QATAR UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DETERMINANTS OF THE INDIVIDUALS' INTENTION TO USE THE IOT SMART HOME TECHNOLOGY IN QATAR

BY

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ABSTRACT

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Title: Determinants of Individual's Intention to Use the IoT Smart Home Technology in Qatar

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This study develops a research model for the main determinants that affect the potential customers' intention to use the Internet of Things (IoT) - Smart Home Technology in Qatar. This study proposes and validates a research model that can explain the behavioral intention of individuals and emphasize the factors that have the strongest impact. Our theoretical model extends the unified theory of acceptance and use of technology 2 [UTAUT2] by including the factors of Mobility, Trust, Perceived Security and the espoused national cultural values of Collectivism, Masculinity and Uncertainty Avoidance. Regression analysis was used to validate the proposed research model and corresponding hypotheses on data collected using a convenience sample of random individuals from Qatar.

Findings: performance expectancy, mobility, price value, trust in smart home technology and its providers have a significant positive impact on the potential customers' behavioral intention to use the smart home technology. The cultural dimensions moderate some of the hypothesized relationships in the proposed model. Perceived security and social influence are strongly related to the perceived trust in smart home technology providers. Effort expectancy and hedonic motivation positively related to the performance expectancy.

Originality/value: This study is the first attempt to study the acceptance of the smart home technology in Qatar.

Keywords: IoT Smart Home Technology, UTAUT2, Behavioral Intention, Mobility, Trust, Price Value, Perceived Security and National Cultural Values.

DEDICATION

I dedicate this research to my beloved parents, wife and daughter whom I credit for pushing me to continue this MBA program. I want to thanks them for always being there and the continuous support.

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First, thanks for God for giving me the strength to complete this work.

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CHAPTER 1: INTRODUCTION

The term “Internet of Things” (IoT) was used for the first time in 1999 by the British technology scientist Kevin Ashton (Internet Society, 2017), the term was used to describe the case when physical objects or sensors in different locations can interconnect with each other, perform actions and share data through the available network technologies without any human interventions.

IoT technology market has been evolved quickly over the last few years which results in a huge number of IoT solutions and services (Iot.ieee.org, 2017), these solutions extended widely to cover most of the needs and requirements of individuals, IoT technology now days have a wide range of applications (McKinsey & Company, 2017) that vary based on the targeted sections and users. Smart homes & appliances, individuals’ health & wellness, smart cities and transportation are some of the possible areas where the IoT technology can take a role and provide effective solutions.

One of the popular applications of the IoT technology are the Smart Home technologies, smart homes concept used to describe the case when the individuals can remotely control & monitor their homes environment and optimize its resources (Kim, 2016), smart home technology adds the intelligence to the home environment by adding wirelessly connected sensors and actuators that control and monitor homes’ households and its operations (Pirbhulal et al., 2016), each sensor is connected and controlled by a centralized hub, this hub can be any PC, tablet or smartphone that can perform local orders processing and be a focal point to control these sensors from inside or outside the home (Risteska Stojkoska and Trivodaliev, 2017).

Many benefits can be gained through adapting smart home solutions and technologies, the ability of these technologies to detect our presence in homes can save costs and improve the efficiency of water and electricity usage, smart homes' households can be programmed to perform its normal activities automatically using a predefined time schedule or through a list of possible triggers. As an example; Smart homes can detect users' presence when they are coming back to their homes by detecting their wearable hubs, smartphones or tablets signals (Theinstitute.ieee.org, 2017) to automatically unlock the doors, turn on lights and calibrate AC's temperature degree to adjust climate temperature, even more; smart homes can remind users about their in-home activities and display the missing calls or emails.

Home appliances can be upgraded to be smart too, refrigerators can display what's the possible food choices and the level of each ingredients, it can notify the users through a phone massage or email when one of the ingredients is almost to finish, washing machine and dish washer are not excluded from this technology, both can detect if there is a need to run and do their duties plus to notify the home residents if an urgent maintenance is expected or needed. The good point in this technology is that all these activities will automatically go back to the idle mode when home residents are getting out from their smart homes, saving by that the billing costs and improves power and water consuming efficiency.

Due to the wide range of possible gains and attractiveness of the smart home technology markets, many of the biggest information technology firms believed in IoT solutions as a strategic market opportunity, and begun to adopt these solutions and offering it to a widespread range of local and global customers, Samsung, LG, Microsoft, Cisco, IBM,

Intel, Dell and Huawie are being considered as the most powerful IoT providers in the worldwide (Butler, 2017).

In 2016, Qatar Mobility Innovation Center (QMIC) - which is built through a partnership between Qatar University and Qatar Foundation in 2009 as a technological research and development center – lunched its locally developed Labeeb IoT platform (Hariharan, 2017), Labeeb IoT platform facilitates the data communication and interaction between different devices, sensors and hubs and offers a core layer for implementing smart home technologies.

As smart home technology became a well-known technology and has many advantages for the individual users, we will try in this study the determine the main factors that affect the individuals' intention to use this technology in Qatar, we will establish a research model based on the previous literature reviews and see if these factors have real impacts on the individuals' intention.

CHAPTER 2: STUDY SIGNIFICANCE & IMPORTANCE

IoT technologies including smart home technologies are characterized by a massive growth, the numbers of the connected things have been increased to reach by 2016 around 6.4 billion devices, many of technology specialists expect that IoT will become an attractive market for many of firms, Cisco estimated that the market of IoT will generate around $14 trillion of profit in the next decade. Given these facts, firms and technology specialist are required to understand more about the changing in needs and expectations of the targeted consumers. Up to date few users are adopting these technologies especially the IoT appliances and smart home solutions (Bernsdorf, Hasreiter, Kranz, Sommer & Rossmann, 2016).

We are needed to identify and understand the factors that determine users' intention to use and accept this type of technology (IoT Smart Home Technology), despite of the huge potential effect of IoT technologies on our personal life, most of the current studies mainly covered the technical factors and aspects of the IoT technology implementation with little attention to understand the technology acceptance factors of the IoT technology from the perspective of individual users (Al-Momani, Mahmoud and Sharifuddin, 2016), which include the factors of ease of use, usefulness, personal attitudes, social context and many others that will be mentioned later through this study.

Study Purpose and Research Questions

In this research, our objective is to propose and test the determinants that we think from research point of view they can affect the individual users' intention to use and apply the IoT smart home technology in their place of residents in Qatar.

Through this research, we will use the Unified Theory of Acceptance and Use of Technology 2 model (UTAUT2) as the main theoretical model, UTAUT2 will be built based on the premise that individuals' intention to use the IoT smart homes technology can be affected by the factors of Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Hedonic Motivation (HM), Price Value (PV) plus to the research proposed factors of Mobility (MO), Perceived Security (PS), Trust in smart home technology (TR1), Trust in technology providers of the smart home technology (TR2) and the effect of the espoused cultural values of Collectivistic (CO), Masculinity (MA) and Uncertainty Avoidance (UA).

Following are the study research questions that we are trying to identify:

RQ1: What are the determinants of the individual's intention to use the IoT Smart Home technology in Qatar?

RQ2: Do the espoused national cultural values have an impact on these determinants?

The next step in this research is an overview for the UTAUT2 model and the previous IoT smart home technology literature reviews to suggest and formulate our hypothesis. After that; we will identify our methodology to develop our instruments for data collection and data analysis. In the last stage, the results of our study and its implications will be ended by the study limitations and future research possibilities.

CHAPTER 3: LITERATURE REVIEW

As Smart Home Technology and Internet of Things solutions were considered as new emerged technologies in the world wide, many firms and technology markets leaders are extremely interested in these technologies and try to find the factors that encourage individuals to use these solutions (Bernsdorf, Hasreiter, Kranz, Sommer & Rossmann, 2016).

In this study, a research model will be developed based on the previous related studies to predict the individuals' intention to use the smart home technology, many models have been built to explain the consumers' acceptance for a new technology like the Technology Acceptance Model (TAM) proposed by Davis in 1999 (Mortenson and Vidgen, 2016), and the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) which was proposed by Venkatesh (Venkatesh et al., 2012).

Despite of the numerous technology acceptance models which have been evolved over the last few decades, the UTAUT2 was the most accepted model (Chang, 2012) since it includes many other models such as the Theory of the Planned Behavior (TPB) and the Technology Acceptance Model (TAM) which was the most favorable method to predict the adoption and use of new technology systems (Venkatesh and Bala, 2008).

Based on that, and through the rest of this study, we will use the Unified Theory of Acceptance and Use of Technology Two as a main theoretical framework for developing our research model and we will add some factors we think from research point of view that they may influence the behavioral intention to use the internet of things smart home technology in Qatar.

The UTAUT2 model was developed by Venkatesh in 2012 (Venkatesh et al., 2012) and contains different constructs that have a possible impact on the individuals' behavioral intention to use a technology, UTAUT2 models covers the factors of Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Price Value and Habit as main factors that have a direct impact on the behavioral intention to use a technology. Gender, Age and Experience called as moderators that moderate and affect the main factors' impact on the behavioral intention as shown in figure 1.

