KAMALUDDEEN UMAR MAIRIGA

INVESTIGATION OF FACTORS AFFECTING USERS' ABILITY TO ACCEPT INTERNET OF

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M.Sc. THESIS

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KAMALUDDEEN UMAR MAIRIGA

Supervisor
PROF. DR. FEZILE ÖZDAMLI

Nicosia
February, 2022

APPROVAL

We certify that we have read the thesis submitted by Kamaluddeen Umar Mairiga titled **"Investigation of Factors Affecting Users' Ability to Accept Internet of Things Services"** and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Educational Sciences.

Examining Committee	Name-Surname	Signature
Head of the Committee:	Assoc. Prof. Dr. Damla Karagözlu	....
Committee Member*:	Assoc. Prof. Dr. Sezer Kanbul	....
Supervisor:	Prof. Dr. Fezile Özdamli	....

Approved by the Head of the Department

10/03/2022

Prof.Dr. Nadire Çavuş

Title, Name-Surname

Head of Department

Approved by the Institute of Graduate Studies

..../..../2022

Prof. Dr. Kemal Hüsnü Can Başer

Head of the Institute

DECLARATION

I certify that the sources from which I gathered and presented the data in this paper were compliant with accepted academic practices and standards of ethical conduct. That being said, as required by these standards of conduct, Relevant papers and results that aren't original to this study have been properly cited.

Kamaluddeen Umar Mairiga

10/03/2022

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Kamaluddeen Umar Mairiga

ABSTRACT

The introduction of the Internet of things is regarded an essential milestone in the information technology revolution, as it has become a popular trend among industries, boosting the efficiency and prosperity of daily lives and activities. Many have already adopted the technology and put it into practice. Although studies indicate that just a minority of people are aware of the significant benefits associated with IoT services, in this scenario, users do not embrace IoT services. Hence, this study aims at investigating the factors affecting users' ability to accept internet of things services. The study utilized a conceptual UTAUT model to investigate the factors. The data was collected from 381 persons comprising of university students, employed persons and military personnel in some countries were targeted. Data was gathered using a questionnaire. The data for the study was analyzed using descriptive statistics, Pearson correlation and multiple linear regression techniques. Six hypotheses were tested and three of them were supported. The results showed performance expectancy, behavioral intention and facilitating conditions had positive and statistically positive influence on users' intention to adopt IoT services. Effort expectancy, social influence and perceived risk were found to have no impact users' intention to adopt IoT services. We expect that this study will inform technology firms about the critical things to consider while ensuring the convenience of IoT services, as well as educate users about IoT service use.

Keywords: Internet of things, IoT service, Adoption, UTAUT, Use intention

ÖZET

Bilgi teknolojisi devriminde görünüşü Nesnelerin İnterneti (Ni) önemli bir evrim olarak kabul ediliyor gelişen endüstriler arasında popüler bir trend haline gelen verim, günlük yaşam ve aktivitelerin esenliği. Birçok teknolojiyi zaten benimsemiş ve uygulamaya koymuştur. olmasına rağmen, Araştırmalar çok az insanın bunun farkında olduğunu göstermiştir. IoT hizmetlerini kullanmaktan elde edilebilecek önemli faydalar, içinde böyle bir durum, kullanıcılar BT hizmetlerini benimsemez. Böylece, bu çalışmanın amacı kullanıcının benimseme niyetini etkileyen faktörleri araştırmak BT hizmetleri. Çalışmada kavramsal bir UTAUT modeli kullanılmıştır. faktörlerini araştırmak için. Veriler 381'den toplandı üniversite öğrencilerinden oluşan kişiler, çalışan kişiler ve bazı ülkelerdeki askeri personel hedef alındı. Veri toplama aracı olarak anket kullanılmıştır. için veri çalışma, tanımlayıcı istatistikler kullanılarak analiz edildi, Pearson korelasyon ve çoklu doğrusal regresyon teknikleri. Altı hipotezler test edilmiş ve üç tanesi desteklenmiştir. sonuçlar performans beklentisini, davranışsal niyeti gösterdi ve kolaylaştırıcı koşullar pozitif ve istatistiksel olarak pozitiftir kullanıcının BT hizmetlerini benimseme niyeti üzerindeki etkisi. Çaba göstermek beklenti, sosyal etki ve algılanan risk kullanıcının BT hizmetlerini benimseme niyetini etkilemez. Umut ediyoruz Bu çalışmanın teknoloji endüstrilerine yardımcı olacağını bilmek için kolaylığını sağlamak için üzerinde durulması.

Anahtar kelimeler: Nesnelerin internet, IoT hizmetleri, Benimseme, UTAUT, Niyeti kulan.

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LIST OF ABBREVIATIONS

BI:	Behavioral Intention
EE:	Effort Expectancy
FC:	Facilitating Conditions
IP:	Internet Protocol
IT:	Information Technology
PEU:	Perceived Ease-Of-Use
PE:	Performance Expectancy
PII:	Personally Identifiable Information
PR:	Perceived Risk
PU:	Perceived Usefulness
RFID:	Radio Frequency Identification
SCM:	Supply Chain Management
SI:	Social Influence
SMEs:	Small and Medium Enterprises
SO:	Smart Objects
SPSS:	Statistical Package for Social Sciences
TAM:	Technology Acceptance Model
TRA:	Theory of Reasonable Action
TRNC:	Turkish Republic of Northern Cyprus
UTAUT:	Unified Theory of Acceptance and Use of Technology

CHAPTER I

Introduction

This chapter discusses the study's background, problem statement, significance, and limitations.

1.1 Background study

The Internet is generally perceived as just a network that maintains people's information (Kreische et al., 2015). However, the number of things connected to the internet has heightened drastically (James et al., 2015). Internet of Things, often called (IoT) is a comprehensive system that retrieves data from the environment and transmits it to computers over a telecommunication network (in this case, the Internet). It is comprised of sensors and objects (Ashton, 2009). As cyber-physical objects that can function in any situation, IoT devices are characterized by their capacity for sensing, communicating, and processing (Cicibaş & Demir, 2016). The objective of IoT is to link everything and everyone and do it in the most efficient manner possible. According to a study conducted by (Mahbub, 2020), the internet connects billions of individuals worldwide, allowing them to communicate and share information. IoT has ushered in a new era of creativity and opportunity by bringing users and interaction into the digital world. IoT is also a new tool for improving consumer relations, thanks to the growing use of smartphones and connected gadgets (Rathod et al., 2020). Each day objects comprise not just the electronic devices that we encounter, but also high-tech products such as automobiles and equipment and non-electronic items such as food, clothing, animals, trees, and water (Vermesan et al., 2013, Vermesan & Friess, 2014).

A massive amount of data is retrieved, evaluated, and used to begin acting on the billions of interconnected things that are capable of detecting, communicating, and interacting, and exchanging data over a public or private Internet Protocol (IP) networks, making way for a vast information in decision making, planning, and management (Sunil & Keyur, 2016). In IoT, everything is virtual; everyone and everything can be located, read, and addressed on the web (Atzori et al., 2014). Many objects, such as home appliances, monitoring cameras, sensors, actuators, displays, and automobiles, can be easily accessed and interacted with the birth of IoT (Zanella et al., 2014). As a result, IoT lowers deployment costs and provides a platform for improved food tracking and monitoring (Li et al., 2017), helps in improving the performance of the supply chain (Zhang et al., 2017), generates a secure and reliable means of information exchange (Haddud et al., 2017), improves the volume and speed of data (Parry et al., 2016), and fastens the decision-making process for the Supply Chain Management (SCM) (Rezaei et al., 2017). As a result, many people who could potentially use it will see a substantial change in their daily lives and behavior. Other instances include smart homes and offices, e-health, and assisted living. Some of the most common IoT applications are security systems, regulators, automobiles, electronic machines, residential and commercial lights, alarm clocks, speaker systems, and vending machines. Application scenarios like this are where the new paradigm will play a key role (Bellavista et al., 2010; Bnadyopadhyay & Sen, 2011; Zanella et al., 2014).

Furthermore, the adoption of the IoT paradigm is hampered by the lack of a well-defined and widely accepted business model capable of attracting investment to promote the deployment of these technologies (Layla et al., 2013). A good example is the Nest Thermostat. It's a Google-owned home gadget. The Nest Learning Thermostat is the company's most famous product. The vast majority of individuals forget to set their thermostats when they leave their homes. As a result, the Nest Thermostat learns its users' schedules, programs itself, and is controllable by phone, tablet, or computer. According to Stokes (2020), the Nest can be programmed to heat or cool during periods of low demand when it is less expensive to meet the needs of time-of-use subscribers.

The Internet of Things is undergoing rapid technological transformation, which impacts the entire world (Dutton, 2014). A wide range of IoT applications is being made possible by the increasing affordability of sensors, computing power, connectivity, and cloud storage (Ogidiaka et al., 2017). Increasing the capacity of standard services through sensor-embedded objects (such as conventional versus "smart" refrigerators) and value-added services is a common goal of many IoT businesses. Studies by (Bitta & Monroe, 1974; Helson, 1964) agree that consumers' perceptions of product or service costs are affected by two factors: the actual price and the degree to which the cost has been reduced. As a result, users are likely to compare the costs of IoT services to internal reference pricing to form an opinion on IoT service pricing (Grewal et al., 1998). Prices higher than the consumer's internal reference price will meet resistance, reducing the adoption of IoT services.

It is expected that IoT will evolve into a new generation of the Internet (Vermesan & Friess, 2014). According to Wojick, libraries may benefit from the Internet of Things by using cutting-edge mechanisms like virtual reality, 3D printing, and smart technology to create new services for users in response to shifting demands (Wojick, 2016). Through smart devices and mobile applications, IoT technology enables the collection of various of private to lifelog data (Yang et al., 2018; Xu et al., 2018). Several market research companies, including the American Telephone and Telegraph Corporation (AT&T), predict that 30 billion IoT devices will be connected by 2020. Globally, about 13 billion digital and electronic networking devices were in use in 2016, which equates to around two devices for each person on the world, and 30 trillion objects will be connected to a global economic impact of approximately $11 trillion by 2020, according to estimates (Rose et al., 2015). IoT came into existence after the number of Internet-connected devices exceeded the world's total population (Evans, 2011). Consumers must first understand what motivates them to adopt IoT services to use them successfully. As a result, the research purpose is to discover the factors that influence users’ ability to accept internet of things services.

1.2 Problem Statement

As that IoT is a relatively new concept, given the fact that many companies in various fields have already begun IoT activities. And these companies are investing in developing adoption techniques to make effective use of IoT and meet the needs of businesses. The majority of the general people are still unaware of and uninterested in it. Consumers may be concerned about and uninformed of the possible security and privacy risks related to their Internet of Things use (Weissman, 2015). To achieve cost-effective security when adopting IoT, people must be aware of the competencies required in information security.

However, Data security and privacy will always be a worry for customers amid IoT; nonetheless, they are optimistic about its potential to help them. Trust is proven to be a significant element determining behavioral desire to use IoT technology, outweighing other concerns like privacy (Yildirima & Ali-Eldina, 2018). Users may be anxious that tasks will not be completed as they had expected, or will not be completed at all, or will be destroyed for various of reasons (Falcone & Sapienza, 2018).

