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MARMARA ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İŞLETME (İNGİLİZCE) ANABİLİM DALI

THE ROLE OF HOSPITAL CORPORATE IMAGE ON THE INTENTION TO USE SMART WEARABLE DEVICES IN THE HEALTHCARE SECTOR

Yüksek Lisans Tezi

VOLHA ULUSOY

İstanbul, 2023

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Danışman: Prof. Dr. Taşkın DİRSEHAN

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ÖZET

SAĞLIK SEKTÖRÜNDE AKILLI GİYİLEBİLİR CİHAZLARI KULLANMA NİYETİNDE HASTANE KURUM İMAJININ ROLÜ

Teknolojinin dünya çapındaki hızlı değişimi ile giyilebilir teknoloji cihazları gibi ürünler, günümüzde daha geniş bir çeşitlilikle gelen bir yükseliş trendine sahip olma eğilimindedir. Bununla birlikte, tüketicilerin bu ürünlere adaptasyonu ve bu ürünlerin kullanımına geçişi mutlak kabul edilemez ve bu ürünlere karşı tüketici kafasında oluşan algı birçok faktör tarafından şekillenmektedir. COVID-19, sağlık hizmetleri endüstrisinde dijital transformasyonu öngörülemez şekilde hızlandırarak, akıllı sağlık cihazlarının yaygın olarak benimsenmesine yol açmıştır. Ancak, önceki araştırmalardan elde edilen bilgilere dayanarak, özellikle pazarlama açısından bu cihazların benimsenmesinde ve kullanım niyetinde bazı zorlukların gözlemlendiği bildirilmiştir. Bu araştırmanın amacı, akıllı giyilebilir teknoloji cihazlarının sağlık sektöründe tüketici tarafından kullanma niyetinin araştırılmasıdır. Bu araştırmanın orjinalliği, TAM'a dayalı akıllı giyilebilir cihazları kullanma niyetini, sinyal teorisinin merceğinden araştırmasından gelmektedir. Bu bağlamda, bu çalışma, kullanıcı olmayanların giyilebilir cihaz kullanma niyetini etkileyen faktörleri incelemektedir. Ayrıca, tüketici yenilikçiliğinin algılanan değer ile yeni ürünün benimsenmesi veya kullanım niyeti arasındaki ilişkinin olası bir moderatörü olduğunu bulan mevcut araştırmalar doğrultusunda, bu çalışma bunun son kullanıcı kabul edilebilirliği üzerindeki etkisini araştırmaktadır. Hastane kurumsal imajı, akıllı giyilebilir sağlık cihazları kullanma niyetinde oynadığı rolü analiz etmek amacıyla sinyal teorisine dayalı olarak bu araştırmaya dahil edilmiştir. Araştırma için akıllı giyilebilir cihaz kullanan ve kullanmayan 201 katılımcı ile anket yapılmıştır. Çalışma sonucunda hastane kurum imajının akıllı giyilebilir cihazların (AGC) kullanma niyeti üzerinde anlamlı bir rol oynamadığı ancak kullanma niyeti üzerinde dolaylı bir etkiye sahip olduğu görülmüştür. Katılımcıların AGC kullanma niyeti açısından cinsiyete ve tüketici yenilikçiliği açısından yaşa göre farklılık göstermediği görülmüştür.

Anahtar Kelimeler: akıllı giyilebilir cihazları, sağlık sektörü, COVID-19, sinyal teorisi, hastane kurumsal imaji, tüketici yenilikçiliği

ABSTRACT

THE ROLE OF HOSPITAL CORPORATE IMAGE ON THE INTENTION TO USE SMART WEARABLE DEVICES IN THE HEALTHCARE SECTOR

With the rapid change in technology worldwide, products such as wearable technology devices tend to have an uprising trend that comes with wider variety nowadays. Consumers, however, are not necessarily adaptive in their nature and their perception is shaped by many factors. COVID-19 has unpredictably accelerated digital transformation in the healthcare industry, leading to widespread adoption of remote smart healthcare devices. But, based on the information from previous researches, the fact that some challenges were observed in adoption and intention to use this devices especially from the marketing point of view. The aim of this research is to investigate the consumer intention to use smart wearable technology devices in healthcare sector. The novelty of this research comes from investigating the intention to use smart wearable devices based on TAM, but through the lens of the signaling theory. In such context, this study examines the factors affecting the intention of non-users to use wearable devices. Moreover, in line with extant research that finds consumer innovativeness as a possible moderator of the relationship between perceived value and new product adoption or intention to use, this study investigates the effect it exerts on the end user intention. Based on the signaling theory, hospital corporate image was included to this research with aim to analyze the role it plays in intention to use wearable health devices. To research, survey was done with 201 participants who have used or who is non-users of smart wearable devices. As a result of the study, it was seen that hospital corporate image do not play a significant role in intention to use smart wearable devices (SWD), but it has an indirect effect on intention to use. It was observed that the participants do not differ in gender in term of intention to use SWD and age in term of consumer innovativeness.

Keywords: smart wearabable devices, healthcare sector, COVID-19, signaling theory, hospital corporate image, consumer innovativeness

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INTRODUCTION

Since the early 1990s, internet usage has grown significantly, which has exponentially boosted the capacity for information use and speed up the global spread of technology. This was reflected in the variety of area given over to technological products in our daily life. In addition, companies have been producing more wearable technology devices in recent years, and these products are thought to represent the start of a new phase in the development of technology (Stinson, 2013).

Technology has also advanced as humanity has started to progress on the path of civilization, and recently, advances in nanotechnology as well as the development of electronic chips, GPS systems, Wi-Fi systems, internet, computers and sensors. Revolutionary changes began to transform the whole world at an unprecedented rate. Smart wearable technologies are also one of the most important evolving areas of these constantly evolving technological developments. While there is not a single unique definition on wearable devices on which majority of researchers agree, this research will draw on the definition of smart wearable devices (SWD) developed by Oh and Kang (2021) which refers to smart wearable devices as a “broad category of devices worn on the body that collect and transmit user information using sensors and communicate with applications” (Oh and Kang, 2021, p. 2). To be considered "wearable technology," a device must communicate data from smart sensors to a smartphone via wireless connections. Wearable devices are used external to the body, either attached as an accessory or embedded in clothes (Raskovic, Martin, & Jovanov, 2004). They can be used in various applications equipped with sensors, internet connections, processors, and operating systems as well as user-friendly interfaces with touch pads/screens. Wearable technologies are commonly expressed as wearable computers, smart clothing and devices, and wearable materials. Briefly say, wearable technologies are mechanical and technological equipment that can be worn by humans.

It is seen that wearable technologies, which are becoming more popular day by day, are now an indispensable part of our daily life. Potential applications show that life is safer, easier, healthier, faster and more fun with wearable technologies. Wearable technologies are recognized as a vision where information will flow seamlessly to the user and medical conditions can be monitored remotely, online data can be accessed instantly, and even superhuman physical and sensory abilities are possible. Mainly,

pandemic COVID-19 supports the lucrative growth of the wearable healthcare devices market. Especially during pandemic healthcare organizations have made more decisions on tech investments and strategies than ever before. With the rapid and global spread of the COVID-19 virus, it is more important than ever that healthcare organizations use available technology, such as healthcare IoT devices, to reduce disease spread. One of the unintended consequences of the COVID-19 pandemic has been the quick discovery and acceptance of new technology, whether for businesses operating remotely and serving consumers in novel ways of physicians and researchers seeking treatment breakthroughs. Due to the ability to maintain ongoing contact, wearable health devices play an important role on both doctors and patients and the development of a professional relationship (Xue, 2019). Technology has given patients access to real-time, actionable, and personal information, thus empowering them in making better decisions about their own health, as well as contributing to the generation of useful data for larger public health initiatives. Patients are given the tools they need to take control of their health issues everywhere without having to leave their homes or take time away from their jobs and receive real-time feedback from doctors. In this way they can avoid needless hospital stays or frequent medical visits, which contributes to lowering stress levels and cutting costs.

Revolutionary changes began to transform the whole world at an unprecedented rate. Smart wearable technologies are also one of the most important areas of these constantly evolving technological developments. The concept of smart wearables has developed rapidly with the globalizing world and has entered the agenda and daily lives of countries and people.

Emphasizing the focus on meeting the changes in individual needs of people, these transformations in traditional medicine shape the concept of modern medicine, thus supporting the improvements in the efficiency of medical care and making healthcare more efficient, more convenient, and more personalized. Wearable technology devices in the health industry allow for the collection of accurate and personalized patient data while planning treatment and lowering health costs. Because of this, the usage of wearable technology products in health services, which is one of the most significant areas of the economy, is expanding dramatically. Many factors influence growth in the health industry, as they do in other sectors, within the market the entire system. The significant convergence of new technology, greater health

awareness, rising healthcare expenditures, and the use of virtual networks by individuals instead of face-to-face conversation. Thanks to these technologies, users have the opportunity to control and manage their own health, while healthcare institutions potentially reduce their costs and improve their services thanks to devices that they can monitor their patients remotely. Thus wearable health technology market is considered as a very attractive market for both producers and consumers.

Businesses can use innovation as one of their most useful instruments to carry on with their operations in a more increasingly competitive environment, increase profitability and efficiency, maintain growth in their current markets, and expand into new ones. However, an organization's ability to understand and monitoring of its customers while also delivering goods and services that meet their requirements is essential to its success.

In order to comprehend consumer perception and better meet their needs, social scientists must therefore pay special attention to the diffusion and acceptance of innovation and technology. As consumers have different reactions and adoption processes towards smart wearable technology products, their attitude and the intention to buy and use them differs.

Therefore, this study focuses on individuals' behavioral intention to use smart wearable health devices. The effectiveness of wearable devices in this context depends on the intended users' acceptance and actual use of the smart wearable technology.

The medical device market is in continuous development and with the growing usage of wearable devices, end user acceptability and intention to use is gaining increased attention in informing the designing and improvement of the latter. Moreover, the novelty of this research comes from investigating the intention to use smart wearable devices through the lens of the signaling theory. In literature, there have been few studies that investigate the intention to use wearable medical devices from the user's point of view in content with hospital corporate image. Given these points, the current study addresses these gaps and experimentally tests a model to explain users' intentions to use smart wearable medical devices taking in account and analyzing impact of their perceived value, hospital corporate image, consumer innovativeness on intention to use. Moreover, a classification of wearable devices was developed as an extension to the literature on wearable health devices.

The writing purpose of this thesis is to inform the reader about the situation on smart wearable devices market. Furthermore, the focus of this study is to find out whether the hospital corporate image, consumer innovativeness and perceived value of smart wearable medical devices play roles in intention to use them. Likewise this research aims to brighten out the value of smart wearable devices in healthcare sector and the role of hospital corporate image in intention to use them. The current study makes use and integrates existing models and theories to investigate the factors affecting the intention of non-users to use smart wearable devices (SWD).

The study is organized as followed: introduction part consists of the scope and importance of this study to introduce the initial concepts and the study structure. In the second part, the theoretical background is discussed referring to the literature reviewed. Also, this part includes the overview of smart wearable devices, explains the situation on global medical wearable devices market, application status of wearables, and hypothesis development. Technology acceptance model and signalling theory are also explained in this chapter. But the main distinction of this study from others is common application of technology acceptance model with signaling theory. Research design and methodology is introduced and further explained in the next part of the study. Afterall, research model development and related hypotheses in terms of perceived value, hospital corporate image, consumer innovativeness, and intention to use are explained. Further on in the same part, sampling design and data collection are detailed together with providing the data analysis method. After research design and methodology, research findings are explained. The survey performed in this study was analyzed via ADANCO and SPSS and at this point, the proposed hypothesis were tested and structural model was clarified. And the study is concluded with discussion and conclusion part. Under this section, scientific contribution and managerial implications of this study are discussed while introducing the limitations this study faces and areas of further research.

1. LITERATURE REVIEW

1.1 Overview of smart wearable devices

As a result of the advancement of digital and mobile technology, many aspects of our lives have been changed. Today's era is the one of informatization and owing to huge progress in technology people's standard of living may be increased significantly. Such technological advances have led to the emergence of wearable technologies that set the groundwork for the next stage of the digital revolution, where technology is not only usable but also wearable. The word “wearable” is often used with other words such as technology (wearable technology), devices (wearable devices) and sometimes the word “wearables” in, plural terms, is used (colloquially) instead (Sultan, 2015).

The concept of smart wearable technology consists as a result of the integration of devices with one another and the human body. Wearable devices used in healthcare are designed to collect data on users' personal health and exercise, and can even send a patient's health information to a healthcare provider or physician in real time. The term "healthcare application" refers to the use of smartphone apps and sensors to forecast disease or infection to help users take the necessary activities as well as assist healthcare professionals in making medical decisions and sharing healthcare information. An activity that focuses on influencing customer healthy habits by offering advice on things like stop smoking, exercising, and nutrition is referred to as a healthcare application.

To prevent the spread of the COVID-19 global pandemic smartphone apps have been successfully used for contact tracing of infected individuals or monitor those in involuntary isolation.

These definitions of healthcare wearable devices imply that they may be useful in disease prevention and review the user's health state. Furthermore, a healthcare wearable device can be attached to the body or incorporated into a component of the body to increase and supplement the human body's healthcare capabilities and be changed according to the user's willingness.

Smart Wearable health technologies are one of the key applications of digital health technologies such as e-health, m-health, telemedicine, digital hospitals, robotic applications, artificial intelligence, and 3D printers. Wearable health solutions provide distinct benefits, including superior real-time processing, flexibility, and compatibility

with wide area processing technology. Telemedicine technology delivers healthcare services where distance is a determinant factor. Telecommunications technologies are used by specialized professionals to exchange correct information for the diagnosis, treatment, and prevention of disease and injury, as well as for continuing education about the health of the needy. This technology encompasses a comprehensive set of actions made to improve an individual's health and well-being in society, and it has a wide range of applications and technologies (Manyazewal, Woldeamanuel, Blumberg, Fekadu, & Marconi, 2021).

While smartphone penetration is reaching oversupply, there are witnessing a fascinating new trend in the mobile device market. Users are increasingly interested in literally wearing a mobile device that promises to improve their quality of life in ways that smartphones alone cannot. Wearables are devices that include smart watches, wrist bands, smart eyewear, smart jewelry, electronic clothing, skin patches, and other similar items. Wearables can sense, collect, and upload physiological data 24 hours a day, seven days a week, enabling opportunity to improve quality of life in ways that smartphones alone cannot. Wearables can also assist users in performing a variety of other valuable microtasks, such as checking incoming text messages and viewing urgent information, much more conveniently and naturally than a smartphone, which is frequently carried in pockets or bags. Wearable devices are also being utilized to provide a variety of value-added services, including indoor localization and navigation, financial payments, physical and mental health monitoring, sport analytics, and medical insurance analytics.

There has recently been a massive increase in the demand for smart e-health care all across the world. Many chronic and acute diseases, as well as general health status, are currently monitored, identified, and controlled using integrated e-health systems (software and hardware) (Baig, GholamHosseini, Moqeem, Mirza, & Lindén, 2017).

Telemedicine combines the convenience, low cost, and immediate availability of health-related information and communication via the Internet and related technologies. Telemedicine can assist patients in being more involved in their treatment plan and expanding their autonomy. Telemedicine, such as telestroke, telecardiology, teledermatology, telepediatrics, telepsychiatry, and teleneonatology, can make a substantial contribution to healthcare in underserved areas. This technology intends to increase access to medical care for everybody, regardless of location, and to reduce the

amount of in-person visits. This issue has grown critical in light of the COVID-19 and quarantine days pandemic. Distance and social distance, which are essential characteristics of telemedicine, can be an important reason to offer a unique opportunity to expedite adoption and the numerous benefits of this technology, which is unavoidable in any case. As a result, telemedicine can be used in three areas of health care: prevention, education, and treatment (Alvandi, 2017).

Broadly, there are three main types of telemedicine: store-and-forward, remote monitoring, and real-time interactive services.

While there is not a single unique definition on these devices on which majority of researchers agree, for the aim of this study the following definition of smart wearable devices (SWD) was drawn, that developed by Oh and Kang (2021) which refers to smart wearable devices as a "broad category of devices worn on the body that collect and transmit user information using sensors and communicate with applications" (Oh and Kang, 2021, p. 2).

Data acquired through the use of wearable health devices provides a variety of advantages to people, patients, healthcare professionals, healthcare organizations, and society in terms of health management, remote health monitoring, healthcare expense reduction, and healthcare service improvement (Erdmier, Hatcher, & Lee, 2016).

Smart wearable health devices incorporate the use of Radio Frequency Identification (RFID) technology, biometrics, sensors, actuators, metering devices collecting, monitoring and controlling healthcare data of the real world into the Healthcare Information Systems. Extending the Internet and communication technology by linking it with "smart" sensing devices and physical objects is a growing trend. Sensors are embedded on the objects or "things", which are linked through networks (wired or wireless) through the use of a similar addressing scheme as that used for the internet (Mital, Chang, Choudhary, Papa, & Pani, 2018).

Smart wearables hold the possibility of establishing a new level of human connectedness when combined with advances in the Internet of Things (IoT), virtual reality, augmented reality, and artificial intelligence/deep learning. Furthermore, the Internet of Things (IoT) introduces a wide range of devices that collect, analyze, and transfer data, such as security cameras with facial recognition technology, sport watches with GPS, and smart homes (Yildirim & Ali-Eldin, 2019). Especially in healthcare

sector the data collected through the wearable medical devices can be easily transferred to the web or other equipment through a 3G network connection, LTE, body area network, smartphone, Bluetooth, 4G networks, Wi-Fi, and 5G networks. The data can also be sent to the physician to get feedback about the health of an individual.

Furthermore, with the progress and quick expansion of internet of things (IoT) technology, a vast amount of medical data has been exchanged and analyzed, becoming the foundation of medical big data. As an inductive use of these data, artificial intelligence, which has advanced fast in recent years, has been established. The integration of IoT and artificial intelligence resulted in instantaneous mobile medical care, which is the key notion of smart medical care.

1.2 Smart wearable devices in healthcare sector

Technological advancements continue to have an impact on human life in a variety of ways, covering everything from education to entertainment. The way people earn money and do business is also changing as a result of the novel gadgets that have appeared. With a growing variety and offerings of smart wearable devices, producers and marketers face an essential challenge in outdoing their competitors in order to reach a wider audience of users. Smart wearable technology is increasingly being used in a variety of consumer sectors, including sports, medical, personal safety, and lifestyle computing. Some of their applications are as follows: fitness, activity tracking, health management, wearable camera, and smart clothing (Cheng & Mitomo, 2017).

The consumer market segments for wearables include: General consumer, Fitness and sports, Fashion and apparel, Home automation and Remote identification, Gaming and recreation. The non-consumer market segments include: Defense and security, Enterprise and industrial, Healthcare (Salah, MacIntosh, & Rajakulendran, 2014).

Wearable sensors, smart textiles, and body-worn clothes are likely to be employed more widely in a variety of fields as they become smaller, cheaper, and more consumer-accessible. The expansion of wearable technologies for health data collection offers the opportunity for user engagement and ongoing health self-management. Using modern data collecting methods and smart technologies allows to obtain patient data

remotely, thereby to reduce the need for the physician and the patient to be in the same place for diagnosis, treatment and follow-up.

Wearable technologies have become one of the important components of providing remote health services, as they enable the patient's data to be recorded continuously and shared with the physician when requested. Although they are mostly used for the early diagnosis of some diseases that are predicted with treatment and follow-up, it possible to use the information they produce about the health of the patient for the diagnosis of diseases that are not foreseen in the person. Smart health technologies provide older adults access to continuing healthcare. Wearable systems can be used at home, thereby reducing physical checkup cost and decreasing the risk of hospital admission.

Passive healthcare management, which has traditionally focused on medical care, is no longer viable due to its failure to detect the alarming increase in chronic and life-threatening diseases, which are frequently associated with unhealthy lifestyles. Wearable devices have emerged as fashionable and useful devices for many people as a result of increased awareness of such phenomena, as well as technological progress and innovation in healthcare.

In the past years wearable technologies increased their impact especially in the healthcare sector, so the most important application area for wearable technology is health. The healthcare sector has been continuously decreasing throughout the years. The growing number of old-age patients, the growth in chronic diseases, and the growing global population have all led to further burden on the healthcare industry.

Istanbul Medipol University Technology Transfer Office Manager Dr. Lecturer İlker Köse stated, 'These technologies, which some see as accessories today, will soon become tools that most of us find very natural to use.'

Health problems such as increasing health costs worldwide, insufficient health services in underdeveloped regions, and the low number of health personnel have accelerated the transition to wearable health technologies (Çakır, Aytekin, & Tüminçin, 2018).

Smart healthcare is more than just a technological advancement; it is an all-encompassing, multi-level transformation. Notably in health sector this shift is reflected in the following changes: medical model transformation (from disease-centered to

patient-centered care), informatization construction shifts (from clinical to regional medical informatization), changes in medical management (from general to personalized management), and also changes in prevention and treatment concepts (from disease treatment to preventive healthcare). Focusing on meeting the individual needs of all these transformations in traditional medicine shapes the concept of modern medicine, thus supporting the improvements in the efficiency of medical care and making healthcare more efficient, more convenient, and more personalized.

The development of wearable sensors for health tracking systems has increased over the last few years. This rise can be attributed to a number of things, including advances in smart technology and targeted political and stakeholder efforts to support initiatives that address the need for new healthcare methods in response to the growing difficulties associated with an aging population.

Also because of the ever-increasing world's population and access to health care becoming more essential, real-time monitoring on a regular basis of various physiological signals has driven research and development of various wearable and implantable systems. This sustainable development is critical to ensure health and well-being at all ages, which can only be accomplished by comprehensive and constant healthcare monitoring. The concept of smart healthcare has gradually gained attention as information technology has progressed. The assertion of "smart medical care" has gradually grown in medical innovation with the emergence of numerous smart wearables in recent years. ‘Smart healthcare’ was born out of the concept of “Smart Planet” proposed by IBM (Armonk, NY, USA) in 2009. Simply put, Smart Planet is an intelligent infrastructure that uses sensors to perceive information, transmits information through the internet of things (IoT), and processes the information using supercomputers and cloud computing (Martin, Varilly, Cohn, & Wightwick, 2010).

1.3 Smart wearable health technology market

Wireless technologies, connected things, low-power electronics, and connected healthcare sectors are lead in a paradigm shift in the wearable medical devices business in the coming years. On global scale, the medical device industry has grown to be one of the major. The expanding and aging global population, diseases induced by poor

living conditions, technological innovations and national purchasing power are the primary drivers of the medical device industry's expansion. It is estimated that from 2025 to 2050, the population over the age of 65 in the world will reach 1.6 billion (He, Goodkind, & Kowal, 2016). Wearable healthcare devices are also one of the new focus areas for large technology companies. Leading technology companies such as Amazon, Google and Apple scrutinize health services as an area where they can make positive improvements with their big data, artificial intelligence algorithms and technologies such as IoT and cloud.