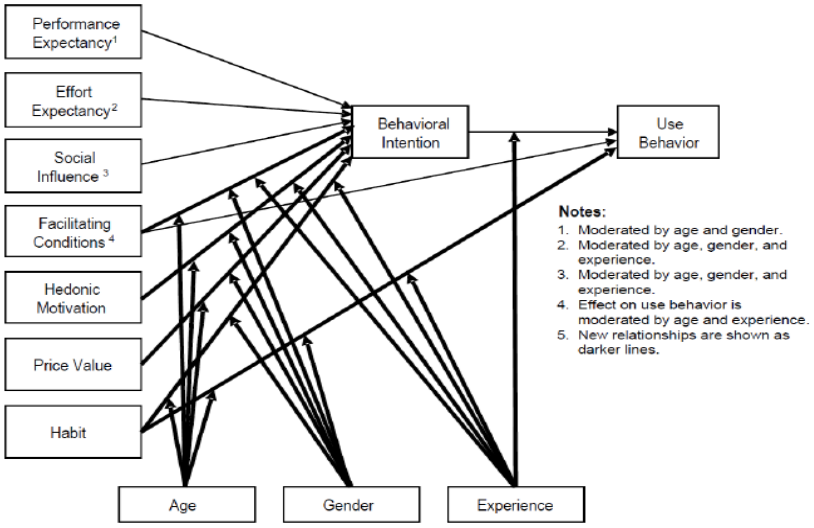

Figure 1. Unified Theory of Acceptance and Use of Technology 2 Model.

Since our study is limited to find the factors that affect the individuals' intention to use the smart home technology in Qatar, some factors will be excluded in our model such as the factors of experience, habit and facilitating conditions as these factors are related to the business environment which is not the case for our study. The factor of habit

measures the automatic behavior to use the technology and very related the factor of the experience (Venkatesh et al., 2012).

We will add other factors and extend the UTAUT2 model as we think - from research point of view - that they are very related in determining individuals' intention for technology usage in Qatar, we will add the factors of Mobility, Perceived Security, Trust in Smart Home Technology & its providers.

The moderating effects of the national espoused cultural values of collectivism, masculinity and uncertainty avoidance will be included in our model to identify if the national cultural values in Qatar have an impact on the individuals' intention.

As a summary, our research model will be developed based on the following three parts listed as follow:

1. Basic Research Constructs of the UTAUT2 Model: Behavioral Intention, Performance Expectancy, Effort Expectancy, Social Influence, Hedonic Motivation and Price Value.
2. Extended Research Constructs: Mobility, Perceived Security and Perceived Trust in Technology and its Providers.
3. The Espoused National Cultural Values (as moderators): Collectivistic, Masculinity and Uncertainty Avoidance cultural values.

1. Behavioral Intention (BI)

Behavioral Intention refers to which extent an individual has built a plan to do a specific future behavior like using a new technology (Macedo, 2017), the main objective from running our study is to determine the technology acceptance factors that have impacts on the individuals' decisions; behavioral intention is the last step in the individuals'

decision making process to adopt the smart home technology (Venkatesh et al., 2012) and we are trying through this study to find the factors that have strong impact on determining the level of the behavioral intention to use the IoT smart home technology.

2. Performance Expectancy (PE)

Performance Expectancy is one of the main and strongest constructs in the UTAUT2 model (Arcila Calderón, López and Peña, 2017), performance expectancy used to reflect the behavioral intention to use a new technology and to measure the users' perception for how much the new technology will help them in achieving their intended goals, it's the degree to which using a specific technology provides advantages for users in performing their activities (Oh and Yoon, 2014). Performance Expectancy helps to explain the process that the individual undergoes to decide to use a new technology, people are more likely to use a new technology when they believe that it will help them to perform their duties better.

Venkatesh et al. integrated five concepts from previous models in the construct of performance expectancy, which are perceived usefulness, extrinsic motivation, job fit, relative advantage and outcome expectancies (Macedo, 2017). An extensive literature reviews suppose that there is a positive relationship between the perceived performance expectancy and the intention to use a new technology (Arcila Calderón, López and Peña, 2017) and (Alaiad and Zhou, 2017), for example; Alaiad and Zhou (2017) found in their research to determine the adoption factors of wireless based smart home healthcare systems that the performance expectancy has a strongly positive impact on patients' intention to use these systems.

In our research, Perceived Performance is the degree to which the individuals believe

that smart home technologies will facilitate the completion of their in-home duties, based on that; we think that if the intended users believe that smart home technology will improve their performance, they will be more likely to use smart home technology in the future, so; we propose the following hypothesis for performance expectancy construct in this study:

H1: There is a positive relationship between home residents' perceived performance expectancy and their intention to use the IoT smart home technology.

3. Mobility (MO)

Yang, Lee and Zo in their study for the adoption of smart home technology using the planned behavior theory PBT (Yang, Lee and Zo, 2017), defined the Mobility factor as the capability of individuals to access a certain technology remotely using smart devices such as laptops or smartphones and through the internet applications while they are outside their homes. They found (Yang, Lee and Zo) that the Mobility factor can positively affect the attitude of individuals toward their intention to use the smart home technology, mobility is considered as a core feature for many technologies (Gunawardana and Ekanayaka, 2009), mobility is a critical factor for individuals and can affect their behavioral intentions (Huang, Lin and Chuang, 2007).

According to Park and Joon Kim (2013) perceived mobility will have a strong and significant effect on individuals' intention to use a technology.

We suppose from research point of view that the availability to control the smart home technology remotely without the need to get a physical access to the main control unit will have a positive impact on individuals' intention to use it in their homes, our hypothesis for the mobility construct will be as follow:

H2: There is a positive relationship between the mobility features and the intention of the individuals to use the IoT Smart Home Technology.

4. Price Value (PV)

According to (Xu, Thong and Tam, 2017) and their study in determining the adoption of mobile internet services, Price Value is defined as the comparison and trade-off between the cost of using a certain technology and the perceived benefits of this technology, they found that the price value can play an important positive role in determining the intention to use a certain technology by individuals.

Price value is considered to have a positive impact on individuals' intention to use a technology when the benefits of using it are more valuable than its cost (Lin, Wang and Wu, 2017). Simply, Price Value factor represents the added value of smart home technology for individuals and if this value covers the cost that may occur when they start using it.

We think that if individuals believe that the benefits of using smart home technologies in their homes will be perceived as more valuable than its costs, price value factor will have a positive impact in our model, so; our hypothesis for the construct of price value will be as follow:

H3: There is a positive relationship between the individuals' perceived price value of the smart home technology and their intention to use it.

5. Trust in Smart Home Technology and its Provider (TR1 & TR2)

Trust construct measure the extent to which individuals believe that the smart home technology is trustful in performing its activities, trust can be considered as one of the key predictors of the behavioral intention toward using a technology (El-Masri and

Tarhini, 2017).

Trust definition mainly depends on other subjects such as the existence of perceived security or uncertainty risk (Ennew and Harjit, 2007), the results of smart home technology adoption may not be clear enough for many expected users which may affect their decisions, on the other side; smart home technology play an important role when adopted in individuals' lives, increasing by that the level of dependency between the individuals as users and the smart home technology.

Sharing personal information with a third party will increase the level of risk and uncertainty (Yadav, Sharma and Tarhini, 2016), as users can't control or force technology providers to do what is expected from them and because of the dependency relationship between them (users and technology providers), riskiness and interdependencies factors will show up and emphasize the factor of trust in the technology adoption process (Hofstede and Bond, 1988).

According to (El-Masri and Tarhini, 2017) study for the adoption of e-learning in Qatar and USA, the existence of trust can have a significant positive impact on users' behavioral intention to use the e-learning services, based on that; we can say that individuals' intention to the use smart home technology in their homes is eventually depends on the level of trust in such technology and its provider, so adding trust to our model will add more insight toward understanding the determinants of intention to use this technology, our two hypotheses for trust construct are stated as follow:

H4: There is a positive relationship between the individuals' trust in the smart home technology and their intention to use it.

H5: There is a positive relationship between the individuals' trust in the technology

providers of the smart home technology and their intention to use it.

6. Effort Expectancy (EE)

Effort expectancy is the expected physical and mental efforts that individuals are expecting to exert while using a new technology system (Maduku, 2017). Effort expectancy is the individuals' perceptions about the level of efforts needed to complete in-home tasks using the smart home technology; effort expectancy is the degree of ease for using a new technology, and covers the concepts of perceived ease of use, complexity and simplicity (Kuo-Yu and Yea-Ru, 2017).

Perceived ease of use and simplicity refers to the level to which users think that using a technology would be free of efforts and easy to use, complexity is the degree to which an innovative technology is considered as being difficult to use and understand (Huang and Kao, 2015).

According to Venkatesh and Morris (2000) and Alalwan, Dwivedi and Williams (2016), effort expectancy can have a positive and significant impact on the perceived performance expectancy, based on that we think that individuals who perceive smart home technology to be effortless and simple to use, would be more likely to feel that the smart home technology is useful in their daily life; our suggested hypothesis for effort expectancy will be as follow:

H6: Perceived effort expectancy has a positive influence the perceived performance expectancy.

7. Hedonic Motivation (HM)

Hedonic Motivation represents the extent to which consumers believe that using a technology is entertaining and enjoyable (Gerhart, Peak and Prybutok, 2015), hedonic

motivation can represent the fun or pleasure derived from using a technology (Venkatesh et al., 2012), in information systems researches, hedonic motivation has been found to has a positive impact in the acceptance process of a new technology and play an important role in determining the individuals' intentions to use the IoT smart home technology, according to Alalwan, Dwivedi and Williams (2016), hedonic motivation has a positive impact on the perceived performance expectancy, so; we included it in our study and suggest the following hypothesis for its impact:

H7: Hedonic motivation has a positive impact on the perceived performance expectancy.

8. Social Influence (SI)

Social Influence construct has an important role in determining how individuals make their decisions to use a new technology (Venkatesh and Morris, 2000), social influence is the degree to which an individual perceives that other important people believe he or she should use a new technology or the social pressure that comes from the external environment that can affect the individuals' behavior to use a new technology (El-Masri and Tarhini, 2017) and (Madigan et al., 2016).

We can say that the social influence is the extent to which an individual perceives the degree of approval of a certain behavior by important referents, or simply; the change in behavior that one or group of persons can cause in others by a direct or indirect way (Koenig-Lewis et al., 2015).

