuals' overall well-being and the lives of themselves and those around them. It also relates to the probability a person will change their health behaviors to avoid a consequence. Nevertheless, several studies have shown that perceived risk of severity is actually the least powerful predictor of whether or not people will engage in preventive health behaviors.

According to the collected interview data, 22 of 22 interviewees (hence, everyone in all three groups) acknowledged the importance of perceived severity (when they think about their health issues, they consider the perceived severity. Basic psychology says that providing rewards or extra benefits for using a product can increase people's usage desire, especially among those who have already started using it. Applying this to the study means that if people perceive the health risk as presenting a danger to their life and family then the solutions which can help them to avoid, prevent or reduce the risk will greatly increase users' adoption intention. The interview data supports this point.

> *"First of all, I think the unhealthy condition can endanger my life or increase the potential risk of getting a chronic disease. If I realise the perceived severity of the disease or a certain health condition, I will purchase a self-monitoring device in order to keep my body health."*
>
> (MTPSHG19)
>
> *"If I don't have the underlying condition or potential risk that can danger my life, I might not have the intention to use the devices."*
>
> (MTPSHG21)
>
> *"……the anxiety towards my body health has been greatly increased during Covid-19; this anxiety also greatly increased my intention to use a health self-monitoring device."*
>
> (NSHG7)

Individuals are more likely to use self-monitoring devices if they believe they are at risk of developing a chronic disease or if their current health condition poses a threat to their life. Basically, they perceive the severity of the disease or condition, and this motivates them to take proactive measures to protect, maintain or change their health. In contrast, if an individual does not perceive their health condition as severe or does not believe they are at risk of developing a chronic disease, they may not have the intention to use self-monitoring devices as they do not see the need to monitor their health regularly.

COVID-19 is relevant here, as anxiety about one's physical condition can also influence one's decision to use self-monitoring devices. If an individual is anxious about their health, they may be more likely to use such devices, even if they are not sensible or necessary. This highlights the importance of providing accurate and reliable information to individuals to help them make informed decisions about their health monitoring needs. The interviewee quotation suggested that individuals have different attitudes towards self-monitoring and towards purchasing monitoring devices, depending on their understanding of disease severity and whether they have a family history of a particular disease. If there is such a family history, the person is more likely to actively monitor their health and purchase corresponding equipment to do so; if they do not have this history, they may only consider monitoring during their annual or quarterly physical examination. For example, if a person's mother has high blood pressure, they may understand the importance of purchasing a blood pressure meter to monitor their own blood pressure. The first quotation, by MTPSHG17, highlights the importance of understanding disease severity in their decision to self-monitor and purchase monitoring equipment. The second, by NSHG3, further elaborates on this point as if there is no threat they are unconcerned about monitoring or purchasing devices; if there were a health threat, this individual implies they would be more willing to buy a self-monitoring device. This suggests that being diagnosed with a specific disease or illness would change their perspective on self-monitoring and purchasing monitoring equipment.

In the third quotation, by MTPSHG21, this individual relates severity to using a monitoring device. The individual in this quotation states that they may refuse to purchase a device if they do not have the disease it is designed to monitor, but if they are made aware of how dangerous the disease is, they may consider monitoring it. This suggests that individuals may weigh the potential risks and benefits of a disease when deciding whether or not to purchase a monitoring device

> *"My son was 20 years old. I talked to him, saying you should take good care of your health. If you take care, you will not have high blood pressure or diabetes in the future. You can live ten years longer. For life, it's a service. So, as I got older, my blood sugar was high, my blood pressure was high, and I found that my blood sugar would take away three years of my life or five years of my life, so I had to control my blood sugar, my blood pressure, and I had to prevent stroke Hemiplegia."*
>
> HPSHG14

Table 6.7 Summary of Perceived Severity Agreement

Evaluation	Perceived Severity	Percentage of total
	Agree	60%
Evaluation of model	Partially Agree	25%
	Disagree	15%

6.3.4.2 Cues to Action

One of the best things about the Health Belief Model is how realistically it frames people's behaviors. It recognizes the fact that sometimes wanting to change a health behavior isn't enough to actually make someone do it. Because of this, it includes two more elements that are necessary to get an individual to make the leap. These two elements are *cues to action* and *self-efficacy.*

Cues to action are external events that prompt a desire to make a health change. They can be anything from a blood pressure van being present at a health fare, to seeing a condom poster on a train, to having a relative die of cancer. A cue to action is something that helps move someone from wanting to make a health change to making the change.

Cues to action is one of the variables from the Health Belief Model-HBM (Rosenstock, 1966) was designed to help explain why people fail to adopt preventive health measures. The model has also been applied to predict the adoption and maintenance of treatment for a diagnosed illness (Carpenter, 2010), as well as adherence to the treatment (Jones, Smith2014). Today, HBM guides the assessment of many health communication interventions (Sohl & Moyer, 2007) and investigations of numerous health behaviors (Carpenter, 2010).

Most participants (85%) described the trajectory of their illness by discussing instances when the severity of symptoms impacted their lives. Overall, severity was explicated as mental anguish, physiological reactions, and suicidal thoughts. Individuals described feeling trapped or caught in an everlasting negative feeling limiting the ability to live as they wished. According to Interviewee HS11, “it’s almost as if you’re going in slow motion. If you’ve seen these films where you’re standing still and everyone’s going around you, it was almost like that.” The difference between typical negative feelings and the extreme mental anguish of depression is summed up by Interviewee HS4 as “just the sheer onslaught of negative thoughts that you just can’t push out.” In addition to the severity of psychological symptoms, many participants noted the physiological component of depression. Individuals talked about combinations of panic, increased heart rate, changes in sleep patterns, getting tired quickly, acting out, eating disorders, inability to work, paranoia, and being uncommunicative. Interviewee HS23 described this experience as “the sub-health condition, I feel physiologically different, I have this sort of pressure around my brain, you know I feel that someone’s got their hands inside there.” Most often, the severity of chronic diseases was marked by suicidal thoughts and attempts. Interviewees described suicide as:

> *“….important thing is cues to action, which may increase your subconscious needs. The prevention and detection of the family genetic disease, because I am in this state personally. In this case, because the family members do have this kind of disease already, so in my personal*

daily life, I will control the diet and fat in order to reduce or prevent the probability of this kind of disease."

(HPSHG7)

Also, the other participants have the similar ideas regarding the perceived severity

"I will…… my body has told me to pay attention to monitoring. I will measure my weight every day using self-monitoring devices, there is an index of that heartbeat. I will pay attention..."

(HPSHG2)

"Because of the perennial illness, I am very scared, so I only have this intention to use self-suggestion."

(MTPSHG19)

Often, individuals with depression revealed they confided in a friend or family member who pushed them to seek assistance. For example, Interviewee HS 6 told her friend about her suicidal thoughts, to which she said her friend replied, "you must go and talk to your GP [general practitioner], you must do something about this." The friend called the doctor for her and accompanied her to the waiting room. Such social support behaviors were seen as instrumental in leading depressed individuals to seek help. Other times, friends, family, and even employers were the first to notice the person needed help. Interviewee HS2 2, explained, "My mate says to me, 'You're depressed.' And I said, 'I'm not.' She said, 'You are' so, as I say, I went to the doctor." Others experienced internal cues to action, noting that they did not feel like themselves or felt something was off, and this spurred them to seek help. One described her attempt to jump out of a third-story window as what led her to seek help, as she understood her action was not "the norm"

"*Because these diseases will directly affect my life safety, I will look at its severity according to the possibility of affecting life safety. It's just that chronic gastroenteritis like me, although it may be more uncomfortable after the onset, but it will not affect my life safety. It is less likely that the gastroenteritis will die directly. But if it is heart disease or cerebral thrombosis, this disease may have very serious consequences. Because you are aware of its severity, you begin to urgently want to prevent this disease."*

(HPSHG9)

" The medical report provide the possibility of this disease. If the condition will turn to be chronic disease, I will definitely monitor it in time and then buy monitoring equipment to monitor the current physical condition."

(MTPSHG19)

Table 6.8 Summary of Cues to Action

Evaluation	Cues to Action	Percentage of total
Evaluation of model	Agree	80%
	Partially Agree	15%
	Disagree	5%

6.3.5 Factors from Social Cognitive Theory

6.3.5.1 Social Conformity

Social influence is the perception outside the individual's thinking that can affect the person's decision to accept something new. It plays a crucial role in influencing user behavior in terms of accepting and adopting an innovation, not only in an organisational context but also an individual one, though these can relate. Individuals can be influenced in diverse ways depending on the information they receive, including the experiences of other users around them, such as peers and family members, and influences simply from there being many users of a certain device.

> *"Personally, I do not have social conformity, but it is very common in Chinese society. It is probably just because if someone else is doing something, someone fears they have not done it and this will have an impact on them in later life. So, they decided to do this first, and then think they are doing the right thing. Perhaps part of the reason is also because someone else has already bought it, and others are just following him or her physically. Personally, I think it should be regarded as a kind of decision made blindly in the actual social situation."*
>
> (HPSHG10)

> *"They will not be affected by social media or herd psychology. The psychology of the audience is the same. Only first understand that you need to do this Apparatus and a physical condition of oneself."*
>
> (MTPSHG16)

These show that individuals are susceptible to influence and often accept peer opinions; in fact, most interviewees alluded to this. An individual is more likely to follow the person in the same social group who is important for them or who has a different influence on their everyday life, especially in Chinese culture where comparison among peers (e.g. colleagues, friends) is a normal phenomenon. This influence can refer to the social factor, which is a construct of social influence in the UTAUT model. Social factors refer to the personal internalisation that comes from the subjective culture in society and concerns the interpersonal identity that is formed from interactions with other people. This is much more marked in the younger generation in China, which suggests that if a significant person around a younger individual is using a new technology, then that individual may feel outdated for not using it, as the following examples show.

> *"I think society now values self-monitoring, and everyone is doing it. So, if you are not doing it, you will feel like you are behind others."*
>
> (HPSHG15)
>
> *"I feel that everyone around me is using self-monitoring devices, and I think it is essential to keep up with them."*
>
> (MTPSHG13)

Additionally, the statement that "self-monitoring is now valued by society" highlights another aspect relevant to the cultural context of China. Compared to Western countries such as the US and the UK, China has a less individualistic culture and is more collective in nature. In a collectivist society, individuals tend to prioritize the interests of the group over their own interests, whereas in an individualistic society, people are more likely to prioritize their personal goals. In a collectivist and low individualistic society, individuals tend to identify themselves with their social context rather than their personal context.

> *"When my friends use health self-monitoring devices, I feel like I should use them too, to show that I am also conscious of my health."*
>
> (NSHG5)

Particularly interesting in this collectivistic culture is that this person "*should use them too*" but also that they do so to "*show that I am…",* so it is not merely about being conscious of one's else but also about conveying this to the public. Social conformity and peer pressure evidently play a significant role in adopting health self-monitoring devices among sub-healthy Chinese individuals, who may feel compelled to use these devices because they perceive this as a societal norm or because they want to fit in with their peers and contextual culture. Social influence thus shapes health behaviors and is relevant for public health campaigns in China that promote the benefits of health self-monitoring devices. However, within this collectivistic culture one participants deems conformity to be ”*reasonable common*” but realises its effects of this on individuals and individuality, which seems a perception more akin to Western culture.

> *“But personally, I do think the social conformity is reasonable and common. If you ask because your friends bought this bracelet, you will definitely feel that you are not making an active decision. Purchase decision, so I feel that when I bought this bracelet, I did not consider my own health, but because other people bought me and bought it, it felt like I was stupid, so if you ask, buy this hand Is it because you have a disease? I will choose to answer that there is no disease, so why should I buy this bracelet? So, I will first reject this problem, and I will tell you that I did not buy this because my friends bought this bracelet.”*
>
> (NSHG7)

This person will not automatically follow social conformity in this regard, so such perhaps outliers may also need considering for these devices – especially in terms of marketing. This person nevertheless speaks of the wider public generally, albeit with mentions of peers, and not those possibly much closer to the person (e.g. family members), influence from which is particularly important for users in the smart city context. Earlier, for instance, HPSHG14 talked about encouraging their son in this regard, and individuals more likely to trust information and recommendations from families (perhaps because it seems genuinely in their best interests). This is deemed a subjective norm, which concerns a person’s perception that he or she should adopt a new behavior from those people who are essential to him or her (Venkatesh et al., 2003), and is a construct under social influence in the UTAUT2 model. According to the UTAUT2 model, subjective norms are a construct under social influence, which is one of the four key constructs that influence an individual's intention to adopt a new technology or behavior. Social influence can take many forms, including the influence of family members, friends, coworkers, and healthcare providers (Venkatesh et al., 2012). In the case of health self-monitoring device adoption among Chinese sub-healthy group, individuals may be more likely to trust information and recommendations from their family members, as they perceive them as being genuinely interested in their well-being. Research has shown that subjective norms can have a significant impact on an individual's intention to adopt new health behaviors. For example, a study by Liao and Cheung (2008) found that subjective norms significantly influenced the intention of Chinese women to undergo breast cancer screening. Similarly, a study by Wu, Wu, and Li (2019) found that subjective norms were a significant predictor of Chinese individuals' intention to adopt mobile health apps. In order to promote health self-monitoring device adoption among Chinese sub-healthy group, it is important to consider the influence of subjective norms and social influence. This could involve developing targeted interventions that involve family members, friends, and other significant others in the adoption process, and providing them with information and resources to encourage and support their loved ones in adopting new health behaviors. It is also important to ensure that healthcare providers are aware of the role of subjective norms in health behavior adoption and are able to effectively communicate with patients and their families about the benefits of adopting new health behaviors.

Table 6.9 Summary of Social Conformity Agreement

Evaluation	Social Conformity	Percentage of total
	Agree	60%
Evaluation of model	Partially Agree	25%
	Disagree	15%

6.3.5.2 Trust in Social Media

Trust deals with beliefs on an entity’s future actions (Gefen et al., 2003), while trust in social media concerns a degree of acquaintance with the other entity (Kim et al., 2008) and can lead to an understanding of an entity’s current situation. In China, WeChat numbers are all linked to one’s WeChat account, and this application supports various ways to add friends, telephone numbers and Tencent QQ numbers (widely used instant messaging tool). WeChat is thus a commonly used platform to connect with known friends, but strangers can also contact people through searching associated accounts and via other additional functionalities . Accordingly, based on previous good experience with other individuals, familiarity emerges. Familiarity contributes to favourable ideas about the future communication experiences of the two sides, but being unfamiliar with the person they are communicating with may give rise to a perceived risk, to some degree. As some interviewees put it:

> *“Now it is an information society. Many sources of information are actually from the media and the Internet, but sometimes they are not noticed. So my point of view is that a person’s view of things will be influenced by the outside world more or more……It will influence my use behavior”*

(NSHG2)

> *"…when I decided to purchase or use a product, usually I will search for some relevant information from social media, such as some public accounts, or some popular science articles, or Xiao hong shu and the like. Usually, these articles will affect my intention to use, but the final decision is still not only based on social media. This kind of information dissemination is used as a marketing method for product diffusion. Therefore, I will seek professional guidance from the health experts in the hospital….. In addition, I believe comments from previous users, but they still have a lot of false information on the market."*

(NSHG5)

The emergence of Web 2.0 technology has changed the dynamics of the media system. In China, various social media platforms such as WeChat, TikTok and Weibo have become increasingly popular, attracting large amounts of users at home and abroad in recent years. For instance, WeChat alone had 1.24 billion monthly active users as of the first quarter of 2020, and TikTok attracted 100 million monthly active users in the US alone as of August 2020. The TikTok user base has become so large that the Trump administration even saw it as a threat to national security and issued an executive order to ban the application along with WeChat in the US. It is intriguing how social media sites such as WeChat and TikTok have attracted such a large loyal user base within China and around the world. With this user base comes much opportunity for product promotion and take up, though trust is an issue as a participant noted:

> *"Trust in social media does exist in China, as the current media has a lot of false information or exaggerated information. People's intention to use a product is not only about the product itself; it is also because of the increasing spread of diffusion from social media. If the popularity of this product increased, customers who reply on the social media will trust the product as well."*

(HPSHG13)

HPSHG13 here highlights the significant role social media plays in shaping people's decision-making process when purchasing or using a product. Notably, 20 out of 22 interviewees said they usually search for relevant information on social media platforms from sources such as various public accounts, popular science articles and Xiao hong shu. They also acknowledge the impact of these sources on their intention to use a product but emphasise that their final decision is not solely based on social media. The interviewees' results reflect a growing trend in the digital age, where people increasingly rely on social media to make informed decisions. With the increasing availability of information online, consumers have access to a vast range of reviews, feedback and product information, though trust remains a concern. Consequently, users often turn to social media for information but do so by seeking out authentic, reliable and relevant information about a product before making a purchase or deciding to use it.

However, the interviewees also recognize that social media is a means of marketing products (NSHG5: "*This kind of information dissemination is used as a marketing method for product diffusion"*), which highlights the fact that companies leverage social media platforms to reach a broader audience and create buzz around their products. Indeed, companies use social media to build brand awareness, promote their products and influence consumers' buying decisions, but participants are mindful of this. Also, communication privacy concerns are commonly aired/perceived by online users. The relationships between perceived privacy concerns and trust in online settings have been proposed in past research (Fogel and Nehmad, 2009). It is understandable that privacy is a concern, as communication functionalities on social media platforms allow users to transfer all kinds of information. For instance, they can send their immediate location, a friend's name card, images and videos through the WeChat communication interface. Concerns about privacy may at times inhibit smooth WeChat interactions. Talking about this issue, an interviewee said:

> *"When I see some articles from the public account on the Internet that provide some very simple health knowledge, and then they talk about the specific functions of this product that can help me to monitor my body health, then I am attracted to the product and go to buy it."*
>
> (HPSHG12)

In general, the comments suggest that social media, especially online articles and user reviews, plays a significant role in influencing people's purchasing decisions for health products. The availability of simple health knowledge and product information attracts people and can make them more willing to buy and use a product, but not everyone may accept all products displayed and promoted on social media and may instead rely on other factors such as personal experience or the opinions of others. Also, there are trust and privacy concerns.

Indeed, the degree of trust in media and the perceived value of a product can influence people's purchasing decisions. Above, says their parents have a high degree of trust in the media and are more willing to buy and use a product they see on the media if the price is within their acceptable range. This highlights the importance of accurate and trustworthy information when it comes to marketing health products. Social media plays a significant role in influencing people's purchasing decisions when it comes to health products. However, individual opinions, personal experience and the perceived value of a product can also play a role in these decisions.

The interviewees cited in this section highlight the importance of simple health knowledge and specific product information in attracting potential customers. They seem somewhat swayed by the ease of understanding provided by certain social media articles and a focus on a product's specific health benefits. As such, clear, concise information about a product's health benefits seems crucial in attracting potential customers.

MTPSHG20 double confirmed the role of social media in shaping opinions and trust when mentioning that their mother was influenced by TV shopping and that they themselves have been exposed to health products through social media. They also say their parents trust the media, which heavily influences their purchasing decisions. For health product purchases as well then, social media and the media more broadly can play a significant role in shaping opinions and influencing purchasing decisions, but trust is fundamental to this.

Although not all individuals are swayed by equipment displayed on social media, the abovementioned individual seems to be less influenced by what is displayed on social media so instead may base their purchasing decisions on different factors. The individual and their specific preferences are thus important when trying to influence purchasing decisions through social media.

This is generally reflected in the interviewees overall, as 18 out of 22 say that social media can significantly impact on health product purchases, and this happens by providing simple health knowledge and/or by shaping opinions and trust, or being ignored altogether. To successfully influence purchasing decisions through social media, one must understand the individual and their specific preferences, provide clear and concise information about the product's health benefits, and build trust with the target audience.

This final aspect (trust) is a recurring subject here and seems central to social media in terms of purchasing and adopting health devices. Interviewees see perceived costs and benefits as salient determinants of whether to trust. In communicating with official accounts, the time spent searching for useful information is a measurement that influences trust. The official accounts play the role of writing and finding interesting theme related articles. For the receivers − i.e., ordinary WeChat users − it is up to them whether to read the notifications, on their own time and according to their interests. So, it is the time-saving that improves the level of trust in mass communication.

> *"Because I think the Chinese people's education level is improving now. Sometimes people too much of these things are very objectionable, that is, people are now self-awareness, this awareness is still relatively strong, still believe in professionals. Many people are skeptical about the Internet celebrity mass media. For example, if it is a small thing, this is my psychology, for example, I may be a piece of clothing or a piece of jewelry, a simple thing may feel good for me to use, if it relates to my health, it relates to my health and my future life.*
>
> (HPSHG14)

The above quotation highlights this person's perspective on the changing education level and awareness among the Chinese people. The interviewee notes that there has been an increase in the number of advertisements and media influences in society, with some referring to these as celebrities. Despite this, the Interviewee believes that people still have a strong sense of self-awareness and rely on professional opinions.

In conclusion, the interviewees' perspective highlights a shift in the education level and awareness of the Chinese people, but it also shows that people still place trust in professionals and their opinions, which suggests that despite the growing influence of media and advertisements there is still a strong reliance on professional advice, especially when it comes to health and well-being.

Table 6.10 Summary of Trust in social media Agreement

Evaluation	Trust in social media	Percentage of total
	Agree	80%
Evaluation of model	Partially Agree	17%
	Disagree	3%

6.3.6 Additional Factors

6.3.6.1 Technical Trustworthiness

Information safety is a key theme that emerged from the qualitative analysis of factors that influence the intention to use health self-monitoring devices, with interviewees expressing concerns about the safety and privacy of the personal health information collected by these devices and how this information is stored, processed, used and shared (and protected from hackers), which all indicates the need for safe, reliable and trustworthy health self-monitoring devices. Interviewees were particularly concerned about the privacy and security of their personal health information and how third parties could use this information. For example, one participant feared that insurance companies or employers could use the sensitive health data collected by these devices against them, either in terms of employment or insurance coverage.

> *"I worry about the information I'm giving out. What if my employer or insurance company finds out about my health information? I'm afraid they might use it against me."*
>
> (NSHG1)

Similar concerns were shared by many others, who felt that the privacy and security of their health information was of utmost importance. They said they would use health self-monitoring devices only if the information collected was shared with their health care providers alone, as with them it should help their health care providers make more informed decisions about their care. However, the security and potential misuse of this information is of great concern. For interviewees, health self-monitoring devices must have robust security measures in place to protect the privacy and security of the health data collected.

They also worry about the reliability of the health self-monitoring devices and the accuracy of the health information these collect, as information collected could be used to make important health decisions, such as diagnosis or treatment. As such, incorrect information could lead to incorrect health decisions.

> *"I don't want to rely on information that's not accurate. If I'm going to use a health self-monitoring device, I need to know that the information it provides is accurate."*
>
> (MTPSHG19)

There are thus two main concerns in this regard: data being private and secure, meaning it goes to healthcare providers only (besides standard anonymous basic information for developers towards device development); and the data generated being reliable and accurate. These are key concerns for developers initially and marketers subsequently in terms of conveying these qualities.

Transparency and Accountability

The need for transparency and accountability was another theme that emerged from the qualitative analysis. Interviewees feel that companies behind health self-monitoring devices should be transparent about their privacy and security practices and remain accountable and responsible for the health data they collect – also being required to provide detailed information about how this information is stored, processed and used. Furthermore, all this should be done with transparency and conveyed accordingly in clear and understandable language.

Finally, 16 out of 20 interviewees felt that the security and privacy of health information should be protected by law and that these legal protections ensure that health data is protected and that individuals have control over the information collected about them, with strict penalties for companies that transgress this and/or mismanage health data but also appropriate legal remedies available for individuals who have had their privacy violated.

Perceived Risk

Interviewees' perceived risk from such technology also concern the potential for technology to detrimentally impact on their mental and physical health – in other words, the perceived likelihood of harm or negative consequences from using the devices.

Some of these factors nevertheless relate to the preceding concerns about privacy and security (data being accessed by unauthorised groups or individuals, leading to potential harm) and the accuracy and the reliability of the devices (incorrect readings or results, leading to inappropriate or harmful health decisions):

> *"I am concerned about the security of my personal information. I don't want anyone else to have access to my health data."*
>
> (HPSHG10)

> *"I am afraid that the readings might not be accurate, and I will end up making the wrong decisions based on that information."*
>
> (HPSHG9)

Perceived risk also extends to the potential for harm resulting from relying too heavily on self-monitoring devices, as users could become too dependent on them and neglect other aspects of their health, such as physical activity and a healthy diet.

> *"I am afraid that I will rely too much on the device and forget to focus on other things that are important for my health."*
>
> (MTPSHG22)

It is similarly possible that such dependency means other warning signs the devices do not convey are overlooked or ignored, and further concerns include negative long-term health effects from prolonged use of the devices – especially radiation exposure or electromagnetic interference.

> *"I am worried about the long-term effects of using the device and the potential harm it may cause to my health."*
>
> (HPSHG10)

Despite these concerns, for most the potential benefits of using self-monitoring devices outweigh perceived risks, as the devices could provide valuable information that helps improve their health and even prevents serious potential health problems. It is one's own decision about whether this is worth it, as the following example shows:

> *"I understand that there may be some risks associated with using the device, but I think the benefits are worth it."*
>
> (NSHG5)

Another benefit concerns the potential to increase one's own accountability and motivation regarding being responsible for one's own health, working towards this and making healthier choices, which they can do through tracking their data and progress.

> *"I think using the device will help me stay motivated and focused on making healthier choices."*
>
> HPSHG11

Overall, then, interviewees have concerns relating to perceived risk (e.g. privacy and security; accuracy and reliability of the devices; dependence and its implications; and long-term effects of usage). Nevertheless, they also acknowledge the potential benefits (e.g. improved health and increased accountability and motivation). Given this, addressing perceived risk when designing and promoting health self-monitoring devices is vital, and health organisations and technology companies should endeavour to provide accurate, reliable and secure devices that minimise potential harm and promote health.

6.3.6.2 Locus of Control

Locus of control refers to an individual's belief in the degree to which they can control events and outcomes in their lives. Those with an external locus of control tend to believe that external factors, such as luck or fate, have a greater impact on their lives than factor counterparts under an internal locus of control, such as their own actions or choices.

Interviewees reported that people who exhibit an external locus of control tend to engage in blinded buying, which relates to the quote of "blinded buying due to wanting to get more mental safety", as 18/22 interviewees believe that purchasing more products provides them with a sense of mental safety. This especially occurs when individuals with an external locus of control are faced with situations that cause anxiety or uncertainty, and they consequently more likely engage in such blinded buying. This behavior was particularly prevalent during the COVID-19 pandemic when many people stockpiled essential items ostensibly because of fears of shortages. In terms of blinded buying, though, they purchased excessive amounts of products, such as toilet paper or hand sanitizer, in an attempt to gain a sense of control and mental safety in a situation that felt out of their control.

> *"The fear and uncertainty caused by the COVID-19 pandemic led to panic buying and a sense of powerlessness among those with an external locus of control."*
>
> (MTPSHG21)

This quote relates to the sub-theme of ‘panic from the large-scale shortage of medical products (during the COVID-19 period)’. The pandemic caused widespread panic and anxiety, particularly among those with an external locus of control who felt powerless in the face of an unpredictable and uncontrollable situation. This sense of powerlessness contributed to panic buying behavior, as individuals sought to gain a sense of control over the situation by stockpiling essential items.

The shortage of medical products, such as personal protective equipment and ventilators, was another major source of anxiety for many people. Many of those with an external locus of control likely felt they could do little to protect themselves or their loved ones from the virus because of the scarcity of medical supplies. This sense of powerlessness may have contributed to their panic and anxiety.