The desire of nations to advance in technological competition and obtaining an advantage in export competition in order to maintain superiority, the concept of developing local health services and reducing health costs with locally produced medical devices, and the regulations applied in the healthcare sector have all had a significant impact on public service in today's globalizing world.

The demand for wearable technology products increments more in the health sector as the level of awareness of individuals increases in parallel with their knowledge, and long and healthy life expectancy increases. The demand for wearable technology devices in the health industry is increasing as the awareness of individuals rises in tandem with their knowledge, and as people live longer and healthier lives. The changing social structure, the struggle to find time in a fast-paced work environment, and the desire to remotely monitor the health conditions of children and family elders all enhance demand for wearable health goods. Businesses that desire to meet the fast expanding demand and find a market place make efforts to develop and promote wearable technology products that can improve individuals quality of life.

Secondly, the rapid advancement of electrical sensing and flexible electronics technology also make a contribution in the advancement of wearable health technologies. Today's growth of wearable technology, particularly wearable health technology, has an impact on the whole market scenario since it is a quickly rising market, and an increase in demand for wearable items will provide market potential for businesses. Corporations are becoming more interested in wearable health devices, which are a rapidly expanding technology, in order to expand into new markets and produce new technological products. Furthermore, the emerging market demand for smart health care solutions represents a significant economic potential value. The wearable healthcare devices market has grown significantly in recent years, owing

primarily to an aging population, an increase in the prevalence of chronic diseases, and the availability of advanced medical devices (including wearables) that enable the delivery of quality care in non-hospital settings. Thus, the wearable health technology market has become one of the fastest growing markets of the last decade (Casselman, Onopa, & Khansa, 2017).

Key players driving the wearable medical devices market growth include Samsung Electronics Co., Ltd., Activinsights Ltd., Xiaomi Corporation, Fitbit, Inc., Apple Inc., Garmin Limited, Huawei Technologies Co., Ltd., OMRON Corporation, Polar Electro Oy, and VitalConnect.

According to Zion Market Research (ZMR) titled "Wearable Medical Devices Market - By Device Type (Diagnostic & Monitoring Devices and Therapeutic Devices), By Application (Sports & Fitness, Home Healthcare, and Remote Patient Monitoring), By Type (Activity Monitors, Smart Clothing, Patches, and Smartwatches), By Distribution Channel (Pharmacies, Hypermarkets, and Online Channel), and By Region: Global Industry Perspective, Comprehensive Analysis, and Forecast, 2019–2025". *t*he global wearable medical devices market value is estimated at 24,941 (USD Million) by 2025 and is projected to grow at a compound annual growth rate (CAGR) of over 18.4% during the period from 2019 to 2025.

In the next 5 to 10 years, the wearables market is expected to expand into a multi-billion euro industry. Although market intelligence companies' forecasts vary, there is consensus that body-centered technologies are quickly diffuse in a variety of application areas.

By providing solutions in the areas of healthy aging, patient monitoring, emergency management, safety at work, productivity development, energy management of homes, and other areas, smart wearables offer unprecedented prospects for tackling urgent social concerns. The European Parliament Scientific and Technology Options Assessment Panel (STOA) identified wearables as one of the ten technologies which will change peoples lives.

The other reports about the future state of the global wearable medical device market volume predict that wearable medical device market volume will be 27.8 billion dollars in 2022 (Markets & Markets Report, 2017), 87 billion dollars in 2025 (Global

Markets Insights Report, 2020), and 93.19 billion dollars in 2027 (Grand View Research Report, 2020).

1.3.1 Global medical wearable devices market

Wearables are expected to become a successful market in the high technology sector soon. The technology of these new devices will undoubtedly be crucial to the optimal operationing of a society in the future, especially in industries like healthcare and entertainment that are considered as ways to increase competitiveness (Dehghani, Abubakar, & Pashna, 2022).

The global market of medical wearables is forecast to grow between 2021 and 2026 (see Figure 1), going from 20.1 billion U.S. dollars to 83.9 billion U.S. dollars. The North American market is expected to generate a higher revenue than the European one, reaching roughly 33.6 billion U.S. dollars by 2026.

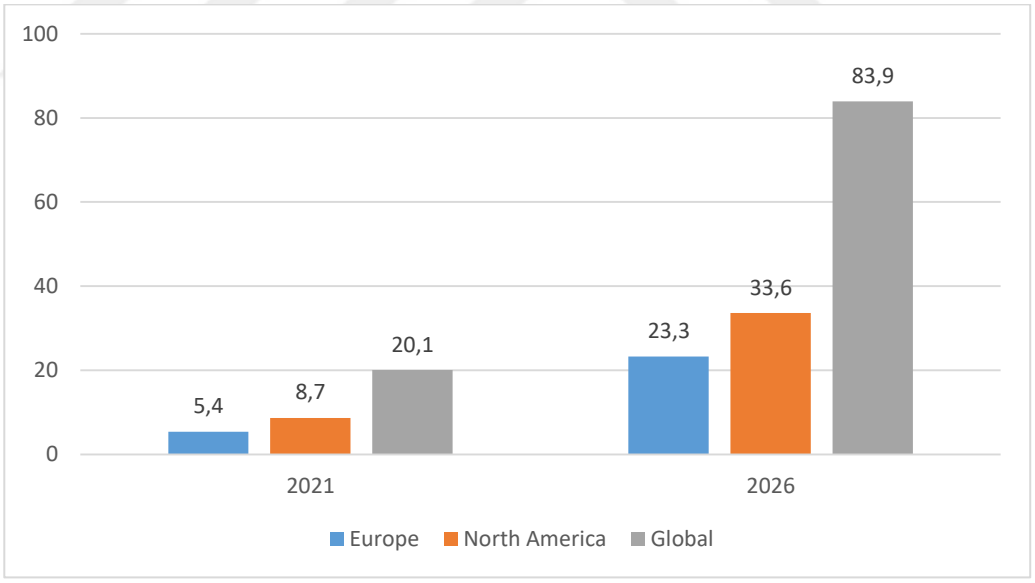


Figure 1: Medical wearable devices market revenue worldwide in 2021 and 2026 by region (in billion U.S. dollars)

Source: Statista, 2022. Medical wearable devices market revenue worldwide in 2021 and 2026. Retrieved from https://www.statista.com/statistics/1289674/medical-wearables-market-size-by-region/#statisticContainer

In 2019, the global digital health market was worth an estimated 175 billion U.S. dollars. With an expected CAGR (compound annual growth rate) of almost 25 percent from 2019 to 2025, the digital health market should reach nearly 660 billion dollars by 2025 (See Figure 2).

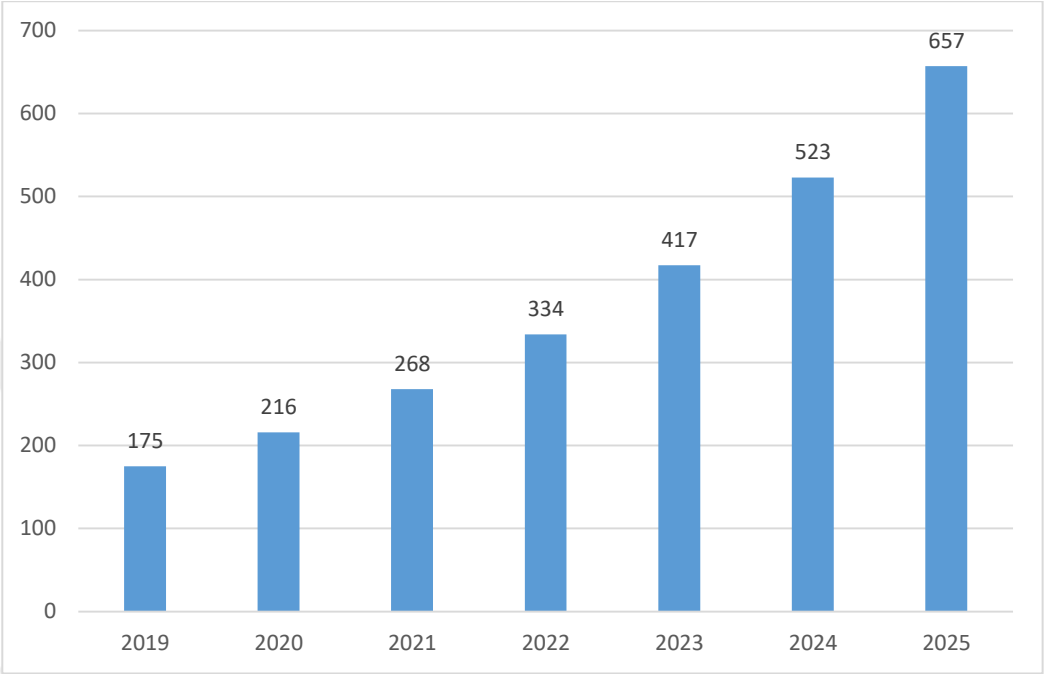


Figure 2: Projected global digital health market size from 2019-2025 (in billion U.S. dollars)

Source: Statista, 2022. Global digital health market size 2019-2025 forecast. Retreived from https://www.statista.com/statistics/1092869/global-digital-health-market-size-forecast/

Increasing use of digital health tools

Over the last decade, investor funding in the digital health industry has increased significantly. In 2020, over 21 billion U.S. dollars was invested in the industry, compared to around one billion U.S. dollars in 2010. Even before the COVID-19 pandemic in 2020, which sharply increased the need for digital health tools to be used, consumers'adoption of telemedicine had been increasing.

Further trends

According to statistic reports from Statista.com, a survey of European health professionals found that they believed the biggest e-health trend in the coming years will be the use of patient owned health data. In general, most healthcare workers thought e-health prospects in their country would improve in the coming year. However, the biggest challenge to implementing e-health changes efficiently and effective in Europe is regarded to be funding and costs.

1.3.2 Digital health devices market in Turkey

Digital health is already an essential component of developed health systems around the globe. The definition of the term is, however, broadly conceived. mHealth, telehealth, health informatics, and, particularly, eHealth are frequently used as synonyms. Without a doubt, digital health employs the most recent information and communication tools to create a faster, more efficient, and cost-effective healthcare practice. Because the health reform aimed for greater efficiency, it was generally regarded as a driving force for digital health solutions.

eHealth Devices - Turkey

Biosensors in eHealth Devices gather information on a person's health parameters and vital signs (blood pressure, temperature, blood glucose, weight) by reading or measuring the data and transmitting it via electric signals. It also discusses social alarms as an example of ambient assisted living technologies, which are emerging technologies enabled by IoT, AI, sensors, wireless communication technologies, and assistive robotics to support the elderly live securely and freely in their environments.

Mobile health applications, connected wearable devices, and telemedicine are among the technologies covered by the Digital Health market. These technologies give users the tools they need to make more informed and data-driven choices about their health and well-being. Products and services emerging in this market allow millions of people globally to more efficiently and conveniently monitor and record their health conditions. They can monitor physical activities, detect early signs of disease development, and even assist with psychological problems. The widespread use of the internet and smartphones, as well as the shift toward a healthier lifestyle and a better

feeling of well-being, have all contributed to the market's growth. The COVID-19 pandemic has played a major role in this trend and pandemic has accelerated development in the Digital Health market by facilitating public access to healthcare and self-monitoring of health conditions.

The Digital Health market can be considered through two lenses: "wellness management" and "health condition management," and is thus divided into two categories: Digital Fitness & Well-Being and eHealth. The primary distinction between them is the initial reason for using digital health products and services. As a result, the first section is centered on products and services that allow users to measure and monitor their (physical and mental) fitness behavior. The second, on the other hand, is focused on goods and services that improve patients' access to care, treatment, and medicines in general, with the ultimate goal of curing diseases.

The Digital Fitness & Well-Being segment includes fitness and motion monitoring devices as well as apps such as fitness apps, nutrition apps, and meditation apps. The eHealth sector has a more complicated structure and is focused on devices, apps, internet-sold pharmaceuticals, and online doctor consultations. To be more precise, eHealth devices, also known as biosensors, gather data on a person's health parameters and vital signs (blood pressure, temperature, blood glucose, weight) by reading or measuring the data and transmitting it via electric signals. Users can use eHealth apps to monitor/detect/analyze their bodily health conditions. Pharmaceuticals sold over the internet include over-the-counter medications that can be bought through online sales channels without a medical prescription. Online doctor consultations, also known as teleconsultations, are exclusively focused on remote consultations between patients and doctors done through online channels such as websites or mobile apps. Both public and private medical institutions can arrange these consultations.

Digital health is still a developing market with significant potential to bring greater benefits to citizens, governments, and businesses in the future. It is anticipated further expansions of digital health products and services, as there is a clear global market for them.

IT in healthcare sector

In recent years, the function of information technology in healthcare has grown in importance. IT is the use of telecommunications and computers to retrieve and share

information; therefore, IT in healthcare is the use of this technology to handle health-related data. Electronic health/medical records (EHRs/EMRs), e-prescriptions, and tech tools that help patients meet objectives like managing blood sugar levels or quitting smoking are the most common examples of healthcare IT. Furthermore, because of the availability of different mobile apps and information platforms, IT in healthcare has been promoted as a means of giving patients more control over their health.

1.3.3 First clinical application in Turkey

According to the news from government news channel trthaber.com 'Smart chip' method that catches cancer cells moves to clinical stage in Turkey. The "smart chip" technology that Middle East Technical University (METU) Technopolis researchers have been working on for seven years, which captures cancer cells circulating in the blood with a simple blood test, has come to an end. Clinical trials will be initiated for the new method, which is aimed to be used instead of needle biopsy, which is a painful and costly method for the patient. Instead, smart chip can reach information about the risks of metastasis and recurrence of cancer and elucidate information about the treatment process with a blood test.

Cancer cells that leave the tumor mass and pass into the blood are called "circulating tumor cells (CTC)," and it is understood that a very high-sensitivity system is required to separate these cells from the blood, and that the new technology that was developed contains many firsts in this field.

The method, which is routinely used in the diagnosis and follow-up of cancer, and a surgical procedure in needle biopsy, is a painful and costly method for the patient to take a sample of the patient's cancerous tissue. Smart chip devices and research activities are completed, so the stage where clinical studies in laboratories will be performed was reached. Also, recently started a clinical trial on 300 patients, thus, it is possible to follow up the diagnosis and treatment of cancer with blood tests on real patients for research purposes. According to the statement of Prof. Dr. Haluk Külah the accuracy rates in the system developed are high and show a superior performance against competitors. The design and patent of the silicon-based chips that was developed with MEMS technology to catch cancer cells in blood analysis belong

entirely to METU. These chips were called smart chips. There are small micro channels like capillaries inside the smart chips. Blood cells are passing one by one through these channels, and meanwhile, thus the blood cells are passing inside the chip. Mechanical structures separate the cancer cells on one side and the non-cancer cells on the other side. By making some analyzes on the sample containing the actual cancer cells, researchers collect information about the type of cancer and which type of chemotherapy will work. Especially important fact, that Patients will be able to have these tests with their current health insurance.

Scientific Director of the project, Biochemistry Specialist Assoc. Dr. Ebru Özgür stated that the system they have been working on since 2015 has reached the stage where it can be tested in laboratories after the validation processes, including preclinical studies, that have been completed. Also, Ebru Özgür stated that the system they developed was used for "research" purposes and that they installed the system in some centers in Ankara and Istanbul, and gave the following information:

"Our study will include breast cancer, colon cancer and non-small cell lung cancer patients. We will also take samples from healthy individuals. We will present their results in a comparative way. Our study will be completed within a year, and then the validation of the process will be completed. The device we developed, As it falls under the category of in vitro diagnostic device, we will make our applications for CE and FDA approval. Once we get our approvals, patients will be able to have these tests done with their existing health insurance. By the end of 2023 year, cancer patients who are treated in certain hospitals, provided that they have the approval of the doctors, will be able to receive blood tests within the scope of our clinical study".

1.3.4 Key players in the global wearable medical devices market

More and more companies are entering the multi-billion dollar sector as demand for wearable technologies tremendously increases. Due to the intense competition, the industry must create a niche for itself. All these new devices are generating a tsunami of data, the implications of which we are only beginning to realize. Wearable devices are undoubtedly able to accelerate the rapid progress of developing dependent industries

(e.g. health, education and so forth) and its market is overlapping and merged with other markets such as apparel and healthcare (Dehghani et al., 2022).

The global smart wearable devices market is fragmented, with the presence of large number of small players. Key players operating in the global medical wearable devices market include Xiaomi Technology Co., Ltd., Samsung Electronics Co. Ltd., Fitbit Inc., Garmin Corporation, Apple Inc., Huawei Technologies Co.Ltd., Polar Electro, OMRON Corporation, Activinsights Ltd., and Vital Connect. Propminent players are adopting growth strategies such as new product development, product launches, product approval, agreement, partnerships, and mergers. In addition, according to literature (Erkılıç & Yalçın, 2020) in major wearable devices market players are also included: Jawbone Inc, Misfit, My Kronoz, Qualcomm Technologies Inc., Adidas Group, Sony Corporation, Lifesense Group.

1.4 COVID-19 impact on smart health wearable market development

Literature said, that pandemic has revealed a need for healthcare IoT (Naqvi et al., 2020).

As today's consumers are both technology-savvy and health-conscious, wearable devices have become an innovation that meets expectations in line with this lifestyle. COVID-19 has unpredictably accelerated digital transformation in the healthcare industry, leading to widespread adoption of remote smart healthcare applications. Recently, there are have been observed many innovations with the integration of technology in the health sector. Among them, one of the most exciting innovations is wearable healthcare devices, which are beginning to support measures that have been discussed in the industry for many years but have not been realized until now and revolutionize pre-health services.

The COVID-19 pandemic outbreak began in China at the end of 2019, expanded fast over the world, and has resulted in ongoing bodily and emotional trauma, including anxiety, despair, fear, nervousness, tension, and mental distress (Ann & Blum, 2020). New social norms have arisen, such as social separation, the use of masks and sanitizers, the avoidance of large gatherings and physical contact. Clinics, hospitals, and

health centers are unable to provide regular treatments to other patients since health facilities are allocated to COVID-19 cases (Naqvi et al., 2020). Doctor visits are frequently canceled or delayed. In-person medical consultations might also expose patients, physicians, and other health-care providers to infection. Elders, in particular, are more concerned since they are at greater risk for Covid-19 (Sun et al., 2020).

The outbreak of COVID-19 has led to an increase of awareness for fitness and healthy lifestyle in many countries. This also supports the lucrative growth of the wearable healthcare devices market. Moreover, COVID-19 shapes the future of the medical IoT technologies market and illustrates the possibilities of healthcare IoT. Especially during pandemic healthcare organizations have made more decisions on tech investments and strategies than ever before. With the rapid and global spread of the COVID-19 virus, it is more important than ever that healthcare organizations use available technology, such as healthcare IoT devices, to reduce disease spread. One of the unintended consequences of the COVID-19 pandemic has been the quick discovery and acceptance of new technology, whether for businesses operating remotely and serving consumers in novel ways of physicians and researchers seeking treatment breakthroughs. As a result of the crises, IoT and related technologies have entered the mainstream (J. J. Kim, Han, & Ariza-Montes, 2021).

COVID-19 drove the healthcare system to the brink of collapse at a time when it was barely surviving day-to-day pressure. Even in the most advanced countries, the healthcare system was not prepared to deal with such dimensions of health crises, let alone developing ones. With the present health crisis, healthcare institutions are under enormous strain, primary healthcare professionals are highly vulnerable, and medical equipment is scarce (Singh et al., 2021).

The current scenario necessitates quick effort to change traditional healthcare infrastructure into a more robust, technology-driven, and self-sustaining healthcare system.

In one word, all artificial intelligence advancements and the effects of the global pandemic COVID-19 are two major motivators for healthcare organizations to adopt medical IoT and artificial intelligence.

1.5 Application status of smart healthcare

Wearable technology applications have increased with the popularity of smartphone use, converging with artificial intelligence (AI), IoT, and smart sensing. They are now widely used in a variety of industries, including gaming, communications, industrial operations, and safety. In healthcare, for example, IBM provides a wide range of mobile services through its Mobile Wireless Health Solutions, while GE Healthcare has created Vscan to give more accurate and timely healthcare services that are not limited by time or location.

Wearable technology has an extensive variety of potential applications in medicine and healthcare (Salah et al., 2014). Global wearable medical devices market, based on the device type was segmented into diagnostic/monitoring devices and therapeutic devices. By device type, the diagnostic/monitoring devices sector had the biggest market share in 2017. A wearable medical device can gather data on the patient's blood pressure, heart rate, brain activity, sleep patterns, glucose levels, and more. And such a device enables more effectively sharing of insights with physicians and/or caregivers (Salah et al., 2014).

1.5.1 Internet of Things and cloud computing in healthcare

IoT, a new Internet revolution, is quickly gaining interest as a major multidisciplinary research issue in the healthcare industry. With the introduction of several gadgets that are wearable and smartphones, various IOT-based devices are transforming and developing the traditional healthcare system into a smarter and more personalized one. As a result, today's healthcare system is also known as the Personalized Healthcare System (PHS).

The Internet of Things (IoT) is a new solution that provides the communication infrastructure required in any technology-driven healthcare system. While the Internet of Things may be employed in a wide range of disciplines and applications, its importance in healthcare systems cannot be overstated. IoT provides a fundamental communications architecture that can facilitate communications between sensors

sampling patients' vitals, healthcare machinery, hospitals, care centers, recovery wards, care facilities, or smart homes (Niaz et al., 2020).

Microelectromechanical system advancements have led in low-cost IoT solutions for healthcare. Low-cost IoT devices are not only equipped with appropriate sensors, radios, batteries, processing, and memory, but they also provide long-term operations at a significantly lower cost than traditional methods.

IoT can be easily implemented in any case. The sophisticated routing and communication mechanisms enable sensors to construct ad hoc on-demand networks and send sensory data to data sinks via multihop networks. The ability of IoT to self-heal makes it more resilient and fault tolerant in sensitive healthcare applications.

The Internet of Things has the potential to expand indefinitely. The low communication power, while improving battery life, also allows for regular reusability and interference avoidance in larger networks. Furthermore, using hierarchical architecture enables IoT to exponentially extend networks and provide massive healthcare infrastructures for collective intelligence.

End-to-end communication between sensors and control centers is provided via IoT. As a result, the Internet of Things can be efficiently used in off-hospital facilities monitoring and analysis of patients. This capability of IoT allows the elderly and vulnerable patients to be continuously monitored in their homes, reducing their exposure and pain. End-to-end connectivity, low latency, and reliability upgraded IoT solutions enable simultaneous monitoring of sensitive patients without the need for dedicated healthcare professionals.

While the benefits of IoT are immense and its potential is boundless, it cannot be used as a stand-alone solution. Rather, IoT acts as a facilitating platform for the adoption of AI, cognitive decision support systems, big data analytics, machine intelligence, and smart healthcare.