The vast majority of past study on this topic has focused primarily on the technical aspects of IoT use, ignoring the viewpoints of IoT users and their use of the technology (Lin & Dong, 2018; Al-Momani et al., 2018). Understanding of the aspects that drive customer confidence in IoT goods and services should help developers construct more efficient and extensively used IoT services (Belanche et al., 2012). To put it another way, an IoT system needs to offer several features, like encryption and functionality, to earn users' trust. This research shall close that knowledge gap because the general public appears to be more familiar with emerging technologies when they first appear on the internet.

1.3 Aim of the Study

The study seeks to discuss the factors that influence users' ability to accept internet of things services.

The study shall investigate six possible mechanisms to discuss the factors that influence users' ability to accept internet of things services.

H1: Performance Expectancy will have a positive effect on the users' BI to accept IoT services.

H2: Effort Expectancy will have a positive influence on the users' BI to accept IoT services.

H3: Social Influence will have a positive influence on users' BI to accept IoT services

H4: Perceived Risk seems to influence negatively on users' BI to accept IoT services

H5: Facilitating conditions will have a positive influence on Users' BI to accept IoT services

H6: Behavioral Intention will positively influence users' ability to accept IoT services.

1.4 Significance/Importance of the Study

Understanding the nature of the Internet of Things is essential for adopting suitable policy measures to promote its innovation and adaption. However, few studies have looked into the elements that influence users' ability to accept Internet of Things services. The study conducts an in-depth examination of the factors that influence users' ability to accept internet of things services. By examining critical elements, developers will understand the critical factors that may affect IoT user acceptance. These characteristics might also be helpful in building and promoting consumer-driven strategies.

Additionally, the study will be beneficial for future research on the Internet of Things acceptance by users. It will raise awareness about smart gadgets in homes, schools, and workplaces, among other places. While increasing awareness, IT companies will also be carried along.

1.5 Limitations of the Study

This study discovered the following limitations:

- An attempted questionnaire gathered data for the study.
- The study was carried out within a limited period of time.

1.6 Research Structure

This thesis divided into five distinct chapters. This chapter presents the basics of the Internet of Things and the study's problem, and the study's objective, significance, and limitations. Finally, the chapter discusses the study's context.

Chapter 2 discusses Related Research and Theoretical Framework about how users accept Internet of Things services. The corresponding research is based on prior research on the acceptance of Internet of Things services and a theoretical framework that discusses the applications, benefits, and issues associated with IoT. Additionally, it highlighted the TAM and UTAUT research paradigms.

Chapter 3 discusses the research methodology, including the research model, participants, data collection process, data analysis methodologies used, and the research timeline.

Chapter 4 reviews the study's results and made comparisons to prior research.

Chapter 5 presents the study's conclusion focused on the findings of the research. The chapter further goes on to give recommendations for further research.

CHAPTER II

Literature Review

This chapter introduces prior studies on the Internet of Things service uptake. This study's theoretical framework serves as the basis for this investigation.

2.1 Related Research

Table 2.1

Related Research Table

Author and Year	Aim	Method	Result
Bajaj et al. (2021)	This research aims to discover the effects of consumer awareness of the Internet of Things and IoT adoption on customer perceptions of safety, status, cost, and convenience.	Quantitative	The results show that students present a favorable attitude of awareness regarding to the cost of IoT devices but a negative attitude of awareness when it comes to safety, convenience, and status. In addition, students portray an excellent attitude about adoption in the case of comfort and prestige.
Amy et al. (2020)	This paper aimed at expanding the evaluation and comprehension of an individual's IoT adoption intention in higher education	Quantitative	According to research findings, the implementation of IoT can help academic students & staff take advantage of the technology's merits to better their job and school performance.

Table 2.1 (Continued).

Almugari et al. (2020)	The study's goal is to find out how IoT adoption in Indian banks is affected by many factors, including public awareness, privacy and security concerns, cost, ease of use, and social norms.	Quantitative	The results demonstrate that convenience, social influence, privacy & safety, and awareness all seem to influence adoption in Indian banks.
Derks (2020)	This study has focused on the perceptions of usefulness and trust, which may hinder the acceptance of IoT devices.	Quantitative	The results show Perceived usefulness appears to mediate the influence of animation on attitudes, leading to a more favorable attitude towards IoT gadgets.
Hashim & Al-Sulami (2020)	The study aims to discover what factors influence Iraqi students' use of Internet of Things (IoT) services.	Quantitative	Results show that SI, EE, Security, and PE are significant factors in BI to adopt IoT services.
Pillai & Sivathanu (2020)	The study aims to explore Indian farmers' use of IoT in agriculture.	Quantitative	According to the findings, Farmers are reluctant to utilize agriculture associated with IoT because they are afraid personal farm and agricultural data might be transmitted out without them knowing. Farmers are concerned about IoT in agriculture because they worry IoT provider corporations were driving their farming activities.

Table 2.1 (Continued).

Tarmizi et al. (2020)	The research intends to examine the IoT adoption by Malaysian halal agro-food businesses together with challenges faced	Quantitative	It was found that halal agro-food SMEs are not using IoT to manage their operations.
Gomes & Osman (2019)	To investigate the current business approaches for enabling efficient IoT technologies and diffusing them into businesses,	Qualitative	The results from the study show that even after integration and eventual adoption, the organization developing the innovation has the possibility to receive feedback from the adopter regarding the innovation's performance, efficiency, and effectiveness, and feedback in terms of product/service usability, and overall satisfaction.
Kang et al. (2019)	Creation of IoT services and solutions tailored to the needs of hospital patients	Quantitative	After a study on both nurses, ward nurses wanted IoT services to improve patient care. In contrast, non-ward nurses wanted IoT services to enhance work productivity.
Lee & Shin (2019)	Aimed at uncovering those factors influencing customers' views and behaviors toward IoT	Quantitative	It was clear that customer intention to use IoT is predicted by PE, SI, FC, and HC

Table 2.1 (Continued).

Madushanki et al. (2019)	The paper examines recent IOT agricultural farming applications & to provide insight into sensor data gathering, technology, and sub-verticals.	Literature review	Wi-Fi has the highest usage demand in the agriculture and farming industry, followed by mobile technology.
Nikbin & Abushakra (2019)	Researchers examine the factors influencing Omani entrepreneurs' desire to use the Internet of Things (IoT).	Quantitative	Findings showed support for most of the hypotheses but not price and effort expectancy on IoT adoption intentions.
Rey et al. (2019)	Investigating the factors influencing the adoption of IoT in the transportation and logistics industry.	Quantitative	Results indicate that IoT adoption in transport and logistics enterprises is strongly influenced by the firm’s size, its absorption capacity, and perception of benefits of connected technologies by entrepreneurs.
Tang & Ho (2019)	To find out what influences the use of smart and connected sensors by Local government.	Quantitative	It is seen that policy needs likely drive the early deployment of smart sensors and IoT by local governments.
Tripathi (2019)	The study aims to build a system dynamics model and identify factors influencing IoT adoption.	Literature review	Companies should leverage modern technologies to adopt IoT and analyze challenges successfully.

Table 2.1 (Continued).

AlHogail (2018)	The study explores the elements that affect customer trust and their implications for IoT technology adoption.	Quantitative	Consumers' faith in IoT products and services is based on their ability to protect their personal information and maintain their privacy. Consumers' trust decisions to adopt an Internet of Things device were influenced by social-related aspects, such as the user network.
Cicibas & Yildirim (2018)	The study aims to consider into account IoT use in the healthcare setting.	Literature review	Long-term user perceptions should be considered to determine how IoT devices are being used. More study is needed for mHealth technologies to be effective in multi-technological situations.
Hsu & Lin (2018)	This study explores factors that influence IoT service uptake using a value-based adoption model (VAM)	Quantitative	Perceived utility and pleasure influence BI via perceived value. PR also influences IoT adoption.
Jaafreh (2018)	Studies the elements that alters the acceptance of IoT by users and develops a model of IoT adoption technology in Small medium enterprises (SME) in Saudi Arabia (KSA)	Quantitative	It was concluded that customer evaluations of usefulness, ease of use, and national culture predict IoT adoption.

Table 2.1 (Continued).

Sivanthanu (2018)	Examine the uptake of wearing IoT gadgets for older adults in healthcare.	Quantitative	It was discovered that wearing IoT gadgets saves older individuals time and effort by measuring their health state.
Tu (2018)	This study explores the existing user requirements for smart home service features. It assesses the relationship in critical criteria and adoption behavior.	Qualitative	An investigation into whether or not companies will use IoT technology in their logistics and supply chain management has uncovered a several uncertainties about the technology’s trustworthiness and other external motivating force and issues, including the benefits and costs for adopting IoT
Ajayi (2017)	Understanding what influences healthcare administrators' decision to deploy a CGM IoT device into their business systems by asking them about their own personal experiences	Quantitative	Results from this study showed that the adoption of CGM IoT devices by healthcare providers is influenced by various factors, including laws and policies, comparative advantages, compatibility, security and privacy concerns, Inexperience or awareness, insurance, complexity, tangibility, quantitative measurements, standards, and cost.

Table 2.1 (Continued).

Macik (2017)	To investigate the amount of IoT adoption by young Polish consumers. and the factors that contribute to this phenomenon.	Quantitative	Univariate ANOVA and structural equation modelling revealed important elements influencing adoption, such as performance expectancy, habit, and personal innovativeness in the IT area.
Mital et al. (2018)	To see how the Internet of Things is being used in India.	Quantitative	Increased willingness to adopt IoT devices based on smart devices could result from hands-on training and demonstrations.
Ogidiaka et al. (2017)	This study aims to find out how many firms in Lagos State, Nigeria, are currently utilizing IoT.	Quantitative	It was revealed in a survey gotten that IoT is still in its infancy, in research and planning, and in the early phases of deployment.
Lin et al., (2016)	It determines what elements influence the adoption of IoT technology in the Chinese agriculture supply chain.	Quantitative	The results showed that employee resistance and uncertainty do not affect IoT adoption.
Patil & (2016)	To investigate the variables influencing retail employees' acceptance and utilization of IoT and offer management solutions for successful IoT integration in retail businesses.	Quantitative	Utilizing IoT can improve the retail purchasing experience by improving employee perceptions of utility, usability, trust, subjective norms, and perceived behavior control.

Table 2.1 (Continued).

Bude & Bergstrand (2015)	To explain IoT, its uses, and some of the concerns that IoT may face in terms of information security.	Quantitative	Interconnecting devices, protocols, applications, etc., requires formal standards in the form of standardization. Developing standards or solutions must leverage open-source protocols and approaches to gain wide acceptance and use.
Gao & Bai (2014)	It is aimed at creating and evaluating an integrated model of consumer acceptability of IoT technologies.	Quantitative	The results backed up the impacts of perceived ease of use, usefulness, social influence, enjoyment, and behavioral control.
Sing et al. (2013)	A study to determine the elements that influence the rate at which IoT-enabled technologies are adopted in India's corporate sector.	Quantitative	Traditional TAM model determinants have a favorable impact on the ability of enterprises to adopt IoT for multiple uses in their organization.
Nasri (2011)	It is focused on the factors influencing the use of Internet banking in Tunisia.	Quantitative	Preferences for Internet banking in Tunisia are heavily impacted by convenience, risk, and security.

