

I. KESKİN

BAÜ 2023

**T.C.
BAHCESEHIR UNIVERSITY
GRADUATE SCHOOL OF EDUCATION
THE DEPARTMENT OF BUSINESS ADMINISTRATION**

**AN EXAMINATION OF THE FACTORS INFLUENCING CONSUMERS'
INTENTION TO USE SMART HOME APPLIANCES WITHIN THE
TECHNOLOGY ACCEPTANCE MODEL FRAMEWORK**

MASTER'S THESIS

İsmail KESKİN

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Program Name:	MBA
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Dr. Fatma Elif Çetin
Institute Director

This thesis was read by us, quality and content as a Master's thesis has been seen and accepted as sufficient.

	Title, Name	Signature
Theis Advisor:	Prof. Elif YOLBULAN OKAN	
2. Member:	Dr. Vahideh ARGHASHI	
3. Member:	Dr. Irmak Bakioğlu	



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Name, Surname : İsmail KESKİN

Signature :

ABSTRACT

AN EXAMINATION OF THE FACTORS INFLUENCING CONSUMERS' INTENTION TO USE SMART HOME APPLIANCES WITHIN THE TECHNOLOGY ACCEPTANCE MODEL FRAMEWORK

Keskin, İsmail

Business Administration Masters Program

Supervisor: Prof. Elif YOLBULAN OKAN

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The emergence of new smart home technologies has brought about applications that can simplify our everyday activities. It is crucial for manufacturers to comprehend the reasons why these innovative applications are either accepted or rejected by consumers. Numerous models have been put forth to identify these reasons, with the Technology Acceptance Model (TAM) being the most prevalent one. This study aims to utilize the TAM to analyze the fundamental factors that impact users' willingness to adopt smart home technologies that are becoming more prevalent in our lives. Data were collected by a online survey instrument in Turkey from 350 smart appliances owners. Structural equation modeling(SEM) and Confirmatory factor analyses (CFA) were used to examine the research hypothesis. Findings showed trust, usefulness and ease of use play a vital role to increase positive attitudes toward intention to use.

Keywords: Smart Home Appliances, Technology Acceptance Model, Novelty, Mobility, Compatibility, Trust, Usefulness, Ease of use, Attitude, Intention to use

ÖZET

TÜKETİCİLERİN AKILLI EV ALETLERİNİ KULLANMA NİYETİNİ ETKİLEYEN FAKTÖRLERİN TEKNOLOJİ KABUL MODELİ ÇERÇEVESİNDE İNCELENMESİ

Keskin, İsmail

MBA

Supervisor: Prof. Elif YOLBULAN OKAN

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Yeni akıllı ev teknolojilerinin ortaya çıkması, günlük aktivitelerimizi kolaylaştıran uygulamaların ortaya çıkmasına neden oldu. Üreticilerin bu yenilikçi uygulamaların tüketiciler tarafından neden kabul edildiğini veya reddedildiğini anlamaları çok önemlidir. Bu nedenleri belirlemek için birçok model önerilmiştir ve Teknoloji Kabul Modeli en yaygın olanıdır. Bu çalışma, hayatımızda daha yaygın hale gelen akıllı ev teknolojilerini benimsemeye istekli kullanıcıları etkileyen temel faktörleri analiz etmek için TKM'i kullanmayı amaçlamaktadır. Veriler, Türkiye'de 350 akıllı cihaz sahibinden online bir anket aracılığıyla toplandı. Araştırma hipotezlerini incelemek için yapısal eşitlik modellemesi (YEM) ve doğrulayıcı faktör analizi (DFA) kullanıldı. Bulgular, güven, faydalılık ve kullanım kolaylığının, kullanma niyeti üzerinde olumlu tutumları artırmak için önemli bir rol oynadığını göstermektedir.

Anahtar Kelimeler: Akıllı Ev Aletleri, Teknoloji Kabul Modeli, Yenilik, Mobilite, Uyumluluk, Güven, Yararlılık, Kullanım Kolaylığı, Tutum, Kullanım Niyeti

FOREWORD

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ABBREVIATIONS

ATU	: Attitude Toward Use
AVE	: Average Variance Extracted
BI	: Behavioral Intention
CFA	: Confirmatory Factor Analysis
CFI	: Comparative Fit Index
COM	: Compatibility
CR	: Composite Reliability
df	: degrees of freedom
EFA	: Exploratory Factor Analysis
GFI	: Goodness of Fit Index
INT	: Intention to Use
IoT	: Internet of Things
KMO	: Kaiser-Meyer-Olkin Test
MO	: Mobilty
NFI	: Normed Fit Index
NNFI	: Non-Normed Fit Index
NOV	: Novelty
PEOU	: Perceived Ease of Use
PU	: Perceived usefulness
RMSEA	: Root Mean Square Error of Approximation
SD	: Standard Deviation
SEM	: Structural Equation Modeling
SRMR	: Standardized Root Mean Square Residual
TAM	: Technology Acceptance Model
TR	: Trust
UTAUT	: Unified Theory of Acceptance and Use of Technology

SYMBOLS

λ	: Standardized factor loadings
χ^2/df	: Goodness of Fit
ε	: Error Term or Residual
χ^2	: Ratio of The Chi-square Statistic



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1. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

In the scope of theoretical framework, first a literature review of the IoT and Smart Home Appliances are included. This chapter also includes models and theories of user technology acceptance and reasoned action theory. The most importantly, it provides detailed literature review on technology acceptance.

1.1 Internet of Things

In 1999, Kevin Ashton introduced the term "IoT" during a P&G summit, which refers to a cutting-edge approach for connecting objects via a network, regardless of their location or time, as documented by Gubbi, Buyya, Marusic, & Palaniswami (2013). There are multiple interpretations of IoT in the literature, but generally, it allows for the remote monitoring and control of products, as well as enabling communication between them, as noted by Hamidi (2019) and van Deursen & Mossberger (2018). The potential for IoT technology has captured the attention of various industries and academic fields, and some companies are adopting IoT into their products while others prefer to wait and see the technology's maturity level, according to Lee & Lee (2015). Smart appliances like refrigerators have the ability to manage food and beverage stock by monitoring inventory changes and automatically adding items to a shopping list, illustrating how IoT technology can alter user behavior and provide numerous advantages, as observed by Gao & Bai (2014). The number of IoT devices connected worldwide is rapidly increasing, with estimates predicting a rise from 15.4 billion in 2015 to 75.44 billion by 2025. Additionally, the global revenue generated by IoT is expected to grow from US\$212 billion in 2019 to US\$1.6 trillion in 2025, according to predictions from Statista in 2019.

1.2 Smart Home Appliances

In the near future, smart home appliances, which are IoT-enabled automated products in home environment, such as smart fridge-freezers, microwaves, washers, HVAC,

ovens, air-cooling systems, safety systems, camera systems, and illumination control, will become more common in everyday life. These appliances offer a variety of functions, such as home automation, entertainment solutions, and energy management, and can be easily integrated into existing homes. Amazon, Samsung, Google, and Apple are the top players in this market, while other major companies like GE Appliances and Bosch also offer intelligent home appliances in their product line.

The domestic home appliance market commonly refers to IoT-enabled home appliances as intelligent domestic devices that are connected to a network, providing consumers with a smart home environment (Takenaka, Yamamoto, Fukuda, Kimura, & Ueda, 2016). Initially, the most popular smart home appliances were smart televisions, air conditioners, and cameras. However, major companies such as Samsung, Bosch, Siemens, and LG have recently expanded their product lines to include a variety of smart home devices, such as vacuum cleaners, microwave ovens, fridge-freezers, dishwashers, and washing machines. Despite the optimistic market predictions, consumer adoption of intelligent home devices is still in the early stages. In order to increase the diffusion of intelligent home products, it is necessary to investigate the factors that are affecting consumer acceptance (Hong et al., 2019).

1.2.1 Smart Home System Within the Scope of the Internet of Things

With the emergence of the 5G era in mobile communication networks, the 'hyperconnectivity' feature has emerged, and services such as IoT, artificial intelligence, autonomous driving, and VR/AR are expected to become widespread (Heo et al., 2020). In the contemporary era, where we are witnessing the swift progression of the internet age and its corresponding impacts, ever-evolving IoT applications facilitate our lives. (M. Taştan, 2019). The Internet of Things, which is used in many physical industries and offers large economic advantages, has emerged as the driving force behind science and technology development thanks to precise sensing, identification, remote control, and others. (Choi et al., 2020). Actually, these advancements in IoT technology have prompted the conversion of conventional homes into smart linked homes. According to Statista's report on "Smart Home Devices Worldwide 2020-2025," published in March 2021, globally there were 349 million smart home devices in 2020, and that number is projected to rise sharply in the next years, reaching 1.77 billion in 2025. (Arif et al., 2020; Statista, 2021).

The foundation of home automation systems is often referred to as the IoT. This technology allows various components of the system to be connected and enables instant communication between them. The IoT paradigm facilitates the shift away from a closed environment where an object is characterized by an identifier to an open era where the object becomes "smart" and interacts with its surroundings. IoT embeds computer intelligence into household appliances and creates a convenient working system for users to measure home conditions and monitor environmental tools. Nowadays, people can connect with each other through the Internet everywhere. In addition, objects such as cars, refrigerators and TVs can also be connected to the Internet (Yao et al., 2020).

A "smart home" is a type of house that offers automated and intelligent services by transmitting and receiving real-time data through various household appliances, including TVs, heating systems, and ovens. These appliances are a part of a humanless, home-based communication system between devices and other settings. Users manage multiple home products according to their user settings depending on the network setup at home to monitor and control themselves (Lee et al., 2020).

Samsung SmartThings, Apple HomeKit, and Google Android are a few of the top IoT systems for homes that have developed in recent years. These platforms link many appliances, enable remote control and operation, and permit the creation of other applications. (Khoa et al., 2020).

1.2.2 Smart Home System Within the Scope of the Internet of Things

Contrary to what we would think, smart home technologies have been around for a much longer. The 1890s and the beginning of the 1900s saw the rise of the concept of a house that might be wiser in terms of the comfort and convenience it offers, when rich individuals began using electricity to create higher levels of automation and sophistication in their homes. Thomas Edison patented an automatic, colored lighting system for homes in 1910, and the same year it was used to promote Edison in advertisements in New York. Similarly, in the United States, the Rural Electrification Administration promoted "modern electric home appliances" in the 1930s along with efforts to electrify rural farms. In 1956, The "Live Better Electrically" promotion by General Electric and Westinghouse offered households a gold medallion in exchange

for switching all of their appliances to electricity. (Sovacool and Furszyfer Del Rio, 2020).

Between 1966 and 1967, the Kitchen Computer, named ECHO IV, was the first smart device, although it was never commercially sold. This smart device could calculate shopping lists, control the temperature of the house, and turn devices on and off. A year later, a Kitchen Computer was developed that could store recipes in its memory, but due to inadequate advertising campaigns, none of its models were sold (Katre and Rojatkar, 2017, 344).

The usage of electric home equipment grew during the 1980s and 1990s. By the late 1980s, half of families in Britain had video recorders, and 75% of homes had color televisions. Additionally, a wide range of technological products, from wireless/cellular phones to entertainment appliances like PlayStation, were introduced during this period (GhaffarianHoseini et al., 2016, 82).

Between 1990 and 2000, various technological breakthroughs, such as the launch of the Hubble Space Telescope into low Earth orbit in 1990 and the Human Genome Project, were achieved. However, the World Wide Web (WWW) emerged during this decade, developed by Tim Berners-Lee in 1989 and publicly launched in 1991. The first web browser (Mosaic), which allowed even novice users to explore the World Wide Web without the need for advanced technical understanding, was publicly launched in 1993. Following these technological advancements, the fundamental aspects of modern existence, such as online shopping, advertising, and other services provided over the internet, began to emerge (GhaffarianHoseini et al., 2016).

Between 2000 and 2015, the internet continued to grow exponentially, and applications such as internet protocol telephony, broadband access, peer-to-peer networking, file sharing, and online gaming became more widespread. In 2012, all publicly available cable networks' data exchange reached 26.7 exabytes/month. One exabyte is equal to 2,500 times the volume of all books ever published. IoT, which was first proposed in 1999, has created a digital world by fusing real-world data with smart items. (GhaffarianHoseini et al., 2016).

The idea of smart homes has drawn the attention of various disciplines since its inception, inspiring research in many areas. As a result, when we look at the literature, we come across several explanations of smart homes, with relation to the study's topic

and the benefits it provides. Table 1 presents a collection of 15 definitions of "smart homes" ranging from Lutolf's idea in 1992 that included shared information and communication systems to Yang and Han's "connected home" equipped with the latest technology to offer personalized services to end-users in 2021. These definitions reveal a variety of common terms used to refer smart homes, such as "smart home services" and "IoT" in the home, "smart appliances", "ICT-based houses," and even "communication-equipped connected homes for human-computer interaction."

Table 1

Significant Definitions of Smart Home Technologies, 1992-2021

Resource	Date	Definition
Gross	1998	It is the adjustment of various mechanisms that provide heating, ventilation, lighting, and other services by using sensors and control systems to monitor a residence.
Dewsbury etc.	2001	A smart home is one that goes beyond the traditional scope of a "brick and mortar" home and is containing technical tools.
Aldrich	2003	A smart home is a building outfitted with information technology that anticipates and responds to the requirements of its occupants. It does this by managing the technology within the house and connecting to the outside world in order to increase comfort, convenience, security, and entertainment.
Ricquebourg etc.	2007	A smart home can be defined as a home equipped with smart objects. It is a residence where a gateway is established between objects and the home through smart home technology, allowing for the transfer of information and enabling monitoring.
Robles and Kim	2010	It is the blending of services and technology through a home network to improve quality of life.
Kadam	2015	A smart home involves the use of technology and services that are interconnected through a home network, aimed at improving the overall quality of life. This is accomplished through the implementation of advanced monitoring systems and remote control functionality.
Hargreaves	2017	A smart house handles several local systems, sends information to users, and gathers and analyzes data about the home.
Marikyan	2019	A smart residential unit outfitted with cutting-edge technology to provide its inhabitants individualized services.
F.Hall	2020	A smart house is a building with a communication network connecting basic electrical appliances and amenities that provide remote access, supervision, and control.
Yang ve Han	2021	A "connected home" is a residence where the user can monitor the status of their home and control home appliances through a cloud server.

1.2.3 Smart Home Concept

The Internet of Things age is here, and every electrical gadget may now be connected thanks to advanced technological advancements. From wearable technology to telemedicine systems and home automation gadgets, the market for "smart objects" is expanding quickly; a great number of new linked products are appearing on the international scene (Papetti et al., 2016). The word "smart" has become a general term for innovative technology with a degree of artificial intelligence. Smart technology's capacity to recognize information from the environment and react appropriately is a key component. Smart technology has taken the place of traditional technology as the foundation of cutting-edge ideas like the "smart home" since its long-term purpose is to improve people's well-being (Marikyan et al., 2019). Info and Communication Technology (ICT) has expanded the range of a general home beyond the "brick and mortar" by introducing and continuously improving smart home technology. It is no longer limited to conventional products such as oven or washing machines, but has begun to be integrated into the fabric of the home (Dewsbury et al., 2001).