To effectively develop smart-health solutions that require IoT, cloud storage and processing services are required to manage and process the raw data acquired by IoT-enabled sensors. Cloud computing is a critical component in the implementation of smart healthcare solutions. Cloud computing, like IoT, is essential for AI-driven healthcare solutions such as remote diagnosis and monitoring, intelligent patient profiling, decision support systems, smart hospital formation, load management and

patient redistribution among hospitals, elderly care and support, patient records maintenance, and vulnerability prevention measures. Cloud computing not only allows for the storing of huge amounts of data created by IoT devices, but it also allows for the application of complex classical and deep learning algorithms. Some cloud providers, such as Amazon Web providers (AWS) cloud compute services, provide dedicated IoT solutions, such as AWS IoT (IoT, 2020).

Figure 3 represents a block diagram of IoT-enabled and cloud-based smart healthcare systems.

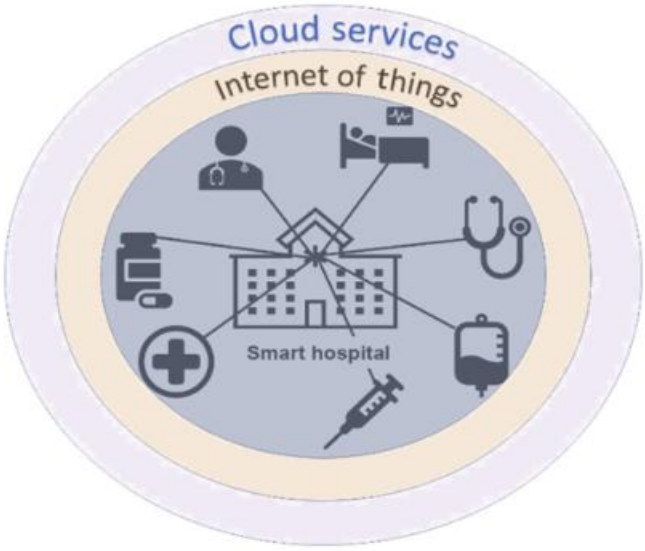


Figure 3: Block diagram of Internet of Things-enabled and cloud computing based smart healthcare system

Source: (Singh et al., 2021). Internet of Things and cloud computing. Digital Health: Elsevier; 2021. p. 152

IoT, like some other sectors, is playing an important role in healthcare. IoT applications in healthcare include routine check-ups, health monitoring, personal fitness, and geriatric care. IoT sensors are also utilized to monitor the performance of various organs in the body. These IoT sensors are typically classified as Wireless Body Area Networks (WBAN). In comparison to traditional healthcare devices, IoT-based gadgets are less expensive and easier to use.

1.5.2 Artificial intelligence in healthcare

The integration of artificial intelligence algorithms into healthcare has been required by the need for computerized, automated medical decision making, as well as more efficient and structured health data records for financial and medical purposes. All throughout the world, artificial intelligence has been successfully implemented in medical and health care services. AI has transformed the healthcare industry, bringing about changes in areas such as health application, data gathering and processing, reporting, follow-up planning, data storage, data mining, and others.

Artificial intelligence in healthcare refers to the use of complex algorithms and software that imitate or approximate human cognition and analyze complex medical and health-related data. Similarly, the use of artificial intelligence technology/automated processes to provide clinical diagnostics, treatment recommendations, and outcome prediction.

As artificial intelligence advancements and technologies emerged, they were eventually incorporated into the field of medicine and healthcare, leading to the creation of a scientific discipline known as "artificial intelligence in medicine." The field is defined as "the scientific discipline pertaining to research studies, projects, and applications that aim at supporting decision-based medical tasks through knowledge- and/or data-intensive computer-based solutions that ultimately support and improve the performance of a human care provider."

The early examples of artificial intelligence in healthcare are:

- Artificial Intelligence assistance for general well-being purposes, such as fitness etc.
- AI-assisted robotic surgery.
- Clinical judgment or diagnosis.
- Precision medicine.
- Drug discovery (pharmacovigilance).
- İndividualized healthcare

The establishment of Electronic Health Records and the subsequent development of Learning Health Systems and Clinical Decision Support Systems were the first instances of artificial intelligence being used in the healthcare industry.

AI can work indefinitely in terms of time and energy, as well as process enormous amounts of medical data. To evaluate the diagnosis, stage, and prognosis of a malignant tumor, a physician may analyze a few histological slices. A computer can process thousands of slices at once. Similarly, it could screen hundreds of patients for covid infection in a single second. This allows for more comprehensive medical care while also increasing the likelihood of being more accurate and minimizing the likelihood of missing critical information. AI is expected to have the greatest direct impact on disciplines that rely on visual data, like as pathology and radiology.

Medical diagnosis has been one of the primary targets of Artificial Intelligence research since the inception of the field. Rapid significant advances in Artificial Intelligence have resulted in the introduction of diagnostic algorithms that outperform humans and may be applied at scale in clinical practice. One of the most crucial tasks physicians perform is diagnosis. Diagnostic errors account for one of the largest sources of burden to healthcare systems globally (Newman-Toker & Pronovost, 2009), with wrong or delayed diagnoses occurring in an estimated 10–15% of cases (Graber, 2013).

Improving diagnosis accuracy and timeliness saves money on unnecessary testing, wrong treatments, and malpractice lawsuits. Improving access to clinicians for underserved populations is also a critical component of any solution to these issues, and it is being prioritized by governments, non-governmental organizations, and digital health organizations. AI has long appeared to be only a few years away from overcoming these challenges, promising to improve access through automation and digitization while decreasing the likelihood of diagnostic errors.

AI benefits image and pattern recognition, decision support systems, robots, apps, pharmaceutical development, health records, clinical research, medical imaging, and other healthcare areas. Companies ranging from start-ups to large enterprises are boosting their investments in medical AI dramatically. Profits and applications drive the development of new AI tools and applications into innovative ventures, with the goal of improving public and personal healthcare. The global AI healthcare market reached

$10.4 billion in 2021 and is predicted to grow at a compound annual growth rate of 38.4% from 2022 to 2030 (Huo et al., 2023).

1.5.3 Electronic Health Records (EHRs)

EHRs were initially developed and commonly used for accounting and workflow management; however, a few EHR prototypes were utilized for information sharing between physicians, as well as between healthcare providers and organizations. EHRs are thought to create stress among healthcare professionals because to poor design, user unfriendliness, and the existence of inefficient workflow dynamics on healthcare structures.

The phrase Clinical Decision Support System (CDSS) refers to a system that assists physicians with medical decision making, particularly in exceedingly complex clinical cases. In this approach, these systems may provide a link between clinical observations and medical science, and have the potential, depending on fundamental algorithms, to influence medical physicians' final decisions in a high-stress medical context. The CDSS is critical to the AIM construction. (Figure 5). (Lidströmer, Aresu, & Ashrafian, 2022).

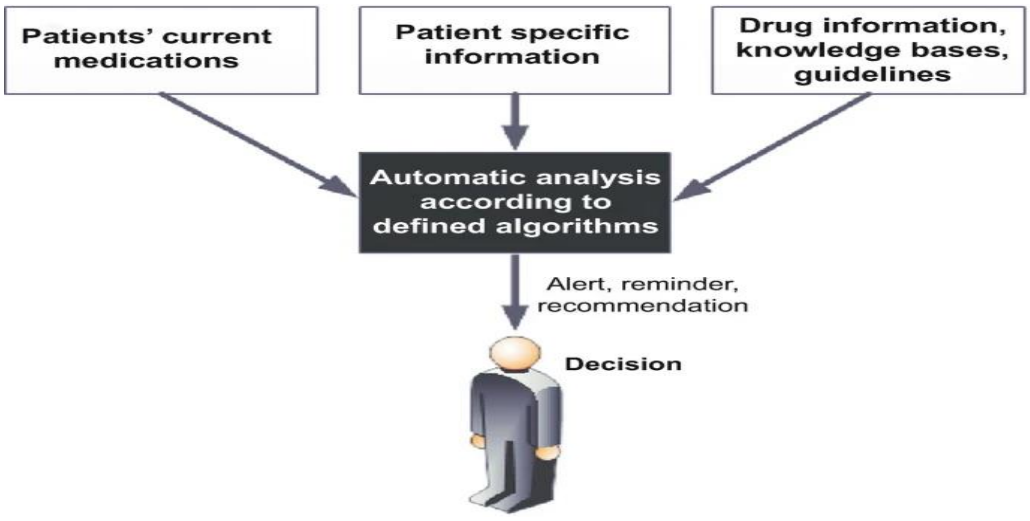


Figure 4: Principle of Clinical Decision Support System (CDSS)

Source: (Lidströmer et al., 2022). Introductory Approaches for Applying Artificial Intelligence in Clinical Medicine. Springer p.67

In a short period of time, wearable technology has managed to establish a significant position in the consumer electronics sector and is now seen as an innovative approach to meet the needs of many businesses. For instance, the construction industry has researched how to control health and safety in the workplace through proximity detection and physiological monitoring of construction workers (Choi, Hwang, & Lee, 2017).

The logistics industry has begun using wearable barcode scanner gloves called ProGloves to simplify work that does not involve the use of hands, and some insurance companies are promoting the use of wearable devices to encourage healthier eating habits and improve corporate wellness among workers (Wire, 2015).

Furthermore, several wearable devices, such as fitness trackers, are used by medical professionals to acquire physiological, behavioral, and contextual data for the diagnosis, treatment, and management of chronic diseases (Chiauzzi, Rodarte, & DasMahapatra, 2015).

Although many studies are underway to determine how these devices can be best adapted to different industries, it is expected that the applications of wearable device technology will rapidly expand in the near future (Chan, Estève, Fourniols, Escriba, & Campo, 2012).

1.6 Classification and application of smart wearable devices in healthcare

The most important application area for wearable technology is health. Wearables provide special opportunities for condition/activity monitoring, feedback, and actuation/delivery services because of the embedded intelligence, connectivity, and ever-increasing usability (e.g. drug delivery or stimulation), localisation, identification, personal contextual notifications, information display and virtual assistance. Essentially, smart wearable technologies and applications can monitor, record, and enhance human life, making them useful for both specific personal and professional activities. Smart watches and fitness trackers are the wearables that are currently extensively used. The list of products that were recently introduced to the market or are still to come, however, is significantly larger. It includes smart patches, textiles, glasses, virtual reality headsets, exoskeletons (wearable robots), as well as smart jewellery (e.g. hearing aid

designed in the form of ear rings and smart jewellery to monitor sleep quality). Figure 5 shows classification of smart health wearable devices without the guidance of a healthprovider.

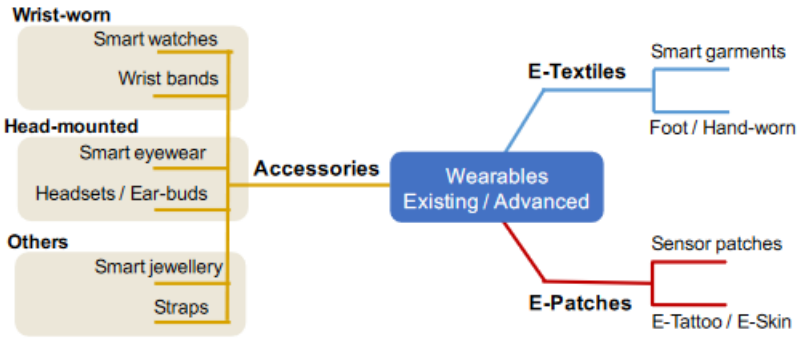


Figure 5: Classification of smart health wearable devices without healthprovider interaction

Source: (Seneviratne et al., 2017).“A Survey of Wearable Devices and Challenges“, IEEE Communications Surveys & Tutorials, 19(4), 2573-2620,p2.

Accessories are characterized as devices that are worn externally by users that do not fall within the category of primary clothing units. In the present wearable market, accessories are by far the most popular category of wearable devices. Smart watches, wrist bands, smart glasses, chest straps, smart belts, and other clothing clip-ons are examples of such electronic devices. Following that, the existing accessories goods was explained in three subcategories, along with their use cases:

Wrist-worns

Wrist-worns are electronic devices that are worn on the wrist, as the name suggests. Existing commercial wrist-worn goods are either smart watches or wrist bands, which are discussed in depth below:

Smart Watches: Smart watches are one of the most popular types of wearable devices. Current smart watches typically have two functions. First, they serve as communication and notification tools, supplementing smartphones with features such as receiving notifications (e.g., phone calls, SMS, email, voice control, and weather updates) and performing micro interactions (e.g., launching an app, limited web browsing, adding reminders, and taking voice commands). Second, most smartwatches

can monitor some human physiological signals and biomechanics, allowing them to function as fitness tracking devices, allowing users to register their daily activities such as automatically logging work out durations, tracking heart rate, step counts, and calories burned. The captured data is transferred to a smartphone or a cloud server for analytics and better user presentation, such as dashboards. The most popular smart watches are: Apple iWatch, Samsung Gear S2, Moto 360, Pebble Time.

Moto 360 is an example of a smart watch products. It is powered by the Android Wear operating system and works in tandem with Android phones. (limited set of functionalities are supported when paired with an iPhone). Moto 360 communicates with the phone via Bluetooth Low Energy (Bluetooth LE) or a WiFi network (when both phone and watch are connected to the same WiFi network), and it can additionally communicate with the internet independently. It can receive phone notifications such as a missed call, SMS, email, and social media updates. In addition, the Moto360 comes with the Google Fit software, allowing users to track their fitness activities using automatic activity identification for activities like walking, running, and cycling.

In addition to the two major areas of smart watch applications; communication and notification and monitoring human physiological signals and biomechanics, some smart watches, such as the Samsung Gear S2 and Moto360, are equipped with ambient sensing capabilities such as light sensors, allowing them to adjust the screen brightness accordingly. Such capabilities have been applied to unique applications that are not now available in consumer wearables (Yoon, Park, & Lee, 2015).

Furthermore, in addition to smartphone manufacturers such as Motorola, Apple, and Samsung, as well as manufacturers who began directly with smart watches such as Pebble, a number of regular wrist watch manufacturers such as Casio, Tag Heuer, Fossil, and Rolex, are now producing smart watches, indicating the popularity of smart watches. Nonetheless, the product analysis showed several usability issues, primarily linked to operating system readiness, such as limited support in different types of smart phones and support for different types of watch faces that more closely resemble traditional wrist watches. Finally, some smart watches have functions such as a GPS sensor, a heart rate sensor, and 3G/4G or WiFi internet connectivity.

Wrist Bands: The other prominent category of wrist-worn wearable devices is wrist bands. While wrist bands and smart watches have certain similarities, wrist bands

are designed primarily to track a specific set of health and fitness activities. As a result, most wrist bands lack a display screen for notifications or have a limited form factor as compared to smart watches, that aim to replace traditional watches. The most popular wrist bands are: UP by Jawbone, Fitbit Flex, MOOV NOW, Nymi Band.

Jawbone's UP4 wrist band is an example of a wrist band that uses bio-impedance sensors to record signals such as heart rate, movement, body temperature, and galvanic skin response(GSR). It can passively track and record user activities like as walking and running, and it can even monitor sleep. On the inside side of the band, five bio-impedance sensors detect the resistance of skin tissues to compute heart rate. A tri-axis accelerometer and temperature sensors (separate sensors for skin temperature and ambient temperature) are also included in UP4. The UP4 does not have a screen because it is a wrist band. The data may be viewed via the smartphone app, which is accessible for both iOS and Android. UP4 supports NFC payments in the same way that a credit card does.

Additionally, new wrist-mounted devices, such as smart watches and fitness bands, are now available with significantly longer battery life and hardware downsizing for translating raw data into real-time interpretable data. Smart watches are currently one of the most popular wearable medical devices. For example, GlucoWatch® biographer, the first non-invasive glucose monitor smart watch certified for commercial use by the U.S. FDA, is a wearable medical device that provides continual, automated, precise, and non-invasive assessments of the glucose levels in the human body. According to reports, the device obtains data on the levels of glucose in the body using reverse Iontophoresis via skin interstitial fluid.

Apparently, smart watches are also used to detect Parkinson's ailment in an individual through analyzing of tremor and balancing of dysfunction with an accelerometer. Furthermore, e-textiles, smart textiles, or smart clothing are used to monitor physiological signals such as daily heart rate, temperature at regular intervals of time, and daily breathing rate as a routine activity. Aside from that, it monitors biomechanics and physical activities such as body acceleration and motion.

Head-mounted devices are wearables that are worn around the head and neck. There are two key sub-categories: a) Smart Eyewear and b) Headsets and Ear-buds.

Smart Eyewear: Smart eyewear includes spectacles or contact lenses with sensing, wireless communication, or other capabilities such as virtual or augmented reality. Nowadays Microsoft HoloLens, FUNIKI Ambient Glasses, Recon Jet, Google Glass, Google Contact Lens, Object Modelling Eye-Wear, iShadow Mobile Gaze Tracker, Indoor Landmark Identification Supporting Wearable, Chroma.

Headsets and Ear-buds: Bluetooth headsets were the first consumer wearable devices and are still by far the most popular type of wearable in the market. Traditional Bluetooth headsets are designed to make hands-free calls, however more current models can conduct more advanced activities (also known as hearables).

Other Accessories are devices that are not mainstream enough to warrant their own category but can be worn on various areas of the human body. The device's functionalities are also broad and distributed. There are two primary sub-categories for clarity: a) Smart Jewellery and b) Straps.

Smart Jewellery: Products in this subcategory include smart rings, necklaces, and clips. Because of their compact size, these devices tend to have specific, concentrated, and limited functionality when compared to the general purpose features provided by smart watches or wrist bands. Smart jewelry is typically designed to notify users to smartphone notifications, make payments, track human physiological signs and biomechanics, or provide environmental sensing. But these items are less prevalent and relatively new to the smart wearable market. Products of smart jewelly are: Smarty Ring, Kerv, Bellabeat Leaf, Oura Ring. For example, Bellabeat Leaf is a health tracking smart jewelry made specifically for women. It just weights 18g and has a tri-axis accelerometer and a haptic vibration motor for notifications. Its design allows it to be worn as a necklace pendant, a clip, or a bracelet. It monitors breathing, everyday activities, sleep, and menstrual periods and transmits the data to the Bellabeat app via Bluetooth. By sensing data from arteries in the finger, the Oura ring continuously tracks sleep and activities. The compatible smartphone app generates reports for total sleep, REM sleep, training frequency and amount, and overall readiness in terms of sleep balance and activity balance. The ring detects when it is on the finger and smoothly syncs with the Oura app.

Straps

Smart straps are chest straps, belts, arm bands (attached onto the upper arm as opposed to a wrist band), or knee straps that are equipped with sensors for health tracking or other features. Smart straps have applications in monitoring human physiological signals, biomechanics, sensing, and haptics.

The Zephyr Bioharnes is a wireless physiological monitoring device that consists of an adjustable cloth chest strap and a Bluetooth transmitter module attached to it. The device can measure vital physiological signals such as ECG, heart rate, breathing rate, skin temperature, and posture in real time. It also detects chest expansions and contractions using an inbuilt capacitive sensor comprised of conductive cloth, foam, and flexible mylar to determine respiration rate. Nonetheless, owing of its high cost and complexity in accessing data, this device is not intended for casual consumers.

E-Textiles

E-textiles are clothes that have sensors and conductive materials embedded in them. Textiles are an excellent medium for health wearables devices due to their stretchability and large-scale skin contact. E-Textiles are primary clothing items that also applicable as wearables, such as smart clothing and smart shoes. Their main fuctions are: monitoring human physiological signals and biomechanics for diverse applications such as health and sports (Gokey, 2016), ambient sensing for military or dangerous areas (Scataglini, Andreoni, & Gallant, 2015), and sensory/haptic applications such as therapeutic massages (Seneviratne et al., 2017). E-Textiles are either conductive and comfortable-to-wear materials like conductive fibers and flexible electronic circuits, or they are ordinary clothing items with standard sensing, actuating, and data transmission modules. One such smart textile (e-suit) is by (Yapici & Alkhidir, 2017), who have developed an intelligent textile-based HWD for the monitoring of ECG. E-textiles are divided into two categories: Smart Garments and Hand/Foot-worns.

Smart Garments

The major clothing pieces are smart garments such as shirts, pants, and undergarments. There are a variety of such items available for monitoring human physiological signals and biomechanics. A variety of sensors, including electromyography (EMG), heart rate, and breathing sensors, are attached to various

clothing items, and the collected data is transferred to a smartphone app through Bluetooth via a hub module (dubbed Core). The software then visualizes the user's muscle exertion, muscle activation, heart rate, and equilibrium and provides feedback.

Foot / Hand-worn

In (Jain et al., 2015), authors proposed a shoe-based sensing and alerting system for the safety of distracted pedestrians. The system consists of inertial sensors mounted on the shoes, two Android applications running on a smartphone for data acquisition and data processing, and a notification feature which alerts the user.

Because of the loose contact between the skin and the SWD, the results of textile-based health wearable devices are distorted. This necessitates the use of extra signal processing techniques on raw data in order to obtain clean signals. Furthermore, textile-based HWDs offer comfort as well as real-time and continuous monitoring of the wearer, but their stability degrades with repeated washing due to the presence of bio-recognizable molecules. Tattoo-based HWDs may somewhat overcome the instability associated with textile-based HWDs.

E-Patches

E-Patches are the most recent category of wearables that are not yet well established as consumer wearables. Similar to existing products, they are classified as: Sensor Patches and, E-Tattoo / E-Skin.

Sensor Patches

Sensor patches is a stick-on patch that monitors ECG and EEG signals. The device can be charged wirelessly and transmit data to a computer in real-time. This patch is well-coupled to the skin which allows patients to move and behave naturally during the monitoring period.

E-Tattoo/E-skin

Traditionally, tattoos have been perceived as a form of body art because of its pliability and compliance. These properties can be used for monitoring and diagnostic purposes. Currently, e-skins are widely used for the detection of electrical and physical parameters such as ECG, EEG, and EMG (S. M. Iqbal, Mahgoub, Du, Leavitt, & Asghar, 2021). Furthermore, because to their compactness and stretchability, tattoo-

based ECG monitoring devices can alleviate the instability and sensitivity difficulties of textile-based ECG monitors. They are also flexible and comfortable to wear.

Wearable devices offer a wide range of applications in healthcare, from physiological diseases like cardiovascular disease, hypertension, and muscle weakness to neurocognitive disorders like Parkinson's disease, Alzheimer's disease, and other psychological diseases. For this aim, several types of wearables are used, such as skin-based wearables such as tattoo-based wearables, textile-based wearables, and biofluidic-based wearables. Wearables have recently showed positive advancements as a medication delivery method, increasing their utility in personalized healthcare.

Smart wearables play an important role in addressing urgent societal issues. Wearable technologies for point-of-care diagnosis or physiological monitoring can aid in the prevention of significant health issues while also reducing the rising economic burden on healthcare services. Moving away from treatment and toward prevention can result in a paradigm change in healthcare.

Smart wearables may measure several characteristics in real time, such as heart rate, respiration, or physical movements, allowing for an accurate analysis of users' context and biometric data. Wearable data allows healthcare providers to diagnose health problems at an early stage, monitor patients, and intervene in a timely manner when problems occur. There is currently a wide range of wearable devices in the healthcare market that track and anticipate epilepsy episodes or monitor diabetic patients' glucose levels and enhance drug delivery.