> *"The large-scale shortage of medical products during the COVID-19 pandemic led to panic among those with an external locus of control, who felt powerless in the face of an unpredictable and uncontrollable situation."*
>
> (HPSHG13)

This quote relates to the sub-theme of ‘panic from the large-scale shortage of medical products (during the COVID-19 period)’ within the broader theme of ‘locus of control’. The COVID-19 pandemic caused widespread panic and anxiety, particularly among those with an external locus of control who felt powerless against an unpredictable and uncontrollable situation.

> *"Individuals with an internal locus of control are more likely to take proactive steps to prevent unforeseen circumstances, as they believe in their ability to control the outcomes of their actions."*

(HPSHG11)

This quote relates to the sub-theme of ‘preventing unforeseen circumstances’ within the broader theme of ‘locus of control’. Individuals with an internal locus of control tend to believe that their actions and choices can impact outcomes in their lives. They are more likely to take proactive steps to prevent unforeseen circumstances because they believe they have the ability to control the outcomes of their actions. For example, such individuals often do something proactively to prevent a potential medical condition, such as exercising regularly and eating a healthy diet to maintain good health. They believe that their actions can positively impact their health outcomes and are more likely to take steps to prevent potential health problems.

> *"Individuals with an internal locus of control tend to be more proactive in seeking out information and taking action to address potential problems."*
>
> (MTPSHG18)

This quote also relates to the sub-theme of ‘preventing unforeseen circumstances’. Those with an internal locus of control tend to be more proactive in seeking out information and taking action to address potential problems. For example, they may research potential health problems and take steps to prevent them, or they may stay informed about current events and take action to protect themselves and their families. This proactive approach can lead to a greater sense of control and empowerment.

6.3.6.3 Product involvement

Product involvement refers to the level of interest and engagement a consumer has with a particular product or service and encompasses various factors including the consumer's personal preferences, attitudes and experiences towards a product as well as the perceived benefits and risks associated with its use. In the context of health self-monitoring devices adoption among Chinese sub-healthy groups, product involvement plays a crucial role in shaping people’s decision-making processes and influencing their adoption behavior. Interviewees’ comments about their level of involvement with technology products covered frequency of use, their enjoyment of the technology and their motivation to use a technology.

<u>Previous Experiences towards Individual Product Adoption</u>

Previous experiences with a particular product or service yield considerations such as the level of satisfaction or dissatisfaction with the product, its perceived benefits and drawbacks, and the overall effectiveness of the product in meeting the consumer's needs. In the current context, previous experiences with similar devices play a significant role in shaping people's attitudes and perceptions towards the adoption of and intention to use new health self-monitoring devices, with 16/22 interviewees highlighting the importance of previous experiences in shaping their attitudes towards these:

> *"I have tried using some health self-monitoring devices before, but they were not very accurate and did not provide me with the information I needed. So, when I heard about this new device, I was a bit hesitant to try it out. However, after reading some positive reviews and talking to people who had used it, I decided to give it a try."*
>
> (HPSHG8)

In this example, previous experiences with similar devices proved off-putting for this individual and resulted in hesitancy to use; however, reading positive reviews and talking with others who had used it helped them overcome this, with these aspects relating to diffusion of innovations.

Diffusion of Innovations

Diffusion of innovations refers to the process by which a new product or service is adopted and diffused within a particular social system. It encompasses various factors such as the characteristics of the innovation, the communication channels used to spread information about the innovation and the social system within which the innovation is being diffused. In the current Chinese context, the diffusion of innovations in health monitoring devices plays a significant role in shaping people's attitudes and behaviors towards adopting new health self-monitoring devices, as the following example shows:

> *"I first heard about this new health self-monitoring device from a friend who had just started using it. She told me how convenient and easy it was to use, and how it had helped her track her health more effectively. After hearing her positive experience, I decided to give it a try, and I have been using it ever since."*
>
> (NSHG5)

Social influence and word-of-mouth communication shaped the adoption behavior of this individual, who consequently decided to try the health self-monitoring device about which information had been ‘diffused’. Effective communication channels thus help spread information about new products and services but also influence intent and actions towards use.

All these results show product involvement’s crucial role in shaping the adoption behavior of Chinese sub-healthy groups towards health self-monitoring devices. Previous experiences with similar devices and social influence through word-of-mouth communication can significantly influence the attitudes and perceptions of consumers towards the adoption of new devices and encourage action in this regard. Effective communication channels and social systems can also play a critical role in the diffusion of information about new innovations within a particular social system.

6.3.6.4 Personality
An individual’s personality also influences the behavior of Chinese sub-healthy groups towards adopting and using health self-monitoring devices, especially personality traits relating to beliefs and evaluations as well as resistance to change.

Beliefs and Evaluations

Beliefs and evaluations here concern perceptions and opinions towards health self-monitoring devices and are based on past experiences, cultural and social norms, and personal preferences. An interviewee held positive thoughts and beliefs about the devices:

> *"I think these devices are very helpful because they can help me monitor my health status, and I can take appropriate actions to improve my health."*
>
> (NSHG3)

Other Interviewees had reservations about the accuracy and reliability of these devices, as they were sceptical about the accuracy and concerned about the privacy of their health data.

"I am not sure about the accuracy of these devices. I don't want to rely on the data provided by these devices blindly. Moreover, I am worried about the privacy of my health data."

(MTPSHG19)

Interviewees' evaluations of health self-monitoring devices are also influenced by their cultural and social norms. Some deem it a social norm to monitor their own health regularly, and health self-monitoring devices allow this; others believe they can take care of their own health without them. For example,

"I don't think I need these devices to take care of my health. I can monitor my health by maintaining a healthy lifestyle and getting regular check-ups from a doctor."

(MTPSHG21)

Resistance to Change

Resistance to change concerns reluctance to adopt new technologies and change one's behavior. Interviewees who exhibited resistance to change were hesitant to use health self-monitoring devices because they were not familiar with these devices, and they perceived them as complicated and challenging to use. Some were also concerned about the cost and affordability of these devices:

"I am not sure if I can afford these devices. Besides, I am not familiar with these devices, and I am worried that they might be challenging to use."

(NSHG2)

Resistance to change applies here in two main ways. Those with high levels of resistance to change were less likely to use health self-monitoring devices, as, basically, they felt that their current health practices were sufficient and that these devices would disrupt their routines. Conversely, those with low levels of resistance to change were more likely to use these devices, as they were open to making changes in their health practices. The results showed this resistance as often being driven by a desire to maintain control over technology use, a fear of change and a lack of knowledge about the new technology.

These findings suggest that healthcare professionals and device manufacturers should consider interviewees' personality traits and cultural and social norms when designing and promoting these devices. They should address the Interviewees' concerns about the accuracy and reliability of these devices and assure them about the privacy of their health data. Additionally, they should provide clear instructions on how to use these devices and offer support to those who exhibit resistance to change. By doing so, they can improve the adoption rates of health self-monitoring devices among Chinese sub-healthy groups, who can then promote their own health and well-being and thereby help the country in its health crises.

6.3.6.5 Health Habit

China is experiencing a growing trend among sub-healthy groups to adopt health self-monitoring devices as a means of managing their own health and wellness habits. From the qualitative analysis, two major themes emerged regarding health habits: eating habits and exercising habits.

Eating habits form a particularly important factor in overall health and well-being. The sub-healthy groups in China are increasingly concerned about their eating habits and are using health self-monitoring devices to track their food intake and gain insights into related aspects.

> *"Me and my family are more likely to use health self-monitoring devices to track our food intake, monitor our weight and calculate our calorie intake."*
>
> (HPSHG11)

Exercising habits form another critical aspect of health and wellness that sub-healthy groups in China are focusing on, and they are using health self-monitoring devices to track their physical activity and motivate themselves to exercise regularly.

> *"I also use health self-monitoring devices to track my physical activity, such as the number of steps taken or the distance covered during a workout."*
>
> (HPSHG12)

Interviewees were more likely to use devices that provided personalised exercise recommendations based on their own health goals and fitness levels. The sub-themes under these health habits include tracking food intake, monitoring weight, calculating calorie intake, tracking physical activity, receiving personalised exercise recommendations and gaining insights into the specific areas of health about which individuals in China are concerned. These findings have implications for developing health self-monitoring devices that cater for the specific needs of sub-healthy groups in China, as well as for public health campaigns aimed at promoting healthy eating and physical activity.

6.3.6.6 Medical Knowledge Level

Several interviewees from the normal sub-healthy group expressed a lack of confidence in their ability to understand medical information or use self-monitoring devices effectively. As one says:

> *"I don't really understand all the medical jargon that doctors use, so it's hard for me to know what my numbers mean when I use the self-monitoring device. I feel like I need more education on what all these numbers mean."*
>
> (NSHG5)

Other participants reported feeling overwhelmed or confused by the amount of information available to them about their health conditions and how to manage them:

> *"I have a lot of information about my health condition, but it's hard to know what's important and what I should focus on. Sometimes I feel like I'm drowning in information."*
>
> (HPSHG9)

Familiarity with certain health self-monitoring devices can impact the intention of sub-healthy people to use them, even if they have limited medical knowledge.

> *"I was a chronic diseases patient with diabetes, but recurrently the index becomes normal. I am familiar with how to use the glucometer devices, but I don't have much medical knowledge."*
>
> (MTPSHG22)

If an individual has experience using a blood pressure monitor or a glucose meter, they may be more likely to continue using these devices as part of their self-care routine, even if they do not fully understand the medical implications of their readings. However, medical knowledge can still influence an individual's ability to interpret and act on the data generated by these devices. For instance, a person with a high blood glucose reading may not know whether to adjust their diet, exercise routine or medication without understanding the underlying causes of their elevated blood sugar levels. In this case, medical knowledge would be necessary to make informed decisions about their health. Therefore, while familiarity with health self-monitoring devices can be a factor in their use, it is important for sub-healthy individuals to also have at least a basic level of medical knowledge to make informed decisions about their health and to use these devices effectively. If they do not have this, perhaps the further education on the resultant numbers that NSHG5 desires can be provided.

6.3.6.7 Health Insurance

Health insurance also influences the adoption of health self-monitoring devices among Chinese sub-healthy groups, with sub-themes under this theme being quality guaranteed and price guaranteed.

On the former, interviewees said they are more likely to adopt health self-monitoring devices if they have confidence in the product's quality. For this, devices must be accurate, reliable and have the necessary certifications to ensure they meet quality standards. For instance:

> *"I will only buy a health self-monitoring device if I am sure that it is of good quality. I want to know that it is accurate and reliable. I also want to see that it has the necessary certifications that show that it meets the standards of quality."*
>
> (NSHG4)

On price guaranteed, interviewees said the price of health self-monitoring devices is a significant factor in their adoption: they must be affordable and available at a reasonable price.

Interviewees will also more likely adopt these devices if they have insurance coverage that helps them cover the cost, which has been supported by MTPSHG20:

"I think the price of health self-monitoring devices is an essential factor. It has to be affordable, and if I have insurance coverage that can help me cover the cost, that would be great."

6.3.6.8 Covid-19

The COVID-19 pandemic influenced interviewees' technology use, including by bringing about increased reliance on technology for communication and information, causing changes in work habits and having impacts on mental health. Covid-19 is another significant theme that emerged from the qualitative analysis results; sub-themes under this are awareness of prevention and motivation.

Awareness of Prevention

Interviewees said the pandemic has made them consider their health more, and they are now consequently more likely to adopt health self-monitoring devices to monitor their health and detect any potential health issues early. According to one participant,

"Since the outbreak of Covid-19, I have become more aware of the importance of monitoring my health. I think health self-monitoring devices can help me detect any potential health issues early."

(HPSHG10)

Motivation

Another sub-theme that emerged under Covid-19 is motivation, as I the pandemic has motivated them to adopt health self-monitoring devices to take control of their health and do everything possible to avoid getting infected with the virus. Interviewees also said that monitoring their health can help them stay healthy and prevent the spread of the virus.

"The pandemic has motivated me to adopt health self-monitoring devices. I want to take control of my health and do everything possible to avoid getting infected with the virus. I believe that monitoring my health can help me stay healthy and prevent the spread of the virus."

(HPSHG13)

This theme emerged across the three different groups.

6.3.6.9 Economic Status

Several interviewees mentioned that their economic status is a significant factor in their decision to use them, which relates to the abovementioned cost and affordability:

> *"I would love to use a glucose meter to monitor my blood sugar levels, but they are so expensive that I cannot afford one. I have to rely on occasional tests at the hospital instead."*
>
> (NSHG7)

> *"I have a blood pressure monitor at home, but I don't use it as often as I should because I have to pay for the disposable cuffs, which can add up over time."*
>
> (MTPSHG17)

Some interviewees did not see the *value* in using health self-monitoring devices, especially if they had to pay for them out of pocket:

> *"I don't see the point in using a glucose meter if I don't have diabetes. It seems like a waste of money to me."*
>
> (NSHG3)

Several interviewees said they lived in rural areas or areas with limited healthcare resources, which made it difficult to access health self-monitoring devices. As an interviewee stated:

> *"My community health centre has a blood pressure monitor that I can use, but it is often in high demand, and I have to wait a long time to use it. It would be more convenient if I could afford to buy my own."*
>
> (NSHG1)

The resource mentioned here is a community one and likely much more expensive than personal devices. It is in high demand, yet perhaps the lack of adopting a personal one here is because this is seen as inferior to the main one (possibly influenced by its being relatively 'cheap' compared with the other), so economic status can influence in various ways. Similarly, another alluded to a particular perspective on economic status, and how the usual conception of this (higher status makes it more easily obtainable) is not always so:

> *"I live in a small village, and there are no pharmacies or medical supply stores nearby. If I want to buy a health self-monitoring device, I have to travel a long way to find one."*
>
> (HPSHG11)

This shows that economic status, which is indirectly hinted at here, is not always about finance and affordability or, as with the previous participant, an apparent/a possible reluctance to use personal devices. Another village resident here (possibly at a decent economic status) faces limited resources and says it would be a seemingly challenging journey to obtain suitable devices. While this seemingly differs from the previous village interviewee, perhaps the underlying reason is similar as it does not seem that difficult to obtain one.

Economic status can also impact the level of trust in health self-monitoring devices, which can influence their use. Interviewees were hesitant to use health self-monitoring devices because they did not trust the accuracy of the readings or the quality of the devices themselves, which relates to earlier themes and also perhaps further explains the sentiments of those in the village above. As an interviewee said:

> *"I have heard stories about cheap health self-monitoring devices giving inaccurate readings, and I don't want to risk my health by using one."*
>
> (MTPSHG19)

This ‘cheap’ aspect resurfaces here, and it may be a significant factor in the reluctance to adopt personal devices because of perceptions about these compared with communal devices.

Evidently, the impact of economic status on the sub-healthy Chinese participants’ intent to use health self-monitoring devices is a multifaceted issue. Affordability, availability, perceived value, conceptions of being ‘cheap’ and perhaps inferior compared with communal devices, and trust in the devices all influence their use. Policymakers and healthcare providers should consider these factors when designing interventions to promote the use of health self-monitoring devices among the sub-healthy population.

6.4 Chapter Summary

The primary aim of this chapter was to explore and understand the key factors influencing the decision of China's sub-healthy population to use digital health self-monitoring tools. This inquiry was guided by the research question (RQ 3): "What are the key factors, identified from quantitative surveys and qualitative interviews, that influence China's sub-healthy population in choosing to use digital health self-monitoring tools, and how significant is their impact?"

To address this research question, a mixed-methods approach was adopted, combining quantitative surveys with qualitative interviews. The interviews involved various sub-healthy groups across China, providing a comprehensive understanding of the multifaceted influences on their health monitoring behaviors. According to the qualitative result: the key findings are: Perceived Usefulness and Ease of Use: The study found perceived usefulness and ease of use to be critical factors. The qualitative data emphasized the importance of product functionality, perceived expectations, body indicators, product quality, and data accuracy in determining the usefulness of these devices. Also confirmed the result from the quantitative analysis. Perceived severity, cues to action, and perceived benefits significantly impacted the participants' decisions. The severity of a health condition and external cues, like family history or health emergencies, heightened the perceived need for monitoring devices.

Social conformity and trust in social media emerged as influential. Participants indicated that peer behavior and information obtained from social media platforms significantly affected their intention to use health self-monitoring tools. In addition, this study explored additional factors which impact on Chinese sub-healhy population' usage behaviour of health self-monitoring devices which are technical trustworthiness, locus of control, product involvement, personality traits, health habits, medical knowledge level, health insurance, economic status, and the impact of Covid-19 were additional factors influencing the participants' decisions. The interviews conducted with three different sub-healthy groups in China reveal an evaluation of the proposed research conceptual model, which verifies the statistical result from Chapter 6 and provides further explanation regarding to the resulted. All the proposed variables have been entirely confirmed by more than half interviewees (14), while 8 interviewee agreed part of the variables. According to the qualitative results, the additional variables has been found and reported in this chapter. The qualitative in-depth interviews undertaken served to interpret the quantitative results but also served as an evaluation of the proposed theoretical models. The next chapter will discuss the results of the quantitative questionnaire and the qualitative interviews.

CHAPTER 7 DISCUSSION

7.1 Introduction

This study's conceptual framework has been employed in this work to identify, investigate, and explore impact factors on intention to use health self-monitoring devices for three sub-healthy Chinese groups ('normal', healthcare professionals and technology-related professionals), doing so from three perspectives: technical, health psychology and social. Eleven hypotheses (see Chapter 1 section 1.4) have been tested to examine the interrelationships among these variables. In this chapter, key finding that have emerged from both Chapter 7 (quantitative analysis) and Chapter 7 (qualitative analysis) are reviewed, discussed, analysed and compared with extant literature, and it does this in relation to the study's hypotheses.

7.2 Interpretation of Findings

This chapter discussed all findings included in this study: baseline model and conceptual model. This research developed a comprehensive acceptance model for digital health self-monitoring technologies by integrating its key precursors: the technology acceptance model (perceived usefulness and perceived ease of use); the health belief model (perceived severity and cues to action); and social factors (social conformity and trust in social media). Health-related behavior change is an important issue for providers of healthcare, and understanding and being able to predict and influence health behavior are essential considerations if client co-operation and participation are to happen. As such, a clear understanding of the causes of behavior is necessary to predict change and for determining methods for influencing positive health behavior, and this work has endeavoured to provide such understanding and much more. As a new model developed for the healthy, the study's model needs further development but also testing for applicability in understanding health and related behavior. As nurses spend more time with patients than any other health care professional, they are in a strong position to influence health behavior so can make a significant contribution in this area by subsequently testing aspects of the model, and from the other perspective it has been useful to include nurses in this study as key healthcare professionals besides the various others who complement this inclusion.

This paper summarises the model and assesses the model using specific criteria for a theory.

7.3 Findings that Contribute to the Technology Acceptance Model

7.3.1 Perceived Usefulness

> H5: Perceived usefulness (PU) of the digital health self-monitoring devices has a positive impact on individual's behavior intention to use (IU) digital health self-monitoring devices.

Prior studies have noted the importance of perceived usefulness, seeing it as a key determinant in many technology acceptance models and its extended models (Davis 1989, King and He, 2006, Fuentes-Martínez, 2020). This study's quantitative finding has further confirmed that perceived usefulness for users indeed impacts on their intention to use health self-monitoring devices (Coeff. = 0.665, P<0.001). In accordance with this result, previous studies have demonstrated that perceived usefulness significantly influences user intention regarding health monitoring devices (Rho et al., 2014), which is also consistent with Ahmadet al.'s (2020) study on elderly diabetic patients' intention to use digital health wearable devices. The implication of this finding is that when individual users perceive a positive function of health self-monitoring devices such as effectiveness in monitoring their health index, they are more likely to use and adopt these devices. This study's qualitative findings are consistent with the quantitative findings as all this work's separate sub-health groups, regardless of their medical knowledge or education level or prior user experiences, agree that digital health self-monitoring devices must monitor their body health effectively and act as a body indicator to remind them about any abnormal health index. This also accords with observations from Et al. (2021), who found that both patients and medication professionals agree that perceived usefulness positively correlates with IU on health-related information systems in hospitals.

Notably, the TAM has been used and tested for the acceptance of digital health related technologies (mobile based technology and health self-monitoring devices separately) in different contexts, but this is the first time it has been tested in the Chinese context and it is likewise the first time it has targeted a sub-health sample in terms of adopting all types of health self-monitoring devices. The findings in this study are useful for this unique context as China has Health China 2030 (HC 2030) – a blueprint initially proposed by President Xi Jingping (The Lancet, 2016) that is a national health strategy with numerous targets to enhance citizens' overall health. Greater investment in health monitoring devices is one of the objectives, and this has led to diverse health monitoring devices on the market. Given the resultant huge number of choices regarding these devices, Chinese customers have more options to select from than those in other countries. For instance, compared with those within India's health device market the Chinese consumer is not faced with limited products on the market (Gelbrich and Sattler 2020) as there are an abundance of these, and consequently many competing products provide more diverse functionalities to meet customers' requirements, which is a particularly prominent characteristic of the Chinese market – even though, as this work has noted, every single potential consumer is not necessarily enamoured by such choices or even multifunctionality of devices as some, albeit relatively few, want several or even one function only. Also, functionality is by no means the only driver of intent and acceptance. Nevertheless, for so many this is indeed a positive, and individual products can potentially meet follow-up requirements because of their multiple functionalities, which further enriches the meaning of perceived usefulness for such potential consumers. The qualitative interviews have further confirmed such insights about the usefulness of specific and various functions. A significant result is that among all the functions for the health self-monitoring devices the 'remind' function is particularly welcome by younger users. This refers to how having an abnormal index will remind users to take action such as a comprehensive body check, and it is especially favoured by younger generations because of their high work pressure and the prevalent work–life imbalance among young Chinese generations, who often neglect (or, in other words, find themselves too busy to monitor) their body health and consequently are more likely to develop chronic diseases at a younger age. Via such devices, then, besides addressing its current dual problems mentioned at the outset China can perhaps even forestall an incoming wave of health problems as these generations age, which otherwise will aggravate any serious national issues regarding health that remain unaddressed. It is thus also an individual motivation regarding intent for and adoption of digital health self-monitoring devices for these young generations as well.

Despite its many positives, the current study has limitations that warrant discussion. For instance, it was conducted only among sub-healthy participants and healthcare professionals in China, for reasons justified at the outset such as these being of immediate concern. This does indeed limit the generalisability of the findings to other contexts and populations, but certain findings such as the above one about younger generations are clearly applicable to all in this group, whose noted lifestyles risk health issues. Many points similarly can nevertheless be considered by other populations within and beyond China, but future studies should include a broader sample of participants to improve the specific generalisability of findings. Additionally, the study used a cross-sectional design, which limits its ability to establish causal relationships between the variables so future studies should use longitudinal designs to explore the causal relationships between the variables.

In sum on perceived usefulness, this study confirms its relevance in this unique Chinese context but has also enriched definitions and understandings of perceived usefulness more broadly.

7.3.2 Perceived Ease of Use

> H6a: Perceived ease of use (PEU) of the digital health self-monitoring devices has positive impact on individual's behavior intention to use (IU) digital health self-monitoring devices.

Perceived ease of use in this work concerns how potential users expect digital health self-monitoring devices to be easy to use, and it has here been hypothesised as positively impacting on intention to use. The results, however, show that it does not significantly influence users' intention of adopting health self-monitoring devices among the Chinese sub-health group in China. This finding is consistent with that of Hu et al. (1999), who also found it not to be positively correlated with behavioral intention to use. It also broadly supports the work of other studies in this area (e.g. Xue et al., 2009; Deng 2013; Wu and Chang, 2016; Safeena et al., 2019; Martins et al., 2017; Oreg, 2020; Featherman et al., 2021; Ryu et al. 2019).

Several factors could explain this finding. Firstly, both quantitative and qualitative results show that those with a professional level of medical knowledge or prior experience of using the digital health self-monitoring devices did not recognise PEU as an important predictor of their intention to use, which reflect the TAM's applicability regarding specific technology and target users. Working professionals such as doctors and nurses are different from those without the relevant education background or experience, as the professionals tend to adopt technologies quicker with less intensive training than that of others. Hence, the adoption of new technologies also depends on the medical knowledge level, educational background and experience.

Secondly, all the listed technologies covered in this study are very easy to operate for most people. A particularly relevant finding in this regard derives from the qualitative results, as healthcare professionals emphasised that under Chinese government regulation (also noted by Wang, 2008) all healthcare products must have clear instruction. Hence, with these PEU is less likely to influence users.

Contrasting a specific TAM hypothesis (David,1989), perceived ease of use was here found to have no direct significant effect on intention to use within the target group, though there are instances of some showing slight concern about this These findings are somewhat surprising given that other research shows this as important for those who are not health professionals and who have little experience in using mobile-based devices in some other developing countries .A reason for this may be that in some developing countries the health-monitoring devices are not as easy to use as the ones in China, with a likely explanation or at least contributing factor being that the instructions are not clear enough (e.g. Al-Emran, 2021). Obviously, this needs addressing in these other contexts but in China, as the previous point noted, regulations have been enacted to ensure clear instructions so this is not an issue currently, though with new products developing this seems an ongoing matter to address constantly and thereby ensure this remains so. In other developing countries PEU becomes less important where there is a lack of clear and comprehensive instructions; hence, other studies have deemed PEU to be an important predictor of user intention (Gelbrich and Sattler 2020; Yang and Forney 2020).

The current study's results also support the idea of Hirakawa and Umemuro (2010: 89), who opined that "no amount of PEU will compensate for low usefulness". This finding suggests that TAM may not be appropriate for user populations who have considerably above-average general competence and intellectual capacity or who have constant and reliable access to assistance in operating technology. The explanatory power of TAM, particularly the perceived ease of use factor, may weaken as users' competency increases. The findings from this study likewise suggest that suppliers should focus more on product usefulness (PU) than perceived ease of use because as long as clear usage instructions have been provided the latter will not likely impact on the vast majority of users' intentions (Yang and Forney 2020), though they should still consider the very few who may still struggle with ease of use and endeavour to rectify this accordingly.

> H6b: Perceived ease of use (PEU) of the digital health self-monitoring devices has positive impact on Perceived usefulness (PU) of digital health self-monitoring devices.

Another interesting finding is that although, as previously noted, PEU is not positively correlated with IU it is positively correlated with PU (Coeff. = 0.624, P<0.001). The association between PEU with PU is interesting but not surprising. PEU is part of a product's functionality, and if the digital health self-monitoring device is very easy to operate then this impacts on people's preciseness of the product's usefulness. As PEU can only influence IU alongside of PU, it influences IU indirectly by interacting with PU. Therefore, the impact of PEU is much less than that of PU. This theoretical relationship is supported by empirical evidence (e.g. Chau, 1996; Davis, 1989, 1993; Davis et al., 1989; Mathieson, 1991; Taylor and Todd, 1995; Szajna, 1996; Venkatesh and Davis, 1996). This finding is also consistent with other literature (Kamal et al., 2020; Rosental and Shmueli, 2021) and supported by Hu et al. (1999) in the research area of telemedicine technology adoption among professional physicians.

Notably, the results also suggest that other factors should be added to the conceptual model, as the construct in TAM appears to lack adequate specificity to explain and enunciate user intention. It can be affected by other factors based on the specialty of the implementation environment: health related technologies. Similarly, findings reported by Adams et al. (1992) indicate that researchers should not focus on PEU in identifying antecedents to information-based technology use, saying: "A heavy emphasis on PEU, particularly at the cost of functionality, is not advisable" (p. 237). Keil et al. (1995) nixed PEU-focused efforts such as developing a good user interface, stating: "No amount of PEU will compensate for low usefulness" (Ibid.: 89). Even though the influence of these two constructs (PU and PEU) on IS use has not been consistent across empirical studies, most TAM research shares the common conclusion: PU influences use but PEU does not (e.g. Chau, 1996; Davis, 1989; Davis et al. 1989; Davis, 1993; Szajna, 1996; Straub et al., 1997).