The IoT age has come to the world, where technologies have matured to enable every electronic device to connect. The market for Smart Things is rapidly growing, there are a lot of new linked products entering the market, ranging from wearable technology to home automation tools. (Papetti et al., 2016). In recent years, the word "smart" has spread to describe every novel technology that incorporates some level of artificial intelligence. The capacity to gather data from the environment and react appropriately is one of smart technology's core properties. Smart technology has made up the foundation of novel concepts like the "smart home" since its long-term objective is to improve people's well-being (Marikyan et al., 2019).

With the help of technologies such as the IoT, machine learning, and mobile applications, home appliances have become automated. The internet can be used in home automation, which provides many features ranging from efficient energy use to more comfort and security. In addition, users can monitor and control their front door, oven, refrigerator, and garden water from even very distant locations without human intervention (Al-Ali and Al-Rousan, 2004). Thus, we can describe a Smart Home as a "residence equipped with a high-tech network that is remotely followed, accessible, managed, or controlled and provides advanced services to its occupants by connecting sensors and home appliances" (Nikou, 2018). Smart Home Technology (SH) is a

growing consumer segment within the ICT industry. According to research by Statista, there were 349 million smart homes in use as of 2020, and that number is shown to increase sharply in the years to come, totaling 1.77 billion by 2025. The popularity of SH devices is due to their unique features, including self-contained properties such as wireless connectivity with internet and ICT devices on the same network, collectively allowing SH device consumers to do the following (Arthanat et al., 2020; Statista, 2021):

- Create sensor networks to collect and monitor information about the home's status and residents,
- Communicate between devices to enable automation and remote access, and
- Connect with user interfaces such as home screens, personal computers, tablets, and smartphones to determine preferences/targets, as well as receive information and feedback.

Smart homes can be integrated into existing structures as well as built during construction. Product design and innovations differ significantly during the construction of structures and are generally project-based. Devices and services within smart home systems vary according to user needs and preferences. Therefore, it is not possible to talk about a standard smart home design today. Devices and services within the system can be removed from the system over time according to user demand or new products and services can be included to the system.

Smart homes are just one example of a range of technologies that fall under the category of assistive or augmentative technologies. There are two primary kinds of smart home technologies. The first includes active devices such as control panels and switches that the homeowner directly interacts with and uses. The second includes passive devices such as sensors and receivers that work to enhance and empower the living experience of the home's occupants without direct contact. These devices and other technologies consist of four main technologies that promote independence (Dewsbury et al., 2001):

1. Assistive Technologies: Technologies or devices that make it easier or safer for someone to execute an activity that they would otherwise be unable to complete.

2. Adaptive Technologies: Technologies that allow any system or device to be modified according to an individual's needs, making the task easier and safer to perform.
3. Inclusive Design or "Design for All" Technologies: Technologies developed according to the principle that devices and systems can be used by the widest possible range of people.
4. Medical Devices: All products used to diagnose, prevent, monitor, treat, or alleviate illness or injury in a healthcare setting, excluding medications.

Smart home technologies (SHTs) include interconnected sensors, monitors, interfaces, devices, and appliances that allow for localized and remote control, as well as automation, of the home environment. Heating and hot water systems, lights, windows, drapes, garage doors, refrigerators, TVs, and washing machines are just a few examples of the appliances and gadgets that may be controlled. Environmental elements including temperature, light, motion, and humidity are detected by sensors and monitors. Software on computer systems provides control functions. Different SHTs typically connect to the network wirelessly using standardized communication protocols (Wilson et al., 2017). Various smart network protocols, such as Z-wave, BlueTooth, Wi-Fi and ZigBee, are used by smart home appliances., (Asaithambi et al., 2021).

Wilson et al. (2014) conducted research on why smart homes are seen as such a increasing and highlighted area, and identified three views from the literature:

1. Functional View,
2. Instrumental View,
3. Socio-technical View.

The Functional View describes smart houses as a method to use technology to more effectively handle the requirements of consumers. The Instrumental View emphasizes the potential of smart homes to manage and reduce household energy demand as part of a future of reduced energy consumption. The smart house is the next phase in the continual electrification and digitization of daily life, according to the socio-technical viewpoint.

1.2.4 Smart Home Technology

An intelligent home (smart home) is a system that connects various facilities through a network, using user interface technology, control technology, computer technology and communication technology to provide more stable control and management by meeting all the automation requirements of the entire system. Traditional smart home applications often interface with and operate building infrastructure using wired lines, which are susceptible to different cable constraints. Additionally, the system's scalability is poor, and installation costs are considerable. A wireless sensor network-based smart home system frees homeowners from the constraints of wires, lowers installation costs, and significantly enhances the system's scalability (Li et al., 2018).

- The following are some fundamental characteristics of a smart home (Lobaccaro et al., 2016):
- Automation: The capacity to run mechanical machinery or carry out automatic tasks;
- Multifunctionality: The capacity to carry out diverse activities or to result in varied results;
- Adaptability: The capacity to recognize, foresee, and accommodate user demands;
- Interaction: The capacity to provide user interaction;
- Efficiency: The ability to perform functions that save time and cost appropriately.

To have a system that controls different functions of the home for comfort, safety, or entertainment purposes, the correct components need to be brought together and used. According to Suryadevara and Mukhopadhyay (2015), a wired or wireless communication system is required along with a set of electronic components to allow information to be transferred to and from the system and the desired sources. The obtained information must then be processed so that it does not cause the activation or deactivation of a function (e.g., "lights turning on because someone enters the room and triggers a sensor"). Physical components such as sensors in a smart home environment also collect data and transfer it to the house following command system.

The system connects over a network, allowing information to be collected and processed (Suryadevara and Mukhopadhyay, 2015).

1.2.5 Smart Home Automation System

Technological developments in today's world have brought innovations and conveniences to every aspect of life. As technology serves humans and people spend a large part of their lives at home and want to use their time more effectively, the classic home structure has begun to be left behind. Home automation system is a technical, method or system that can control the lighting, security, climate conditions and many other parameters of the house that can be centrally controlled with minimal human involvement (Yılmaz et al., 2014). One of the key elements considered in developing smart home automation is that these systems can work seamlessly with phones, tablets and personal computers. Phones have now become one of everyone's standards. Considering such a variable, controlling the smart home system with a phone provides a convenience for the family using the home system (Özaydın, 2017). The system can be designed to be controlled from inside or outside the house, either wired or wireless, depending on user preference (Bostancı, 2017). In other words, home automation is a system designed for comfort and energy savings, allowing tasks that normally take more time to be done in a short period of time. Automation not only ensures efficient but also economical use of electricity and water, and reduces much of the waste. Smart Home Automation is an important application of IoT technologies. It allows the monitoring of energy consumption by using various sensors and actuators that control light, temperature and humidity in buildings, schools, offices and museums, and controlling the environment (Ali, 2018). Current examples of home automation are remotely adaptable control, modernized lights, robotized internal controller adjustment, reservation machines, compact/email/content alerts and remote video detection sensors (Sharma and Priyajot, 2019).

The Home Automation System has the following features (Wagh and Wanik, 2014):

- Adapted to New Technologies: Uses wireless communication instead of wired communication.
- Trust: A reliable system.
- Expandability: Related modules can be added or removed to adapt to your needs.

- **Low Cost:** Selected wireless devices are cheap, and we only need one computer for the main system.
- **Energy Efficient:** The battery life of wireless autonomous devices is limited, so battery management is essential to increase battery life.

1.2.6 Advantages of Smart Home Systems

Smart home technology provide advantages in many areas, including reducing their negative impact on the nature, reducing energy expenses, and enhancing the security and safety of buildings. Systems not only control building processes but also transform data to assist users in finding new methods to cut expenses and improve building comfort and efficiency (Fabi et al., 2017). Smart homes are one of the critical applications in the IoT paradigm. IoT is becoming more and more developed as a consequences of the adoption of smart house equipment. To make people's lives more convenient and pleasant, the majority of smart home appliances link to the Internet. Today, the ability to combine and control devices for smart home management has significantly increased and developed. A smart house is similar to a home that has been specially designed based on preferences and unique characteristics. It can manage and control a home's interior and external characteristics, such as lighting, temperature, doors, and windows. A room's brightness, temperature, background music, and even the playing of TV shows may all be changed using smart home management, all in accordance with the homeowner's tastes and judgments. (Khoa et al., 2020). In general, experts from different fields ranked the thirteen benefits and advantages of smart home technology based on their importance for smart homes (Sovacool and Del Rio, 2020):

1. Energy savings
2. Comfort and controllability
3. Financial benefits and cost savings
4. System advantages for networks, grids, and operators
5. Environmental benefits, including carbon, pollution, and waste
6. Aesthetics, such as style, design, feeling, and fashion
7. Health benefits and assisted living
8. Social benefits, such as inclusion, networking, and status

9. Educational benefits and learning
10. Entertainment, such as music, movies, and streaming
11. Security and safety
12. Other enhanced experiences (e.g., shopping)
13. Free services or promotional gifts

Every advancement in technology increases its impact and makes our lives easier. Smart homes are now one of the critical and popular things in digital innovation, following the smartphone.

1.2.7 Smart Home Usage in the World and in Turkey

Smart home usage has been increasing all around the world, and Turkey is not an exception. The market size for smart homes globally is projected to reach 151.4 billion USD by 2024, with a CAGR of 12.5% from 2019 to 2024 (statistas, 2021). Factors such as increasing demand for energy-efficient systems, the emergence of IoT-enabled smart homes, and the growing need for convenience, safety, and security are driving the market growth.

A report by Mordor Intelligence states that the smart home market in Turkey is expected to grow at a CAGR of 16.1% during the forecast period of 2021-2026. The increasing number of smart homes in the country is mainly due to the rise in disposable income, increasing awareness of energy-efficient solutions, and the growing popularity of home automation systems. Moreover, the Turkish government's initiatives to promote energy efficiency and green buildings have also contributed to the growth of the smart home market in the country.

Although Turkey is still in the early stages of adopting smart home technology, the industry is anticipated to expand quickly over the next few years as more people become aware of the advantages of home automation systems. The most popular smart home devices in Turkey include smart lighting systems, smart thermostats, smart locks, and home security systems (Sovacool and Del Rio, 2020). As the market grows, the range of smart home devices available in the country is expected to expand, providing consumers with more options for automating their homes.

2. Methodology and research design

2.1 The Subject and Importance of the Research

A suitable definition of the smart home concept involves an intelligent system that utilizes data about consumers and their environment to adjust and fulfill their expectations in a convenient and efficient manner (Perumal, Sulaiman, Sharif, Ramli, & Leong, 2013). These intelligent home devices are a range of connected consumer goods, including security systems, cameras, heating, air conditioning, lighting, and appliances such as washers, dryers, dishwashers, ovens, coffee machines, and refrigerators. They can connect to the internet, allowing consumers to remotely monitor and control them using applications. With the advent of the Internet of Things (IoT), the home appliance market has transitioned from functionality-based to connected, facilitating a data-driven decision-making process where connected appliances are more effective than their traditional counterparts (Mocrii, Chen, & Musilek, 2018).

According to Statista (2019), the global smart home appliance (SHA) market value was US\$73,719 million in 2019 and is expected to reach US\$158,876 million by 2024. The worldwide home diffusion rate was 7.2% in 2019 and is projected to increase to 19.3% by 2024.

In Turkey, SHA sales reached US\$293 million in 2019 and are anticipated to reach US\$788 million by 2024 (Statista, 2019). In 2019, the number of homes with any smart home appliances was 800,000, exhibiting a YoY growth rate of 41%. Furthermore, the home penetration rate was 4.2% in 2019 and is forecasted to increase to 15% by 2024. Although the market penetration rate in Turkey is lower than the global average, the annual growth rate is significantly high, with a CAGR for 2019-2024 of 21.9%, indicating large growth potential over the next few years.

In Turkey, the security segment, mainly comprising cameras and door locks, is the largest segment, with a market size of US\$113 million in 2019, projected to increase to US\$296 million by 2024. The second-largest segment includes white goods and small consumer goods such as refrigerators, washers, ovens, microwaves, coffee devices, and vacuum cleaners, which generated US\$77 million in revenue in 2019 and are expected to reach US\$217 million by 2024. The remaining SHA market includes

sound systems, door sensors, automated heating control, air conditioners, etc., and generated a total revenue of US\$103 million in 2019, projected to increase to US\$275 million in 2024.

The global smart home appliance market is expanding rapidly, and Turkey is experiencing a similar trend with optimistic future predictions. However, the market and products have not yet reached their full maturity level, so it is important for producers to understand the effective factors on consumer acceptance and usage to shape the market's future. Smart home appliances have the potential to change consumer behaviors and expectations for products while creating new benefits for consumers. Companies like Bosch and Samsung are introducing smart home appliances such as fridges, washers, sensors, and coffee machines, with a focus on improving the products' smart capabilities and adding new product groups.

Based on a comprehensive academic review of published studies, it is apparent that there is room for improvement in terms of consumer acceptance of smart home appliances both globally and in Turkey. The concept has received increased attention in academic literature, with a growing number of published studies. However, most of these studies have an organizational perspective, and there is a recent increase in studies focusing on consumer acceptance, especially in global research. Typically, these studies identify determinant factors that impact consumer behavioral intentions to accept smart home appliances by selecting an established theory or combining several theories. However, there is a lack of a unified methodology in the literature that can combine the effects of consumer technology acceptance and service expectation.

Based on existing research, Hubert et al. (2019) found that compatibility and usefulness were the critical elements effecting the intention to use smart house appliances. Baudier et al. (2018) suggested that the highly educated new generation is more likely to adopt smart home appliances and companies can target this population. Their findings were based on the TAM and UTAUT2 models. According to Hong et al. (2019), risk factors such as function, finances, confidentiality, and psychology were influenced by technology uncertainty and service untouchability of smart homes. These factors, except for financial risk, could be barriers to consumer acceptance. Shuhaiber and Mashal (2019) extended the TAM model and identified trust,

awareness, enjoyment, and perceived values such as ease of use, risks, and usefulness as the constructs influencing consumer adoption of intelligent homes.

Although smart home appliances have the potential to significantly change the market, there is not much interest in such a change in Turkey. Furthermore, academic studies on consumer acceptance of the IoT in Turkey are limited. From a global perspective, however, academic interest has been increasing, and published research has been on the rise. For instance, Doyduk and Bayarçelik (2019) conducted a study on consumer acceptance of the IoT in Turkey using the TAM model, and found that the ease of use and usefulness of IoT applications influenced usage. Recently, a few studies on smart homes have been included in academic publications in Turkey, such as a conceptual study on establishing a smart home environment targeting the elderly and disabled consumers (Das, Tuna, & Tuna, 2015).