Table 2.1 summarizes related research on the factors of Internet of Things adoption. According to this research, the likelihood of IoT adoption may be influenced by various technological, organizational, and environmental factors. Although previous research focused on IoT adoption, little research was done on the factors that influence users' ability to accept the Internet of things. In addition, the TAM or DOI models have been applied in past research to determine the factors influencing IoT adoption. In light of the substantial empirical research already done, this study

intends to further develop and test the UTAUT model of factors influencing IoT service adoption.

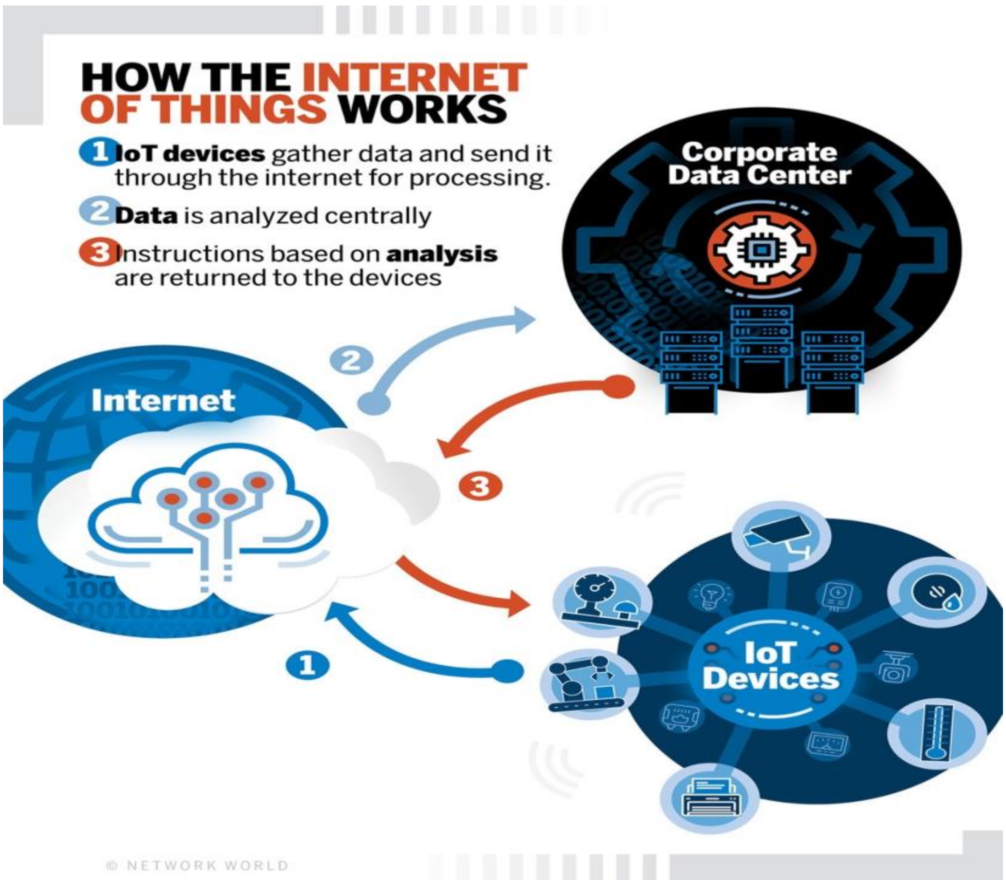
2.2 Theoretical Framework

2.2.1 Applications of Internet of Things

Everybody has a different take on how IoT has evolved over the past decade. According to Whitmore et al. (2015), the Internet of Things has no general definition. IoT refers to many things, including smartphones, RFID tags, sensors, and actuators which can be communicated via the internet or over a network (Atzori et al., 2010; Sadeeq, et al., 2018). The software has been programmed into these objects to collect and process data from the environment. Over a network, data will be dispersed across a central database or multiple storage devices. Figure 2.2 shows the IoT process.

Figure 2.2

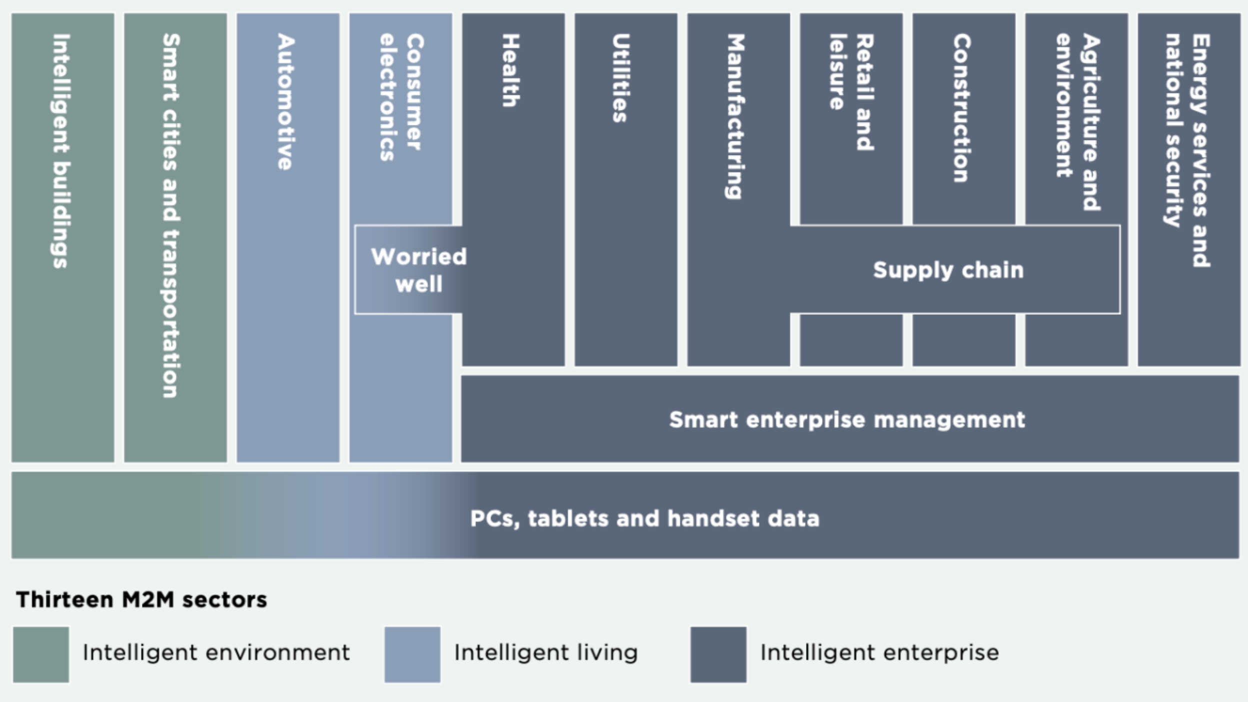
Overview of how IoT works (Fruhlinger, 2020)



It has been proven that IoT could be utilized in various industries. Some of these industries are home automation, scientific research, IT, disaster prediction, water monitoring systems, to manufacturing and production in the agricultural sector and transportation (Desai & Mahalakshmi, 2018). Fig 2.3 below shows thirteen industry sectors where IoT services are adopted.

Figure 2.3

IoT Industry Sector Categories (GSMA, 2014)



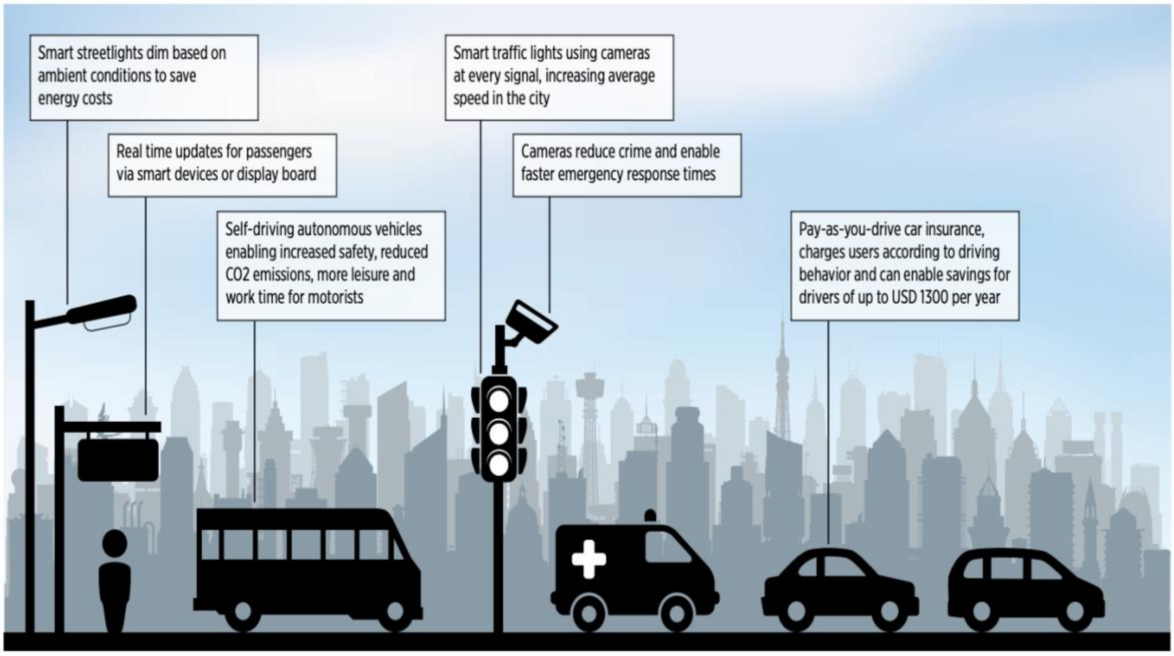
IoT has lately inspired logistics and distribution networks, and it is likely to influence the distribution networks in the future (Tu, 2018). Real-time tracking of everything from acquisition of raw materials to finished products distribution can be achieved with the Internet of Things. This is advantageous to all supply chain members since it provides visibility, adaptability, responsiveness, and stock reduction on both sides. Waste reduction and process optimization might save $2.7 trillion in the IoT-based supply chain. (Paper, 2014).

As previously noted, IoT applications are frequently used in the retail industry. The retail IoT market is expected to grow from $14 billion in 2015 to $36 billion in 2020. Consumers could track and choose numerous product features using automated vending machines, RFID tags, animations, virtualized closets, smart screens that display product information, and self-checkout technologies. Amazon Dash, Amazon Go, Wallmart Pickup Towers, and other IoT-based programs are already used at

Walmart and Amaz (Marr, 2017). IoT applications, on the contrary, offer a more significant marketing potential than retail IoT applications (Maier, 2016). Customer satisfaction may be improved in many ways, such as energy efficiency and home security. Still, these aren't the only areas where IoT connectivity might be beneficial. Incorporating connected, intelligent technology and cloud services into houses will aid in addressing the pressing issues of energy efficiency and security. Cost savings and outages will be avoided thanks to connected smart gadgets, improving home security through remote monitoring. Fig 2.4 shows an example of IoT applications in Smart Cities.

