THE USE AND ACCEPTANCE OF INFORMATION AND COMMUNICATION TECHNOLOGIES BY SENIOR CITIZENS: A TECHNOLOGY ACCEPTANCE MODEL (TAM) FOR TURKISH POPULATION

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF INFORMATICS OF
THE MIDDLE EAST TECHNICAL UNIVERSITY
BY

HACER GÜNER

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF INFORMATION SYSTEMS

SEPTEMBER 2017

Approval of the thesis:

THE USE AND ACCEPTANCE OF INFORMATION AND COMMUNICATION TECHNOLOGIES BY SENIOR CITIZENS: A TECHNOLOGY ACCEPTANCE MODEL (TAM) FOR TURKISH POPULATION

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ABSTRACT

THE USE AND ACCEPTANCE OF INFORMATION AND COMMUNICATION TECHNOLOGIES BY SENIOR CITIZENS: A TECHNOLOGY ACCEPTANCE MODEL (TAM) FOR TURKISH POPULATION

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September 2017, 90 pages

To become an information society, it is required that the citizens have access Information and Communication technologies (ICT) in appropriate ways. ICT plays a major role to improve inclusion of various parts of the society into daily life, such as elderly citizens. As in neighbor countries in the EU and in the Middle East, the population of Turkey is getting older, according to the Turkish Statistical Institute (TurkStat, 2016). This urges the need for a systematic investigation of ICT needs of elderly citizens and potential problems that may be faced during the course of interaction with ICT interfaces. Given that the research on ICT use of elderly citizens in Turkey is not at a mature state recently, the present study aims at closing the gap by focusing on the use and acceptance of ICT by elderly citizens in comparison to younger adults. It reports data collected from 232 elderly participants (the age range from 60 to 96 years old) and 235 younger adults (the age range from 19 to 40 years old). The findings of the study show that, both elderly and younger adults confirm the Technology Acceptance Model (TAM) in a similar way. This was accompanied by elderly citizens' need for assistance, encouragement and friendlier interface designs. We believe that the findings obtained in the present study will contribute to increasing awareness about the needs and expectations of elderly citizens and inspire further research on ICT use of elderly population in Turkey.

Keywords: Senior Citizens, Technology Acceptance Model, Acceptance of ICT, Turkish Elderly Population, Structural Equation Modeling

ÖZ

YAŞLILARIN BİLGİ VE İLETİŞİM TEKNOLOJİLERİ KULLANIMI VE KABULÜNÜN İNCELENMESİ: TÜRK POPÜLASYONU İÇİN TEKNOLOJİ KABUL MODELİ

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Tez Yöneticisi: Yrd. Doç. Dr. Cengiz ACARTÜRK

Eylül 2017, 90 sayfa

Bilgi toplumu olmak, bütün vatandaşların bilgi ve iletişim teknolojilerine (BİT) gerektiği şekilde erişebilmesini zorunlu kılmaktadır. BİT, yaşlı vatandaşlar gibi toplumun farklı kesimlerinin günlük hayata dâhil edilmesinde önemli bir rol oynamaktadır. Türkiye İstatistik Kurumu tarafından yayınlanan rapora göre Türkiye, tıpkı komşu Avrupa Birliği ve Orta Doğu ülkelerinde olduğu gibi, giderek yaşlanan bir nüfusa sahiptir (TÜİK, 2016). Bu durum, yaşlı vatandaşların BİT konusundaki ihtiyaçlarının ve BİT ile etkileşimlerinde karşılaşabilecekleri potansiyel problemlerin sistematik olarak analiz edilmesi gereksinimini doğurmaktadır. Türkiye'de yaşlıların BİT kullanımı konusunda yapılan çalışmaların kısıtlı olduğu düşünüldüğünde, bu çalışma ile yaşlı vatandaşların BİT kullanımı ve kabulü ile sonuçların genç nüfusla karşılaştırılmasına odaklanarak bu eksikliğin doldurulması hedeflenmektedir. Bu kapsamda, 232 yaşlı (yaşları 60 ile 96 arasında değişen) ve 235 genç (yaşları 19 ile 40 arasında değişen) katılımcıdan veri toplanmıştır. Çalışmada elde edilen bulgular, hem yaşlı hem de genç nüfus için Teknoloji Kabul Modelinin benzer şekilde doğrulandığını göstermektedir. Bununla birlikte, yaşlı vatandaşların BİT kullanımı konusunda yardıma, cesaretlendirilmeye ve daha kullanıcı dostu arayüzlere ihtiyaç duydukları tespit edilmiştir. Bu çalışmanın, yaşlı vatandaşların ihtiyaç ve beklentileri konusunda farkındalığın artmasına katkı sağlaması ve Türkiye'de yaşlı nüfusun BİT kullanımı konusunda yapılacak daha kapsamlı araştırmaları teşvik etmesi beklenmektedir.

Anahtar Sözcükler: Yaşlı Vatandaşlar, Teknoloji Kabul Modeli, BİT Kabulü, Türk Yaşlı Nüfus, Yapısal Eşitlik Modeli

To my lovely mother

ACKNOWLEDGMENTS

First of all, I would like to thanks my supervisor Asst. Prof. Dr. Cengiz ACARTÜRK for his patience and endless support during my thesis study. He always encouraged me and guided me to go ahead in my difficult times.

I would like to give special and sincere thanks to my father İhsan GÜNER and my mother Münevver GÜNER for their invaluable support and love during every single day of my life.

I would like to thank my sister Hatice Kübra GÜNER for her patience and advices whenever I feel stressful and desperate.

I would like to express my gratitude to my brother M. Fatih GÜNER for his assistance to me during data collection period in public gardens and nursery houses. Without his support, I might not be able to collect data so effectively.

I would like to thank my dear friend Merve BAŞDOĞAN for her review and valuable comments on my thesis.

I would like to thank all my friends who always make me feel motivated and determined.

Finally, I am deeply grateful to participants of my study, especially to senior citizens, for their precious contribution to science.

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LIST OF ABBREVIATIONS

ANX	Anxiety
AOA	American Optometric Association
ATU	Attitude toward Use
BI	Behavioral Intention
CFA	Confirmatory Factor Analysis
EFA	Exploratory Factor Analysis
FC	Facilitating Conditions
HCI	Human Computer Interaction
ICT	Information and Communication Technologies
METU	Middle East Technical University
PEOU	Perceived Ease of Use
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares - Structural Equation Model
PU	Perceived Usefulness
SEM	Structural Equation Model
SI	Social Influence
SPSS	Statistical Package for Social Sciences
SS	Self-Satisfaction
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UN	United Nations
UTAUT	Unified Theory of Technology Acceptance Model
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

A developed information society provides the citizens' access to Information and Communication Technologies (ICT) by appropriate means. ICT play a major role to improve inclusion of various parts of the society into daily life, such as children and elderly (i.e., senior) citizens. Exhibiting similar trends to the European Union (EU) countries and the countries in the Middle East, the population of Turkey is getting older, according to Turkish Statistical Institute (2017). Turkish elderly (65+ years old) population comprises 8.3% of the entire population in 2016, close to 8.7 % for the elderly population worldwide (TurkStat, 2017). Turkey is the 66th country among 167 countries regarding the proportion of elderly citizens in the entire population (USCB, 2016).

As for the age dependency ratio of elderly adults (i.e., the measurement for the proportion of elderly population, ages over 65, to the productive population, ages from 15 to 64.), it was 8.8% in year 2000 in Turkey. Then it increased to 12.3% in 2016 (TurkStat, 2017). That shows an increase in the number of senior citizens, who no more work in professional jobs, thus needing financial and societal support from younger citizens.

The previous research literature reveals that the use of ICT may lessen the dependency of elderly citizens to the society in various ways (Mitzner et al., 2010) and enhance elderly citizens' perceived quality of life (Mynatt & Rogers, 2002). This urges the need for a systematic investigation of ICT needs of elderly citizens and potential problems that may be faced during the course of interaction with ICT interfaces.

To improve the ICT utilization among senior citizens, it is necessary to enhance acceptance and adoption of ICT by its users. On the other hand, investigating the use and acceptance of ICT by senior citizens is a challenging domain of research due to wide variety of education levels, socio-economic status, physiological conditions and health conditions (González, Ramírez & Viadel, 2012; Macedo, 2017). The factors that influence the acceptance of ICT by elderly may be expressed in terms of several concepts that involve perceived usefulness, perceived easiness, safety issues, privacy concerns, perceived costs, perceived need, social influence, personal traits, and so on (Peek et al., 2014).

To explain the use and acceptance of ICT by senior citizens, Davis' (1989) Technology Acceptance Model (TAM) has been frequently used in research studies (e.g., Braun, 2013; Nayak, Priest & White, 2010; Ma, Chan & Chen, 2016; Macedo, 2017; McCloskey, 2006; Pan & Jordan-Marsh, 2010). According to TAM, the main factors that influence individuals' use and acceptance of information and communication technologies are stated as "*perceived usefulness"* and "*perceived ease of use"* (Davis, 1989; Venkatesh & Davis, 2000), as well as a set of external variables, such as "*social influence"*, "*anxiety"*, "*facilitating conditions"* and "*self-satisfaction"* (Venkatesh, Morris, Davis, & Davis, 2003; Ma, Chan & Chen, 2016). In the present study, our goal is to investigate the use and acceptance of Turkish senior citizens and younger population within the framework of TAM. We present the purpose and the scope of the study precisely in the following section.

1.1. The Purpose and Scope of the Study

Recently, human computer interaction (HCI) research on ICT use of elderly citizens in Turkey is not at a mature state. The present study aims at filling in the gap by focusing on the use and acceptance of ICT by elderly citizens in comparison to younger adults. For this, data were collected from 232 elderly participants (the age range from 60 to 96 years old) and 235 younger adults (the age range from 19 to 40 years old).

The results are reported in three parts, namely descriptive analyses, the application of the Technology Acceptance Model (TAM), and the transcription of open-ended questionnaire items. In the descriptive analyses, participants' age, gender, education status, occupation, monthly income, residence, daily activities, ICT use, the duration of ICT use, activities using ICT and social media use were presented. In the second part, based on the findings from the TAM questionnaire, the proposed research model and the hypotheses were examined by the Structural Equation Modeling (SEM) technique. Finally, the opinion of the participants about ICT and the use of ICT were investigated by analyzing their responses to a set of open-ended questions.

The findings of the present study show that both senior citizens and younger adults confirmed the Technology Acceptance Model (TAM) in a similar way. On the other hand, elderly participants exhibited eagerness to use ICT in daily life. This was accompanied by elderly citizens' need for assistance, encouragement and friendlier interface designs. We believe that the findings obtained in the present study will contribute to increasing awareness about the needs and expectations of senior citizens and inspire further research on ICT use of elderly population in Turkey.

1.2. The Significance of the Study

Making efforts to be a developed information society, Turkey may need to pay special attention for the increasing elderly population. Therefore, more systematic research is required to clarify the needs, expectations and problems of elderly population while using ICT. Being immature state of the study conducted on ICT use by Turkish elderly citizens, the main significance of this study is to contribute the literature by filling that gap. Besides, findings of the present study may have implications for not only researchers but also policy makers in terms of ICT-related constraints and problems of elderly population. The factors influencing the use and acceptance of ICT by elderly may infer crucial inputs for future policy planning in terms of educational, social and economic aspects. Efficient and appropriate use of ICT may support elderly to be productive and independent while performing daily activities at older age. Therefore, the results of the study are also important to declare the common characteristics of ICT-related problems and the influencers of ICT acceptance among Turkish elderly population.

1.3. The Outline of the Thesis

The remaining parts of the thesis are planned as below.

In this chapter, Chapter 1, general theoretical background for the research questions were introduced together with the explanation of the purpose and scope of the study. Chapter 2 presents the literature review related to ICT use by senior citizens and the Technology Acceptance Model (TAM). In Chapter 3, the methodology of the study, including research design, research model and hypotheses, instrument development, data collection and analysis, was described. In Chapter 4, the findings of the study and statistical data analysis were explained. Furthermore, the results of hypotheses testing and confirmed research model were demonstrated. Chapter 5 presents a discussion of the results, conclusion and implications for further research.

CHAPTER 2

LITERATURE REVIEW

In this chapter, the literature was reviewed related to the current demographics of senior citizens in Turkey and the use and acceptance of ICT by senior citizens together with the Technology Acceptance Model (TAM). In section 2.1, the age characteristics of elderly population were discussed within the framework of the previous research. Second, aging effects were investigated in the scope of physiological and psychological perspectives presented in section 2.2. Then, in section 2.3, the use of ICT by senior citizens was examined. Since the present study was conducted with senior citizens in Turkey, senior citizens ICT use was also investigated in section 2.4. The research model of the present study was based on Technology Acceptance Model (TAM); therefore, TAM and related constructs were presented in section 2.5.