To sum up, there is a lot of potential for further research into consumer acceptance of smart homes in Turkey. This study specifically looks at smart home appliances by using TAM model in Turkey. The success of innovations and smart home appliances depends on user acceptance, and this preparations targeting to find the main factors that effect behavioral intention towards smart home appliances.

2.2 The Aim of the Research

The TAM is the most frequently used structure to discover user implementation of information technologies. The statement further notes that several products have been launched in Turkey in recent years, and sales quantities are increasing. The behavioral intention to use of smart consumer goods are considered in the scope of this study.

The statement also mentions that several moderating variables, including marital status, gender, age, household income level, home classification, and education, were included in the study. These variables may have an influence on the relationship of factors related to behavioral intention. By including these variables, the study aims to provide a more comprehensive meaning of the elements that effect consumer behavior in the context of smart consumer goods in Turkey.

The statement presents two main research questions that are the focus of the study. The first research question aims to explore whether technology acceptance factors affect the behavioral intention (BI) to accept Smart Home Automation (SHA) from the

consumer's viewpoint. This question is important because it can provide insights into the factors that influence consumers' willingness to accept SHA, which can help companies develop more effective marketing strategies.

Finally, the second research question aims to investigate whether individual differences, such as marital status, gender, age, household income level, home classification, and education, moderate the relationship between BI to accept SHA. This question is essential because it can help identify specific groups of consumers who may have different attitudes towards SHA acceptance and require targeted marketing strategies. Overall, these research questions aim to provide a comprehensive meaning of the elements that affect consumer adoption of SHA in Turkey.

2.3 The Theoretical Model of the Research

2.3.1 Reasoned Action Theory

The Theory of Reasoned Action (ToRA), which is frequently expanded to the Theory of Planned Behavior (ToPB), is a cognitive theory that aids psychologists in understanding how people act in particular situations.

According to LaCaille (2020), most notably, the ToRA has been utilized to forecast and explain a variety of health behaviors.

When two psychologists Martin Fishbein and Icek Ajzen developed the concept of reasoned behavior in 1975, they improved the information integration theory.

Fishbein and Ajzen created the theory after attempting to define the differences between attitude and behavior. The ToRB differs from the concept of information integration for a number of reasons. The first of them is the idea of behavioral focus.

The ToRA also acknowledges that there are a number of criterias that could limit the influence of mood on behavior. Belief, attitude, subjective norms, and intention are the four fundamental concepts in the ToRA (Fishbein and Ajzen, 1975):

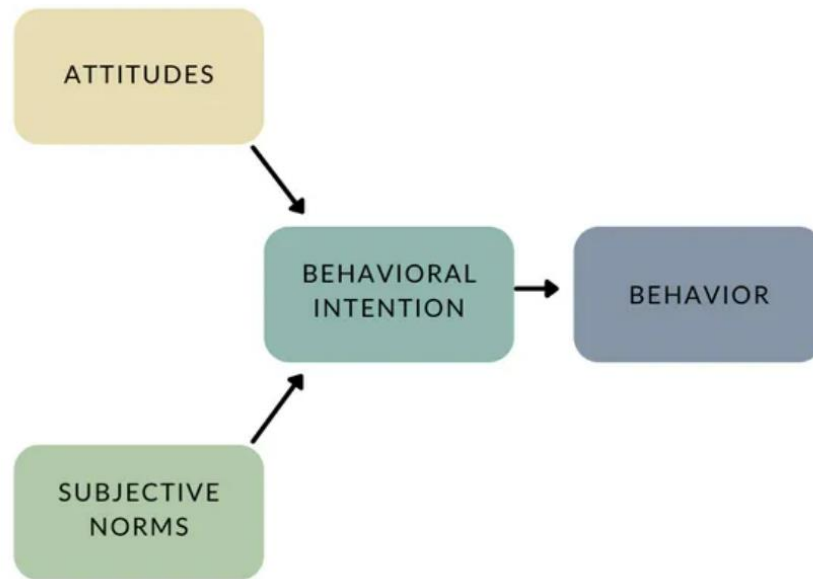


Figure 1. The Theory of Reasoned Action (ToRA)

The probability that something possesses a particular trait is known as belief. This expression is frequently used to characterize someone who thinks a specific action or behavior will have consequences.

The way a person feels about a particular behavior will decide whether they think it is a good or bad idea and whether they think the consequences will be ones they value. The central tenet of this paradigm is that attitudes which may be defined as a function of beliefs. The strength of a person's beliefs and how they evaluate the results of each of those beliefs combine to form their attitudes.

Subjective standards are the result of all the influential people in a consumer's life and whether they are perceived to be in favor of the behavior.

Intention is the state of being ready to participate in behavior. This clarifies how likely someone thinks they are to participate in a particular behavior.

Each of these ideas is frequently incorporated by behavioral scientists into an algorithm intended to predict human behavior. They are all linked as a result, and ultimately affect behavior.

2.3.2 Technology Acceptance Model

A theoretical framework known as the TAM explains that how people react to and allow new information technology. Developed in the 1980s by Fred Davis, the TAM

has been used in research to examine consumer behavior towards various technological innovations.

The basic idea behind the model is that users' intentions to use a new technology are effected by two main elements: perceived usefulness (PU) and perceived ease of use (PEOU) (Venkatesh et al., 2003). PU measures how much a user thinks a technology will increase efficiency of their life, whereas PEOU measures how much a user thinks a technology is simple to pick up and use.

According to TAM, users' PU and PEOU are themselves influenced by a number of other elements, including subjective norms, which refer to the influence of social norms and the opinions of others; perceived behavioral control, which shows that the user's perceived ability to use the technology; and enabling conditions, which speak to the tools and assistance at the user's disposal to make technology usage easier.

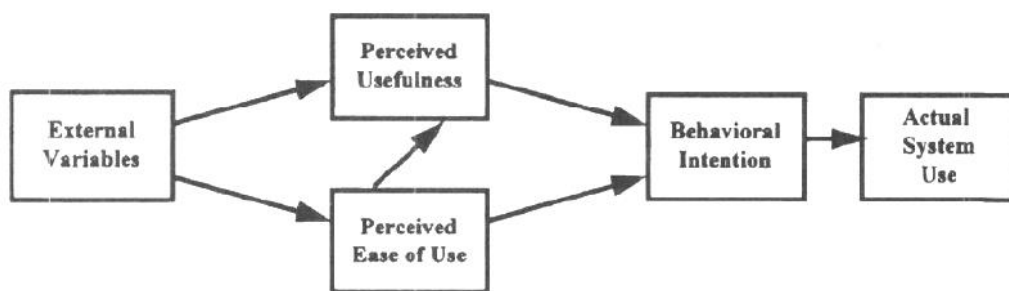


Figure 2. TAM (Venkatesh & Davis, 1996)

In practice, researchers use surveys and other data-gathering techniques to measure users' perceptions of the various elements that affect their intentions to use a technology (Taylor & Todd, 1995). By understanding these perceptions, researchers can identify factors that may hinder or promote technology adoption, and develop strategies to encourage its use (Agarwal & Karahanna, 2000).

2.4 Theoretical framework

TAM is the most widely preferred concept in information systems study via in part to its clarity and ease (King and He, 2006). It investigates how technology has affected and how people behave. Davis (1989) first suggested the paradigm, which has cognitive psychology as its foundation. It was modified from a psychological theory called the theory of reasoned action (Fishbein and Ajzen, 1975), which describes how people react when confronted with an information system (Hu et al., 1999).

According to Davis (1989), the real use of an information system is determined by the user's purpose. The desire of a user to use the technology is explained by the perceived ease of use (PEOU), attitude toward use (ATU), and perceived usefulness (PU).

The primary factor influencing a user's desire to use an information system is the ATU, which is influenced by the user's primary views, PEOU and PU. The brain variables PEOU and PU are impacted by system characteristics or outside influences (Davis, 1989). The literature contains data showing that PU has a favorable effect on ATU (Davis, 1989; Venkatesh and Davis, 2000). There are research demonstrating the beneficial effects of ATU on BI and PU on BI (Davis, 1989; Luarn and Lin, 2005). Additionally, research demonstrates that PEOU directly affects ATU and PU. (Davis, 1989; Chen et al., 2002).

2.5 Variables and Hypothesis

2.5.1 Novelty

Technological novelty refers to the introduction of new technological functionalities or capabilities that were not previously available or feasible. Technological change occurs when these new functionalities or capabilities are incorporated into the existing repertoire of technologies, leading to changes in how tasks are performed, products are made, and services are delivered.

The novelty of a technology can be attributed to its innovativeness and its ability to pique the interest of its users, as noted by Schrepp (2015). Client experience managers should not simply try to leverage technology to meet consumers' demand for novelty in order to develop technology-enhanced experiences (Dabholkar & Bagozzi, 2002; Lin, 2003), but also consider how the technology can enhance and add value to the core experiences of customers.

Hypothesis 1 (H1). Novelty will have positive effects on mobility function of smart home appliances.

Hypothesis 2 (H2). Novelty will have positive effects on compatibility function of smart home appliances.

2.5.2 Mobility

The purpose of this study is to examine the relationship between perceived mobility and the utility, quality of the services, and system responsiveness of mobile cloud services. Perceived mobility has been highlighted as a vital component in the use of mobile services since mobility is an essential component of wireless and ubiquitous network services. Huang et al. (2007) defined perceived mobility as the user's awareness of the value of mobility in mobile systems and services. For this study, perceived mobility refers to the user's perception of their ability to access and use specific mobile services through their mobile device. According to Siau and Shen (2003), the perceived mobility of communication via wireless networks was their most important feature. Huang et al.'s (2007) research also showed how the perceived portability of product has a critical function in raising the perceived value of remote education services. These results lead the existing study to make the below hypotheses:

Hypothesis 3 (H3). Mobility will have positive effects on perceived usefulness of smart home appliances users.

Hypothesis 4 (H4). Mobility will have positive effects on ease of use of smart home appliances users.

2.5.3 Compatibility

The literature on innovations diffusion has suggested that certain perceived characteristics are relevant to adoption decisions, including related benefit, complexity, and compatibility, particularly in the context of technology innovations (J.A. Hoffer, M.B. Alexander, 1992; G.C. Moore, I. Benbasat, 1991). Both relative advantage and complexity, which are already addressed by the constructs of utility and ease of use in TAM, refer to the extra advantages of the innovation relative to current alternatives. Complexity assesses how challenging it would be to learn to utilize the invention. As shopping online can be considered a new innovation in comparison to traditional modes of shopping, we also included compatibility, which assesses how well the innovation aligns with the values and needs of potential adopters. In this study, we define compatibility as the extent to which consumers believe that smart home appliances matches their requirements and lifestyle.

Hypothesis 5 (H5). Compatibility will have positive effects on trust of smart home appliances users.

Hypothesis 6 (H6). Compatibility will have positive effects on perceived usefulness of smart home appliances users.

Hypothesis 7 (H7). Compatibility will have positive effects on perceived ease of use of smart home appliances users.

2.5.4 Trust

In most business and social encounters where there is ambiguity, trust is a distinguishing characteristic. Almost all interactions ask for some level of confidence, particularly those that take place in the ambiguous world of e-commerce (Ba, S., and Pavlou, P.A, 2002). Because it creates hopes for effective interactions, trust has long been seen as a catalyst in relationships between consumers and marketers (Schurr, P.H., and Ozanne, J.L., 1985). For example, trust has all the time been a key factor in shaping customer behavior and has been demonstrated to be especially significant in uncharted territory, such as the setting of Internet-based e-commerce (Gefen, D., and Straub, D.W., 2002; Jarvenpaa, S.L., and Tractinsky, N., 1999). One of the major arguments cited for why customers avoid online shopping is a lack of trust (Keen, P.G.W., 1999). Therefore, one could legitimately contend that the high level of uncertainty prevalent in the majority of online transactions has increased the significance of confidence in e-commerce (Fung, R., and Lee, M., 1999). In reality, a number of academics have suggested that trust is a crucial component of B2C e-commerce. For example, Palmer, Bailey, and Faraj contend that increasing customer confidence in online merchants is crucial for the expansion of B2C e-commerce. In numerous cultures, trust has been experimentally demonstrated by Jarvenpaa and Tractinsky to directly influence customer purchase plans. Gefen demonstrated that the adoption of Internet technologies depends on confidence. Trust is essential in consumer-marketer interactions (Stewart et al., 2000). Finally, Keen emphasized the strategic ramifications of trust for relationships between consumers and marketers in his argument that trust is the cornerstone of online trade. All of this demonstrates how important it is to increase customer confidence in online merchants if B2C e-commerce is to continue expanding. According to some definitions of trust, it is the conviction that the other party will act morally and satisfy the trusting party's hopes while not preying on its weaknesses (Gefen, D. , 2000).

According to the reasoned action theory, trust leads to positive attitudes towards Web retailers, which in turn reduces fears of opportunism and infrastructure concerns. This belief in the trustworthiness of a Web retailer has an important effect on intention to engage in online transactions. Many studies have established that trust is linked to positive attitudes (Gefen, D. Building, 1997; Jarvenpaa, S.L., and Tractinsky, N., 1999; Jarvenpaa, S.L.; Tractinsky, N., 2000). Hence, trust is likely to positively influence transaction intentions through attitudes. Additionally, trust reduces behavioral uncertainty by giving consumers a sense of control over their online transactions. This control positively influences purchase intentions (Ajzen, I., and Fishbein, M., 1980; Fishbein, M., and Ajzen I., 1975). The correlations between trust and attitude is further supported by placing party trust in the context of TRA as a behavioral belief. Trust leads to positive perceived behavioral and perceived control, which reduce uncertainty and provide expectations for satisfactory transactions, ultimately resulting in positive effects on consumer behavioral intentions.

The use of smart products necessitates a "zero trust" model as they require access to personal data. Trust (TR) is a powerful predictor of how useful, easy to use, and acceptable a technology is, especially in the context of IoT where privacy and security risks are high. The relationship in between trust and the Technology Acceptance Model (TAM) has been extensively explored in previous studies, with studies indicating that TR has a greater impact on PU. This is because trust enables consumers to feel secure in their interactions with the e-vendor, ensuring that they receive the expected benefits and services (Ha, S.; Stoel, L., 2009; Prayoga, T.; Abraham, J., 2016; Prayoga, T.; Abraham, J., 2016). Based on this study recommends the below hypotheses:

Hypothesis 8 (H8). Trust will positively influence attitude related to smart home appliances users.

2.5.5 Usefulness

TAM proposes that there are multiple factors, including effectiveness, performance, and productivity, that are linked to the PU of a system (Davis, 1989). PU shows that consumer's belief that preferring a particular system would make better their job performance. Past analyses have emphasized the importance of PU in determining technology acceptance (Lee et al., 2003). In fact, 74 studies revealed a favorable

association between the intention to utilize a technology and its perceived utility, according to Lee, Kozar, and Larsen's 2003 research.