Figure 2.4

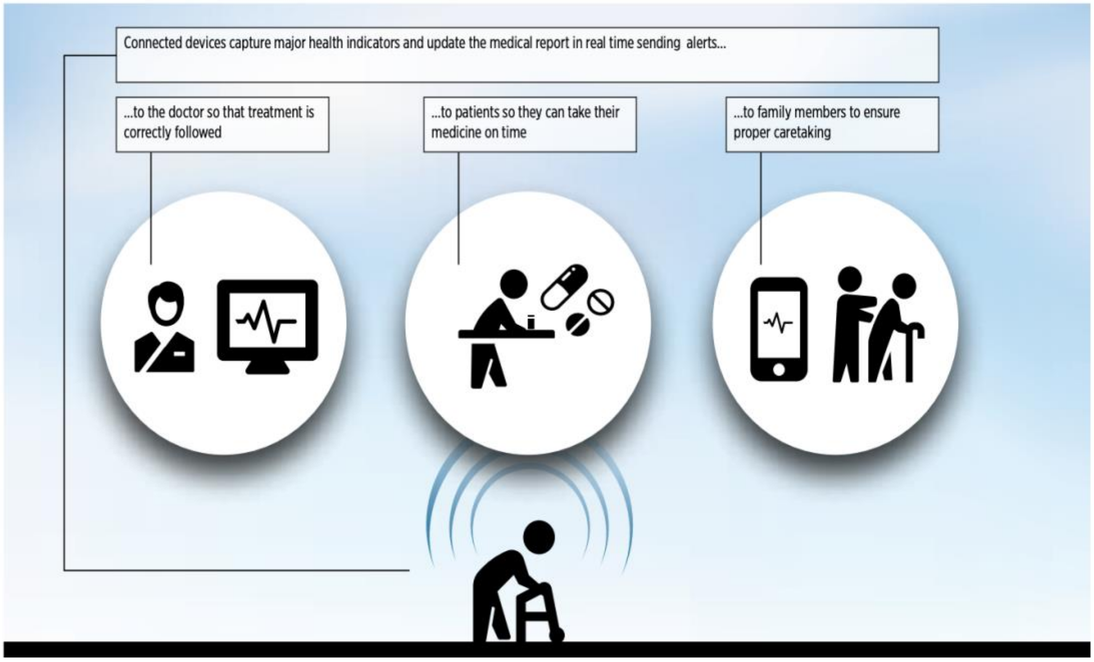
IoT Applications in Smart cities (GSMA, 2014)



IoT will help improve health access and efficiency. In situations where healthcare demand doubles, e-health services can help expand coverage and monitor chronic and age-related illnesses at the patient's home. As shown in Figure 2.5, patients benefit from better care and a lighter burden on the health sector with Internet of Things. This is accomplished by assisting these patients in gaining access to resources that will enable them to live healthy lifestyles.

Figure 2.5

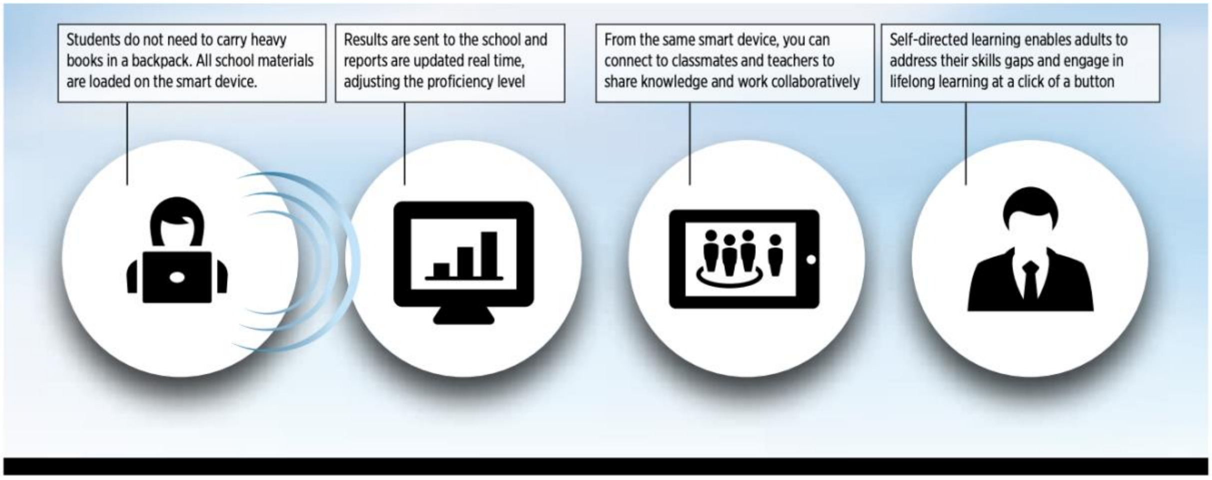
IoT Applications in Health Sector (GSMA, 2014)



Mobile-enabled solutions adjust the learning process for each student in education, improving overall skill levels and connecting virtual and real classrooms to make learning more accessible and easier. Fig 2.6 shows an example of IoT applications in education.

Figure 2.6

IoT Applications in Education (GSMA, 2014)



Customers can expect less workload, a better lifestyle, and enhanced convenience from IoT solutions (Dong et al., 2017). IoT applications make day-to-day domestic tasks more efficient and more straightforward to monitor and regulate. This new technology will impact on people's daily routines (Wang et al., 2013).

2.2.2 Benefits of IoT Adoption

Internet of Things can influence every aspect of civilization (Coetzee & Eksteen, 2011). When it comes to IoT adoption, one of the key motivations is determining whether or not it can be widely adopted (Bi; Atzori et al., & Zhong et al., 2017). IoT has grown in complexity. Making effective use of data from IoT devices has a lot to gain for the evolution of IoT devices. IoT adoption offers several benefits to a business, including cost savings, product and service advances, and reduction in risk (Ebersold & Glass, 2015). Ten years from now, the Internet of Things is predicted to be a significant IT trend. (Coombs et al., 2016), with substantial consumer benefits (Uckelmann et al., 2011). Despite the fact, most of independent constructs positively affect IoT; its implementation deadline has been delayed (Ives et al., 2016). Cost and security problems must be addressed and evaluated to promote IoT usage.

Communication. IoT will make it easier to track items (like machinery, supplies and tools) thanks to sensing devices and connections, allowing businesses to more easily identify and address asset concerns. To maximize asset utilization, do preventive maintenance. Thanks to resource usage, data and information can be successfully delivered to the people and systems that use it. It also uses sensors like RFID to detect current location and mobility, such as the placement of things and people (Stergiou et al., 2018).

Control and Automation. Furthermore, IoT allows enterprises to obtain visibility into their operations, issue anomaly alerts, and respond automatically from a remote device. IoT services sensors and video cameras assist assure equipment security and defend against physical threats at work. To deal with issues, as they arise, teams need to be able to coordinate and automate IoT services. Caro et al. (2013) found that automation and control systems affected IoT adoption significantly and explained three ways in which IoT is used on the retail distribution network. Customers and employees can be analyzed and inventoried using it as a video network. Consumers' and employees' cellphones are the second IoT device utilized by retailers on the supply side to monitor payments during an inventory operation. The use of smart access cards, as a sign of loyalty for customers, could be another alternative. Finally, IoT is used to monitor and manage commodities in transit on the supply side.

Cost Saving. Preventing equipment failure through new sensor data and enabling scheduled maintenance are two ways the Internet of Things saves a company's money. IoT investment returns can be quickly returned within a year if IoT capacity is enabled. It also improves the efficiency of resources, the productivity of the company, and organizational structure through IoT. Kim et al. (2007) reported that cost is a vital determinant of the intention to adopt innovation.

IoT Self-Configuration. According to Stergiou et al., (2018) existing enterprises and operational systems stored in public cloud systems or private data centers require connectivity via IoT. Maintenance and management are simplified when IoT services are deployed on a cloud platform. Multi-cloud IoT vendors respond effectively to the client and regional needs. IoT devices can communicate with current systems and several Connected devices over the cloud (Botta et al., 2016). Integrating IoT and cloud computing brings new data interchange and internet-enabled service possibilities. Also, a robust universal network infrastructure that is dependent on public and compatible communication protocols would emerge. Self-configuration and connectivity to the cloud are two ways IoT devices can tailor their behavior (Distefano et al., 2015). Additionally, IoT systems can obtain crucial functionality from the Cloud.

2.2.3 Challenges of IoT Adoption

When both the bad and good elements of an IoT deployment are analyzed, successful implementation is achieved. Security and privacy issues, unstable connectivity, a shortage of experienced IT experts, and IoT adoption are hampered by the lack of sufficient technology for storing and interpreting the data provided by Internet of Things (Joshi, 2018).

Security Risks. IoT security problems include permission, authentication, identity management, system configuration, archiving and maintenance (Tu, 2018). The increasing adoption of IoT is hindered by concerns about security, according to Voas & Laplante (2017). IoT systems lack suitable standards and are extremely dynamic and insecure. Furthermore, IoT systems use a wide range of communication devices. Challenges might be present with portability because IoT devices which are interconnected are not always portable. Finally, securing IoT systems is impossible (Bertino, 2016). The most serious concerns posed by IoT are software attacks, which may bring entire systems down, harm data, or even refuse service while altering it. Studies show that seventy percent of IoT devices commonly used lack software protection, weak permission, encryption, authorization, and user interface security (Lee & Lee, 2015).

Privacy Risks. Kolias et al., (2016) studied IoT-related privacy issues such as the Personally Identifiable Information (PII) leaking, sensitive personal data, and unauthorized function execution. The Internet of Things encompasses various applications that are already used daily. The IoT refers to the vast number of Smart objects (SO) communicating over the internet. As more people and devices use IoT applications, the applications' privacy is in harm's way. IoT applications can reveal an individual's identity and whereabouts to others, raising privacy concerns. Invasion of user privacy by violent publicity, individual spam at POS locations, customer routes and profiles on user habits, and significant criminal acts are all instances (Samani et al., 2015).

Infrastructure. As real-time data grows; businesses must choose a long-term data storage solution. The data is kept centrally and cannot be accessed in real-time. As a result, companies should migrate from centralized data storage to a distributed cloud platform (Joshi et al., 2018). Also important is for organizations to ensure that their infrastructure is up to date and capable of managing IoT-connected and sensing devices and production in real-time.

Reliability of Network Connections. A stable and reliable network (Joshi et al., 2018). For IoT, standard IP networks are preferable to specialized ones. IoT can perform IP networks without reliability or compatibility issues.