2.1. Senior Citizens and Aging Society

Although there is no standard criterion for the definition of being a senior citizen, the ages 60+ and 65+ years commonly refer to the elderly population in many studies. According to the World Health Organization (WHO) and the United Nations (UN), the age of chronologically 60 years is considered to be the starting point of being described as a senior citizen (Kowal & Dowd, 2001). On the other hand, Eurostat, the official statistical department of the European Union, refers the age of 65+ years as the defining age for being elderly (Eurostat, 2011). Turkish Ministry of Family and Social Policies defines 40-59 years as middle aged; 60-74 years as young-elderly, 75-89 years as middle-elderly and 90+ years as old-elderly by referring to the definition of WHO (2013).

The age classifications for senior citizens may exhibit variance in different cultures, socio-economic conditions and social norms. Furthermore, categorizing people based on chronological age may not be straightforward due to biological, psychological and social dimensions alongside chronological measurement. Therefore, various studies focusing on senior citizens conducted with different age groups such as 50+, 55+, 60+ and 65+ years old (eg. Kowal & Dowd, 2001; Macedo, 2017; Wagner, Hassanein & Head, 2010; Kooij, deLange, Jansen & Dikkers, 2008). In the scope of the present study, the age of 60+ years was considered as senior citizens in line with the

assumption of World Health Organization and Turkish Ministry of Family and Social Policies.

As reported by World Health Organization (WHO), the world population is getting older rapidly as the years passing (2015). As a matter of fact, the elderly population will increase from 900 million to 2 billion between 2015 and 2050; so, senior citizens will comprise 22% of the world population in 2050 (cf. 12% in 2015). Based on those projections, the number of elderly people will be doubled in the next few decades. Therefore, it is necessary to systematically investigate and to take precautions about the potential problems and the needs of the aging society.

2.2. Age-related Changes and Effects of Aging

Age-related changes are associated with several factors, such as sensation, perception, cognition and movement control (Fisk et al., 2009). Sensation refers to awareness about basic senses such as color, odor, and flavor. Sensory processes are broadly classified as taste, smell, haptics, audition, and vision (Fisk et al., 2009). Among those, auditory, visual and haptic capabilities are usually considered more relevant to technology design. Although visual impairments influence the entire population, independent from age, elderly citizens chronically undergo negative impacts of the weakness in visual abilities. Consequently, assistance may be need to prepare for related age-related visual changes.

Due to the effects of aging, elderly may have problems with vision, handicraft, mobility, perception level and selective attention (Demiris, Rantz & Aud, 2004). More specifically, they may experience capability decrease in memory, attention, mobility, vision and perception due to chemical and neurological changes in the brain. Owsley (2011) examines aging effects in spatial contrast sensitivity, vision under low luminance, temporal sensitivity and motion perception, and visual processing speed. According to Owsley, among those changes, vision deterioration is accounted for one of the top chronic situations in company with the diabetes, arthritis and heart disease (American Optometry Association, 2015). Visual impairment in elderly is generally associated with deteriorated visual field, impaired contrast sensitivity, poor visual acuity, self-reported and/or performance based poor, debilitated depth perception and the presence of cataract (Boptom, Cumming, Mitchell & Attebo, 1998; West et al., 2002). Due to the effects of visual impairment, elderly may suffer from falls, limited mobility and difficulty in performing physical activities (Boptom et al., 1998; West et al., 2002, Reed-Jones, Solis, Lawson, Loya, Cude-Islas & Berger, 2013)

Owsley, Ball & Keeton (1995) reports that visual search skills may be deterred by age in elderly, due to the impairment on visual field sensitivity. The results of the study may explain the cause of the widespread complaints of elderly people such that they have difficulty in visual search tasks and mobility issues like falls and vehicle crashes all of which require visual abilities. However, visual field sensitivity may not be the

only determinant factor since visual search processes may be very comprehensive and they depend on attentional skills as well.

According to previous research, aging has a declining effect not only on the visual abilities, but also related functionalities such as selective attention, focusing, concentration and face recognition (Horwood & Beanland, 2016; Konar, Bennett & Sekuler, 2013; Staudinger, Fink, Mackey & Lux, 2011; Wiegand et al., 2015). Moreover, study indicates that senior citizens are also different from younger ones in terms of word identification and reading (Zang et al., 2016). In the study, elderly people had longer fixations and back-and-forth eye movements during the tasks comparing with the younger participants. Furthermore, it is found that elderly citizens were tending to read more slowly and carefully (Zang et al., 2016). Another study demonstrates that the use of technology may be more formidable for elderly people with cognitive impairment (Rosenberg, Kottorp, Winblad, & Nygard 2009). The use of daily technology items like remote controls, cell phones, microwave ovens and medical devices in elderly people may be affected by age-related changes on vision, perception, cognition and attention.

This section presented a review of age-related effects and their implications in daily life from a perspective of physiological, psychological and cognitive basis. The findings in the literature review that senior citizens may experience negative effects of aging. Those age-related changes may have implications for the acceptance of ICT by elderly citizens. Nevertheless, there is not so much study investigating the impact of aging on use of ICT or the constraints of elderly people while using ICT (Macedo, 2017). Therefore, systematic research is necessary to clarify the needs and potential limitations of senior citizens as a requirement of being a developed information society. The following section presents a closer look at the use and acceptance of ICT by senior citizens from a societal perspective.

2.3. Use and Acceptance of ICT by Senior Citizens

Information and communication technologies (ICT) are becoming increasingly essential for every segment of society in terms of accessing information, facilitating communication, getting social services, and so on. ICT covers the tools such as computers, Internet and mobile phones which may be considered compulsory even for daily activities in today's world. As a result, it is inevitable that ICT use should cover all segments of a population, including elderly citizens.

Elderly citizens substantially benefit from ICT in the form of contacting family and friends, reaching necessary information, getting medical or social assistance, utilizing public services and interacting with others (Macedo, 2017). Previous research proposes that technology use may lessen the dependency of seniors to family or caregivers for providing assistance (Mitzner et al., 2010) and enhance elderly people' perceived quality of life (Mynatt & Rogers, 2002).

On the other hand, a common view is that elderly citizens are usually hesitant and worried about using technological devices, such as computers or smart phones, and feel nervous and diffident about their ability to use latest technologies (Laguna & Babcock, 1997; Marquie, Jourdan-Boddaert & Huet, 2002). However, this does not necessarily signify an unfavorable attitude toward technology utilization. Fischer et al. (2014) states that elderly usually fall behind the current technology since they are impeded by limited interaction with technology, thus lacking the development of necessary skills.

The reason behind the limited use of technology by elderly adults go beyond physiological changes, such as aging effects in vision (see the previous section) and societal aspects, such as generational patterns (e.g. generations who never interacted with technology at work due the era in which they lived, Selwyn, 2004). On top of them, the use and acceptance of ICT is closely connected to experience and attitude of elderly citizens in ICT. Nayak, Priest & White (2010) report that absence of a computer, lack of Internet connection and inadequacies in necessary skills are the most common excuses for non-use of ICT by elderly. In fact, most of the elderly have no experience of using computers or internet during their life, which may explain little or no attention towards ICT.

On the other hand, Selwyn (2004) proposes that although occupational necessities often lead people using or learning to use computers, the mandatory use of technology at work does not necessarily mean posterior use in older age. Mitzner et al. (2010) analyzed attitudes of elderly adults toward technology in the context of home, work and healthcare. The results of the study imply that elderly are eager to use technology items despite the common assumption that they are anxious or reluctant use technology.

Hanson (2010) states that there are inequalities between elderly users and younger ones in terms of accessing information and communication technologies such that seniors generally connect information technologies via outdated devices. This may influence the technology adoption of elderly people since old equipment is commonly lacking or limited in functions with respect to up-to-date equipment. Therefore, it is required to provide user-friendly interface designs for elderly, simplified procedures and cost-efficient alternatives for elderly (Fischer et al., 2014). In addition, the usefulness and usability of the provided products are needed to be principally handled in detail. Hanson states that elderly users have a tendency to use technology only if their needs are fulfilled in contrast to younger users who may use technological items in perfunctory manner. These findings reveal the use of ICT by elderly citizens has multiple facets, including physiological, societal and personal aspects.

A systematic investigation of the use and acceptance of ICT by elderly is also more sophisticated than by younger adults due to the wider variety of education level, socio-economic status, and physiological condition (González, Ramírez & Viadel, 2012; Macedo, 2017). Peek et al. (2014) propose that the factors that influence the acceptance of ICT by elderly may be listed as perceived usefulness, perceived easiness, safety and

privacy concerns, costs, perceived need, social influence, and personal traits. In another study, it is proposed that elderly adults' use and acceptance of technology may be influenced by a wide range of issues such as unaffordable costs, lack of basic skills or computer literacy, difficulty in accessing ICT, privacy and security concerns, low self-efficacy and deficiency of user-friendly interfaces (Hanson, 2010). Porter & Donthu (2006) discusses the role of demographics (i.e.; age, gender, education, and race) together with the perceived difficulty and expensiveness to access technology by elderly. Trust and Internet use frequency are also indicated as to affect the behavioral intention of elderly people to use ICT (Braun, 2013). Czaja et al. (2006) points that there is no clear evidence about age-related impairments influence technology adoption; nevertheless, education level, socioeconomic status, perceived benefits of technology, ease of access, provided training and technical support may be the leading factors (Czaja et al., 2006; Czaja & Lee, 2007). To sum up, there is no consensus on the list of factors that influence ICT use of elderly citizens for a systematic study. However, a commonly accepted model is TAM, as introduced below.

2.4. Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM), originally proposed by Davis (1989), is a well-known and widely cited model to clarify and anticipate the effects on technology acceptance of individuals. TAM is based on the ground of the Theory of Reasoned Action (TRA) developed by Fishbein & Ajzen (1975) and Theory of Planned Behavior (TPB) proposed by Ajzen (1991).

Theory of Reasoned Action (TRA) examines the relationship among the attitude and intention to behavior during the course of performing an action. Based on TRA, the action of an individual is predicted by his/her behavioral intention, which is determined by prior attitudes and subjective norms (Fishbein & Ajzen, 1975).

Theory of Planned Behavior (TPB) is the extended version of TRA, which incorporates perceived behavioral control into the model. TPB implies that attitude (feeling or opinion toward target behavior), subjective norms (opinion of the social environment) and perceived behavioral control (perception of the easiness to accomplish behavior) together determine the individual's behavioral intention, as well as the actual behavior (Ajzen, 1991). For example, a person may want to use a smart phone; however, if he does not have sufficient money, or if his social environment does not support using a smart phone and/or he finds it difficult to use a smart phone, then he will probably perform a behavior of not using smart phone. Theory of Planned Behavior (TPB) is illustrated Figure 1.

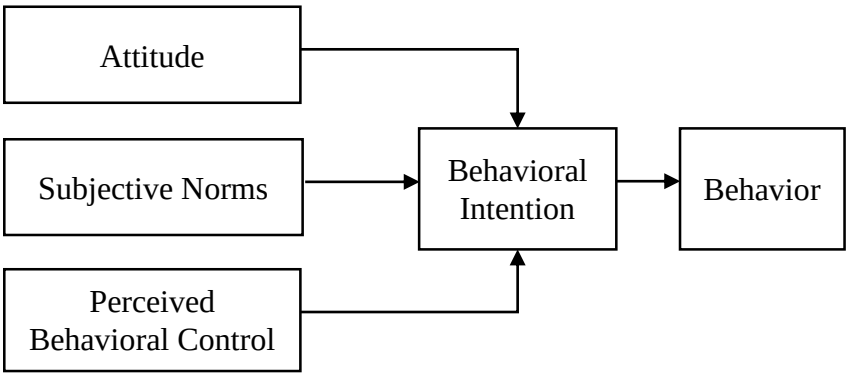


Figure 1. Theory of Planned Behavior (TPB) proposed by Ajzen (1991)

In a similar way, TAM proposes that the actual use is anticipated by behavioral intention, which is determined by the attitude. On the other hand, TAM discusses how attitude and behavioral intention are influenced by perceived usefulness and perceived ease of use together with the external factors. According to TAM, an individual's perceived usefulness and perceived ease of use determine the acceptance of using specific technology or system. *Perceived usefulness* is defined as the subjective opinion of an individual about the use of a new technology (Davis, 1989). *Perceived ease of use*, on the other hand, is expressed as the perception of a person about the easiness of the new technology (Davis, 1989). In particular, if an individual considers a technology or a system as being useful and easy to use, s/he will be more eager to adopt that technology or system.

The relationship between perceived usefulness and perceived ease of use with acceptance of technology has been supported by follow-up studies (Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh et al., 2012). The original Technology Acceptance Model (TAM) is demonstrated in Figure 2.