According to Davis (1989) and Venkatesh and Davis (2000), a consumer is more likely to consider a technology product or system to be more valuable if they believe it to be simple to use and require little effort. According to Revels et al. (2011). Based on these findings, we propose the below hypothesis:

Hypothesis 9 (H9). Perceived usefulness will have positive effects on attitude of smart home appliances users.

2.5.6 Ease of use

Based on TAM, attitude and the desire to use a good or service are both preceded by PEOU. This impact can be direct, or indirect through its influence on self-efficacy and technical requirements (Davis, Bagozzi, & Warshaw, 1989). Recent studies have consistently supported the notion that PEOU significantly affects a consumer's intention to use a product or service, as well as its impact on PU (Khalifa & Shen, 2008; S. Kim & Garrison, 2009; Luarn & Lin, 2005; Wei et al., 2009).

Hypothesis 10 (H10). Perceived ease of use will have positive effects on attitude of smart home appliances users.

Hypothesis 11 (H11). Perceived ease of use will have positive effects on usefulness of smart home appliances.

2.5.7 Attitude and intention to use

The way potential adopters perceive the attributes of an innovation, not how experts or change agents classify them, is what influences the adoption rate (Rogers, 1995). The attitude of potential adopters towards an innovation determines their intention to adopt or reject it. Social psychology theories, such as intention models and behavioral decision theories, have been used by IS researchers to study IT adoption by companies and usage by consumers (Harrison et al., 1997). According to the planned behavior theory (Ajzen, 1988; Ajzen & Madden, 1986), intentions are simultaneously determined by attitudes toward behavior, subjective norms, and perceived behavior control. Actions are subsequently influenced by intentions. Empirical researches show that attitudes are a good predictor of actual behavior (Mathieson, 1991). Therefore, decision makers' perceptions play an essential role in predicting and explaining their

behavior. One example is Davis (1993), who utilized attitude theory to understand why users either confirm or decline information systems, and how the design features of these systems can impact their acceptance. Similarly, Harrison et al. (1997) utilized the theory of planned behavior to forecast and explain the decisions made by small business executives to adopt IT. In order to compare attitudes and views regarding IT innovation before and after adoption, Karahanna, Strub, and Chervany (1999) evaluated together theories such as innovation diffusion and attitude. The conclusion of these analyses approve the idea that perceptions and attitudes can be used to effectively predict and clarified the adoption or acceptance behavior of potential adopters.

Previous research has confirmed that PU and PEOU have a important effect on both attitude and intention to use a product. However, the slow adoption of IoT technology applications may be due to a lack of clear communication regarding their benefits to potential users. This is consistent with the TAM's PU construct, which shows that the PU of IoT goods and applications is probably high. In the context of IoT technologies, Gao and Bai (2014) have confirmed the PU and PEOU as the determinants of user intentions towards IoT technologies, as proposed in the original TAM. According to this, below hypotheses are suggested:

Hypothesis 12 (H12). Attitude will have positive effects on intention to use for smart home appliances users.

2.6 Methodology and research design

According to King (2003), a smart home is an area where people live that has communication networks, home appliances, and sensor-based products that can be accessed, surveillanced, and controlled from a distance. According to Taylor et al. (2007) and Chan et al. (2008), the home can also provide services that are tailored to the requirements of its residents. The phrase "Smart Home" is often used to describe any type of habitation, including apartments, villas, single-family homes, and units in communal housing developments.

According to the definition now in use, sensors are tools used to monitor conditions like temperature, energy use, motions, locations, items, and more. Home appliances are commonly known as white goods, and they typically include household items such

as oven and cooling machines. According to King (2003) and Li et al. (2004), the smart home concept revolves around the networked connection and coordination of various technological components, including sensors, devices, and appliances, with information. This network forms the foundation of the smart home, enabling it to function as an interconnected system. According to Scott (2007), the inclusion of a home network is the key distinction between a smart house and a typical home. The network supports smart home capabilities by enabling the connecting and integration of numerous appliances and systems inside the house.

Smart Homes is one of the several fields of ubiquitous computing. In order to achieve this later, accommodations for safety, energy saving, healthcare, comfort, and safety must be smart. Systems for remote monitoring are frequently seen in smart homes. These systems often make use of the internet and telecommunication to provide remote house control and to help people from specialized centers. These systems are commonly employed in many smart home applications and are necessary for allowing smart home functionality. Smart households improve the quality of life by offering supportive services and automated appliance control (Alam et al, 2012).

According to the World Health Organization (2018), the percentage of people over 60 in the world's population will nearly double from 12% to 22% by 2050. This age group is more likely to have chronic long-term illnesses and is typically prepared to deal with the difficulties of living alone. Additionally, more than one billion individuals, or over 15% of the world's population (based on projections for the global population in 2010), are thought to have some sort of impairment. One of the most frequent causes of disability is chronic illness, which includes conditions like diabetes, cancer, and cardiovascular illnesses. Other major causes of disability include injuries from conflicts and traffic accidents. It is unreasonable or perhaps impossible for hospitals or nursing homes to care for all of these people for an indefinite amount of time. The answer is to provide patients' homes with both assistive technologies and healthcare services (Alam et al., 2012). One of the most recent surveys on smart homes was written by Chan et al. (2008), who also covered the related technologies of wearables, implantable devices, and assistive robotics. They discussed a global selection of top smart home projects that are organized by country and continent, as well as the associated wearable, implantable, and mobile technologies.

An crucial requirement for creating an atmosphere of intelligence in a smart home is location awareness. The location detection methodologies and system were addressed by Hightower & Borriello (2001). In order to aid researchers in choosing the best location system, they have taken into account many factors such accuracy, precision, measurement scale, and cost.

The state-of-the-art for localization and tracking on techniques and systems used in sensor networks was highlighted by Manley et al. (2006). Based on the monitored items, sensor network technologies, and application settings, they classified location and detection systems. However, their approach is more closely related to monitoring objects than it is to tracking humans.

The most efficient approach to alert homeowners of any concerns is through home automation technology. However, traditional security systems safeguard residents' possessions and keep them safe from trespassers. Robles and Kim (2010) examined the context-aware technologies for smart home security and talked about home automation and security. Short summaries of networked robots, aware community systems, and rule-based smart home architecture were provided. They gave a comparison of several smart home technologies. However, the review avoided discussing the algorithmic elements that are thought to be part of context awareness. Pishva and Takeda (2008) looked at a few recent security-related problems and recognized many current difficulties from a social, technological, and practical standpoint. However, they talked about a few procedures that might be implemented if there was a security breach.

2.7 Data collection

This study used an online, self-administered survey tool. Consumers who utilized smart home appliances provided the data. Due to the accessibility and availability of the target participants, the researchers adopted a non-probability sampling strategy with a rapid data collection process (Saunders et al., 2009), and constraint of time and budget (Zikmund, 2003). Data were gathered using Google Form in Turkey between November 2022 and February 2023. Three portions of an online survey were used for the investigation. The first component of the survey asked questions about smart home equipment ownership, usage patterns, and perceived relevance. After that, participants were asked to answer a screening question on what variables most affected their choice

to buy smart home goods. Price, promotion, social context, brand, online purchasing possibilities, utility, user-friendliness, and other elements were among these considerations. Participants then answered all of the inquiries pertaining to the research variables. They responded to several demographic inquiries in the third segment. The survey was completed in around 15 minutes. 360 surveys were performed in total. After data cleaning and surveys with missing values or partial replies are removed, a sample of 350 valid surveys is utilized to evaluate the study hypotheses.

2.8 Sample profile

The data for the study was collected from Turkish consumers who were over the age of 18 and owned at least one smart home appliance, such as an oven, dishwasher, fridge, vacuum cleaner, television, heater, etc. and use actively related appliances. The majority of responders (53%) were female, with ages ranging from 18 to over 56; 40% were between 25 and 35; and 26 % were between 36 and 45. The majority of them (65%) have a university degree. Married (61%) and frequently employed full-time (87%). (see Table 2).

Table 2

Sample profile

Characteristics	Number (n)	Percentage (%)
<i>Gender</i>		
Male	165	47.1
Female	185	52.9
<i>Education</i>		
Primary/Secondary School	74	21.1
Associate degree	49	14.0
Bachelor's degree	154	44.0
MSc/PhD	73	20.9
<i>Age Groups</i>		
Below 18	0	0
18-25	57	16.3
26-35	139	39.7
36-45	90	25.7
46-55	51	14.6
Above 55	13	3.7
<i>Marital status</i>		
Single	135	38.6
Married	214	61.1
Divorced	1	0.3

<i>Occupation</i>		
Private sector employee	305	87.1
Student	22	6.3
Businessman	22	6.3
Unemployed	0	0
Retired	1	0.3
<i>Income Turkish lira (TTL)</i>		
5 TTL and less	9	2.6
5 - 10 TTL	23	6.6
10 - 15 TTL	49	14.0
15 - 20 TTL	92	26.3
20 - 25 TTL	80	22.9
25 TTL or above	97	27.7
<i>Dwelling type</i>		
Apartment	243	69.4
Single house	90	25.7
Villa	16	4.6
Waterside	1	0.3

2.9 Measures

All measuring items were modified from other research and rated on a Likert scale of 1 to 5 (1 being the strongest disagreement and 5 the strongest agreement). An online-based survey was administered to measure novelty adopted from (Yim et al., 2017), mobility adopted from (Hill & Roldan, 2005), compatibility adopted from (Zhang & Liu, 2022), consumer involvement based on (Kapferer & Laurent, 1993). The items for the four main TAM constructs—perceived usefulness (PU), perceived ease of use (PEOU), attitude toward use (ATU), and behavioral intention (BI)—were adapted from previous TAM studies (Davis, 1989; Wu, 2011; Igarria et al., 1997; Venkatesh et al., 2003; Venkatesh and Davis, 2000; López-Nicolás et al., 2008). The trust-related (TR) items were modified from Fogel and Nehmad (2009).

3. RESULT

The analyzes and results carried out for the purpose of our study are explained in detail in the following headings.

3.1 Data Analyses

To investigate the suggested model, this study used structural equation modeling (SEM) with AMOS 24. SEM aids researchers in analyzing the connections between several dependent and independent variables (Kline, 2011). This effective statistical approach assesses conceptual models adapted from earlier studies and calculates how well the model fits the data that has been gathered (Hair et al., 2017). To evaluate the proposed hypotheses, we conducted a two-step study (Anderson & Gerbing, 1988). Initially, the model's validity and reliability were assessed, and the results revealed a satisfactory match. The link between the constructs was then investigated using path estimates utilizing SEM analysis.

3.2 Distributions of variables measured in the research

In this section, the mean and standard deviation values of the variables obtained in line with the sample profile related to intention to use, attitude towards use, trust, usefulness, ease of use, mobility, compatibility and novelty which are the variables of the study, are included.

3.2.1 Distribution of research participants regarding novelty

The average and standard deviation (SD) values of the variables obtained in line with the answers of the participants on the scale consisting of a total of three variables to determine the novelty connections of the consumers are given in Table 3.

Table 3

Responses of Participants Regarding the Novelty Scale.

Code	Item	Mean	Std. dev
NOV1	The smart product app is surprising.	3.70	0.82
NOV2	The smart product app is unique.	3.53	0.88
NOV3	This smart product app is different from other apps.	3.86	0.75
Overall Average of Novelty Scale		3.70	

The arithmetic mean of one of the three expressions in the scale is above the general mean of the scale. The statement “The smart product app is unique.” has mean values below the general average of the scale.

3.2.2 Distribution of research participants regarding mobility

The average and SD values of the variables obtained in line with the answers of the participants on the scale consisting of a total of three variables to determine the mobility connections of the consumers are given in Table 4.

Table 4

Responses of Participants Regarding the Mobility Scale.

Code	Item	Mean	Std. dev
MO1	It is convenient to access smart products anywhere at any time.	3.84	0.79
MO2	It is convenient to use smart products while moving from place to place or doing anything else.	3.84	0.69
MO3	Mobility is an outstanding advantage of smart products.	3.97	0.72
Overall Average of Mobility Scale		3.88	

The arithmetic mean of one of the three expressions in the scale is above the general mean of the scale. The statement “It is convenient to access smart products anywhere at any time.” and “It is convenient to use smart products while moving from place to place or doing anything else.” have mean values below the general average of the scale.

3.2.3 Distribution of research participants regarding compatibility

The average and SD values of the variables obtained in line with the answers of the participants on the scale consisting of a total of four variables to determine the compatibility connections of the consumers are given in Table 5.

Table 5

Responses of Participants Regarding the Compatibility Scale.

Code	Item	Mean	Std. dev
COM1	The use of the smart product app is compatible with my daily life.	3.99	0.64
COM2	The use of the smart product app is great for interacting with my home appliances.	4.00	0.60
COM3	I feel comfortable with the smart product app because I can manage my daily home activities at any time without any problem.	3.94	0.74
COM4	The use of the smart product app fits well with the way I like to manage my house.	3.95	0.71
Overall Average of Compatibility Scale		3.97	

The arithmetic mean of two of the four expressions in the scale is above the general mean of the scale. The statement “I feel comfortable with the smart product app because I can manage my daily home activities at any time without any problem.” and “The use of the smart product app fits well with the way I like to manage my house.” have mean values below the general average of the scale.

3.2.4 Distribution of research participants regarding trust

The average and SD values of the variables obtained in line with the answers of the participants on the scale consisting of a total of four variables to determine the trust connections of the consumers are given in Table 6.

Table 6

Responses of Participants Regarding the Trust Scale.

Code	Item	Mean	Std. dev
TR1	I think the providers of the smart products are reliable.	3.75	0.72
TR2	I think the providers of the smart products keep promises and commitments.	3.73	0.68
TR3	I think the providers of the smart products keep customers' best interests in mind.	3.73	0.77
TR4	I feel confident in the brand of the smart product providers.	3.99	0.79
Overall Average of Trust Scale		3.80	

The arithmetic mean of one of the four expressions in the scale is above the general mean of the scale. The statement “I think the providers of the smart products are reliable.”, “I think the providers of the smart products keep promises and commitments.” and “I think the providers of the smart products keep customers' best interests in mind.” have mean values below the general average of the scale.

3.2.5 Distribution of research participants regarding perceived usefulness

The average and SD values of the variables obtained in line with the answers of the participants on the scale consisting of a total of four variables to determine the perceived usefulness connections of the consumers are given in Table 7.

Table 7

Responses of Participants Regarding the Perceived Usefulness Scale.

Code	Item	Mean	Std. dev
PU1	The use of the smart products improves my performance.	4.12	0.80
PU2	The use of the smart products increases my productivity.	4.22	0.76
PU3	The use of the smart products makes me accomplish tasks relevant to my daily activities more quickly than in the traditional ways.	4.14	0.74
PU4	The use of the smart products is useful.	4.13	0.64
Overall Average of Perceived Usefulness Scale		4.15	

The arithmetic mean of one of the four expressions in the scale is above the general mean of the scale. The statement “The use of the smart products improves my performance.”, “The use of the smart products makes me accomplish tasks relevant to my daily activities more quickly than in the traditional ways.” and “The use of the smart products is useful.” have mean values below the general average of the scale.