7.4 Findings that Contribute to Health-Related Behavior Change

7.4.1 Perceived Severity

> H1a: Perceived Severity (PS) has a beneficial effect on Perceived usefulness (PU) towards self-monitoring digital health equipment.

Hypothesis H1a posits that perceived severity (PS) of a health condition positively influences the perceived usefulness (PU) of self-monitoring digital health equipment. This hypothesis is grounded in the Health Belief Model (HBM), which suggests that an individual's perception of the seriousness of a health condition can motivate them to take preventive or corrective actions. In this context, when individuals perceive a high severity regarding potential health issues, they are likely to view health monitoring technologies as more useful or beneficial. However, the surprising lack of support for H1a in this study might be attributed to a disconnect between the perception of health risks and the perceived utility of the technology.

> H1b: Perceived Severity (PS) has a beneficial effect on Perceived ease of use (PEU) towards self-monitoring digital health equipment.

Hypothesis H1b suggests that perceived severity has a beneficial effect on the perceived ease of use (PEU) of digital health equipment. The rationale behind this hypothesis is that a higher perception of health risks might motivate individuals to engage more thoroughly with health technology, thereby finding it easier to use over time due to increased familiarity and urgency. However, the lack of support for H1b indicates that perceived severity may not directly influence how easy the technology is perceived to be used. This could be due to the complexity of the technology itself or a lack of appropriate health literacy among users, which prevents them from easily adopting and using the technology, regardless of their perception of the severity of health issues.

> H8: The influence of Perceived Severity (PS) on behavioral intention to use (IU) mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

Hypothesis H8 addresses the mediating role of perceived usefulness (PU) and perceived ease of use (PEU) in the relationship between perceived severity (PS) and behavioral intention to use (IU) health digital self-monitoring technologies. The hypothesis proposes that while PS influences IU, this relationship is mediated through PU and PEU. However, the lack of support for H8 in this study suggests that the perceived severity of health issues may not significantly influence users' intentions through these mediating factors. This could be due to several reasons, such as users not perceiving the technology as an effective solution to the health risks they perceive, or because other factors, such as personal health beliefs or alternative health management strategies, play a more dominant role in their decision-making process.

The current research integrated the technology acceptance model (TAM) with the health belief model (HBM) among other, including the factors of perceived severity (PS) and cues to action (CA) in relation to predicting health related behavioral change. In this study, PS concerns the perceived severity of getting the diseases. It has been tested in the baseline model (PU directly impacts on intention to use) and hypothesised as having a positive impact on behavioral intention to use through the mediator PU and PEU. The quantitative finding of the baseline model confirmed that perceived severity directly impacts on users' intention to use health self-monitoring devices ($r = 0.359$, $r < 0.001$). Surprisingly, none of the three hypotheses discussed in this subsection – H1a, H1b and H8 – have tested positive in this study. Consistent with Rosenstock (1974), this research nevertheless found that a perceived severity of potential diseases directly impacts on users' intention to use digital health self-monitoring devices. The qualitative results in this study are consistent with this, as they highly support the direct relationship between PS and IU. As this study was conducted uber Covid-19 period, this will greatly impact on individual health related behavior for the following reasons.

1. The study was conducted during the COVID-19 period, which heightened individuals' awareness of health risks and the severity of potential diseases. This heightened awareness likely led to a more direct influence of PS on IU, overshadowing the mediating roles of PU and PEU. According to WHO reports in 2020, individuals with chronic diseases faced higher mortality rates if infected by COVID-19, increasing the perceived severity among participants and directly influencing their intention to use health self-monitoring devices.

2. Circumstantial and Environmental Factors: The unique circumstances of the COVID-19 pandemic, including lockdown policies and difficulties in accessing healthcare services, might have led individuals to perceive a greater severity in potential health issues. This perception could directly motivate the use of self-monitoring devices as an immediate response to health concerns, bypassing the more nuanced perceptions of usefulness and ease of use.

3. Cultural and Behavioral Responses to the Pandemic: The study found that Chinese residents perceived a higher severity in their health due to the serious portrayal of COVID-19 by healthcare institutions. This cultural and environmental factor likely heightened the direct impact of PS on IU, without the mediation of PU and PEU.

Furthermore, this study’s qualitative results show that for the participating sub-healthy group, even though some had not yet started monitoring their conditions or preventing their potential chronic diseases, most are very conscious of their health (even if other factors have a detrimental impact on these concerns such as the busy and highly stressful lives many young people lead). Therefore, when these people perceived risks such as mortality and when the threat of illness arises, the perceived severity will directly impact on users’ intention to use, the mediation effect of PU and PEU did not play an important role in this relationship.

In sum, the special circumstances of the COVID-19 pandemic and the heightened awareness of health risks fundamentally altered the dynamics of technology adoption in this study. The direct impact of perceived severity on usage intention overshadowed the hypothesized mediation roles of perceived usefulness and ease of use. This finding aligns with other research works, such as those by Huang et al. (2016) and Rosental and Shmueli (2021), highlighting the importance of perceived severity in technology adoption, particularly in the context of health monitoring during a global health crisis. However, the results of hypothesis H1a, H1b and H8 are not very encouraging. This study does not support any relationship between PS and PU or PS and PEU. In addition, the relationship between PS and IU are not successfully mediated by either PU or PEU, and this aligns with extant literature .

7.4.2 Cues to Action

> H2a: Cues to Action (CA) has a beneficial effect on Perceived usefulness (PU) towards self-monitoring digital health equipment.

Hypothesis H2a posits that cues to action (CA) positively affect the perceived usefulness (PU) of self-monitoring digital health equipment. This hypothesis is grounded in the understanding that specific triggers, such as environmental factors or personal experiences, can enhance an individual's perception of the utility of health technologies. For example, the illness of a family member can serve as a cue to action, heightening the perceived usefulness of health monitoring devices in preventing or managing health conditions. This concept aligns with Rosenstock's Health Belief Model (1974), which emphasizes the importance of cues in prompting health-promoting behaviors. The positive correlation between CA and PU in this study is also supported by the findings of Carpenter (2010) and Sheeran et al. (2016), who noted the significant predictive power of cues to action in determining health behaviors.

> H2b: Cues to Action (CA) has a beneficial effect on Perceived ease of use (PEU) towards self-monitoring digital health equipment.

Hypothesis H2b suggests that cues to action (CA) have a beneficial effect on the perceived ease of use (PEU) of self-monitoring digital health equipment. The rationale behind this hypothesis is that cues such as educational content on social media or guidance from healthcare providers can simplify the understanding and operation of digital health devices, thereby enhancing their perceived ease of use. These cues act as facilitators, providing necessary information and motivation that make the technology seem less intimidating and more user-friendly. Prior research by Huang et al. (2016) and Rosental and Shmueli (2021) supports this relationship, highlighting how external cues can influence individuals' interactions with health technologies.

H9: The influence of Cues to Action (CA) on behavioral intention to use (IU) mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

Hypothesis H9 addresses the mediating role of perceived usefulness (PU) and perceived ease of use (PEU) in the relationship between cues to action (CA) and behavioral intention to use (IU) health digital self-monitoring technologies. The hypothesis posits that while CA directly influences PU and PEU, these perceptions, in turn, mediate the effect of CA on IU. This mediation suggests that cues to action first enhance the perceived usefulness and ease of use of the technology, which subsequently increases the likelihood of its adoption. This relationship aligns with the Technology Acceptance Model (TAM) proposed by Davis (1989), which asserts that external variables, like cues to action, can indirectly affect technology adoption through PU and PEU. The current study enriches this model by specifically illustrating how cues to action play a pivotal role in the adoption and usage of self-monitoring digital health equipment, with PU and PEU serving as crucial mediators in this process.

Cues to action refer to the stimuli that prompt an individual to engage in a health behavior (Rosenstock, 1974).This study sees cues to action (CA) as certain events, people (family or close friends), environments (e.g. that of Covid-19) or things that trigger people to change their behavior. There are many examples of these. The illness of a family member or social media can provide cues; restaurants that provide nutritional information on their menus offer a cue to consider calorie content in food choices; posters in public restrooms offer hand-washing cues; highway signs to ‘buckle up’ provide cues to action; and calendar reminders and mobile device alarms can also trigger action. Cues can also be internal, such as chest pain, discomfort or fatigue. Cues to action is another important variable in the health belief model, which posits that a cue, or trigger, is necessary for prompting engagement in health-promoting behaviors.

The factor of cues to action was tested in the base line model in the quantitative analysis (Chapter 5) and, as evident above, hypothesised in H2a, H2b and H9. The study shows a positive correlation in the above three hypotheses. Specifically, the quantitative data analysis shows that PU and PEO act as the mediator effect that relates cues to action to behavioral intention to use. However, CA does not directly impact on behavioral intention to use.

Cues to action have been found to be a significant predictor of health behaviors in prior research, as noted by Carpenter (2010) and Sheeran et al. (2016). Additionally, Huang et al. (2016) and Rosental and Shmueli (2021) found evidence to support the relationship between cues to action and health behaviors, further highlighting the importance of this construct.

In the context of self-monitoring digital health equipment, the proposed hypotheses suggest that cues to action will have a positive effect on both perceived usefulness (PU) and perceived ease of use (PEU). Prior research has also shown that perceived usefulness and perceived ease of use are important factors in technology adoption and use (Davis, 1989; Venkatesh et al., 2003). By demonstrating the impact of cues to action on PU and PEU, the current study builds upon prior research and provides further insight into the factors that promote the adoption and use of self-monitoring digital health equipment.

Moreover, the proposed hypothesis H9 suggests that cues to action may indirectly influence behavioral intention through the mediating effects of PU and PEU. This is consistent with the Technology Acceptance Model (TAM), which posits that PU and PEU mediate the effect of external variables, such as cues to action, on technology adoption and use (Davis, 1989). The current study contributes to the literature by specifically examining the role of cues to action in the adoption and use of self-monitoring digital health equipment and highlighting the mediating effects of PU and PEU.

7.5 Findings that Contribute to How Specific Social Factors Impact on Individuals' Adoption Behavior Of Digital Health Self-Monitoring Devices

This study integrated TAM with other models/theories and the core social characteristic in China of social conformity as a type of driver for behavior, whereby individual intention to use health digital self-monitoring devices is positively impacted by the behavior of family and friends (Youn and Lee, 2019) but also others such as role models.

7.5.1 Social Conformity

H3a: Social Conformity (SC) positively impacts on Perceived Usefulness (PU) towards digital health self-monitoring devices.

H3b: Social Conformity (SC) positively impacts on Perceived Ease of Use (PEU) towards digital health self-monitoring devices.

H3a and H3b were not supported by the quantitative results. In exploring the reasons behind this lack of support for hypotheses H3a and H3b, the qualitative results suggest that factors other than social conformity influence individual perceptions of technology. One key factor is autonomous decision-making in technology adoption, where individuals may prioritize personal research over social influence. This trend is supported by the findings of Vodanovich, Sundaram, and Myers (2010), who emphasize the role of individual autonomy in technology adoption decisions. Furthermore, the subjective nature of health needs and preferences in determining the perceived usefulness and ease of use of health devices aligns with the observations of Venkatesh and Davis (2000), who argue that individual differences significantly influence technology acceptance. The inherent characteristics of digital health devices themselves, such as complexity or intuitiveness, independently determine their perceived usefulness and ease of use, irrespective of social norms. This assertion is in line with the research of Davis (1989), who noted the direct impact of system characteristics on user perceptions.

In the context of health devices, users have varied health needs, levels of technological literacy, and personal preferences, which can all significantly impact their perceptions of PU and PEU. These subjective factors can lead to diverse evaluations of the same technology, independent of social norms or pressures.The inherent characteristics of digital health devices, such as their complexity, user-friendliness, design, and functionality, can independently influence users' perceptions. As Davis (1989) observed, system characteristics have a direct impact on user perceptions. A device that is inherently complex or not user-friendly may not be perceived as useful or easy to use, regardless of social conformity.

The quality and credibility of information available about health devices, particularly on digital and social media platforms, play a crucial role. Wathen and Burkell (2002) emphasize the critical role of information credibility in shaping user attitudes toward technology. Misinformation or lack of comprehensive information can lead to skepticism and hinder the formation of a unified opinion regarding the technology's usefulness and ease of use.

H10: The influence of social conformity (SC) on behavioral intention to use (IU) is mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

This study's findings show that SC directly and positively impacts on IU (Coeff. =0.155, $p < 0.05$) and H10 been, which is consistent with prior findings in related fields (REF). Similar results in China have emerged from Taherdoost (2018) and Choi and Chung (2012), while Huang et al. (2016) concluded that co-worker opinions positively influence individuals' intention to use. Therefore, the users' intention to use will be boosted in a similar manner from families or friends adopting certain behavior. This phenomenon can be classified as social conformity.

In this research, social conformity, as a typical social factor, is elaborated based on both critical literature and empirical study of Chinese social characteristics (e.g. Chen and Touve, 2009; Zhang et al., 2020). Such literature shows that specific social characteristics greatly influence Chinese individuals' buying behavior, but such social characteristics may not be applied in different contexts because of the following two limitations with literature evidence.

1. Country: The hypothesis has limitations in certain other target groups, and the social conformity factor likely has less impact on intention to use if the target group is from a different country. Take the United States, for example, as Chen et al's (2017) results differed from the current study as, for them, the social factor is not the essential predictor for impacting on American individuals' intention to use. Such a difference can be further explained by the following qualitative results.

2. Technology type: Different types of technology can also change the relationship between SC and IU. For instance, Bagozzi and Warshaw (1989) and Mathieson (1991) reported non-significant path (unsupported) relationship between subjective norms (a type of social factor) and the intention to use the normal information system within a particular working environment. For instance, the SC may not positively impact on IU in non-medical information technology sector.

Limitations regarding other countries and different technology types also emerged in the qualitative study, wherein health technology supplier participants said social impact can significantly impact on intention to use, though they added that interpretations of social impacts across various countries differ. Therefore, local customers likely have different points of view on the behavior of their family and friends, so the marketing strategy is usually different in different countries. Also, as people can have different opinions on different technologies, might not always want people to conform in relation to others and adopt the same technology. These two limitations explain why the impact of SC on IU usually differs across different contexts, countries and technology types, which creates challenges in terms of developing a general technology for adoption across different countries. The impact of SC on IU for such a Chinese sub-health group as studied herein is rarely researched. This study innovatively specifies how SC impacts on IU for this Chinese group, and it demonstrates that SC makes a positive impact on intention to use digital self-monitoring devices.

Social conformity can also be explained from psychological perspectives in the qualitative study. For instance, one doctor participant said Chinese people are significantly influenced by normative effects in their daily lives, especially regarding buying behavior, because they tend to pursue a common target within a certain group so they can fit in with others easily. Commonalities with others are a special psychological phenomenon, especially in this context as the study contributes to the social influence literature by considering this within unique Chinese social characteristics. which is consistent with Bagozzi et al. (2000). While social impact can be experienced as social pressure on one's behavior, the social norms in China, a collectivist nation, are about conforming in the sense of being interrelated to other people (Suh et al., 1998) and pursuing common goals. This finding is also useful for health technology providers, who can adjust their marketing or diffusion strategies in relation to the particular social conformity in China. Furthermore, social technology needs to be introduced in a country with a similar social background and culture, herd mentality and can be introduced in a human-to-human way.

7.5.2 Trust in Social Media

This study explores the role of trust in social media (TS) in influencing the perceived usefulness (PU) and perceived ease of use (PEU) of digital health self-monitoring devices, and its subsequent impact on the intention to use (IU) these devices. The hypotheses tested include the direct impacts of TS on PU and PEU (H4a and H4b) and the mediation of this relationship by PU and PEU (H11). In this regard, it proposed the following hypotheses:

> H4a: Trust in social media (TS) positively impacts on Perceived Usefulness (PU) towards digital health self-monitoring devices.

H4a is not supported. Additionally, the result from the baseline model shows that trust in social media does not directly influence individuals' perceived ease of use (PEU) but does indirectly influence user intention regarding digital health self-monitoring devices in China. This is consistent with findings from the studies of Godin (2001), Gao and Zhao (2022), Walter et al. (2007), Kurucz (2008), Palka et al. (2009) and Sormunen (2019), which all showed that trust in social media does not have a significant direct impact on future intention to use digital health information devices. The qualitative results reveal a nuanced view of trust in social media. Interviewees acknowledged the role of social media in influencing their decision-making process for health products. They often rely on information from platforms like WeChat, Xiao Hong Shu, and TikTok, highlighting the significant impact of these platforms in the information society. However, there is an underlying skepticism about the accuracy and reliability of the information available on these platforms. This skepticism stems from the increasing prevalence of false information and exaggerated claims on social media, as noted by interviewees and aligned with the quantitative findings which did not support H4a.The qualitative insights complement the quantitative results by providing context to the lack of a direct impact of trust in social media on perceived usefulness (PU). While users may find digital health devices easy to use (as supported by H4b), their trust in the usefulness of these devices is not solely based on social media. This finding resonates with studies by Gefen et al. (2003) and Kim et al. (2008), emphasizing the importance of familiarity and past positive experiences in building trust.

H4b: Trust in social media (TS) positively impacts on Perceived Ease of Use (PEU) towards digital health self-monitoring devices.

The positive correlation between trust in social media and perceived ease of use (PEU) of digital health devices (H4b) is a significant finding. According to the quantitative analysis result, H4b and H11 are fully supported: H4b TS → PEU (Coeff. = 0.196, $P < 0.05$), Trust in social media implies that users have confidence in the information provided on these platforms regarding health devices. This trust can stem from various factors, such as the credibility of the source, the quality of the information presented, and the consistency of the message with the user's prior beliefs or experiences. According to Gao and Zhao (2022), trust in online sources can significantly reduce the perceived complexity of new technologies, making them seem more accessible and easier to use. This effect is crucial in the context of digital health devices, where perceived complexity can be a significant barrier to adoption. The quantitative analysis also revealed a significant positive correlation between TS and PEU of digital health devices, affirming H4b. This correlation implies that users who trust the information provided on social media regarding health devices perceive these devices as more user-friendly. Factors such as source credibility, information quality, and message consistency with prior beliefs or experiences significantly influence this trust. Gao and Zhao (2022) have noted that trust in online sources can substantially reduce the perceived complexity of new technologies, making them appear more accessible and easier to use. This aspect is particularly crucial for digital health devices, where complexity can hinder adoption. Trust in social media fundamentally shapes how users interact with digital health technologies. When users place trust in the information provided on social media platforms about health devices, this trust extends beyond the initial perception of the product. It influences how they engage with the device, particularly when following the steps and guidelines presented on these platforms.

H11: The influence of trust in social media (TS) on behavioral intention to use (IU) mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

The mediated influence of TS on IU through PU and PEU (H11) highlights a more complex pathway in the decision-making process (H11 TS → IU (Coeff. = 0.140, $P < 0.05$)). It suggests that while users may trust the information on social media, this trust first influences their perceptions of the ease of use and usefulness of the device, which in turn affects their intention to use it. This finding aligns with the Technology Acceptance Model (TAM), which posits that PU and PEU are primary determinants of technology adoption (Davis, 1989). Sormunen's (2019) research supports this, suggesting that ease of use and usefulness are critical factors that mediate the relationship between external influences (like TS) and usage intentions. In practical terms, when users find credible health-related information on social media, it reduces their uncertainty about the technology. This reduction in uncertainty can make the technology seem more user-friendly and useful, thereby increasing the likelihood of its adoption. The role of social media in demystifying technology and providing practical insights into its application is vital. For example, user reviews, testimonials, and how-to videos on social media can significantly enhance the perceived ease of use and usefulness of health devices.

The qualitative data underscore the critical role social media plays in shaping opinions and trust regarding health products. Despite the awareness of false information, interviewees still seek out social media for initial information. This behavior aligns with the quantitative finding (H11) that trust in social media indirectly influences user intention through perceived ease of use (PEU) and perceived usefulness (PU). The moderated relationship suggests that while social media is a starting point for information gathering, its influence is filtered through users' perceptions of the product’s ease of use and usefulness.

The interviewees' acknowledgment of social media as a marketing tool reflects a sophisticated consumer awareness. This awareness influences their decision-making process, aligning with the indirect influence of trust in social media found in the quantitative results. Consumers use social media for initial information but rely on additional sources, such as professional guidance and real user experiences, before making a decision. This trend underlines the importance for companies to not only engage in social media marketing but also to ensure the availability of reliable and professional information to reinforce consumer trust.

Privacy concerns, as discussed by interviewees, play a significant role in the dynamics of trust in social media. These concerns align with the findings of Fogel and Nehmad (2009), suggesting a relationship between perceived privacy concerns and trust in online settings. The concerns about privacy can impact the smooth interaction and trust-building process on platforms like WeChat, where users share a plethora of personal information.

The qualitative results also highlight the impact of the increasing education level and self-awareness among Chinese consumers. Interviewees expressed skepticism towards internet celebrity mass media and emphasized a reliance on professional opinions, especially regarding health-related products.

The study's findings have important implications for the adoption of digital health technologies. Firstly, they emphasize the need for health technology companies to engage actively with social media platforms to build trust among potential users. This engagement could include providing accurate, clear, and useful information about their products, responding to user queries, and addressing any misconceptions.

Secondly, the findings highlight the importance of designing user-friendly digital health devices. Companies should focus on simplifying the user interface and providing clear instructions to enhance the perceived ease of use. Additionally, they should demonstrate the practical usefulness of their products in real-life scenarios, possibly through social media campaigns, to align with the perceptions formed by users on these platforms.

In conclusion, the study's integration of qualitative and quantitative findings offers a comprehensive understanding of the role of trust in social media in the adoption of digital health self-monitoring devices in China. The findings indicate that social media significantly influences users' initial perceptions of these technologies, with this impact being moderated by factors like consumer skepticism, awareness of marketing strategies, privacy concerns, and the reliance on professional opinions. The support for hypotheses H4b and H11 underscores the critical role of social media in shaping perceptions of the ease of use and usefulness of digital health technologies. Trust in the content about health devices on social media platforms not only makes these devices seem more accessible and user-friendly but also plays a key role in influencing users' intentions to adopt them. This relationship is mediated through the users' perceived attributes of these technologies. These insights are particularly valuable for health technology companies, highlighting the necessity of a multifaceted approach in their marketing and communication strategies. Emphasizing the importance of building trust, ensuring privacy, and providing reliable and professional information is crucial for these companies as they strive to enhance the adoption of their products in a market that is increasingly influenced by digital platforms and an educated consumer base.

7.5.3 The Moderation Effect: Age as a Moderator

This study has uncovered the significant influence of age as a demographic factor in the adoption of digital health self-monitoring devices. Age was hypothesized to have direct and moderating effects on behavioral intention to use (IU), perceived usefulness (PU), and perceived ease of use (PEU). It was also considered as a potential mediator impacting the relationship between PU, PEU, and IU.

The study found that age positively moderates the relationship between PU and IU, indicating that younger users might place greater value on the usefulness of digital health technologies in forming their intention to use them. This finding aligns with the work of Venkatesh et al. (2003), who within their Unified Theory of Acceptance and Use of Technology (UTAUT) model, identified age as an important moderator, particularly noting that younger employees in an organizational context showed a stronger relationship between performance expectancy (akin to PU) and behavioral intention. This suggests that younger individuals may be more responsive to the functional benefits of technology in deciding whether to adopt it.

Contrastingly, the study did not find age to significantly moderate the relationship between PEU and IU. This finding is consistent with prior research, such as Chung et al. (2010) and Wang et al. (2009). Chung et al. (2010) noted no moderating effect of age on PU's relationship with the intention to engage in online communities, and similarly, Wang et al. (2009), in the context of e-learning, failed to find a moderating effect of age on the relationship between performance expectancy and behavioral intention. These results might suggest that while age influences how users perceive the usefulness of technology, it does not significantly alter how the ease of use of the technology impacts their intention to use it.

The variability in the impact of age across different studies and contexts points to the complex nature of this demographic factor in technology adoption. King and He (2006) and Porter and Donthu (2006) have also explored the role of age in technology acceptance, further highlighting its multifaceted influence. While age can be a predictor of technology adoption tendencies, its effects are not universally consistent across different types of technology and user contexts.

For practitioners and designers of digital health technologies, understanding the nuanced role of age can inform more targeted marketing strategies and user interface design. Recognizing that younger users may prioritize the usefulness of technology suggests a need for marketing approaches that emphasize the functional and performance benefits of digital health devices. On the other hand, given that ease of use does not significantly vary with age in its impact on intention to use, designers should aim for universally accessible and user-friendly interfaces that cater to all age groups.

In summary, this study highlights the nuanced role of age as a demographic variable in the adoption of digital health technologies. Age influences the relationship between perceived usefulness and users' intentions to adopt these technologies, particularly among younger users. However, its impact on the relationship between perceived ease of use and intention to use is less pronounced. These findings underscore the importance of considering age in developing and marketing digital health technologies, ensuring that strategies and designs are appropriately tailored to different age groups to maximize adoption and user satisfaction.

7.6 Chapter Summary

This chapter has systematically explored and provided insightful findings in response to the research questions raised at the beginning of our study. The primary aim was to understand the factors impacting the Chinese sub-healthy group's intention to use digital health self-monitoring devices and applications. Through a combination of quantitative and qualitative methods, this research has made significant strides in understanding the complex dynamics of digital health adoption in this specific demographic.

Addressing Research Questions:

Factors Influencing Intention to Use (Q1): The study has identified several key factors influencing the Chinese sub-healthy group's intention to use digital health self-monitoring applications. These factors include perceived severity and usefulness, cues to action, social conformity, and trust in social media. Each factor plays a crucial role in shaping attitudes and intentions towards health self-monitoring devices.

Interrelationships Among Factors (Q2): The research has illuminated the interrelationships among these identified factors. It has been observed that these factors do not work in isolation but interact in complex ways to influence user behavior and intentions.

Significance of Key Factors (Q3): The significance of these factors, as evidenced through quantitative surveys and qualitative interviews, is profound. They collectively contribute to the decision-making process of China's sub-healthy population in considering digital health self-monitoring tools.

The hypotheses formulated at the outset of this research have been instrumental in guiding the investigation. The results regarding to several hypotheses, notably the positive impacts of perceived severity, cues to action, social conformity, and trust in social media on both perceived usefulness and ease of use of digital health self-monitoring devices have been discussed. Furthermore, the hypotheses concerning age as a moderator and the mediating role of perceived usefulness and ease of use have added depth to our understanding of the adoption process.

This chapter not only provides answers to our research questions but also contributes to the broader field of digital health self-monitoring devices adoption. The findings have practical implications for the design and promotion of health self-monitoring devices targeted at the Chinese sub-healthy population. Refer to Table 7.1 for a detailed summary of the research, encompassing its objectives, inquiries, and principal findings. This table systematically illustrates how the formulated hypotheses have addressed the research questions and explicates the extent to which the findings have contributed to achieving the study's primary objectives.