The human body has a variety of physiological signs that can be measured: from electrical to biochemical, human biosignals can be extracted and used to better understand the body's health status and response to external factors. It is critical to understand the main biosignals that contribute to a better human body health analysis before understanding how the signs are generated and how they can be obtained using wearable sensors and devices. Nowadays, technology and wearable situations allow to categorize wearable health devices according to three aspects (Figure 6): scenario of use (home/remote or clinical environment); the type of monitoring (offline or online); and the type of user (healthy or patient) (Banaee, Ahmed, & Loutfi, 2013).

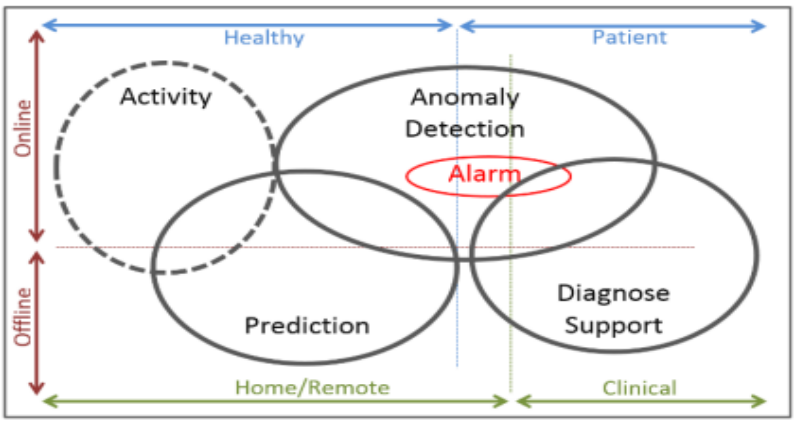


Figure 6: Schematic overview of the four main data mining processes

(activity, prediction, anomaly detection and diagnosis/decision support) in relation to different aspects of wearable sensing in wearable health devices. Filled line-Medical purposes; Traced line: Activity purposes.

Source: (Banaee et al., 2013). Data mining for wearable sensors in health monitoring systems: a review of recent trends and challenges. Sensors, p.17475.

Regarding this classification, it is possible to divide smart wearable devices in healthcare in two main areas, activity monitoring area (1) and the medical area (2) that is divided in three main sub-categories (Figure 6):

(1) Activity area—where fitness/wellness and non-medical applications, self-monitoring and rehabilitation procedures are included.

(2.1) Prediction—consists in the identification of events that have not occurred yet, providing medical information to help in the prevention of further chronic problems, and sometimes, can support a diagnosis decision (Banaee et al., 2013);

(2.2) Anomaly Detection—responsible for the identification of unusual patterns that are not conformed to the expected behavior, based on classification methods to distinguish normal data from outlier data. Alarm is a subtask mainly used in anomalies detection, raising an alarm as soon as an anomaly is detected (Banaee et al., 2013);

(2.3) Diagnosis Support—is one of the most important tasks of clinical monitoring, resulting in a clinical decision according to retrieved knowledge of vital signs, health records and anomaly detection data (Banaee et al., 2013).

This categorization of wearable health devices led to better understanding of the main areas of application, showing their multi-purpose usages. It is known that the use

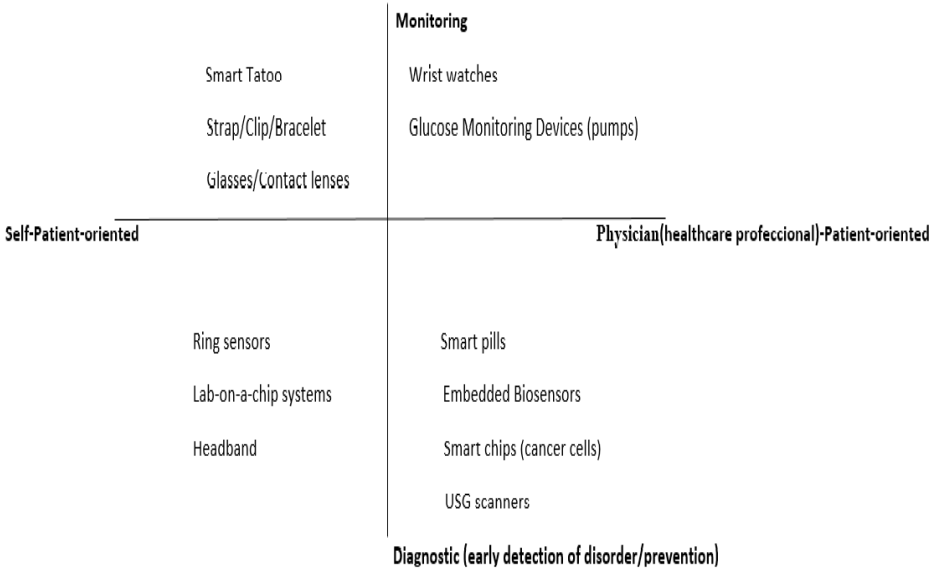
and monitoring capabilities are limited to which signals wearable medical devices are capable of capturing.

Based on device, the global wearable devices market has been bifurcated into diagnostic/monitoring and therapeutic devices. The diagnostic/monitoring devices segment has been split into vital signs monitoring devices, glucose monitoring devices, sleep monitoring devices, fetal monitoring and obstetric devices, and neuromonitoring devices. The teurapeutic devices segment has been segregated into pain management devices, rehabilitation devices, and insulin pumps.

In terms of apllication, the global wearable devices market has been divided into sports/fitness, home healthcare, and remore patient monitoring.

Based on previous researches, with aim to identify the most useful, both medical and not medical (described as “activity”) and to better understand the evolution of scientific investigation in SWDs, the Figure 7 was created according to two criterias: the expected purpose of application (monitoring, diagnostic (early detection of disorder/prevention) and the object-orientation information (Self-Patient-oriented, Physician (Healthcare professional)-Patient-oriented):

Figure 7: SWD classification matrix according to the purpose of application and object-orientation information



Source: Developed by the researcher

This study is focusing on the fourth part of the matrix, which is “Diagnostic (early detection of disorder/prevention) smart medical devices”. The effect of TAM and Signaling Theory is analyzed by focusing on Physician (healthcare Profeccional)-Patient-oriented smart medical devices in the study.

Physicians have typically supported patients as they consider various treatment choices as subject matter specialists. However, against the backdrop of precision medicine approaches as well as digital surveillance and prevention regimes, increasingly patients are expected to take initiative and care for themselves – by generating data, by looking for people who can help them make sense of the information, and by being the main actors in disease prevention. In reflecting on the “datafication of health” (Weiner, Will, Henwood, & Williams, 2022), scholars have identified the expectation that patients, equipped with smart phones and other tools to collect data on various aspects of their bodies and lives, will be increasingly asked to prevent lifestyle diseases or even diagnose their own medical problems. Digital health proponents have suggested that this development might result in a completely new model of care for doctor-patient relationships. New standards for patient involvement and care have emerged as a result of the digital revolution that has accompanied the increase in the number of personal devices and digital applications in medicine. These new standards have given birth to various forms of "digital selfcare."

Self-oriented: Increasingly, patients are expected to take initiative and care for themselves through practices of digital self-care: by generating data, by looking for people who can help them make sense of the information, and by being the main actors in disease prevention. Equipped with smart phones and other tools to collect data on various aspects of their bodies and lives from brain waves to activity to diet, patients are expected to prevent lifestyle diseases and diagnose their own medical problems, heralding an entirely new model of care within doctor-patient relationships.

The wearable health monitoring systems that use medical sensors in-home and outside the hospital can help residents and caregivers by continuous and non-invasive health monitoring with minimal doctors' and patients' interaction (Cho, Lee, Lim, Kwon, & Yoon, 2009).

Physician (healthcare professional)-oriented: IoT, online communities, digital health records, and other healthcare-related technologies are frequently cited as ways to

raise the existing levels of healthcare delivery. Such technologies have a wide range of benefits from the perspectives of patients and organizations, and this is due to their capacity to continuously collect, analyze, interpret, and share health data. Particularly, Electronic Health Record (EHR) stands as a major technology for sharing health data among the triad: health policymakers, healthcare providers, and patients. It gives patients access to their own health information and diagnosis, involving them in collaborative interaction with care providers. Additionally, it gives medical professionals immediate access to a patient's medical information wherever they are. As a result, it helps with precise treatment decision-making and raises the standard of care. EHR additionally reduces organizational expenses, encourages health care innovation and research, and supports policy decision-making.

Certain wearable health devices are used under the guidance of a physician since they can create major problems if not utilized properly. Ingestible sensors, wearable injectors, and wearable insulin pumps, for example, required medical intervention to decide whether the user requires such a device and to place it properly on the human body or to determine the right drug dosage. On the other hand some wearable health sensors (devices that can be easily worn by the user without requiring any medical procedure) without intervention by experts for monitoring various applications are represented in Figure 8, that reveals detailed classification and categories of wearable devices, e.g., wrist-worn (smart watches, wristbands), head mounted (smart eyewear, headsets), ornaments (smart jewelry, rings and chains), e-textiles (smart garments, t-shirt and wears), e-patches (sensor patches and e-tattoo), sports and fitness (smart wearable sensors, smart bracelets), etc.

Various miniaturized, epidermal or electronic skin (E-skin) sensors for monitoring various biometric signals have made encouraging progress, bringing users one step closer to ultimate personalized health-care management within the IoT-based wireless body area network system with closed-loop feedbacks.

In general terms, such wearable personalized healthcare system may have three tiers. In the first tier, a wide variety of wearable sensors (wristbands, smart textiles, smart rings, epidermal tattoos, microneedle patches, eyeglasses, masks, etc.) capture various physical/physiological/biochemical signals from different parts of human body (Ates et al., 2022). In the second layer, real-time biometric data are transmitted to the worldwide internet via wireless units (e.g., low energy Bluetooth) for remote healthcare

data processing and analytics. Adaptive machine learning and artificial intelligence (AI) algorithms may be completed in the final tier, enabling efficient AI-based decision making and feedback-controlled closed-loop responses for efficient medicinal interventions or therapies.

There have been a few excellent reviews in wearable healthcare from different perspectives (J. Kim & Campbell, 2019), (Yao, Swetha, & Zhu, 2018), (Trung & Lee, 2016). In Figure 8, the significance of "soft stretchable wearable healthcare" was disclosed by covering novel materials and design, types of biometric signals, and closed-loop feedbacks. The representative biometric signals include blood pressure (BP)/pulse, electroencephalogram (EEG), electrooculogram (EOG), electrocardiogram (ECG) electromyogram (EMG), and chemical/biochemical profiles (metabolites, ions, drugs, and biomolecules) (Lyu, Gong, Yin, Dyson, & Cheng, 2021).

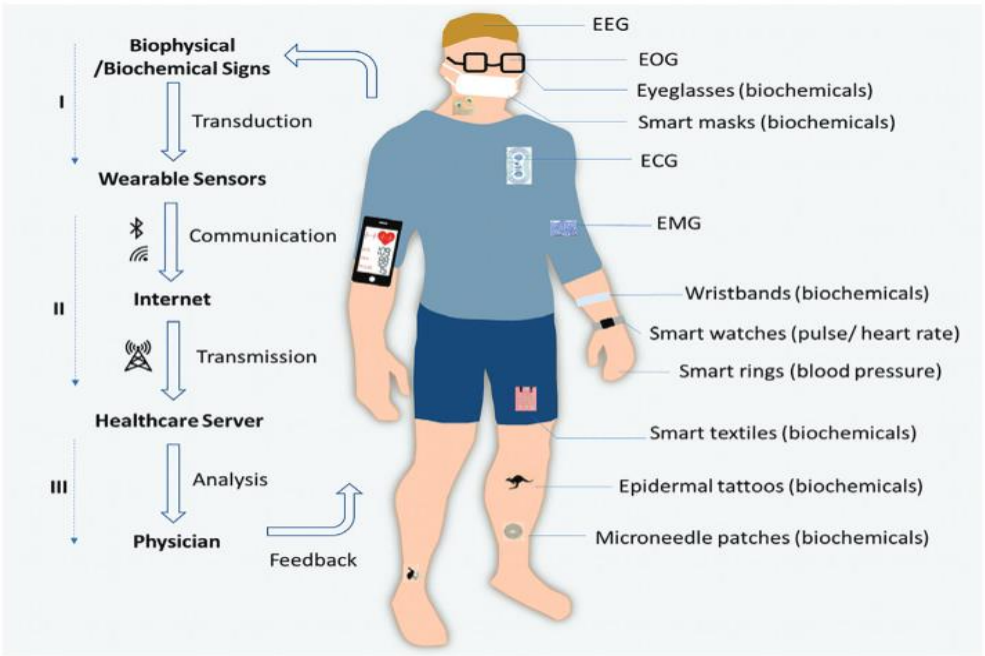


Figure 8: Schematic illustration of the IoT based wireless body area network (WBAN) systems for personalized healthcare management

Source: (Lyu et al., 2021) Soft wearable healthcare materials and devices. *Advanced healthcare materials*, *p.2.*

Figure 8 shows representative examples of wearable health technology products that provide realtime monitoring of health status with the help of integrated smart

sensors. In this context, some examples of wearable health technology products help to monitor tears via smart lens, body temperature via temperature sensors, saliva for tooth protection, breathing via face mask, perspiration via biosensors, activity via strain sensors, personal power via friction electrification generators, blood pressure via pressure sensors, photoplethysmogram (PPG) via photodetector, and scars via electroencephalogram (EEG) sensors.

Previous researches disclosed the fact, that besides competitive **skin-based HWDs** (wrist bands, smartwatches, wearable vests, skin patches, implantable HWDs, different monitoring biomarkers), there is another group of health wearable devices – **Biofluidic-based health wearable devices.** Body secretions like sweat, saliva, tears, and urine contain important biomarkers that are essential for monitoring and diagnostic purposes. HWDs can be used directly or through their integration with other platforms, for example, microfluidic platforms can be integrated for the extraction of useful information from different biofluids (S. M. A. Iqbal & Butt, 2019). Microfluidic platforms of different materials can be used in HWDs for example, polymer-based microfluidic devices, paper-based microfluidic devices, and micro-sized needles known as microneedles (Padash, Enz, & Carrara, 2020).

Wearable Drug Delivery Systems supports delivering drugs in a controlled manner. For instance, (Ly, Layne, Huyett, Nazzaro, & O'Connor, 2019) have utilized the Bluetooth technology for the controlled release of insulin. The Bluetooth enabled insulin pump is tubeless in nature and can hold up to 200 units of U-100 insulin. It consists of cannula insertion and automated priming along with a personalized diabetes manager, portable for the remote control of insulin delivery. In another research, (Keum et al., 2020) have developed a smart contact lens for the detection of glucose levels from tears and for delivering drug for diabetic retinopathy therapy (Keum et al., 2020). According to the type of application, SWDs were divided as shown in Figure 9.

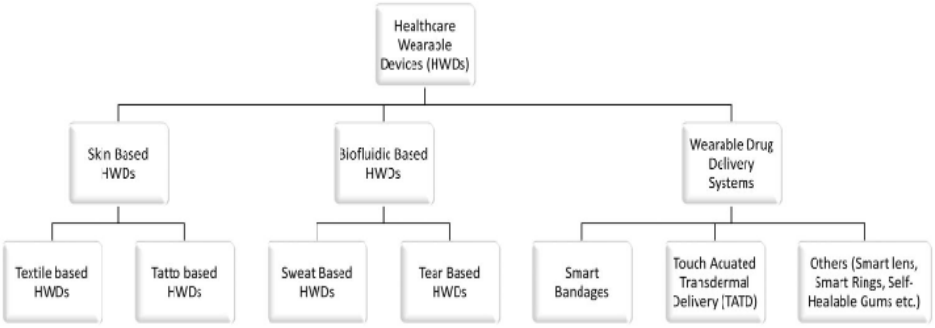


Figure 9: Classification of Smart Healthcare Wearable Devices (SHWDs)

Source: (S. M. Iqbal et al., 2021). Advances in healthcare wearable devices. Flexible Electronics: p.2.

The International Electrotechnical Committee (IEC) Standardisation Management Board Strategic Group 10 on Wearables has ongoing efforts to clarify the terminology and obtain an agreed understanding of Wearable Smart Devices. It distinguishes between the following categories of smart wearables: near-body electronics, on-body electronics, in-body electronics and electronic textiles (Banerjee, Chakraborty, Kumar, & Biswas, 2020).

The global wearable healthcare devices market is segmented as follows:

By Device Type:

Diagnostic and Monitoring Devices

- Vital Sign Monitoring Devices
- Sleep Monitoring Devices
- Glucose Monitoring Devices
- Fetal Monitoring and Obstetric Devices
- Neuromonitoring Devices

- Therapeutic Devices
  - Rehabilitation Devices
  - Respiratory Therapy Devices
  - Pain Management Devices

- Insulin Pumps

By Application:

- Sports and Fitness
- Home Healthcare
- Remote Patient Monitoring

By Type:

- Activity Monitors
- Smart Clothing
- Patches
- Smartwatches

By Distribution Channel:

- Pharmacies
- Hypermarkets
- Online Channel

1.7 Advantages and disadvantages of wearable technologies

Wearable technology devices are designed to make people lives safer and more efficient. However, in addition to its benefits, it has some drawbacks that might have a negative impact.

Wearable technology provide the following advantages:

Efficiency: Wearable technologies are used in various ways in different sectors to increase productivity. For example, in the healthcare industry, doctors can easily find solutions using wearable technology without having to look at a patient's veins and then wait for a scan or X-ray. In the business world, wearable technology products help solve problems faster and with significant benefits to both the company and its customers.

Employee Satisfaction: Choosing the right wearable technology products for businesses also significantly increases employee satisfaction and job participation, making the investment more than worth it.

Leveraging Different Technologies: One of the most important features of wearables is their ability to connect to other systems. Investing in these wearable devices increases the effectiveness of the investments made and increases the value in that market.

Other: Wearable devices save time as they allow many tasks to be done at the same time, and allow the use of advanced voice detection systems instead of long messages and texts.

In addition to the many benefits and advantages of wearable technologies, there are also some disadvantages that are mentioned below:

Potential for Distractions: Like smartphones, wearables offer distractions. For example, while the smartwatch is a great kit, the many features offered by the manufacturers and the growing number of updates mean there is always something new to play with.

Expensive: Wearable devices that provide business benefits are often quite expensive.

Non-independence: Many wearable devices require different platforms to function properly. In this case, while investing in wearable devices, new systems may be required at the same time.

Size and Battery Limitations: Despite major advances in smart wearable technology, most devices are still subject to technical limitations. The most important is the size of such devices and the limited battery capacity provided. This is a situation that both makes it difficult to use and destroys reliability.

Confidentiality Issues: It is very important to ensure privacy and data security and to design products in this way. Personal health data is more sensitive than other types of personal information (e.g. demographic characteristics, consumers' interests and or purchase history information, social network environment etc.). Thus, users of wearable medical devices are more likely to worry about their health data than other personal information, and especially if it could be shared with unconcerned persons.

1.8 Technology Acceptance Model (TAM)

Davis created the Technology Acceptance Model (TAM) in 1985 as an adaptation of the Theory of Reasoned Action and Theory of Planned Behavior in order to reveal the reasons for technology acceptance (Davis, Bagozzi, & Warshaw, 1989). Since its inception, the model has been extensively used in a variety of study areas relating to technology adoption as a means to assess acceptance in pre-post use scenarios. Considering the model and logic that there is a sequence of causal relationships between what individuals believe about using a system and actual use, the rationales suggest that users' beliefs about a technology will influence their attitude, which in turn will modify their intention to use or not use the technology.

The rationale of the model assumes that gaining knowledge on the factors that shape intentions is useful in explaining, predicting and controlling acceptance of a technology. According to the first version of the model, three main factors shape intentions towards technology. The most immediate precursor to technology usage is behavioral intention to use it (BI), which is now universally understood to be what is meant when one talks about technology acceptance. End-user satisfaction is another popular interpretation of acceptance. BI is occasionally the sole measurable outcome of interest in the TAM since it is believed to accurately predict actual usage, and the latter is challenging to measure. One's attitude about using the technology might affect their BI. Perceived utility (PU) and perceived ease of use (PEOU) are the two factors that determine attitude (ATT). Likewise, it is stated that PU has an impact on BI, and that PEOU has an impact on PU.

During the course of the years, the TAM model has undergone a lot of modifications. For instance, the ATT component, which initially mediated part of the impact of PU and PEOU, was eliminated from the model in an update known as TAM2. Subjective norm (SN) is a new variable that TAM2 adds to measure the social impact that leads end users to positively appraise and embrace Technology. The Unified Theory of Acceptance and Use of Technology (UTAUT), a theory that has a striking similarity to TAM, was developed even more recently in a commendable attempt to assemble the technology acceptance literature. Under these circumstances, UTAUT combines PU, PEOU, and SN to provide a performance expectation construct, an effort expectancy construct, and a social impact construct.

TAM, either in the original model as developed by Davis in 1985, or in the adapted versions that evolved with time, has been frequently used in the healthcare industry to comprehend and foresee how new healthcare technology will be embraced and utilized by healthcare professionals, patients, and other stakeholders. An example is the assessment of electronic health records (EHRs). TAM has been utilized to comprehend the elements that affect healthcare providers' acceptance and adoption of EHRs (Noblin, Wan, & Fottler, 2013); (Razmak & Bélanger, 2018); (Tubaishat, 2018). The creation and usage of mobile health (mHealth) applications is another example. TAM has been used to uncover the elements that affect the acceptance and usage of mHealth apps by patients and providers as well as to create interventions to boost adoption and use (Rajak & Shaw, 2021). The usages of TAM in healthcare and generally speaking, it has been a useful framework in comprehending and enhancing the adoption and usage of healthcare technologies. Yet, its application in healthcare is anticipated to keep expanding as new technologies are developed.

Particularly, this study focuses not just on individuals' behavioral intention to accept and use smart wearable health devices, but also on the role of hospital corporate image on intention to use them. There have been few studies in literature that look at wearable medical devices from the individuals' point of view in content with hospital corporate image. To address the mentioned research gaps, this research was conducted and experimentally tested a model that try to explain pre-post users' intents to adopt and use smart wearable medical devices taking in account and analyzing the effect of their PV, perceptions of Hospital Corporate Image and as additional factor also individuals' consumer innovativeness.

1.9 Signaling Theory

When purchasing a good or service, particularly for the first time, customers frequently want to know a number of things that are difficult to directly perceive. Customers frequently know much less about the real worth of a product than the company they are purchasing it from. This might lead to a mismatch between perception and reality. One way to bridge that gap is by demonstrating the knowledge and commitment to customers. Companies that are committed to transparency and fairly communicating with their customers on a regular basis tend to view marketing as an

investment rather than an expense and rarely fail to understand the importance of the market signals they send.