As individuals interacting with each other's over time, their trust will be more concrete, and they will perceive each other as trustworthy (Tsai and Ghoshal, 1998), close social interactions allow for share of information and experiences, so; Social Influence can

play an important role in determining the individuals' trust in the smart home technology.

According to Beyari and Abareshi (2016); users will have a higher level of trust when they receive positive feedbacks from the surrounding referent people, so; we believe that the social influence will have a positive impact on the perceived trust and has a positive influence on the potential users' trust, as stated in the following two hypotheses:

H8: Social Influence has a positive impact on the individuals' perceived trust in the smart home technology.

H9: Social Influence has a positive impact on the individuals' perceived trust in the technology providers of the smart home technology.

9. Perceived Security (PS)

Smart home technology collects information about home residents' lifestyle such as their daily movement, energy usage and purchases preferences to help them in their daily life, which put many challenges for smart home technologies developers to avoid the threats of breaching the security policies and home residents' privacy (Venkatesh et al., 2012).

The perceived security concept can be defined as the level to which individuals believe that using a such technology will be free of risk (Fang, Chan, Brzezinski and Xu, 2003), security factor is a set of procedures and computer programs that used to protect and authenticate the source of information to ensure the integrity for technologies (Junadi and Sfenrianto, 2015), Junadi and Sfenrianto in their study (2015) using the UTAUT2 model added perceived security factor, and after their analysis; they found that the

perceived security factor has a significant positive role in the process of users' adoption for the E-payment systems in Indonesia.

Shin and Shin (2011) in their study for the virtual mall shopping found that the perceived security has a direct and positive impact on users' trust in that technology, which in turn (users' trust) had a positive impact on users' intention to use the virtual mall shopping technology.

The perceived security constructs in our model are put to study how the security level affects the individuals' behavioral intention process to use the smart home technologies in their homes, we think that there is a positive relationship between the perceived security and the trust in the smart home technology and its technology providers, based on that, our hypotheses for this construct is stated as follow:

H10: Perceived security has a positive impact on the individuals' perceived trust in the smart home technology.

H11: Perceived security has a positive impact on the individuals' perceived trust in the technology providers of the smart home technology.

10. The Moderating Effect of the National Cultural Values

As this study for developing a research model for the factors that determine the behavioral intention to use the smart home technologies at the individual level, cultural values and traits may propose influential moderating effects on our proposed model, five main cultural dimensions were proposed by Hofstede in 2009 (Hofstede, 2009), which are the Collectivism/Individualism, Masculinity/Femininity, Uncertainty Avoidance, Power Distance and Long-term orientation, until this moment; Hofstede's definition still one of the most accepted definitions for the cultural dimensions (Alshare and Mousa,

2014) , (Ashraf, Thongpapanl and Auh, 2014).

In this study, we will focus on Collectivism, Masculinity and Uncertainty Avoidance cultural effects and exclude the Power Distance and Long-Term Orientation effects. Power distance is related to the business level; power distance is the extent to which less powerful employees expect that power is distributed inequality in the organizations and businesses (Alshare et al., 2011) which is not the case for our study as our focus on the individual level and home residential only. Long-term orientation scores for the Arab region are unavailable (Hofstede Insights, 2017) and the related values are still unclear (Alshare and Mousa, 2014).

Next literature reviews show what's the possible role and impacts for the espoused national cultural values in our study:

a. Collectivism

Collectivism refers to the level of the integration and strength of the relationships between a group of people, it's the degree to which individuals emphasize the needs of the group as a higher priority than individuals' needs and prefer to work as a group rather than individuals (Hofstede and Bond, 1988). The people who have individualistic cultural values (Opposite of Collectivistic cultural values) are less concern about the opinion of others in their social environment and have stronger self-orientation traits, a person with individualism background take care about his self only and prioritize his needs over the other group needs (Baker and Delpechitre, 2013). On the other side; the people who have collectivistic cultural values will comply more with the ideas of other referents within the group and will more likely to adopt new technologies (Alshare, El-Masri and Lane,

2015).

Since the Collectivism factor is considered to be one of the most important cultural factors that may affect how users perceive a new technology (Leidner and Kayworth, 2006), we included it in our study and extended our acceptance model to figure out its effect, people from collectivistic background are more effected by the social norms (Srite and Karahanna, 2006), individuals who have collectivism values will respect and conform the opinions of others within the group (Alshare and Mousa, 2014). According to Alshare, El-Masri and Lane (2015) and (Srite, 2006) studies, the collectivistic cultural values positively moderate the social influence impact in the determining the behavioral intention process to use a technology. If the individuals in our study who espouse cultural values of collectivism see their close influential referents trust the smart home technologies, they would be affected by their behavior, therefore; we propose the following two hypotheses for the possible impacts collectivistic values:

H12: The relationship between the social influence and the trust in the smart home technology is positively moderated by the espoused national cultural values of collectivism.

H13: The relationship between the social influence and the trust in the technology providers of the smart home technology is positively moderated by the espoused national cultural values of collectivism.

b. Uncertainty Avoidance

Uncertainty avoidance is the level of uncertainty acceptance that can be taken by individuals and shown by their emphasizing on rules obedience, ritual behavior and labor

mobility (Hofstede, 2009). This dimension examines to which extent the individuals will be threaten in different situations such as using a new technology, uncertainty can be reduced through informational influence and share of experience about how others perceived the new system (Srite and Karahanna, 2006) and building clear manuals and instructions.

Uncertainty avoidance may have a negative impact on the behavioral intention to use a new technology system by individuals (Nistor, Göğüş and Lerche, 2013), individuals who are not fine with the uncertainty (Uncertainty Avoiders) attempt to make life predictable and more controllable as much as possible, and will be hesitated if they are trying something new which they had never been doing it before. Individuals who are known as uncertainty accepters will be relaxed and more comfortable to run new experiences and situations as they are tolerant with new opinions and have fewer rules to follow (Hofstede, 2009).

Many studies found that there is trivial relationship between the cultural value of uncertainty avoidance and the perceived risk (Besbes et al., 2016), the individuals who have a high level of uncertainty, will exert more riskiness feeling toward using a new products or solutions.

Based on Hofstede center website (https://www.hofstede-insights.com/country-comparison/), gulf region espoused a high level of uncertainty avoidance with average of 80 out of 100 (Saudi Arabia, United Arab Emirates and Kuwait), this high level of uncertainty probably will lead to high level of perceived risk for individuals in Qatar. As we are trying to find the effect of uncertainty avoidance as a cultural construct in our model, we suppose that the perceived security will have a positive impact on the trust in

the smart home technology and its providers for the individuals who have uncertainty avoidance cultural values. The perceived security factor will minimize the impact of possible related risks (perceived risks) for using the smart home technology and encourage uncertainty avoiders to use it. Based on that, we state to following two hypotheses for uncertainty avoidance cultural values as follow:

H14: The relationship between the perceived security and the trust in the smart home technology is positively moderated by the espoused national cultural values of uncertainty avoidance.

H15: The relationship between the perceived security and the trust in the technology providers of the smart home technology is positively moderated by the espoused national cultural values of uncertainty avoidance.

c. Masculinity

Masculinity as a general definition is the degree of gender inequality owned by individuals, masculinity means if the individuals have masculine behavior and traits such as: focusing on work goals, recognitions, advancements, challenges, being aggressive and high work centrality. Feminine, on the opposite side; means if the individuals have behaviors and traits such as: focusing on quality of life, cooperation, employment security, friendly atmosphere, being nurturing and less centrality of work (Srite and Karahanna, 2006).

Males and females can have and show different extents of masculine and feminine values which are not necessary to be related to their actual physical gender. In general; the effect of behavioral gender (Masculinity or Femininity) has a lasting and powerful impact

throughout the technology adoption life cycle (Venkatesh et al., 2004), the individuals who espouse masculinity values are more likely to adopt a new technology as they focus more on advancement and challenges (Srite, 2006). According to Venkatesh and Zhang (2010), Srite and Karahanna (2006) and Nistor, Göğüş and Lerche (2013). Masculinity is expected to have a strong positive impact on performance expectancy, based on that; we will try to study the effect of masculinity on technology adoption and see what's its impact on the behavioral intention to use the smart home technology in Qatar.

Since the smart home technologies will support the individuals who espouse masculinity values by improving their duties performance and goal achievements, we propose that the masculinity cultural values will positively moderate the effect of performance expectancy on the behavioral intention to use the smart home technology, thus; our hypothesis for the Masculinity impact will be stated as follow:

H16: The relationship between the performance expectancy and the trust in the smart home technology is positively moderated by the espoused national cultural values of masculinity.

Literature Review Summary

According to the previous literature reviews and through the rest of this study, we will study and test all the previous reported hypotheses to find the factors that have an influential effect on the individuals' decisions to use the IoT smart home technologies in Qatar.

Next table, Table1; contains all research hypotheses in our study followed by our suggested research model as shown in figure 2.

Table 1

Summary of the Research Study Hypotheses

Research Constructs Hypotheses
• H1: There is a positive relationship between home residents' perceived performance expectancy and their intention to use the IoT Smart Home Technology. • H2: There is a positive relationship between the mobility features and the intention of the individuals to use the IoT Smart Home Technology. • H3: There is a positive relationship between the individuals' perceived price value of the smart home technology and their intention to use it. • H4: There is a positive relationship between the individuals' trust in the smart home technology and their intention to use it. • H5: There is a positive relationship between the individuals' trust in the technology providers of the smart home technology and their intention to use it. • H6: Perceived effort expectancy has a positive influence the perceived performance expectancy. • H7: Perceived hedonic motivation has a positive impact on the perceived performance expectancy. • H8: Social Influence has a positive impact on the individuals' perceived trust in the smart home technology. • H9: Social Influence has a positive impact on the individuals' perceived trust in the technology providers of the smart home technology. • H10: Perceived security has a positive impact on the individuals' perceived trust in the smart home technology. • H11: Perceived security has a positive impact on the individuals' perceived trust in the technology providers of smart home technology.
Espoused National Cultural Values Hypotheses
• H12: The relationship between the social influence and the trust in the smart home technology is positively moderated by the espoused national cultural values of collectivism. • H13: The relationship between the social influence and the trust in the technology providers of the smart home technology is positively moderated by the espoused national cultural values of collectivism. • H14: The relationship between the perceived security and the trust in the smart home technology is positively moderated by the espoused national cultural values of uncertainty avoidance. • H15: The relationship between the perceived security and the trust in the technology providers of the smart home technology is positively moderated by the espoused national cultural values of uncertainty avoidance. • H16: The relationship between the performance expectancy and the trust in the smart home technology is positively moderated by the espoused national cultural values of masculinity.