The subsequent chapter will serve as the conclusion of this research. It aims to synthesize the key insights and findings, discuss their implications, and provide recommendations based on the comprehensive analysis conducted throughout the study. This final chapter will also reflect on the research's contributions to the field and suggest potential avenues for future investigation

Table 7.1 Research Summary of Aims, questions, objectives and findings

Research Questions	Aim	Objectives	Research Hypothesis
Q1: What factors impact customers' intention to use digital health self-monitoring applications among the Chinese sub-healthy group?	This thesis aims to critically analyse the factors affecting the acceptance and adoption of digital health self-monitoring devices from the perspective of a Chinese sub-health group.	1. To critically review the literature on health technology adoption models among the Chinese sub-healthy group and explore the factors that influence their user behavior.	Hypothesis one (H1a) Perceived Severity (PS) has a beneficial effect on Perceived usefulness (PU) towards self-monitoring digital health equipment.
Q2: What are the relationships among the factors that determine the usage and intention to use?		2. To implement a survey and interviews to gather primary quantitative and qualitative data on investigating the factors that impact health self-monitoring device adoption among Chinese sub-healthy groups.	Hypothesis two (H1b) Perceived Severity (PS) has a beneficial effect on Perceived ease of use (PEU) towards self-monitoring digital health equipment.
Q3: What are the key factors, identified from quantitative surveys and qualitative interviews, that influence China's sub-healthy population in choosing to use digital health self-monitoring tools, and how significant is their impact?		3. To apply the primary data to identify the technical and psychological influences on user behavior towards health self-monitoring devices among Chinese sub-healthy groups. 4. To apply the primary data to evaluate the relationship between Chinese social characteristics and use behavior. 5. To identify factors and determinants that influence use behavior towards intention to use and explore the moderating effect that influences the relationship between user behavior and intention to use. 6. To propose a comprehensive model for understanding health self-monitoring device acceptance in China.	Hypothesis three (H2a) Cues to Action (CA) has a beneficial effect on Perceived usefulness (PU) towards self-monitoring digital health equipment. Hypothesis four (H2b) Cues to Action (CA) has a beneficial effect on Perceived ease of use (PEU) towards self-monitoring digital health equipment. Hypothesis five (H3a) Social Conformity (SC) positively impacts Perceived Usefulness (PU) towards digital health self-monitoring devices. Hypothesis Six (H3b) Social Conformity (SC) positively impacts Perceived Ease of Use (PEU) towards digital health self-monitoring devices. Hypothesis Seven (H4a) Trust in social media (TS) positively impacts Perceived Usefulness (PU) towards digital health self-monitoring devices. Hypothesis Eight (H4b) Trust in social media (TS) positively impacts Perceived Ease of Use (PEU) towards digital health self-monitoring devices. Hypothesis Nine (H5) The perceived usefulness (PU) of digital health self-monitoring devices has a positive impact on an individual's behavior and intention to use (IU) digital health self-monitoring devices.

			Hypothesis Ten (H6a) Perceived ease of use (PEU) of digital health self-monitoring devices has a positive impact on an individual’s behavior and intention to use (IU) digital health self-monitoring devices.
			Hypothesis Eleven (H6b) Perceived ease of use (PEU) of digital health self-monitoring devices has a positive impact on the Perceived usefulness (PU) of digital health self-monitoring devices.
			Hypothesis Twelve (H7a) Age successfully moderates the relationship between perceived usefulness (PU) to behavioral intention to use (IU) health digital self-monitoring technologies.
			Hypothesis Thirteen (H7b) Age successfully moderates the relationship between perceived ease of use (PEU) to behavioral intention to use (IU) of health digital self-monitoring technologies.
			Hypothesis Fourteen (H8) The influence of Perceived Severity (PS) on behavioral intention to use (IU) is mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.
			Hypothesis Fifteen (H9) The influence of Cues to Action (CA) on behavioral intention to use (IU) is mediated by the perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.
			Hypothesis Sixteen (H10) The influence of social conformity (SC) on behavioral intention to use (IU) is mediated by the perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.
			Hypothesis Seventeen (H11) The influence of trust in social media (TS) on behavioral intention to use (IU) is mediated by perceived usefulness (PU) and perceived ease of use (PEU) of health digital self-monitoring technologies.

CHAPTER 8 CONCLUSION AND RECOMMENDATIONS

8.1 Introduction

This culminating chapter synthesizes the research findings, delineating both theoretical and practical implications. It recognizes limitations and proposes future research avenues in health technology adoption, thereby concluding the thesis. This chapter serves as a reflective consolidation of the study's journey, integrating key findings and contributions, and envisages the future trajectory of health technology adoption research and practice, particularly for service providers and policymakers. This thesis has rigorously explored factors influencing health self-monitoring device adoption behaviors among China's sub-healthy groups. Employing mixed methods, it has gleaned insights from Chinese sub-healthy individuals, enhancing our comprehension of IT-based health technology application adoptions and behavioral shifts in this demographic. These insights offer profound implications for a spectrum of stakeholders including individuals, suppliers, policymakers, service providers, entrepreneurs, and healthcare institutions.

A pilot study preceded the main study, which included qualitative and quantitative data collection and analysis, offering a robust examination of responses from 694 survey participants and 22 in-depth interviews with diverse sub-healthy groups. This comprehensive approach validated the proposed research conceptual model and elucidated the results of the quantitative data. Chapter breakdowns are as follows: Chapter 1 set the research context and methodology; Chapter 2 reviewed the background of this research: the development of health self-monitoring devices in China and reviewed the theoretical models related to health IT-based technology adoption; Chapter 3 designed the conceptual model for this research; Chapter 4 presented the methodology; Chapters 5 and 6 reported quantitative and qualitative findings, respectively; and Chapter 8 discussed these results in comparison to existing literature. This chapter aims to assess how the research purpose, objectives, and hypotheses have been fulfilled, presenting a summary of the study's theoretical and practical contributions, and offering targeted recommendations for future research and practice in health self-monitoring devices.

This chapter aims to draw conclusions by rigorously assessing the extent to which and how the research purpose, objectives, and hypotheses have been achieved. A comprehensive summary of the theoretical and practical contributions of this study will be provided, followed by corresponding recommendations aimed at enhancing the readability and applicability of the findings. The primary objective is to make a significant and valuable contribution to the academic discourse on health IT-based technology, especially health self-monitoring device adoption and health-related behaviors change to provide guidance for future research and practices in this field.

8.2 Summary of the Research Findings

8.2.1 Purpose of the study Aim and Objectives

The purpose of this research is to investigate the factors influencing the acceptance and adoption of digital health self-monitoring applications by the sub-healthy population in China. This study examines the interplay between various individual and social factors to provide a more comprehensive understanding of the underlying mechanisms driving adoption behaviors, and to identify key drivers of technology acceptance in the context of health monitoring devices. The findings can potentially aid health service providers in improving their marketing strategies, thereby increasing the adoption of these technologies, which could lead to better health outcomes for individuals and reduce the burden on the Chinese healthcare system. Additionally, this study contributes to the broader theoretical development of the Technology Acceptance Model (TAM) by extending its application to a specific social and cultural context and exploring the role of different social factors in technology adoption.

The study aims to answer what factors affect the acceptance and adoption of digital health self-monitoring applications from the perspective of the Chinese sub-health group.

The research objectives are as follows:

1. To critically review the literature on health technology adoption models among the Chinese sub-healthy group and explore the factors influencing their user behavior.

2. To implement surveys and interviews to gather primary quantitative and qualitative data on the factors impacting health self-monitoring device adoption among Chinese sub-health groups.

3. To apply the primary data in identifying the technical and psychological influences on user behavior towards health self-monitoring devices among Chinese sub-health groups.

4. To evaluate the relationship between Chinese social characteristics and usage behavior using primary data.

5. To identify factors and determinants affecting usage behavior and intention to use, and explore the moderating effects influencing the relationship between user behavior and intention to use.

6. To propose a comprehensive model predicting health self-monitoring device acceptance in China.

8.2.2 Answering the Research Question

The purpose of this research is to investigate the factors that influence the acceptance and adoption of digital health self-monitoring applications by the sub-healthy population in China. By examining the interplay between various individual and social factors, this study seeks to provide a more comprehensive understanding of the underlying mechanisms that drive the adoption behaviors and to identify key drivers of technology acceptance in the context of health monitoring devices. The findings of this research can potentially help health service providers to improve their marketing strategies and increase the adoption of these technologies, which can ultimately lead to better health outcomes for individuals and reduce the burden on the Chinese healthcare system. Additionally, this study contributes to the broader theoretical development of the Technology Acceptance Model (TAM) by extending its application to a specific social and cultural context and exploring the role of different social factors in technology adoption.

The study aimed to answer <u>factors affecting the acceptance and adoption of digital health self-monitoring applications from the perspective of a Chinese sub-health group.</u>

As such, this study proposes the following research questions:

Q1: What factors impact customers' intention to use digital health self-monitoring applications among the Chinese sub-health group?

Q2: What are the relationships among the factors that determine the usage behavior and intention to use?

Q3: To what extent and how do these that are the key factors impact the, identified from quantitative surveys and qualitative interviews, that influence China's sub-healthy group's intention population in choosing to use digital health self-monitoring applications tools, and how significant is their impact?

In order to answer the research questions, this thesis has designed a research conceptual model to explore the adoption of health self-monitoring devices among Chinese sub-healthy groups. Figure 8.1 presents the four major research phases, and triangulation methods have been adopted to provide a robust conceptual model and answer the research questions.

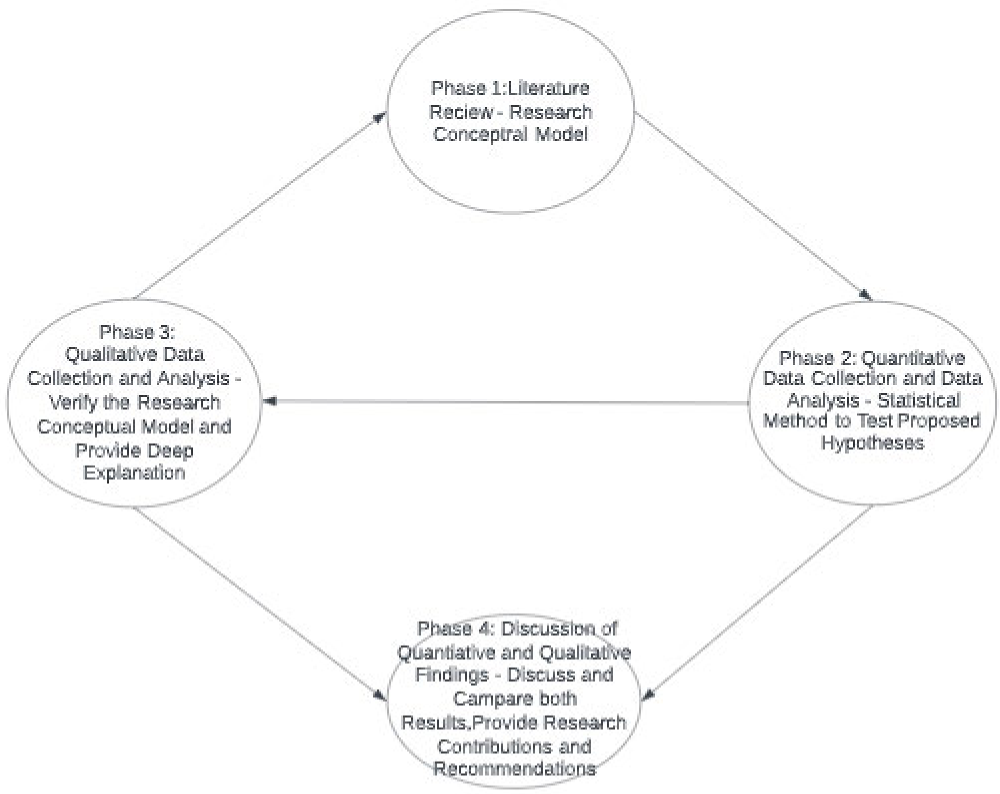


Figure 8.1 Four key phases used in this research.

8.2.1.1 Answering Research Questions and Achieving the Research Objectives

To achieve the research objectives, the present study designed a comprehensive research model to investigate the factors that influence the adoption of digital health self-monitoring applications by Chinese sub-healthy individuals. The research model was divided into four major phases, with a triangulation approach employed to ensure its robustness and to address the research questions effectively. Objectives 1-4 focused on reviewing the previous literature on the impact factors of health self-monitoring adoption in the Chinese context, by examining the relevant theories. Furthermore, both quantitative and qualitative data were collected to verify the conceptual model and to identify additional impact factors. Objectives 4-6 aimed to validate the conceptual model.

The discussion chapter in Chapter 8 addressed all six research objectives, with research hypotheses considered in detail. Objective a) was to understand the underlying technology adoption theories, which was achieved in Chapter 2. Section 2.4 provided an overview of the relevant research on new technology intention to use. Sections 2.5 discussed technology adoption models and theories, including the Technology Acceptance Model and the unified theory of acceptance and use of technology. Section 2.6 explored health behavior and investigated impact factors from psychological perspectives. Section 2.5 defined and justified social factors by reviewing and adopting the Social Cognitive Theory in 2.5.1. The conceptual framework of the research and the resulting hypotheses were established in Chapter 3 theoretical framework development.

The methodology was described in Section 4, and hypothesis testing results were presented in Section 5.3.3 to achieve Objectives 2-5. Qualitative results were provided in Chapter 6 to achieve Objectives 3-5. Finally, the discussion chapter 7 revised the proposed conceptual model based on the findings from both quantitative and qualitative data, ultimately achieving Objective 6.

The study's objectives were realized through a meticulously designed research model, scrutinizing the factors impacting the adoption of digital health self-monitoring applications by the sub-healthy population in China. This model, segmented into four key phases and bolstered by a triangulation methodology, ensured a comprehensive and effective addressal of the research questions. The initial objectives encompassed a critical review of pertinent literature on health self-monitoring adoption factors in China, culminating in the establishment of a nuanced conceptual framework. Subsequently, a blend of quantitative and qualitative data substantiated this model, illuminating additional influential factors.

This research enriches the understanding of digital health self-monitoring technology acceptance by synergizing diverse theoretical constructs, encompassing technology acceptance models, health behavior change frameworks, and specific Chinese cultural facets. Importantly, it extends the TAM to integrate social variables, shedding light on how varying contexts and device types can sway adoption outcomes. The study underscores the criticality of considering the impact of COVID-19 on health technology adoption behaviors within the unique context of China's sub-healthy group.

The present study contributes to the knowledge of digital health self-monitoring technology acceptance by integrating various theories and concepts, including technology acceptance models, health behaviors change models, and Chinese-specific characteristics. This study also extends the application of the Technology Acceptance Model to incorporate social considerations, providing insight into how different contexts and device types can affect the adoption results. The study also highlights the importance of considering the impact of COVID-19 on health technology adoption behaviors in the specific circumstances of the Chinese sub-healthy group.

8.2.1.2 Answering Research Gaps

This research addresses two types of gaps: empirical and theoretical. The existing literature review indicates that several scholarly studies have explored health technology adoption, particularly in the areas of digital and information, including wearable health technology. However, there is a paucity of research on innovative self-monitoring devices in the context of developing countries, especially China. There is very limited research on the capability of health self-monitoring adoption and intention to use. This current research predicts the intended behavior of health self-monitoring devices among the Chinese sub-healthy group, as health self-monitoring technology can significantly reduce the burden on the current healthcare system and support unprecedented events, such as the Covid-19 situation. Additionally, the target group, i.e., sub-healthy people, is crucial, as limited health resources have been used to control and manage this group. Furthermore, if the sub-healthy group does not self-manage their health condition and sub-healthy condition, they are highly likely to develop into people with chronic diseases. The adoption and use of these devices also provide the ability to remotely monitor the health of the body and potentially reduce chronic diseases. (Seshadri et al., 2022; Kichloo et al., 2020; NHS, 2020; Monaghesh & Hajizadeh, 2020; Shen, Chen, Yue & Xu, 2021; Bitar & Alismail, 2021; Alduaij, 2022).

This research provides a comprehensive understanding from the perspective of the sub-healthy group and helps to fill the research gaps. According to the existing literature, many studies have been conducted in this sector, yet many questions remain unanswered. Research is continuously needed for the newly emerging innovative technologies. Furthermore, studies are needed to explore the impact factors based on different cultural and social characteristics. Predicting the intention to use health self-monitoring devices can provide empirical data for both health institutions and technology suppliers to improve the quality of healthcare and greatly help individuals avoid chronic diseases. Therefore, the outcomes of this study will enable health institutions, suppliers, and policymakers to consider measures and implement solutions on how to improve the effectiveness of health self-monitoring technologies.

This study also provides a perspective from the Chinese social environment. The thesis considers trust in social media and social conformity, which are two specific Chinese characteristics. These factors are crucial for understanding the impact factors in the Chinese context. Limited attention has been paid to exploring the impact factors regarding health technology adoption by considering specific Chinese social characteristics.

8.3 Research Contributions

8.3.1 Theoretical Contributions

This study aims to investigate the factors that impact sub-healthy individuals' intention to use health self-monitoring devices, as their adoption can greatly prevent chronic diseases and promote daily health monitoring. The significance of this research lies in its potential to reduce the healthcare burden in China and assist healthcare providers in promoting their products.

The proposed conceptual framework is unique in that it integrates three well-established theoretical models (TAM, HBM, and SCT) to provide a comprehensive understanding of the factors that influence user adoption of health self-monitoring devices among sub-healthy groups in China. This integration of models is the first of its kind, offering a novel perspective on the impact of health-related behaviors change in a Chinese context. By incorporating the strengths of each theoretical model, the proposed framework elucidates the key factors that influence user adoption, including perceived usefulness, perceived ease of use, health beliefs, self-efficacy, social support, and cultural characteristics. These factors are critical to understanding the complex decision-making processes involved in health technology adoption among sub-healthy groups in China. Furthermore, this study sheds light on the challenges associated with the adoption of health self-monitoring devices in China's emergent market. By employing a mixed-method approach that includes both survey-based quantitative methods and qualitative semi-structured interviews with professionals in the information and ICT organization and hospital sector, this study offers a comprehensive perspective on the decision-making processes involved in health technology adoption among sub-healthy groups in China.

The insights gleaned from this study are significant, not only in terms of improving our understanding of health-related behavior change but also in facilitating the promotion and diffusion of health self-monitoring devices in China. By identifying the factors that influence user adoption, healthcare providers can tailor their marketing strategies and product offerings to better meet the needs of sub-healthy groups in China, ultimately leading to better health outcomes and reduced healthcare burden. This study makes a valuable contribution to the body of knowledge on health-related technology adoption and behavior change. The proposed conceptual framework provides a powerful tool for researchers, healthcare providers, and policymakers seeking to understand and address the challenges associated with health technology adoption in China.

To be more specific, this research pioneers in examining the determinants influencing sub-healthy individuals' adoption of health self-monitoring devices, with an emphasis on reducing the healthcare burden in China and aiding healthcare providers in optimizing their product strategies. This study stands out for its innovative conceptual framework that synthesizes three renowned theoretical models—Technology Acceptance Model (TAM), Health Belief Model (HBM), and Social Cognitive Theory (SCT). This unique amalgamation offers fresh insights into the dynamics of health-related behavior change within the Chinese context. A key feature of this framework is its ability to dissect and understand the multifaceted factors driving technology adoption. These include perceived usefulness and ease of use, alongside health beliefs, self-efficacy, social influence, and cultural factors. These insights are crucial for unraveling the complex decision-making processes prevalent in health technology adoption among Chinese sub-healthy populations.

The study's approach, encompassing both quantitative and qualitative methodologies, provides a comprehensive view of the adoption barriers and facilitators in China's emerging health self-monitoring technology market. This methodology is particularly significant for its practical implications. It enables healthcare providers to tailor their strategies effectively to meet the specific needs of the sub-healthy groups in China, potentially leading to improved health outcomes and a reduction in the healthcare system's burden.

This thesis significantly enriches the scholarly conversation surrounding the adoption of health technology and behavioral transformation, while simultaneously providing practical insights for stakeholders in the industry. It introduces a comprehensive and well-structured framework that is invaluable for researchers, medical practitioners, and policy architects, particularly for understanding and facilitating the adoption of health technologies within the unique landscape of China's healthcare sector.This study's theoretical contributions to the domain of health self-monitoring device adoption are multifaceted and substantial, particularly in the context of chronic disease management and technology acceptance models.

1. Advancements in Technology Acceptance Models (TAM): A pivotal contribution of this research is the successful application and validation of the Technology Acceptance Model in the unique cultural milieu of China's health self-monitoring devices sector. This adaptation extends the utility of TAM to diverse cultural contexts and underscores its relevance in emerging markets. The study's novel integration of the TAM with health psychology perspectives, specifically the Health Belief Model (HBM) and Social Cognitive Theory (SCT), provides a more holistic understanding of

factors influencing users' intentions to adopt health-related technologies. This approach enhances the explanatory power of TAM by incorporating health psychological factors like perceived health status and benefits, alongside the established technological predictors of perceived usefulness and ease of use.

The pivotal advancement of this research lies in its nuanced adaptation and validation of the Technology Acceptance Model (TAM) within the culturally rich and diverse context of China's health self-monitoring devices sector. This significant effort highlights TAM's versatility and relevance in a globalized world, especially in emerging markets that present unique cultural and social dynamics. Originating as a model to understand computer usage behavior, TAM, developed by Davis in 1989, has evolved substantially over the years. Its core constructs, perceived usefulness and perceived ease of use, have been universally acknowledged as fundamental in predicting user acceptance and behavior towards technology. This universality is further emphasized by the model's successful application across various sectors, adapting and expanding to include additional influential factors.

In China, a country undergoing rapid technological growth and marked by a distinct cultural landscape, the rise of health self-monitoring devices reflects an increasing awareness and demand for health technology solutions. This research's adaptation of TAM to the Chinese market is a critical exploration of how local cultural, economic, and social norms shape technology acceptance. This involves not just tweaking the original TAM constructs but potentially introducing new dimensions that resonate more with Chinese users, offering a richer and more culturally sensitive understanding of technology adoption. Further enriching this adaptation is the integration of key health psychology perspectives, specifically the Health Belief Model (HBM) and Social Cognitive Theory (SCT). HBM, a psychological framework that predicts health behaviors based on individual attitudes and beliefs, and SCT, which emphasizes the role of social experience and observational learning in shaping behavior, together provide a holistic approach to understanding technology adoption in the health sector. This novel integration extends TAM's explanatory power beyond its original focus, incorporating health psychological factors like perceived health status and benefits alongside traditional technological predictors.

The research marks a significant stride in the evolution of TAM, demonstrating its adaptability and relevance in the rapidly changing landscape of technology and health.

By incorporating health psychology models into TAM, the study not only underscores the model's applicability in diverse cultural settings but also paves the way for more user-centric and culturally sensitive health technology solutions. It highlights the importance of a multi-faceted approach, considering both technological and psychological factors, in understanding and predicting technology adoption and usage behaviors. This research stands as a testament to the evolving nature of TAM and its enduring capacity to provide valuable insights in understanding the complex interplay between technology, culture, and health.

2. Impact of Social Factors: Another key academic contribution is the study's exploration of social factors in technology adoption. The direct impact of social conformity on the intention to use health self-monitoring devices reveals the critical role of social influences in technology acceptance. This insight necessitates a deeper consideration of social dynamics in designing and promoting health technologies, particularly in the Chinese context. Furthermore, the study's findings on the successful mediation of trust in social media by perceived usefulness and ease of use enrich the current discourse on trust in technology adoption.

3. Contextual Considerations: The research emphasizes the importance of context-specific factors in technology adoption. The study's framework accounts for variations in social factors across different cultural settings and device types, underscoring the need for context-sensitive technology adoption strategies. This aspect is especially relevant in the face of global challenges such as the COVID-19 pandemic, where the study offers insights into the impact of such crises on technology adoption behaviors.

4. Chronic Disease Management: From a healthcare perspective, this study makes a significant theoretical contribution by highlighting the potential of digital health self-monitoring technology in managing chronic diseases. Chronic diseases, a leading cause of global morbidity and mortality, pose a significant burden, particularly in China. The adoption of health self-monitoring technology, as demonstrated in this study, offers a proactive approach to managing daily health, detecting early symptoms, and providing customized interventions. This proactive management strategy has the potential to significantly reduce the burden of chronic diseases on individuals, society, and healthcare systems.

5. Integration of Theories: Uniquely, this study combines TAM, HBM, and specific Chinese cultural factors into a comprehensive framework for understanding health

self-monitoring device adoption in China. This integrated approach, considering the nuances of the Chinese social and cultural context, presents a model that could be applicable in other emerging markets, thus contributing to a broader understanding of digital health self-monitoring technology acceptance.

To sum up, the theoretical contributions of this research are significant and manifold. This study is not only provide insights into the applicability of TAM in different cultural settings but also highlight the necessity of integrating social and health psychological factors in understanding technology adoption. These contributions offer valuable directions for future research in health-related IT technology adoption, particularly in developing a more nuanced understanding of the interplay between technological, health-related, cultural, and social factors in technology adoption behaviors.

8.3.2 Practical Contributions

The study found that potential users in the Chinese sub-health group had a positive perception of digital health self-monitoring technologies, and their intention to use these technologies was influenced by factors such as perceived usefulness, ease of use, and subjective norm. Perceived usefulness refers to the extent to which users perceive that a technology will improve their health, while ease of use refers to the perceived ease of using the technology. Subjective norm refers to the perceived social pressure to use the technology.The study's findings have several implications for healthcare providers and policymakers. Healthcare providers can use the results to develop more effective digital health self-monitoring technologies that meet the needs and preferences of potential users in the Chinese sub-health group. They can also use the findings to design interventions that encourage the adoption of these technologies among this group.

Policymakers can use the study's findings to develop policies that support the adoption of digital health self-monitoring technologies in China. For example, they can design policies that provide incentives for healthcare providers to invest in these technologies or policies that promote public awareness and education about the benefits of digital health self-monitoring technologies.In addition to its contributions to healthcare providers and policymakers, the study's findings have implications for users of digital health self-monitoring technologies. Users can benefit from the insights provided by the study to make informed decisions about using these technologies. They can consider factors such as perceived usefulness, ease of use, and subjective norm when deciding whether to adopt digital health self-monitoring technologies. Furthermore, this study's focus on the Chinese sub-health group has significant implications for the field of healthcare research. Most studies on digital health self-monitoring technologies have been conducted in developed countries, leaving a gap in research in developing countries such as China. This study fills this gap by providing insights into how potential users in the Chinese sub-health group perceive these technologies. By expanding the scope of research to include diverse populations, healthcare researchers can develop a more comprehensive understanding of the factors that influence adoption and use of digital health self-monitoring technologies across cultures and socioeconomic backgrounds.

8.3.3 Policy Implications

Based on the research findings, it is recommended that the Chinese government should regulate the health self-monitoring devices market and utilize the results of the study to propose policy reform measures that meet user needs and increase their intention to use these devices. The ultimate goal is to achieve the 2023 health targets and alleviate healthcare burden.

To achieve this goal, according to the research findings, the government should establish clear guidelines and standards for health self-monitoring devices to ensure their safety, quality, and functionality to improve the perceived usefulness and perceived ease of use. The policies should also encourage manufacturers to develop more affordable and accessible devices that meet the needs of the sub-healthy population.

The need for enhancing the monitoring of advertising practices in China stems from the fact that there are currently many fake and inaccurate pieces of information being spread through social media platforms. This misinformation can cause distrust in the accuracy of the information being presented and can lead to a decreased intention to use health self-monitoring devices.

By enhancing the monitoring of advertising practices, the Chinese government can help to mitigate the spread of false information and promote more accurate and trustworthy content. This, in turn, can lead to an increase in trust in social media and an increased intention to use health self-monitoring devices.