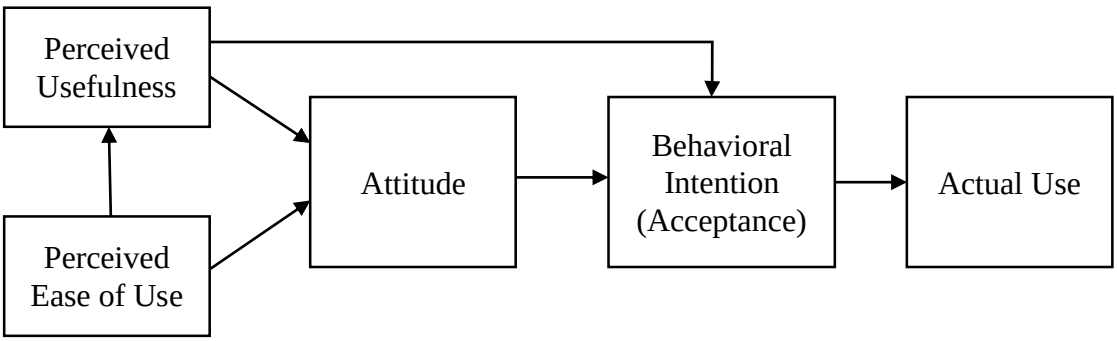


Figure 2. Original Technology Acceptance Model (TAM) by Davis (1989)

After the original TAM, it was used in research with various revisions and extensions, such as TAM2 (Venkatesh & Davis, 2000), TAM3 (Venkatesh & Bala, 2008) and UTAUT - Unified Theory of Technology Acceptance Model (Venkatesh et al., 2003). TAM has been usually extended by adding some other external factors which are supposed to have impact on the acceptance of technology (Davis, Bagozzi & Warshaw, 1989). Among different versions of TAM, the two main constructs affecting technology use, namely perceived usefulness and perceived ease of use, remain the same. However, external factors that influence perceived usefulness and perceived ease of use may change such as social influence, anxiety, facilitating conditions, self-satisfaction, self-efficacy, cost tolerance, perceived enjoyment, experience and so on (Abdullah & Ward, 2016). The final Technology Acceptance Model (TAM) is demonstrated in Figure 3.

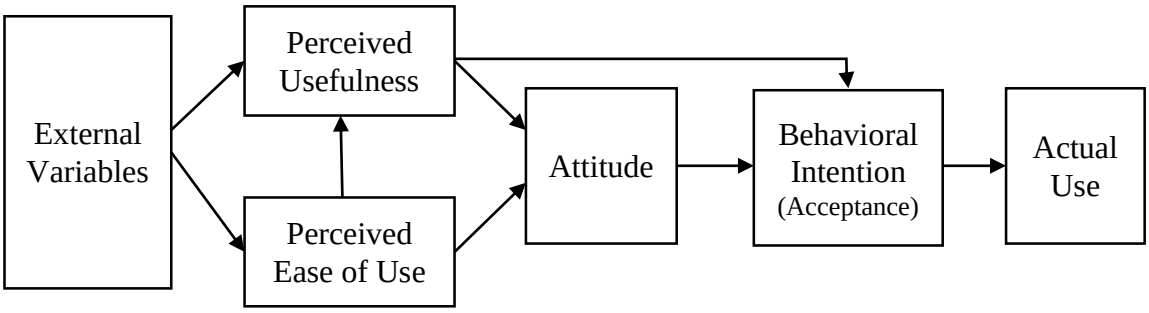


Figure 3. Final Technology Acceptance Model (TAM) by Davis, Bagozzi & Warshaw (1989)

The main focus of TAM is to explain the determinants of technology use with different groups of participants in different contexts. Therefore, TAM is a frequently employed model to systematically investigate the use and acceptance of ICT by elderly people (Macedo, 2017; Peek et al., 2014). Perceived usefulness and perceived ease of use are also proved for elderly to predict the attitude toward using ICT (Porter & Donthu, 2006) and behavioral intention to use ICT (Macedo, 2017). Furthermore, social influence (Chan & Chen, 2016; Macedo, 2017; Pan & Jordan-Marsh, 2010), facilitating conditions (Chan & Chen, 2016; Ma, Chan & Chen, 2016; Macedo, 2017; Pan & Jordan-Marsh, 2010; Peek et al., 2014), anxiety (Chan & Chen, 2016; Peek et al., 2014) and self-satisfaction (Chan & Chen, 2016; Ma, Chan & Chen, 2016; Peek et al., 2014) are common factors that have been reported to have an impact on the acceptance of technology by elderly. The frequently proposed determinants of ICT acceptance by elderly adults in the scope of TAM were summarized in the Table 1.

Table 1. Review of frequently used TAM constructs in studies examining ICT acceptance by elderly

Construct	Definition	Literature
Perceived usefulness	The subjective opinion of an individual about the use of a particular system or technology within the defined context (Davis, 1989).	Braun, 2013; Chan & Chen, 2014; Chung et al., 2010; Heerink et al., 2010; Hoque & Sorwar, 2017; Lian & Yen, 2014; Ma, Chan & Chen, 2016; Macedo, 2017; Magsamen-Conrad et al., 2015; McCloskey, 2006; Nayak, Priest & White, 2010; Niehaves and Plattfaut (2014); Pan & Jordan-Marsh, 2010; Porter & Donthu, 2006; Rámon-Jerónimo et al., 2013;
Perceived ease of use	The perception of a person about the easiness of a particular system or technology while using within the defined context (Davis, 1989).	Braun, 2013; Chan & Chen, 2014; Chung et al., 2010; Heerink et al., 2010; Hoque & Sorwar, 2017; Karahasanovi et al. (2009); Lian & Yen, 2014; Ma, Chan & Chen, 2016; Macedo, 2017; Magsamen-Conrad et al., 2015; McCloskey, 2006; Nayak, Priest & White, 2010; Niehaves and Plattfaut (2014); Pan & Jordan-Marsh, 2010; Porter & Donthu, 2006; Rámon-Jerónimo et al., 2013; Ryu, Kim & Lee, 2009
Attitude	Positive or negative feelings of a person to use a particular system (Venkatesh et al., 2003).	Chan & Chen, 2014; Czaja et al., 2006; Heerink et al., 2010; Ma, Chan & Chen, 2016; Nayak, Priest & White, 2010; Porter & Donthu, 2006
Behavioral Intention	An individual's perception on the possibility of using a particular technology (Venkatesh et al., 2003).	Braun, 2013; Chung et al., 2010; Heerink et al., 2010; Hoque & Sorwar, 2017; Ma, Chan & Chen, 2016; Macedo, 2017; Magsamen-Conrad et al., 2015; Niehaves and Plattfaut (2014); Pan & Jordan-Marsh, 2010; Rámon-Jerónimo et al., 2013; Ryu, Kim & Lee, 2009
Social influence	An individual's perception on the opinions of social environment for his/her	Braun, 2013; Chan & Chen, 2014; Heerink et al., 2010; Hoque & Sorwar, 2017; Karahasanovi et al. (2009); Lian & Yen, 2014; Macedo, 2017; Magsamen-Conrad

	use of particular system (Venkatesh et al., 2003).	et al., 2015; Niehaves and Plattfaut (2014); Pan & Jordan-Marsh, 2010
Facilitating conditions	An individual's anticipated extent of the resources (e.g. money, knowledge, assistance) to support for using a system (Venkatesh et al., 2003).	Chan & Chen, 2014; Heerink et al., 2010; Hoque & Sorwar, 2017; Lian & Yen, 2014; Ma, Chan & Chen, 2016; Macedo, 2017; Magsamen-Conrad et al., 2015; Niehaves and Plattfaut (2014); Pan & Jordan-Marsh, 2010; Ryu, Kim & Lee, 2009
Anxiety	An individual's concerns about using a particular system (Venkatesh et al., 2003).	Chan & Chen, 2014; Czaja et al., 2006; Heerink et al., 2010; Hoque & Sorwar, 2017; Karahasanovi et al. (2009); Phang et al., 2006; Peek et al., 2014; Ryu, Kim & Lee, 2009
Self-satisfaction	An individual's beliefs about his/her fulfillment of herself/himself while using technology (Park et al. 2013).	Ma, Chan & Chen, 2016; Peek et al., 2014; Wang, Rau & Salvendy, 2011
Demographics	Characteristics such as age, education level, socio-economic status, race, experience and so on.	Chung et al., 2010; Czaja et al., 2006; Nayak, Priest & White, 2010; Lian & Yen, 2014; McCloskey, 2006; Pan & Jordan-Marsh, 2010; Porter & Donthu, 2006; Ryu, Kim & Lee, 2009

In spite of its popularity and widespread use, TAM is also criticized for its limitations. A major critique is about TAM's prediction of actual use based on self-reported answers which may be biased or distorted by several other factors (Bagozzi, 2007; Lee, Kozar & Larsen, 2003). TAM is criticized for overlooking the social acknowledgement changing by continuous development of ICT as the years passing (Benbasat & Barki, 2007). Moreover, results of TAM may differ considering the voluntary or mandatory choice of an individual about using a system or technology (Yousafzai, Foxall & Pallister, 2007). Despite the critics, TAM is still the most widely accepted model to explain technology acceptance and adoption despite the criticisms for the limitations. TAM explains how perceived usefulness and easiness of systems influence technology use taking into account of other external variables such as social and personal characteristics. Therefore, the present study was designed based on the TAM and the results were analyzed in the framework of this model. The implications of the present study are supposed to make a significant contribution for evolution of TAM with different samples and in different contexts.

The following section presents an overview of the demographics of senior citizens in Turkey and preliminary information about their ICT use.

2.5. Senior Citizens in Turkey and Their Use of ICT

Based on the statistics published by Turkish Statistical Institute, the elderly population who are 65+ years old is reported as 6,651,503 people in 2016 (TurkStat, 2017). This represents 8.3% of overall Turkish population while that was 7.5% in 2012. Along with the increase in the world elderly population, the number of elderly adults is rising in Turkish population and this population is expected to grow faster in the next decades. In particular, elderly were reported to form 8.7% of the world population in 2016 (TurkStat, 2017). The top three countries with highest number of elderly population are Monaco (31.3%), Japan (27.3%) and Germany (21.8%). Turkey was the 66th country among 167 countries in terms of the ratio of elderly population in the society (USCB, 2016).

As the society is getting older, the number of elderly internet users (age of 65-74) is growing such that they represent 8.8% of the total population in 2015 while it was 3.6% in 2012 (TurkStat, 2017). The proportion of elderly males (12.5%) is larger than the proportion of elderly females (5.8%) (TurkStat, 2017).

A closer look at social relationships reveals that 22.5% of the total household population lives together with at least one elder person at home. Moreover, the proportion of elderly households living alone in total households is 5.4% and in total one person households is 36.0% in 2014 (TurkStat, 2017). The results show that almost half of the citizens living alone are formed by elderly people. The Turkish elderly adults are reported to consider their entire family (64.2%), their children (18.1%), their spouse (6.9%) and their grandchildren (6.4%) as source of happiness (TurkStat, 2017). Elderly adults are anxious to be a burden to their children (92%), having illnesses (85%) and requiring continuous care from others (83%) respectively (National Geographic Turkey, 2012). The average life span of Turkish people increased, according to the findings of the Turkish Gerontology Atlas Research (Tufan, 2009). The average lifespan is 59 years for men and 63 years for women in 1990, while it is 69 years for men and 73 years for women in 2012 (National Geographic Turkey, 2012). On the other hand, the age dependency of elderly adults (age of 65+) in Turkey is 8.8% in 2000 while it becomes 12.3% in 2016 (TurkStat, 2017). Those findings indicate that as an aging society, the dependency of senior citizens would be going up if they are not provided with the assistance to be able facilitate their daily activities by themselves. Accordingly, an increase in ICT use of elderly citizen has the potential to increase the quality of life of elderly population in the society through improving the relationship with the family, as well as improving individual independence and inclusion in the society.

Information and Communication Technologies (ICT), especially computers and cell phones, may contribute increasing the quality of life through providing independence in certain tasks. On the other hand, a close look at daily activities reveals that elderly adults usually spend time with watching television (93%), having chat with friends or family (55%) and listening to radio (48%) (National Geographic Turkey, 2012). Moreover, technological devices that Turkish elderly citizens have involve washing

machine, vacuum cleaner, dishing machine, refrigerator and television (Hazer & Kılınç-Sökmen, 2009). The majority of the elderly people have difficulties in using ICT in an efficient way in everyday tasks, recently (TurkStat, 2017).

Turkey is a developing country, and as in many other developing countries, it has been making efforts to digitalize government services (e.g., e-Government Gateway). Not only public institutions but also private organizations have been converting services and information they provide. Nevertheless, widely used services, such as e-government websites are usually criticized for lacking usability and accessibility features (Akgul & Vatansever, 2016; Durmus, 2012; Guner & Inal, 2015; Kurt, 2011). Recently, more systematic research and development are necessary to improve digitization for the use of elderly citizens. For a systematic study of the ICT needs of elderly citizens, the present study employs the Technology Acceptance Model (TAM), which is presented in the following section.