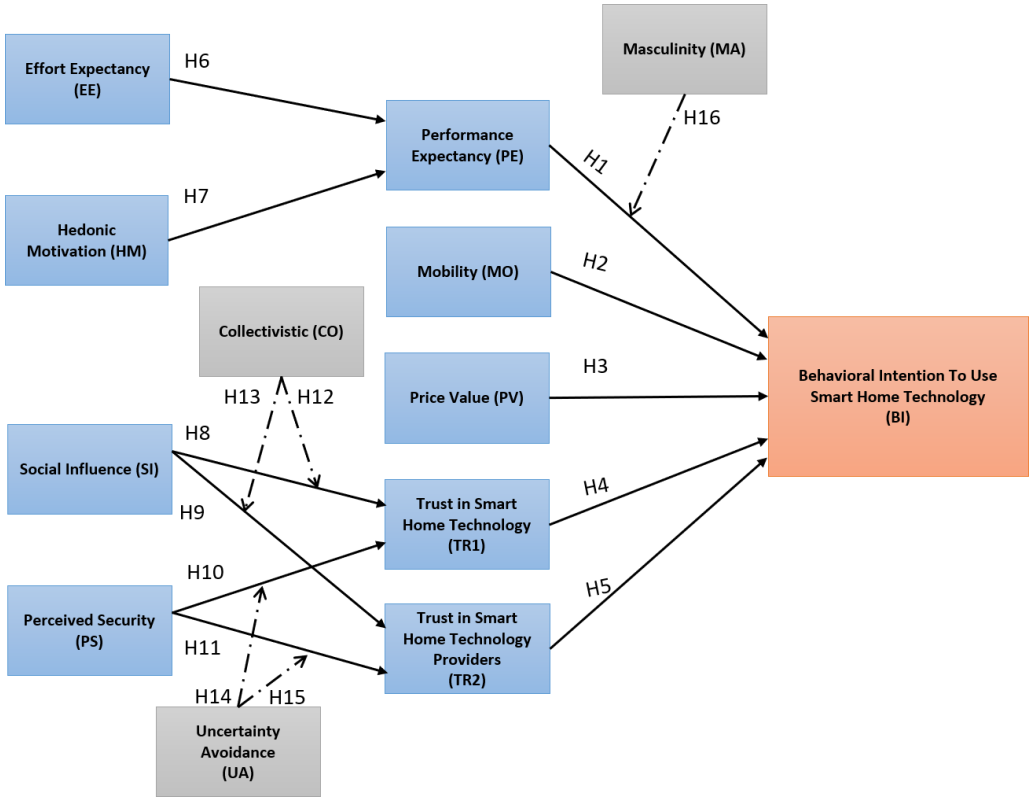

Figure 2. Proposed Research Model of the Smart Home Technology Acceptance

CHAPTER 4: RESEARCH METHADOLOGY

A. Instrument Development

Online surveys were used to collect data; surveys method was helpful in extracting clear and massive amount of data from the individuals who participated in our study, surveys are known as low costly and convenient method to gather data.

Our survey contains three parts, Main Constructs, Proposed Constructs and Moderating Constructs; main constructs represent the factors that are presented by Venkatesh, Thong and Xu (2012), which includes: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Hedonic Motivation (HM), and Price Value (PV).

Proposed constructs are the factors that we think they may have a potential effect on individuals' behavioral intention to the use smart home technology, we extended the UTAUT2 model to include the constructs of Mobility (MO), Perceived Security Risk (PS), Trust in smart home technology (TR1) and trust in its providers (TR2).

Moderating constructs are the espoused national cultural values that moderate the relation between the constructs, Collectivistic (CO) values that moderate the effect of Social Influence (SI), Masculinity (MA) values that moderate the effect of Performance expectancy (PE) and Uncertainty Avoidance (UA) values that moderate the effect of Perceived Security (PS).

Each construct in our survey has 3 to 4 items which used to measure their effect. In total 49 items have been used and 6 demographic questions: Nationality, Gender, Age, Education Level, Education Background and Hours Spent in home excluding sleeping.

The survey is available in Arabic & English; the survey was translated to Arabic and audited with a help from professional translators to validate the meaning of the survey. Participants responded to the statements on a seven-point Likert scale that have been ranged as: Strongly Disagree, Disagree, Somewhat Disagree, Neutral, Somewhat Agree, Agree and Strongly Agree; see appendix 10.

B. Statistical Procedure

SPSS was used to compute frequencies, means, standard deviations, reliability coefficients, exploration factor analysis and the ANOVA variance analysis. Seven regression models were run to test the research model and hypotheses.

A summary of the statistical analysis steps is as follow:

- Saving data in excel sheets, then data were properly coded from 1 as a "strongly disagree" to 7 as a "strongly agree", demographic data were also coded basing on sequence order of answers (example: Gender: 1=Male, 2=Female; Education Level: 1=High School, 2=Bachelor's Degree, 3=Master Degree, 4=PhD Degree and so on for the rest of questions).
- The coded data were exported to the SPSS and the initial descriptive statistics (range, mean and standard deviation) were run for all scale-item variables, see appendix 1.
- Reliability and Validity assessment were conducted, Cronbach's alpha and corrected item total correlations were performed, an exploratory factor analysis using a rotated component matrix was conducted to check the consistency between different group variables and to assess the validity of the constructs.

- Several regression models have been conducted to test the validity of our hypotheses as follow:
    - BI regressed against the factors of PE, MO, PV, TR1 and TR2.
    - PE regressed again EE and HM.
    - TR1and TR2 separately Regressed again SI and PS.
    - Three regression models to test the impact of the national cultural values of collectivistic, uncertainty avoidance and masculinity.
    - The assumptions of the regression analysis were evaluated and obtained.

CHAPTER 5: DATA ANALYSIS

A. Characteristic of Respondents

One -hundred and sixty-two responses were collected for this study, as shown in Table 2 – next page. Approximately 49% of participant in the study survey are male and 51% are female, most of participants are between 18 to 30 years old – 61.7%, 35.8% were between 30 to 42 years old and only 2.5% were older than 42 years. Approximately 28% of participants were Qataris and 72% as Non-Qataris, 59% indicated that they are spending 5 to 10 hours in their homes on daily basis, 20% less than 5 hours and another 21% for more than 10 hours. 60.5% of participants have a bachelor's degree, 27.8% graduate degree (master or PhD degree), 11.7% high school; their educational background varied as 6.2% social sciences, 12.3% Hard Sciences, 56.8% Business and 24.7% reported as others.

Table 2

Summary of the Demographic Variables

Variable	Count	Percentage
Gender		
Male	79	48.8%
Female	83	51.2%
Age		
18 to < 30	100	61.7%
30 to < 42	58	35.8%
> 42	4	2.5%
Nationality		
Qatari	46	28.4%
Non-Qatari	116	71.6%
Hours Spent in Home Excluding Sleeping		
< 5 Hours	32	19.8%
5 to 10 hours	96	59.3%
> 10 hours	34	21.0%
Education Level		
High School	19	11.7%
Bachelor's	98	60.5%
Master	43	26.5%
PhD	2	1.2%
Education Background		
Social Sciences	10	6.2%
Hard Sciences	20	12.3%
Business	92	56.8%
Others	40	24.7%

B. Reliability of the Constructs

All items in our survey were loaded on their intended constructs except for HM1, PV2 and PV3 that showed low loading values, these items were removed and not included in our analysis.

As shown in table 3, all items had factor loading greater than 0.50, according to (Hair et al, 2006); loadings above 0.50 are acceptable for exploratory studies. All constructs met the minimum value for Cronbach's alpha coefficient for construct reliability test (α=0.70), so; all them will be accepted for the further analysis and will be included in our model regression tests.

Table 3

Reliability and Validity Test for the Survey Items

Rotated Component Matrix										
Items	Component									Corrected Item-Total Correlation
	1	2	3	4	5	6	7	8	9	
PE1	0.771									0.789
PE2	0.798									0.757
PE3	0.745									0.748
PE4	0.798									0.822
EE1		0.735								0.719
EE2		0.721								0.766
EE3		0.723								0.765
EE4		0.838								0.762
SI1			0.838							0.725
SI2			0.856							0.813
SI3			0.800							0.783
HM2				0.740						0.860
HM3				0.767						0.894
HM4				0.687						0.834
PV1					0.655					0.685
PV4					0.505					0.685
MO1						0.706				0.581
MO2						0.854				0.700
MO3						0.711				0.620
PS1							0.718			0.652
PS2							0.797			0.686
PS3							0.834			0.789
PS4							0.746			0.683
TR1A								0.685		0.728
TR1B								0.548		0.712
TR1C								0.790		0.723
TR1D								0.757		0.545
TR2A									0.722	0.714
TR2B									0.809	0.730
TR2C									0.763	0.650
Cronbach's α	0.898	0.868	0.822	0.933	0.811	0.784	0.856	0.840	0.836	

CHAPTER 6: RESULTS OF THE STUDY

A. Hypotheses Testing

To answer our first research question for the factors that determines the individuals' intention to use the smart home technology, several regression analysis have been conducted, the first regression analysis was used to test H1, H2, H3, H4 and H5 hypotheses, in which the behavioral intention to use the smart home technology (BI) was regressed against the Performance Expectancy (PE), Mobility (MO), Price Value (PV), Trust in Smart Home Technology (TR1) and Trust in the Providers of Smart Home Technology (TR2), see Appendix 2. The regression equation was significant and explained 55% of the variance in the behavioral intention of the individuals to use the smart home technology; all independent variables were significant at different confidence levels. Mobility (MO) and trust in the providers of the smart home technology (TR2) had the strongest impact on the behavioral intention with standardized coefficient values equal to 0.270 and 0.222 respectively.