Signaling theory is fundamentally concerned with reducing information asymmetry between two parties (Spence, 2002). Starting from the seminal work of Spence (1973), that focuses on the labor market and describes the behaviors in reducing information asymmetry, it found further application in a variety of study scenarios, to assist the understanding of information asymmetry.

Signaling theory is a concept in economics and sociology that explains how individuals and organizations use signals to convey information about their quality or abilities to others. The theory suggests that signals are used to overcome the problem of asymmetric information, which occurs when one party has more information than another. In the context of employment, for example, an employer may use signals such as educational qualifications, work experience, and references to indicate their abilities to a potential employer. These signals can help to reduce the uncertainty of the employer about the employee's quality and suitability for the job.

In the context of consumer behavior, companies may use signals such as corporate image, advertising, and product quality to indicate the quality and value of their products to potential customers. These signals can help consumers to make more informed purchasing decisions and help companies to differentiate their products from competitors.

Overall, signaling theory is an important concept in understanding how information is conveyed and interpreted in various economic and social contexts. According to the theory, the main parties in this sequence are the signaler and the receiver, together with the signal itself. In their most basic form, signaler and receiver interact by sending and receiving a single signal. The fundamental tenet of the signaling theory is that signalers are insiders (such as executives or managers) who acquire knowledge about a person, product, or organization that is unavailable to outsiders. The unavailability of information to outsiders creates an information asymmetry. On the whole, the information that insiders get would be beneficial to outsiders and inform their decision-making process.

Information about quality and information about intent are two general categories of information that (Stiglitz, 2000) identifies as being particularly relevant in

terms of asymmetry. A broad range of management studies that explicitly use signaling theory focus on the importance of signaling in understanding how parties resolve information asymmetries concerning latent and unobservable quality. Accordingly, the literature highly agrees on the existence of an information asymmetry about performance and quality in healthcare between patients and physician/provider (Hammer, Haas-Wilson, Sage, & Peterson, 2003). This informational inequality is the starting point of diverse estimations between patients and providers referring to the same service encounter and of the need to adopt certain technologies. As information affects the decision-making process, it will be useful to understand how it may affect their intention to adopt the technology. In this context, signaling theory can help to explain the influence of information asymmetry in the adoption of smart wearable devices in hospitals. Patients may get a signal from hospitals' corporate image and brand quality, that may be useful to craft as an antecedent of technology acceptance and intention to adopt and use smart medical devices.

1.10 Hypothesis Development

In the following section, perceived value, performance/financial risks, behavioral intention to use smart wearable devices, hospital corporate image and consumer innovativeness will be explained for hypothesis development.

1.10.1 Hospital Corporate Image as a signal

Healthcare is one of the most essential, yet personalized, services that a customer is able to receive. More competition will exist within the healthcare industry as more healthcare options become available to consumers (e.g., minute clinics in drug stores, after-hour urgent care clinics). As hospitals compete on care and quality results, marketing will become increasingly important. Effective marketing strategies require the development of a powerful brand identification, and in response to these challenges, leading healthcare organizations have increased their efforts to reinforce their brands and corporate image.

Hospital corporate image refers to the perception that the public has of a hospital or healthcare organization. It includes the hospital's reputation, brand identity, and overall image in the community. A strong corporate image can enhance a hospital's ability to attract patients, recruit top medical talent, and secure partnerships with other healthcare organizations.

There are several elements that contribute to a hospital's corporate image, including:

1. Quality of care: A hospital's reputation for providing high-quality care is critical to its corporate image. Patients and their families want to feel confident that they will receive the best possible care when they visit a hospital.

2. Patient experience: The patient experience is an essential element of a hospital's corporate image. Patients want to feel that they are receiving compassionate, personalized care, and that their needs are being met.

3. Staff expertise: The expertise and professionalism of a hospital's staff are essential to its corporate image. Patients want to know that they are being treated by skilled and knowledgeable healthcare professionals.

4. Facilities and technology: The physical environment and technology of a hospital are also critical to its corporate image. Patients want to receive care in a modern, clean, and well-equipped facility.

5. Community engagement: A hospital's involvement in the local community can also contribute to its corporate image. Hospitals that are active in community outreach and education programs are often seen as caring and committed to the well-being of their community.

Creating and maintaining a positive corporate image requires a comprehensive approach that includes all of these elements. Hospitals can achieve this by investing in quality care, providing exceptional patient experiences, recruiting and retaining top medical talent, and engaging with their local communities.

In light of the definitions and explanations, corporate image is, ‘the composition of all the information people obtain and subconsciously reserve about an organization during a specific timeframe, which cumulatively culminates in an evaluative

perceptional favorable or unfavorable judgment, using all the communication resources available to them' (Gürses & Kiliç, 2013).

The concept of corporate image has incited increased interest in business and management fields, as determining how they are perceived by the public and re-formulating their strategies accordingly is critical for the efficient and effective execution of business functions, enhancement of corporate performance, and corporate sustainability. In particular, corporate management executives in healthcare are becoming increasingly conscious of the significance of corporate image and its implications for their companies' long-term sustainability.

In recent years service offerings with health and wellness at their core have become an essential component of the global healthcare business. In the beginning, patients from less developed countries might travel to developed countries to gain access to renowned and skilled physicians as well as advanced medical facilities.

Building company image and identity is the easier method to accomplish product differentiation, attract and keep customers, and achieve total organizational goals in today's highly competitive business environment. Corporate image is a valuable intangible asset that describes the manner in which a company, its activities, and its products are perceived by the public. In other words, corporate image is a function of organizational communication or signals of its overall operations which determine the perceptions of customer, employees, government, competitors, suppliers, potential employees and other stakeholders (Kolade & Ogunnaike, 2014).

According to a study based on the image forming theory by (Riezebos, Riezebos, Kist, & Kootstra, 2003), brand image can be arguably formed through inductive inferences. In this case, social aspects and marketing communication strategies were found to be prominent inductive processes with extensive credibility toward instilling the image of a brand in the minds of fellow consumers (Riezebos et al., 2003). Prior studies have found that brand name and corporate image are the most important extrinsic signals customers use to evaluate products across cultures when they face uncertainty about them (Dawar & Parker, 1994); (Richardson, Dick, & Jain, 1994). Moreover, the role of corporate image as a social signal is widely accepted as a key motivational factor in consumer choice (Lannon & Cooper, 1983).

Corporate image is important specifically in healthcare industry. In the context of healthcare, hospital corporate image is a patient's perception of the hospital based on interactions with its services, actions, and activities, as well as what they have read about the hospital and visual images they recognise. Corporate image is important for health organizations in several terms. Image is effective on hospital executives in distributing future resources and determining priorities. If the image of a hospital gets tarnished, its market share will decrease through the decreases in the preferences of hospital, consumer, supplier and physician. On the other hand, a good hospital image will increase patients' tendency to choose the hospital in the future (K. H. Kim, Kim, Kim, Kim, & Kang, 2008).

Corporate identity is referred to as the personality of the hospital in quantitative (i.e. size of the hospital, availability of modern equipment, volume of patronage) and qualitative (i.e. quality of service, reputation and image of the hospital) terms that distinguish one hospital from another and attract and retain patients. Perceived quality product means patient's judgment about the level of efficient and excellence healthcare delivery (Kolade & Ogunnaike, 2014).

In the healthcare context and in terms of hospitals, the main goal of creating a strong and positive hospital corporate image (HCI) is to establish the hospital as a first-choice medical facility, increase patient satisfaction and loyalty. Under these considerations, the HCI can be considered as the perception that patients have of a hospital based on their interactions with its services, as well as information they have acquired about the facility and recognizable visual symbols. It is understandable that being an important factor in attracting patients and building loyalty, it will probably exert an effect on the perceived value of using a wearable devices and on intention tu use this devices when the recommendation of the usage of these devices comes from a hospital that has a positive HCI, or shortly a good reputation as compared to other medical facilities (Alrubaiee, Aladwan, Joma, Idris, & Khater, 2017). Thus, wearable device consumers may consider not only the device's brand name but also its provider and application development healthcare corporations, as they are relatively new smart devices, and their brand names are easily exposed.

In the light of this information, it was assumed that the hospital corporate image may also have an influence on intentions to use smart wearable medical devices. In this

study hospital corporate image has been considered as a signal. Therefore, it is assumed that:

H1: Hospital corporate image has a significant positive role in SWD's perceived value.

H2: Hospital corporate image has a significant positive role in intention to use SWD.

1.10.2 Consumer Innovativeness

Nowadays smart wearable technologies are anormally popular. Majority of people who purchase and use such devices are innovators and early adopters.

Consumer perception of a new product or service is invariably crucial for its success because it directly drives adoption behavior for new technologies. Furthermore, product innovativeness has a substantial impact on a company's profitability; hence, understanding how consumers innovativeness in their products is a top priority for each corporation.

As business competition has increased, new product development has come to be the main source of company competitive power. It is critical for academic researchers and IT firms to appreciate how consumers react to new smart wearable technology. Nonetheless, in the case of health smart devices, little attention has been paid to the innovative aspect in developing users' long-term intentions. Because of the dynamically fast-moving technology environment, some people believe that there are very few smart devices that arouse their interest in using a wearable device at the present time.

There is absolutely no doubt that new product responses are linked to consumer innovativeness, which means that investigating individual innovativeness is essential. The first study that relates individual innovativeness to personality traits was by Midgley and Dowling in 1978. Individual innovativeness was defined as the degree to which an individual can accept new knowledge and make innovative choices without the influence of others, emphasizing its independence from communicated experience, situational effects, and product category. Actualized innovativeness is defined as how fast an individual accepts innovative things. In the market context, actualized

innovativeness is represented by the purchase intentions, attitudes towards a new product, the relative time of the adoption of new products and the number of new products owned (Lassar, Manolis, & Lassar, 2005).

The diffusion of innovations theory (Kapoor, Dwivedi, & Williams, 2014), technology acceptance model (Davis et al., 1989), expectation confirmation theory (Bhattacherjee, 2001), and flow theory (Koufaris, 2002) are the major theories that are widely discussed and used by various researchers to predict the adoption process and consumer's decision behavior for the target market. Nevertheless, little attention has been paid to the role of innovativeness in building users' intention in the context of emerging smart technology. Accordingly, our research aims to conduct a new model to explain the users' intention to use SWD, and the contents of this research focused on the consumer innovativeness' effect on perceived value and behavioral intention to use SWD. In a recent research on consumer innovativeness in new technology adoption intentions, (G. Li, Zhang, & Wang, 2015) point out that consumer innovativeness remains an important concept in understanding the adoption of new products, and predict consumers' innovative buying behavior using innovativeness as a personality trait. Consumer innovativeness can be conceptualized as "the tendency to buy new products in a particular product category soon after they appear in the market and relatively earlier than most other consumers in the market segment" (Foxall, Goldsmith, & Brown, 1998).

Consumer innovativeness influences a person's propensity for engaging in unique and risky behaviors. Hirschman (1980) claimed that innovation may be thought of as the desire to learn more about a new product rather than purchasing it. It may be thought of as a low-risk sort of novelty-seeking behavior that is easily available. The initial good impression that a consumer has of a new product (such as enthusiasm) is known as perceived novelty. In contrast to other customers, such as followers, innovative consumers have a propensity to have favorable views toward the new functions and features, and thus are prepared to take more risks to test them out, and even have a stronger inclination to embrace them (Lee, Qu, & Kim, 2007). According to previous studies, individuals with higher innovativeness are more likely to seek out new opportunities. So, based on this information, this study estimates the role of consumer innovativeness in perceived value and intention to use SWD. Thus, it is assumed that:

H3: Consumer innovativeness has a significant role in intention to use smart wearable devices in healthcare.

H4: Consumer innovativeness has a significant positive role in perceived value of smart wearable devices.

1.10.3 Perceived Value

The term "perceived value" describes how a user evaluates the value and utility of a specific technology or system. It's a crucial element in figuring out if users will accept and use a technology. Perceived value is an indicator of a consumer's adoption intention, as it reflects utility by comparing benefits and sacrifices (Knight & Young Kim, 2007). Perceived value in the TAM is often quantified in terms of the benefits that the user believes come with utilizing the technology. The TAM suggests that people are more likely to accept a technology if they believe it to be useful and if they believe using it will be more beneficial as compared to the costs and efforts involved (Davis, Bagozzi and Warshaw, 1989). For example, (Turel, Serenko, & Bontis, 2010) confirmed that the overall perceived value of hedonic digital artifacts (such as MP3 songs) had a significant effect on behavioral intention to use in the future. In line with extant research that suggests perceived value as an antecedent of adoption intention, we consider that the perceived value will have an effect in the intention to use wearable devices, and greater value perceived by patients will be linked with increased intention to adopt the technology. Thus, to deepen the understanding of customers' adoption behaviors around wearable devices, perceived value should be considered as a predictor of customer adoption behaviors. Therefore, the following hypothesis proposed that:

H5: The perceived value of healthcare smart wearable devices will play significant positive role in intention to use them.

1.10.4 Intention to Use

With the continued growth in the usage of smart wearable devices in healthcare, further research into the major drivers determining intention to use is required. Intention

to use is the ‘‘degree of the psychological state of the people’s general minds to use specific services and systems” (Davis, 1989).

The subjective likelihood or willingness of a user to utilize a specific technology or system is referred to as intention to use a technology in the TAM. In general, the TAM considers intention to use a technology to be a key construct because it aids designers and developers in understanding consumers' adoption and usage patterns and can be used to lead the design and development of more likely-to-be-adopted technology. Considering that the literature confirms that intention is the primary determinant and a reliable predictor of actual use, it will be used as the outcome variable of the model of investigation.

1.10.5 Perceived Benefits and Perceived Risks

Despite the favorable prospects and functionality of smart wearable devices, little study on user acceptability and behaviors has been conducted because they are still in the early stages of commercialization. This research focuses on customers’ perceived value of wearable devices and intention to use them as well as its determinants. This study divides users into potential users and actual users to compare the significant factors influencing intention to use smart wearable devices.

(Orr, 2003) found that both extrinsic and intrinsic factors influenced perceived value and behavioral intention. Social image, the extent to which peers in a user’s social network respect and admire the user because of IT usage (Lin & Bhattacherjee, 2010), is another important component of perceived benefit because people want to improve their social status or differentiate it from those of others in their social system.

(Dowling & Staelin, 1994) conceptualized perceived risk as the consumer’s perception of the uncertainty and adverse consequences of purchasing a product or service. While a number of risk dimensions have been suggested, performance and financial risk are the most commonly used to estimate risk. Financial risk is defined as the possibility of monetary loss due to a customer, including product repair or replacement and refunds (Horton, 1976). This risk also includes possible future costs as well as the perceived price at the point of purchase. Performance risk is the possibility that it will incur a loss when a product or brand falls short of a customer's expectations.

Thus, a conceptual distinction between financial and performance risk is that the price of the product is an intrinsic component of financial risk, whereas price is not directly related to performance risk. (H.-W. Kim, Chan, & Gupta, 2007) regarded perceived fee (monetary) and technicality (non-monetary) as components of perceived sacrifice; these constructs are similar to financial risk and performance risk, respectively.

Trying a new product or service always carries some risk because every action has unintended consequences, some of which are almost always unpleasant. Risk may cause consumers to delay or cancel the purchase of a new product and thus negatively affect an intention to use. (Sarin, Sego, & Chanvarasuth, 2003) suggested that customers perceive the decision to purchase new high-tech products as risky because these products and their industries exhibit pervasive technological and market uncertainties. (Chen & Dubinsky, 2003) discovered that the main perceived risk components, performance risk and financial risk, were negatively connected with online shoppers' perceived customer value. Wearable gadgets are new high-tech items, and their performance, pricing, and maintenance costs may all be important elements in determining their value as useful computing devices. Thus, perceived performance risk is defined as the probability that wearable devices would not function properly, whereas perceived financial risk is defined as the possibility of monetary loss incurred as a result of purchasing or maintaining wearable devices.

A wide range of risks have been identified in the literature, but the most discussed in terms of technology are the financial and performance risks related with the purchase of a product/new technology. Consumers' concerns about a technology failing to function as anticipated and the loss that would result from this failure are referred to as performance risk. Performance risk has been recognized by extant research as a deterrent to the use of wearable technologies (Nasir & Yurder, 2015). Therefore, consumers' perceived performance risks of the smart wearable devices can negatively affect their attitude to it and hence decrease their intention to buy and use the product. Another study on elder Chinese adults also showed that participants' higher perception of performance risk led to a lower perception of health monitoring wearables usefulness, which could further prevent them from buying the wearable devices (J. Li, Ma, Chan, & Man, 2019). Intelligent wearables can continuously monitor people's everyday behavior and activities, which is one of its primary tasks. As such, whether one wearable device can detect and measure the target parameters accurately is an

essential performance issue. In some cases, such as clinical medicine, inaccurate measurements can lead to irreversible losses. As a conclusion, according to the statements from previous researches that confirm the significant role of perceived risks factor in intention to use toward smart wearable systems.

On the other hand, financial risk is the “net financial loss to the consumer including the possibility that the product may be repaired, replaced, or the purchase price refunded” (Horton, 1976). Consumers' worries about potential financial losses when purchasing wearable technology may have a detrimental impact on their purchase intentions.

1.11 Group Differences

Demographic and socioeconomic characteristics are essential factors in social science research. The incorporation of these factors in social science studies, as well as their analysis and interpretation of results, beneficial effects both academic and administrative fields. Moreover, demographic and socioeconomic differences have been one of the most important topics for years in terms of psychology, marketing, and behavioral studies. These studies showed that purchasing involvement, attitude, evaluation may show differences in terms of different age groups, income levels and gender (Czaja & Sharit, 1998), (Slama & Tashchian, 1985). Therefore, it was also assumed that gender, age groups and income levels may vary in terms of some important variables of this study. Therefore, we supposed following hypothesis:

H6: There is a difference between women and men in term of intention to use SWD.

H7: There is a difference between age groups in term of consumer innovativeness.

2. RESEARCH DESIGN AND METHODOLOGY

This research has been conducted to evaluate the role of hospital corporate image, consumer innovativeness, and perceived value of smart wearable medical devices in intention to use them among users and non-users. This research is about the application of the Technology Acceptance Model and Signaling Theory in medical wearable marketing. The data was collected by descriptive research applying an online survey. Quantitative data has been conducted with users and non-users of smart wearable devices. Estimated variables and factors of the study were explained in details in the literature review section.

2.1 Research Purpose and Objectives

The outbreak of COVID-19 has led to an increase of awareness for fitness and healthy lifestyle, and hence it has effect on the demand of the modern technology which help to stay fit and healthy. As today's consumers are both technology-savvy and health-conscious, wearable devices have become an innovation that meets expectations in line with this lifestyle. COVID-19 has unpredictably accelerated digital transformation in the healthcare industry, leading to widespread adoption of remote smart healthcare devices. But, based on the information from previous researches, the fact that some challenges were observed in adoption and intention to use this devices especially from the marketing point of view. In such context, this study examines the factors affecting the intention of non-users to use wearable devices from the lens of Signaling Theory. Moreover, in line with extant research that finds consumer innovativeness as a possible moderator of the relationship between perceived value and new product adoption or intention to use, this study investigates the effect it exerts on the end user acceptability.

As it was explained in SWD Classification Matrix (Figure 7) wearable medical devices are differentiated according to the purpose of application and object-orientation information. This study focuses on the fourth section of the matrix, which are Physician (healthcare Profeccional)-Patient-oriented smart medical devices.

The purpose of this study is to find out whether the hospital corporate image, consumer innovativeness and perceived value of smart wearable medical devices play

roles in intention to use them. Likewise this research aims to brighten out the role of smart wearable devices in healthcare sector and inluence of hospital corporate image on intention to use them.

2.2. Model Development

The current study makes use and integrates existing models and theories to investigate the factors affecting the intention of non-users to use smart wearable devices (SWD). Considering that the literature confirms that intention is the primary determinant and a reliable predictor of actual use (Turner et al., 2010; Jimenez et al., 2021), it will be used as the outcome variable of this study model of investigation. Through a combination of the Technology Acceptance Model (TAM) to understand the behavioural intention to use SWD and Signaling Theory, where the Hospitals Corporate Image will serve as a signal to the patient and affect intention to use, developed model considers a set of constructs such as Hospital Corporate Image, Perceived Value, Consumer Innovativeness, and Intention to use.

The research model has been represented graphically. The model was created based on previous studies. The research model below (Figure 10) was conctructed by creating significant variables about the Technology Acceptance Model and Signaling Theory. The conceptual research model presented shows the dependent relationship between variables.

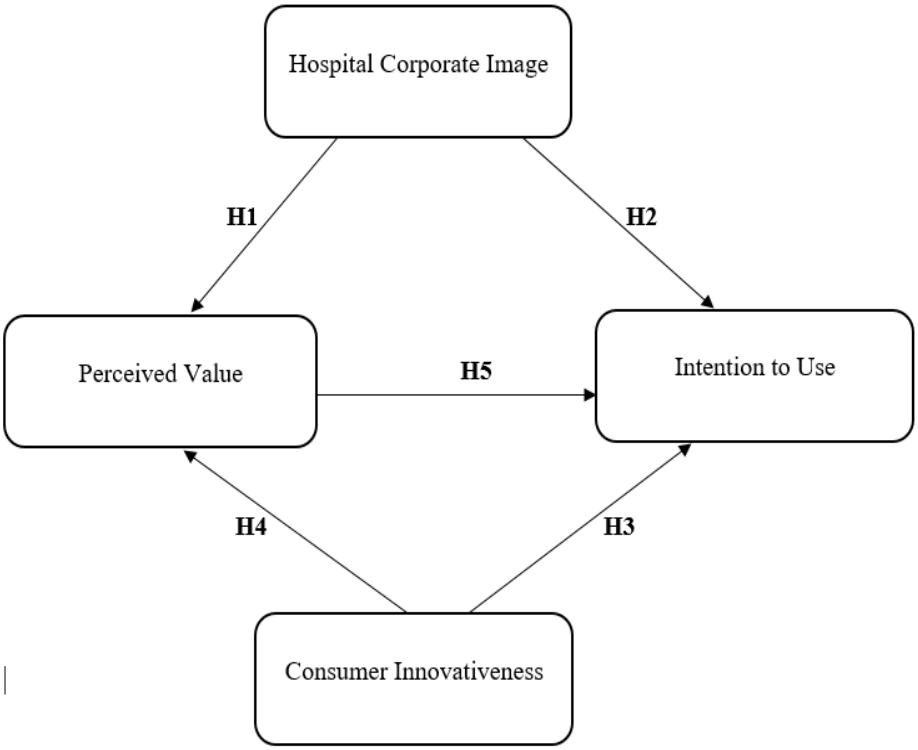


Figure 10: Research Model
Source: Developed by the researcher

2.3 Proposed Hypothesis

As it was explained in the previous section, the aim of this study is to find out whether the hospital corporate image, consumer innovativeness and perceived value of smart wearable medical devices play roles in intention to use them. According to the conseptual model, hypothesis are drawn up to measure the influence of independent variables on dependent variables. In order to analyze the relationships, regression analysis will be conducted. The following Table 1 demonstrates the list of the hypothesis of the study.