To further increase trust in social media, it is recommended that social media platforms implement stricter policies regarding the verification of information and sources. Additionally, efforts can be made to promote media literacy among the Chinese population, educating them on how to identify false information and choose reliable sources of information.By taking these steps, the Chinese government can help to build a more trustworthy and reliable social media environment and provide the healthy social platform which can also been use as disease prevention popularization. False advertisers and those who disseminate inaccurate medical information should be subject to legal sanctions. Such behavior not only poses a threat to public health and safety, but also undermines public trust in social media and medical devices.

To address these issues, the Chinese government should adopt more stringent legal measures to combat false advertising and the dissemination of inaccurate medical information. For example, stricter laws and regulations can be enacted to regulate the advertising industry and social media platforms, and to punish violators.

Moreover, the government can collaborate with social media platforms and medical device manufacturers to establish stricter guidelines and standards, ensuring that the information and products they provide are reliable and comply with relevant regulations and standards. This can help increase public trust in social media and medical devices, while protecting public health and safety.In order to effectively combat false advertising and inaccurate medical information, it is important for the government to recognize the severity of these issues and take appropriate action to address them. This may involve investing in more robust monitoring and enforcement mechanisms, as well as increasing public education and awareness campaigns to promote critical thinking and informed decision-making. Ultimately, only through a concerted effort by all stakeholders can we hope to successfully combat false advertising and ensure the safety and well-being of the public.

Additionally, government should promote public awareness of the benefits of health self-monitoring devices and the severity towards the sub-healthy condition and chronic diseases through mandatory education and training programs. To increase public awareness of disease prevention and the importance of self-monitoring, collaboration with universities and medical institutions is essential. It is recommended that these entities work together to develop training materials and programs that utilize Chinese society's social conformity. By promoting collectivism activities, individuals are more likely to attend and increase their health awareness.

Lastly, integrating health self-monitoring devices into the national medical insurance system would make them more accessible and affordable for the sub-health demographic. By adopting these policy reforms, the Chinese government can effectively regulate the market, increase awareness and utility of self-monitoring devices, and contribute to public health improvements, ultimately realizing the health objectives of 2023 and alleviating the healthcare burden.

8.4 Limitations and Further Research

Although this study has provided valuable insights into the antecedents of users' adoption of health self-monitoring technology, there are still some limitations that need to be addressed in future research.

Limitation 1: Conducted in China, Limiting Generalizability on a Global Scale

One of the main limitations of this study is that it was conducted solely in China, which may restrict its generalizability to other cultural and economic contexts. Since China is a unique context with its own cultural norms, values, and social and economic factors that can influence users' adoption of health self-monitoring technology, the findings of this study may not necessarily apply to other countries, especially those with different cultural backgrounds, healthcare systems, and regulatory environments.

China is undergoing rapid economic growth, and its population is becoming more urbanized and digitally connected. The Chinese government has launched several initiatives to encourage the adoption of health self-monitoring technology as a means of improving the health outcomes of its citizens. For instance, the Healthy China 2030 initiative aims to prevent and control chronic diseases, such as diabetes, obesity, and cardiovascular diseases by promoting the use of health self-monitoring technology. Additionally, the Chinese government has implemented various policies to promote the development and adoption of digital health technologies, including the Internet Plus Healthcare initiative and the Digital China 2020 strategy.

The Chinese healthcare system is also distinct from those of many other countries. For example, China has a large rural population that may face different challenges in accessing healthcare than urban populations. Furthermore, China's healthcare system is characterized by a combination of public and private healthcare providers, which may have differing incentives and capacities to adopt and promote health self-monitoring technology. Additionally, the regulatory environment for health self-monitoring technology in China may differ from that of other countries, which could affect users' trust and willingness to adopt this technology.

The study's unique cultural, economic, and healthcare system factors suggest that the findings may not be generalizable to other countries. Thus, future research should replicate this study in different countries to determine whether the results hold across different cultural and economic contexts. For instance, a comparative study between China and the United Kingdom could explore whether the factors that influence user’s' adoption of health self-monitoring technology differ between these two countries. This could help identify cultural and economic factors that may be universal or specific to each country and how they influence users' adoption of health self-monitoring technology. The UK data already been collected among the British sub-healthy groups. The following plan in to provide the comparison study with China and to explore whether the proposed research conceptual model still suitable for UK context.

In addition, investigating the role of culture in shaping users' attitudes towards health self-monitoring technology adoption would be valuable for future research. Cross-cultural differences in values, beliefs, and norms may affect users' perceptions of the benefits and risks of health self-monitoring technology and their willingness to adopt and use this technology. For example, in collectivistic cultures that emphasize social harmony and cooperation, individuals may be more willing to use health self-monitoring technology if it benefits their community's collective well-being. In individualistic cultures that emphasize personal autonomy and achievement, individuals may be more willing to use health self-monitoring technology if it enhances their personal health and well-being. Therefore, a cross-cultural study could identify how cultural/social factors interact with other factors, such as age, gender, and socioeconomic status, to influence user’s adoption of health self-monitoring technology.

Limitation 2: Availability of Health Insurance Coverage

Another economic factor that could impact the adoption of health self-monitoring technology by users is the availability of health insurance coverage. In many countries, health insurance policies may cover the cost of health self-monitoring technology, thereby increasing the willingness of users to adopt and use such technology. However, in countries where health insurance coverage is limited or non-existent, users may be less willing to pay for health self-monitoring technology out of their own pocket. Thus, future research could explore the role of health insurance coverage in promoting the adoption of health self-monitoring technology and investigate how this relationship may vary across different cultural and economic contexts.

Limitation 3: Regulations Regarding to the Products Quality

Additionally, regulatory factors may also have an impact on users' adoption of health self-monitoring technology. In some countries, health self-monitoring technology may be subject to strict regulations regarding data privacy, security, and accuracy. Users may be more willing to adopt and use health self-monitoring technology if they perceive it to be safe, reliable, and compliant with regulatory standards. Therefore, future research could investigate the role of regulatory factors in shaping users' attitudes towards health self-monitoring technology adoption and explore how these factors may differ across different countries and regions.

Limitation 4: Self-reported Measure of Intention to Adoption

Final limitation of this study pertains to the measurement of users' adoption of health self-monitoring technology. Specifically, the study relied on self-reported measures of adoption, which may be subject to response bias and may not accurately reflect consumers' actual use of self-monitoring technology. Self-report measures are frequently utilized in technology adoption research because of their convenience and efficiency in gathering data. However, their validity and reliability may be compromised by certain limitations (Venkatesh et al. 2003; Roca et al. 2006 & Pavlou and Fygenson, 2006). A significant limitation is social desirability bias, which can lead individuals to report socially desirable attitudes and behaviors instead of their true attitudes and behaviors. This bias may be particularly relevant in the context of health self-monitoring technology, as users may feel compelled to report that they are using the technology, even if they are not. As a result, self-report measures may not present an accurate and complete picture of users' adoption and use of self-monitoring technology. Users may over-report or under-report their use of technology due to social desirability or recall biases, or they may use self-monitoring technology without reporting it.

To overcome these limitations, future research could employ more objective measures to track users' health-related behaviors, such as wearable devices or smartphone apps. Such measures can provide more reliable and accurate information that is free from the biases of self-report measures. Alternatively, combining self-report and objective measures could provide a more comprehensive understanding of users' adoption and use of self-monitoring technology while addressing the limitations of self-report measures.

This study highlights the unique cultural, economic, and healthcare system factors that may influence the adoption of health self-monitoring technology among users in China. Although the study's findings may not necessarily apply to other countries, future research could replicate the study in various cultural and economic contexts to determine the validity of the results across different regions. Moreover, future research could examine the impact of cultural, social, economic, and regulatory factors on the actual usage of health self-monitoring technology and investigate how these factors interact to influence usage rates instead of only measuring the intention to use.

8.5 Chapter Summary

This research significantly advances the fields of information systems acceptance, health technology, and chronic disease prevention, demonstrating its potential to assist governmental efforts in mitigating chronic disease prevalence in China. It achieves this by elucidating the factors influencing the acceptance of enabling technologies within the unique Chinese milieu. The insights garnered from this study are poised to inform governmental policies and initiatives, thereby contributing to the prevention and control of chronic diseases and enhancing the overall health and well-being of the Chinese populace.

Digital health self-monitoring technologies emerge as pivotal tools in the prevention and management of chronic diseases. The study elucidates factors influencing the adoption of these technologies, providing a valuable reference for government policies aimed at promoting their use within the Chinese demographic. It identifies perceived usefulness, severity, and social conformity as integral in shaping behavioral intentions toward the adoption of digital health self-monitoring technologies. Consequently, governmental strategies could focus on amplifying the perceived benefits, ease of use, and reliability of these technologies to enhance their adoption.

The influence of social conformity, particularly from family and friends, is underscored as a key factor in the adoption and use of these technologies. The government, therefore, could initiate public awareness campaigns to educate the populace about the advantages of digital health self-monitoring technologies, leveraging social influence to encourage their adoption. Furthermore, highlighting the gravity of chronic diseases and the ramifications of neglecting sub-health conditions could propel the intention and usage of health self-monitoring devices.

The research also highlights the critical role of trust in the adoption and utilization of these technologies. It suggests that the government should establish rigorous quality standards, regulations, and authenticity in advertising for these technologies to foster trust among potential users, thereby enhancing their adoption rates. This study stands to support the government in reducing the chronic disease population in China by advocating for the adoption and effective utilization of digital health self-monitoring technologies. Its findings offer a framework for government policies that emphasize the practicality, ease of use, and trustworthiness of these technologies, while ensuring their quality and safety. The study's adoption of both quantitative and qualitative research methodologies, including survey-based quantitative methods and semi-structured qualitative interviews with healthcare and medical device professionals, lends robustness to its conclusions.

In summary, the research makes substantial theoretical contributions by applying the Technology Acceptance Model (TAM) within the Chinese cultural context of health self-monitoring devices. It reveals how perceived severity and social conformity directly influence behavioral intention, thereby shedding light on the intricacies of technology adoption in health-related scenarios. The integration of TAM with the Health Belief Model (HBM) and Social Cognitive Theory (SCT), considering unique Chinese cultural aspects, provides a comprehensive perspective on the adoption of health self-monitoring devices.

Key theoretical advancements of the study include:

1. The validation of TAM within the context of health self-monitoring devices in China.

2. The direct impact of perceived severity and social conformity on adoption intentions.
3. The effective mediation of trust in social media by perceived usefulness and ease of use.
4. The acknowledgment of diverse social factors across different contexts and device types.
5. The expansion of TAM to include social considerations, particularly pertinent in the context of the COVID-19 pandemic.

These theoretical contributions enhance our understanding of digital health self-monitoring technology acceptance and provide a solid foundation for future research in emerging markets and chronic disease management. The study's practical implications are critical for healthcare providers and policymakers. It reveals that the Chinese sub-health group perceives digital health self-monitoring technologies positively, with factors like perceived usefulness, ease of use, and subjective norms influencing their adoption intentions.

Key implications for stakeholders are as follows:

Healthcare providers can utilize these findings for effective technology development and marketing strategies tailored to the specific needs of the sub-health group.

Policymakers can draw on this research to devise supportive policies for the adoption of digital health self-monitoring technologies, thereby enhancing public health outcomes. This research addresses a vital gap by focusing on the sub-health group in China, a segment often underrepresented in health technology studies. Its findings offer profound insights into this group's perceptions and behaviors, which are essential for the development of targeted health interventions.

The policy implications of this study are particularly relevant for the Chinese government:

1. The implementation of regulations to ensure the safety, quality, and functionality of health self-monitoring devices.
2. The enhancement of advertising monitoring practices and promotion of media literacy to combat misinformation.

3. The elevation of public awareness about disease prevention and the importance of self-monitoring, in collaboration with academic institutions and medical organizations.
4. The integration of health self-monitoring devices into the medical insurance system, enhancing their accessibility and affordability. These policy recommendations are strategically designed to foster an environment conducive to the growth and significant contribution of health self-monitoring technology in achieving China's 2023 health objectives.

This thesis systematically addresses the research questions and achieves its objectives, offering a comprehensive analysis of health self-monitoring device adoption among China's sub-healthy population. Bridging empirical and theoretical gaps, the study provides essential insights for advancing health technology adoption in culturally diverse contexts. Its contributions, both theoretical and practical, pave the way for future research and practical applications, emphasizing the need for context-sensitive approaches in the adoption of healthcare technologies. As the study concludes, it not only addresses its initial research questions but also opens new avenues for investigation in the evolving field of health technology. This study makes a significant contribution to the domains of information systems acceptance, health technology, and chronic disease prevention. It highlights the pivotal role of digital health self-monitoring technologies in diminishing the burden of chronic diseases in China by enhancing the understanding of technology acceptance in this specific context. The findings inform and shape government policies and initiatives geared towards chronic disease prevention and control, thereby improving the overall health and well-being of the Chinese population. Key findings include the critical importance of perceived usefulness, severity, and social conformity in shaping behavioral intentions toward adopting digital health self-monitoring technologies. These insights can inform governmental strategies to promote technology adoption, emphasizing benefits, ease of use, and reliability, while leveraging social influences.

The study underscores the importance of trust as a fundamental factor in technology adoption, suggesting the necessity for robust quality standards and authentic advertising practices to build user confidence. By focusing on these elements, government initiatives can more effectively encourage the use of these technologies and contribute to reducing the prevalence of chronic diseases. Overall, this research provides valuable insights for healthcare service providers, policymakers, entrepreneurs, and users, enhancing the understanding of digital health self-monitoring technology applications in China. Its mixed-method approach, encompassing quantitative and qualitative methodologies, strengthens the comprehensiveness and validity of its conclusions.

In conclusion, this research represents a significant stride in understanding digital health self-monitoring technology within the Chinese context. Its theoretical and practical insights are instrumental for stakeholders in healthcare and policy, offering guidance for future initiatives aimed at enhancing public health through technology adoption. The study's thorough approach, integrating quantitative and qualitative analyses, ensures a well-rounded understanding of the factors influencing health technology adoption, making it a valuable reference for ongoing and future research in the field.

APPENDICES:

APPENDIX A: ETHICAL APPROVAL NOTIFICATION

Coventry University Ethics Committee

Medium to High Risk Research Ethics Approval

Project Title

The adoption of digital health self-monitoring application among Chinese sub-healthy group: the integration of the unified theory of acceptance and use of technology(UTAUT) and health belief model(HBM)

Record of Approval

Principal Investigator

I **request an ethics peer review** and confirm that I have answered all relevant questions in this checklist honestly.	X
I confirm that I will carry out the project in the ways described in this checklist. I will immediately suspend research and request new ethical approval if the project subsequently changes the information I have given in this checklist.	X
I confirm that I, and all members of my research team (if any), have read and agreed to abide by the Code of Research Ethics issued by the relevant national learned society.	X
I confirm that I, and all members of my research team (if any), have read and agreed to abide by the University's Research Ethics, Governance and Integrity Framework.	X

Name: Xinwen Zhang..

Date: 01/10/2019...

Student's Supervisor (if applicable)

I have read this checklist and confirm that it covers all the ethical issues raised by this project fully and frankly. I also confirm that these issues have been discussed with the student and will continue to be reviewed in the course of supervision.

Name: Xue Zhou ....

Date: 05/11/2019...

Reviewer (if applicable)

Date of approval by anonymous reviewer: 16/12/2019

Medium to High Risk Research Ethics Approval Checklist

Project Information

Project Ref	P94859
Full name	Xinwen Zhang
Faculty	Faculty of Business and Law
Department	Centre for Business in Society
Supervisor	Xue Zhou
Module Code	CBiS-PhD
EFAAF Number	
Project title	The adoption of digital health self-monitoring application among Chinese sub-healthy group: the integration of the unified theory of acceptance and use of technology(UTAUT) and health belief model(HBM)
Date(s)	24/09/2018 - 30/09/2021
Created	01/10/2019 14:56

Project Summary

Recently, demographic changes are placing an increasing number of concerns on the health care system globally. Due to an aging population with an increasing chronic disease, there is a growing demand for health care services. Besides, food safety issues and increasing working pressure environments will increase the amount of sub-health residents who can become potential chronic disease patients. However, the Chinese healthcare system is facing the problems of inefficient burden-sharing, hospital professional shortages, overspend on health delivery and lack of the following care among chronic disease patients. Based on the demand and challenges, preventing residents with a chronic disease by using a health self-monitoring application can be an essential solution. Also, the Chinese government states that the healthcare system needs to devote more technological resources substantially to ensure high-quality services that meet public expectations. This research will use the unified theory of acceptance and use of technology (UTAUT) to investigate the user behavior among Chinese sub-health groups towards health self-monitoring application, integrating with the health belief model (HBM)

Names of Co-Investigators and their organisational affiliation (place of study/employer)	
Is the project self-funded?	NO
Who is funding the project?	
Has the funding been confirmed?	NO

Are you required to use a Professional Code of Ethical Practice appropriate to your discipline?	NO
Have you read the Code?	NO

Project Details

What is the purpose of the project?	The aim of the project is to investigate the factors which make the most impact on the adoption of digital health self-monitoring application among Chinese sub-healthy group.
What are the planned or desired outcomes?	The expected outcome of the research is to well answer all the research questions and realize the research aims. With all the related analysis and evaluations, recommendations regarding the health belief model will be made to help spread the implementation of health technology and maximize its benefits in healthcare delivery in China.
Explain your research design	In order to answer the research questions and fulfill the research objectives, the research plan focuses on three stages. Firstly, secondary data will be gathered from the previous studies and their findings. Qualified literature will be sifted according to the keywords in the available database. Meanwhile, the data from governmental reports and newspapers about healthcare technology and technology healthcare projects will be collected as well. This step is aimed to build the draft research conceptual framework. Secondly, data will be collected using the surveys (questionnaires) focus on the Chinese sub-health group. The quantitative data analysis method will be used. Finally, base on the data analysis result, this research will use the method of the In-Depth interview. The data will be analyzed by the qualitative method.
Outline the principal methods you will use	This research will use mix method, using a questionnaire-based survey and in-depth interview. The method aims to investigate the research questions. What factors will determinate the actual health self-monitoring devices among the Chinese sub-health group? The questionnaire-based survey will use the online questionnaire to collect the data from Chinese sub-health groups, which can explore the factors that influence the actual use behaviors of health self-

	monitoring devices. I will share a link to my survey through social media. The participants can assist the research to test the developed hypotheses. The face-to-face in-depth interview will ask the participants questions related to the research questions. The method gives participants a certain degree of freedom and permit spontaneity rather than forcing them to select from a set of pre-determined responses. The participant includes the doctors/home healthcare nurses and Chinese health self-monitoring devices users who have the sub-health condition. I will interview the doctors' participants in their working hospitals. I will gain the approval of the appropriate authority from the hospital before I invite any hospital personnel for the interview. In addition, the sub-health participants will be people who already used the health self-monitoring devices before and has sub-health conditions. Both the quantitive and the qualitative method aims to test the developed hypothesis and answer the research questions. In order to do the comparison between different tires cities in china. The participants of the online questionnaires and the survey will from different city tiers in china which includes three different city tiers. Cities in different tiers reflect differences in consumer behavior, income level, population size, consumer sophistication, infrastructure, talent pool, and business opportunity. The tier system typically includes cities in mainland China only. The cities I have chosen are: First tiers cities: Beijing; Shanghai; Qingdao and Guangzhou Second tiers cities: Suzhou; Yantai; Ningbo and Dalian Third tiers cities: Luoyang; Xiangshan and Sanya The researcher will follow the DPA and GDPR regulations to collect and protect

	data.
Are you proposing to use an external research instrument, validated scale or follow a published research method?	NO
If yes, please give details of what you are using	
Will your research involve consulting individuals who support, or literature, websites or similar material which advocates, any of the following: terrorism, armed struggles, or political, religious or other forms of activism considered illegal under UK law?	NO
Are you dealing with Secondary Data? (e.g. sourcing info from websites, historical documents)	YES
Are you dealing with Primary Data involving people? (e.g. interviews, questionnaires, observations)	YES
Are you dealing with personal or sensitive data?	YES
Will the Personal or Sensitive data be shared with a third party?	NO
Will the Personal or Sensitive data be shared outside of the European Economic Area ("EEA")?	NO
Is the project solely desk based? (e.g. involving no laboratory, workshop or off-campus work or other activities which pose significant risks to researchers or participants)	NO
Are there any other ethical issues or risks of harm raised by the study that have not been covered by previous questions?	NO
If yes, please give further details	

DBS (Disclosure & Barring Service) formerly CRB (Criminal Records Bureau)

Question			Yes	No
1	Does the study require DBS (Disclosure & Barring Service) checks?			X
	If YES, please give details of the serial number, date obtained and expiry date			
2	If NO, does the study involve direct contact by any member of the research team:			
	a)	with children or young people under 18 years of age?		X
	b)	with adults who have learning difficulties, brain injury, dementia, degenerative neurological disorders?		X
	c)	with adults who are frail or physically disabled?		X
	d)	with adults who are living in residential care, social care, nursing homes, re-ablement centres, hospitals or hospices?		X
	e)	with adults who are in prison, remanded on bail or in custody?		X
		If you have answered YES to any of the questions above please explain the nature of that contact and what you will be doing		

External Ethical Review

Question		Yes	No
1	Will this study be submitted for ethical review to an external organisation? (e.g. Another University, Social Care, National Health Service, Ministry of Defence, Police Service and Probation Office)		X
	If YES, name of external organisation		
2	Will this study be reviewed using the IRAS system?		X
3	Has this study previously been reviewed by an external organisation?		X

Confidentiality, security and retention of research data

Question		Yes	No
1	Are there any reasons why you cannot guarantee the full security and confidentiality of any personal or confidential data collected for the study?		X
	If YES, please give an explanation		
2	Is there a significant possibility that any of your participants, and associated persons, could be directly or indirectly identified in the outputs or findings from this study?		X
	If YES, please explain further why this is the case		
3	Is there a significant possibility that a specific organisation or agency or participants could have confidential information identified, as a result of the way you write up the results of the study?		X
	If YES, please explain further why this is the case		
4	Will any members of the research team retain any personal of confidential data at the end of the project, other than in fully anonymised form?		X
	If YES, please explain further why this is the case		
5	Will you or any member of the team intend to make use of any confidential information, knowledge, trade secrets obtained for any other purpose than the research project?		X
	If YES, please explain further why this is the case		
6	Will you be responsible for destroying the data after study completion?	X	
	If NO, please explain how data will be destroyed, when it will be destroyed and by whom		

Participant Information and Informed Consent

Question			Yes	No
1	Will all the participants be fully informed BEFORE the project begins why the study is being conducted and what their participation will involve?		X	
	If NO, please explain why			
2	Will every participant be asked to give written consent to participating in the study, before it begins?		X	
	If NO, please explain how you will get consent from your participants. If not written consent, explain how you will record consent			
3	Will all participants be fully informed about what data will be collected, and what will be done with this data during and after the study?		X	
	If NO, please specify			
4	Will there be audio, video or photographic recording of participants?		X	
	Will explicit consent be sought for recording of participants?		X	
	If NO to explicit consent, please explain how you will gain consent for recording participants			
5	Will every participant understand that they have the right not to take part at any time, and/or withdraw themselves and their data from the study if they wish?		X	
	If NO, please explain why			
6	Will every participant understand that there will be no reasons required or repercussions if they withdraw or remove their data from the study?		X	
	If NO, please explain why			
7	Does the study involve deceiving, or covert observation of, participants?			X
	Will you debrief them at the earliest possible opportunity?			
	If NO to debrief them, please explain why this is necessary			

Risk of harm, potential harm and disclosure of harm

Question			Yes	No
1	Is there any significant risk that the study may lead to physical harm to participants or researchers?			X
	If YES, please explain how you will take steps to reduce or address those risks			
2	Is there any significant risk that the study may lead to psychological or emotional distress to participants?			X
	If YES, please explain how you will take steps to reduce or address those risks			
3	Is there any risk that the study may lead to psychological or emotional distress to researchers?			X
	If YES, please explain how you will take steps to reduce or address those risks			
4	Is there any risk that your study may lead or result in harm to the reputation of participants, researchers, or their employees, or any associated persons or organisations?			X
	If YES, please explain how you will take steps to reduce or address those risks			
5	Is there a risk that the study will lead to participants to disclose evidence of previous criminal offences, or their intention to commit criminal offences?			X
	If YES, please explain how you will take steps to reduce or address those risks			
6	Is there a risk that the study will lead participants to disclose evidence that children or vulnerable adults are being harmed, or at risk or harm?			X
	If YES, please explain how you will take steps to reduce or address those risks			
7	Is there a risk that the study will lead participants to disclose evidence of serious risk of other types of harm?			X
	If YES, please explain how you will take steps to reduce or address those risks			
8	Are you aware of the CU Disclosure protocol?		X	

Payments to participants

Question			Yes	No
1	Do you intend to offer participants cash payments or any kind of inducements, or reward for taking part in your study?			X
	If YES, please explain what kind of payment you will be offering (e.g. prize draw or store vouchers)			
2	Is there any possibility that such payments or inducements will cause participants to consent to risks that they might not otherwise find acceptable?			
3	Is there any possibility that the prospect of payment or inducements will influence the data provided by participants in any way?			
4	Will you inform participants that accepting payments or inducements does not affect their right to withdraw from the study at any time?			