The second regression has been used to test H6 and H7 hypotheses, in which the performance expectancy (PE) was regressed against the independent variables of effort expectancy (EE) and hedonic motivation (HM), see Appendix 3. This model was also significant and explained 47% of the variance in the performance expectancy of individuals, in this model; both the independent variables were significant and have a confidence level of 99%. Hedonic motivation (HM) had the strongest impact with standardized coefficient equal to 0.467.

The third analysis has been used to test H8 and H10 hypotheses, in which the trust in the smart home technology (TR1) was regressed against the social influence (SI) and the perceived security (PS) as independent variables, see Appendix 4.

The regression equation for this model was significant and explained 37% of the variance in the trust in the smart home technology, however; in this model, the social influence effect wasn't significant (H8 not significant, $p = 0.494$) and the effect of the perceived security (H10) was significant in determining the trust in smart home technology with confidence level of 99% and standardized coefficient equal to 0.595.

One possible explanation for the social influence being not significant to impact the trust in the smart home technology is that the individuals consider the provider of the technology more than the technology itself, for example; individuals believe and trust the products of Google, Samsung or iPhone because of the brand name of these providers and as individuals have good experiences with them. Not all individuals have experiences with the smart home technology.

To find the impact of social influence (SI) and the perceived security (PS) on the trust in the smart home technology, the fourth regression analysis was used to test H9 and H11 hypotheses, in which the trust in the providers of the smart home technology (TR2) was regressed against the social influence (SI) and perceived security (PS) as independent variables, see Appendix 5. Regression equation was also significant and explained 31% of the variance in the trust in the technology providers, in this model; both the independent variables social influence and perceived security were significant and have confidence level of 95% and 99% respectively, which support our suggestion that the individuals consider more the technology providers more than the technology itself in

their recommendations and advising. Individuals have good experiences with technology providers of the smart home technology, as they offer many other technologies that we strongly accept and trust, such as smart phones, PC's and other home accessories, this fact makes us more trustful in their brands and recommend them for others.

B. Effects of the Espoused National Cultural Values

To measure the impact of the cultural values in our proposed model, new input variables have been formulated by the multiplication of Social Influence by Collectivism (SIXCO), Perceived Security by Uncertainty Avoidance (PSXSI) and Performance Expectancy by Masculinity (PEXMA). These new variables have been used as inputs to test the H12, H13, H14, H15 and H16 hypotheses.

H16 hypotheses proposes that the masculinity cultural values positively moderate the impact of the performance expectancy on the behavioral intention to use the smart home technology, a new regression analysis has been conducted to test this hypothesis, behavioral intention (BI) as a dependent variable was regressed against the PEXMA, MO, PV, TR1 and TR2 as independent variables.

Based on the output results, see Appendix 6; H16 hypothesis was significant and has a confidence level of 95%, therefore, masculinity cultural values have been proven to positively moderate the effect of performance expectancy as the correlation factor (t-value) is positive and equal to 2.1.

The collectivistic hypotheses H12 and H13, propose that the collectivistic cultural values positively moderate the social influence impact (SI) on the trust in the smart home technology (TR1) and the trust in the technology providers of the smart home technology (TR2), but as the impact of social influence (SI) on the trust in the smart home

technology (TR1) was not significant (H8 not significant), H12 will be not significant too.

For the uncertainty avoidance cultural values impact hypotheses, H14 and H15 propose that the uncertainty avoidance values positively moderate the impact of the perceived security (PS) factor on the trust in the smart home technology (TR1) and its technology providers (TR2).

Two regression analysis have been conducted to test these hypotheses (H12, H13, H14 and H15) were TR1 and TR2 regressed against SIXCO and PSXUA and based on their outputs, see Appendix 7 & Appendix 8; H12 wasn't significant while H13 hypothesis was significant and has a confidence level of 90%, therefore, collectivistic cultural values has been proven to positively moderate the effect of social influence on the trust in the providers of the smart home technology as the correlation factor (t-value) is positive and equal to 1.73.

H14 and H15 hypotheses were also significant and have a confidence level of 99%, therefore; uncertainty avoidance cultural values have been proven to positively moderate the effects of the perceived security as the correlation factor (t-value) for both is positive and equal to 8.01 and 6.5 respectively.

Figure 3 - next page, shows the final results for all research hypotheses in our developed model.

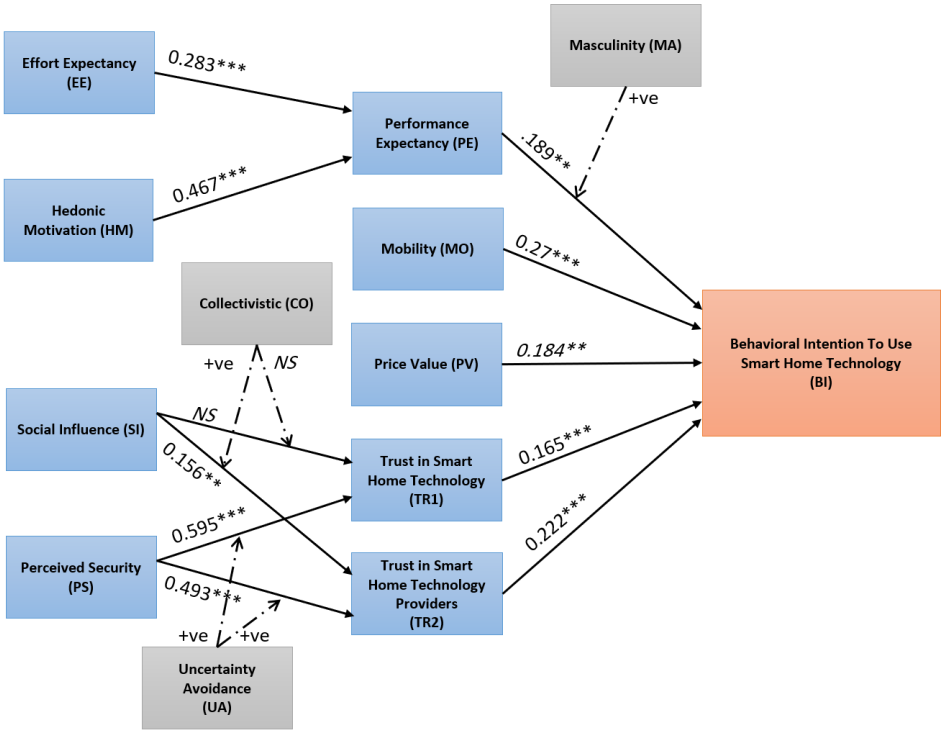

Figure 3. Results of the Study Hypotheses

CHAPTER 7: DISCUSION & IMPLICATIONS

The results of the proposed research model show that the behavioral intention to use the smart home technology was significantly impacted by the factors of performance expectancy, mobility, trust in the smart home technology, trust in the providers of this technology and price value

Among the significant predictors, the mobility and trust in the provider of the smart home technology factors have the biggest impact as reflected by their regression coefficient value (0.270 and 0.222 respectively), that means the ability to control the smart home technology remotely and the trust relationship with the providers of this technology are the main determinant for individuals' intention to use the smart home technology. Therefore, we think that smart home technology developers should focus on the features that allow users to remotely access and use the smart home technology and make this technology more interactive in completion the in-home tasks and duties. The providers of the smart home technologies need to improve individuals' trust in their technology and brands as these factors have significant impacts on the individuals' intentions to use the smart home technology.

For the second model, performance expectancy was significantly depending on the effort expectancy and hedonic motivations, both was significant and have a positive impact, hedonic motivation has a stronger impact than the effort expectancy, which mean that individuals will have better perceived performance expectancy if they enjoy using the smart home technology and perceive it as entertaining tool. These results show that it's very important to design the smart home technology in a way makes it easy to use and

more entertaining to motivate individuals to it.

In the third model for determining the impact of the social influence and the perceived security on the trust in the smart home technology; social influence impact wasn't significant; the perceived security factor was only significant in this model. That implies that as the smart home technology is perceived as secure, individuals will trust the smart home technology more, so; the developers of the smart home technology are required to increase the level of security for this technology and inform others about the latest security polices applied.

Regarding to the fourth regression model which was for determining the impact of the social influence and the perceived security on the trust in the providers of the smart home technology, both were significant and have a positive impact, however; the perceived security has a much strongest impact than the social influence on the trust in the providers of the smart home technology which proof more our suggestion that it's very important to develop clear security policies that can be easily understood by the potential users.

On the opposite from the previous model; social influence in this analysis significantly impacted the trust in the technology providers. As we mentioned before; these providers offer many other solutions that we accept and use, and improve our trust in these providers' brands. It's good for the technology providers to keep in mind the social influence impacts and try to create a good image about them in the market especially for who are referent in the groups and can affect others' decisions.

Gulf region societies have high scores for the collectivism, masculinity, and uncertainty avoidance cultural values as shown in Figure 4, where the low level of individualism imply a high level of collectivism (Hofstede Insights, 2017).