3.2.6 Distribution of research participants regarding perceived ease of use

The average and SD values of the variables obtained in line with the answers of the participants on the scale consisting of a total of four variables to determine the perceived ease of use connections of the consumers are given in Table 8.

Table 8

Responses of Participants Regarding the Perceived Ease of Use Scale.

Code	Item	Mean	Std. dev
PEU1	The use of the smart products is clear and understandable.	3.63	0.80
PEU2	The use of the smart products does not require a lot of mental effort.	3.58	0.97
PEU3	The smart products are easy to use.	3.91	0.71
PEU4	It is easy to get smart products to do what I want them to do.	4.14	0.66
Overall Average of Perceived Ease of Use Scale		3.81	

The arithmetic mean of two of the four expressions in the scale is above the general mean of the scale. The statement “The use of the smart products is clear and understandable.” and “The use of the smart products does not require a lot of mental effort.” have mean values below the general average of the scale.

3.2.7 Distribution of research participants regarding attitude

The average and SD values of the variables obtained in line with the answers of the participants on the scale consisting of a total of three variables to determine the attitude connections of the consumers are given in Table 9.

Table 9

Responses of Participants Regarding the Attitude Scale.

Code	Item	Mean	Std. dev
ATT1	The use of the smart products is clear and understandable.	4.09	0.65
ATT2	The use of the smart products does not require a lot of mental effort.	4.09	0.67
ATT3	The smart products are easy to use.	4.04	0.71
Overall Average of Attitude Scale		4.07	

The arithmetic mean of two of the three expressions in the scale is above the general mean of the scale. The statement “The smart products are easy to use.” has mean values below the general average of the scale.

3.2.8 Distribution of research participants regarding intention to use

The average and SD values of the variables obtained in line with the answers of the participants on the scale consisting of a total of three variables to determine the attitude connections of the consumers are given in Table 10.

Table 10

Responses of Participants Regarding the Intention to Use Scale.

Code	Item	Mean	Std. dev
INT1	I am willing to use the smart products in the near further.	4.17	0.68
INT2	I plan to use the smart products in the near further.	4.17	0.74
INT3	I will make an effort to use smart products in the near further.	4.06	0.75
Overall Average of Intention to Use Scale		4.13	

The arithmetic mean of two of the three expressions in the scale is above the general mean of the scale. The statement “I will make an effort to use smart products in the near further.” has mean values below the general average of the scale.

3.2.9 Reliability and validity analyses of the scales used in the research

Before conducting hypothesis testing in this section, reliability and validity tests were performed on the scales used in the research. Cronbach's alpha coefficient was used for reliability testing, and exploratory and confirmatory factor analyses were used for validity testing. The results are shown in the following sections.

3.3 Results of the validity analysis

The study's scales' validity was examined using a structural validity analysis approach. The degree to which a measure properly represents the theoretical structure it is designed to measure is known as structural validity (Nakip, 2006). Since the scales were modified for the purposes of the study, confirmatory and exploratory factor analyses were used to examine the construct validity of the scales.

The scales employed in the study had strong structural validity, which means they properly measured the constructs, according to the validity analysis's findings. In addition, both exploratory and confirmatory factor analyses showed satisfactory fit indices for the adapted scales, supporting their construct validity. Therefore, it can be concluded that the scales used in the study are valid measures for the constructs under investigation.

Structural validity tests whether the scale properties are consistent with an appropriate theoretical structure regarding the latent variables based on observed variables (Çokluk et al., 2012). The common method used in structural validity analysis is factor analysis. Factor analysis is a practical method used to reveal relationships between latent and observed variables, develop scales, and reduce the number of observed variables (Çokluk et al., 2012; Hair et al., 2010). Factor analysis examines the relationships between many variables and classifies them according to their common characteristics (Nakip, 2006: 403).

In the study, KMO sample adequacy measure and Bartlett's test, which determines the degree of correlation between variables, were used for exploratory factor analysis. To conduct exploratory factor analysis, the KMO value should be 0.50 or above, and the Bartlett value (p) should be less than $\alpha=0.05$ significance level (Hair et al., 2010:105). KMO value is interpreted as poor if $0.5 \leq \text{KMO} < 0.6$, weak if $0.6 \leq \text{KMO} < 0.7$, moderate if $0.7 \leq \text{KMO} < 0.8$, good if $0.8 \leq \text{KMO} < 0.9$, and excellent if $\text{KMO} \geq 0.9$

(Hair et al., 2010:105). A high KMO value indicates that each variable can be accurately and perfectly predicted by other variables (Çokluk et al., 2012). Additionally, another important assumption in factor analysis is that all significant factors should account for at least 60% of the total variance (Kurtuluş, 2010:189).

The acceptable level of model fit goodness is another important aspect in exploratory factor analysis. Model fit goodness statistics explain how well the proposed model fits the obtained data and whether this model is supported by the data set as a whole at an acceptable level. The commonly used model fit goodness statistics in the literature and the threshold values used for interpretation are explained in Table 11.

Table 11

Values of Model Fit Goodness Statistics.

Goodness of fit measure	Perfect/Good Fit	Acceptable Fit
χ^2/sd	≤ 3	$\leq 4-5$
GFI	$\geq 0,90$	$\geq 0,85$
RMSEA	$\leq 0,05$	$\leq 0,08$
Standardized RMR	$\leq 0,05$	$\leq 0,10$
CFI	$\geq 0,95$	$\geq 0,90$
NFI	$\geq 0,95$	$\geq 0,90$
NNFI	$\geq 0,95$	$\geq 0,90$

Source: (Hair et al., 2010; Hooper et al., 2008; Kline, 2015: 193-209)

The chi-square (χ^2) goodness-of-fit test indicates whether the proposed model fits the data as a whole. A small χ^2 statistic value indicates that the observed and expected covariance structures match well (Meydan and Şeşen, 2011). However, since the χ^2 statistic value is related to the sample size, this value is not always significant in large samples. In other words, small differences between the observed and the model covariance matrix in large samples may make the χ^2 value significant at a high level. Therefore, in research, the χ^2 statistic is calculated by dividing it by the degrees of freedom (df) as an adequacy criterion. A χ^2/df ratio below five indicates that the model is acceptable, and a χ^2/df value of three or less indicates that the model has a good fit (Çokluk et al., 2012: 268; Şimşek, 2007: 47; Bayram, 2010: 71; Kline, 2015: 204).

The GFI is a measure of the relative amount of explained variance and covariance in the proposed model. This value is directly related to the sample size and ranges from 0 to 1. A GFI statistic value greater than 0.95 indicates a good fit, while a value

between 0.90 and 0.95 indicates an acceptable fit (Bayram, 2010: 74; Şimşek, 2007: 14). The SRMR statistic value is defined as the standardized difference between the observed and estimated covariances. An SRMR statistic value less than 0.08 indicates an acceptable fit (Brown, 2006: 82; Kline, 2015: 209). The root mean square residual (RMR) indicates the average difference between the sample and population covariance matrices. A value less than 0.05 indicates an excellent or good fit (Çokluk et al., 2012: 269).

The CFI statistic value ranges between 0 and 1. It is an index of non-central chi-square distribution. A value greater than 0.97 indicates good fit, while a value between 0.95 and 0.97 indicates acceptable fit (Byrne, 2010: 78; Meydan and Şeşen, 2011: 34). The Normalized Fit Index (NFI) statistic value also ranges between 0 and 1. It is determined by dividing the tested model's chi-square value by the independent model's chi-square value. According to Byrne (2010) and Meydan and Esen (2011), a value of 0.95 or higher suggests an excellent match and a value of 0.90 or higher an acceptable fit.

The scales that have been proven to be structurally appropriate through factor analyses were used as the basis for further stages of the study.

3.3.1 The Results of Exploratory and Confirmatory Factor Analyses for Novelty

Exploratory factor analysis was conducted to assess the construct validity of the three item novelty variable in the study's scales. Principle axis factoring was used as the factorization method, and varimax rotation was used as the rotation technique in the exploratory factor analysis. Table 12 displays the factor structure discovered from the exploratory research.

Table 12

Exploratory Factor Analysis Results for the Novelty Connection Scale.

Code	Item	Factor Load
NOV1	I am willing to use the smart products in the near further.	0.81
NOV2	I plan to use the smart products in the near further.	0.91
NOV3	I will make an effort to use smart products in the near further.	0.82
Cronbach's Alpha Based on Standardized Items		0.81
Cumulative %		77.64
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)		0.64

Bartlett's Test of Sphericity = 382.366 p=0,000 (df=6) *p<,01

Before conducting the factor analysis, Bartlett's test and the KMO value were calculated to test the suitability of the data for exploratory factor analysis (EFA). As reported in Table 3.10, the results indicate that Bartlett's test is crucial and the KMO is 0.64, indicating that the dataset is suitable for factor analysis. When the factor loadings of the variables measuring novelty were examined after varimax rotation, it was found that the factor loadings were 0.81 or higher. Furthermore, exploratory factor analysis revealed that a single-factor structure explained 77.64% of the total variance, which is an acceptable level. As a result of this analysis, a final 3-item novelty scale was obtained, with the scale has a good level of reliability, according to its Cronbach's alpha rating of 0.81. Following this step, confirmatory factor analysis was conducted to assess the structural integrity of the novelty variable scale obtained from exploratory factor analysis. The results of the CFA for the novelty variable are shown in Table 13.

Table 13

Confirmatory Factor Analysis Results for Novelty Scale.

Code	λ	λ^2	ϵ	N	AVE	CR
NOV1	0.67	0.45	0.55			
NOV2	0.90	0.82	0.18	3	0.61	0.82
NOV3	0.74	0.55	0.45			

The three items in the research that evaluate novelty underwent CFA. Table 3.11 lists the findings of this investigation. The results indicate that the λ of the items under a single factor are at a high level (>0.67), and the structure is represented by three items.

The composite validity of the scale used in the study was assessed using the AVE and CR values. It was determined that the AVE value was 0.61 (above 0.50) and the CR value was 0.82 (above 0.70), which proved that the validity of the model was within acceptable limits. When examining the model fit values, it was generally seen that the model fit values were within good and excellent limits. As a result, the construct validity of the novelty scale was established in terms of CFA. In this context, it was often that the novelty scale would consist of a single factor and three items in subsequent analyses of the study.

3.3.2 The Results of Exploratory and Confirmatory Factor Analyses for Mobility

EFA was carried out to assess the construct validity of the three item mobility variable in the study's scales. Principle axis factoring was used as the factorization method, and varimax rotation was used as the rotation technique in the EFA. Table 14 displays the factor structure discovered from the exploratory research.

Table 14

Exploratory Factor Analysis Results for the Mobility Scale.

Code	Item	Factor Load
MO1	It is convenient to access smart products anywhere at any time.	0.79
MO2	It is convenient to use smart products while moving from place to place or doing anything else.	0.87
MO3	Mobility is an outstanding advantage of smart products.	0.84
Cronbach's Alpha Based on Standardized Items		0.78
Cumulative %		69.04
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)		0.68

*Bartlett's Test of Sphericity = 291.709 p=0,000 (df=3) *p<,01*

Before conducting the factor analysis, Bartlett's test and the KMO value were calculated to test the appropriate of the data for EFA. The dataset is eligible for factor analysis, as shown in Table 3.11, where the findings reveal that Bartlett's test is important and the KMO value is 0.68. When the factor loadings of the variables mobility were examined after varimax rotation, it was found that λ were 0.79 or higher. A single component structure explained 69% of the overall variation, which is an acceptable amount, according to EFA. As consequences of this study, 3-item mobility scale was obtained, with a Cronbach's alpha value of 0.79, showing that the scale is highly trusting. After this, CFA was carried out to evaluate the mobility variable scale's structural soundness as a result of the EFA. Table 15 displays the findings of the confirmatory factor analysis for the mobility variable.

Table 15

Confirmatory Factor Analysis Results for Mobility Scale.

Code	λ	λ^2	ϵ	N	AVE	CR
MO1	0.67	0.44	0.56	3	0.54	0.78
MO2	0.79	0.63	0.37			
MO3	0.75	0.56	0.44			

The three items in the research that evaluate mobility underwent CFA. Table 3.11 lists the findings of this investigation. The results indicate that the standardized λ of the items under a single factor are at a high level (>0.67), and the structure is represented by three items.

To assess the scale's composite validity for the study, the AVE and CR values were computed. The results showed that the model's validity was within allowable bounds because the AVE value was 0.54 (above 0.50) and the CR value was 0.78 (above 0.70). When examining the model fit values, it was generally seen that the model fit values were within good and excellent limits. As a result, the construct validity of the mobility scale was established in terms of CFA. In this context, it was agreed that the mobility scale would consist of a single factor and three items in subsequent analyses of the study.

3.3.3 The Results of Exploratory and Confirmatory Factor Analyses for Compatibility

The construct reliability of the four item compatibility variable in the study's scales was evaluated using exploratory factor analysis. Principle axis factoring was used as the factorization method, and varimax rotation was used as the rotation technique in the EFA. The factor structure received from the exploratory analysis is presented in Table 16.

Table 16

Exploratory Factor Analysis Results for the Compatibility Scale.

Code	Item	Factor Load
COM1	The use of the smart product app is compatible with my daily life.	0.85
COM2	The use of the smart product app is great for interacting with my home appliances.	0.86
COM3	I feel comfortable with the smart product app because I can manage my daily home activities at any time without any problem.	0.88
COM4	The use of the smart product app fits well with the way I like to manage my house.	0.87
Cronbach's Alpha Based on Standardized Items		0.89
Cumulative %		75.13
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)		0.83

*Bartlett's Test of Sphericity = 780.983 p=0,000 (df=6) *p<,01*

Before conducting the factor analysis, Bartlett's test and the KMO value were calculated to test the suitability of the data for EFA. As remarked in Table 3.11, the results indicate that Bartlett's test is important and the KMO is 0.83, indicating that the dataset is suitable for factor analysis. When the factor loadings of the variables compatibility were examined after varimax rotation, it was obtained that the λ were 0.85 or higher. A single component structure explained 75% of the overall variation, which is a satisfactory amount, according to EFA. As consequences of this study, 4-item compatibility scale was obtained, with a Cronbach's alpha value of 0.89, demonstrating that the scale is quite trustworthy. Following this step, confirmatory factor analysis was conducted to assess the structural integrity of the compatibility variable scale obtained from EFA. Table 17 displays the findings of the CFA for the compatibility variable.

Table 17

Confirmatory Factor Analysis Results for Compatibility Scale.

Code	λ	λ^2	ϵ	N	AVE	CR
COM1	0.78	0.60	0.40	4	0.67	0.89
COM2	0.81	0.66	0.34			
COM3	0.85	0.72	0.28			
COM4	0.83	0.69	0.31			

The four items used in the study to determine compatibility were used to a CFA. The analyses' findings are shown in Table 3.11. The findings show that four items adequately describe the structure, with the standardized λ of the items falling under a single factor being at a high level (>0.67).