Capacity to give valid consent

Question			Yes	No
1	Do you propose to recruit any participants who are:			
	a) children or young people under 18 years of age?			X
	b) adults who have learning difficulties, mental health condition, brain injury, advanced dementia, degenerative neurological disorders?			X
	c) adults who are physically disabled?			X
	d) adults who are living in residential care, social care, nursing homes, re-ablement centres, hospitals or hospices?			X
	e) adults who are in prison, remanded on bail or in custody?			X
	If you answer YES to any of the questions please explain how you will overcome any challenges to gaining valid consent			
2	Do you propose to recruit any participants with possible communication difficulties, including difficulties arising from limited use of knowledge of the English language?			X
	If YES, please explain how you will overcome any challenges to gaining valid consent			
3	Do you propose to recruit any participants who may not be able to understand fully the nature of the study, research and the implications for them of participating in it or cannot provide consent themselves?			X
	If YES, please explain how you will overcome any challenges to gaining valid consent			

Recruiting Participants

Question				Yes	No
1	Do you propose to recruit any participants who are:				
	a)	students or employees of Coventry University or partnering organisation(s)?			X
		If YES, please explain if there is any conflict of interest and how this will be addressed			
	b)	employees/staff recruited through other businesses, voluntary or public sector organisations?		X	
		If YES, please explain how permission will be gained	I am going to interview the employees at a local hospital.		
	c)	pupils or students recruited through educational institutions (e.g. primary schools, secondary schools, colleges)?			X
		If YES, please explain how permission will be gained			
	d)	clients/volunteers/service users recruited through voluntary public services?			X
		If YES, please explain how permission will be gained			
	e)	participants living in residential care, social care, nursing homes, re-ablement centres hospitals or hospices?			X
		If YES, please explain how permission will be gained			
	f)	recruited by virtue of their employment in the police or armed forces?			X
		If YES, please explain how permission will be gained			
	g)	adults who are in prison, remanded on bail or in custody?			X
		If YES, please explain how permission will be gained			
	h)	who may not be able to refuse to participate in the research?			X
		If YES, please explain how permission will be gained			

Online and Internet Research

Question				Yes	No
1	Will any part of your study involve collecting data by means of electronic media (e.g. the Internet, e-mail, Facebook, Twitter, online forums, etc)?			X	
	If YES, please explain how you will obtain permission to collect data by this means		The research is an online-based survey which will use the electronic media. I will follow the regulations of DPA and GDPR.		
2	Is there a possibility that the study will encourage children under 18 to access inappropriate websites, or correspond with people who pose risk of harm?				X
	If YES, please explain further				
3	Will the study incur any other risks that arise specifically from the use of electronic media?				X
	If YES, please explain further				
4	Will you be using survey collection software (e.g. BoS, Filemaker)?			X	
	If YES, please explain which software		quatrics		
5	Have you taken necessary precautions for secure data management, in accordance with data protection and CU Policy?			X	
	If NO	please explain why not			
	If YES	Specify location where data will be stored	University approved CU OneDrive to securely store the data.		
		Planned disposal date	30/09/2021		
		If the research is funded by an external organisation, are there any requirements for storage and disposal?			X
		If YES, please specify details			

Languages

Question			Yes	No
1	Are all or some of the consent forms, information leaflets and research instruments associated with this project likely to be used in languages other than English?		X	
	If YES, please specify the language[s] to be used	Chinese and English		
2	Have some or all of the translations been undertaken by you or a member of the research team?		X	
	Are these translations in lay language and likely to be clearly understood by the research participants?		X	
	Please describe the procedures used when undertaking research instrument translation (e.g. forward and back translation), clarifying strategies for ensuring the validity and reliability or trustworthiness of the translation	Because all the participants are Chinese, a Chinese version questionnaire will be sent to make sure the participants understand their interests and questions properly. In order to make the version of the questionnaire understandable and correctly. The translate progress will follow 4 stages: Forward translation, Expert panel Back-translation, Pre-testing, and the final version. To be more specific, the approach to forwarding translation should be translating, emphasizing conceptual rather than literal translations, as well as the need to use natural and acceptable language for the broadest audience. In terms of the back translation approach, which should forward the translated version of a file that is rendered closely back into its original language by an independent translator. The translator will not see the original source language file used for the forward translation. After the translation, pre-test the instrument on the target population is necessary for the research.		
3	Have some or all of the translations been undertaken by a third party?			X
	If YES, please specify the name[s] of the persons or agencies performing the translations			
	Please describe the procedures used when undertaking research instrument translation (e.g. forward and back translation), clarifying strategies for ensuring the validity and reliability of the translation			

Laboratory/Workshops

<table>
<tr><th colspan="2">Question</th><th>Yes</th><th>No</th></tr>
<tr><td rowspan="2">1</td><td>Does any part of the project involve work in a laboratory or workshop which could pose risks to you, researchers or others?</td><td></td><td>X</td></tr>
<tr><td>If YES:

If you have risk assessments for laboratory or workshop activities you can refer to them here & upload them at the end, or explain in the text box how you will manage those risks</td><td colspan="2"></td></tr>
</table>

Research with non-human vertebrates

Question		Yes	No
1	Will any part of the project involve animal habitats or tissues or non-human vertebrates?		X
	If YES, please give details		
2	Does the project involve any procedure to the protected animal whilst it is still alive?		
3	Will any part of your project involve the study of animals in their natural habitat?		
	If YES, please give details		
4	Will the project involve the recording of behaviour of animals in a non-natural setting that is outside the control of the researcher?		
	If YES, please give details		
5	Will your field work involve any direct intervention other than recording the behaviour of the animals available for observation?		
	If YES, please give details		
6	Is the species you plan to research endangered, locally rare or part of a sensitive ecosystem protected by legislation?		
	If YES, please give details		
7	Is there any significant possibility that the welfare of the target species of those sharing the local environment/habitat will be detrimentally affected?		
	If YES, please give details		
8	Is there any significant possibility that the habitat of the animals will be damaged by the project, such that their health and survival will be endangered?		
	If YES, please give details		
9	Will project work involve intervention work in a non-natural setting in relation to invertebrate species other than Octopus vulgaris?		
	If YES, please give details		

Blood Sampling / Human Tissue Analysis

Question		Yes	No
1	Does your study involve collecting or use of human tissues or fluids? (e.g. collecting urine, saliva, blood or use of cell lines, 'dead' blood)		X
	If YES, please give details		
2	If your study involves blood samples or body fluids (e.g. urine, saliva) have you clearly stated in your application that appropriate guidelines are to be followed (e.g. The British Association of Sport and Exercise Science Physiological Testing Guidelines (2007) or equivalent) and that they are in line with the level of risk?		
	If NO, please explain why not		
3	If your study involves human tissue other than blood and saliva, have you clearly stated in your application that appropriate guidelines are to be followed (e.g. The Human Tissues Act, or equivalent) and that they are in line with level of risk?		
	If NO, please explain why not		

Travel

Question			Yes	No
1	Does any part of the project require data collection off campus? (e.g. work in the field or community)		X	
	If YES: You must consider the potential hazards from off campus activities (e.g. working alone, time of data collection, unfamiliar or hazardous locations, using equipment, the terrain, violence or aggression from others). Outline the precautions that will be taken to manage these risks, AS A MINIMUM this must detail how researchers would summon assistance in an emergency when working off campus. For complex or high risk projects you may wish to complete and upload a separate risk assessment	Potential risks: 1. Auto accidents or breakdowns. 2. Communication device failure in remote locations. 3. Injury, illness or death of participants or group leaders. 4. Weather-related emergencies. 5. Theft or other crimes. Solutions: 1. Prepare a first aid kit and an emergency kit with provisions, e.g. bandages, batteries, blankets, energy bars, flashlights, water, etc. 2. Implement security measures for participants, personal property and university-owned or leased property. Personal property (not university-owned) is the owners' responsibility. 3. Determine cell phone coverage for any areas of the event, prior to travel. Special satellite phones may be needed for remote areas. 4. Participants should be involved in emergency planning to address their needs for appropriate assistance during a medical emergency. 5. Advise participants of potential issues that could arise from injury/illness situations so that they can properly plan for their specific needs (e.g. accessibility, allergies, medical insurance, and medication).		
2	Does any part of the project involve the researcher travelling outside the UK (or to very remote UK locations)?		X	
	If YES: Please give details of where, when and how you will be travelling. For travel to high risk places you may wish to complete and upload a separate risk assessment	The questionnaire focuses on the Chinese sub-health group. This research will use Quatrics as the techniques of the online survey. The data will not be narrow within the campus. In addition, the in-depth interview will focus on the Chinese hospital personnel which includes		

		operation managers and doctors.		
3	Are all travellers aware of contact numbers for emergency assitance when away (e.g. local emergency assistance, ambulance/local hospital/police, insurance helpline [+44 (0) 2071 737797] and CU's 24/7 emergency line [+44 (0) 2476 888555])?		X	
4	Are there any travel warnings in place advising against all, or essential only travel to the destination? NOTE: Before travel to countries with 'against all travel', or 'essential only' travel warnings, staff must check with Finance to ensure insurance coverage is not affected. Undergraduate projects in high risk destinations will not be approved			X
5	Are there increased risks to health and safety related to the destination? e.g. cultural differences, civil unrest, climate, crime, health outbreaks/concerns, and travel arrangements?			X
	If YES, please specify			
6	Do all travelling members of the research team have adequate travel insurance?		X	
7	Please confirm all travelling researchers have been advised to seek medical advice regarding vaccinations, medical conditions etc, from their GP		X	

APPENDIX B: PARTICIPANT INFORMATION

Informed Consent Agreement for delivery and questionnaire collection (English Version)

Informed Consent Agreement for delivery and questionnaire collection and Participant Form (Chinese Version)

Information Consent Agreement For three sub-healthy groups (English Version)
Study title: Use of Electronic Medical Self-Monitoring Devices among Chinese Sub-Healthy People: A Combination of Technology Acceptance Model and Health Belief Model

Participant Information Form

You are invited to participate in the study 'Adoption of digital health self-monitoring apps in a Chinese sub-health population: combining a unified theory of technology acceptance and use with a model of health beliefs'. Xinwen Zhang, a second year PhD student at Coventry University, is leading this research. Before you decide to take part, it is important to understand why the research is being conducted and what it will involve. Please take the time to read the following information carefully.

The aim of this study is to investigate the factors that influence the adoption of digital health self-monitoring apps among Chinese sub-healthy people. You are invited to participate in this study as your answers will demonstrate the accuracy and validity of the model. By sharing your experiences with us, you will help Xinwen Zhang and Coventry University to better understand the core factors that influence user acceptance of technology. This research has been reviewed and approved through Coventry University's formal research ethics process. There are no significant risks associated with participation.

This questionnaire is not compulsory. If you do decide to participate, please retain this information sheet and complete the informed consent form to indicate that you understand your rights to the study and are happy to participate. Please make a note of your participant number (on the consent form) and provide it to the Principal Investigator if you intend to withdraw from the study at a later date. You may withdraw information from the project dataset at any time and at any time until the data is destroyed on 30-10-2020/until the data is fully anonymised in the 30-10-2020 records. You should note that your data may be used in the production of formal research outputs (e.g. journal articles, conference papers, theses and reports) prior to this date, so you are advised to contact the University as early as possible if you wish to withdraw. Research. To opt out, please contact the Principal Investigator (contact details are provided below).

Or please contact : researchproservices.fbl@coventry.ac.uk; please call +44 (0) 2477658461. This way, if the Principal Investigator is not available, your request can be dealt with promptly. You do not need to give a reason. The decision to withdraw or not to participate will not affect you in any way.

If you decide to take part in the survey, you will be asked a number of questions. The focus group for the questionnaire is people with pre-diabetes (high blood pressure / frequent tiredness / blurred vision / weight changes/sleep problems) and will be conducted at your convenience and in a safe environment. Ideally, we would like to audio record your responses (and need your consent), so the location should be in a relatively quiet area. The questionnaire will take approximately 15 minutes to complete.

Data protection and confidentiality

Your data will be processed by the General Data Protection Regulation 2016 (GDPR) and the Data Protection Act 2018. All information collected about you will be kept strictly confidential. Your data will be referenced by a unique participant number and not by name, unless it will be completely anonymised in our records. If you consent to the recording of audio, all recordings will be destroyed once they have been transcribed. Your data will only be viewed by the researcher. All electronic data will be stored in a password protected computer file. All paper records will be stored in a locked filing cabinet. Your consent information will be kept separate from your responses to minimise the risk of a data breach. The Principal Investigator will be responsible for data destruction and all data collected will be destroyed on or before.

Data Protection Rights

Coventry University is the data controller for the information you provide. You have the right to access information about you. Your right of access may be exercised by the General Data Protection Regulation and the Data Protection Act 2018. You also have other rights including the right to rectification, deletion, objection and data portability. For more detailed information, including the right to complain to the Information Commissioner's Office, please visit www.ico.org.uk. For questions about your data, enquiry.ipu@coventry.ac.uk.

If you are unhappy with any aspect of this research, please contact the Principal Investigator, Xinwen Zhang, in the first instance, zhangx87 @ uni.coventry.ac.uk. If you still have concerns and wish to make a formal complaint, please write to Zhou Xue, Senior Lecturer, Coventry University, Coventry CV1 5FB, email: aa8959@coventry.ac.uk.

In your letter, please provide information about the research project, specify the name of the researcher and give details of the grounds for your complaint.

Informed consent:

Study title: Use of electronic medical self-monitoring devices among Chinese sub-healthy people: will combine technology acceptance model and health belief model.

You are invited to participate in this study to collect data on factors that influence the adoption of digital health self-monitoring applications among the Chinese sub-healthy population.

You must read the accompanying participant information sheet before deciding to participate. If there is anything that is unclear, or if you would like more information about any aspect of this study, please do not hesitate to ask. It is important that you have the right to decide if you wish to participate. If you wish to participate, please confirm your agreement by circling 'yes' to each of the following statements and then date and sign the participant's signature.

1 I confirm that I have read and understood the participant information sheet for the above study and have been given the opportunity to ask questions.	<u>YES</u>	NO
2 I understand that my participation is voluntary and that I may withdraw my data at any time without giving any reason by contacting the Principal Investigator and the Research Support Office until the date specified in the Participant Information Sheet.	<u>YES</u>	NO
	<u>YES</u>	NO
3 I have noted my participant number (top left of this consent form), which may be requested by the Principal Investigator if I wish to withdraw from the study.	<u>YES</u>	NO
	<u>YES</u>	NO
4 I understand that all information I provide will be kept secure and confidential.	<u>YES</u>	NO
5 I am happy that the information I have provided (for anonymous use) can be used in academic papers and other formal research outputs.	<u>YES</u>	NO

Participant	Date	Signature

Researcher	Date	Signature

Information Consent Agreement for three sub-healthy groups (Chinese Version)

研究题目：中国亚健康人群对于电子医疗自我监控设备的使用：将结合科技接受度模型和健康信念模型

参加者信息表

邀请您参加“在中国亚健康人群中采用数字健康自我监控应用程序：将技术的接受和使用统一理论与健康信念模型相结合”的研究。考文垂大学的二年级博士生张馨文正在领导这项研究。在您决定参加之前，重要的是要了解为什么要进行研究以及将涉及什么。请花时间仔细阅读以下信息。

本研究旨在调查影响中国亚健康人群采用数字健康自我监控应用程序的因素。邀请您参加此研究，因为您的答案将证明模型的准确性和有效性。通过与我们分享您的经验，您将帮助张欣文和考文垂大学更好地理解影响用户技术接受度的核心因素。这项研究已经通过考文垂大学的正式研究伦理程序进行了审查和批准。参与没有重大风险。

此问卷不是强制性的。如果您确实决定参加，请保留此信息表并填写知情同意书，以表明您了解自己对该研究的权利，并乐于参与。请记下您的参与者编号（在同意书上），如果您以后打算退出研究，请提供给首席研究员。您可以随时随时从项目数据集中提取信息，直到数据在 30-10-2020 被销毁为止/直到数据在 30-10-2020 的记录中完全匿名为止。您应注意，在此日期之前，您的数据可能会用于正式的研究成果（例如期刊文章，会议论文，论文和报告）的生产中，因此，如果您希望退出，建议您尽早与大学联系。研究。要退出，请联系首席研究员（联系方式在下面提供）。

另请联系研究支持办公室 researchproservices.fbl@coventry.ac.uk；请致电+44（0）2477658461。这样一来，如果首席研究员不在，您的请求就可以得到迅速处理。您无需给出理由。退出或不参加的决定不会以任何方式影响您。

如果您决定参加调查，将会询问您一些问题。问卷调查的重点人群是糖尿病前期人群（血压高/经常感到疲倦/视力模糊/体重变化/睡眠问题），并且会在您方便的时候在安全的环境中进行。理想情况下，我们希望音频记录您的回复（并且需要您的同意），因此该位置应位于相对安静的区域。问卷大约需要 15 分钟能完成。

数据保护与保密

您的数据将由《 2016 年通用数据保护条例》（GDPR）和《 2018 年数据保护法》处理。收集到的有关您的所有信息将严格保密。除非在我们的记录中将其完全匿名，否则您的数据将以唯一的参与者编号而不是姓名来引用。如果您同意录制音频，则所有录制的内容一旦被转录都会被销毁。您的数据将仅由研究人员查看。所有电子数据将存储在受密码保护的计算机文件中。所有纸质记录将存储在上锁的文件柜中。您的同意信息将与您的回复分开保存，以最大程度地减少发生数据泄露时的风险。首席研究员将负责数据销毁，所有收集的数据将在或之前销毁。

资料保护权

考文垂大学是您提供的信息的数据控制器。您有权访问有关您的信息。您的访问权可以由通用数据保护条例和 2018 年数据保护法行使。您还拥有其他权利，包括更正，删除，异议和数据可移植性的权利。有关更多详细信息，包括向信息专员办公室投诉的权利，请访问 www.ico.org.uk。有关您的数据的问题，评论和请求也可以发送到大学数据保护官-enquiry.ipu@coventry.ac.uk。

如果您对本研究的任何方面不满意，请首先与首席研究员张馨文联系，zhangx87 @ uni.coventry.ac.uk。如果您仍然有疑虑并希望提出正式投诉，请致信考文垂大学高级讲师薛周，考文垂 CV1 5FB，电子邮件：aa8959@coventry.ac.uk。

在您的来信中，请提供有关研究项目的信息，指定研究人员的姓名并详细说明投诉的理由。

知情同意书：

研究题目：中国亚健康人群对于电子医疗自我监控设备的使用：将结合科技接受度模型和健康信念模型

邀请您参加此研究是为了收集数据，该项目的目的是调查影响中国亚健康人群采用数字健康自我监控应用程序的因素。

在决定参加之前，您必须阅读随附的参与者信息表。 如果有任何不清楚的地方，或者您想了解有关此研究任何方面的更多信息，请不要犹豫提问。重要的是，您有权利来决定是否希望参加。 如果您愿意参加，请在以下每个声明中划圈"是"，然后在参加者的签名和日期上注明日期，以确认同意。

1 我确认我已经阅读并理解了上述研究的参与者信息表，并且有机会提出问题。	是	否
2 我了解我的参与是自愿的，并且我可以在没有给出任何理由的情况下随时与主要研究人员和研究支持办公室联系，直到参与者信息表中指定的日期为止随时撤回我的数据。	是	否
3 我已经记下了我的参与者号（本同意书的左上方），如果我想退出研究，首席研究员可能会要求提供该参与者号。	是	否

4 我了解我提供的所有信息将被安全保存并保密。	是	否
5.我很高兴我提供的信息（匿名使用）可用于学术论文和其他正式研究成果中。	是	否
6.我很高兴能将采访录音录入	是	否
7. 我同意参加上述研究是感谢您参与这项研究。非常感激你的帮助。 参加者的姓名日期签名　研究人员日期签名	是	否

参与者	日期	签名
研究员	日期	签名

APPENDIX C: QUANTITATIVE MATERIALS

Survey for Health Self-monitoring devices adoption among Chinese Sub-healthy group (English Version)

Fart 1: Following questions are designed to obtain health related information about you. Please tick the item that best describes information attained by your site.

Q1 Please click the likely skill (from 1: Bad habit to 5: Health habit) 1 2 3 4 5

Please rate the item as to the extent of your health habit using the following scale

Q2 How often do you exercise?

Please click the likely skill (from 1: never to 5: often) 1 2 3 4 5

Q3 Do you monitor your daily exercise time?

- Yes (If yes, how?)
- No (if no, why?)

Q4 Do you think monitoring your daily exercise is important?

- Yes (If yes, why?)
- No (If no, why?)

Q5 How often do you have a health checkup? (Health check include regularly health check, blood tests etc.)_____________

Q6 Will you accept to check your health condition regularly?

- Yes (If yes, please write down your preference of check method e.g. self-monitoring or GP)
- No (If no, why?)

Q7: Have you suffered or are you suffering from any of the conditions below?

- Constant tiredness
- Weaker memory
- Indigestion
- Inattention
- Bad sleep quality
- Headache
- Inflections
- Bad sleep quality
- Frequently Headache
- Other symptoms_____________
- Not Application

Q8: Have you used or are you using any self-monitoring technologies to monitor you unhealth condition or your health condition?

- Yes (If selected, please write the type of you using/used technology)
- No (If no, why?)

Q9: What do you think of your medical knowledges level?

Please click the likely skill (from 1: unprofessional to 5: professional)	1	2	3	4	5

Please rate the item as to the extent of your health habit using the following scale

Q10: How much are you willing to spend on health self-monitoring devices(Percentage of your salary)_______________

Q11 What aspect will you consider when you intended to purchase a health self-monitoring technology? ______________

Part two: Factors impacts on Health Technology Acceptance Intention

This part aims to obtain your perception of the factors that impact on your acceptance intention towards the health self-monitoring technologies.

Please indicate your level of agreement by checking the number that best reflects your perception of yourself about your perspective towards using health self-monitoring technologies. Meaning of scale: 1 (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), 5 (Strongly Agree)

Your acceptance intention from the technology perspective	**1**	**2**	**3**	**4**	**5**
I find health self-monitoring technologies are useful for monitoring my health condition.					
Health self-monitoring technologies enable me to have more control on my health condition.					
Using self-monitoring technologies improves my health condition.					
Using self-monitoring technologies can help me to prevent chronic diseases.					
My interaction with self-monitoring technologies is clear and understandable.					
It is easy for me to develop the needed skills to use the self-monitoring technologies.					
I found the functions of self-monitoring technologies are easy to operate.					
Your acceptance intention from the psychological perspective	**1**	**2**	**3**	**4**	**5**
I am worried about getting a chronic disease because it can have major effects on my life and family.					
Having a chronic disease will have major effects on my work and income.					
I am concerned about to get a chronic disease because it will danger my life.					
COVID-19 increase my perceived severity towards chronic disease.					
I started to use health self-monitoring devices when I was diagnosed with some abnormal index.					
I start to monitor my health condition frequently because I do not want to suffer any chronic disease that my family members who had it.					
I start to monitor my health condition when I have some unhealthy symptoms.					
Your acceptance intention from the social and culture perspective	**1**	**2**	**3**	**4**	**5**

I trust in the recommendation towards the health self-monitoring technologies from the social media.					
I reply on the recommendation of health self-monitoring technologies from the social media.					
I believe the recommendation of health self-monitoring technologies from the social media.					
I often consult others in the virtual community to help me choosing the suitable health self-monitoring technologies.					
If I want to be part of the virtual community, I often follow others who from my virtual community and to buy the same brand health self-monitoring technologies which they bought.					
It is important that others in the virtual community like the health self-monitoring technologies which I bought.					
To make sure I buy the right health self-monitoring technologies, I often observe the buying behavior from the people who are in my virtual community.					
I would like to know what health self-monitoring technologies that I bought can make good impressions to my virtual community.					
Resistance to change	**1**	**2**	**3**	**4**	**5**
I want the health self-monitoring technologies to change the way I check with my health condition.					
I want the health self-monitoring technologies to change the way I monitor my health condition					
Overall, I want health self-monitoring technologies to change the way I currently live					
Customer Innovativeness	**1**	**2**	**3**	**4**	**5**
I often find myself sceptical of new health self-monitoring devices					
I am suspicious of new inventions and new ways of thinking					
I am generally cautious about accepting new ideas					
Trust in Privacy Protection	**1**	**2**	**3**	**4**	**5**
I trust the privacy and data security while using the health self-monitoring technologies.					
I trust that if I use Health self-monitoring technologies on monitor my health condition, my health-related information will not be obtained by someone else.					
I trust the data protection and securing while using the health self-monitoring technologies					
Technology Anxiety	**1**	**2**	**3**	**4**	**5**

I feel apprehensive towards using the health self-monitoring technologies					
I hesitate to use the health self-monitoring technologies for fear of making mistakes with it					
The health self-monitoring technologies are intimidating to me					

Please indicate your level of agreement by checking the number that best reflects your perception of yourself about your perspective of intention to use the health self-monitoring devices.

Intention to use	**1**	**2**	**3**	**4**	**5**
Given an opportunity, I will use the health self-monitoring devices in my health care practice.					
I intend to use health self-monitoring related technologies in my practice as frequent as possible.					
I believe using health self-monitoring related technologies would improve my health care behavior.					
I estimate there would be high chance of me using health self-monitoring technologies in my health care practice.					

PART Three -General Information Respondent Details

Following questions are designed to obtain demographic information about you. Please tick the item that best describes information attained by your site.

Q1 Which country are you from?

- UK
- Others

Q2 What is your gender?

- Male
- Female
- Prefer not to say
- Prefer to self-describe

Q3 Which of following age group do you belong to

- Less than 18 (end of the survey)
- 18- 28 years
- 29- 39 years
- 40- 50 years
- 51- 61 years
- Over 61 years

Q4 What is the highest degree of education you have completed?

- Less than a high school diploma
- High School
- Bachelor's Degree
- Master's Degree
- Ph.D. or higher

Q5 What is your current employment status?

- Employed full time
- Employed part time
- Unemployed and currently looking for work
- Unemployed and not currently looking for work
- Student
- Retired
- Homemaker
- Self-employed
- Unable to work
- Others _______________

Q6 What is your occupation? _____________

Q7 What is your gross yearly income

- Less than £1000
- £1001-£2000
- £2001-£3000
- £3001-£4000
- £4001-£5000
- £5001-£6000
- Over £60000

Survey for Health Self-monitoring devices adoption among Chinese Sub-healthy group (Chinese Version)

第一部分： 以下问题是为了获得与您有关的健康信息。请在最能说明您的网站所获得信息的项目上打勾。

Q1 请点击可能的技能（从 1：坏习惯到 5：健康习惯） 1 2 3 4 5

请用以下量表对您的健康习惯的程度进行评分

Q2 您多长时间做一次运动?

请点击可能的技能（从 1：从不到 5：经常） 1 2 3 4 5

Q3 您是否监控自己每天的运动时间?

- 是 (如果是，怎么做？)

- 没有 (如果没有，为什么？)

Q4 你认为监控你的日常运动是否很重要?

- 是 (如果是，为什么？)

- 不是 (如果不是，为什么？)

Q5 您多长时间做一次健康检查？(健康检查包括定期体检、验血等)______________

Q6 您是否接受定期检查您的健康状况?

- 是（如果是，请写下您喜欢的检查方法，如自我监测或全科医生）。

- 否（如果否，为什么？）

Q7: 您是否曾经或正在遭受以下任何一种情况的困扰?

- 持续疲倦

- 记忆力减弱

- 消化不良

- 注意力不集中

- 睡眠质量差

- 头痛

- 转折

- 睡眠质量差

- 经常头痛

- 其他症状______________

- 未应用

Q8: 您是否已经或正在使用任何自我监测技术来监测您的不健康状况或您的健康状况?

- 是（如果选择，请写出您使用/被使用的技术类型）

- 没有（如果没有，为什么？）

Q9: 您认为您的医学知识水平如何?

请点击可能的技能（从 1：不专业到 5：专业） 1 2 3 4 5

请用以下量表对您的健康习惯的程度进行评分

Q10：您愿意花多少钱购买健康自我监测设备（占您工资的百分比）_______________

Q11、当您打算购买健康自我监测技术时，您会从哪些方面考虑? ______________

第二部分： 影响健康技术接受意向的因素

本部分旨在了解您对影响您对健康自我监测技术接受意向的因素的看法。

请在最能反映您对使用健康自我监测技术的看法的数字上打勾，以表明您的同意程度。量表的含义： 1（非常不同意），2（不同意），3（中立），4（同意），5（非常同意）。

你从技术角度的接受意向 1 2 3 4 5

我发现健康自我监测技术对监测我的健康状况很有用。

健康自我监测技术使我能够对我的健康状况有更多的控制。

使用自我监测技术可以改善我的健康状况。

使用自我监测技术可以帮助我预防慢性疾病。

我与自我监测技术的互动是清晰和可理解的。

我很容易培养出使用自我监测技术所需的技能。

我发现自我监测技术的功能很容易操作。

你从心理学角度的接受意向 1 2 3 4 5

我很担心得了慢性病，因为它会对我的生活和家庭产生重大影响。

得了慢性病会对我的工作和收入产生重大影响。

我担心得了慢性病，因为它会危及我的生活。

COVID-19 增加了我对慢性病的严重性的感知。

当我被诊断出一些不正常的指数时，我开始使用健康自我监测设备。

我开始经常监测我的健康状况，因为我不希望像我的家人那样患上任何慢性病。

当我有一些不健康的症状时，我就开始监测我的健康状况。

你从社会和文化角度的接受意向 1 2 3 4 5

我相信社会媒体对健康自我监测技术的推荐。

我赞同社会媒体对健康自我监测技术的推荐。

我相信来自社交媒体的健康自我监测技术的建议。

我经常咨询虚拟社区中的其他人，帮助我选择合适的健康自我监测技术。

如果我想成为虚拟社区的一部分，我经常关注我的虚拟社区中的其他人，并购买他们购买的相同品牌的健康自我监测技术。

重要的是，虚拟社区中的其他人喜欢我购买的健康自我监测技术。

为了确保我购买正确的健康自我监测技术，我经常观察我的虚拟社区中的人的购买行为。

我想知道我购买的健康自我监测技术能给我的虚拟社区带来什么好印象。

对改变的抗拒 1 2 3 4 5

我希望健康自我监测技术能改变我对自己健康状况的检查方式。

我希望健康自我监测技术能改变我监测自己健康状况的方式。

总的来说，我希望健康自我监测技术能改变我目前的生活方式。

客户创新能力 1 2 3 4 5

我经常发现自己对新的健康自我监测设备持怀疑态度

我对新的发明和新的思维方式持怀疑态度

我通常对接受新想法持谨慎态度

对隐私保护的信任 1 2 3 4 5

我信任使用健康自我监测技术时的隐私和数据安全。

我相信，如果我使用健康自我监测技术来监测我的健康状况，我的健康相关信息不会被其他人获取。

我相信在使用健康自我监测技术时的数据保护和安全。

技术焦虑症 1 2 3 4 5

我对使用健康自我监测技术感到忧虑

我对使用健康自我监测技术犹豫不决，因为我害怕在使用时犯错

健康自我监测技术让我望而生畏

请在最能反映您对自己使用健康自我监测设备的看法的数字上打勾，以表明您的同意程度。

有意使用 1 2 3 4 5

如果有机会，我将在我的医疗实践中使用健康自我监测设备。

我打算在我的实践中尽可能频繁地使用健康自我监测相关技术。

我相信使用健康自我监测相关技术会改善我的健康护理行为。

我估计我在我的医疗实践中使用健康自我监测技术的可能性很大。

第三部分 - 一般信息 受访者详细信息

以下问题旨在获得有关您的人口统计信息。请在最能说明您的网站所获得的信息的项目上打勾。

Q1 您来自哪个国家?