Table 1. List of Hypothesis

H1	Hospital corporate image has a significant positive role in SWD's perceived value
H2	Hospital corporate image has a significant positive role in intention to use SWD
H3	Consumer innovativeness has a significant role in intention to use smart wearable devices in healthcare
H4	Consumer innovativeness has a significant positive role in perceived value of smart wearable devices
H5	The perceived value of healthcare smart wearable devices will play significant positive role in intention to use them
H6	There is a difference between women and men in term of intention to use SWD.
H7	There is a difference between age groups in terms of consumer innovativeness

Source: Developed by the researcher

2.4 Research Method

In attempt to solve a research problem, firstly research must be designed. The design used in a study is determined by the nature of problems associated to the research objectives. There is already plenty of literature regarding particular research methodologies and approaches. Each study design contains a set of research methods that are commonly used to collect and analyze the variıus types of data obtained from investigations (Walliman, 2021). The essence of research design is to transform a research problem into data that can be analyzed to deliver accurate answers to research questions at a minimum cost. Kerlinger (1986) defines research design as a plan, structure, and method of investigation used to gain answers to research questions with optimal control of variables.

Thus, research design refers to the overall plan or strategy that researchers develop to answer research questions or investigate a specific problem or phenomenon. It encompasses the framework, structure, and approach used to collect, analyze, and interpret data in a systematic and logical manner. A well-designed research study ensures that the research objectives are achieved effectively and that the findings are reliable and valid.

There are two types of research designs: exploratory and conclusive. The final one's primary objective is to test specific hypotheses and identify relationships. While the exploratory research is conducted to provide insights and understanding the nature of marketing problem (Malhotra & Malhotra, 2012). Because of the fact, that the aim of this study is to test specific hypothesis and recognize relationships, it is a conclusive research.

Also, conclusive research is separated into descriptive and causal research. A descriptive study is conducted to describe the problem by testing hypotheses with a large number of samples and it also has two types including Cross-sectional (single and multiple) and Longitudinal design. While causal research is applied to gather proof of cause-and-effect relationship. As this study is attempted to decsribe the problem that is the role of smart wearable devices in hospital corporate image and healtcare sector by testing specific proposed hypothesis, it is descriptive research. Moreover, because the sample of this study is collected for only once, this study is a single cross-sectional descriptive research with a survey.

2.5 Measurement Development

As mentioned in the previous section, hypotheses are examined based on quantitative method. Therefore, a survey was designed to collect data. The survey is designed based on following items.

There are 4 different variables, which are “Hospital Corporate Image”, “Perceived Value”, “Consumer Innovativeness”, “Intention to use”. Every variable has been tested by different items which are based on the previous literature overlook. Totally 15 items are applied to design the survey as a survey question. To test all items, it was used 5 points Likert scales, ranging from “strongly don’t agree (1)” to “strongly

agree (5). First section of questionnaire was conducted to gather information about awareness of SWD among participants and about their previous experience in usage of SWD. Also if the parciciant is a user of SWD, additional quastions were asked to determine the purpose, for which SWD were used, and one question about healthstatus. Moreover, before completing the questionnaire, demographic and socio-economic information was gathered in the last section to understand background characteristics of the sample. Table 2 indicates the proposed variables with items and references fron the literature.

Table 2. Table of measured items

Variables		**Items**	**References**
Hospital Corporate Image (HCI)	HCI1	The hospital brand that would recommend or provide me with SWDs should possess complete practical functions (medical services and adequate medical facilities).	Adopted from: (Gürses & Kiliç, 2013) *International Business Research*, *6*(12), 31, (Tan, Ojo, Cheah, & Ramayah, 2019) Quality Management Journal, 26(3), 129–143, (Cham, Cheng, Low, & Cheok, 2020). *European Business Review*.
	HCI2	The hospital brand that would recommend or provide me with SWDs should possess a positive symbolic meaning (good reputation, credibility, and positive image).	
	HCI3	I feel that the hospital brand that would recommend or provide me with SWDs should provide me with a pleasant service experience.	
	PV1	Despite some challenges, I think using health SWD can help to manage health.	Adopted from:

Perceived Value	PV2	Compared to the effort to put, using SWD is beneficial to me	Sirdeshmukh et al. (2002)
	PV3	Compared to the time to spend, using health SWD is worthwhile to me	
	PV4	Using SWDs offer me value for money	
Intention to Use	IU1	I think using SWD is worthwhile	Adopted from: (Papa, Mital, Pisano, & Del Giudice, 2020) Technological Forecasting and Social Change, 153, 119226. Davis et al., 1989, Hsu and Lin, 2015
	IU2	I think I can rely on the health services provided by SWD	
	IU3	I will develop healthy habits with the health SWD in the future	
	IU4	I think using SWD provides preventive measures to help stay healthy	
Consumer Innovativeness	CIN1	If I heard about a new information technology, I would look for ways to experiment with it	Adopted from: (Compeau & Higgins, 1995) MIS quarterly, 189-211. (Agarwal & Prasad, 1998), Wells et al., 2010
	CIN2	In general, I am among the first in my circle of friends to use a new technological product or service when they appear	
	CIN3	I think new technology is a progress compared with the past	
	CIN4	I found using new technology to be a novel experience	

Source: Developed by the researcher

2.6 Sampling Design

Before conducting the survey, the target group has been defined; sampling techniques and sample size has been determined. Explanations in details about study sampling design are proposed below.

2.6.1 Target Population

The target population is the specific group of people chosen by the researcher to collect data (Malhotra & Malhotra, 2012). The target population of the study is identified as people who also have used SWD for monitoring health status or people with no-prior use of SWD's to manage health, live in Turkey, and who is older than 18 years old.

2.6.2 Sampling Techniques

Survey participants for the study were found by applying the snowball method, that fits the purpose of the research.. Snowball sampling is a non-probability sampling technique which currently enrolled research participants help recruit future subjects for a study, and which is applied broadly in social science studies. Snowball sampling is provided through the orientation of people who know and share with people with similar characteristics to the study (Biernacki & Waldorf, 1981). Firstly, in order to reach respondents, contact was made with the medical doctors and careproviders, which which provided the mean to establish a contact with their patients. After, data was gathered by sending questionnaire via mail and on digital platforms like Instagram and Facebook and etc.

2.6.3 Sample Size

According to the consideration from literature that sample size is the number needed for the data analysis (Glenn, 1992). If descriptive statistics are to be used, e.g., mean, frequencies, then nearly any sample size will sufficient. On the other hand, a good size sample, e.g., 200-500, is needed for multiple regression, analysis of covariance, or loglinear analysis, which might be carried out for more comprehensive state impact assessments. The sample size should be appropriate for the type of analysis being conducted.

Existing and potential wearable devices users, as well as respondents who were exposed to wearable devices formed the sample of targeted respondents in this research.

With the confidence that this selection criteria not only enable to draw more relevant findings; concurrently it also ensures that they had sufficient knowledge to respond to the questions in the questionnaire on the intention to use smart medical wearable devices. For this research, a total of 201 responses were gathered for further statistical analysis.

2.7 Data Collection Method

In order to make an analysis, primary data has been gathered by conducting the survey as a quantitative method. Firstly, before questionnaire was delivered to extended number of people, a pre-test was conducted with ten people who are participants volunteer from Marmara University (marketing students) with the aim to evaluate the survey and to check if there is a misunderstanding. As results showed that there is no misunderstanding about the quiestions, but participants recommended to change a section about the previous using of SWD and to add a question about the Health Status. Hence, this section has been edited according to participants' recommendations and after the survey was send to respondents.

Through an evaluation process on the honesty, rigour, transparency, respect and protection of participants, the study received ethical approval from the Social Sciences Research Ethics Committee at Marmara University on 26.05.2023.

Respondents were asked to 30 questions, including part about their demographic and socio-economic characteristics, their awareness and previous experience in SWD usage, propensity to innovativeness, also intentions and motivations to use SWD for healthcare purporses. The questionnaire consists of three parts. The first part is developed to understand respondents' awareness and opinions toward wearable devices, their health status and one assumption question, considering intention to use SWD if the healthcare provide will suggest to use for collecting medical information. The questions are both Yes/No and multiple choices questions. The second part of the questionnaire is to grasp respondents' attitude and opinions toward using wearable devices in healthcare sector. Likert type is used for the second part. It is one of the broadly used measurement scales. There are five responses from strongly disagree to strongly agree (Malhotra & Malhotra, 2012). Respondents are asked to state their

degree of agreement or disagreement in the second part. The final section includes mainly demographic questions to analyze the differences between participants. The questionnaire was self-administered, and the data collection process took place from February to April. Total of 201 people were reached.

The questionnaire was completed by respondents online. In fact, the survey was prepared through Google Forms; then, the link was sent to participants. Since the research has been conducted in Turkey with Turkish citizens, the language of the survey is Turkish (See in Appendix 1). Nonetheless, the English version of the survey also presented in Appendix 2.

2.8 Data Analysis Method

The data obtained from the survey was analyzed by using statistical programs. ADANCO 2.3.1 partial least square path modeling (PLS-PM) was applied to make an inferences about proposed hypothesis. In addition, as a Structural Equation Modeling technique, PLS enables the researcher to analyze complex relationships between variables while also examining their direct, indirect and moderating relationships (Nitzl, Roldan, & Cepeda, 2016). Therefore, SmartPLS was preferred for PLS-PM rather than traditional PLS. Firstly, the consistent PLS algorithm were used to test Cronbach's alpha, average variance extracted (AVE), construct reliability (CR), factors loading, model fit. ADANCO is a graphical user interface for modeling structural equations with composites. It can implement PLS modeling, PLS-SEM modeling, and simple least squares regression utilizing sum scores. It uses consistent PLS, dominating indicators to adjust for sign uncertainty, and overall goodness-of-fit testing (Bryson et al., 2020). Thus, consistent PLS bootstrapping were applied for path analysis. 5000 subsamples, with a 95% significance level were considered. The structural model was tested using consistent partial least squares path modeling (PLSc-PM). This method has some advantages. It is based on regression, which minimizes the residual variances of the variables (Dirsehan & Cankat, 2021). Afterwards, some analyzes were conducted to measure the reliability of the model.

3. RESEARCH FINDINGS

The following part of the study willl presented the non-response bias test, descriptive analysis of respondent, analysis of constructs, the model's of goodness of fit, analysis of the structural model, testing group differences. Also outcomes of the survey and their interpretation will be provided.

3.1 Non-Response Bias Test

The amount of non-response and the difference in estimate between respondents and non-respondents constitute the non-response bias associated with an estimate. The extrapolation method, which is a well-known strategy for avoiding non-response bias, is used to examine non-response bias. (Rogelberg & Luong, 1998) state that "Nonresponse bias occurs when the individuals responding to a survey differ from nonrespondents on variables relevant to the survey topic". Based on the continuum of resistance theory which suggests that late responders are almost non-responders and therefore can be used as a proxy for the non-response group, research relevant variables are compared between early and late responders. An independent sample t-test was applied to compare early respondents to check if there is a difference between variables. The first 30 responses to the survey and the last 30 responses were taken and it was analyzed whether there was a significant difference between them. All variables in the model were included to this test. The findings show that there is no significant 0.05 level differences between these groups.

3.2 Descriptive Analysis of Respondents

As it is stated before, the survey was conducted with 201 respondents. In order to
provide a better explanations of the survey results, descriptive analysis is done. It provides respondents' general information about demographics, socioeconomic characteristics, their health status characteristics, and also their awareness about SWDs.

3.2.1 Demographic and Socioeconomic Characteristics of Respondents

The majority of the sample group consists of males with 51,2% whereas the percentage of female respondents is 47,8%. The rest of the population who does not want
to state gender is 1%. Among a total of 201 respondents, 103 of them are male, 96 of them are female and 2 respondents did not state the gender.

Income levels of sample indicates that 34% of sample earn 8501-15000 TL, 28% of them earn 15001-25000 TL, 23% of them earn more than 25000TL, 7% of them earn 7501-8500 TL, and 8% of them earn less then 7500TL.

34,8% of sample consists of people who are between 30-39 years old, 29,4% of them is between 18-29 years old, 24,90% of them are between 40-49 years old, and 10,9% of them are above 50 years old.

This outcomes shows that the sample mostly consists of young generation, which indicates that the data supports the fact that smart wearable technologies are preferred mostly by young generation, that especially intended to innovative devices.

Also respondents were asked about their occupation. Because the survey was conducted using snowball methods, participants were not selected by special profession factor, thus according to responses, people of different occupations, students and retired also participated.

The respondents' Demographic and Socioeconomic information is presented in Table 3. Distribution of Sample's Demographic Characteristics is shown in Appendix 4.

Table 3. Sample's Demographic and Socioeconomic Characteristics

Attributes	***Distribution***	***Frequency***	***%***
Gender	Female	96	47,8%
	Male	103	51,2%
	Not stated	2	1%
Age	18-29	59	29,4%
	30-39	70	34,8%
	40-49	50	24,9%
	50+	22	10,9%
Income Level (TL)	7500 or less	16	8%
	7501-8500	14	7%
	8501-15000	69	34,3%
	15001-25000	56	27,9%
	25001 and above	46	22,9%

Source: Computed by the researcher

3.2.2 Awareness about SWDs of the Sample Group

In the first section of the survey participants were asked about if they are aware of the smart wearable devices. According to results of the received data, 129 (64%) of partcipants from the total 201 are aware of smart wearable devices, 72 (36%) of them are not yet (Figure 11).

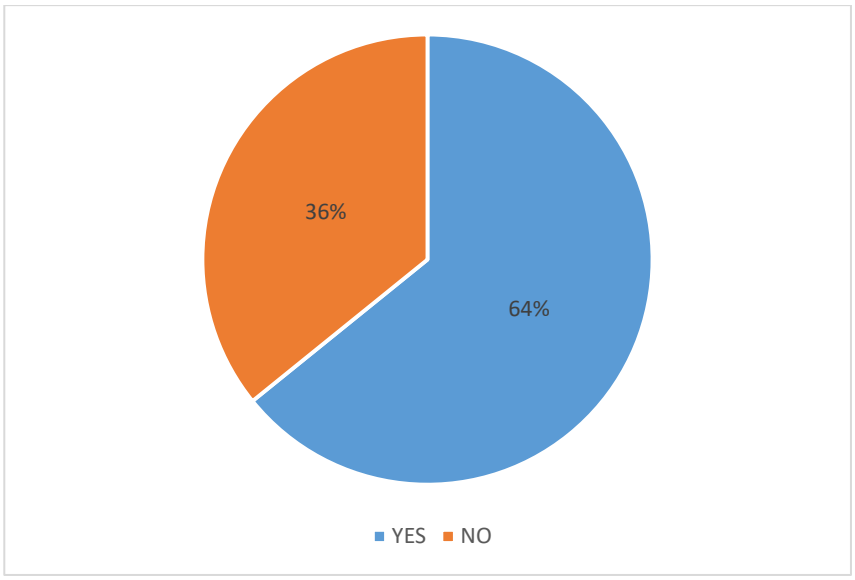


Figure 11: Sample Groups awareness about SWD

Source: Computed by the researcher

Moreover, the survey asked a question about the usage experience of the smart wearable devices. In other words, to make an assumptions about the existing and potential users among the participants, second question from the first section of the survey was applied. As shown in Figure 12, only 38% (77 respondents) have ever used SWD, whereas the majority 62% (124 people) of the respondents have not ever used them.

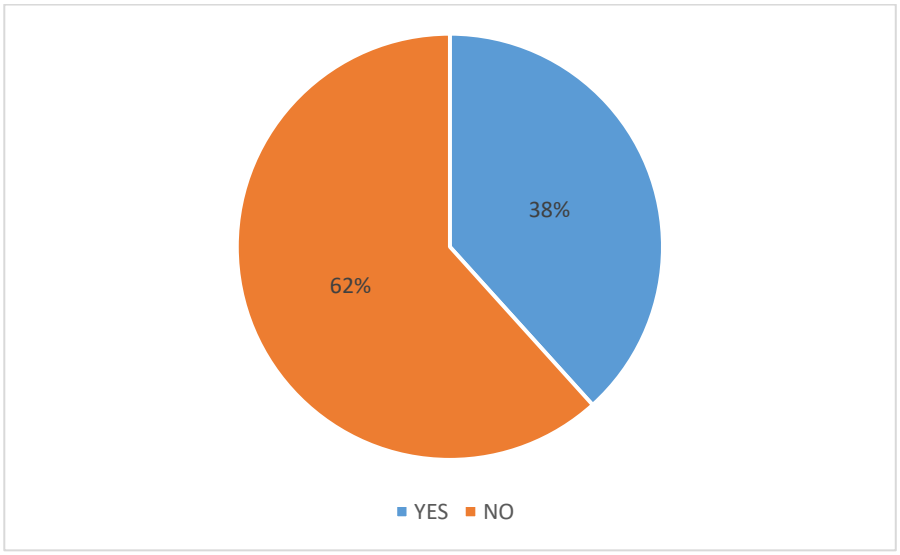


Figure 12: Sample Groups SWD usage

Source: Computed by the researcher

3.2.3 Purposes to Use SWDs and Health Status of the Sample Group

As it is mentioned in the literature part, previous studies proved that the most broadly application of wearable devices is in healthcare sector with the purpose of medical diagnosis, monitoring and early detection of the diseases. Thus, this study also strives to understand what are the purposes to use SDWs among exisitng users and their health status. Based on the assumption, that potential users are also might be a SWDs users in the future, survey was continued with 124 non-users also to estimate intention to use.

Existing users among participants (77 people) were asked which "for purposes they have used SWDs" (see Appendix 3). According to answers, 87% that they use wearable devices for self-monitoring, 31% for diagnostic (self prevention and early detection), 21% for instant intervention, 10% of responses with aim of monitoring (by the healthcare provider), only 3,9% for diagnosis (by healthcare provider/prevent/early detection). Moreover, 34% of users applied SWDs for other purposes (Table 4). Especially important to notice, that participants have a multiple choices for this question. Therefore, as Table shows, total percentage frequency is above 100%.

Table 4. Purposes to use smart wearable devices

Purposes to use SWD	**Frequency**	**%**
Monitiring by myself	67	87%
Other purposes	26	34%
Diagnostic (self prevention and early detection)	24	31%
Instant intervention	16	21%
Monitoring (by the healthcare provider)	8	10%
Diagnosis (by healthcare provider/prevent/early detection	3	4%

Source: Computed by the researcher

Lastly, all of total 201 participants were asked "Which of the below best describes health status in general": (see Appendix 5). 100 (49,8%) of them answered, that they do not have any ongoing health problem, 84 (41,8%) face some minor health problems, 17 (8,5%) participants face some major health problems (Figure 13).

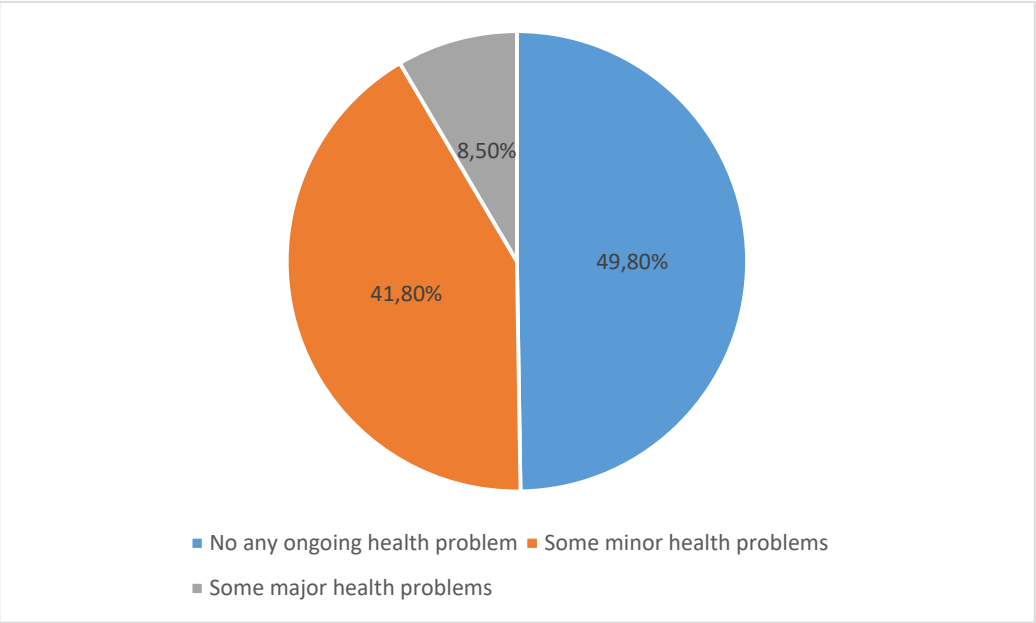


Figure 13: Sample's Health Status
Source: Computed by the researcher

3.3. Analysis of the Constructs

3.3.1 Normal Distribution Test

Before conducting analysis, a Normal Distribution Test is done to understand whether the dependent variables are normally distributed. Normality test was implemented by ADANCO 2.3.1 to understand if the data are normally distributed. The distribution of skewness and kurtosis values are presented in the Table 10.

The acceptable value range for Kurtosis and Skewness is between -1,5 and 1,5 (Tabachnick, Fidell, & Ullman, 2013). According to outcomes, the dependent variables are normally distributed because the values of Skewness and Kurtosis for all dependent variables are between +1,5 and -1,5. Even though the Kurtosis value of Hospital Corporate Image (HCI3) is 1,59, it is also acceptable. The Skewness value for Hospital

Corporate Image is 1,5004 as presented in Table 5. However, according to (George & Mallery, 2010) a Kurtosis value between +2 and -2 can be acceptable in many cases.

Table 5. Findings of the Normal Distribution Test

Variable	Skewness	Kurtosis
Hospital Corporate Image	1,5004	1,59
Perceived Value	0,7812	0,5128
Consumer Innovativeness	0,8107	0,5912
Intention to Use	0,8242	0,3789

Source: Computed by the researcher

3.3.2 Multicollinearity Test

Multicollinearity test was conducted on the variable as a way of eliminating any correlation between two or more independent variable which may cause error with the research findings. Multicollinearity founds where two or more independent variables are highly correlated with each other such that two or more independent variables measure the identical thing but in a different manner. (George & Mallery, 2010) suggest that tolerance value less than 0.1 indicates a serious collinearity problem. Field (George & Mallery, 2010) indicated that when the VIF (Variance Inflated Factor) values are greater than 10, then there is a cause for concern. From the Table 6 presented below, it can be seen that all the VIF values are essentially less than 10. That means that the data was free of Multicollinearity problem.