The composite validity of the scale used in the study was assessed using the AVE and CR values. It was determined that the AVE value was 0.67 (above 0.50) and the CR value was 0.89 (above 0.70), which proved that the validity of the model was within acceptable limits. When examining the model fit values, it was generally seen that the model fit values were within good and excellent limits. As a result, the construct validity of the compatibility scale was established in terms of CFA. In this context, it was agreed that the compatibility scale would consist of a single factor and four items in subsequent analyses of the study.

3.3.4 The Results of Exploratory and Confirmatory Factor Analyses for Trust

EFA was used to evaluate the four item's construct validity of trust variable in the study's scales. Principle axis factoring was used as the factorization method, and varimax rotation was used as the rotation technique in the EFA. Table 18 displays the factor structure discovered from the exploratory research.

Table 18

Exploratory Factor Analysis Results for the Trust Scale.

Code	Item	Factor Load
TR1	I think the providers of the smart products are reliable.	0.88
TR2	I think the providers of the smart products keep promises and commitments.	0.90
TR3	I think the providers of the smart products keep customers' best interests in mind.	0.88
TR4	I feel confident in the brand of the smart product providers.	0.86
Cronbach's Alpha Based on Standardized Items		0.90
Cumulative %		77.64
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)		0.84

*Bartlett's Test of Sphericity = 881.596 p=0,000 (df=6) *p<,01*

To determine if the data were appropriate for EFA, Bartlett's test and the KMO value were computed prior to doing the factor analysis. The dataset is acceptable for factor analysis, as shown in Table 3.11, where the findings reveal that Bartlett's test is important and the KMO is 0.84. When the λ of the variables compatibility were examined after varimax rotation, it was observed that the λ were 0.86 or higher. Furthermore, EFA revealed that a single-factor structure found 78% of the total variance, which is an acceptable level. Consequences of this study, 4-item trust scale was obtained, with a Cronbach's alpha value of 0.90, demonstrating the scale's high degree of dependability. Following this step, CFA was done to assess the structural integrity of the trust variable scale obtained from EFA. Table 19 displays the findings of the CFA for the trust variable.

Table 19

Confirmatory Factor Analysis Results for Trust Scale.

Code	λ	λ^2	ϵ	N	AVE	CR
TR1	0.84	0.70	0.30	4	0.70	0.90
TR2	0.88	0.78	0.22			

TR3	0,84	0.70	0.30
TR4	0.80	0.64	0.36

A CFA was performed on the four study-required items that evaluate trust. Table 3.11 lists the findings of this investigation. The consequences indicate that the standardized λ of the items under a single factor are at a high level (>0.67), and the structure is represented by four items.

The AVE and CR values were evaluated to evaluate the scale's overall validity throughout the research. It was determined that the AVE value was 0.70 (above 0.50) and the CR value was 0.90 (above 0.70), which proved that the validity of the model was within acceptable limits. When examining the model fit values, it was generally seen that the model fit values were within good and excellent limits. As a consequence, CFA was used to establish the construct validity of the trust scale. In this context, it was agreed that the trust scale would consist of a single factor and four items in subsequent analyses of the study.

3.3.5 The Results of Exploratory and Confirmatory Factor Analyses for Perceived Usefulness

EFA was used to evaluate the four item's construct validity for perceived usefulness variable in the study's scales. The factorization method utilized in the EFA was principle axis factoring, while the rotation method employed was varimax rotation. Table 20 displays the factor structure that was discovered during the exploratory study.

Table 20

Exploratory Factor Analysis Results for the Usefulness Scale.

Code	Item	Factor Load
PU1	The use of the smart products improves my performance.	0.89
PU2	The use of the smart products increases my productivity.	0.89
PU3	The use of the smart products makes me accomplish tasks relevant to my daily activities more quickly than in the traditional ways.	0.84
PU4	The use of the smart products is useful.	0.74
Cronbach's Alpha Based on Standardized Items		0.85
Cumulative %		69.30
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)		0.78

*Bartlett's Test of Sphericity = 653.966 p=0,000 (df=6) *p<,01*

Bartlett's test and the KMO value were calculated to ascertain whether the data were appropriate for an EFA. The dataset is eligible for factor analysis, as remarked in Table 3.11, where the findings reveal that Bartlett's test is important and the KMO is 0.78. When the λ of the variables usefulness were examined after varimax rotation, it was found that the λ were 0.74 or higher. Furthermore, EFA revealed that a single-factor structure explained 69% of the total variance, which is an acceptable level. Consequences of this study, 4-item usefulness scale was obtained, with a Cronbach's alpha value of 0.78, demonstrating that the scale is quite trustworthy. Following this step, confirmatory factor analysis was conducted to assess the structural integrity of the usefulness variable scale obtained from exploratory factor analysis. Table 21 displays the findings of the CFA conducted on the usefulness variable.

Table 21

Confirmatory Factor Analysis Results for Usefulness Scale.

Code	λ	λ^2	ϵ	N	AVE	CR
PU1	0.75	0.56	0.44	4	0.55	0.83
PU2	0.74	0.54	0.46			
PU3	0.81	0.65	0.35			
PU4	0.69	0.47	0.53			

A CFA was done on the four study-required items that evaluate trust. Table 3.11 lists the findings of this investigation. The findings show that the structure is represented by four items, and the standardized λ of the codes under a single factor are at a high level (>0.67).

The AVE and CR values were evaluated to the scale's total reliability in the study. It was determined that the AVE value was 0.55 (above 0.50) and the CR value was 0.83 (above 0.70), which proved that the validity of the model was within acceptable limits. When examining the model fit values, it was generally seen that the model fit values were within good and excellent limits. As a result, the construct validity of the usefulness scale was established in terms of CFA. In this context, it was agreed that the usefulness scale would consist of a single factor and four items in subsequent analyses of the study.

3.3.6 The Results of Exploratory and Confirmatory Factor Analyses for Perceived Ease of Use

EFA was used to evaluate the construct validity of the scales' four-item perceived ease of use measure. The rotation method utilized in the EFA was varimax rotation, and the factorization method employed was principle axis factoring. Table 22 displays the factor structure that was discovered during the exploratory study.

Table 22

Exploratory Factor Analysis Results for the Ease of Use Scale.

Code	Item	Factor Load
PEU1	The use of the smart products is clear and understandable.	0.80
PEU2	The use of the smart products does not require a lot of mental effort.	0.82
PEU3	The smart products are easy to use.	0.89
PEU4	It is easy to get smart products to do what I want them to do.	0.66
Cronbach's Alpha Based on Standardized Items		0.81
Cumulative %		63.75
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)		0.74

*Bartlett's Test of Sphericity = 515.179 p=0,000 (df=6) *p<,01*

Bartlett's test and the KMO were calculated to ascertain whether the data were appropriate for an EFA. The dataset is acceptable for factor analysis, as reported in Table 3.11, where the findings reveal that Bartlett's test is important and the KMO is 0.74. When the factor loadings of the variables ease of use were examined after varimax rotation, λ were noted to be 0.66 or greater. Furthermore, A single factor structure explained 64% of the overall variation, according to EFA, which is an adequate amount of explanation. This research produced a 4-item scale measuring ease of use, with a Cronbach's alpha score of 0.81 suggesting the scale is quite trustworthy. Following this step, CFA was conducted to assess the structural integrity of the ease of use variable scale obtained from EFA. Table 23 displays the findings of the confirmatory factor analysis for the ease of use variable.

Table 23

Confirmatory Factor Analysis Results for Ease of Use Scale.

Code	λ	λ^2	ϵ	N	AVE	CR
PEU1	0.73	0.53	0.47	4	0.55	0.83
PEU2	0.67	0.45	0.55			

PEU3	0,83	0.68	0.32
PEU4	0.72	0.52	0.48

A CFA was done on the four study-required items that evaluate trust. Table 3.11 lists the findings of this investigation. The results indicate that the standardized λ of the items under a single factor are at a high level (>0.67), and the structure is represented by four items.

To assess the scale's composite validity for the study, the AVE and CR values were computed. It was determined that the AVE value was 0.55 (above 0.50) and the CR value was 0.83 (above 0.70), which proved that the validity of the model was within acceptable limits. When examining the model fit values, it was generally seen that the model fit values were within good and excellent limits. As a result, the construct validity of the ease of use scale was established in terms of CFA. In this context, it was agreed that the ease of use scale would consist of a single factor and four items in subsequent analyses of the study.

3.3.7 The Results of Exploratory and Confirmatory Factor Analyses for Attitude

The construct validity of the three-item attitude variable in the study's scales was evaluated using exploratory factor analysis. The factorization method utilized in the EFA was principle axis factoring, while the rotation method employed was varimax rotation. Table 24 displays the factor structure that was discovered during the exploratory study.

Table 24

Exploratory Factor Analysis Results for the Attitude Scale.

Code	Item	Factor Load
ATT1	It is a good idea to use the smart products.	0.92
ATT2	I would have positive feelings toward the smart products.	0.90
ATT3	It is better for me to use smart products instead of other products.	0.88
Cronbach's Alpha Based on Standardized Items		0.88
Cumulative %		81
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)		0.73

*Bartlett's Test of Sphericity = 578.514 $p=0,000$ ($df=3$) $*p<,01$*

Bartlett's test and the KMO value were calculated to ascertain whether the data were appropriate for an EFA. As indicated in Table 3.11, the dataset is suitable for factor

analysis, and the results demonstrate that Bartlett's test is significant and the KMO value is 0.73. When the λ of the variables attitude were investigated after varimax rotation, it was found that the λ were 0.88 or higher. Furthermore, exploratory analysis revealed that a single-factor structure explained 81% of the total variance, which is an acceptable level. As consequences of that, 3-item attitude code was obtained, with a Cronbach's alpha value of 0.88, demonstrating that the scale is quite trustworthy. Following this step, CFA was carried out to assess the structural integrity of the attitude variable scale obtained from EFA. Table 25 displays the findings of the CFA for the attitude variable.

Table 25

Confirmatory Factor Analysis Results for Attitude Scale.

Code	λ	λ^2	ϵ	N	AVE	CR
ATT1	0.84	0.70	0.30			
ATT2	0.85	0.72	0.28	3	0.72	0.88
ATT3	0.85	0.72	0.28			

The three items used in the study to evaluate attitude underwent CFA. Table 3.11 lists the findings of this investigation. The results indicate that the standardized λ of the items under a single factor are at a high level (>0.67), and the structure is represented by three items.

To assess the composite reliability of the study's scale, the AVE and CR values were computed. The results showed that the model's validity was within allowable bounds because the AVE value was 0.72 (above 0.50) and the CR value was 0.88 (above 0.70). When examining the model fit values, it was generally seen that the model fit values were within good and excellent limits. As a result, the construct validity of the attitude scale was established in terms of CFA. In this context, it was agreed that the attitude scale would consist of a single factor and three items in subsequent analyses of the study.

3.3.8 The Results of Exploratory and Confirmatory Factor Analyses for Intention to Use

The construct validity of the three item intention to use variable in the study's scales was evaluated using exploratory factor analysis. The factorization method utilized in the EFA was principle axis factoring, while the rotation method employed was

varimax rotation. Table 26 displays the factor structure that was discovered during the exploratory study.

Table 26

Exploratory Factor Analysis Results for the Intention to Use Scale.

Code	Item	Factor Load
INT1	I am willing to use the smart products in the near further.	0.92
INT2	I plan to use the smart products in the near further.	0.93
INT3	I will make an effort to use smart products in the near further.	0.89
Cronbach's Alpha Based on Standardized Items		0.90
Cumulative %		83.5
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)		0.74

*Bartlett's Test of Sphericity = 678.221 p=0,000 (df=3) *p<,01*

Bartlett's test and the KMO value were calculated to ascertain whether the data were appropriate for an EFA. The dataset is acceptable for factor analysis, as remarked in Table 3.11, where the findings reveal that Bartlett's test is important and the KMO is 0.74. When the factor loadings of the variables intention to use were examined after varimax rotation, it was noticed that the λ were 0.89 or higher. A single component structure explained 84% of the overall variation, which is a satisfactory amount, according to EFA. This investigation produced a 3-item intention to use scale with a Cronbach's alpha value of 0.90, demonstrating the scale's good reliability. The intention to use variable scale derived from the EFA was then subjected to CFA to evaluate its structural integrity. Table 27 displays the outputs of the confirmatory factor analysis carried out on the intention to use variable.

Table 27

Confirmatory Factor Analysis Results for Intention to Use Scale.

Code	λ	λ^2	ϵ	N	AVE	CR
INT1	0.90	0.80	0.20	3	0.76	0.90
INT2	0.90	0.80	0.20			
INT3	0.82	0.67	0.33			

On the three questions that assess study intention to use, confirmatory factor analysis was done. Table 3.11 lists the findings of this investigation. The results indicate that the standardized λ of the codes under a single factor are at a high level (>0.67), and the structure is represented by three items.

The AVE and CR values were calculated to evaluate the composite validity of the scale in the study. It was determined that the AVE value was 0.76 (above 0.50) and the CR value was 0.90 (above 0.70), which proved that the validity of the model was within acceptable limits. When examining the model fit values, it was generally seen that the model fit values were within good and excellent limits. As a result, the construct validity of the intention to use scale was established in terms of CFA. In this context, it was agreed that the intention to use scale would consist of a single factor and three items in subsequent analyses of the study.

3.4 Results of reliability analysis

According to the findings of reliability analysis, every statement on a scale exhibits internal consistency with one another and yields reliable results when tested repeatedly. The commonly used analysis for reliability assessment is internal consistency evaluation. In this method, the consistency between all statements in a scale is examined and a high relationship between variables is expected. The Cronbach's alpha coefficient is commonly calculated for internal consistency examination (Hair et al., 2010). However, before performing this test, it is necessary to examine whether the data used in the research have an appropriate reliability level for analysis (Kurtuluş, 2010: 184). The Cronbach's alpha coefficient ranges from 0 to 1. In this context, values of 0.70 and above prove that the scale is within acceptable limits in terms of reliability (George and Mallery, 2016). The Cronbach's alpha coefficient values are interpreted as follows for the reliability of the scale:

- If $\alpha \geq 0.9$, the scale is considered to be extremely reliable.
- If $0.8 \leq \alpha < 0.9$, the scale is considered to be highly reliable.
- If $0.7 \leq \alpha < 0.8$, the scale is considered to be moderately reliable.
- If $0.6 \leq \alpha < 0.7$, the reliability of the scale is questionable.
- If $0.5 \leq \alpha < 0.6$, the reliability of the scale is low.
- If $\alpha < 0.5$, the scale is considered to be unreliable.

Table 28 lists the Cronbach's Alpha values determined for the scales employed in the study's dependent as well as independent variables. According to the analysis results,

each scale employed in the study had very high and outstanding levels of dependability.