In this chapter, the scientific foundation of the present study was described within the framework of the relevant literature. The aging society and the situation of senior citizens in information era were discussed based on the statistics and research conducted in literature. Age-related changes to which senior citizens may experience and the effects of aging that may be influential on the use of technology were described with the findings of previous studies. As a requirement of modern times, it was examined that how the use of information and communication technologies (ICT) have an impact on the lives of senior citizens. Besides, the research investigating the use and acceptance of ICT by elderly population was presented. Since the present study focuses on the use and acceptance of ICT by Turkish senior citizens, the demographic information and present conditions of elderly population in Turkey was reviewed. Finally, the Technology Acceptance Model (TAM) proposed by Davis (1989) was explained by reviewing the prior research. Given those systematical review of the literature, the methodology of the present study was presented in the following chapter.

CHAPTER 3

METHODOLOGY

The research design of the study, hypotheses with conducted research model, brief description about participants, instrument utilized in the study, data collection procedure and data analysis methods are explained in this chapter.

3.1. Research Design

The present study mainly aims to investigate the acceptance and use of information and communication technologies (ICT) by senior citizens and its comparison with younger adults. First of all, the literature review was done related with the technology acceptance model, use of ICT by elderly and demographics of Turkish senior citizens. The studies conducted with elderly population were examined to determine the hypotheses and to form the research model. Since there are few studies related with ICT use of senior citizens in Turkey, the research was decided to principally focus on information and communication technologies use of Turkish elderly people. To extend the scope of the study, the younger adults between 19-40 years old were also determined to be included into the research for comparison with elderly adults.

Second, research model and hypotheses of the research were established after the literature review. Then, the instrument of the study was formed based on the Technology Acceptance Model originally developed by Davis (1989). The research model and instrument development process are explained in the following sections.

After the instrument was set up, the data collection process was started by applying the instrument with elderly and younger adults. The instrument was distributed through various environments including nursery houses, associations for retired people, public gardens, social media platforms, university e-mail groups.

Following the data collection period, all the data were transcribed and coded to conduct the statistical analyses. Demographic data and answers to descriptive questions were investigated and compared between the two groups (elderly citizens and younger adults). The questions that form the technology acceptance model were analyzed separately. Normality, reliability and validity of the questionnaire were tested by

examining skewness and kurtosis values; Cronbach's Alpha coefficient and results of factor analysis. The structural equation model was applied to test hypotheses of the study.

3.2. Hypotheses and Research Model

The principal goal of this research is to establish a model to analyze use and acceptance of ICT by senior citizens and its comparison with younger population. Therefore, the same questionnaire was applied for elderly and younger participants separately. The findings were analyzed with same methods and results were compared to interpret the determinants for use and acceptance of ICT by elderly population.

Technology Acceptance Model (TAM) proposed by Davis (1989) is a commonly used model to explain and predict the acceptance of technology. The use and acceptance of ICT by senior citizens has also been examined based upon the TAM by recent studies (e.g., Braun, 2013; Nayak, Priest & White, 2010; Ma, Chan & Chen, 2016; McCloskey, 2006; Pan & Jordan-Marsh, 2010). In accordance with TAM, the principal factors that influence the individuals' use and acceptance of information and communication technologies are identified as perceived usefulness and perceived ease of use (Davis, 1989; Venkatesh & Davis, 2000) with other external variables such as social influence, anxiety, facilitating conditions and self-satisfaction (Venkatesh, Morris, Davis, & Davis, 2003; Ma, Chan & Chen, 2016).

"Perceived usefulness" is defined as the subjective opinion of an individual about the use of a particular system or technology within the defined context (Davis, 1989). On the other hand, "*perceived ease of use"* is described as the perception of a person about the easiness of a particular system or technology while using within the defined context (Davis, 1989). Perceived usefulness and perceived ease of use are accepted as two main constructs affecting the attitude (Davis, 1989; Yang & Yoo, 2004) and the behavioral intention (Venkatesh & Davis, 2000) to use ICT. That is, the more ICT is perceived as useful and easy to operate; the more positive effect on acceptance by users. In case of senior citizens, it is also supported that perceived ease of use and perceived usefulness predict the intention (Braun, 2013; Macedo, 2017) as well as attitude (Kim, Chun & Song, 2009; Porter & Donthu, 2006) on using ICT. Moreover, Venkatesh (2002) proposes that perceived ease of use directly influence perceived usefulness considering the easy use of a system contributes its usefulness. Considering those findings, the related hypotheses were formed as follows:

H1.1: Perceived usefulness (PU) has a positive impact on attitude towards using (ATU).

H1.2: Perceived usefulness (PU) has a positive impact on behavioral intention (BI).

H2.1: Perceived ease of use (PEOU) has a positive impact on perceived usefulness (PU).

H2.2: Perceived ease of use (PEOU) has a positive impact on attitude towards using (ATU).

H2.3: Perceived ease of use (PEOU) has a positive impact on behavioral intention (BI).

"Attitude towards using" is defined as positive or negative feelings of a person to use a particular system (Venkatesh et al., 2003). Davis (1989) proposes attitude as a predictor of behavioral intention for technology use. Although, attitude construct is excluded from some of the subsequent models (Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh et al., 2012), recent studies have found that attitude significantly predicts the intention (e.g. Kim, Chun & Song, 2009; Park, 2009; Vijayasarathy, 2004; Yang & Yoo, 2004). A person's feelings and opinions may be influential on his/her intention. Therefore, the attitude was included in this research and the following hypothesis was formed:

H3: Attitude towards using (ATU) has a positive impact on behavioral intention (BI).

"Social influence" is defined as an individual's perception on the opinions of social environment for his/her use of particular system (Venkatesh et al., 2003). In other words, social influence is about the impact of others such as family members, friends, relatives or people whose point of view is seen worthwhile. Social influence also found as a component to affect perceived usefulness and perceived ease of use (Lu, Yao & Yu, 2005) which are two main constructs deciding technology acceptance. That is, if other people whose viewpoints are valued support or encourage someone for using ICT, his/her perception toward a system in terms of usefulness and easiness may be positively affected. Considering those findings, the related hypotheses were formed as follows:

H4.1: Social influence (SI) has a positive impact on perceived usefulness (PU).

H4.2: Social influence (SI) has a positive impact on perceived ease of use (PEOU).

"Facilitating conditions" is defined as an individual's anticipated extent of the resources to support for using a system (Venkatesh et al., 2003). In the present study, facilitating conditions are described as the person's belief about the costs; namely money, knowledge and assistance, s/he needs to afford to use ICT. Since people may need money to possess a technology; require knowledge to use that technology and ask for assistance to learn using, facilitating conditions may be influential factor on

acceptance of ICT. That is, facilitating conditions positively contributes perceived usefulness and perceived ease of use (Ma, Chan & Chen, 2016; Teo, 2009; Agudo-Peregrina et al., 2014). Considering those findings, the related hypotheses were formed as follows:

H5.1: Facilitating conditions (FC) has a positive impact on perceived usefulness (PU).

H5.2: Facilitating conditions (FC) has a positive impact on perceived ease of use (PEOU).

"Anxiety", in the context of ICT use for the present study, is defined as an individual's concerns about using a particular system (Venkatesh, 2000; Venkatesh et al., 2003). Anxiety about using technology may cause from the individual's fear of making mistakes or losing information due to his/her wrong actions. As anxiety increases, the perception of a person about the effort s/he needs to use this system will increase so that the perceived easiness of system use will be negatively affected. Moreover, anxiety may diminish the experience of use which will lead to an adverse influence on perceived usefulness. The significant impact of anxiety on perceived usefulness (Park, Son & Kim, 2012; Purnomo & Lee, 2013) and perceived ease of use (Park, Son & Kim, 2012; Venkatesh & Bala, 2008) have been supported by research. Considering those findings, the related hypotheses were formed as follows:

H6.1: Anxiety (ANX) has a negative impact on perceived usefulness (PU).

H6.2: Anxiety (ANX) has a negative impact on perceived ease of use (PEOU).

"Self-satisfaction", in the context of ICT use for the present study, is defined as an individual's beliefs about his/her fulfillment of herself/himself while using technology (Park et al. 2013). If a person feels satisfied with his/her own while using a system, s/he will be more intending to use and gain increasing experience. As a result, usefulness and easiness of system perceived by user may be affected in a positive way (Abdullah, Ward & Ahmed, 2016; Joo, Lim & Kim, 2011; Park, 2009). Considering those findings, the related hypotheses were formed as follows:

H7.1: Self-satisfaction (SS) has a positive impact on perceived usefulness (PU).

H7.2: Self-satisfaction (SS) has a positive impact on perceived ease of use (PEOU).

According to TAM, perceived usefulness and perceived ease of use, two principal determinants of system use, are influenced by outside factors named *external variables* (Davis, 1989). Various studies are conducted to examine the impact of different external variables in different contexts (Abdullah, Ward & Ahmed, 2016). Among those external variables, social influence, anxiety, facilitating conditions and self-satisfaction were included in the present study because those are most commonly used factors studied with elderly population (Ma, Chan & Chen, 2016; Macedo, 2017). Moreover, perceived usefulness and perceived ease of use are proposed to be the predictors for attitude and behavioral intention of users (Davis, 1989). Attitude factor

is omitted from the model in some of the extended TAM studies because the construct is not found significant determinant of system use for selected sample (Venkatesh & Davis, 2000; Venkatesh et al., 2003). However, many studies recently supported the importance of attitude to predict behavioral intention and system use (e.g. Kim, Chun & Song, 2009; Park, 2009; Vijayasarathy, 2004; Yang & Yoo, 2004). Therefore, attitude is not excluded from the original TAM model in the scope of the present study. The research model is demonstrated in Figure 4.

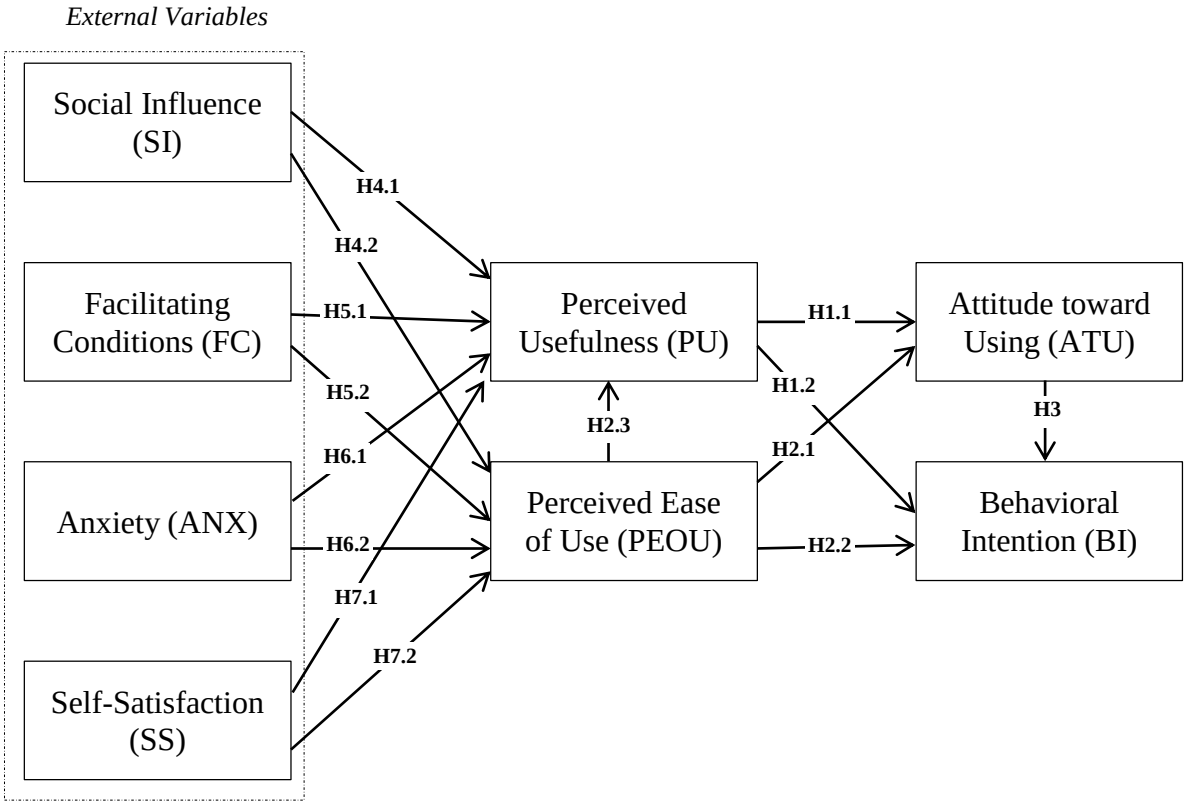


Figure 4. Research model

3.3. Instrument

The instrument of the present study consists of three main parts, namely demographics, TAM questionnaire and open-ended items. In the first part; that is, demographics, participants were asked about their age, gender, education status, occupation, monthly income, residence, daily activities, ICT use, duration of ICT use, activities performed by using ICT and social media use. With this demographic data, it is aimed to precisely describe the sample and give a snapshot of current situation of participants.