2.3 Technology Acceptance Model (TAM)

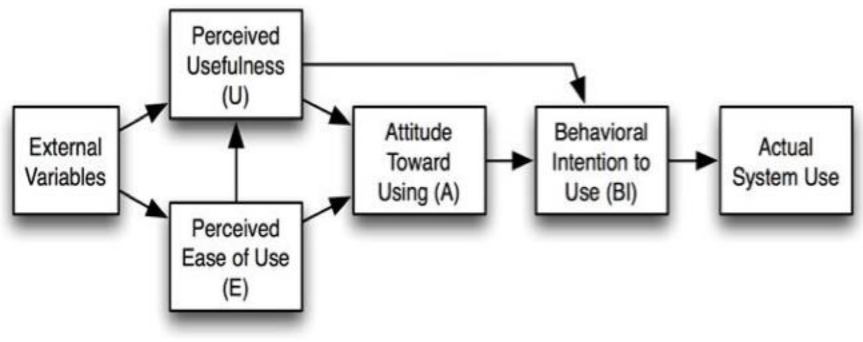
Information systems in institutions have become more popular since their establishment; user technology adoption has received a lot of attention. When it comes to determining whether or not to utilize technology, researchers have spent a lot of time attempting to figuring out what elements influence a users' values and views. TAM was developed by Davis (1989) in which has since become a common approach for researching variables influencing end-user acceptance of technology. TAM has assumed the lead in characterizing end-user behavior toward technology. Theory of Reasonable Action (TRA) and the Planned Activity Theory (TPB) are the foundations of this model (Marangunić & Granić, 2015). The TAM is a foundation for this research to understand what influences people in IoT adoption.

A dynamic relationship between external factors and actual system utilization occurs when TAM modifies perceived ease-of-use (PEU) and perceived usefulness (PU). These are two remaining parts to TAM; behavioral intention to use and attitude toward using. According to Davis (1989), How much a person thinks that using a specific item would improve their work efficiency is considered PU. How inconvenient a person feels a specific approach will be is defined as PEU (Sharp, 2006).

Behavioral intention to use indicates how much an individual has planned for or determined not to do a future activity (Brezavek et al., 2016). Attributes such as ease of use and usefulness play a role. The attitude to use describes how a person's attitude toward a technology determines whether or not they use it (Maranguni & Grani, 2015). TAM is represented in Figure 2.7 below.

Figure 2.7

Technology acceptance model (Davis, 1989)



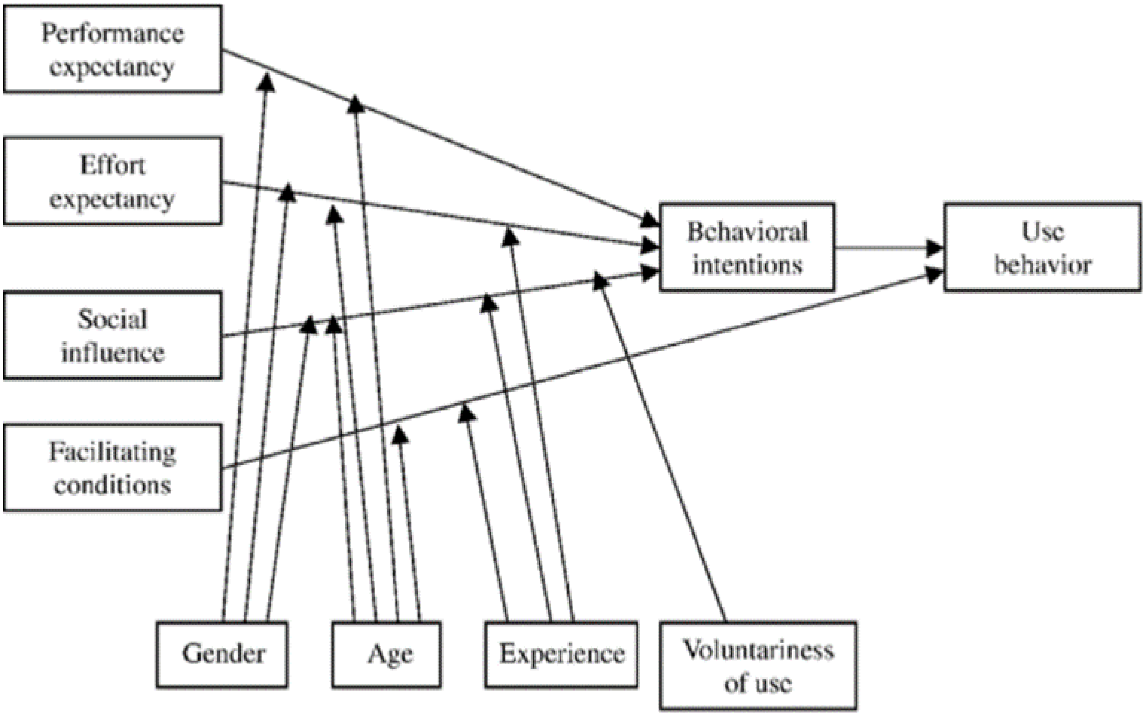
2.4 Unified Theory of Acceptance and Use of Technology (UTAUT)

It has been modified to overcome the challenges of comprehending TAM constructs by incorporating new parameters and constructs with significant influence. UTAUT model was introduced by Venkatesh et al. (2003), which is among TAM virtual extensions. The UTAUT model describes how PE, SI, FC, and EE have an apparent favorable effect on technology adoption (Arias-Oliva et al., 2019).

PE is the belief that employing a specific technology to improve performance will be beneficial. SI measures how much others think a person should utilize a given technology. FC denotes a person's confidence in their technical and organizational resources to employ a certain technology. EE is the ease with which technology can be utilized (Venkatesh et al., 2003). Through the mediator role of the intention to use, the four factors described by UTAUT impact the study of IoT adoption. The UTAUT model is shown in Figure 2.8.

Figure 2.8

Unified theory of acceptance and use of technology (Venkatesh et al., 2003)



CHAPTER III

Research Methodology

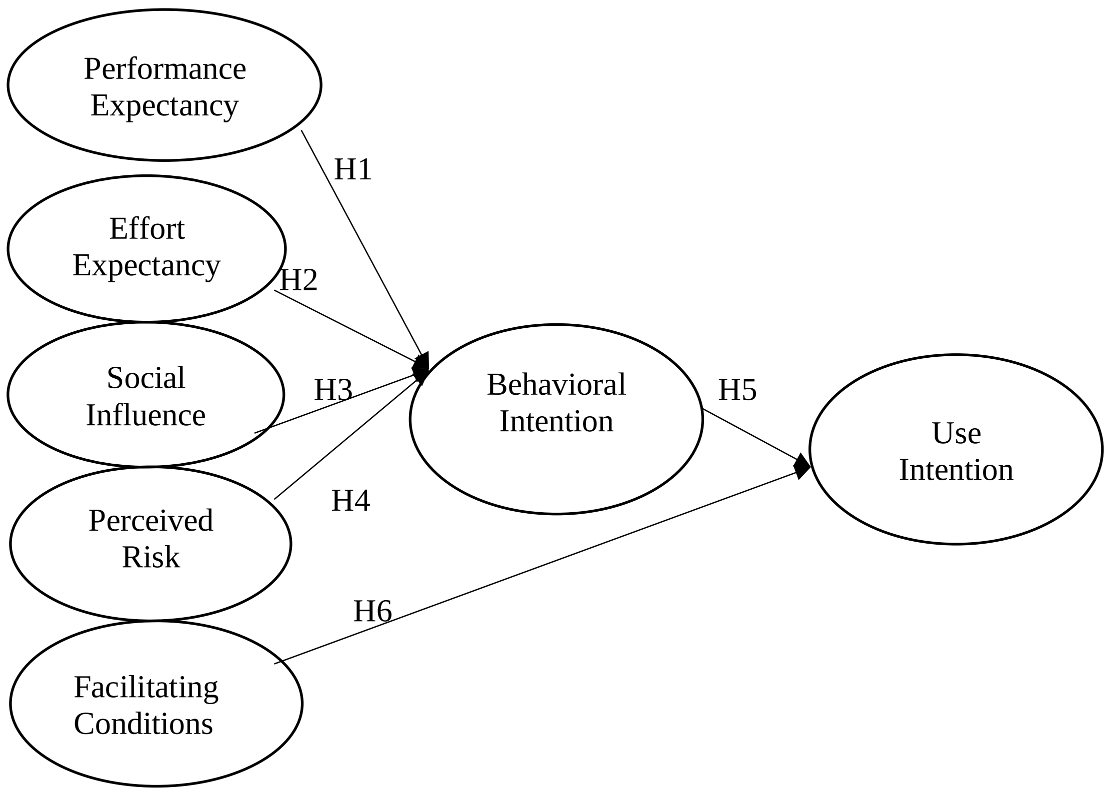
This chapter provides a detailed explanation of the methodology. Participants' information and data collection were included in this study. Data analysis methodologies and a research timeline were also covered.

3.1 Research Model

The UTAUT model was used as a theoretical framework; this study investigates technology adoption. Based on a generic appraisal of technology, the early UTAUT elements were not inclusive of perceived risk. Researchers criticized the two models for excluding perceived risk (Alotaibi, 2014; Sing 2014). As a result, the UTAUT model was tweaked to meet IoT adoption's unique characteristics. Adding to the UTAUT model variable, perceived risk was included in the analysis of IoT technology adoption. Perceived risk is the uncertainty and potential adverse effects of adopting or purchasing a product (Xie et al., 2017). The research model for the study is shown in Figure 3.1.

Figure 3.1

Research Model of the study



3.2 Research Hypothesis

A total of six hypotheses were investigated discover what influences user's ability to accept IoT services.

The first factor that has been found to influence a users' BI to accept IoT services is performance expectancy. Factors affecting customer acceptability of IoT technology were investigated by Gao & Bai (2014). They discovered that if customers understand the benefits of using this technology, their willingness to accept IoT services is likely to grow. As a result, this hypothesis can be made:

H1: Performance Expectancy will have a positive effect on the users' BI to accept IoT services.

The second component revealed to influence a users' BI to accept IoT services is the effort expectancy. As examined by Hashim & Hassan (2015), it was found that IoT technology adoption intentions are influenced positively by perceived ease of use in the TAM and UTAUT models. As a result, this hypothesis can be made:

H2: Effort Expectancy will have a positive influence on the users' BI to accept IoT services.

Making and enacting decisions is heavily influenced by social factors. The third component to be discovered to influence a users' behavioral intention to accept IoT services is social influence. A study done by Venkatesh et al. (2012) looked at customer acceptance and use of technology. The study found that when a new technology is first introduced, consumers rely on social media contexts like the thoughts of classmates, family members, and friends because they lack credible information about it. According to the survey findings, those who have already used this technology are more willing to purchase IoT services. Therefore, the hypothesis can be made:

H3: Social Influence will have a positive influence on users' BI to accept IoT services

Another factor that alters users' BI to accept IoT services is perceived risk. E-services adoption was investigated by Featherman & Pavlou (2003). They looked at the adoption process from the perspective of perceived risk. This study looked into the effects of both actual and perceived risks. It was established that IoT service are frequently associated with security, financial, and other problems. As a result, perceived risk is considered an obstacle to IoT service adoption. The following hypothesis can be made as a result:

H4: Perceived Risk seems to influence negatively on users' BI to accept IoT services.

Facilitating Conditions are the final hypothesis discovered to influence a users' behavioral intention to accept IoT services. Mathur (2003) investigated the elements that influence professionals' cloud computing adoption decisions. He described Facilitations as "conditions for people to adapt to technology," and IoT adoption is encouraged by this condition. This hypothesis is made:

H5: Facilitating conditions will have a positive influence on Users' BI to accept IoT services.