Table 28

Reliability Analysis of the Scales Used in the Research

Variable	Number of item	Cronbach's Alpha
Novelty	3	0.81
Mobility	3	0.78
Compatibility	4	0.89
Trust	4	0.90
Perceived Usefulness	4	0.85
Perceived Ease of Use	4	0.81
Attitude	3	0.88
Intention to Use	3	0.90

3.5 Research Hypotheses Testing

3.5.1 Structural Equation Modeling

The goal of the study was to assess the suggested structural model in accordance with its goals using structural equation modeling (SEM). SEM is a widely used analysis method that allows for testing hypotheses by comparing alternative models and identifying the best fit. SEM analyses enable the determination of all effects (direct and indirect) among the variables in the study (Çelik and Yılmaz, 2016). In SEM analysis, the relationships between the variables in a theoretical structure based on a model are examined to determine whether they occur or not. The primary goal of SEM is to explain whether the theoretical models are validated by the dataset (Bayram, 2010). Two types of variables are examined in SEM models: latent variables and observed variables. Latent variables are measured through one or more observed variables and are dependent on them. The fundamental aim of SEM analysis is to identify the causal relationships between these latent variables (Byrne, 2010).

Several assumptions need to be met when conducting SEM analysis. These include the requirement for observed and latent variables to have multivariate normal distributions, the absence of correlation among the error terms, and the absence of multicollinearity among the latent variables (Bayram, 2010: 51). Additionally, at least three or more observed variables need to be used to measure each latent variable in the model (Kline, 2015). Another critical assumption of SEM modeling is that the sample

size should not be small. It is commonly recommended that the sample size in SEM analyses should be greater than 200.

Theoretical models in SEM analysis are tested against sample data (Kline, 2015). Two fundamental models are required for conducting this analysis: measurement models and structural models (Şimşek, 2007). The suggested model's construct validity is examined using the measurement model, which is based on confirmatory factor analysis (Hair et al., 2010; Kline, 2015). The purpose of this analysis is to show the relationships between observed and latent variables and to create structural equations (Malhotra, 2010; Meydan and Şeşen, 2011). A multivariate statistical analysis technique that uses the logic of multiple regression analysis is called path analysis (a structural model). This analysis allows for testing direct and indirect relationships between two or more variables (Gürbüz and Şahin, 2014: 316).

In SEM analysis, the theoretical model is tested by comparing it with the sample data (Kline, 2015). The measurement model and the structural model are the two fundamental models needed to carry out this study (İmşek, 2007). The suggested model's construct validity is examined using the measurement model, which is based on confirmatory factor analysis (Hair et al., 2010; Kline, 2015). The purpose of this analysis is to show the connections between observed and latent variables and to establish structural equations (Malhotra, 2010; Meydan and Şeşen, 2011). On the other hand, path analysis (structural model) is a multivariate statistical analysis method that works on the logic of multiple regression analysis. This analysis allows testing direct and indirect relationships between two or more variables (Gürbüz and Şahin, 2014: 316).

In SEM analysis, there are two different methods used for model testing, which are called single-stage and two-stage methods. In the single-stage method, the measurement model and path model analyses are conducted simultaneously for model testing. In this method, all statistical values are calculated for both models at the same time. In the two-stage method, the measurement model is tested first. Then, all goodness-of-fit indices are calculated based on the results of this analysis. After that, the structural model analysis is conducted (Çelik and Yılmaz, 2016). According to this approach, it is not correct to exclude the structure that is not confirmed by the measurement model from the path model. Therefore, in research studies, the measurement model is tested first, followed by the structural model (Çokluk et al.,

2012: 339). This method is more preferred in the literature and considered as an advantageous method compared to the single-stage method (Kline, 2015: 268). Accordingly, in the current study, the maximum likelihood method and the two-stage approach were used in structural equation modeling. Therefore, confirmatory factor analysis was used in the first stage to build the measurement model. Path analysis was used in the second stage to test the structural model based on the measurement model. Additionally, Hayes SPSS Process analysis was used for the analysis of mediator variables.

3.6 Evaluation of the measurement model (Confirmatory Factor Analysis)

The study's measurement model test was conducted using CFA. This analysis allows for the inclusion of the structures included in the research model as a whole. Detailed explanations regarding CFA are provided in the validity analysis section. In the implemented measurement model, the scale structures whose final structures were decided in previous sections were used, and the fit of the model was analyzed. The statistical significance of the factor loadings of the observed variables under each latent variable was initially looked at before evaluating the suitability of each latent factor separately.

Analyzing the measurement model tested with CFA requires that the standardized factor loadings (λ) between observed and latent variables have a minimum of 0.70 and high correlation coefficients between latent variables, but not too high ($r > 0.90$) to avoid the problem of multicollinearity (Kline, 2015; Bagozzi et al., 1991). In addition, the model's fit indices should fall within appropriate bounds (Hair et al., 2010; Hooper et al., 2008).

In accordance with the explanations given, the analysis output of the measurement model using the AMOS 23 program is presented in Figure 3.

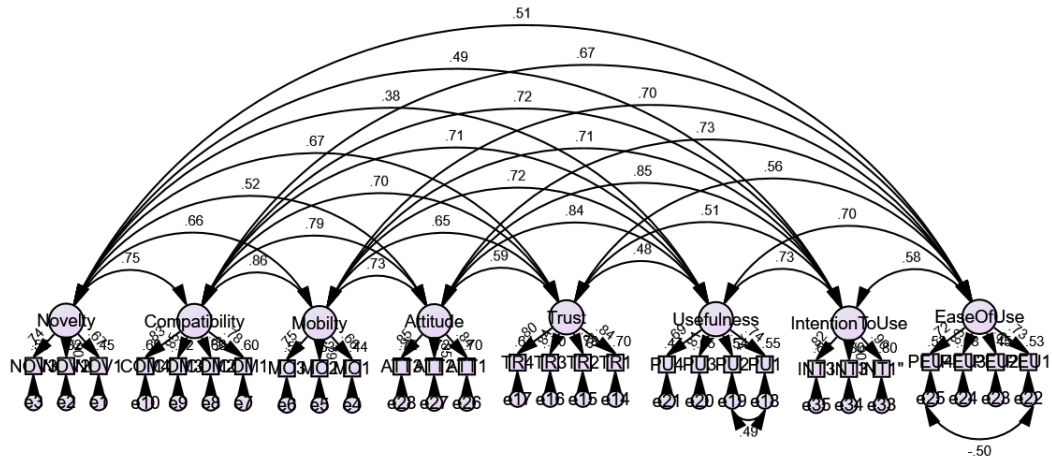


Figure 3. CFA Model

Table 29

Measurement Model Results.

Construct	λ	λ^2	ϵ	N	AVE	CR
Novelty				3	0,606	0,819
NOV1	0,673	0,453	0,547			
NOV2	0,903	0,815	0,185			
NOV3	0,741	0,549	0,451			
Mobility				3	0,543	0,780
MO1	0,662	0,438	0,562			
MO2	0,793	0,629	0,371			
MO3	0,75	0,563	0,438			
Compatibility				4	0,669	0,890
COM1	0,776	0,602	0,398			
COM2	0,813	0,661	0,339			
COM3	0,849	0,721	0,279			
COM4	0,833	0,694	0,306			
Trust				4	0,703	0,904
TR1	0,836	0,699	0,301			
TR2	0,881	0,776	0,224			
TR3	0,837	0,701	0,299			
TR4	0,798	0,637	0,363			
Usefulness				4	0,554	0,832
PU1	0,745	0,555	0,445			
PU2	0,736	0,542	0,458			
PU3	0,806	0,650	0,350			
PU4	0,686	0,471	0,529			
EaseOfUse				4	0,547	0,828
PEU1	0,73	0,533	0,467			
PEU2	0,672	0,452	0,548			
PEU3	0,827	0,684	0,316			
PEU4	0,722	0,521	0,479			
Attitude				3	0,715	0,883
ATT1	0,838	0,702	0,298			

ATT2	0,851	0,724	0,276			
ATT3	0,848	0,719	0,281			
IntentionToUse				3	0,758	0,904
INT1	0,896	0,803	0,197			
INT2	0,897	0,805	0,195			
INT3	0,817	0,667	0,333			

When examining the standardized λ in Table 29, it is seen that the standardized factor loadings of observed variables that explain latent variables are greater than the evaluation limit of 0.70 that was determined. However, the standardized factor loadings of the variables "NOV1, MO1, PU4, PEU2" are seen to be approximately between 0.66-0.69, close to the limit value, and due to the high CR and AVE values of the relevant latent variable, it was decided to keep these variables in the model.

Furthermore, when evaluating the CR and AVE values of the latent variables in the measurement model, it was found that the AVE values were closed to the limit value of 0.50 (0.54 and above), and the CR values were much higher than the limit value of 0.70 (0.78 and above), and these values were found to be within appropriate bounds (Hair et al., 2010).

The correlation matrix results showing the correlations between variables are presented in Table 30. When examining these values, it is seen that the highest value is 0.86 and the other values are lower. Based on the results, it was determined that there is no multi-collinearity between factor structures at a level that would create a significant linear relationship (>0.90) (Bagozzi et al., 1991). The existence of a certain level of relationship between some variables that are theoretically expected to be related represents a situation.

Table 30

Measurement Model Results.

	1	2	3	4	5	6	7	8
Intention to Use (1)	1.000							
Attitude (2)	.850	1.000						
Ease of Use (3)	.575	.733	1.000					
Usefulness (4)	.733	.837	.696	1.000				
Trust (5)	.509	.593	.560	.483	1.000			
Compatibility (6)	.716	.787	.673	.709	.701	1.000		
Mobilty (7)	.711	.734	.699	.718	.650	.858	1.000	
Novelty (8)	.494	.516	.510	.383	.666	.753	.660	1.000

The validity of the constructs was investigated using CFA. To assess the measurement model, we ran a CFA concurrently for all variables. The 28 remaining items were subjected to CFA, and the results indicated a satisfactory match (2 / df = 2.59, RMR = .032, CFI = .927, IFI = .927, NFI = .887, RMSEA = .068). All of these indicators are close to the acceptable limits that have been recommended in the literature (Bentler & Bonett, 1980; Hair et al., 2010). The findings of the measurement model's CFA showed that the results were well-fitting: the model's chi-squared statistic was significant (2 (320) = 831.112, P .000), but the normed chi-square was lower (2 /df = 2.59) than the 3.0 threshold advised by Hair et al. (2017). The root indicates that all fit indices - CFI = .927 > .90, IFI = .927 > .90, NFI = .887 > .80, and RMSEA = .0768.08—were within the ranges suggested for a reasonable model fit (Bentler & Bonett, 1980). Each regression value was also statistically significant (p.001) and valid (p.001). These findings demonstrated the viability of the suggested model.

3.7 Testing of Structural Models

The paths that have been added to the final model from the measurement model were analyzed using structural model path analysis. Through this analysis, the existence and effect levels of causal connections within latent variables were assessed. The paths in the final measurement model were analyzed using structural model path analysis with the AMOS 23 program. The diagram obtained from this analysis is shown in Figure 4.

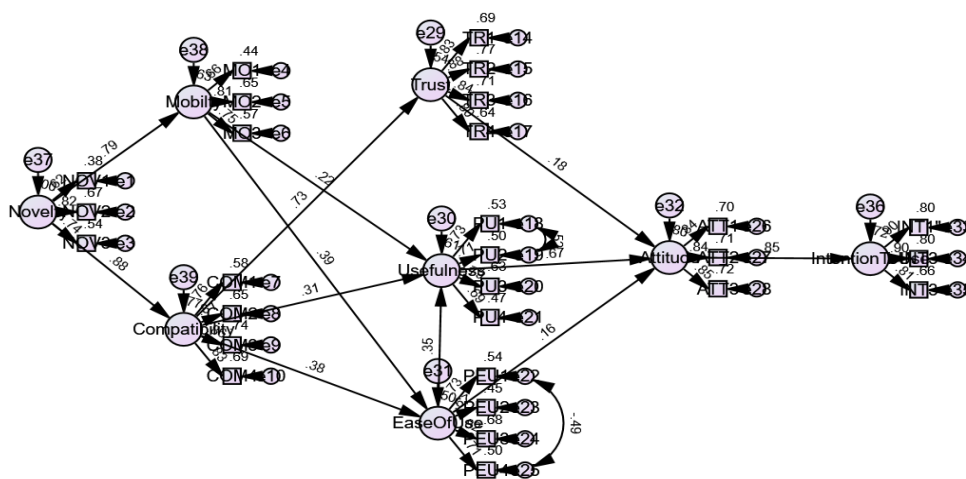


Figure 4. SEM diagram

In the evaluation of the structural model, the standardized path coefficients (β) calculated and the t-values used to assess the significance of each path were tested. If

the calculated t-values were greater than the critical t-value (1.96 for a significance level of 0.05 and 2.576 for a significance level of 0.01), it was decided that the relevant factor loading was significant (Çelik and Yılmaz, 2016). Table 31 displays the findings of this investigation.

Table 31

Values of Structural Relationships Obtained from Structural Modeling

Relationships	β	t value	P
Mobilty \leftarrow Novelty	.82	8.92	0.001
Compatibility \leftarrow Novelty	.85	10.53	0.001
EaseOfUse \leftarrow Mobilty	.43	4.55	0.001
EaseOfUse \leftarrow Compatibility	.45	4.75	0.001
Usefulness \leftarrow Mobilty	.24	2.64	0.008
Usefulness \leftarrow Compatibility	.37	3.97	0.001
Usefulness \leftarrow EaseOfUse	.35	4.58	0.001
Trust \leftarrow Compatibility	.89	12.17	0.001
Attitude \leftarrow Usefulness	.63	8.53	0.001
Attitude \leftarrow EaseOfUse	.15	2.52	0.012
Attitude \leftarrow Trust	.16	3.88	0.001
IntentionToUse \leftarrow Attitude	.96	16.65	0.001

According to the results, all path coefficients between latent variables are statistically significant at the 0.01 level. It was found that the t-values were statistically significant within the 95% confidence intervals. Additionally, when the fit statistics in Table 32 were examined, it was found that the overall model fit statistics were within the acceptable fit limits and were classified as excellent/good fit.

Table 32

Fit Statistics for the Structural Model

Fit Index	value	Fit evaluation
χ^2 /df (1005.6/336)	2.99	Accepted
RMSEA	.076	Accepted
NFI	.863	Accepted
CFI	.904	Accepted
IFI	.905	Accepted
RMR	.041	Accepted

When the values in Table 32 were examined, it was determined that the final structural model fits and the obtained final structural model can be used to evaluate the hypotheses of the study. In this context, hypotheses were evaluated by considering the path coefficients (β) of the effects between variables. In this interpretation,

standardized path coefficients less than 0.10 indicate small effects, relationships around 0.30 indicate moderate effects, and relationships of 0.50 and above indicate high-level effects (Kline, 2015: 185). When the relationships and effect coefficients obtained from the structural model of this study were examined, the following were observed:

- On the mobility, novelty connection (0.82) has a high level effect.
- On the compatibility, novelty connection (0.85) has a high level effect.
- On the ease of use, mobility connection (0.43) and compatibility (0.45) have moderate effects.
- On the ease of usefulness, mobility connection (0.24), compatibility (0.37) and ease of use (0.35) have moderate effects.
- On the trust, compatibility connection (0.89) has a high level effect.
- On the attitude, ease of use connection (0.15) and trust (0.16) have moderate effects, while usefulness (0.63) has a high level effect.
- On the intention to use, attitude (0.96) has a high level effect.