The second part of the instrument is adopted from the previous research of TAM in which the scale and items were used and validated (Davis, 1989; Venkatesh et al.,

2003; Park et al. 2013). This part comprises 25 questions of 7-point Likert scale such that "1" indicated "strongly disagree", "2" indicated "disagree", "3" indicated 'somewhat disagree', "4" indicated "neutral", '5' indicated "somewhat agree", "6" indicated "agree", and "7" indicated "strongly agree". Since the TAM questionnaire is published in English, all the items were translated into Turkish from three different professional translators. Those three different translations were examined by subject experts and a single Turkish version of the questionnaire was generated. The items and the related literature are given Table 2.

Table 2. Constructs and hypotheses of study

Construct	Items	Source
Perceived Usefulness (the subjective opinion of an individual about the use of a particular system or technology within the defined context (Davis, 1989))	**PU1:** "Using ICT would enable me to accomplish my daily life activities more quickly." **PU2:** "Using ICT would enhance my effectiveness on daily life." **PU3:** "Using ICT would make it easier to do my daily life activities." **PU4:** "I would find ICT useful in my daily life activities."	Davis, 1989; Venkatesh et al., 2003
Perceived Ease of Use (the perception of a person about the easiness of a particular system or technology while using within the defined context (Davis, 1989))	**PEOU1:** "Learning to use ICT would be easy for me." **PEOU2:** "I would find it easy to get ICT to do what I want it to do." **PEOU3:** "I would find ICT easy to use."	Davis, 1989; Venkatesh et al., 2003
Attitude toward Using (positive or negative feelings of a person to use a particular system (Venkatesh et al., 2003))	**ATU1:** "Using ICT is a good idea." **ATU2:** "Using ICT is enjoyable." **ATU3:** "I like using ICT."	Venkatesh et al., 2003
Social Influence (an individual's perception on the opinions of social environment for his/her use of particular system (Venkatesh et al., 2003))	**SI1:** "People who influence my behavior think that I should use ICT." **SI2:** "People who are important to me think that I should use ICT." **SI3:** "People whose opinions are valuable for me prefer me to use ICT."	Venkatesh et al., 2003

Facilitating Conditions (an individual's anticipated extent of the resources to support for using a system (Venkatesh et al., 2003))	**FC1:** "I have the money necessary to use ICT." **FC2:** "I have the knowledge necessary to use ICT." **FC3:** "A specific person (or group) is available for me to give assistance with difficulties of ICT use."	Venkatesh et al., 2003
Anxiety (an individual's concerns about using a particular system (Venkatesh, 2000; Venkatesh et al., 2003))	**ANX1:** "I feel apprehensive about using ICT." **ANX2:** "It scares me to think that I could lose a lot of information due to a wrong operation while using ICT." **ANX3:** "I hesitate to use ICT for fear of making mistakes I cannot correct." **ANX4:** "Using ICT is somewhat intimidating to me."	Venkatesh et al., 2003
Self-satisfaction (an individual's beliefs about his/her fulfillment of herself/himself while using technology (Park et al. 2013))	**SS1:** "Using ICT makes me feel younger." **SS2:** "Using ICT increases my sense of achievement." **SS3:** "ICT help me to keep pace with the times."	Park et al. 2013
Behavioral Intention (an individual's perception on the possibility of using a particular technology (Venkatesh et al., 2003))	**BI1:** "I intend to use ICT more in my daily life." **BI2:** "I plan to use ICT more in my daily life."	Venkatesh et al., 2003

The third part of the questionnaire involves two open-ended questions asking for the opinion of participants about ICT and the use of ICT by elderly/younger adults. This part of the questionnaire was optional and was answered by only participants who wanted explain his/her thoughts in detail.

After the instrument was formed, a pilot study was conducted with five participants to analyze whether the questionnaire could be understood by senior citizens as intended. Based on the comments of the pilot participants, the instrument was reviewed once more with the assistance of a measurement and evaluation specialist. The questionnaire was put into the final form after revising misunderstood words and syntax errors.

Before applying the instrument, the ethical clearance was taken from Research Center for Applied Ethics at METU. The Turkish version of the instrument is given in Appendix A and the English version of the instrument is given in Appendix B.

3.4. Data Collection and Participants

All of the participants were chosen voluntary-based and randomly from public places. In general, senior citizens were reached via nursery houses, associations for retired people and public gardens. On the other hand, younger adults were mainly reached through social media accounts, e-mail groups and announcement in public places. All participants were given a consent form before they started to fill the instrument.

Based on the preference of senior citizens, the instrument was applied with the help of the researcher. That is, the researcher read the questions explicitly, she noted down the answers of the participant and she confirmed the given answer by repeating after writing. Senior citizens who preferred to fill the questionnaire on their own were only guided if they wanted to ask any question related with the explanation of the instrument items. All of the younger participants filled the questionnaire by themselves after the instructions given by researcher.

The range for the ages of the participants was determined 60+ years old for elderly adults and 18-40 years old for younger adults. The participants out of this range are not included any of the analysis. After the out-of-range data is excluded, the participants of the present study are 232 elderly adults (aged 60-96; $M = 66.60$, $SD = 6.22$) and 235 younger adults (aged 19-40; $M = 29.80$, $SD = 4.98$). Elderly participants were 97 female (41.81%) and 135 male (58.19%) while younger adults were 110 female (46.81%) and 125 male (53.19%).

All the demographic data and descriptive information about participants are reported in the Results chapter.

3.5. Data Analysis

Structural Equation Model (SEM) is used to test the hypotheses in the present study since SEM is commonly used and accepted to analyze behavioral data in information science (Gefen, Straub, & Boudreau, 2000). SEM has been also widely used in the studies that examine TAM (e.g. Al-Gahtani, 2016; Burton-Jones & Hubona, 2006; Kim, Chun & Song, 2009; Ma, Chan & Chen, 2016; Macedo, 2017; Park, Son & Kim, 2012).

In SEM, the significance of the relationships between multiple independent and dependent factors is inspected. SEM indicates connections between constructs of a model with hierarchical or non-hierarchical and recursive or non-recursive structural equation methods. SEM has two main approaches as component-based SEM which demonstrates variance and covariance-based SEM which explain the appropriateness

of observed covariance with hypothesized covariance (Sarstedt et al., 2014). In the present study, partial least square (PLS), a prediction-oriented and component-based SEM method, was chosen since the aim of current research is to predict the effects of constructs among each other with a somewhat complicated model (Roldán & Sánchez-Franco, 2012; Sarstedt et al., 2014).

Partial Least Squares - Structural Equation Model (PLS-SEM) consists of the assessment of measurement model and assessment of structural model (Gefen, Straub, & Boudreau, 2000). The measurement model explains the theoretical background of how measured constructs are put together to form a research model while structural model signifies the relationship between measured constructs in the research model.

In the scope of the present study, statistical software IBM Statistical Package for Social Sciences (SPSS 20) was used to test reliability, normality and explanatory factor analysis of the construct. On the other hand, the structural model was analyzed with the Partial Least Squares Structural Equation Model (PLS-SEM) software SmartPLS 3.2.6 due to its easy to use interface. The remaining descriptive and demographic data were examined with a combination of software MS Excel 2010 and IBM SPSS 20.

CHAPTER 4

RESULTS

In this chapter, the findings of the study and results of the statistical analyses were reported. First, the descriptive data gathered from the demographic part of questionnaire was explained and compared between two groups of participants, namely elderly and younger adults. In this section, the data about the participants' age, gender, education status, occupation, monthly income, residence, daily activities, ICT use, duration of ICT use, activities using ICT and social media use were examined. Second, the 25 items building TAM questionnaire were analyzed based on the partial least squares structural equation model (PLS-SEM). The validity and reliability of the constructs were analyzed to test the measurement model. Based on the PLS-SEM, hypotheses were tested and the research model took its final form. Hypotheses were tested separately for elderly and younger adults to see the difference in the research model among two groups. The observed research models for two groups were compared with the original TAM model. Finally, answers given to the open-ended questions were examined with content analysis method to reveal common patterns and frequencies of responses. Sample phrases were also given to represent the opinions of participants more precisely

4.1. Descriptive Analysis and Demographic Data

The questionnaires were collected from 235 younger adults (aged 19-40; $M = 29.80$, $SD = 4.98$) and 232 senior citizens (aged 60-96; $M = 66.60$, $SD = 6.22$). Among participants, 97 female (41.81%) and 135 male (58.19%) were senior citizens while 110 female (46.81%) and 125 male (53.19%) were younger adults. The gender distribution of the participants is given in Figure 5.

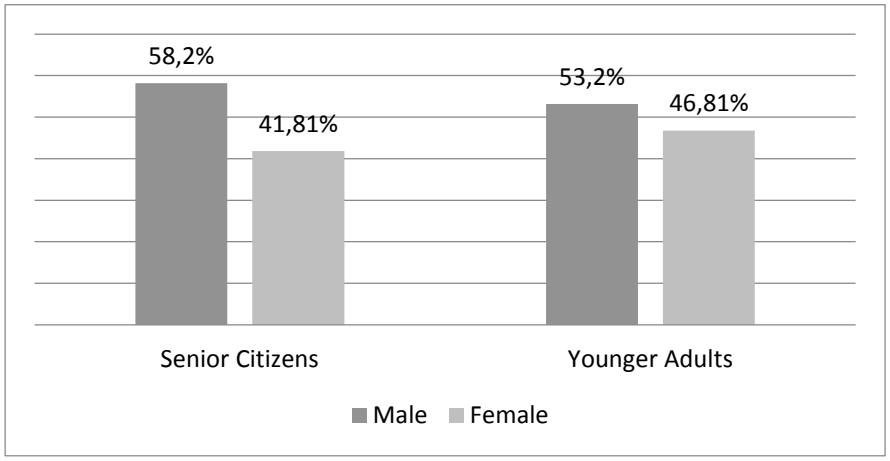


Figure 5. The gender distribution of the participants

The age of senior citizens varied in the range of 60-96 years old. 110 participants were in the range 60-64 years old; 67 participants were in the range of 65-69 years old; 27 participants were in the range of 70-74 years old; 15 participants were in the range of 75-79 years old; 13 participants were over 80 years old. The age distribution of the senior citizens is shown in Figure 6.

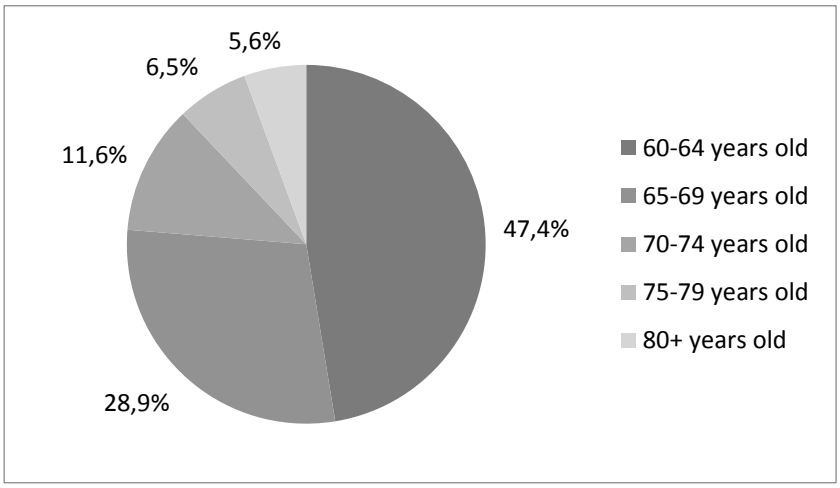


Figure 6. The age distribution of the senior citizens

The age of younger adults varied in the range of 19-40 years old. 25 participants were in the range 19-24 years old; 103 participants were in the range of 25-29 years old; 61 participants were in the range of 30-34 years old; 46 participants were in the range of 35-40 years old. The distribution of the younger adults is shown in Figure 7.

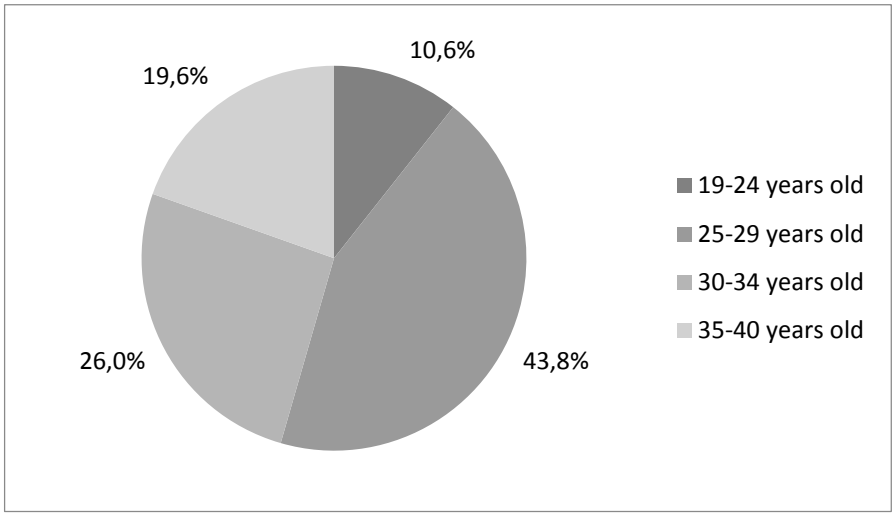


Figure 7. The age distribution of the younger adults

The education level of the senior citizens varied from literate to master degree. 20 participants were literate; 28 participants had primary school degree; 7 participants had secondary school degree; 73 participants had high school degree; 93 participants had bachelor's degree, 11 participants had postgraduate degree.