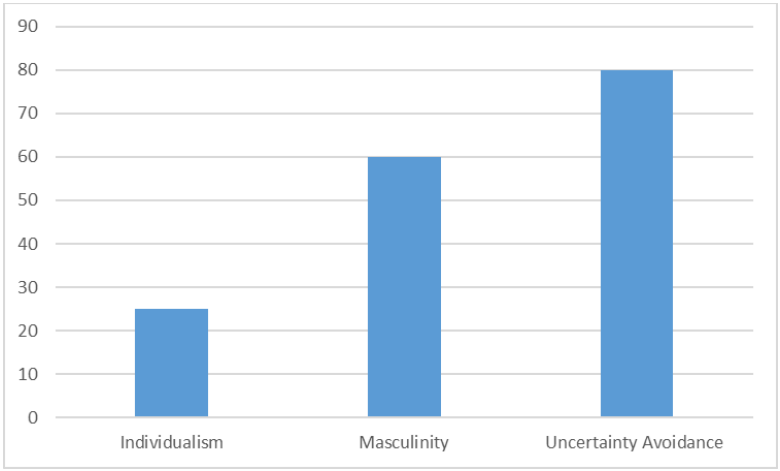

Figure 4. Cultural Values Scores for the Gulf Region Societies

The espoused cultural values in our research model had significant positive impacts as intended in the previous studies, the cultural values of masculinity positively moderated the impact of performance expectancy on the behavioral intention to use the smart home technology by individuals, this result assumes that the people who espouse these values would use this technology as this technology meets their high needs for improvements, recognition and achievements. As the societies in the gulf region have a high record of masculinity, smart home technology providers need to focus more on how people would perceive the benefits from such technology and develop it to be more effective and efficient in meeting their needs for achievements and progress.

The collectivistic cultural values in our study positively moderated the impact of the social influence on the trust in the providers of the smart home technology, that means that the trust of individuals who have collectivistic values in the technology providers will be affected by the other referents approval for the smart home technology providers, in this case; the technology developers are required develop their brands and create good images for themselves in the market to utilize the impact of social influences and the collectivistic values together.

The uncertainty avoidance cultural values in our developed model positively moderated the impact of the perceived security on the trust in the smart home technology and the trust in its technology providers, that proves that the improvement of perceived security level for the smart home technology will encourage the individuals who espouse the values of uncertainty avoidance to use the smart home technology as intended in the previous studies. As we said before, smart home technology developers need to improve the level of the perceived security by creating clear policies and guarantee that all individuals feel secure when they use the smart home technology. Providers of the smart home technology need to focus more on the security issues especially for the societies that have a high score of uncertainty avoidance.

CHAPTER 8: LIMITATION & FUTUR RESEARCH

This study has some limitations that should be pointed out, first; the small sample size, as the smart home technologies can be used widely, using a larger sample size will enhance the validity of our results. Second; this study targeted mainly the general individuals in Qatar, repeating the same study to include different countries will enhance the validity and generality of the results and enrich the studies in this arena. Related adoption research for the smart home technologies were difficult to find, few resources covered the topics of smart home technology adoption process.

Even so; the results of this study supported prior research results that used the UTAUT2 as a basic model, we recommend an empirical study across a wider range of population using different statistical and sampling techniques to study the factors that determine the behavioral intention to use the smart home technology.

Finally, more studies are required for the espoused cultural values, as these values are not easy to measure and can impact the individuals' decisions to use the smart home technology.

CHAPTER 9: CONCLUSION & RECOMENDATIONS

To conclude, it's clear that the smart home technology can be a useful technology for all individuals in Qatar, however; this technology still would face some challenges.
Smart home technology developers need to focus on the factors that determine the behavioral intention to use it; the proposed factors in our developed model have significant impacts as shown in the results before and can be used as a basis for understanding the individuals' needs -with an exception for the price value.
Smart home technology developer can improve their products by focusing on the following point:

- Smart home technology should be designed to improve individuals' performance in their home and to be easy to use and understand.
- Using smart home technology should be entertaining and enjoyable for users, otherwise; they will be frustrated and have negative impacts.
- The ability to control the smart home technology remotely is a very important feature, as the mobility factor in our study has the most significant impact.
- Smart home technology developers should focus on how to improve the individuals' perceived trust and security for using the smart home technology, it's important for the individuals to feel safe and secure.
- Social influence play an important role in affecting the individuals to trust the smart home technology, technology providers and developers must create good examples for using this technology and share these results with others.

- The national cultural values are important elements in the technology adoption and affect the individuals' decisions; the technology developers must understand its impacts and find the best ways to minimize its negative effects.
- The insignificant impact of the social influence on the trust in the smart home technology doesn't mean that this factor is not important, this result can be due to error in sampling. Technology providers are needed to give the chance for the individuals to experience this technology and make good stories about it to utilize the impact of the social influences.
- The Factors of performance expectancy, effort expectancy and hedonic motivation had a significant impact on the behavioral intention to use the smart home technology in our proposed model, which confirms the results of (El-Masri and Tarhini, 2017) and (Oh and Yoon, 2014) studies for predicting the technology adoption.
- The proposed factors of mobility, trust and perceived security had a strong and significant impact on the individuals' behavioral intentions in our proposed model which confirms the results of Yang, Lee and Zo in their study for the user acceptance of smart home services (Yang, Lee and Zo, 2017).
- The espoused national cultural values in our study were found to have a positive moderating effect as what was intended in our model which also confirm the results of Alshare and Mousa in their study for the moderating effect of the espoused cultural dimensions on consumers' intentions to use mobile payment devices (Alshare and Mousa, 2014).

Finally, smart home technology market is very attractive for many technology providers, understanding the needs of the potential customers is the first step to offer better smart home services, based on our study these needs are the efficiency in performance, accessibility and be trustful and secure technology with adequate price.

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APPENDICES

Appendix 1: List of Scale Items

Constructs and Items	Mean	Std. Dev
Performance Expectancy α=0.898		
Using Smart Home Technology in my home would enhance my interaction with my home appliances.	5.56	1.43
Using Smart Home Technology in my home would increase the efficiency of my home activities.	5.13	1.66
Using Smart Home Technology in my home would allow me to better manage and control my home.	5.43	1.40
Overall, I believe that smart home technology is useful when it's integrated with my home.	5.50	1.34
Effort Expectancy α=0.868		
Learning how to use smart home technology in my home would be easy to me.	5.54	1.32
My interactions with my in-home appliances and activities when using smart home technology would be clear and understandable.	5.34	1.17
I would find it easy to use smart home technology.	5.51	1.27
It would be easy for me to be skillful in using smart home technology.	5.64	1.19
Social Influence α=0.822		
People who are important to me think that I should use the smart home technology.	4.43	1.51
People who influence my behavior think that I should use smart home technology.	4.27	1.40
People whose opinions I value prefer that I use smart home technology in my home.	4.46	1.38
Hedonic Motivation, α=0.933		
Using smart home technology would be fun.	6.12	5.40
Using smart home technology would be enjoyable.	5.63	1.38
Using smart home technology would be entertaining.	5.59	1.35
Using smart home technology would be pleasant.	5.62	1.33
Price Value, α=0.784		
Smart Home technology would add distinctive value to my home.	5.40	1.54
Smart home technology would be reasonable priced.	3.63	1.56
Smart home will be good value for money.	4.51	1.40
Smart Home technology would provide good values.	5.01	1.32
Mobility, α=0.784		
It's convenient to access smart home technologies anywhere at any time.	5.63	1.29
It would be convenient to use smart home technology while moving from place to place or while doing anything else.	5.43	1.33
Mobility would be an outstanding advantage of smart home services.	5.65	1.34
Perceived Security, α=0.856		
Smart home technology would be a secure technology.	4.34	1.51
I would not be worried that information I provide when using smart home technologies could be used by others.	3.65	1.73

I would feel secure when I access my personal data using smart home technology.	4.01	1.51
Overall, smart home technology would be a safe method to access my personal information.	4.02	1.49
Trust in Smart Home Technology, α=0.840		
I trust that Smart Home technology is a safe technology.	4.15	1.38
I believe that Smart Home technology is trustworthy.	4.24	1.39
I trust Smart Home technology to do its job right.	5.06	1.28
Smart Home technology can fulfill its work.	5.10	1.17
Trust in Smart Home Technology Providers, α=0.811		
I believe Smart Home technology providers are reliable.	4.76	1.27
I believe Smart Home technology providers keep promises and commitments.	4.60	1.23
I feel confidence in the brand of Smart Home technology providers.	4.85	1.21
Behavioral Intention, α=0.936		
I intend to use smart home technology in the future.	5.31	1.46
I will always try to use smart home technology.	5.07	1.47
I predict to use smart home technologies in the future.	5.40	1.49
I plan to use Smart Home technologies in future.	5.37	1.43
Collectivism, α=0.797		
It is better to work in a group than as individuals.	5.15	1.46
Being accepted as a member of a group is more important than being independent.	4.91	1.49
Group success is more important than individual success.	5.10	1.38
Individual rewards are not as important as group welfare.	4.81	1.56
Masculinity, α=0.779		
It is important for me to have a job that provides an opportunity for advancement.	6.05	1.19
It is important for me to work in a prestigious and successful organization.	6.01	1.24
It is important for me to have a job that has an opportunity for high earnings.	5.99	1.30
It is important that I outperform my coworkers.	4.99	1.55
Uncertainty Avoidance, α=0.921		
I like to work in a well-defined job where the requirements are clear.	5.76	1.43
It is important for me to work for an organization that provides high employment stability.	6.10	1.24
Clear and detailed rules/regulations are needed so employees know what is expected of them.	5.99	1.29
Order and structure are very important in a work environment.	6.13	1.27