Table 6. The Values of VIF

Variable	*Item*	*VIF*
HOSPITAL CORPORATE IMAGE	HCI1	4,1616
	HCI2	4,6973
	HCI3	4,2360
PERCEIVED VALUE	PV1	3,4911
	PV2	6,1231
	PV3	4,5118
	PV4	3,0877
CONSUMER INNOVATIVENESS	CIN1	2,4141
	CIN2	2,0027
	CIN3	5,2109
	CIN4	5,4621
INTENTION TO USE	IU1	5,5153
	IU2	3,4777
	IU3	4,5730
	IU4	4,7548

Source: Computed by the researcher

3.3.3 Construct Reliability and Convergent Validity of the Constructs

Before conducting the structural model, Construct Reliability and Convergent Validity were analyzed.

The consistency of the constructs that compose the model was examined through the reliability process, that was done by analyzing the level of construct reliability, taking into consideration Dijkstra-Henseler's rho (ρA), Jöreskog's rho (ρc) and Cronbach's alpha(α).

Construct Reliability (CR) is a method used to evaluate internal consistency. And CR values more than 0.70 are acceptable to be interpreted as internal consistency (Hair, Black, Babin, Anderson, & Tatham, 2014). Prior researchers evaluated and reported construct reliability by means of the Dijkstra-Henseler's rho (pA) reliability coefficient (Dijkstra & Henseler, 2015). Similar to CR, the reliability coefficient ρA should indicate values of 0.70 or higher in exploratory research and values above 0.80 or 0.90 for more advanced stages of research (Dijkstra & Henseler, 2015). In this study , the reliability coefficient Dijkstra-Henseler's rho (pA) of each measurement construct is above 0.70. Jöreskog's rho (ρc) used as the composite reliability indicator, is also regarded as the construct's reliability. All construct reliability values are shown in Table 7. All construct reliability values are between 0.8643 and 0.9496, according to the results. As a consequence of this, because all values are greater than 0,70, it may be concluded that all CR values are acceptable.

Cronbach's Alpha is another method for measuring reliability and evaluating internal consistency (Wasko & Faraj, 2005). Cronbach alpha values greater than 0.70 are considered acceptable by (Hair et al., 2014). In this study Cronbach's alpha values are from 0.8643 to 0.9471. The PLS algorithm result showed that all Cronbach Alpha values are greater than 0.70 for all variables, which is acceptable. As a result, data can be considered to be internally consistent.

There are two ways to evaluate construct validity: Discriminant validity and Convergent validity. Convergent validity is determined by the average variance extracted (AVE) values and standardized factor loadings (Wasko & Faraj, 2005). Based on (Hair et al., 2014), AVE values must be greater than 0.50 in order to be considered as acceptable. Table 7 presented AVE values ranging from 0.6332 to 0.8426, indicating that all values are greater than the acceptable range of 0.50. Table 7 also shows that the factor loadings of all items range between 0.5781 and 0.9757. For factor loadings, values more than 0.70 are acceptable (Hair et al., 2014). As a result, the factor loading of this research are acceptable as well.

Table 7. Evaluation of scales for reliability and convergent validity

Constructs	İtems	Loadings	Cronbach's Alpha	Dijkstra-Henseler's rho (ρ_A)	Jöreskog's rho (ρ_c)	AVE
Hospital Corporate Image	HCI1	0,8774	0,9410	0,9440	0,9412	0,8426
	HCI2	0,8977				
	HCI3	0,9757				
Perceived Value	PV1	0,9573	0,9380	0,9439	0,9384	0,7929
	PV2	0,9456				
	PV3	0,8635				
	PV4	0,7845				
Intention to Use	IU1	0,9496	0,9471	0,9496	0,9476	0,8191
	IU2	0,8342				
	IU3	0,9142				
	IU4	0,9183				
Consumer Innovativeness	CIN1	0,6723	0,8643	0,9028	0,8690	0,6332
	CIN2	0,5781				
	CIN3	0,9256				
	CIN4	0,9435				

Source: Computed by the researcher

The other way to estimate validity is discriminant validity. The recent literature (Dijkstra & Henseler, 2015) assessed discriminant validity by means of the heterotrait-monotrait ratio (HTMT). While some researchers propose a threshold of 0.90 (Teo, Srivastava, & Jiang, 2008), others recommend values of HTMT that are below 0.85 in order to ensure discriminant validity (Clark & Watson, 2016). The HTMT values and the corresponding confidence intervals deriving from a bootstrapping procedure are outlined in Table 8. Since none of measurement constructs violates the HTMT 0.90 and HTMT 0.85 criterion and all constructs additionally fulfill the HTMT inference test, conclusion of adequate discriminant validity is inferred. The correlations range of variables is from 0,5819 to 0,8286.

Table 8. Evaluation of correlation matrix and discriminant validity (HTMT)

Latent Constructs	***HCI***	***PV***	***IU***	***CIN***
HCI				
PV	0,6297			
IU	0,6253	0,8286		
CIN	0,5819	0,6048	0,7431	

Source: Computed by the researcher

Moreover, in this study discriminant validity was assessed by estimating the values of Fornell-Larcker Criterion, which "postulates that latent variable shares more variance with its assigned indicators with another latent variable in the structural model" (Hair et al., 2014). This criteria requires that the square root of each AVE be higher than its correlation coefficients with any other latent construct. The Fornell-Larcker criterion is met for all variables (Table 9).

Table 9. Evaluation of correlation matrix and discriminant validity

Latent Constructs	**HCI**	**PV**	**IU**	**CIN**
HCI	0,8426			
PV	0,3975	0,7929		
IU	0,3934	0,6886	0,8191	
CIN	0,3539	0,3725	0,5547	0,6332

Source: Computed by the researcher

Squared correlations; AVE in the diagonal.

3.3.4 The Model's Goodness of Fit

Model fit tests rely on bootstrapping to determine the possibility of generating a correlation matrix difference as large as the one seen for the sample in question between the empirical and model-implied correlation matrix. In order to determine the model fit the standardized root mean squared residual (SRMR), the geodesic discrepancy (dG), and the unweighted least squares discrepancy (dULS) are used in the study. The SRMR is more sensitive and effective than the "goodness-of-fit" criterion (Tenenhaus, Vinzi, Chatelin, & Lauro, 2005). The quality criteria are that the value of those three parameters should be lower than the bootstrap at 95 percent (HI95) or 99 percent (HI99) or the SRMR should be less than 0.08. (Hu & Bentler, 1999).

The study results presented in Table 10 revealed that the saturated model's SRMR, dULS, and dG values are less than the 99th percentile bootstrap value (HI99), suggesting that the hypothesized model is accurate and the data fits the model. The model is acceptable in this framework since all of the parameters are valid, as shown in Table 10.

Table 10. Total Model Fit Results

	Saturated Model		
Parameters	Values	HI95	HI99
SRMR	0,0424	0,0331	0,0376
dULS	0,2161	0,1314	0,1695
dG	0,2985	0,3000	0,5494

Source: Computed by the researcher

3.4 Analysis of The Structural Model

The structural model was examined using ADANCO 2.3.1 software version. The values of the t-statistic, and p-value were all substantial enough to show a significant path coefficient. According to analysis, presented in Table 11 and Table 12, following evidence was explained.

Table 11. Structural Model Results

Effect	Path Coefficients	Standard error	t-value	p-value
H1:HCI ->PV	0,414***	0,1037	3,9908	0,001
H2: HCI ->IU	0,046	0,0974	0,5715	0,5677
H3: CIN ->IU	0,365**	0,0992	5,7983	0,0000
H4: CIN ->PV	0,364***	0,1074	3,3901	0,0007
H5: PV ->IU	0,579***	0,1090	5,3098	0,0000

Source: Computed by the researcher

p < .05*, p < .01, p < .001*****

H1 posits that Hospital corporate image has a significant positive role in SWD's perceived value. The obtained results show that HCI (ß=,414; p=,001) has a significant positive effect (H1) on intention to use SWD. Hence, H1 was supported and HCI does have a strong direct effect on PV.

H2 estimates that Hospital Corporate Image has a significant positive role in intention to use SWD. Results show that HCI (ß=,046;p=,0035) does not have a significant positive effect on intention to use SWD. But, at the same way HCI mostly has an indirect effect in total effect on IU (see Table 12). Thus, H2 was partially supported.

H3 predicts the role of Consumer innovativeness in intention to use smart wearable devices in healthcare. Based on the results, Consumer innovativeness (ß=,365; p=,0000) does have a role in intention to use. So, H3 was supported.

H4 estimates that Consumer innovativeness has a significant positive role in perceived value of smart wearable devices. The results show that Consumer

innovativeness (ß=,364; p=,0007) has a significant positive role in perceived value. Therefore, H4 was supported.

H5 posits the role of the perceived value of healthcare smart wearable devices in intention to use them. Obtained results revealed, that perceived value (ß=,579; p=,0000) definitely does have a positive significant role in intention to use SWD. Thereby, H5 was supported.

Finally, Hospital Corporate Image (ß=,414) and Consumer Innovativeness (ß=,364) both significantly influence perceived value and jointly explain 48% of the total variance in perceived value. Perceived Value (ß=,579), Consumer Innovativeness (ß=,365) and Hospital Corporate Image (ß=,046) explain 78% total variance in intention to use SWD.

Table12 shows the total and indirect effects between variables. As explained before, Hospital Corporate Image does not have significant positive effect on intention to use SWD, but HCI has a positive indirect effect (ß=,2394) on intention to use SWD. And lastly, Consumer innovativeness also have a positive indirect effect (ß=,2394) from total (ß=,3351) on intention to use SWD.

Table 12. Total and Idirect Effects

Effect	***Indirect Effect***	***Total Effects***
H1:HCI -> PV		0,4138
H2: HCI ->IU	0,2394	0,2850
H3: CIN ->IU	0,2107	0,3351
H4: CIN ->PV		0,1658
H5: PV ->IU		0,5786

Source: Computed by the researcher

R squared as a statistical measure determines the proportion of the variance in the dependent variable that can be explained by the independent variable. Thus, R squared shows how well the data fit the regression model, in other words how well the

regression model explains observed data. Therefore, R Squared is assessed as it used to evaluate the goodness of fit in regression analysis. “R Square is assessed as it used to evaluate the goodness of fit in regression analysis (Benitez, Henseler, Castillo, & Schuberth, 2020)” according to (Dirsehan & Cankat, 2021). R squared values range from 0 to 1 and are commonly stated as percentages from 0% to 100% (Fernando, 2021). In this study, R square of Intention to Use SWD is 0.7802. However, if phenomena are less understood, the lower R Square can be acceptable (Benitez et al., 2020). As seen in Table 13, the values obtained as a result of the analysis meet the recommended values.

Table 13. R Square Results

Construct	**Coefficient of determination (R^2)**
Perceived Value	0,4832
Intention to Use	0,7802

Source: Computed by the researcher

As a result of PLS-PM, the conceptual model is accepted with supported hypotheses. Appendix 6 demonstrates the path analysis of the model.

3.5 Testing Group Differences

Group difference tests were done applying SPSS. Further investigation was conducted in order to determine whether there is a difference in the mean of different age groups in terms of consumer innovativeness, and gender in terms of intention to use SWD. With the aim to evaluate the differences between group it was applied to one way-ANOVA and independent t-test by utilizing SPSS.

Firstly, gender group was examined to understand if there is a difference between

gender in terms of intention to use SWD. An independent t-tests was applied by using

SPSS. Before analysis, variables' questions re-grouped in SPSS, then the analysis have been done. For this analysis, two answers with 'not stated' gender were ignored. Thus, total 199 answers were analyzed for gender differences. Table 14 indicates that there are no statistically significant differences between female and male in terms of intention to use SWD. Therefore, H6 is not supported.

Table 14. Independent Samples T-test for Differences between Female and Male

		N	Mean	SD	Std. Error Mean	t	Sig.
Intention to Use	Male	103	2,1796	,96977	,09555	-0,634	0,750
	Female	96	2,2682	1,00082	,10215		

Source: Developed by the researcher

Secondly, age group was considered to understand if there is a difference between
age group in terms of consumer innovativeness. Before analysis, age informations were re-grouped as 18-29, 30-39, 40-49 and 50 and above. Table 15 represents the results of one-way ANOVA of age groups in terms innovativeness. Received statistical values indicate that there are no statistically significant differences between age groups in terms of consumer innovativeness. Therefore, H7 is not supported.

Table 15. One-way ANOVA test for differences between age groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3,974	3	1,325	1,737	**,161**
Within Groups	150,209	197	,762		
Total	154,183	200			

Source: Developed by the researcher

Outcomes from the analysis of the structural model about suggested hypothesis are presented in Table 16. H2 was partially supported, H6, H7 were not supported.

Table 16. Summary of Hypothesis

	Hypothesis	Supported	Not Supported	Partially Supported
H1	Hospital corporate image has a significant positive role in SWD's perceived value	**X**		
H2	Hospital corporate image has a significant positive role in intention to use SWD			**X**
H3	Consumer innovativeness has a significant role in intention to use smart wearable devices in healthcare.	**X**		
H4	Consumer innovativeness has a significant positive role in perceived value of smart wearable devices	**X**		
H5	The perceived value of healthcare smart wearable devices will play significant positive role in intention to use them.	**X**		
H6	There is a difference between women and men in term of intention to use SWD.		**X**	
H7	There is a difference between age groups in term of consumer innovativeness		**X**	

Source: Developed by the researcher

4. DISCUSSION

In this chapter, the research findings presented formerly in this study will be overall reviewed and the relationship between variables affecting consumer intention to use of smart wearable technology devices are discussed.

Despite the positive prospects and functionality of wearable devices, little research has been done on user acceptance and intention to use and behaviors concerning smart devices because they are still in the very early stage of commercialization. It become reasonably vital to understand the role of smart wearables in healthcare sector and which factors have an effect on people's acception and intention to use them. This research was conducted to find out whether the hospital corporate image, consumer innovativeness and perceived value of smart wearable medical devices play roles in intention to use them and examine the relationships between them. Likewise this research aims to brighten out the role of smart wearable devices in healthcare sector and inluence of hospital corporate image on intention to use them. From a marketing point of view, an online survey was developed to estimate the role of hospital corporate image in intention to use smart wearable devices. Existing and potential wearable devices users, as well as respondents who were exposed to wearable devices formed the pool of targeted respondents in this research. In this framework, the survey was conducted with 201 respondents to analyze hypotheses.

In order to understand the role of hospital corporate image on intention to use SWD, suggested hypotheses (Table 1) were tested. Figure 7 presents that different smart wearable devices available to use. They were segmented into four categories according to the purpose of application and object-orientation information. This study focused on the fourth part of the classification matrix, which is "Diagnostic (early detection of disorder/prevention) smart medical devices". The effect of TAM and Signaling Theory is analyzed by focusing on Physician (healthcare Profeccional)-Patient-oriented smart medical devices.

After the model was established, a survey study was conducted in accordance with the model. The data obtained as a result of the survey study was converted into numerical data and analyzed with the ADANCO software. Firstly, the model was tested to see if it was significant. Afterwards, path analyzes were made and the relations

between the variables were examined. As a result, 2 of the 7 predetermined hypotheses were not supported, 4 were supported, 1 hypothesis was partially supported.

According to the accepted hypotheses, hospital corporate image does not have a significant positive effect on intention to use SWD, thus does not play a significant role, but has a positive indirect effect on intention to use SWD. On the other hand, hospital corporate image has a significant positive role in SWD's perceived value. Based on obtained results, consumer innovativeness has a significant role in intention to use smart wearable devices and in perceived value. Finding from conducted research revealed, that perceived value definitely does have a positive significant role in intention to use SWD. The study also revealed the indirect effects of variables. First, hospital corporate image plays in indirect effect in intention to use SWD. Consumer innovativeness also has a positive indirect effect in intention to use SWD. Furthermore, samples group were examined whether there is a difference between gender in terms of intention to use and between age groups in terms of consumer innovativeness. Received statistical results indicated that there are no statistically significant differences between age groups in terms of consumer innovativeness and between a gender in terms of intention to use SWD.

5. CONCLUSION

In this section, scientific contribution and managerial implications of this study are discussed while introducing the limitations the study faces and providing suggestions for further research.

5.1. Academic Implications

To begin with, this study contributes to a limited body and extent of research, as academical studies on smart wearable devices especially in healthcare sector are still rare. So, by looking at this significant and promising topic which is yet still not fully explored and rather under-researched, it is believed that this study adds to the literature.

The study was conducted to prove the importance of wearable technologies in healthcare and to find out a significant factos that have an effect on acceptance and intention to use them. Indeed, the main purpose of the research from the marketing point of view to understand the role of hospital corporate image in actual and potential users intention to use smart wearable devices.

Earlier studies proved the significant roles of perceived usefulness, perceived ease of use, and intention to use, compatibility, facilitating conditions, and self-reported health status in directly predicting the intention to use toward smart wearable technology (J. Li et al., 2019). This study was designed by applying the Technology Acceptance Model and Signaling Theory in common, focusing mainly on hospital corporate image as a signal. Consumer innovativeness was also used as a part of the extended model, through which new independent factors are added, revealing more findings on consumer intention patterns for technology products and smart wearable devices in particular. Because of the fact, that there is no detailed data report on wearable health technology products in Turkey since individual measurement applications are not widely used and also the necessary infrastructure is absent to integrate with applications of health services in Turkey, it was especially important to assess the current situation of the service providers and also to determine whether consumers are ready for a new system like wearable technology in Turkey.

At the time of this study, there were not many studies related smart wearable devices in healthcare sector in the foreign literature. Academic resources related to

similar research solutions were used as helpful resources. This study aims to be a reference for academic studies based on smart wearables. On the other hand, there are very few academic studies on wearable technology especially in Turkey. This study, which aims to be among the first in this field, will guide the future articles and researches.

On the other hand, not all of hypotheses assumed based on signaling theory were supported. This showed that hospital corporate image does not play a significant role in intention to use smart wearable devices, but has an indirect effent on intention to use them. However, hospital corporate image has a strong positive effect on perceived value. Moreover, research reveled the statement that consumer innovativeness as a possible moderator of the relationship between perceived value and new product intention to use, thus this study has statistically confirmed the significant role of consumer innovativeness in intention to use SWD and perceived value.

5.2 Managerial Implications

The smart wearable devices market is growing rapidly in Turkey. The demand for wearable technology devices in the health industry is increasing as consumers' awareness grows in parallel with their knowledge, and long and healthy life expectancy rises. The outbreak of COVID-19 was the one of the main reasons to translate traditional medicine to smart one. On the verge of technological advancement, smart healthcare is more than just a technological advancement; it is an all-encompassing, multi-level transformation.

The study also makes contributions to the industry, not just in the domain of technological products but also across all areas, as the conclusions and insights it provides prompt further discussion of the overall impact of consumer behavior on intention to use and purchasing decisions. Managers of technology companies who aim to expand their businesses by gaining a larger market share and stimulating more demand can, in some cases, use this research as an exploratory tool to look into how consumers are adapting to and intending to use technology.

Companies should also take a good look at why potential users have never used smart wearable devices before. Most of the respondents stated that they are not

awarable about this devices and never needed it before and that is why they did not use it.

Marketing managers should consider various strategies for increasing actual users' continuous adoption and potential users' intention to use wearable devices. Healthy habits should be emphasized in marketing strategies targeting actual users, and in order to attract new users, wearable devices advertising must emphasize their superior usefulness in the healthcare sector.

Furthermore, by getting closer to exploring the factors behind wearable technology acceptance and the effect of culture, companies may be able to understand the consumers deeper and serve them accordingly, with customized features and characteristics per culture and target group. Thus, the older population especially concerned about using and performance of wearable devices, external support such as providing well-designed technology training for older adults is a promising way to help them overcome concerns in using innovation technologies, which in turn will enhance older adults' smart wearable technology acceptance. Furthermore, a customized setting of smart wearable systems for transmitting physical signs to caregivers and clinical centers would effectively mitigate the privacy violation concerns of older adults.

Based on the performance risk concerns, research and development should continuously strive to realize the technical advances required for wearable device diffusion, such as the always-on battery, low-power/high-performance processor modules, and the always-connected environment with other smart devices. Furthermore, technology manufactures and fashion brands need to reinforce and collaborate with each other to address the visual attractiveness and brand name issues. Due to the fact, that wearable devices are so rare used and applied in healthcare, financial risk concerns is high, managers should decrease a maintenance or repair costs and financial expenses associated with wearable technology. To sum up, managers are adviced to increase perceived benefits by make an effort to decrease performance and financial risks. Unquestionably, creative and practical wearable technology will improve daily life and achieve the goals of early health issue diagnosis.

5.3 Research Limitations

Although the findings of this study provide meaningful insights into intention to use wearable devices, several issues should be addressed in future research.

Firstly, as mentioned before, because of the lack of research about wearable healthcare technologies, especially in the Turkish market, this paper aimed to investigate the wearable health technology market in Turkey. However, survey was conducted mainly with participants from a single region, especially with people who live in İstanbul. So, the survey results may not a good representative of the generality of respondents in all locations. Additional economic and cultural effects on intention to use smart wearables should be explored to achieve possible higher predicting ability, and to generalize the results to other regions. Not all the individual differences among the survey respondents were examined in this study. Smart wearables are modern and expensive technology products, thus it might be have a sense to examine the difference between sample's income groups in terms of intention to use SWD.

Despite its limitations, this study contributes to a more systematic understanding of wearable device adoption. It will provide the foundation for future research on related topics.

5.4 Further Research Directions

Further research is needed to extend smart wearables marketing studies. Especially, SWD classification matrix (Figure 7) should be examined in more detail, focusing on self-patient oriented wearables. The different devices models shown in the matrix will be examined. Also, the issue of the insignificant role of hospital corporate image in intention to use smart devices should be reexamined with additional variables included in the constructs.

Lastly, future research may also consider a longitudinal approach to examine whether hospital corporate image will play a direct effect on intention to use. Such a longitudinal study will significantly add to the value of research in the smart technology in medical field.

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APPENDICES

Appendix 1- Questionnaire in Turkish

SORU FORMU

SAĞLIK SEKTÖRÜNDE AKILLI GİYİLEBİLİR CİHAZLARI KULLANMA NİYETİNDE HASTANE KURUM İMAJININ ROLÜ

Sayın katılımcı,

Bu anket, Marmara Üniversitesi Pazarlama Anabilim Dalı Yüksek Lisans tezinde kullanılmak üzere 'Akıllı giyilebilir cihazlarının sağlık sektöründeki rolü ve hastane imajını geliştirme etkisinin' incelenmesine yönelik bir araştırma kapsamında hazırlanmıştır.

Soruların doğru ya da yanlış cevapları yoktur ve cevaplar sadece bilimsel amaçlarla kullanılacaktır. Anketi yanıtlamak üzere zaman ayırdığınız ve katkı sağladığınız için teşekkür ederiz.