The education level of the younger adults varied from high school degree to master degree. 23 participants had high school degree; 125 participants had bachelor's degree, 87 participants had postgraduate degree. The education level of the participants is shown in Figure 8.

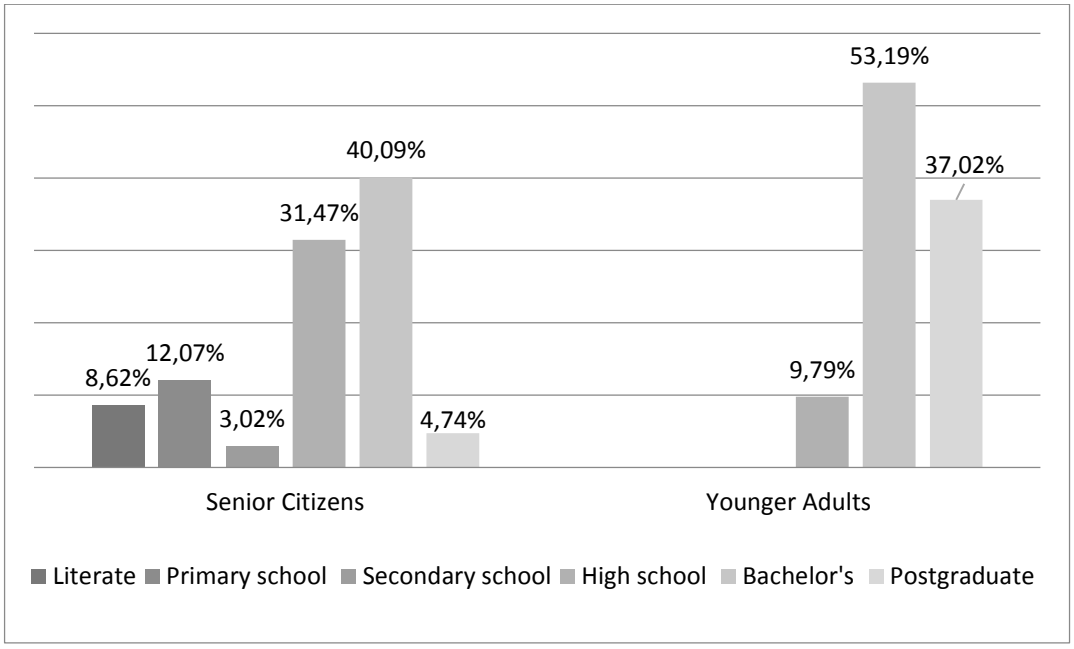


Figure 8. The education level of the participants

The monthly income of the senior citizens was asked in the questionnaire. According to the answers, 14 of the participants had no income; 7 of the participants had monthly income less than 1000 TL; 66 of the participants had monthly income between 1000 and 2000 TL; 48 of the participants had monthly income between 2000 and 3000 TL; 97 participants had monthly income more than 3000 TL (1 TL = 0.2842 USD = 0.2417 EUR on August 19, 2017).

The monthly income of the younger adults was also asked in the questionnaire. According to the answers, 20 of the participants had no income; 15 of the participants had monthly income less than 1000 TL; 26 of the participants had monthly income between 1000 and 2000 TL; 26 of the participants had monthly income between 2000 and 3000 TL; 148 participants had monthly income more than 3000 TL. The monthly income of the participants is shown in Figure 9.

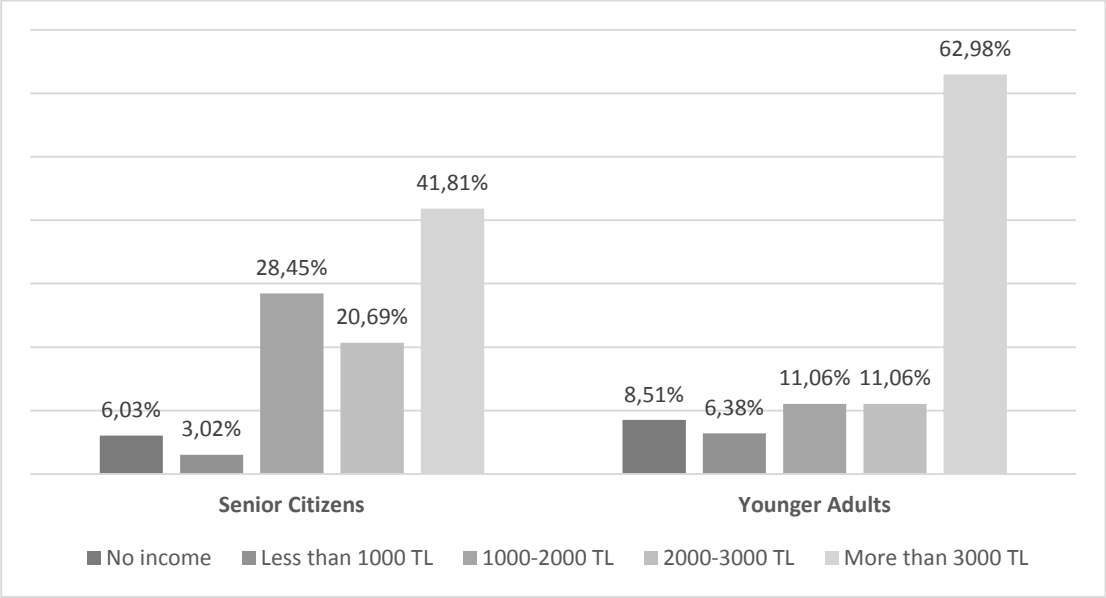


Figure 9. The monthly income of the participants

According to the questionnaire results, 20 of the senior citizens lived alone; 182 of the senior citizens lived with his/her spouse; 17 of the senior citizens lived with their children; 3 of the senior citizens lived with their relatives; 10 of the senior citizens lived in a nursing home. The residence distribution of the elderly participants is given in Figure 10.

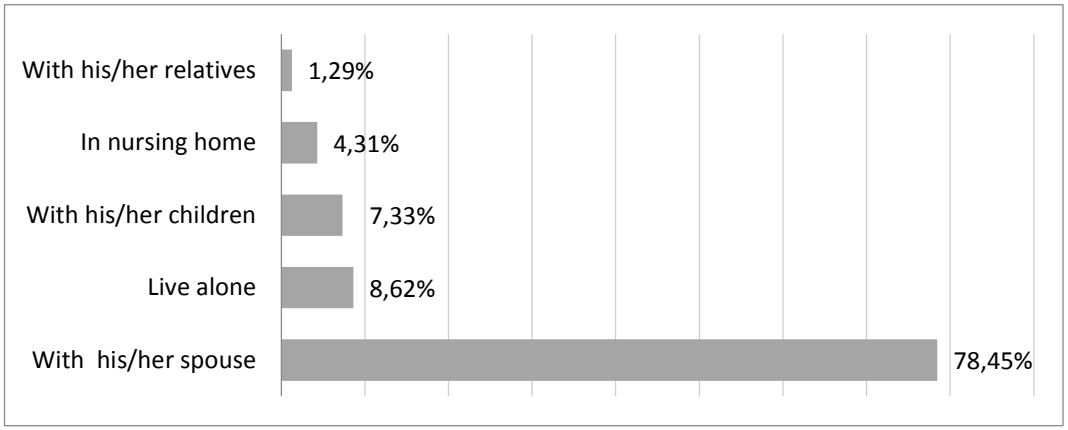


Figure 10. The distribution of senior citizens based on their residence

According to the questionnaire results, 34 of the younger adults lived alone; 16 of the younger adults lived with their friend(s); 113 of the younger adults lived with their spouse and/or their children; 70 of the younger adults lived with their family (parents and/or siblings); 2 of the younger adults lived in a dormitory. The residence distribution of the younger participants is given Figure 11.

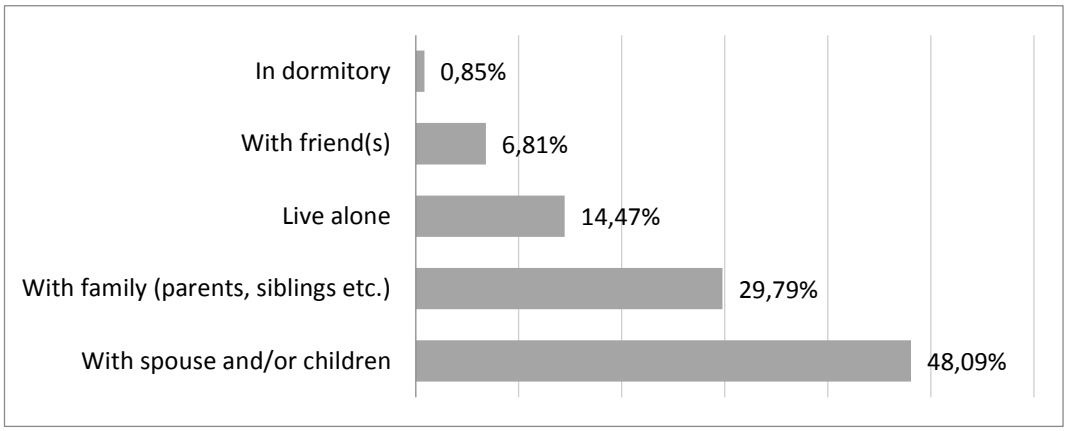


Figure 11. The distribution of younger adults based on their residence

All of the participants were asked what kind of activities they are doing in their daily life. More than half of the senior citizens stated that they were watching TV as the most common activity. The other reported daily activities were chatting with spouse/family, spending time with friends, reading book, reading newspaper/magazine, walking around, praying, looking after their grandchildren, attending courses/seminars, having a nap, dabbling in artistic activities like music and painting, and other activities (Doing sports, working in a job, involving in NGO activities etc.). The distribution of given answers for senior citizens are showed in Figure 12.

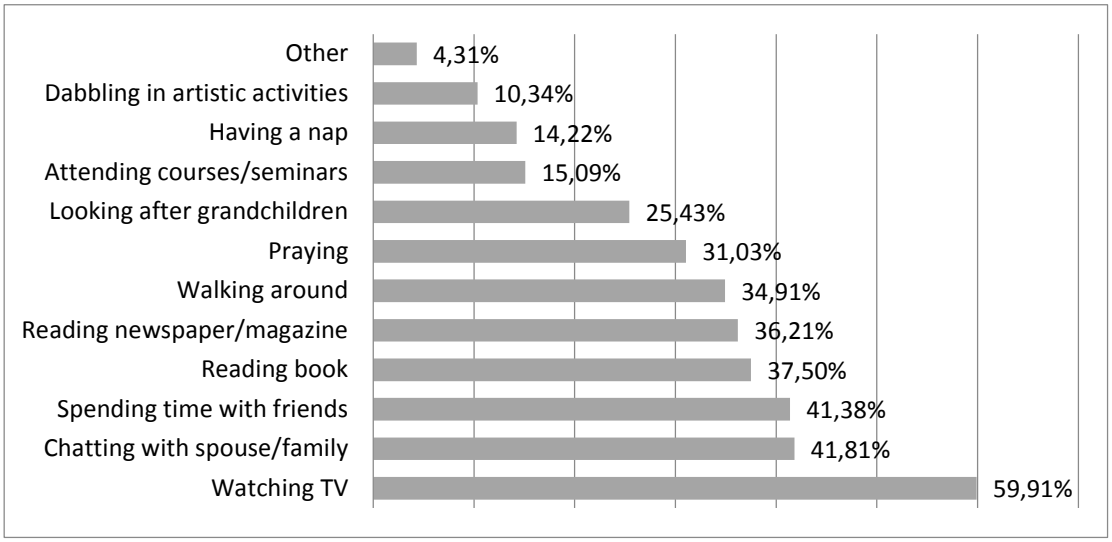


Figure 12. The daily life activities of senior citizens

On the other hand, most of the younger adults stated that they spend time by working in a job. The other reported daily activities were chatting with spouse/family, spending time with friends, studying, reading book, watching TV, having a nap, walking around, reading newspaper/magazine, dabbling in artistic activities like music and painting, attending courses/seminars, playing PC games, looking after children and housekeeping and other activities (going to the cinema/theatre, doing sports etc.). The distribution of given answers for younger adults are showed in Figure 13.