This study dependent variables are Behavioral Intention and Use Intention. According to a study by Hsu et al. (2016), the utilization of IoT services is greatly influenced by behavioral intention. Therefore, the hypothesis can be made:

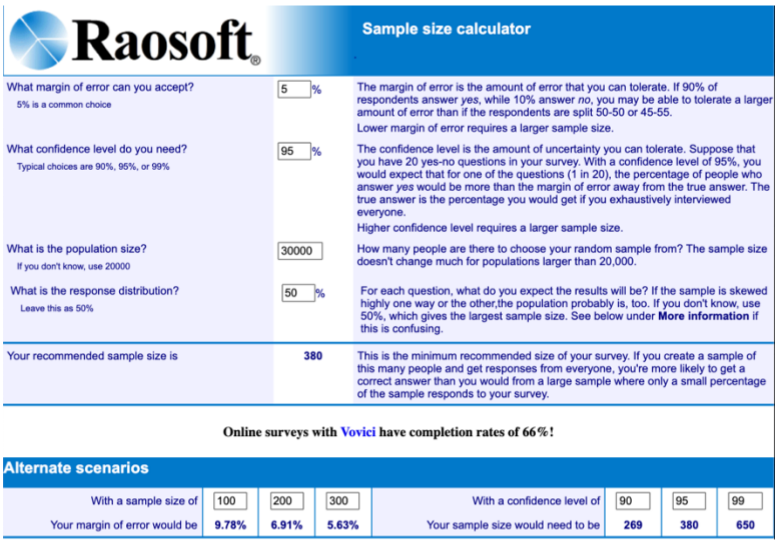
H6: Behavioral Intention will positively influence users' ability to accept IoT services.

3.3 Research Participants

Data was collected from university students, employees, and other volunteers worldwide for the study. Volunteers of various ages were chosen, regardless of nationality. The study's sample size was determined using the web survey software Rao soft sample calculator.

Figure 3.2

Rao soft calculator (Retrieved 30th July 2021) from http://www.raosoft.com/samplesize.html



The survey was shared with the volunteers via a link on social media channels. In this study, the data from 381 participants were used in the analysis.

3.3.1 Participants Demographic data of the research

Participants' personal information is illustrated in Table 3.1. Participants were split equally between men and women, with 46.7% male and 53.3% female. 42.8 percent of the participants were from Nigeria, according to the nationality breakdown, 17.1% from TRNC, 16.3% from Turkey, 23.9% from other countries. The age distribution of participants showed 17.1% were less than 21 years old, 39.6% were within the range of 21-30 years old, 22.0 % aged 31-40, while 21.3 % were well beyond the age of 40. The occupation distribution of the participants showed 39.4% were university students, 50.7% were employed, 3.4% were military and others were 6.6% as well.

Table 3.1

Personal Information

Demographic Variables		Number	Percentage (%)
Gender	Male	178	46.7
	Female	203	53.3
Nationality	Nigeria	163	42.8
	TRNC	65	17.1
	Turkey	62	16.3
	Others	91	23.9
Age	Less than 21	65	17.1
	21-30	151	39.6
	31- 40	84	22.0
	More than 40	81	21.3
Occupation	University Student	150	39.4
	Employed	193	50.7
	Military	13	3.4
	Others	25	6.6

3.4 Data Collections Tool/Materials

The study's data was gathered through the use of a questionnaire. It was generated with Google Forms and distributed to volunteers via social media with the Google Forms Address. In total, the survey had two sections.

Section I

Personal Information. The first was to acquire personal data from participants. Personal information is required to determine whether or not the selected participants match the data collecting criteria. The personal data obtained in this area included the gender, nationality, age, and occupation of volunteers.

Section II

Factors that Influence Users' Ability to Accept of Internet of Things services. This section was aimed at understanding the factors users' ability to accept IoT services. The questionnaire was derived from Venkatesh et al. (2003). This section contains various variables that influence Users' ability to accept Internet of Things services. This section contains seven sub-sections with 26 items. 5-point Likert scale responses from strongly disagree to strongly agree were used for every item.

Dimension 1

Use Intention (4 items). The first-dimension deals with the Use intention. It is referred to as the desire or motivation to utilize IoT. The adoption of IoT is a primary emphasis of the study; hence this dimension is critical.

Dimension 2

Behavioral Intention (3 items). The second-dimension deals with behavioral intention and whether or not it affects a users' ability to accept IoT services. The willingness to perform an activity is described as behavioral intention. It enquires about the users' level of awareness regarding IoT services adoption. This dimension is essential because it examines whether the behavioral intention of using IoT services influences users' ability to accept IoT services.

Dimension 3

Performance Expectancy (4 items). Performance expectation is a third-dimension aspect that influences the users' ability to accept IoT services. It is also the degree to which a person believes it will benefit them to adopt a given technology. Users are asked if they believe that implementing the internet of things will improve their performance. This dimension is significant as it examines if the performance expectancy impacts users' ability to accept IoT services.

Dimension 4

Effort Expectancy (4 items). The fourth component focuses on how effort expectancy affects a users' willingness to accept IoT services. The ease with which a specific technology can be used is measured by its effort expectancy. It asks if the user feel it is easy to use IoT services. This dimension is critical because it examines whether the users' expectation of effort influences their abilities to embrace IoT services.

Dimension 5

Social Influence (3 items). Social impact is a variable used when deciding whether or not to accept IoT services. People's willingness to adopt new technologies is influenced by their perceptions of those around them is referred to as social influence. It asks if users believe their peers believe they should use internet of things services. This dimension is required to determine whether social influence alters users' ability to embrace IoT services.

Dimension 6

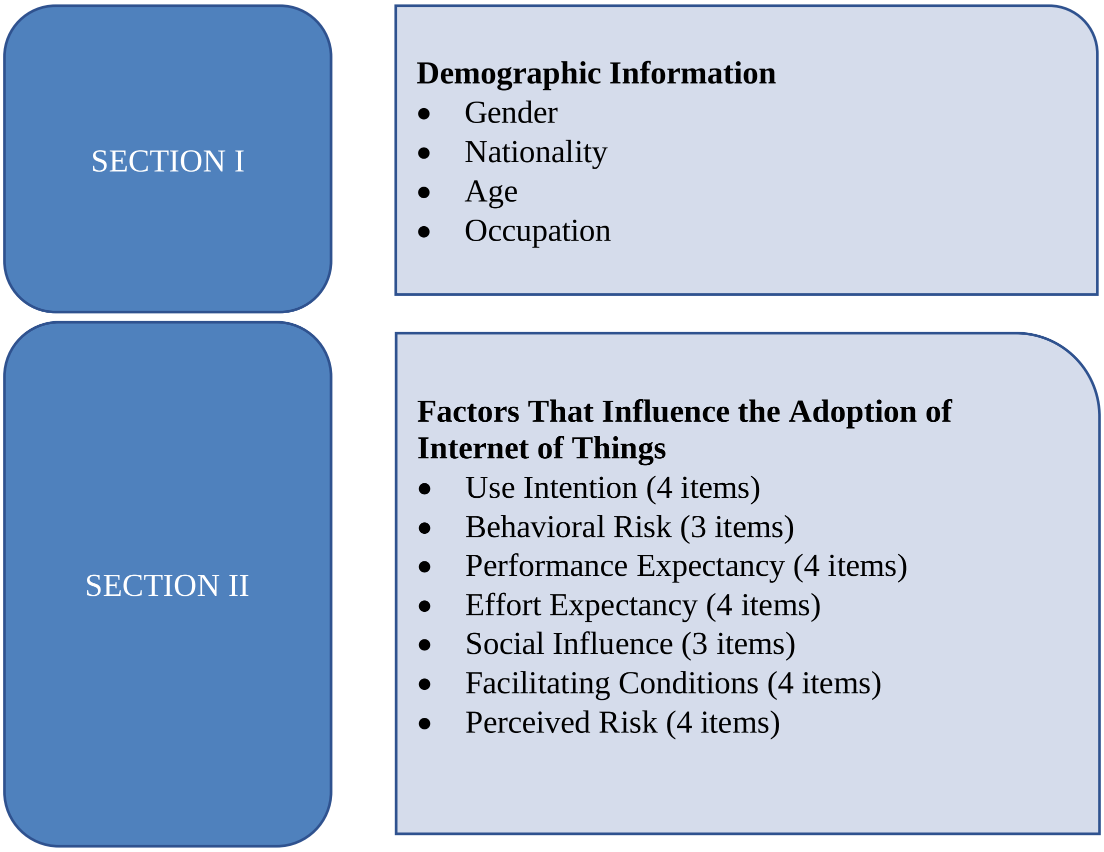
Facilitating Conditions (4 items). User acceptance of IoT services is influenced by facilitating conditions, which are discussed in the sixth dimension. A person thinks they have the technical and organizational facilities necessary to use a certain technology is regarded as facilitating conditions. It examines whether users believe they have the resources necessary to implement the internet of things. This dimension is essential because it examines facilitating conditions, that is a factor assumed to influence the users' ability to accept internet of things services

Dimension 7

Perceived Risk (4 items). The seventh-dimension deals with perceived risk and how it influences Users' ability to accept IoT services. When it comes to purchasing or using a certain product, item, or service, people's opinions of the level of uncertainty and potential negative outcomes are called perceived risk. It asks about the level of danger users believe is associated with the adoption of IoT services. This dimension is essential because it examines whether the risk attached to using IoT services influences Users' ability to accept internet of things services

Figure 3.3

The structure of the questionnaire



3.4.1 Reliability Test

The Cronbach's alpha was tested to analyze the inner consistency of the items. It is used as a measurement of scale reliability. Each scale and coefficient of reliability test resulted in more than 0.700, and the overall result of dimensions was 0.908. As determined by the results of the subscale reliability test. Social Influence had the highest Alpha test score of.955 and Behavioral Intention had the lowest result of.904 as seen below. Konting et al, (2009) states that Cronbach's alpha value ranging from 0.9 to 1.0 is treated as excellent internal consistency of the scale. Also, the closer Cronbach's alpha is near 1.00, the more trustworthy the scale is, according to Armstrong and Foley (2003). Whereas the Rule of thumb states that it should be more than 0.7 if total no items is more than 10. Hence, it was determined that the scale can be used as the reliability is excellent. Table 3.2 shows the study reliability test.