- 英国

- 其他国家

Q2 您的性别是什么?

- 男

- 女性

- 不愿透露

- 倾向于自我描述

Q3 您属于以下哪个年龄组?

- 小于 18 岁（调查结束时）

- 18- 28 岁

- 29- 39 岁

- 40- 50 岁

- 51- 61 岁

- 61 岁以上

Q4 您完成的最高教育程度是什么?

- 低于高中毕业证书

- 高中

- 学士学位

- 硕士学位

- 博士或以上

Q5 您目前的就业状况是什么?

- 全职工作

- 兼职工作

- 失业，目前正在找工作

- 失业但目前没有找工作

- 学生

- 退休人员

- 家庭主妇

- 自营职业者

- 无法工作

- 其他 ______________

Q6 您的职业是什么？ ____________

Q7 您的年总收入是多少

- 低于 1000 英镑

- £1001-£2000

- £2001-£3000

- £3001-£4000

- £4001-£5000

- £5001-£6000

- 超过 60000 英镑

APPENDIX D: QUALITATIVE MATERIALS

Interview Questions (English Version)

Part 1: Demographic Questions

Q1: What is your gender?

Q2: What is your age?

Q3: Which city are you come from? Which city are you working in?

Q4: What is your occupation?

Q5: What is your income level?

Part 2: Health related information

Q1: To what extent you care to your body health? How?

Q2: Do you have any underlying health conditions?

Q3: Have you use any health self-monitoring devices before? YES/NO

YES:

- Are you using any health self-monitoring devices now?
- How often?
- Why you using the health self-monitoring devices? (Purpose)
- Do you think it will help you to prevent chronic disease? Please specific the reason.

NO:

- How do you perceive that health self-monitoring devices aim to prevent chronic disease?
- If you have chance, how will you choose the suitable self-monitoring devices? Why?

Part 3: Use behavior of health self-monitoring devices

Q1: How do you perceive the factors that influence on your use behavior?

Q2: How do you perceive the performance expectancy/ effort expectancy /perceived severity/cues to action/trust in social media/ social conformity can be one of the reasons that impact on your acceptance behavior?

- Could you please sort all above factors in importance order? Why？Please specify each of factors.
- According to the questionnaire result, majority of people did not think their intention to use influenced by trust in social media or social conformity. How do you perceive the reasons of this?

Q3: How to define your medical knowledge level? Do you think sometimes you have intention to use the self-monitoring devices but you will not actually use it? Why? How do you perceive medical knowledge can influence on it?

Q4: How to define your health habit? How you perceive that good or bad health habit will influence on your use behavior? (You have intention to use but you don’t have good health habit so you might no insist on using it)

Q5: Due to an increasing number of young people have chronic disease recently, how do you perceive young people should use self-monitoring devices?

Q6: Due to the COVID 2019, how do you perceive that people should pay more attention on promote the chronic disease? Solutions / self-monitoring devices?

Q7: How do you perceive the factors that influence on user’s acceptance behavior will be different between different age group /city/economic status?

Adding Question:

Q1: In the future, what kind of self-monitoring devices you desire?

Q2: How do you perceive the common self-monitoring devices in Chinese hospitals? What are they? And what are the most important functions?

Q3: From doctor perspective, how do you perceive factors that contribute to increasing the intention to use?

Interview Questions (Chinese Version)

Part 1: Demographic Questions

问题 1：请问您的性别是?

问题 2：请问您的年龄是?

问题 3：您来自哪个城市？您在哪个城市工作?

问题 4：您从事什么职业?

问题 5：您的收入水平是多少?

Part 2: Health related information

问题 1: 您是否关心您的身体健康？请问您通常选择通过什么样的方式?

问题 2: 您是否有任何亚健康的症状

- 是 您是否有采取任何行动去保持身体健康或预防慢病疾病
- 否 您是否有预防慢性疾病的意识

问题 3: 问题 3：您以前使用过任何健康自我监测设备吗？是/否

是:

- 您现在正在使用任何健康自我监控设备吗?
- 请问您使用的频率是多少?
- 请问您为什么使用健康自我监控设备？（目的）
- 您认为这将有助于您预防慢性病吗？请具体说明原因。

没有：

- 您如何看待健康自我监控设备可以预防慢性病？

- 如果有机会，您将如何选择合适的自我监控设备？

Part 3: Use behavior of health self-monitoring devices

问题 1：您认为影响人们使用健康自我检测设备的意图的因素有哪些？

问题 2：您如何看待 设备的功能性/设备操作的简易性/对慢性疾病感知的严重性/当您身体出现不适是对自我进行的暗示/对社交媒体的信任/从众心理 可能是影响接受行为的原因之一？

-您如何看待以上影响因素？ 请问您认为影响用户使用意图最重要的因素是哪一个？您可以对以上所有因素按照重要性进行排序吗？为什么您这样认为呢？请指定每个因素。

-根据问卷调查结果，大多数人认为他们的使用意图不受社交媒体或社会从众心理影响。您如何看待其原因？

问题 3：请问您如何定义您的医学知识水平？您是否认为有时您打算使用健康自我监测仪器，但实际上却不会使用它？为什么？您如何看待医学知识会对其产生影响？

问题 4：如何定义您的健康习惯？您如何看待良好或不良的健康习惯会影响您的使用意图或行为？ （您打算使用它，但是您没有良好的健康习惯，因此您可能不会坚持使用它）

问题 5：由于最近有越来越多的年轻人患有慢性病，您如何看待年轻人应使用自我监控设备？

问题 6：由于 COVID 2019，您如何看待人们应该更多地关注慢性病的传播？解决方案/您如果看待自我监控设备会更好的帮助人们预防慢性疾病？

问题 7：您如何看待不同的年龄段/城市/经济状况的用户，影响他们的使用意图的的因素会有所不同？

Adding Question doctors:

（你接触过的病人是怎样）

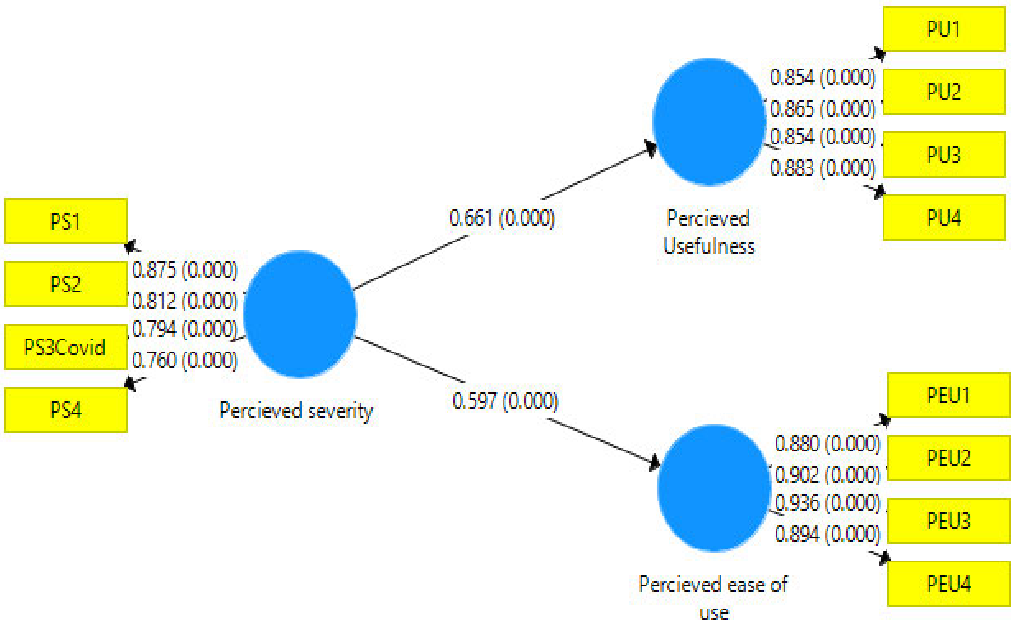
问题 1：将来，您需要什么样的自我监控设备？

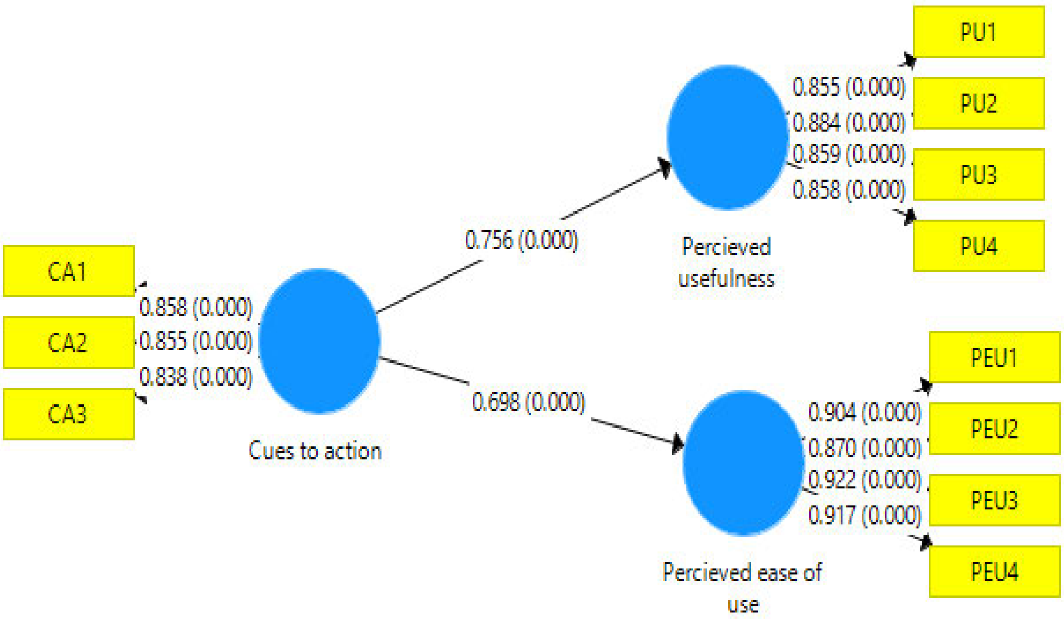
问题 2：您如何看待中国医院中常见的健康自我监控设备？是什么？最重要的功能是什么？

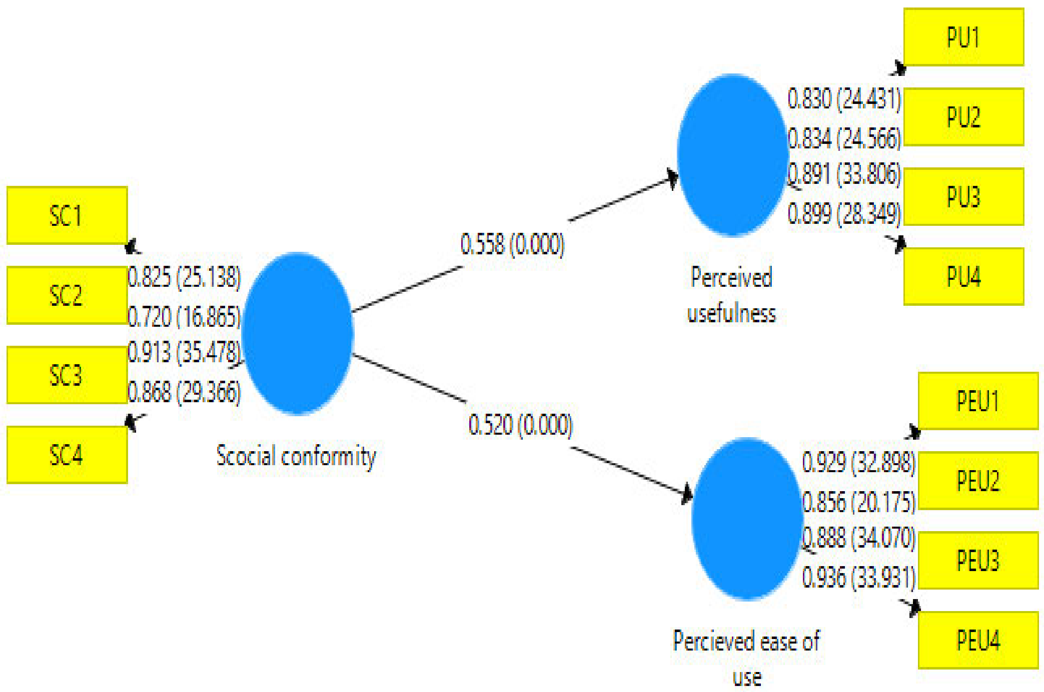
问题 3：从医生的角度来看，您如何看待有助于增加使用意愿的因素？

APPENDIX E: ADDITIONAL QUANTITATIVE ANALYSIS RESULT

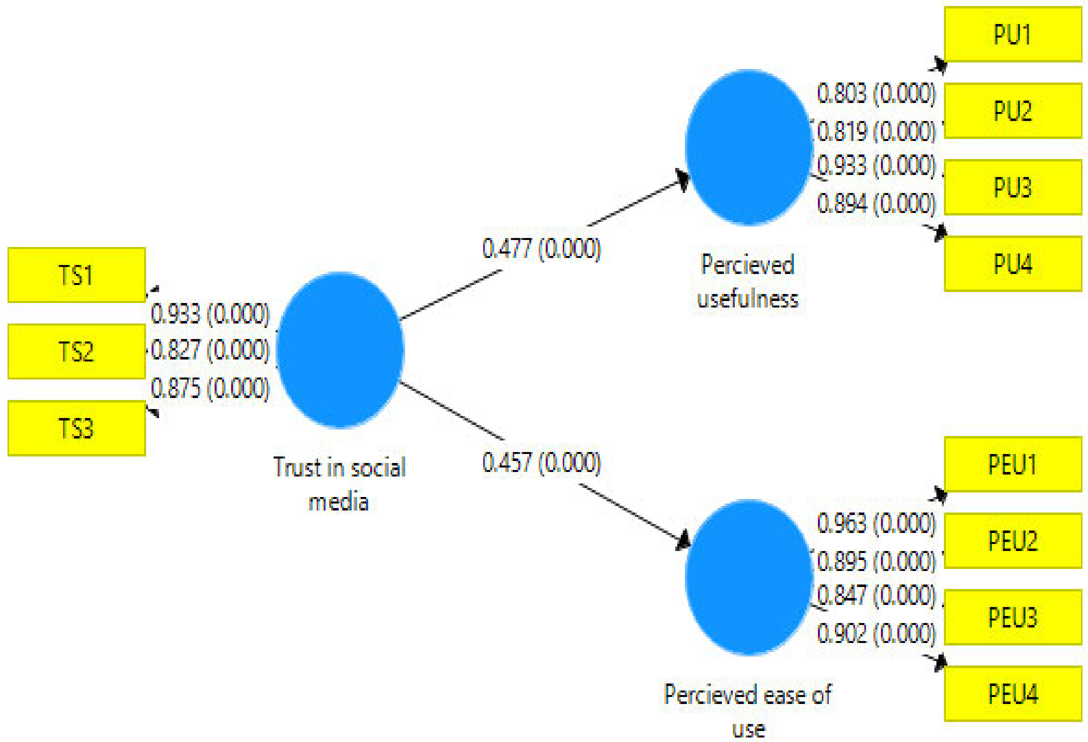
Quantitative supporting data


PU1
PU2
PU3
PU4
0.854 (0.000)
0.865 (0.000)
0.854 (0.000)
0.883 (0.000)
Percieved Usefulness
0.661 (0.000)
PS1
PS2
PS3Covid
PS4
0.875 (0.000)
0.812 (0.000)
0.794 (0.000)
0.760 (0.000)
Percieved severity
0.597 (0.000)
PEU1
PEU2
PEU3
PEU4
0.880 (0.000)
0.902 (0.000)
0.936 (0.000)
0.894 (0.000)
Percieved ease of use


PU1
PU2
PU3
PU4
0.855 (0.000)
0.884 (0.000)
0.859 (0.000)
0.858 (0.000)
Percieved usefulness
0.756 (0.000)
CA1
CA2
CA3
0.858 (0.000)
0.855 (0.000)
0.838 (0.000)
Cues to action
0.698 (0.000)
PEU1
PEU2
PEU3
PEU4
0.904 (0.000)
0.870 (0.000)
0.922 (0.000)
0.917 (0.000)
Percieved ease of use



PU1
PU2
PU3
PU4
0.830 (24.431)
0.834 (24.566)
0.891 (33.806)
0.899 (28.349)
Perceived usefulness
0.558 (0.000)
SC1
SC2
SC3
SC4
0.825 (25.138)
0.720 (16.865)
0.913 (35.478)
0.868 (29.366)
Scocial conformity
0.520 (0.000)
PEU1
PEU2
PEU3
PEU4
0.929 (32.898)
0.856 (20.175)
0.888 (34.070)
0.936 (33.931)
Percieved ease of use



PU1
PU2
PU3
PU4
0.803 (0.000)
0.819 (0.000)
0.933 (0.000)
0.894 (0.000)
Percieved usefulness
0.477 (0.000)
TS1
TS2
TS3
0.933 (0.000)
0.827 (0.000)
0.875 (0.000)
Trust in social media
0.457 (0.000)
PEU1
PEU2
PEU3
PEU4
0.963 (0.000)
0.895 (0.000)
0.847 (0.000)
0.902 (0.000)
Percieved ease of use

	CA1	CA2	CA3	IU1	IU2	IU3	PEU1	PEU2	PEU3	PEU4	PS1	PS2	PS3	PS4	PU1	PU2	PU3	PU4	SC1	SC2	SC3	SC4	TS1	TS2	TS3
CA1	1	0.734	0.719	0.464	0.468	0.457	0.54	0.525	0.553	0.546	0.693	0.643	0.629	0.602	0.561	0.56	0.556	0.565	0.448	0.391	0.497	0.472	0.388	0.343	0.363
CA2	0.734	1	0.717	0.463	0.467	0.455	0.539	0.523	0.552	0.544	0.691	0.641	0.627	0.6	0.56	0.559	0.555	0.564	0.447	0.39	0.495	0.47	0.387	0.342	0.362
CA3	0.719	0.717	1	0.453	0.457	0.446	0.528	0.512	0.54	0.533	0.677	0.627	0.614	0.588	0.548	0.547	0.543	0.552	0.438	0.382	0.485	0.461	0.379	0.335	0.355
IU1	0.464	0.463	0.453	1	0.765	0.746	0.581	0.564	0.595	0.586	0.412	0.382	0.373	0.358	0.61	0.609	0.604	0.614	0.329	0.287	0.365	0.347	0.32	0.283	0.3
IU2	0.468	0.467	0.457	0.765	1	0.753	0.586	0.569	0.6	0.592	0.415	0.385	0.377	0.361	0.616	0.615	0.61	0.62	0.332	0.29	0.368	0.35	0.323	0.286	0.303
IU3	0.457	0.455	0.446	0.746	0.753	1	0.572	0.555	0.585	0.577	0.405	0.376	0.368	0.352	0.6	0.599	0.595	0.605	0.324	0.283	0.359	0.341	0.315	0.279	0.295
PEU1	0.54	0.539	0.528	0.581	0.586	0.572	1	0.79	0.834	0.822	0.471	0.437	0.428	0.409	0.669	0.667	0.662	0.674	0.387	0.337	0.428	0.407	0.384	0.34	0.36
PEU2	0.525	0.523	0.512	0.564	0.569	0.555	0.79	1	0.81	0.798	0.458	0.424	0.415	0.398	0.649	0.648	0.643	0.654	0.375	0.327	0.416	0.395	0.373	0.33	0.349
PEU3	0.553	0.552	0.54	0.595	0.6	0.585	0.834	0.81	1	0.842	0.483	0.448	0.438	0.419	0.685	0.684	0.679	0.69	0.396	0.345	0.439	0.417	0.393	0.348	0.368
PEU4	0.546	0.544	0.533	0.586	0.592	0.577	0.822	0.798	0.842	1	0.476	0.441	0.432	0.413	0.675	0.674	0.669	0.68	0.39	0.34	0.433	0.411	0.388	0.343	0.363
PS1	0.693	0.691	0.677	0.412	0.415	0.405	0.471	0.458	0.483	0.476	1	0.71	0.695	0.665	0.5	0.499	0.495	0.504	0.421	0.367	0.467	0.443	0.387	0.343	0.363
PS2	0.643	0.641	0.627	0.382	0.385	0.376	0.437	0.424	0.448	0.441	0.71	1	0.644	0.617	0.463	0.463	0.459	0.467	0.391	0.341	0.433	0.411	0.359	0.318	0.336
PS3C	0.629	0.627	0.614	0.373	0.377	0.368	0.428	0.415	0.438	0.432	0.695	0.644	1	0.604	0.454	0.453	0.449	0.457	0.382	0.333	0.424	0.402	0.351	0.311	0.329
PS4	0.602	0.6	0.588	0.358	0.361	0.352	0.409	0.398	0.419	0.413	0.665	0.617	0.604	1	0.434	0.433	0.43	0.437	0.366	0.319	0.406	0.385	0.336	0.298	0.315
PU1	0.561	0.56	0.548	0.61	0.616	0.6	0.669	0.649	0.685	0.675	0.5	0.463	0.454	0.434	1	0.747	0.741	0.753	0.398	0.347	0.441	0.418	0.385	0.34	0.36
PU2	0.56	0.559	0.547	0.609	0.615	0.599	0.667	0.648	0.684	0.674	0.499	0.463	0.453	0.433	0.747	1	0.74	0.752	0.397	0.346	0.44	0.418	0.384	0.34	0.36
PU3	0.556	0.555	0.543	0.604	0.61	0.595	0.662	0.643	0.679	0.669	0.495	0.459	0.449	0.43	0.741	0.74	1	0.747	0.394	0.344	0.437	0.415	0.381	0.337	0.357
PU4	0.565	0.564	0.552	0.614	0.62	0.605	0.674	0.654	0.69	0.68	0.504	0.467	0.457	0.437	0.753	0.752	0.747	1	0.401	0.349	0.444	0.422	0.387	0.343	0.363
SC1	0.448	0.447	0.438	0.329	0.332	0.324	0.387	0.375	0.396	0.39	0.421	0.391	0.382	0.366	0.398	0.397	0.394	0.401	1	0.593	0.754	0.716	0.639	0.566	0.599
SC2	0.391	0.39	0.382	0.287	0.29	0.283	0.337	0.327	0.345	0.34	0.367	0.341	0.333	0.319	0.347	0.346	0.344	0.349	0.593	1	0.658	0.624	0.558	0.494	0.522
SC3	0.497	0.495	0.485	0.365	0.368	0.359	0.428	0.416	0.439	0.433	0.467	0.433	0.424	0.406	0.441	0.44	0.437	0.444	0.754	0.658	1	0.793	0.709	0.628	0.664
SC4	0.472	0.47	0.461	0.347	0.35	0.341	0.407	0.395	0.417	0.411	0.443	0.411	0.402	0.385	0.418	0.418	0.415	0.422	0.716	0.624	0.793	1	0.673	0.596	0.63
TS1	0.388	0.387	0.379	0.32	0.323	0.315	0.384	0.373	0.393	0.388	0.387	0.359	0.351	0.336	0.385	0.384	0.381	0.387	0.639	0.558	0.709	0.673	1	0.772	0.817
TS2	0.343	0.342	0.335	0.283	0.286	0.279	0.34	0.33	0.348	0.343	0.343	0.318	0.311	0.298	0.34	0.34	0.337	0.343	0.566	0.494	0.628	0.596	0.772	1	0.723
TS3	0.363	0.362	0.355	0.3	0.303	0.295	0.36	0.349	0.368	0.363	0.363	0.336	0.329	0.315	0.36	0.36	0.357	0.363	0.599	0.522	0.664	0.63	0.817	0.723	1

	CA1	CA2	CA3	IU1	IU2	IU3	PEU1	PEU2	PEU3	PEU4	PS1	PS2	PS3	PS4	PU1	PU2	PU3	PU4	SC
CA1	1	0.734	0.719	0.464	0.468	0.457	0.54	0.525	0.553	0.546	0.693	0.643	0.629	0.602	0.561	0.56	0.556	0.565	
CA2	0.734	1	0.717	0.463	0.467	0.455	0.539	0.523	0.552	0.544	0.691	0.641	0.627	0.6	0.56	0.559	0.555	0.564	
CA3	0.719	0.717	1	0.453	0.457	0.446	0.528	0.512	0.54	0.533	0.677	0.627	0.614	0.588	0.548	0.547	0.543	0.552	
IU1	0.464	0.463	0.453	1	0.765	0.746	0.581	0.564	0.595	0.586	0.412	0.382	0.373	0.358	0.61	0.609	0.604	0.614	
IU2	0.468	0.467	0.457	0.765	1	0.753	0.586	0.569	0.6	0.592	0.415	0.385	0.377	0.361	0.616	0.615	0.61	0.62	
IU3	0.457	0.455	0.446	0.746	0.753	1	0.572	0.555	0.585	0.577	0.405	0.376	0.368	0.352	0.6	0.599	0.595	0.605	
PEU1	0.54	0.539	0.528	0.581	0.586	0.572	1	0.79	0.834	0.822	0.471	0.437	0.428	0.409	0.669	0.667	0.662	0.674	
PEU2	0.525	0.523	0.512	0.564	0.569	0.555	0.79	1	0.81	0.798	0.458	0.424	0.415	0.398	0.649	0.648	0.643	0.654	
PEU3	0.553	0.552	0.54	0.595	0.6	0.585	0.834	0.81	1	0.842	0.483	0.448	0.438	0.419	0.685	0.684	0.679	0.69	
PEU4	0.546	0.544	0.533	0.586	0.592	0.577	0.822	0.798	0.842	1	0.476	0.441	0.432	0.413	0.675	0.674	0.669	0.68	
PS1	0.693	0.691	0.677	0.412	0.415	0.405	0.471	0.458	0.483	0.476	1	0.71	0.695	0.665	0.5	0.499	0.495	0.504	
PS2	0.643	0.641	0.627	0.382	0.385	0.376	0.437	0.424	0.448	0.441	0.71	1	0.644	0.617	0.463	0.463	0.459	0.467	
PS3C	0.629	0.627	0.614	0.373	0.377	0.368	0.428	0.415	0.438	0.432	0.695	0.644	1	0.604	0.454	0.453	0.449	0.457	
PS4	0.602	0.6	0.588	0.358	0.361	0.352	0.409	0.398	0.419	0.413	0.665	0.617	0.604	1	0.434	0.433	0.43	0.437	
PU1	0.561	0.56	0.548	0.61	0.616	0.6	0.669	0.649	0.685	0.675	0.5	0.463	0.454	0.434	1	0.747	0.741	0.753	
PU2	0.56	0.559	0.547	0.609	0.615	0.599	0.667	0.648	0.684	0.674	0.499	0.463	0.453	0.433	0.747	1	0.74	0.752	
PU3	0.556	0.555	0.543	0.604	0.61	0.595	0.662	0.643	0.679	0.669	0.495	0.459	0.449	0.43	0.741	0.74	1	0.747	
PU4	0.565	0.564	0.552	0.614	0.62	0.605	0.674	0.654	0.69	0.68	0.504	0.467	0.457	0.437	0.753	0.752	0.747	1	
SC1	0.448	0.447	0.438	0.329	0.332	0.324	0.387	0.375	0.396	0.39	0.421	0.391	0.382	0.366	0.398	0.397	0.394	0.401	
SC2	0.391	0.39	0.382	0.287	0.29	0.283	0.337	0.327	0.345	0.34	0.367	0.341	0.333	0.319	0.347	0.346	0.344	0.349	
SC3	0.497	0.495	0.485	0.365	0.368	0.359	0.428	0.416	0.439	0.433	0.467	0.433	0.424	0.406	0.441	0.44	0.437	0.444	
SC4	0.472	0.47	0.461	0.347	0.35	0.341	0.407	0.395	0.417	0.411	0.443	0.411	0.402	0.385	0.418	0.418	0.415	0.422	
TS1	0.388	0.387	0.379	0.32	0.323	0.315	0.384	0.373	0.393	0.388	0.387	0.359	0.351	0.336	0.385	0.384	0.381	0.387	
TS2	0.343	0.342	0.335	0.283	0.286	0.279	0.34	0.33	0.348	0.343	0.343	0.318	0.311	0.298	0.34	0.34	0.337	0.343	
TS3	0.363	0.362	0.355	0.3	0.303	0.295	0.36	0.349	0.368	0.363	0.363	0.336	0.329	0.315	0.36	0.36	0.357	0.363	

APPENDIX F: ADDITIONAL THEMATIC ANALYSIS INITIAL RESULT

Theme and coding

Different types of the devices intention to use behavior influence by easy to operate.