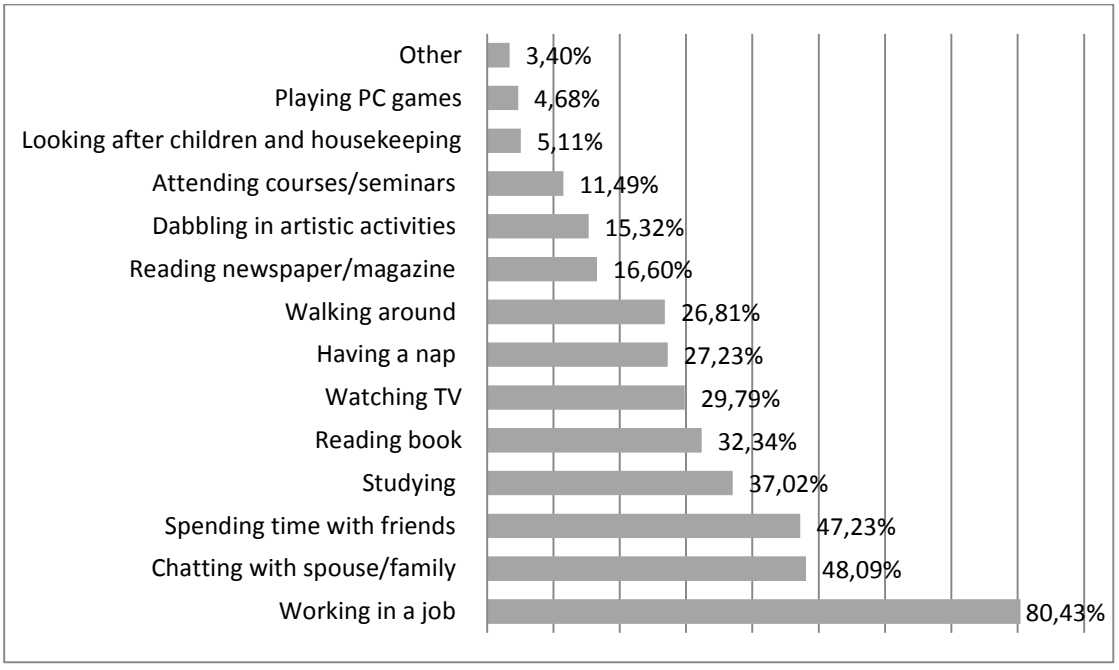


Figure 13. The daily life activities of younger adults

Among the senior citizens who participated in the study, 216 (93.1%) of them expressed that they use information technologies in their daily life while 16 (6.9%) of them expressed that they don't use any of the information technologies. On the other hand, all of the 235 (100%) younger adults involved in the study used information technologies in their daily life. The ICT use of participants are demonstrated in Figure 14.

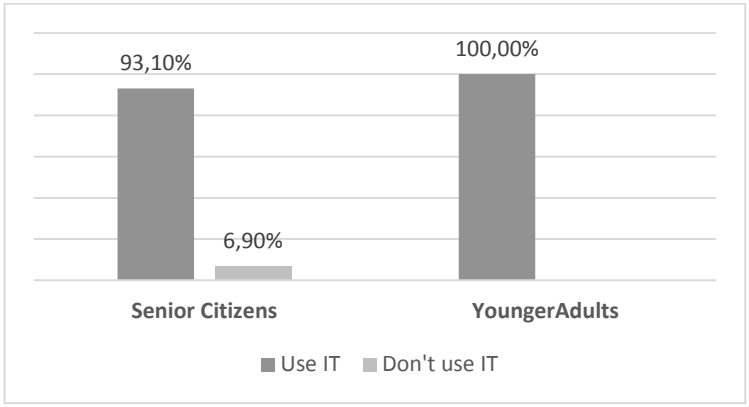


Figure 14. The ICT use of the participants

Among the senior citizens who used information technologies, 160 of them used smart phone; 149 of them used Internet; 119 of them personal computer; 69 of them used tablet computer; 60 of them used non-smart mobile phone. On the other hand, among the younger adults who used information technologies, 233 of them used smart phone; 235 of them used Internet; 231 of them used personal computer; 135 of them used tablet computer; 2 of them used non-smart mobile phone. The distribution of participants based on their technology use is given in Figure 15.

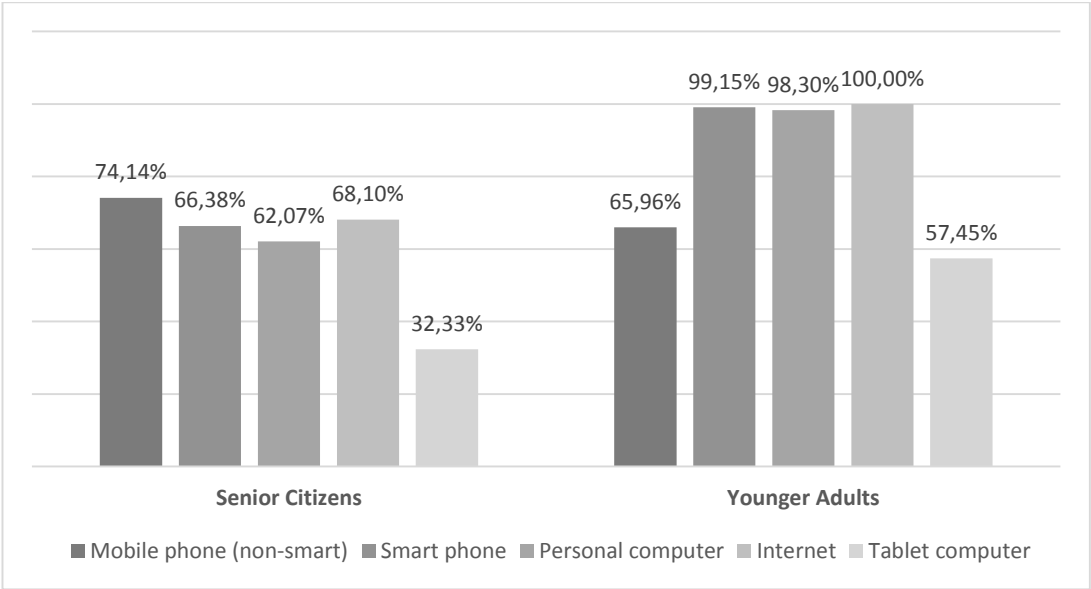


Figure 15. The distribution of participants based on ICT use

The participants stated how many years they have been using information technologies. The distribution of senior citizens based on the duration of their technology use is given in Figure 16.

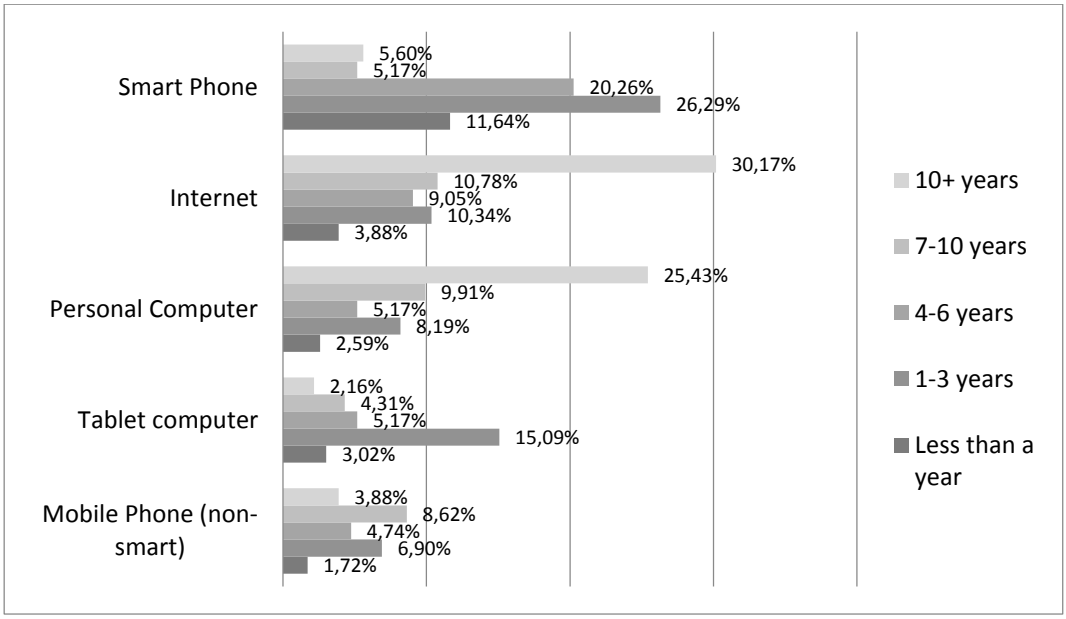


Figure 16. The duration of ICT use by senior citizens

The distribution of younger adults based on the duration of their technology use is given in Figure 17.

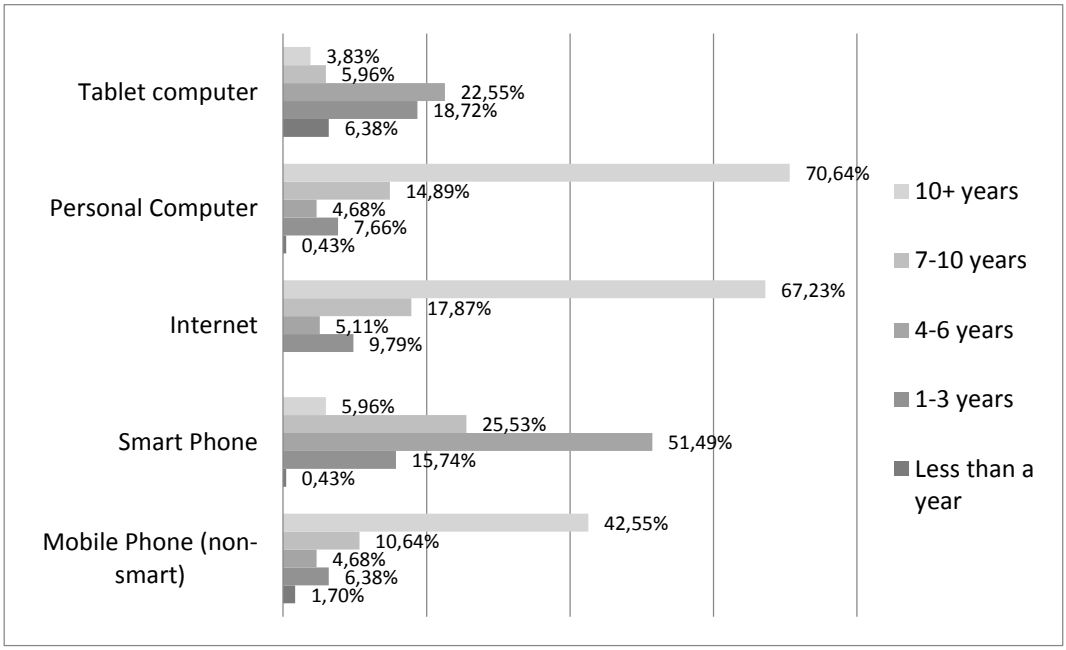


Figure 17. The duration of ICT use by younger adults

As reported by senior citizens, they mostly used information technologies in daily activities to contact with their family. The distribution of the number of participants based on their aim to use information and technologies is given in Figure 18.

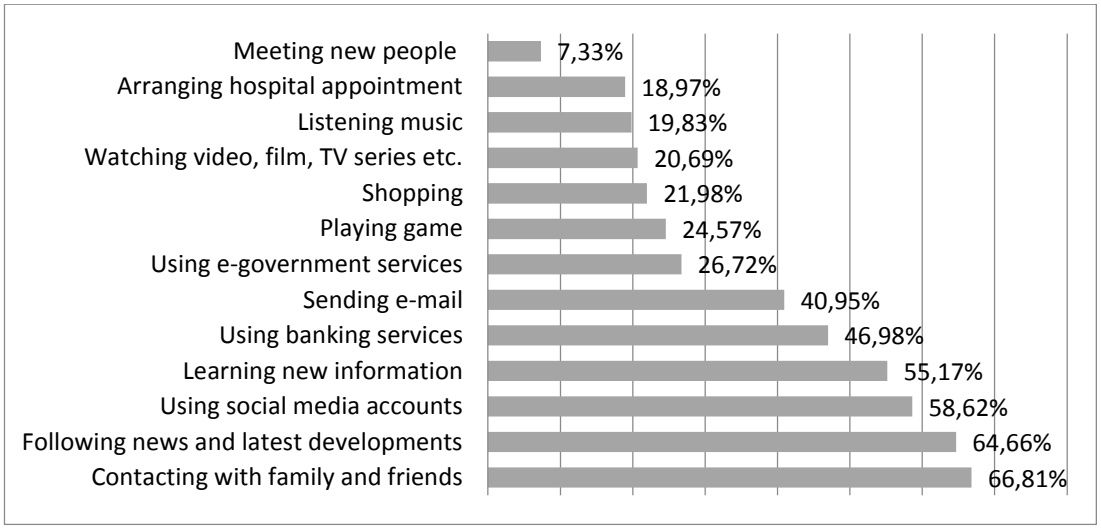


Figure 18. The aim of senior citizens to use ICT

As reported by younger adults, they mostly used information technologies in daily activities to follow news and latest developments. The distribution of the number of participants based on their aim to use information technologies is given in Figure 19.