Sağlık sektöründe akıllı giyilebilir cihazlar (AGC)
Sağlık, spor, güvenlik, oyun, moda ve daha birçok alanda kullanılan giyilebilir teknolojiler, fiziksel aktivite ve davranışların yanı sıra fizyolojik ve biyokimyasal değerlendirmelerin düzenli olarak izlenmesini sağlayarak günlük yaşamın önemli bir parçası haline geliyor. Son dönemde tüm dünyayı etkisi altına alan pandemi (COVID-19) nedeniyle sağlık durumunun hastane dışında ve anlık olarak takip edilebilmesi büyük önem taşıyor. Giyilebilir teknolojiler bir bozukluğun teşhisi veya erken tespiti için tedaviden önlemeye doğru ilerleyerek ciddi sağlık sorunlarının önlenmesine yardımcı olabilir. Akıllı Giyilebilir cihazlar (AGC), sağlık hizmeti verilerini toplamak, yönetmek ve kontrol etmek için biyometri, sensörler ve implante edilebilir cihazların kullanımını kapsamaktadır.

Akıllı giyilebilir cihazlar (AGC) ile ilgili bilginiz var mı?	☐ Evet	☐ Hayır
Hiç akıllı bir giyilebilir cihaz (AGC) kullandınız mı?	☐ Evet	☐ Hayır

Hangi Akıllı Cihaz?	
Hangi akıllı cihaz(lar)ı kullandınız?	
Akıllı giyilebilir cihazları hangi amaç(lar) için kullandınız?	☐ İzleme (kendi başıma takip) ☐ İzleme (sağlık kuruluş tarafından takip) ☐ Teşhis (kendimi önlemek ve erken teşhis) ☐ Teşhis (sağlık kuruluş tarafından önlemek/erken tespiti) ☐ Anlık müdahale için ☐ Diğer

Aşağıdakilerden hangisi genel olarak sağlık durumunuzu en iyi tarif eder?	☐ Devam eden bir sağlık sorunum yok ☐ Bazı küçük sağlık sorunlarıyla karşılaşıyorum ☐ Bazı önemli sağlık sorunlarıyla karşı karşıyayım

Bir sonraki bölüm 5 kısmıdan oluşmaktadır. Lütfen aşağıdaki soruları kendi düşüncenize göre tek bir yanıt seçerek yanıtlayınız: 'Kesinlikle Katılmıyorum', 'Katılmıyorum', 'Ne katılıyorum ne katılmıyorum', 'Katılıyorum', 'Kesinlikle Katılıyorum'.

Sağlıkta AGC genellikle aktivite monitörleri, akıllı saatler, akıllı giysiler gibi diğer giyilebilir cihazlarla birlikte gruplandırılır ve hepsinin amacı, cihaza takılı non-invaziv sensörler kullanarak hastanın sağlığıyla ilgili önemli verilerin toplanmasına yardımcı olmaktır. Bu veriler hasta tarafından veya sağlık hizmeti kuruluş tarafından önleme veya erken teşhis (tanı koymak) amacıyla değerlendirilebilir.

Lütfen aşağıdaki soruları, sağlık uzmanınızın sağlık durumunuza göre AGC kullanmanızı önereceği varsayımına dayanarak yanıtlayın.

Tıbbi bilgileri toplama amaçla hastalıkla ilgili verileri kontrol altında tutan AGC'ları kullanım niyetinizi düşünerek sonraki sorulara cevap veriniz.

	Kesinlikle Katılmıyorum	Katılmıyorum	Ne Katılıyorum ne Katılmıyorum	Katılıyorum	Kesinlikle Katılıyorum
Sağlık durumunuz için sağlık kuruluşunuz size teşhis amaçlı giyilebilir bir cihaz (akıllı haplar, çipler, gömülü biyosensör, implante edilebilir sensör) kullanmanızı önerir ise, kabul eder misiniz?					

Marka İmajından Beklentiler

		Kesinlikle Katılmıyorum	Katılmıyorum	Ne Katılıyorum ne Katılmıyorum	Katılıyorum	Kesinlikle Katılıyorum
1.	Bana AGC'ları önerecek veya sağlayacak hastane markası, eksiksiz pratik işlevlere (tıbbi hizmetler ve yeterli tıbbi tesisler) sahip olmalıdır.					
2.	Bana AGC'ları tavsiye edecek veya sağlayacak hastane markasının pozitif bir sembolik anlamı olmalıdır (iyi itibar, güvenilirlik ve pozitif imaj).					
3.	Bana AGC'ları önerecek veya sağlayacak hastane markasının iyi bir hizmet deneyimi sağlaması gerektiğini düşünüyorum.					

Algılanan Değer						
1.	Bazı zorluklara rağmen, sağlık AGC'ların kullanmanın sağlığı yönetmeye yardımcı olabileceğini düşünüyorum					
2.	Sarf ettiğim çaba ile karşılaştırıldığında, AGC kullanmak benim için yararlıdır					
3.	Harcanacak zamana kıyaslandığında, sağlık AGC kullanmak benim için zahmete değerdir					
4.	AGC'ları kullanmak verdiğim paramın karşılığını verir					
Tüketici Yenilikçiliği						
1.	Yeni bir bilgi teknolojisi duyduysam, onu denemenin yollarını arıyorum.					
2.	Genel olarak, yeni bir teknolojik ürün veya hizmet ortaya çıktığında arkadaş çevremde ilk kullananlardan biri oluyorum.					
3.	Yeni teknolojinin geçmişe göre bir ilerleme olduğunu düşünüyorum.					
4.	Yeni teknolojiyi kullanmayı yeni bir deneyim olarak buluyorum					
AGC'ları kullanma niyeti						
1.	AGC kullanmanın faydalı olduğunu düşünüyorum					
2.	AGC'ların sunduğu sağlık hizmetlerine güvenebileceğimi düşünüyorum.					
3.	Gelecekte sağlıkta kullanılan AGC ile sağlıklı alışkanlıklarımı geliştireceğim					
4.	AGC kullanmanın sağlıklı kalmaya yardımcı olacak önleyici tedbirler sağladığını düşünüyorum					
5.	Kişisel sağlığımı yönetmek için giyilebilir sağlık AGC'larını kullanmaya güveniyorum.					

Lütfen yaşınızı belirtiniz	☐
Lütfen cinsiyetinizi belirtiniz	☐ Erkek ☐ Kadın ☐ Belirtmemeyi tercih ediyorum

Bireysel aylık geliriniz (TL)	☐ 7500 TL ve altı ☐ 7501-8500 TL ☐ 8501-15000 TL ☐ 15001-25000 TL ☐ 25001 TL ve üstü
Lütfen mesleğinizi belirtiniz	☐

Appendix 2 - Questionnaire in English

QUESTIONNAIRE

THE ROLE OF HOSPITAL CORPORATE IMAGE ON THE INTENTION TO USE SMART WEARABLE DEVICES IN THE HEALTHCARE SECTOR

Dear Participant,

This survey was prepared within the scope of a research to examine the 'Role of smart wearable health devices in healthcare sector and their impact on improving hospital image' to be used in Marmara University Marketing Department Master's thesis.

There are no right or wrong answers to the questions and answers will be used only for scientific purposes. Thank you for taking the time and contributing to answering the questionnaire.

Smart wearable devices (SWDs) in healthcare sector (SWD)		
Wearable technologies used in health, sports, security, gaming, fashion and various other fields are becoming an important part of daily life by allowing regular monitoring of physiological and biochemical variables as well as physical activity and behaviors. Due to the pandemic (COVID-19), which has recently effected the whole world, it is very important to be able to monitor the health status outside of the hospital and instantly. Wearable technologies for diagnosis or early detection of disorder can help prevent serious health problems by moving away from treatment towards prevention. Smart Wearable devices (SWD) incorporate the use of biometrics, sensors, and implantable devices to collect, manage and controll healthcare data.		
Are you aware of smart wearable devices (SWD)?	☐ Yes	☐ No

Have you ever used a smart wearable device(SWD)?	☐ Yes	☐ No

Which Smart Device?	
Which smart device(s) did you use?	
For which purpose(s) have you used smart wearable devices?	☐ Monitoring (by myself) ☐ Monitoring (by the healthcare provider) ☐ Diagnostic (self prevention and early detection) ☐ Diagnostic (prevention/early detection by the careprovider) ☐ Instant intervention ☐ Other

Which of the below best describes your health status in general?	☐ I don't have any ongoing health problem ☐ I face some minor health problems ☐ I face some major health problems

The next section consists of 5 constructs. Please respond the questions below according to your opinion by selecting one answer: 'Strongly Desagree', 'Desagree', 'Neither agree nor disagree', 'Agree', 'Strongly Agree'.

Role of smart wearable devices in healthcare sector

SWD in healthcare are often grouped together with other wearables, such as activity monitors, smartwatches, smart clothing, and are all intended to help gather important data concerning the health of the patient using non-invasive sensors installed on the device. This data may be evaluated by petient itself or by healthcare provider with the aim to prevent or early detect (diagnose).

Please respond the below questions based on the assumption that your healthcare provider will suggest you to use a SWD according to your health status

Answer the next questions by considering your intention to use SWDs that keep the data about your disease under control for the purpose of early diagnosis.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
If your healthcare provider recommends you to use a wearable device (smart pills, chips, embedded biosensor, implantable sensor) for diagnostic purposes for your health condition, would you accept it?					

Expectations of Brand Image

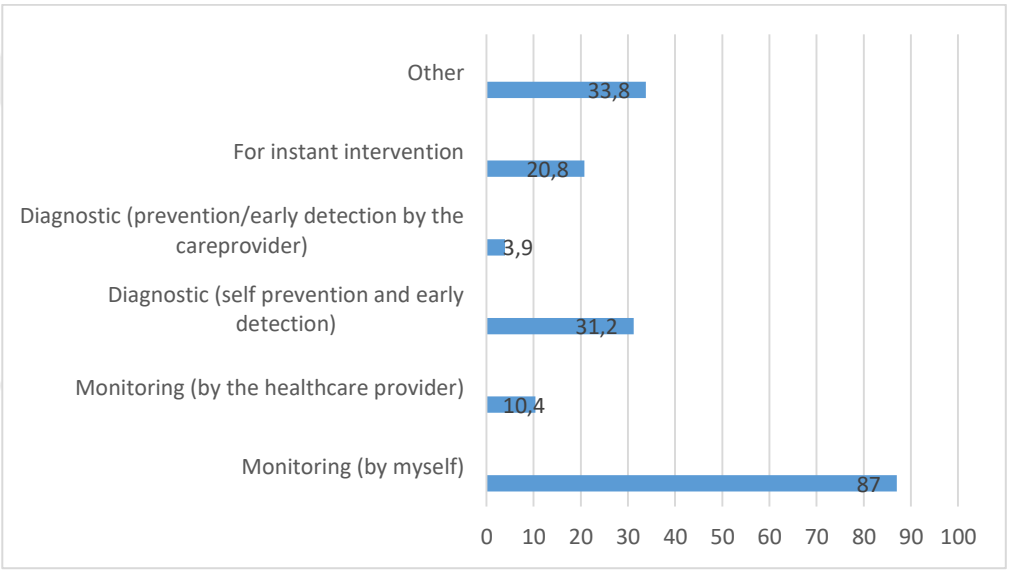
		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1.	The hospital brand that would recommend or provide me with SWDs should possess complete practical functions (medical services and adequate medical facilities)					
2.	The hospital brand that would recommend or provide me with SWDs should possess a positive symbolic meaning (good reputation, credibility, and positive image)					
3.	I feel that the hospital brand that would recommend or provide me with SWDs should provide me with a pleasant service experience					

Perceived Value						
1.	Despite some challenges, I think using health SWD can help to manage health					
2.	Compared to the effort to put, using SWD is beneficial to me					
3.	Compared to the time to spend, using health SWD is worthwhile to me					
4.	Using SWDs offer value for money					
Consumer Innovativeness						
1.	If I heard about a new information technology, I would look for ways to experiment with it					
2.	In general, I am among the first in my circle of friends to use a new technological product or service when they appear					
3.	I think new technology is a progress compared with the past					
4.	I found using new technology to be a novel experience					
Intention to Use SWDs						
1.	I think using SWD is worthwhile					
2.	I think I can rely on the health services provided by SWD					
3.	I will develop healthy habits with the health SWD in the future					
4.	I think using SWD provides preventive measures to help stay healthy.					

Please indicate your age	☐
Please indicate your gender	☐ Male ☐ Female ☐ Prefer not to indicate

Individual monthly income (TL)	☐ 7500 TL or less ☐ 7501-8500 TL ☐ 8501-15000 TL ☐ 15001-25000 TL ☐ 25001 TL and above
Please indicate your occupation	☐

Appendix 3 - Purposes to use smart wearable devices



Appendix 4 - Sample's Demographic Characteristics

APP 4.1. Distribution of Sample's Gender in Percentages

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	103	51,2	51,2	51,2
	Male	96	47,8	47,8	99,0
	Not indicated	2	1,0	1,0	100,0
	Total	201	100,0	100,0	

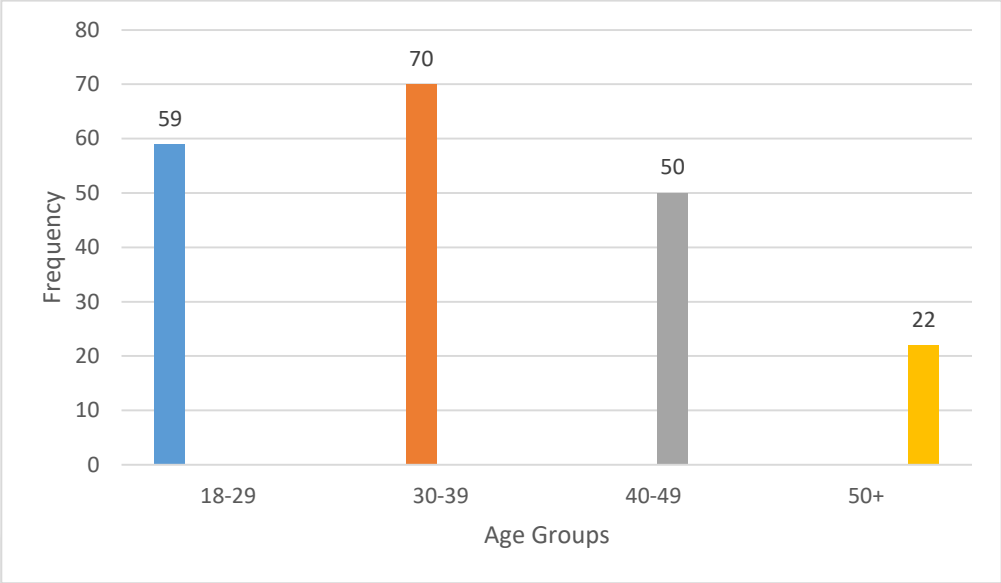
Source: Computed by the researcher

APP 4.2. Distribution of Age Groups in Percentages

Age Groups	Frequency	Percent	Cumulative Percent
18 - 29	59	29,4	29,4
30 -39	70	34,8	64,2
40 -49	50	24,9	89,1
50 +	22	10,9	100,0
Total	201	100,0	

Source: Computed by the researcher

APP 4.2.2. Distribution of Age Groups



Source: Computed by the researcher

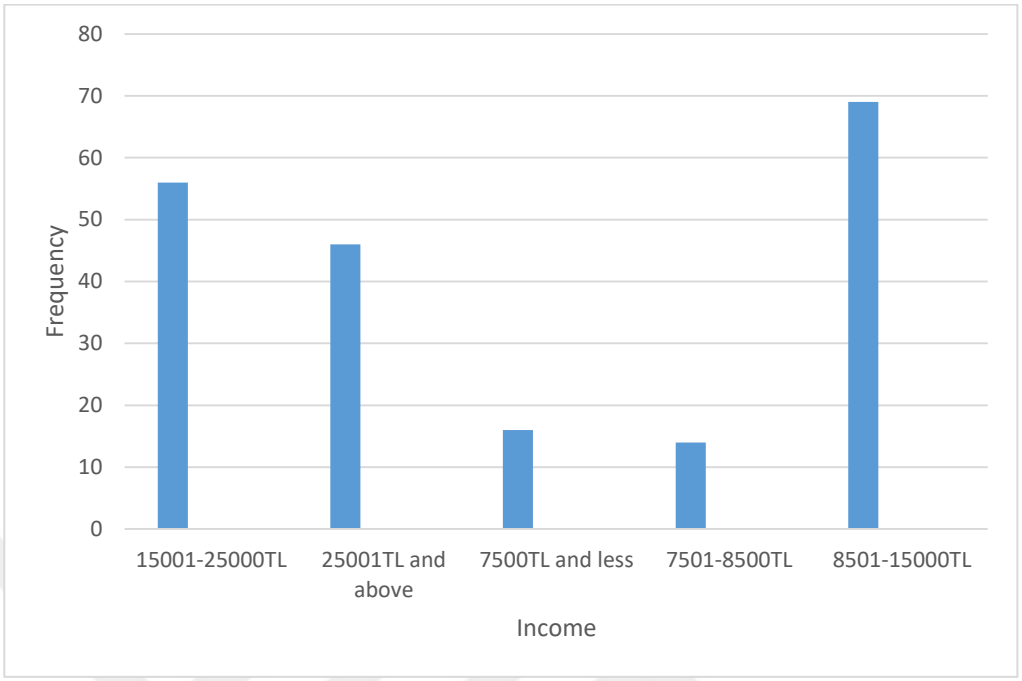
APP 4.3. Distribution of Sample's Income in Percentages

Income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15001-25000 TL	56	27,9	27,9	27,9
	25001 TL and above	46	22,9	22,9	50,7
	7500 TL and less	16	8,0	8,0	58,7
	7501-8500 TL	14	7,0	7,0	65,7
	8501-15000 TL	69	34,3	34,3	100,0
	Total	201	100,0	100,0	

Source: Computed by the researcher

APP 4.3.1. Distribution of Sample's Income



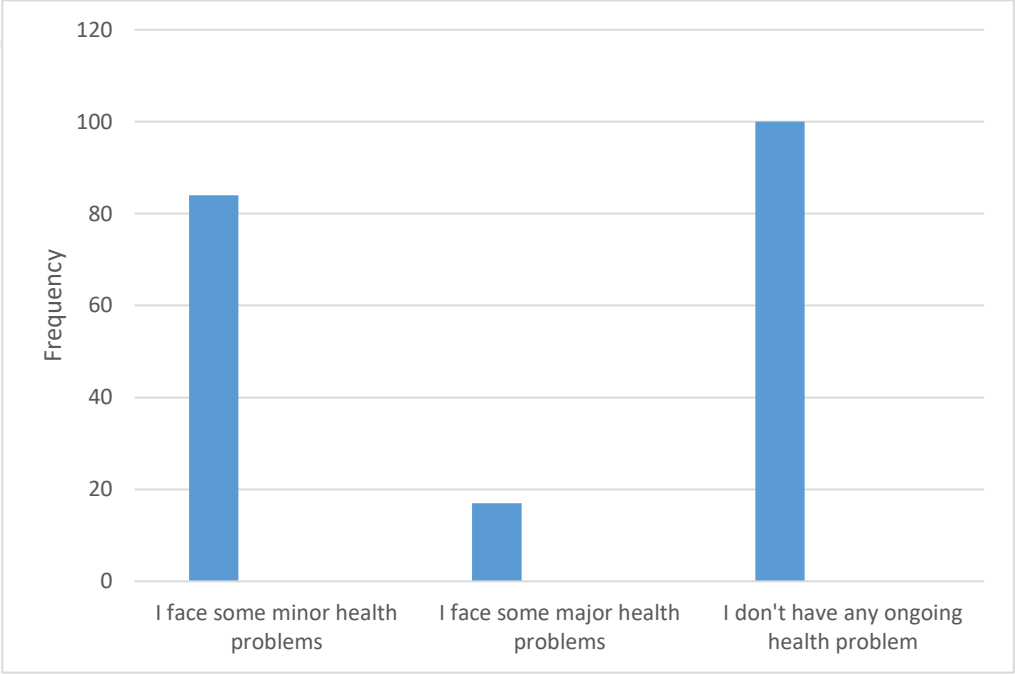
Source: Computed by the researcher

Appendix 5 – Sample's Health Status

Health Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I face some minor health problems	84	41,8	41,8	41,8
	I face some major health problems	17	8,5	8,5	50,2
	I don't have any ongoing health problem	100	49,8	49,8	100,0
	Total	201	100,0	100,0	

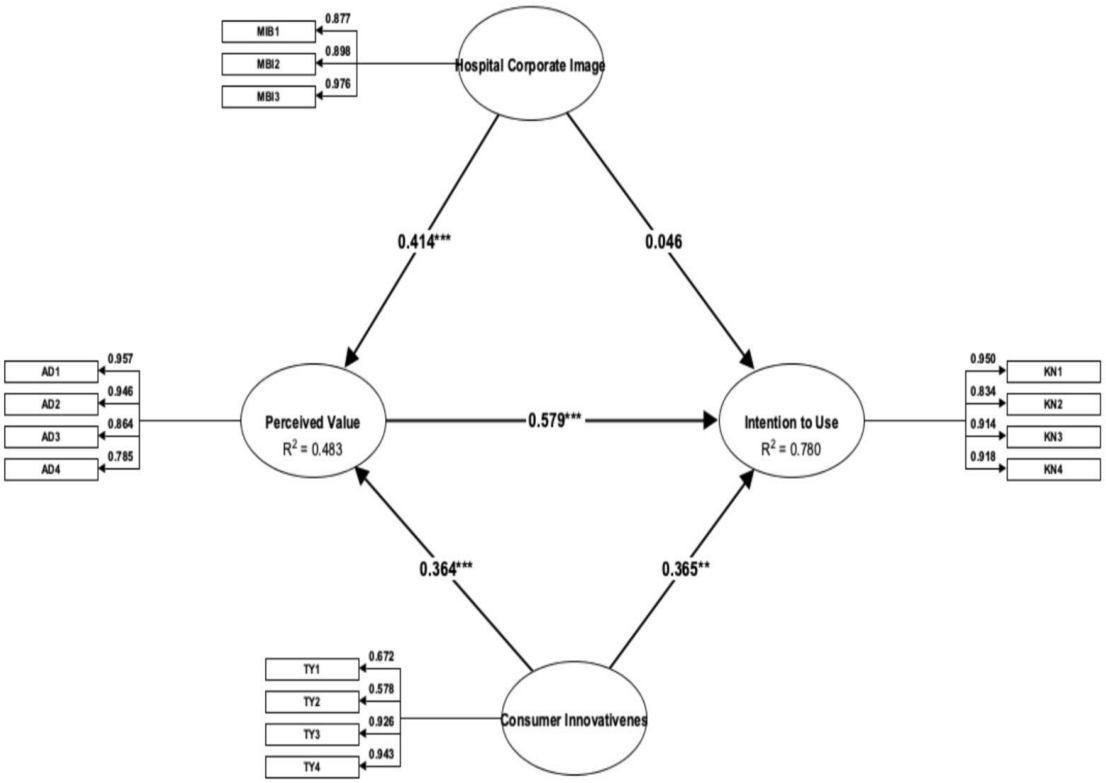
Source: Computed by the researcher



Source: Computed by the researcher

Appendix 6 - Path Analysis of The Model

[1]



Source: Developed by the researcher

[1] Numbers on arrows directed to variables are path coefficients,
Numbers on arrows directed to items are loading values
** significance level p‹ ,01
*** significance level p‹ ,001