Appendix 2: Regression Model 1 - BI Analysis

Regression analysis output for the impact of the perceived expectancy (PE), mobility (MO), price value (PV), trust in smart home technology (TR1) and the trust in the smart home technology providers (TR2) on the behavioral intention to use the smart home technology (BI).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.753[a]	0.567	0.553	0.870

a. Predictors: (Constant), TR2, MO, PE, TR1, PV

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	153.597	5.000	30.719	40.636	.000[b]
	Residual	117.174	155.000	0.756		
	Total	270.771	160.000			

a. Dependent Variable: BI

b. Predictors: (Constant), TR2, MO, PE, TR1, PV

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.023	0.390		-0.060	0.952
	PE	0.177	0.071	0.189	2.499	0.013
	PV	0.176	0.077	0.184	2.273	0.024
	MO	0.281	0.065	0.270	4.307	0.000
	TR1	0.163	0.062	0.165	2.633	0.009
	TR2	0.261	0.077	0.222	3.394	0.001

a. Dependent Variable: BI

Appendix 3: Regression Model 2 - PE Analysis

Regression analysis outputs for the impacts of the effort expectancy (EE) and hedonic motivation (HM) on the performance expectancy (PE).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.687[a]	0.473	0.466	1.015157

a. Predictors: (Constant), HM, EE

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	145.928	2	72.964	70.801	.000[b]
	Residual	162.826	158	1.031		
	Total	308.754	160			

a. Dependent Variable: PE

b. Predictors: (Constant), HM, EE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.334	0.443		0.753	0.453
	EE	0.374	0.102	0.283	3.676	0.000
	HM	0.524	0.086	0.467	6.065	0.000

a. Dependent Variable: PE

Appendix 4: Regression Model 3 - TR1 Analysis

Regression Analysis output for the effect of the social influence (SI) and perceived security (PS) impacts on the trust in the smart home technology.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.612[a]	0.375	0.367	1.050522

a. Predictors: (Constant), PS, SI

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	104.629	2	52.314	47.403	.000[b]
	Residual	174.368	158	1.104		
	Total	278.997	160			

a. Dependent Variable: TR1

b. Predictors: (Constant), PS, SI

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.798	0.320		5.625	0.000
	SI	0.045	0.065	0.046	0.685	0.494
	PS	0.560	0.063	0.595	8.838	0.000

a. Dependent Variable: TR1

Appendix 5: Regression Model 4 - TR2 Analysis

Regression Analysis output for the effect of the social influence and perceived security impacts on the trust in the technology providers of the smart home technology.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.568[a]	0.322	0.314	0.917

a. Predictors: (Constant), PS, SI

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.197	2.000	31.599	37.546	.000[b]
	Residual	132.971	158.000	0.842		
	Total	196.168	160.000			

a. Dependent Variable: TR2

b. Predictors: (Constant), PS, SI

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.641	0.279		9.463	0.000
	SI	0.126	0.057	0.156	2.223	0.028
	PS	0.390	0.055	0.493	7.042	0.000

a. Dependent Variable: TR2

Appendix 6: Regression Model 5 - Cultural values impacts on BI Analysis

Regression analysis for the moderating effect of the masculinity cultural values on the performance expectancy impact (PEXMA) on the behavioral intention to use the smart home technology (BI).

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.750[a]	0.562	0.548	0.874
a. Predictors: (Constant), PEXMA, TR1, MO, TR2, PV				

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	152.243	5.000	30.449	39.818	.000[b]
	Residual	118.528	155.000	0.765		
	Total	270.771	160.000			
a. Dependent Variable: BI						
b. Predictors: (Constant), PEXMA, TR1, MO, TR2, PV						

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.179	0.386		0.463	0.644
	PV	0.209	0.074	0.219	2.824	0.005
	MO	0.271	0.066	0.261	4.106	0.000
	TR1	0.161	0.062	0.164	2.596	0.010
	TR2	0.266	0.077	0.226	3.445	0.001
	PEXMA	0.019	0.009	0.154	2.099	0.037
a. Dependent Variable: BI						

Appendix 7: Regression Model 6 - Cultural values impacts on TR1 Analysis

Regression analysis outputs for the moderating effect of the collectivistic & uncertainty avoidance cultural values on the social influence and perceived security impacts (SIXCO & PSXUA) for the trust the smart home technology (TR1).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.597[a]	0.356	0.348	1.066014

a. Predictors: (Constant), PSXUA, SIXCO

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	99.448	2	49.724	43.756	.000[b]
	Residual	179.549	158	1.136		
	Total	278.997	160			

a. Dependent Variable: TR1

b. Predictors: (Constant), PSXUA, SIXCO

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.321	0.243		9.567	0.000
	SIXCO	0.000	0.010	0.002	0.025	0.980
	PSXUA	0.079	0.010	0.596	8.019	0.000

a. Dependent Variable: TR1

Appendix 8: Regression Model 7 - Cultural values impacts on TR2 Analysis

Regression analysis outputs for the moderating effect of the collectivistic & uncertainty avoidance cultural values on the social influence and perceived security impacts (SIXCO & PSXUA) for the trust in the providers of the smart home technology (TR2).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.572[a]	0.327	0.319	0.914

a. Predictors: (Constant), PSXUA, SIXCO

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	64.181	2.000	32.091	38.415	.000[b]
	Residual	131.987	158.000	0.835		
	Total	196.168	160.000			

a. Dependent Variable: TR2

b. Predictors: (Constant), PSXUA, SIXCO

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.104	0.208		14.926	0.000
	SIXCO	0.015	0.008	0.131	1.726	0.086
	PSXUA	0.055	0.008	0.494	6.493	0.000

a. Dependent Variable: TR2

Appendix 9: Survey in English and Arabic Versions

Determinants of Individuals' Intention to Use IoT Smart Home Solutions in The State of Qatar

This survey questionnaire is an attempt to understand the determinants that affect the individuals' intention to use the Internet of Things Smart Home technologies in Qatar. Your inputs are an essential element in this study and will be kept strictly confidential and anonymous. Your participation is voluntary, and you may withdraw or skip any question.

This information will be used for research purposes only. This survey will take 10 to 15 minutes. The time and effort you spend in answering this survey is highly appreciated.

Internet of Things Smart Home Technology is a general term given to the homes which have been fitted with internet connected devices that enable some degree of automation or remote control for home appliances, security and environment.

If you have any questions pertaining to this survey or research study, please feel free to contact me at my email address: oa1512416@qu.edu.qa.

The College of Business and Economics at Qatar University supports the practice of protection for human subjects participating in research and related activities.
Research Ethics Approval No.: QU-IRB 800-E/17.

Sincerely,
Osaid Alsamarah

1. Questions & Items:

Please indicate your answer by circling the number that best reflects the degree to which each statement reflects to you.

(1) Strongly Disagree (SD) (2) Disagree (D) (3) Somewhat Disagree (SWD)
(4) Neutral (N) (5) Somewhat Agree (SA) (6) Agree (A)
(7) Strongly Agree (SA)

#	Items	Rate	SD	D	SWD	N	SWA	A	SA
			1	2	3	4	5	6	7
1	Using Smart Home Technology in my home would enhance my interaction with my home appliances.								
2	Using Smart Home Technology in my home would increase the efficiency of my home activities.								
3	Using Smart Home Technology in my home would allow me to better manage and control my home.								
4	Overall, I believe that smart home technology is useful when it's integrated with my home.								
5	Learning how to use smart home technology in my home would be easy to me.								
6	My interactions with my in-home appliances and activities when using smart home technology would be clear and understandable.								
7	I would find it easy to use smart home technology.								
8	It would be easy for me to be skillful in using smart home technology.								
9	People who are important to me think that I should use the smart home technology.								
10	People who influence my behavior think that I should use smart home technology.								
11	People whose opinions I value prefer that I use smart home technology in my home.								
12	Using smart home technology would be fun.								
13	Using smart home technology would be enjoyable.								
14	Using smart home technology would be entertaining.								
15	Using smart home technology would be pleasant.								
16	Smart Home technology would add distinctive value to my home.								

17	Smart home technology would be reasonable priced.							
18	Smart home will be good value for money.							
19	Smart Home technology would provide good values.							
20	It's convenient to access smart home technologies anywhere at any time.							
21	It would be convenient to use smart home technology while moving from place to place or while doing anything else.							
22	Mobility would be an outstanding advantage of smart home services.							
23	I would be more concerned about my personal privacy when using smart home technology.							
24	I would be more sensitive about the way that smart home technology handles my personal information.							
25	I would be concerned about threats to my personal privacy these days.							
26	To me, it would be most important to keep my privacy safe from others.							
27	Smart home technology would be a secure technology.							
28	I would not be worried that information I provide when using smart home technologies could be used by others.							
29	I would feel secure when I access my personal data using smart home technology.							
30	Overall, smart home technology would be a safe method to access my personal information.							
31	I trust that Smart Home technology is safe technology.							
32	I believe that Smart Home technology is trustworthy.							
33	I trust Smart Home technology to do its job right.							
34	Smart Home technology can fulfil its work.							
35	I believe Smart Home technology providers are reliable.							
36	I believe Smart Home technology providers keep promises and commitments.							
37	I feel confidence in the brand of Smart Home technology providers.							
38	I intend to use smart home technology in the future.							

39	I will always try to use smart home technology.							
40	I predict to use smart home technologies in the future.							
41	I plan to use Smart Home technologies in future.							
42	It is better to work in a group than as individuals.							
43	Being accepted as a member of a group is more important than being independent.							
44	Group success is more important than individual success.							
45	Individual rewards are not as important as group welfare.							
46	It is important for me to have a job that provides an opportunity for advancement.							
47	It is important for me to work in a prestigious and successful organization.							
48	It is important for me to have a job that has an opportunity for high earnings.							
49	It is important that I outperform my coworkers.							
50	I like to work in a well-defined job where the requirements are clear.							
51	It is important for me to work for an organization that provides high employment stability.							
52	Clear and detailed rules/regulations are needed so employees know what is expected of them.							
53	Order and structure are very important in a work environment.							