Table 3.2

Construct and Reliability Test

Constructs	No of Items	Cronbach Alpha
Use Intention	4	.939
Behavioral Intention	3	.904
Performance Expectancy	4	.932
Effort Expectancy	4	.949
Social Influence	3	.955
Facilitating Conditions	4	.948
Perceived Risk	4	.945
Total	26	.908

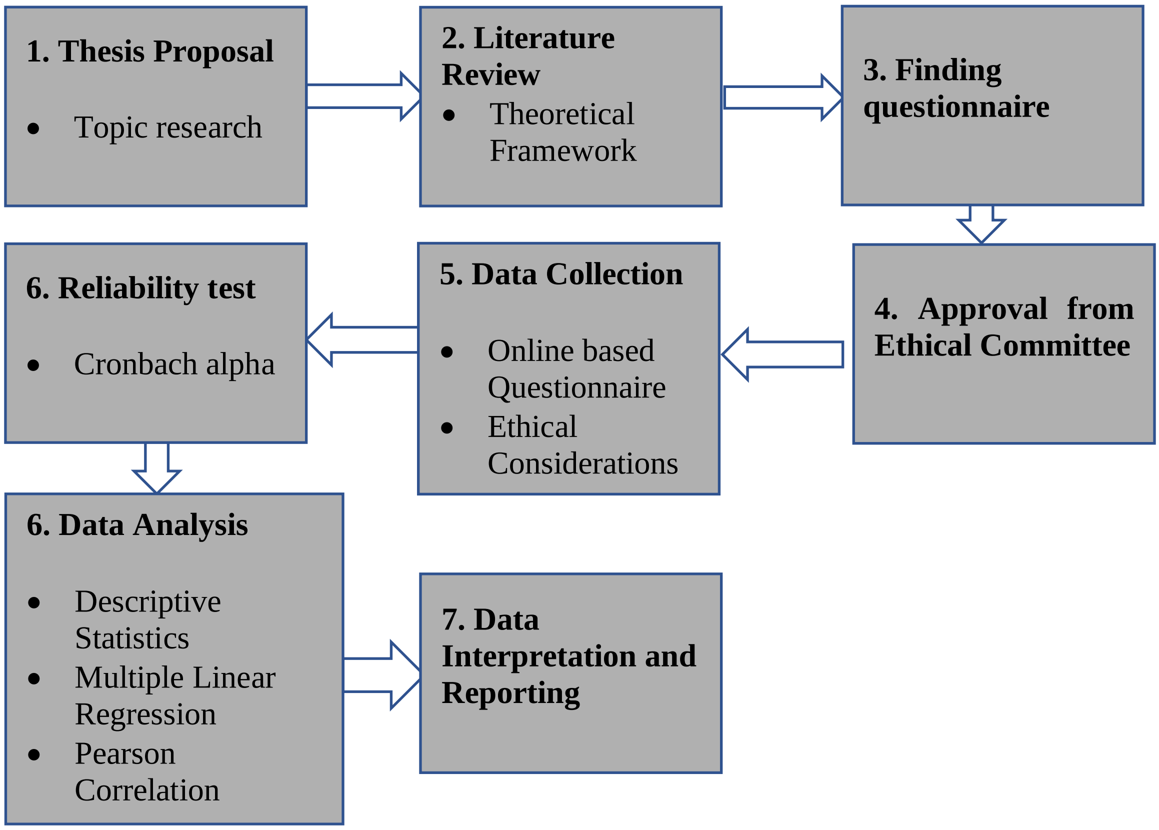
3.5 Research Procedure

The following steps were used to conduct this study:

1. Finding the topic and thesis proposal was written outlining the study and submitted to the supervisor.
2. Previous literature on Internet of Things was carefully studied to gain information on the topic and to find the missing gaps of the literature.
3. A questionnaire sample was drafted.
4. The ethical committee application form, including the questionnaire, was filled and submitted to the committee for review.
5. After the application was approved, the questionnaire was distributed to the participants.
6. Online Data Collection
7. After data collection was finished, the retrieved data from the participants was inputted into SPSS and the data was analyzed.
8. After data analysis was done, the remaining chapters were written respectively.
9. The thesis was submitted to the supervisor for review

Figure 3.4

Research Procedure



3.5.1 Ethical Consideration

To have a feasible, open, and impartial, ethical considerations are vital. It was approved by the Near East University's Ethics Committee to conduct the research, which oversees, reviews, and supports all school research. The researcher was careful to ensure that participants were informed of their participation and that their permission was secured before participation. The researcher also stated that no individuals were forced or under any duress to participate in the study. Finally, the researcher promised that all participants in the study would remain anonymous.

3.6 Data Analysis Methods

The researcher utilized descriptive statistics to describe individual demographics, reliability tests to ensure data correctness, and Pearson correlation to examine variable relationships. Multiple linear regression was also used to estimate the research model. For the study, the researcher used SPSS 20.

3.7 Research Schedule

The study schedule is the most important thing to remember during the thesis. It is the time required to complete the thesis from beginning to end. It must be well-planned in order to complete the thesis on time. February 2021 marked the start of the thesis, which was completed in November 2021. Every stage was given a completion date to ensure that the job was completed on time. Some stages were completed simultaneously

Table 3.3

Research Schedule

Procedure	**Durations (Weeks)**
Topic proposal and research	2
Literature review	2
Questionnaire Design sample	2
Approval of questionnaire by the. ethics committee	6
Distribution of Questionnaires to the participants	6
Data collection	9
Data Analysis in SPSS software	5
Complete the chapters (During the research one by one)	5
Thesis submitted to the supervisor	2
Total	39 Weeks

Figure 3.5

Gantt chart

CHAPTER IV

Results and Discussion

Data analyzed are presented in this part, including the findings. This analysis is also compared to other studies in the same field to see any similarities or differences.

4.1 Dependencies between the Constructs

Analysis of the model's components was done using correlation analysis to determine how they are related. Table 4.1 below shows the correlation between the constructs.

Table 4.1

Correlation Matrix

Constructs	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Performance Expectancy	1						
Effort Expectancy	.659**	1					
Social Influence	.147**	.191**	1				
Perceived Risk	-.133**	-.042**	.257**	1			
Facilitating Conditions	.539**	.400**	.149**	-.141**	1		
Behavioral Intention	.646**	.475**	.130*	-.121*	.622**	1	
Use Intention	.499**	.391**	090	-.152**	.624**	.471**	1

Note: **. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Based on the findings in Table 4.1, we may conclude that the correlation between most of the constructs were perfectly correlated. This idea is based on the fact that correlation can determine whether or not multicollinearity exist (Pallant, 2010). Multicollinearity is a concern when the coefficients between factors are less than 0.90.

The dependent path could be determined from the correlation matrix above by examining the scale and reading the correlation coefficient. The definition of an observed linear relationship between two different configurations is that they can be strong or weak, positive or negative. However, this is not enough to disprove the proposed hypothesis. It is essential to consider all possible influences on the independent variables' proportions (i.e., PE, FC, EE, PR, and SI) to the dependent variable (i.e., Use intention and Behavioral Intention). Therefore, in section 4.3, the researcher utilized multiple regression analysis.

4.2. The Ability to Accept IoT

A descriptive analysis was performed to understand the intentions of users to adopt IoT services. The results obtained for each construct were average as most constructs were in the 4.2 range. This table illustrates the standard deviation and mean of user responses.

Table 4.2

Mean and Standard Deviation

Constructs	Items	Mean	SD
Use Intention	1. I have intention to use IoT services in my daily life	4.38	1.038
	2. I plan to employ the use IoT services in the near future	4.17	1.047
	3. I am eager to use services devices	4.28	1.095
	4. I intend to recommend IoT services to people	4.25	1.094
	Sub-Total	**4.27**	**.98**
Behavioral Intention	5. I hope to use IoT services	4.20	.896
	6. I intend to leverage IoT services instead of traditional services.	4.10	.932
	7. My desire to use IoT services is high.	4.25	.839
	Sub-Total	**4.18**	**.82**

Table 4.2 (Continued)

Performance Expectancy	8. Using IoT services will help me achieve important goals.	4.23	.873
	9. Adopting IoT services will help me achieve my goals quickly	4.18	.858
	10. Using IoT services will make it easier for me to do my daily activities	4.32	.832
	11. Using IoT services shall improve my standard of living	4.23	.931
	Sub-Total	**4.24**	**.80**
Effort Expectancy	12. I can easily learn how to use IoT services.	4.22	.862
	13. Using IoT services will be clear and understandable for me	4.18	.823
	14. It will be easy for me to operate IoT services	4.28	.817
	15. I can easily become an expert in IoT services.	4.24	.819
	Sub-Total	**4.23**	**.77**
Social Influence	16. I choose to use IoT services because all my friends use IoT services	2.98 2.90	1.311 1.285
	17. I choose to use IoT services is because the media encourages use of IoT services	2.87	1.322
	18. I choose to use IoT services is because all my family members use IoT services		
	Sub-Total	**2.92**	**1.25**

Table 4.2 (Continued)

Facilitating Conditions	19. I possess the network for using IoT services	4.26	.927
	20. I possess the required skills and knowledge for using IoT services	4.25	.903
	21. I have internet connection to utilize IoT services	4.31	.905
	22. I have constant supply of electricity to use IoT services	4.31	.885
	Sub-Total	**4.28**	**.84**
Perceived Risk	23. Adapting to internet of things is	2.85	1.093
	risky	2.77	.896
	24. It's risky to use IoT services	2.86	.945
	25. There is too much uncertainty		
	associated with the use of IoT services	2.82	.963
	26. Compared with traditional services, IoT services are riskier		
	Sub-Total	**2.83**	**.89**

The mean and standard deviation of the constructs are shown in Table 4.2. The majority of the outcomes were extremely favorable.

Item 1 had the highest mean value, as seen in Table 4.2. “I have intention to use IoT services in my daily life’’ (M=4.38). This indicates that most participants want to use and accept IoT services. Table 4.2 revealed the item with the second highest mean was item 10 “Using IoT services will make it easier for me to do my daily activities.” (M=4.32). It means participants believe adapting to IoT services will make their daily activities easier and faster than usual.

On the other hand, Table 4.2 revealed the item with the lowest mean was item 24 “Using IoT services is risky.” (M=2.77). This proves that the participants believe using IoT services is not risky. Table 4.2 revealed the item with the second-lowest mean was item 26 “Compared with traditional services, IoT services are riskier.” (M=2.82). This shows that the participants don’t think IoT services are riskier compared to other traditional services. Table 4.2 revealed the item with the third-lowest mean was item 23 “Adapting to the internet of things is risky” (M=2.85). This means that the participants disagree that adapting to internet of things is associated with risk.

Furthermore, Table 4.2 showed that the construct with the highest mean to be Facilitating conditions (M=4.28). This means that the participants believe they have the technical and organizational resources required to use IoT services. AlAwadhi & Morris (2008) discovered that conducive conditions substantially impacted on IoT service adoption intentions. Table 4.2 showed the construct with the second-highest mean of Use Intention (M=4.27). This showed that the participants have a strong intention to adapt to IoT services. Yu-sheng et al. (2019) came to the same conclusion.

Table 4.2 showed the construct with the third-highest mean as Performance Expectancy (M=4.24). This means that participants think using IoT services will benefit them and boost their performance. IoT service adoption is influenced by expected benefits, according to Park & Ryo (2013). At an early stage in the system's development, researchers in e-government have noticed that the system's practical advantages could attract users to use it (Al-Shafi & Weerakkody, 2010; Shareef et al., 2011). These studies all show the critical role of performance expectancy in influencing users’ intention to adapt to IoT services.

Table 4.2 showed the construct with the fourth highest mean of Effort Expectancy (M=4.23). As a result, the participants are certain that utilizing IoT services will be comfortable and straightforward for them. According to Weerakkody et al. (2013), the BI to use IoT services is strongly influenced by the expectation of effort.

Table 4.2 showed the construct with the fifth-highest mean to be Behavioral Intention (M=4.18). This indicates that users have plans to utilize IoT services in future. They have a positive mind when it comes to IoT use. This is also evident with Venkatesh et al., (2003).