Function of the devices	Devices	Usage	Has been impacted by easy to operate impact	Supported by interviewees
1. Integrate and co-ordinate various healthcare activities under the same fundamental activity system 2. Self-treatment 3. Preparation before fact – to face diagnosis 4. Access and share the same and right information on right time for seamless co-operative work among organizations	Wearable Devices/healthcare official self-monitoring mobile App	Chronic diseases people /sub-healthy group and healthy individuals	No- very easy to operate	H1 H2

and among persons				
1. Tele-care 2. Visit management 3. Intelligent alarms 4. Tele education 5. Intelligence knowledge management	Phone based online self-medical consultant devices/platform	Chronic diseases people /sub-healthy group and healthy individuals	No- very easy to operate	H7 H9 H10 H11
1. Monitor daily blood pressure index	Blood monitoring monitor devices	Chronic diseases people and sub-healthy group	Yes/No Guidance and assistant provided is very clear, require some experience and medical knowledge	H10 H3 H4
1. Estimate the oxygen saturation of the blood and the pulse rate 2. Oxygen saturation gives information about the amount of oxygen carried in the blood	Oximeter	Sub-healthy group and people with other diseases, chronic obstructive pulmonary disease (COPD) asthma pneumonia lung cancer anemia	Yes/No Guidance and assistant provided is very clear, require some experience and medical knowledge	H20 H6 H7

3. to assess how well a new lung medication is working 4. to evaluate whether someone needs help breathing 5. to determine how effective supplemental oxygen therapy is, especially when treatment is new 6. to assess someone's ability to tolerate increased physical activity 7. to evaluate whether someone momentarily stops breathing while sleeping — like in cases of sleep		heart attack or heart failure congenital heart disease		

apnea — during a sleep study				
1. check your blood sugars (glucose levels) at home	Glucometer	Chronic diseases people and sub-healthy group	Yes Guidance and assistant provided is very clear, operation is very easy	H14 H7
1. Symptom management 2. Prevent potential diseases or abnormal index in advance 3. Collect health related data 4. Provide health community	Immutouch: wearable monitoring devices	Sub-healthy group, Alzheimer's disease group, potential Alzheimer's disease group and people with chronic diseases (long term)	No – very clear guidance has been provided	H21 H6
1. to help diagnose and monitor conditions affecting the heart.	ECG monitoring devices	Sub-healthy group, Chronic heart disease patients, Potential chronic disease group with abnormal index and people with	Yes/No Some ECG functions has been provided	H19 H15

		other chronic diseases		

Examples of initial coding:

Identified Themes	Coding	Excerpt from interview transcript
Degree of recognition towards body health/ Chronic disease prevention cognitive	- Definitely care - Care - Not Care	YanJun Chen: "Yes, I definitely care about my body." "Through using regular self –monitoring devices and fitness to avoid the potential risk of chronic diseases." David: "Because I have been weak since childhood. So, I definitely care about my body health. Also, I will do everything to prevent any chronic disease." Doctor Yu: "I cared about my body health, therefore, I have high cognitive of disease prevention" "Because of my high chronic disease prevention cognitive, I more likely to adopt the health self-monitoring technology, especially when I have some unhealthy symptoms" Doctor Li: "Well, I do care about my body health. Because of this thing, actually because I am a medical student, and I am familiar with the severity of chronic diseases. So, prevention is important for my life." Doctor Wang:" I definitely care about my body health, therefore, I usually have one-year physical examination, and also, I am a medical student myself, and may also self-examine, such as blood sugar, blood pressure, this is the case. " Miss Chen:" I cared about my body health; therefore, I will keep monitoring my health data and keep doing exercises." Professor Liu :"Because chronic sub-health population is more need to monitor, now many chronic diseases have become younger, young people does not have this awareness (they do not care about their body health), to pay attention to their physical health, a year physical examination or a longer period of time, so by the time they have symptoms, they're health condition already into a very severe condition, because young people have faster blood circulation, so their chronic symptoms more likely to become serious. Therefore, the disease prevention cognitive can directly impact on their prevention and using behavior towards any self-monitoring derives." Miss Xin "…It should be 8/10 at this stage. My personal physical condition has gone through a very bad period, so I have paid more attention to my body and realized the importance of body health and chronic disease prevention. Periodic physical examination can help me eliminate the hidden dangers of large-scale diseases, and I will also feel the changes of my body every day. It assists me to have a better health habit and keep my body health…."
Performance Expectancy Perceived Usefulness	- Body Alarm - Perceived benefit - Product Quality - Data accuracy - Multi-functions - Functions meet self-needs	Jialun Hu "Self-monitoring devices it likes an alarm to remind me and monitor my health condition. Daily life is very busy; I cannot remember all thing I need to do to do this today." "What exactly and what extent of new information or great benefit I could get from it? I think the perceived benefit can be the essential factor impact on my user behaviour" Doctor Yu: "It depends on its functions. Because I think the multi-functional devices will definitely provide more comprehensive analysis of my body health, which provided a clear and detailed report. Monthly monitoring is much more effective than annual physical monitoring, and problems can be discovered in time." "In order of importance. The first is functional of the self-monitoring devices" Miss Xin: "Personally, function is what I expect the most and is also the purpose of product design. If a product can greatly meet the needs of consumers and bring convenience, I believe that its other defects (such as difficult to operate) can be reduced…." Mr. Chen:"1. If the function is relatively simple, most people may still choose to go to the hospital for ordinary physical examination. As far as the intention of using the product is concerned, we should focus on the function. Because now you have started to use the product or understand the impression of the product." "2. It must be because there is a demand, so if the functionality is strong enough, then this standard to meet the demand. I want to know about my physical condition in advance. It may only be used intermittently, and the period of use may not be very long." "3. The first important thing is function." " 4…. Personally, I think it should be functional. Before I have the intention to use I have to investigate and research the product using scientific approach and decide whether to use it." Miss lu: "1. Products function is very important for me…. if the provided data is accurate, it will bring great help to my daily life, and will understand my body better and better monitor my body." "2. The second is that the functionality of the instrument is also very important" Mr. Hunag: "I think that at my age, I have more functional requirements. This device has to solve or monitoring all my health problems/data. One machine has multi-functions. I not only can use this device to monitor my health status, but also need some other basic life functions…."

Effort Expectancy Ease of use	- Automation - Easy to operate	Jialun Hu "Self-monitoring devices should remind me to do exercises or give my body health information automatically. And I can see my health condition whenever I want to see which is much better than I check them by myself. If I need to check by myself, it is too complicated and I will forget to do it." Doctor Yu: "I would like to adopt the health self-monitoring devices, if the function is not complete, the operation is very simple. Otherwise, I will reconsider about my intention to use." Mr Chen:" For ease of operation, this may be limited by age, maybe this is not important, but it should not be too complicated and will influence on my intention to use as well...."
Perceived Severity	Life-threatening Unhealthy condition	Doctor Yu: "First of all, I think it is important in terms the unhealthy condition which can threat my life or increase the potential risk of getting chronic disease. If I realize the perceived severity of the disease or a certain health condition, I will purchase self-monitoring device in order to keep my body health." "If I don't have the underlying condition or potential risk which can danger my life, I might not have the intention to use the devices." Mr. Chen: "......or they have discovered that their physical health is not ideal. When they are anxious about their physical condition and then make a decision, they may not be sensible." "The third important thing is the understanding of disease severity, unless it has a family history of disease. In this case, generally choose to actively monitor, and then use and find the corresponding equipment. Otherwise, you may only find changes in the body during the annual or quarterly physical examination, and then make a decision." Miss Lu: "1. When I found out that I hve chronic disease or unhealth symptoms, I am more willing to buy this device and conduct a self-monitoring. For example, as my mother had no high blood pressure before, she would never buy a blood pressure meter, but since she had high blood pressure, she would Understand the importance of this instrument, and then purchase." Mr.Huang: ".....but if I talk about the severity of the disease, I may pay attention to such a situation." "If the device is dangerious, but this device can monitor my grandma's disease, I may refuse, because I do not have this disease. But if you tell everyone how dangerous this disease is, you may wonder if you have this disease, and you might consider monitoring it..." "
Cues to Action	Genetic disease Physical Symptoms	Mr. Chen: ".... important thing is cues to action, which may increase your subconscious needs. The prevention and detection of the family genetic disease, because I am in this state personally. In this case, because the family members do have this kind of disease already, so in my personal daily life, I will control the diet and fat in order to reduce or prevent the probability of this kind of disease." Mr. David:"I will...... my body has told me to pay attention to monitoring. I will measure my weight every day using self-monitoring devices, there is an index of that heartbeat. I willpay attention..." Mr. Huang: "Because of the perennial illness, I am very scared, so I only have this intention to use self-suggestion." "Because these diseases will directly affect my life safety, I will look at its severity according to the possibility of affecting life safety. It's just that chronic gastroenteritis like me, although it may be more uncomfortable after the onset, but it will not affect my life safety. It is less likely that the gastroenteritis will die directly. But if it is heart disease or cerebral thrombosis, this disease may have very serious consequences. Because you are aware of its severity, you begin to urgently want to prevent this disease." " The medical report provide the possibility of this disease. If the condition will turn to be chronic disease, I will definitely monitor it in time and then buy monitoring equipment to monitor the current physical condition."
Social Conformity	Mentality conformity Social culture	Mr.Chen: "Personally, I don't have social conformity, but it is very common in Chinese society. Probably just because someone else is doing this, fearing that he hasn't done it will have an impact on later life. So they decided to do this first, and then think they are doing the right things. Perhaps part of the reason is because someone else has already bought it, and others just following him or her physically. Personally, I think it should be regarded as a kind of decision made blindly in the actual social situation." Miss Lu: "They will not be affected by social media or herd psychology. The psychology of the audience is actually the same. Only first understand that you need to do this Apparatus and a physical condition of oneself " Professor mark: "Social media plays an important role, , 2, a psychology of social media and herdsmen, so-called health products such as melatonin, why it can succeed, it is great, thanks in large part to its one advertising investment, its one Propaganda efforts A kind of brainwashing duck-feeding one instils this, so I think this may also be a way to let others accept the product. It must have done enough to propagate in the masses of the media, which can bring the economic benefits it wants. Now people are immune to this thing, because there are too many false information, so they are disgusting for the overwhelming advertising." Professor Chen: "I think the psychology of conformity may be the first, no matter how perfect it is, no one pays attention to it. I am more concerned about whether people accept or not." Mr. Huang: "I think the social media, including advertising, may affect this kind of fast-moving consumer goods. This kind of health self-monitoring device consumption or use situation. For our age, especially people who born after 1990 even born after 2000, in the future, after

		2000, it will be said that there would not be much impact in this area. The people who born after 1960,1970, like my parents, they may be affected by social media, because their consumption habits are different. The information receiving is also different. Young people receive some information, more affected by this self-consciousness." "But, personally, I do think the social conformity is reasonable and common. If you ask because your friends bought this bracelet, you will definitely feel that you are not making an active decision. Purchase decision, so I feel that when I bought this bracelet, I did not take into account my own health, but because other people bought me and bought it, it felt like I was stupid, so if you ask, buy this hand Is it because you have a disease? I will definitely choose to answer that there is no disease, so why should I buy this bracelet? So I will first reject this problem, and I will tell you that I did not buy this because my friends bought this bracelet." Doctor Wang: "I will think about whether or not this devices is suitable for me. Everyone's physical condition is different; your physical condition is different. If you want to observe your own indicators, there are many solutions. For example, if you see that your parents may have a family history of cancer, you should pay more attention to this kind of cancer monitoring. For example, if you have diabetes or high blood pressure at home, I might be more concerned about whether you are monitoring this machine for blood sugar and blood pressure, because there is no machine that can monitor all the indicators of your body. I only rely on the functionality and performance of the thing I use for the convenience brought to me, it can bring me practicality, and the herd mentality in this respect."
Trust in social media	Advertisement diffusion Social characteristics	Miss Xin: "Now it is an information society. Many sources of information are actually from the media and the Internet, but sometimes they are not noticed. So my point of view is that a person's view of things will be influenced by the outside world more or more......It will influence my use behavior" Mr. Chen: "…when I decided to purchase or use a product, usually will search some relevant information from social media, such as some public accounts, or some popular science articles, or Xiaohongshu and the like. Usually these articles will affect my intention to use. But the final decision is still not only based on social media. This kind of information dissemination is used as a marketing method for product diffusion. Therefore, I will seek for professional guidance from the hospital__ In addition, I believe the comments from the past users, but they still have a lot of false information on the market." "Trust in social media do exist in China, the reason can be current media has a lot of false information or exaggerated information. People have intention to use a product is not only about the products itself, it because of the increasing spread of diffusion from social media. If the popularity of this product increased, customers who reply on the social media will trust the product as well. At this situation, two groups of people will be observed, 1. They just listen to the social media and buying whatever social media think is good. 2.some people will choose to understand the functionality of the product then decided use or not. Group 2 usaully has higher education level. For example, the media do directly affect people's use behaviour. Apart of this, many elderly people are more likely belong to grouop 1, as soon as they see what a public account says is good, they hurried to buy this product. And many times, they are actually deceived. Blindly buying can be explained that some people do not have high level of education; they do not have sufficient social experience for such or they have discovered that their physical health is not ideal. When they are anxious about their physical condition and then make a decision, they may not be sensible." Miss Lu: "When I saw some articles from the public account on the Internet, which provide some very simple health knowledge, and then talk about the specific functions of this product and can help me to monitor my body health. Then I will be attracted and go to buy." "First of all, when I decided to choose a device, I would definitely not only consider about the products it-self. I also read relevant diffusion article, and user's review...." "I do thing, an increasing number of people will be influenced by social media, like my mother used to watch the TV shopping, and the TV shopping is introducing a Miao-style foot bath every day, and then she bought a lot for our family to use together. I often watched this kind of health product online, and chose this kind of health product, like what kind of footbath bucket and so on. In addition I think my parents have a high degree of trust in the media, mainly when they are doing online shopping, they will obtain more medical knowledge and medial information, Then they will understand ......and when they feel that the price is within the acceptable range, they more willing to buy and use them." Mr.Huang: "I think that the equipment displayed on social media may not be accepted by me ...." Doctor Wang: "Because I think the Chinese people's education level is improving now. There are many things like advertisements and media. Now they are not called advertisements. What are they called celebrities or the like? Sometimes people too much of these things are very objectionable, that is, people are now self-awareness, this awareness is still relatively strong, more or less still believe in professionals. For example, the doctor's suggestion, or the hospital's suggestion, is the doctor's suggestion. The advice of people who understand the medical field is still the main one. Many people are skeptical about the Internet celebrity mass media. For example, if it is a small things, this is my psychology, for example, I may be a piece of clothing or a piece of jewelry, a simple thing may feel good for me to use, if it relates to my health, it relates to my health and my future life In terms of quality, I still believe in medicine more. I think so about these suggestions from professionals."

Medical Knowledge Level		Miss Xin :"Because they are not engaged in any medical field, only ordinary people's cognitive level Individuals do not rule out such self-testing instruments, but have to admit that the lack of knowledge in the medical field may bring some difficulties and obstacles in selection and use." Mr. Chen: "As far as the hospital is concerned, I think it still needs some simple medical knowledge." Miss Lu: "I am not medical student or professionals, only ordinary people's cognitive level, I have to admit that the lack of knowledge in the medical field may bring some difficulties and obstacles in selection and use. It will be influenced to use intention." Professor Chen: "This person with a high medical level actually has two parts. Some people will know how to operate because of their professional silks. Instead, he will monitor at home. But some people think that he works at hospital, he can use more professional staff, so he does not need to test at home." Mr. Huang: "The level of medical knowledge is definitely influential, because my medical knowledge is sufficient, I know when to detect each disease, and then what is the value of the test, I may monitor from time to time, but if I don't know, I Looking at a bunch of numbers every day, I might not be monitoring anymore. This is not always the case. If I realize that I am sick, I will definitely choose the first time and find a way to cure the disease." Doctor Wang: "People with a relatively high level of knowledge, there are still, for example, you are in a living standard, and there are people with a relatively high standard of living, such as a leader, a person with a high social status, right? There are also people with more comprehensive knowledge, people with higher academic knowledge, people with higher levels, these people pay more attention to their health, because he has financial ability, he will think a lot, he has the ability to think Live a better life, and hope that life will continue, so health also cares about this kind of health, so I care more about my own health monitoring. I don't know if I'm right. In that case, my classmates or friends, I feel that they are a lot, they are very concerned, most of them are highly educated, and the knowledge level is also a bit of social status, such as being a leader or being a income comparison There are still many high ones, and they are still comparative.
Technical potential Risk	Technology Safety Information safety	Jialun Hu" I think if put into my body that's dangerous. But I don't mind the current smart devices what I'm using. It should be smarter health monitoring watch. I would probably be scared if you say that the device will put into my body. Because you know it's not. it's not doesn't seems to be very safe. I don't want to take any risk" ""it's always a balance or a consideration between the benefits and the risks isn't it. ""It's potential risk, yes, when you talk about this, I think the safety comes my mind. One way is the safety to wear. This devices or using this devices because at the moment okay, let's say the smart watches it's actually emitting some electronic signals so that would be a potential risk, kind of like that making yourself as like a centre of the Wi-Fi signal. So this signal might impact my body health and damage some of my organ. Additionally, the other safety actually reminding me is about the data safety. Then you using this smart devices whether all your personal data, including your health data will be protected in a safety way so that no other people would be able to access or using that for other purpose." Mr. Chen: "Products safety is very important, if it will cause some adverse effects on my body when I am using it or after use. then I may not be able to choose it, apperently." Professor Mark: "I think the effectiveness of these physical health monitoring instruments on the market may not come out some reliable products. Even if Apple monitors all aspects of the body, very few people can accept or trust." Professor Mark: "Because the product safety concern, customer will not accept health self-monitoring equipment, first say is to be implanted in the human body, is it implanted in the human body, where? How big is the minimally invasive, will there be some rejection for me? ...... To sum up, saftey of using the product and after using the product is the big problems will influence on their intention or use bahviour." "On the second point, I feel that my personal privacy is not guaranteed and may be disclosed. This is one of the reasons why I will not adopt it...... but it is very likely that some criminals or people with ulterior motives will disclose your personal privacy. The leakage may cause some problems, and I am not very optimistic." Doctor Wang: "If there are many families with family history, such as diabetes, or high blood pressure, cerebral haemorrhage, cerebral infarction, such as grandparents or grandma or grandpa or their parents and uncles, relatives and friends may be caused by these diseases Injuries, such as hemiplegia or diabetes, have many complications. Seeing that they are very harmful and affecting their quality of life, they may be conscious. It is possible that children from this type of family are more likely than those without these examples. The child can pay attention, can pay attention, the consciousness is relatively strong, can be conscious. 2. Unless he sees the harmfulness of the disease, the harmfulness of the disease, he can really feel that the harmfulness of the disease will cause great harm to him in the future, his quality of life will become worse and worse, he You may see a living example. He meant to accept it in particular, so that he can do it seriously."

Health Habit	Life habit: eating/ exercising	Miss Xin: "People who use it first (willing to spend time to understand and learn this tool) must be more concerned about physical health, so I think it may affect the frequency of use, but limited..."
Health Insurance	Quality guaranteed Price guaranteed	Doctor Liu: "1. I think that if the devices or drugs have be included in the range of medical insurance, it may be two cases. One is that the price of such equipment and drugs has always been in a high state, and the proportion of people with such diseases should be relatively high. Then the state may join the medical insurance out of a kind of social welfare for the people, which should be caused by more general diseases. If it is a product that does not include medical insurance, the social penetration rate of the product is not very high. There are other products of the same type that can be replaced, and it has already been in circulation in the market. So maybe the country doesn't need to intervene or make a decision about whether the product should be covered by medical insurance. 2. First of all, generally speaking, medical products listed in China will pass a registration number of the Food and Drug Administration. Then generally speaking, their level of monitoring and management is relatively high, so it is still easier to believe. If this product does not have a great impact on the body, then I may still choose to use it through my investigation of the capabilities and social contributions of the company to which the product belongs. In other words, more use cases are publicized by product companies, which may increase decision-making power." Mr.Huang: "If the self-monitoring devices been covered by medical insurance which means the quality can be guarantee, because it is supported by the government." Doctor Wang: Of course, we believe that big ones are more qualified. For example, you said that you have a certificate from the Food and Drug Administration or what kind of medical device access, as well as the equipment testing that these self-made manufacturers go out of, which are more recognized by the state. We still believe in this. For example, we must ask the hospital to believe that the hospital must purchase these things. It must have these qualifications before it can be used in the clinic, right, so that it can be used by patients, so we believe more in the hospital. 2. Of course, we believe that the big ones are more qualified, for example, you said that you have a certificate from the Food and Drug Administration or what kind of medical device access, as well as the equipment testing that these self-made manufacturers out of the country have more recognized. We still believe in this thing, for example, we must ask the hospital to believe that the hospital must buy these things, it must have these qualifications before it can be used in clinical, right, can be used for patients, so I believe in the hospital thing.
Product Brand	Famous Brand has high quality. Relevant medical devices license	Miss Lu: "I think product brand do affect me, like iPhone, it exist a brand effect. If you are used to this kind of system, and then change to the Android system, maybe you are not used to it. There is also a sense of dependence." Professor Mark: "......and famous celebrity endorsements will have some brand effects." "Customers will rely on products brand...." "People do not understand this, they do not understand the procedures, medical device registration certificate. The people's subjective consciousness will think that the big brands of the top 500 enterprises must be good things, but expensive things are a little. An unknown brand with high-tech content in it, marketing is not very good, and basically there is no future......"
Income level; Living city; economic status	Price Cost performance	Mr.Chen: "I think that the basis of the use of equipment should be price, cost. Another is whether their consciousness is strong enough." "2. It depends on whether the product is worth buying, or its use value." "3.Then, will the price issue be too high, can't afford the price, as well as these costs incurred during use such as maintenance or future updates?" "4. For the general public, the first thing is definitely the price issue. Is the cost too high and is it necessary to use this product to monitor your physical condition." "People in different cities are people in big cities. Their medical materials and knowledge will be more popular and better than those in small cities. Have better medical materials." Miss Lu: "The price is related, ... different family from different income differenct will accept different extent of price, In terms of differnet tiers of cities......" Professor Mark: "I think it must be a cultural issue, followed by personal spending habit. Young people spend a lot of money every month. You let him spend extra money and pay attention to his health. Not everyone can do it." "People of different economic conditions pay different attention to their own health. The richer people will always pay attention to their health. This factor is not necessarily the first, I think it is a possible factor." Professor Chen: "I think the economic status can be an important variables, like I am in Tianjin, the economic status is better than others (Tier 1 city). My university, in Yunnan, has a relatively poor economic level (Tier 3 city). Then, I clearly feel that even the people there If you are sick, you don't want to have treatment. Therefore, they are more don't care about

		prevent chronic disease in advance. And if most people don't have enough medical knowledge, he spends money to think that the monitoring equipment is just monitoring. I don't know this data, and I don't know that I am sick." "Price. Unwilling to spend money in such a place. The psychology of some people in China is that money is reserved for children, and there is the concept of saving money. As long as it is not necessary to buy this thing, it is generally not bought. Although young people do not have the concept of saving money, young people are willing to buy a game console or a health-monitoring device. In fact, for me, I am unwilling and will not spend money to test my health." "I think medical insurance is really important. Because many people can't guarantee life, he will not think about anything else." Mr. Huang: "1 The price of apple watch is relatively high, so for the public, it may not be able to accept this kind of equipment. 2. Will definitely consider 3. If there is no major risk in my body, I may not spend so much money to buy this equipment. In fact, I tell you that the richer the more the more the choking."
COVID-19	Prevention cognitive increased	Mr. Chen: "Yes, and family members will be reminded to increased the prevention cognitive. Older people are more susceptible to grab chronic diseases.... It should be. Because after this incident, the prevention awareness toward chronic disease will be raised collectively. As one of the ordinary people, I will definitely improve my personal health awareness." "2. The purchase volume should not be very large. Then he came from different cities, and users with different economic conditions actually have different factors that affect their use of this product." Miss Lu: "First of all, from this COVID-19, I will pay more attention to my physical health, enhance my immune function, etc. There may be a slight change, but health habits and will use self-monitoring for long-term in order to prevent chronic disease... It is not a one-off phenomenon. We need to continuous be awarded of our body health and keep monitoring our body health." Mr. Huang: "I will not change much, because the public's understanding of this COVID-19 may feel that this person IS weak, and the body is not very good, so he will die. Then I will exercise every day. Keep in a good health condition and do not easily get chronic diseases. I may choose to buy this device with a therapeutic function, but only a monitoring function. I don't need it at all. Why don't I go to a professional medical examination institution for testing?"

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