2. Demographics

(1) Gender: o Male o Female

(2) Age (Years): o <18 o 18 to < 30 o 30 to < 42 o > 42

(3) Nationality: o Qatari o Non-Qatari

Hours spent daily in your home excluding sleeping time:

o < 5 Hours o 5 to 10 Hours o > 10 Hours

(4) Education Level:

o High School o Bachelor's Degree o Master Degree PhD Degree

(5) Educational Background:

o Social Sciences o Hard Sciences o Businesses o Others

Thank you very much for participation

العوامل المؤثرة في رغبة الأفراد في إستخدام حلول "إنترنت الأشياء - المنازل الذكية" في دولة قطر

تهدف هذه الدراسة إلى تحديد العوامل المحددة في رغبة الأفراد لإستخدام تكنولوجيا المنازل الذكية في دولة قطر.

المدخلات الخاصة بك تعتبر عنصر أساسي في هذه الدراسة، وسيتم الإحتفاظ بها بسرية تامة, مشاركتك في هذا الإستبيان تطوعية وبإمكانك وقفها في أي وقت أو تجاهل أي سؤال لا تراه مناسباً.

سيتم إستخدام هذه المعلومات لأغراض البحث العلمي فقط, يتطلب هذا الإستبيان من 10 الى 15 دقيقة من وقتك القيم, الوقت والجهد الذي تقضيه في الإجابة عن هذا الاستبيان هو محل تقدير كبير.

تكنولوجيا إنترنت الأشياء للمنازل الذكية هي التكنولوجيا المعنية بتمكين المقيمين في المنزل من التحكم بالأجهزة المنزلية عن طريق ربطها بشبكة الإنترنت ليتم التحكم بها عن بعد وبرمجة عملها بشكل ألي يضمن توفير الراحة والسلامة الملائمتين للمقيمين في المنزل .

إذا كان لديك أي أسئلة تتعلق بهذا الاستبيان أو هذه الدراسة، فلا تتردد في الإتصال بي على عنوان البريد الإلكتروني:

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كلية الإدارة و الإقتصاد في جامعة قطر تدعم ممارسة الحماية للمشاركين في البحوث والأنشطة ذات الصلة.

موافقة رقم: QU-IRB 800-E/17

مع خالص التقدير،

أسيد السمارة

طالب ماجستير في إدارة الأعمال

(1) الإستبيان:

الرجاء إختيار إجابتك عن طريق تحديد الرقم الذي يعكس مدى انطباق العبارات التالية عليك.

(1) غير موافق بشدة. (2) غير موافق. (3) نوعا ما غير موافق.
(4) محايد. (5) نوعا ما موافق. (6) موافق.
(7) موافق بشدة.

	العبارة	غير موافق بشده 1	غير موافق 2	نوعا ما غير موافق 3	محايد 4	نوعا ما موافق 5	موافق 6	موافق بشدة 7
1	إستخدام تكنولوجيا المنازل الذكية في منزلي سوف يحسن من تفاعلي مع الأجهزة المنزلية.							
2	إستخدام تكنولوجيا المنازل الذكية في منزلي سوف يزيد من فعاليتي في أداء النشاطات المنزلية.							
3	إستخدام تكنولوجيا المنازل الذكية في منزلي سوف يسمح لي بإدارة وتحكم أفضل لمنزلي.							
4	بشكل عام, أعتقد أن حلول المنازل الذكية مفيدة عند تطبيقها في منزلي.							
5	تعلم كيفية إستخدام تكنولوجيا المنازل الذكية في منزلي سيكون سهلا بالنسبة لي.							
6	تفاعلي مع الأجهزة والنشاطات المنزلية بإستخدام تكنولوجيا المنازل الذكية سيكون واضحا ومفهوما.							
7	سوف يكون من السهل لدي إستخدام تكنولوجيا المنازل الذكية في منزلي.							
8	سوف يكون من السهل لدي أن أكون ماهراً في إستخدام تكنولوجيا المنازل الذكية.							
9	الأشخاص المهمين بالنسبة إلي يعتقدون أنه من الضروري إستخدام تكنولوجيا المنازل الذكية.							
10	الأشخاص المؤثرين في سلوكي يعتقدون أنه من الضروري إستخدام تكنولوجيا المنازل الذكية.							
11	الأشخاص اللذين أقدر أفكارهم يفضلون أن أستخدم تكنولوجيا المنازل الذكية في منزلي.							
12	إستخدام تكنولوجيا المنازل الذكية سوف يكون تجربة مرحة.							
13	إستخدام تكنولوجيا المنازل الذكية سوف يكون تجربةً ممتعةً.							
14	إستخدام تكنولوجيا المنازل الذكية سوف يكون تجربةً مسليةً.							
15	إستخدام تكنولوجيا المنازل الذكية سوف يكون تجربةً جذابةً.							
16	تكنولوجيا المنازل الذكية ستشكل قيمةً اضافيةً لمنزلي.							
17	تكنولوجيا المنازل الذكية ستكون أسعارها معقولة.							
18	تكنولوجيا المنازل الذكية ستكون لها قيمةً جيدةً مقابل المال.							
19	تكنولوجيا المنازل الذكية ستضيف قيمةً اضافيةً جيدةً للمنزل.							
20	سيكون من المناسب القدرة على استخدام تكنولوجيا المنازل الذكية من أي مكان وفي أي وقت.							
21	سوف يكون من المناسب القدرة على إستخدام تكنولوجيا المنازل الذكية أثناء الإنتقال من مكان إلى أخر أو عمل أي أنشطه أخرى.							
22	إستخدام تكنولوجيا المنازل الذكية أثناء التنقل يعتبر ميزةً مهمةً.							

23	أكون أكثر قلقا حول خصوصيتي الشخصية عند إستخدام تكنولوجيا المنازل الذكية.							
24	أنا أكثر حساسية حول الطريقة التي تعالج بها تكنولوجيا المنازل الذكية بياناتي الشخصية.							
25	أنا قلق بخصوص التهديدات التي تواجه خصوصيتي الشخصية هذه الايام.							
26	بالنسبة لي, من المهم جدا إبقاء خصوصياتي آمنةً وبعيدةً عن الأخرين.							
27	تكنولوجيا المنازل الذكية تعتبر تكنولوجيا أمنة.							
28	أنا لا أشعر بالقلق بأن معلوماتي المستخدمة في تكنولوجيا المنازل الذكية يمكن إستغلالها من الأخرين.							
29	أشعر بالأمان عند الدخول لبياناتي الشخصية بإستخدام تكنولوجيا المنازل الذكية.							
30	بشكل عام, تكنولوجيا المنازل الذكية تعتبر وسيلةً أمنةً لدخول وإستخدام معلوماتي الشخصية.							
31	أثق في تكنولوجيا المنازل الذكية كتكنولوجيا أمنة.							
32	أعتقد أن تكنولوجيا المنازل الذكية تكنولوجيا جديرةٌ بالثقةِ.							
33	أثق بقيام تكنولوجيا المنازل الذكية بمهامها بشكل صحيح.							
34	تكنولوجيا المنازل الذكية تستطيع القيام بأعمالها على أكمل وجهٍ.							
35	أعتقد أنه من الممكن الإعتماد على مزودي خدمة تكنولوجيا المنازل الذكية.							
36	أعتقد أن مزودي خدمة تكنولوجيا المنازل الذكية يوفون بعهودهم وإلتزاماتهم.							
37	أشعر بالثقة في العلامة التجارية لمزودي تكنولوجيا المنازل الذكية.							
38	لدي النية في إستخدام تكنولوجيا المنازل الذكية في المستقبل.							
39	دائما سأحاول إستخدام تكنولوجيا المنازل الذكية.							
40	أتوقع إستخدامي لتكنولوجيا المنازل الذكية في المستقبل.							
41	أنا أخطط لإستخدام تكنولوجيا المنازل الذكية في المستقبل.							
42	العمل ضمن مجموعة أفضل من العمل بشكل فردي.							
43	أن أكون عضوا مقبولا في المجموعة أكثر أهميتا من أن أكون عضوا مستقلا.							
44	نجاح المجموعة أهم من نجاح الفرد.							
45	المكافأت الفردية ليست بنفس أهمية مصلحة الجماعة.							
46	من المهم لدي الحصول على وضيفة تعطيني الفرصة لتطوير نفسي.							
47	من المهم لدي العمل في مؤسسة مرموقة وناجحة.							
48	من المهم لدي الحصول على وظيفة ذات دخل فردي مرتفع.							
49	من المهم أن أتفوق على زملائي في العمل.							
50	أفضل العمل في وظيفة محددة جيدا و واضحة المتطلبات.							
51	من المهم لدي العمل في مؤسسة توفر درجة عالية من الأمان الوظيفي.							
52	يجب توفر قوانين وأنظمة واضحة ومفصلة بحيث يتمكن الموظفون من معرفة ما هو المطلوب منهم.							
53	النظام والهيكل الإداري مهمان جدا في بيئة العمل.							

(2) البيانات الديموغرافية:

(1) الجنس: ○ ذكر ○ أنثى

(2) العمر (سنة): ○ أقل من 18 ○ 18 إلى 30 ○ 30 إلى 42 ○ أكثر من 42

(3) الجنسية: ○ قطري ○ غير قطري

(4) عدد الساعات التي تقضيها في المنزل (بإستثناء فترة النوم):
○ أقل من 5 ساعات ○ 5 إلى 10 ساعات ○ أكثر من 10 ساعات

(5) المؤهل العلمي:
○ ثانوية عامة أو أقل ○ درجة بكالوريوس ○ درجة الماجستير ○ درجة الدكتوراه

(6) الخلفية العلمية:
○ العلوم الإجتماعية ○ العلوم الطبيعية ○ الأعمال ○ أخرى

شكرا جزيلا على مشاركتكم معنا!