In this section of the research, all of the expected hypotheses were supported in the final structural model of the study.

4. CONCLUSIONS AND RECOMMENDATIONS

The results section of the study interprets the analysis findings and hypothesis test results in accordance with the research objectives. In summary, the findings obtained from the effects of novelty, mobility, compatibility, trust, usefulness and ease of use on smart home appliance user's attitudes, intention, and behavior in these hypotheses are presented. Based on these results, the practical and theoretical contributions of the research are explained. Additionally, recommendations that will be beneficial for future research are provided in this section.

4.1 The Summary Results of the Research

A study model that takes into account elements including customer attitudes, intents, usability, trust, mobility, compatibility, and novelty was tested using SEM. The model was tested using the AMOS 23 statistical package program. In addition, based on the results obtained, mediating effects of variables. The mediating variables were analyzed using the SPSS Process by Hayes, and the mediating variable model was analyzed using the SPSS 24 statistical package program.

As part of the research aim, online survey were conducted with a total of 350 participant who actively use smart home appliances. Data collection was carried out between October 2022 and January 2023 with participation who live in Istanbul and Tekirdağ.

Prior to completing hypothesis testing, scales employed in the study were assessed for their reliability and validity. The construct validity of the research scales was examined using EFA and CFA jointly since the scales were modified for the study's aims. The reliability test used the Cronbach's alpha coefficient calculation. For the EFA, the Kaiser-Meyer-Olkin sample adequacy measure (KMO) and the Bartlett test, which determines the degree of correlation between variables, were used. In addition, the λ of each variable in the obtained factor matrix were examined. Considering all these aspects, when evaluating the validity of the scales calculated in the study;

- Based on the measurements taken regarding the novelty (KMO: 0.64 and total explained variance: 77.64%),
- Based on the measurements taken regarding the mobility (KMO: 0.68 and total explained variance: 69.04%),
- Based on the measurements taken regarding the compatibility (KMO: 0.83 and total explained variance: 75.13%),
- Based on the measurements taken regarding the trust (KMO: 0.84 and total explained variance: 77.64%),
- Based on the measurements taken regarding the usefulness (KMO: 0.78 and total explained variance: 69.30%),
- Based on the measurements taken regarding the ease of use (KMO: 0.74 and total explained variance: 63.75%),

- Based on the measurements taken regarding the attitude (KMO: 0.73 and total explained variance: 81.03%),
- Based on the measurements taken regarding the intention (KMO: 0.74 and total explained variance: 83.49%),

After this stage, CFA was applied for each variable, and the fit of the models was examined according to both the goodness-of-fit values and the significance level. Additionally, λ for each factor in the obtained factor matrix were examined.

In the third step of the research, CFA was applied to all variables included in the model together, and a measurement model test was conducted. Factor loadings values between all observed and measurement model's latent variables were investigated, and it was found that all of the values were statistically important. At this stage, the most appropriate scale structure was determined to perform structural equation analysis. When the values were examined, it was determined that the goodness-of-fit statistics obtained for the measurement model were of a respectable standard. These values are as follows: $\chi^2 / df = 2.59$, RMR = .032, CFI = .927, IFI = .927, NFI = .887, RMSEA = .068. Based on these values, the degree to which the data and model are fit was proven to be acceptable and high.

At this point, it was determined if the values acquired from the measurement model were reliable, convergent valid, and discriminant valid. To test the discriminant validity of all λ calculated from the CFA, the correlation matrix of factor loadings was checked, and it was found that there was no multi-collinearity between the structures at a level that would create linear relationships (>0.90) (Bagozzi et al., 1991). Based on these values, it was interpreted that the discriminant validity of the model was at an acceptable level. In addition, all factor loadings were checked, and it was observed that these values were mostly above 0.70, and only four factors loading were close to this value (in the range of 0.66-0.69). Given these results, the model was found to have convergent validity. With this, the reliability (CR) and average variance explained (AVE) values of the model were also examined. As seen in Table 29, the values of the reliability were above the acceptable value (≥ 0.70), and the average variance explained by the variables was (≥ 0.50) (Hair et al., 2010). In the final stage, Cronbach's alpha values for the structures and observed variables in the measurement model were calculated. According to the

results, all alpha values were high (in the range of 0.78-0.90), and the internal consistency of the variables used in the model was determined. Considering the outcomes obtained from the measurement model as well as the reliability results, it was decided that the model was suitable for conducting structural equation analysis.

In the final stage, the paths between the latent variables obtained in the measurement model were examined by conducting a structural model test. In this context, the "t" values (significance levels) for the causal relationships established between these variables were examined, and it was determined that at the .001 level of significance, all relationships were statistically significant at a 95% confidence level.

Finally, the effects were examined through SEM analysis based on the relationships revealed in the final structural model. Table 33 displays the findings of this investigation.

Table 33

Support Status of Hypotheses Tested in the Study

Relationships	Status
H1: Mobility ← Novelty	Verified
H2: Compatibility ← Novelty	Verified
H3: Usefulness ← Mobility	Verified
H4: EaseOfUse ← Mobility	Verified
H5: Trust ← Compatibility	Verified
H6: Usefulness ← Compatibility	Verified
H7: EaseOfUse ← Compatibility	Verified
H8: Attitude ← Trust	Verified
H9: Attitude ← Usefulness	Verified
H10: Attitude ← EaseOfUse	Verified
H11: Usefulness ← EaseOfUse	Verified
H12: IntentionToUse ← Attitude	Verified

It can be observed from Table 33's results that all hypotheses are supported. Figure 5 displays the important correlations between the structural model and the variables discovered via the investigation.

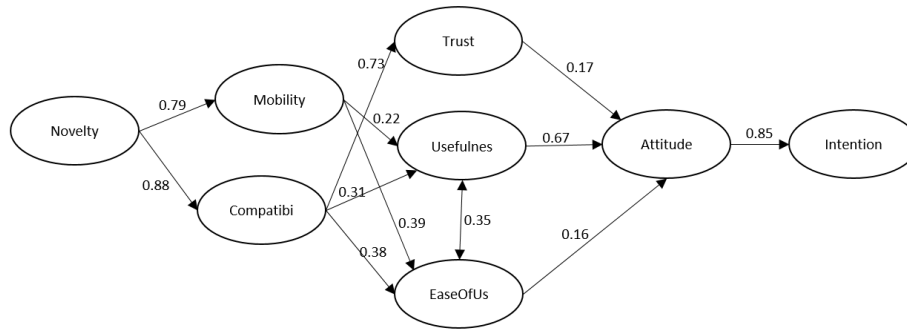


Figure 5. Structural Model Figures

When examining the goodness of fit statistics obtained from the structural model, it was found that all of these values are acceptable. These values are: chi-square/df: 2.99; CFI: 0.90; NFI: 0.86; CFI: 0.90; RMR: 0.41; RMSEA: 0.076. After checking the goodness of fit values of the model, standardized path coefficients obtained from the model were examined, and the structural equalities existing in the model were interpreted. When examining the standardized path coefficients, it was found that the effects of five relationships (novelty on mobility and compatibility; compatibility on trust; usefulness on attitude; attitude on intention to use) were high (>0.50), and the effects of all other variables were moderate (>0.30) (Kline, 2015). Accordingly, Table 34 includes standardized path loads, structural equalities, and total explained variance ratios for variables.

Table 34

Support Status of Hypotheses Tested in the Study

Dependent Variable	In-dependent Variable	R ²
Mobility	1. Novelty ($\beta = .79$)	.63
Compatibility	2. Novelty ($\beta = .88$)	.77
Trust	3. Compatibility ($\beta = .73$)	.54
Usefulness	4. Mobility ($\beta = .22$)	.60
	5. Compatibility ($\beta = .31$)	
	6. EaseOfUse ($\beta = .35$)	
EaseOfUse	7. Mobility ($\beta = .39$)	.50
	8. Compatibility ($\beta = .38$)	
Attitude	9. Trust ($\beta = .18$)	.80
	10. Usefulness ($\beta = .67$)	
	11. EaseOfUse ($\beta = .16$)	
Intention	12. Attitude ($\beta = .85$)	.72

When examining the variables that affect mobility, it was determined that the novelty (0.79) had a high level of effect and explain 63% of the variance in the mobility variable. When examining the variables that affect compatibility, it was determined that the novelty (0.88) had a high level of effect and explain 77% of the variance in the compatibility variable. Regarding the variable of trust, the compatibility (0.73) have a high level of effect, and these variable explain 54% of the variance in the trust variable. When examining the variables that affect usefulness, it was observed that the mobility (0.22), compatibility (.31) and ease of use (.35) had a moderate level of effect, and these variables explain 60% of the variance in the usefulness variable. Regarding the variable of ease of use, the mobility (0.39) and compatibility (0.38) have a moderate level of effect, and these variables explain 50% of the variance in the ease of use variable. When examining the variables that affect attitude, it was observed that the trust (0.18) and ease of use (.16) had a moderate level of effect, while usefulness (0.67) had a high level of positive effect. Together, these three variables explain 80% of the variance in the attitude variable. Regarding the variable that affect intention, it was determined that the attitude (0.85) had a high level of effect and explain 72% of the variance in the intention variable.

When examining the results obtained from variable analysis and structural equation analysis, we can make the following comments:

- The fulfillment of behavioral intention to use involves a number of structures, including attitude. According to research findings, the attitude has a important effect on the behavioral intention. This effect is realized by trust, usefulness and ease of use. These three variables are seen to have a full mediating effect in this relationship. While usefulness has a high level of effect (0.67) on the relationship behavioral intention and attitude, trust (0.18) and ease of use (0.16) have a mid level effect. According to research findings, the attitude directly and positively affects intention. In this context, it can be seen that the attitude is an important factor that should be considered in intention activities.
- Compatibility is an important construct in realizing the attitude towards behavioral intention. According to the results of this study, novelty has a very high impact (0.88) on behavioral intention. Additionally, according to the research findings, compatibilit is directly related to trust, usefulness and ease of use which have positive and high impact on attitude.

- When examining usefulness, it is explained that there is a significant relationship between the high level of attitude and the increase in behavioral intention. According to the results of this study; mobility (0.22), compatibility (0.31), and ease of use (0.35) have a very high impact (0.60) on usefulness.

4.2 The Contributions of the Study

This research explains the theoretical role of the key factors that influence consumers' intentions to use smart home technologies entering our lives within the framework of the Technology Acceptance Model. In this context, considering the relationship between the proposed structures, the research shows which factors are effective on consumers' usage intention. The proposed structural model contributes to the literature by explaining the important underlying factors in consumer usage intentions. Specifically, this study examines the collective role of trust, usefulness, ease of use, mobility, compatibility, novelty and attitude toward use by consumers from technology participation, in technology usage intentions among smart home appliance users.

Examining these behaviors and intentions is crucial for understanding the relationship between producers and consumers and strengthening relational marketing strategies. Properly explaining the factors that influence consumer usage intentions from a marketing perspective can provide companies with significant competitive advantages in strategies developed based on these behaviors. Therefore, the results obtained from this study are expected to be useful in improving the marketing strategies of firms in the industry and in academic studies related to the subject. Furthermore, given the importance and timeliness of consumer usage intentions and the insufficient level of research on this topic in emerging markets, conducting a study in this field can contribute to the literature and be useful in advancing the subject.

Positive evaluations of technology usage intentions by consumers can create positive attitudes towards behaviors. Positive behavioral attitudes increase the likelihood of exhibiting related behaviors. In this context, companies need to increase trust, usability, and ease of use ratios in technology adoption activities to create deeper, sustainable relationships with their consumers. Additionally, maintaining high levels of mobility and compatibility levels that express individual consumer characteristics is essential.

Taking a macro view and considering Turkey's economic conditions, it is important to recognize that the adoption and usage of smart home technologies are influenced not only by individual factors but also by broader economic factors. For instance, Turkey's economic conditions, such as income levels, employment rates, and technological infrastructure, can significantly impact consumer behavior and their willingness to adopt and utilize smart home technologies. Economic stability, disposable income, and access to affordable and reliable internet services can influence consumers' purchasing power and their perception of the value and affordability of smart home technologies. Additionally, the availability and cost of smart home appliances in the market, as well as government policies and incentives promoting the adoption of smart technologies, can also play a crucial role in shaping consumer usage intentions. These macro-level factors should be considered when analyzing the proposed structures and understanding the dynamics of consumer behavior in the Turkish market.

Understanding the relationship between producers and consumers in the Turkish context and designing effective marketing strategies can help companies gain a competitive edge and meet the specific needs and preferences of Turkish consumers. Furthermore, conducting a study on consumer usage intentions in emerging markets like Turkey is particularly valuable due to the limited research available in this area. By contributing to the literature and advancing knowledge on this subject, your research can fill existing gaps and provide valuable insights for both industry practitioners and academic researchers. Overall, by considering the macro view and Turkey's economic conditions, following studies can offer a deeper understanding of the factors influencing consumer usage intentions and provide valuable implications for marketing strategies in the smart home technology industry.

4.3 Recommendations

The recommendations that can be presented for future studies and for those managing intention to use activities are outlined in this section, based on the research results and limitations. Firstly, this study tests the proposed model on smart home appliance users to assess the impact of trust, usefulness, ease of use, mobility, compatibility, novelty, and consumer interest level on attitude and, intention to use activities. Future research could examine online and offline intention to use in different product or industry

categories, or make comparisons between multiple products or different product categories based on the level of intention.

The consumer intention to use examined in the target of the research are, as described in the literature review section, a multidimensional and extensive concept. Therefore, it is possible for these intentions to be influenced by many factors that are specific to the individual and directed towards the brand. Future studies may investigate the topic in terms of different dimensions of the relevant variables.

In addition, the effect of the social area on intention, especially the effects of other users and important people (such as influencers and celebrities) in online participation, can be examined on attitudes and intention towards participation. However, other variables that are effective in participation intention (such as product love, brand loyalty, automation level, etc.) can be included in the model to analyze their effects on the occurrence of relevant intentions. Finally, the intention to use examined in the scope of the research can be divided into online and offline participation, and differences between the relevant groups can be explained.

Based on the study results, technology manufacturer's and their marketing managers can increase positive attitudes towards intention to use activities by first ensuring harmony between product characteristics and consumer identity, and by informing consumers about the general benefits and enjoyment of intention to increase their products interest levels. The study's results clearly demonstrate how high levels of intention connection affect individuals' personal perceptions. Therefore, in this context, the priorities of manufacturers should be to create high loyalty between product characteristics and the target audience's identity and to include these characteristics in consumers' self-development and management.

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