Table 4.2 showed the construct with the lowest mean to be Perceived risk (M=2.83). Participants believe there is no or less risk associated with the use IoT services. People's intention to use IoT services does not change as a result of this. Brender & Markov (2013) discovered perceived risk to be a grave factor in user intention toward IoT services. They believe that when individuals have more security worries about an IoT service, their perception of risk increases, negatively impacting their desire to use it.

Table 4.2 showed the construct with the second-lowest mean to be social influence (M=2.92). Participants believe other individuals don't pursue them to use IoT services. This means they believe social influence is not influencing their intention to adopt IoT services. However, Research by Bai & Gao (2014) looked at the impact of social influence on IoT services. The results demonstrated that social influence substantially impacts the behavioral intention to utilize IoT services. While analyzing the adoption of a smart fridge in UK, Alolayan (2014) found that the most important component was social influence.

4.3 Relationships between the Constructs of the Proposed Research Model

Multiple linear regression analysis was used to estimate the model outputs, as shown in the following sections:

The researcher formulated hypotheses centered on the four factors (PE, EE, and PR) which BI is linked to. In BI (R2=.503) 50.3% of the variance is due to the utilization of IoT services, whereas, BI and FC explain (R2=.459) 45.9% of variance in UI.

The following findings were reported after the computation of a regression analysis model:

4.3.1 Influence of Performance Expectance on Behavioral Intention

Hypothesis 1 was supported after examining the coefficients in Table 4.3 (F= 65.560; R2 .425; p< .05). PE has a significant influence on BI (β=.578, p<.05). Therefore, H1 is supported.

Table 4.3.

Influence of Performance Expectancy on Behavioral Intention

Dependent Variable: Behavioral Intention			
Model	**B**	**T**	**P**
Performance Expectancy	.578	10.985	.000
Model F 65.560			
R2 .425			

This means that if the user thinks that of IoT services are more helpful for work performance, he/she will be more willing to use these IoT services.

4.3.2 Influence of Effort Expectance on Behavioral Intention

Hypothesis 2 didn't support after examining the coefficients in Table 4.3 (F= 65.560; R2 .425; p> .05. EE was deemed to be insignificant on BI (β=.084, p>.05).

Table 4.4

Influence of Effort expectancy on Behavioral Intention

Dependent Variable: Behavioral Intention			
Model	**B**	**T**	**P**
Effort Expectancy	.084	1.600	.110
Model F 65.560			
R2 .425			

This suggests that IoT service ease of use has no influence a users' BI to utilize IoT services. Nevertheless, the connection between EE and BI was not substantiated, rejecting H2.

4.3.3 Influence of Social Influence on Behavioral Intention

Table 4.3's coefficients did not support Hypothesis 3 (F= 65.560; R2 .425; p> .05.) SI has no significance on BI (β=.042, p>.05).

Table 4.5

Influence of Social Influence on Behavioral Intention

Dependent Variable: Behavioral Intention			
Model	**B**	**T**	**P**
Social Influence	.042	1.013	.312
Model F 65.560			
R2 .425			

IoT services will not be adopted if users believe that someone close to them supports their use. The SI and BI relationship were not supported, rejecting H3.

4.3.4 Influence of Perceived Risk on Behavioral Intention

Hypothesis 4 was not supported after examining the coefficients in Table 4.3 (F= 65.560; R2 .425; p>.05. The impact of PR on BI was not proven (β=-.051, p>.05).

Table 4.6

Influence of Perceived Risk on Behavioral Intention

Dependent Variable: Behavioral Intention

Table 4.6 (Continued).

Model	B	T	P
Perceived risk	-.051	-1.244	.214
Model F 65.560			
R2 .425			

Users' BI to use IoT services appears to be negatively affected by PR. Relationships between PR and BI were not supported, rejecting H4.

4.3.5 Influence of Behavioral Intention on Use Intention

Hypothesis 5 was supported after examining the coefficients in Table 4.3 (F= 126.417; R^2 .401; $p< .05$. BI was discovered to be impacted by UI (B=.134, P-value<0.05).

Table 4.7

Influence of Behavioral Intention on Use Intention

Dependent Variable: Use Intention			
Model	**B**	**T**	**P**
Behavioral Intention	.134	2.639	.009
Model F 126.417			
R2 .401			

This means behavioral intentions are correlated significantly with Use Intention. Fishbein (2014) indicates that users' willingness to perform is strongly linked to their attitudes about the activities and their perceptions about the actions, boosted by their desire to follow the rules.

4.3.6 Influence of Facilitating Conditions on Use Intention

Hypothesis 6 was supported after examining the coefficients in Table 4.3 (F= 126.417; R^2 .401; $p< .05$. FC was discovered to be impacted by UI (B=.541, P-value<0.05).

Table 4.8

Influence of Facilitating Conditions on Use Intention

Dependent Variable: Use Intention			
Model	**B**	**T**	**P**

Table 4.8 (Continued).

Facilitating Conditions	.541	10.634	.000
Model F 126.417			
R2 .401			

This means the user thinks that it is very important that he/she feels they do have the ability to use IoT services, indicating that facilitating conditions are an important influencing factor.

4.4 Summary of the findings

The table below summarizes the outcomes of the study regarding the tested hypothesis and the decisions made as a result of the findings.

Table 4.9.

Summary of findings

Hypothesis	**IV**	**DV**	**Supported**	**p Values**	**Standardized coefficient (β)**
H1	Performance Expectancy	Behavioral Intention	Yes	.000	.578
H2	Effort Expectancy	Behavioral Intention	No	.110	.084
H3	Social Influence	Behavioral Intention	No	.312	.042
H4	Perceived Risk	Behavioral Intention	No	.214	-.051
H5	Behavioral Intention	Use Intention	Yes	.009	.134
H6	Facilitating Conditions	Use Intention	Yes	.000	.541

To Summarize the table, six independent factors were examined to find out how much of an effect they had on the dependent variable. The ($p<0.05$) of PE, BI and FC showed how highly intention to use was influenced significantly. The ($p>0.05$) of EE, SI and PR showed no significant influence on the intention to use. Therefore, Three out of the six hypotheses were supported.

CHAPTER V

Conclusion and Recommendations

Here, the study's conclusion is summarized in terms of its findings. Additional research recommendations are made in the following section of the chapter.

5.1 Conclusion

Technology has accelerated the rate of change in society in recent years. Since Internet of things emerged, examining this new technology, which now has a massive market of applications and a great future potential, is critical. The acceptance of this new technology by users will have an impact on the growth of IoT device market as well as how users react to marketing strategies that use IoT applications. Along with the benefits of IoT, there are still some concerns that potential users haven't worked out, which makes adopting this new technology apprehensive. Acceptance and adaptation are required for widespread use of any new technology.

To summarize, the study examined the factors that influence users' ability to accept IoT services, and the study was analyzed using a questionnaire sampling approach. Meanwhile, as a conceptual adoption model, the UTAUT model was used. Six hypotheses were tested, and three of them were supported. Findings showed performance expectancy, BI, and FC was discovered to have a positive and significant influence on Users' ability to accept Internet of Things services. EE and SI had no influence Users' ability to accept Internet of Things services while PR had a negative and no influence Users' ability to accept Internet of Things services. According to the results, the crucial factors influencing Users' ability to accept Internet of things services are performance expectancy and facilitating conditions since they have the highest degree of variance among factors. This indicates that organizations developing IoT services or applications must make them user-friendly, responsive, and capable of improving the users' daily activities. The more advantages IoT services bring, the more likely they will be used. For the IoT-producing industries, focusing on utility will be beneficial. Usability improvements for IoT services would also boost acceptability.

5.2 Recommendations

In light of the results, the paper makes the following recommendations for future research:

- This research investigates the factors that influence Users’ ability to accept Internet of Things services among people in Nigeria, TRNC, Turkey, and a few others. Research in different countries and comparative studies on Users’ ability to accept IoT services could focus on future studies.
- Users' ability to accept IoT services was analyzed using the UTAUT conceptual paradigm. Future Research can focus on using other models to investigate the factors.
- Another element of future research is assessing Users’ ability to accept IoT services from other viewpoints.

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Appendices

Appendix A

Ethical Approval Letter

10.02.2022

Dear Kamaluddeen Umar Mairiga

Your application titled **“Investigation of Factors Affecting Users' Ability to Accept Internet of Things Services”** with the application number NEU/AS/2022/142 has been evaluated by the Scientific Research Ethics Committee and granted approval. You can start your research on the condition that you will abide by the information provided in your application form.

Assoc. Prof. Dr. Direnç Kanol

Rapporteur of theScientificResearchEthicsCommittee

Note: If you need to provide an official letter to an institution with the signature of the Head of NEU Scientific Research Ethics Committee, please apply to the secretariat of the ethics committee by showing this document.

Appendix B

Questionnaire

Investigating Factors that Influence Users' Ability to Accept Internet of Things Services

Dear Participant,

These questions are aimed at finding out what influences users' ability to accept internet of things services. You are expected to respond to each question to the best of your knowledge and choose the answer that you feel is most appropriate or close to your opinion. The results of this survey will be used purely for the study report and will not be shared with any other institution.

Thanks for your time and cooperation

Kamaluddeen Umar Mairiga

Masters Student

Department of Computer Information Systems Near East University

E-mail: 20196206@std.neu.edu.tr

Prof. Dr. Fezile Özdamli

Thesis Supervisor

Department of Computer Information Systems

Near East University

Email: fezile.ozdamli@neu.edu.tr

SECTION I: Personal Information

1. Gender

a) Male
b) Female

2. Age

a) Less than 21
b) 21-30
c) 31-40
d) More than 40

3. Nationality

a) Nigeria
b) TRNC
c) Turkey
d) Other:_____

4. Occupation

a) University Student
b) Employed
c) Military
d) Other:_____

SECTION II: Factors that influence Users' ability to accept Internet Things services.

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Use Intention					
1. I have intention to use IoT services in my daily life?					

2. I plan to employ the use IoT services in the near future?					
3. I am eager to use services devices					
4. I intend to recommend IoT services to people					
Behavioral Intention					
5. I hope to use IoT services					
6. I intend to leverage IoT services instead of traditional services.					
7. My desire to use IoT services is high					
Performance Expectancy					
8. Using IoT services will help me achieve important goals.					
9. Adopting IoT services will help me achieve my goals quickly					
10. Using IoT services will make it easier for me to do my daily activities					

11. Using IoT services will improve my standard of living					
Effort Expectancy					
12. I can easily learn how to use IoT services.					
13. Using IoT services will be clear and understandable for me					
14. It will be easy for me to operate IoT services					
15. I can easily become an expert in IoT services.					
Social Influence					
16. I choose to use IoT services because all my friends use IoT services					
17. I choose to use IoT services is because the media encourages use of IoT services					
18. I choose to use IoT services is because all my family members use IoT services					
Facilitating Conditions					

19. I possess the hardware and software for using IoT services					
20. I possess the required skills and knowledge for using IoT services					
21. I have internet connection to utilize IoT services					
22. I often have electricity supply to use IoT services					
Perceived Risk					
23. Adapting to internet of things is risky					
24. It's risky to use IoT services					
25. There is too much uncertainty associated with the use of IoT services					
26. Compared with traditional services, IoT services are riskier					

Thank you for your time

Appendix C

Turnitin Similarity Report