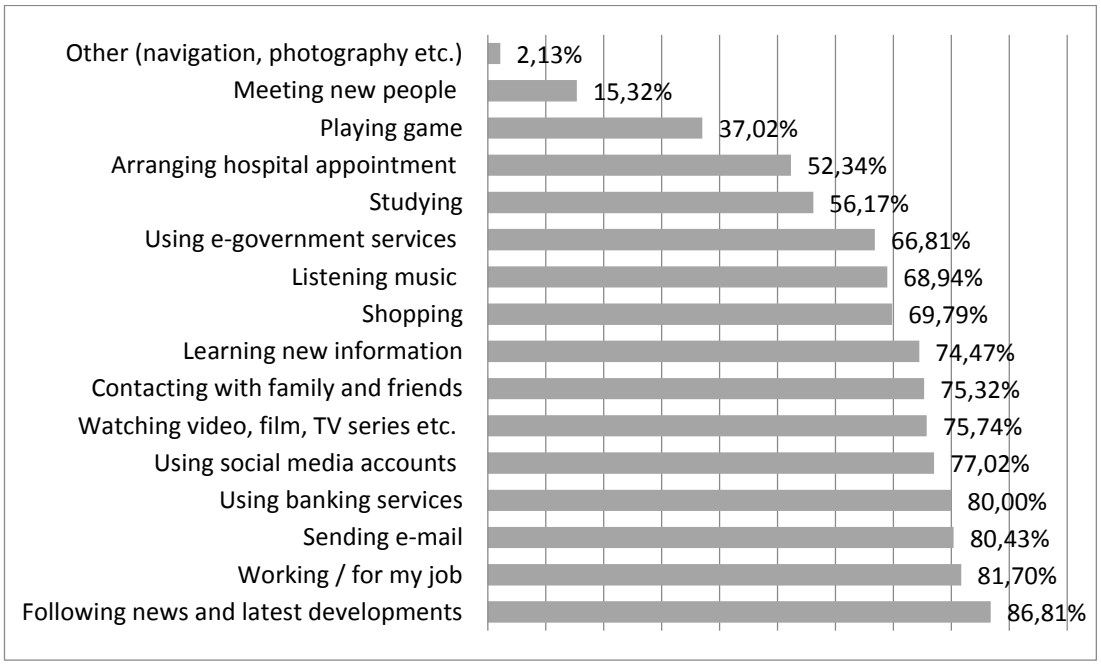


Figure 19. The aim of senior citizens to use ICT

Participants were asked about if they have a social media account like WhatsApp or Facebook. 173 of senior citizens stated that they have a social media account while 59 of them stated that they don't have any social media account. On the other hand, 231 younger adults stated that they have social media account while 4 younger adults stated that they don't have any social media account. Based on the answers, the most commonly used social media tools were WhatsApp and Facebook both among senior citizens and younger adults. The distribution of the participants based on their social media use is shown in Figure 20.

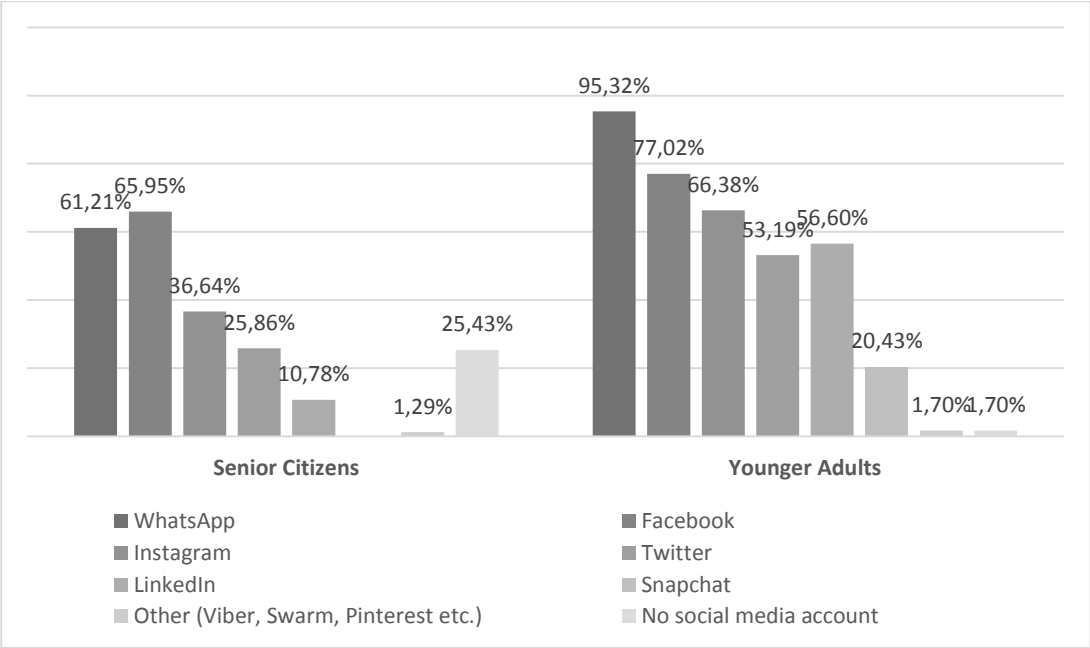


Figure 20. The distribution of participants based on their social media use

4.2. TAM Questionnaire Results for Senior Citizens

The questionnaire was conducted with 232 senior citizens (between 60-96 years old) who were 97 female (41.81%) and 135 male (58.19%). Other demographic data of participants were given in the previous section.

4.2.1. Measurement Model Analysis for Senior Citizens

Measurement model was used as the preliminary analysis to specify the validity and reliability of the constructs forming research hypotheses. To decide on the normality of data distribution, skewness and kurtosis values were used. To evaluate the reliability of items, the internal validity was tested by calculating Cronbach's alpha values. To appraise the validity of items, factor analysis was used with calculation of item loadings. The assessment of measurement model was executed via IBM SPSS 20.

4.2.1.1. Normality Statistics for Questionnaire Conducted with Senior Citizens

The values for skewness and kurtosis between -1.5 and +1.5 are generally considered as a sign of normal univariate distribution of data (Tabachnick & Fidell, 2007). Moreover, depending on the criteria of the study, skewness and kurtosis values between -2 and +2 are may be also seen as acceptable for proving normal univariate distribution of data (George & Mallery, 2010). In the present study, skewness and kurtosis values remain between -1.5 and +1.5 for all constructs. The values are given in Table 3.

Table 3. Skewness and kurtosis values for TAM construct (Senior Citizens)

	Skewness	Kurtosis	Std. Deviation
Perceived Usefulness(PU)	-1.137	.173	1.42514
Perceived Ease of Use (PEOU)	-.901	-.125	1.47893
Attitude towards Use (ATU)	-1.124	.651	1.24955
Social Influence (SI)	-.970	.063	1.34232
Facilitating Conditions (FC)	-.793	-.070	1.34156
Anxiety (ANX)	.206	-1.185	1.81984
Self-Satisfaction (SS)	-.637	-.604	1.55111
Behavior Intention (BI)	-.462	-.821	1.80775

4.2.1.2. Correlations between Items (Senior Citizens)

Correlation analysis was used to basically describe the magnitude of association between two variables. Among the correlation analysis techniques, Pearson's correlation coefficient is the widely accepted and used method to measure the degree and direction of the linear relationships. The Pearson correlation coefficient r can take values between +1 and -1. Values between 0 and 1 indicate positive relation while values between 0 and -1 indicate negative relation. A value of 0 (zero) indicates that there is no association between the two variables. The magnitude of the p specifies the degree of relationship such that p values between 0.5 and 1.0 or -0.5 and 1.0 means high correlation; p values between 0.3 and 0.5 or -0.3 and -0.5 means medium correlation; p values between 1 and 0.3 or -0.1 and -0.3 means low correlation.

According to the results of Pearson Correlation between TAM Constructs, the relationships among **PU-PEOU** (r=.563, p<.01), **PU-ATU** (r=.704, p<.01), **PU-SI** (r=.518, p<.01), **PEOU-ATU** (r=.588, p<.01), **PEOU-FC** (r=.567, p<.01), **ATU-SI** (r=.627, p<.01), **ATU-SS** (r=.599, p<.01), **SI-SS** (r=.538, p<.01) were found to be highly positive correlated. Furthermore, the relationships among **PU-FC** (r=.430, p<.01), **PU-ANX** (r=-.316, p<.01), **PU-SS** (r=.481, p<.01), **PEOU-SI** (r=.498, p<.01), **PEOU-ANX** (r=-.415, p<.01), **PEOU-SS** (r=.333, p<.01), **ATU-FC** (r=.461, p<.01), **ATU-ANX** (r=-.314, p<.01), **ATU-BI** (r=.496, p<.01), **SI-FC** (r=.425, p<.01), **SI-BI** (r=.430, p<.01), **FC-ANX** (r=-.406, p<.01), **FC-SS** (r=.393, p<.01), **FC-BI** (r=.415, p<.01), **SS-BI** (r=.474, p<.01) were found to have a medium correlation. The relationships among **PEOU-BI** (r=.285, p<.01), **SI-ANX** (r=-.181, p<.01), **ANX-SS**

(r=-.148, p<.05), **ANX-BI** (r=-.141, p<.05) were found to have a low correlation. The detailed correlation table is shown in Table 4.

Table 4. Pearson correlation coefficient among TAM constructs (Senior Citizens)

(n=232)	PU	PEOU	ATU	SI	FC	ANX	SS	BI
PU	**1**							
PEOU	.563**	**1**						
ATU	.704**	.588**	**1**					
SI	.518**	.498**	.627**	**1**				
FC	.430**	.567**	.461**	.425**	**1**			
ANX	-.316**	-.415**	-.314**	-.181**	-.406**	**1**		
SS	.481**	.333**	.599**	.538**	.393**	-.148*	**1**	
BI	.389**	.285**	.496**	.430**	.415**	-.141*	.474**	**1**

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Based on the results of Pearson Correlation between TAM Constructs and Demographics, there is not found a strong association. The relationships among **PU-Gender** (r=.339, p<.01), **PU-Education Level** (r=.339, p<.01), **PU-Monthly Income** (r=.373, p<.01), **ATU-Education Level** (r=.335, p<.01), **FC-Age** (r=-.332, p<.01), **FC-Education Level** (r=.451, p<.01), **FC-Monthly Income** (r=.468, p<.01), **ATU-Education Level** (r=.335, p<.01), **ANX-Monthly Income** (r=-.312, p<.01), **BI-Education Level** (r=.333, p<.01) were found to have medium correlation. The relationships among **PEOU-Age** (r=-.175, p<.01), **PEOU-Education Level** (r=.296, p<.01), **PU-Monthly Income** (r=.240, p<.01), **ATU-Age** (r=-.204, p<.01), **ATU-Monthly Income** (r=.290, p<.01), **SI-Age** (r=-.181, p<.01), **SI-Education Level** (r=.240, p<.01), **ANX-Age** (r=.187, p<.01), **ANX-Education Level** (r=-.292, p<.01), **SS-Education Level** (r=-.235, p<.01), **SS-Monthly Income** (r=.212, p<.01), **BI-Age** (r=-.229, p<.01), , **BI-Monthly Income** (r=.192, p<.01) were found to have low correlation. The detailed correlation table is shown in Table 5.

Table 5. Correlation between TAM constructs and demographics (Senior Citizens)

(n=232)	Age	Gender	Education Level	Monthly Income
Perceived Usefulness(PU)	-.113	.339**	.422**	.373**
Perceived Ease of Use (PEOU)	-.175**	.079	.296**	.240**
Attitude towards Use (ATU)	-.204**	.119	.335**	.290**
Social Influence (SI)	-.181**	-.036	.240**	.075
Facilitating Conditions (FC)	-.332**	.028	.451**	.468**
Anxiety (ANX)	.187**	-.082	-.292**	-.312**
Self-Satisfaction (SS)	-.087	.034	.235**	.212**
Behavior Intention (BI)	-.229**	.017	.333**	.192**

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

4.2.1.3. Reliability Statistics for Questionnaire Conducted with Senior Citizens

The reliability analysis was conducted to prove that measured constructs were reliable to do further analysis. With the reliability analysis, it was aimed to ensure that all of the participants understand the questionnaire items in the same way. If participants may interpret the items differently, the answers would be inconsistent and meaningless. Cronbach's alpha value was used to determine the reliability and internal consistency of measured factors in a Likert scale questionnaire. In general, value of 0.7 for Cronbach's alpha value is considered acceptable to prove reliability.

The results of reliability analysis for whole scale and item-total statistics are demonstrated in Table 6.

Table 6. Reliability statistics of instrument (Senior Citizens)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.863	.889	25

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PU1	124.19	402.766	.572	.684	.854
PU2	124.30	398.123	.655	.815	.851
PU3	124.19	401.554	.622	.786	.853
PU4	123.92	404.543	.701	.670	.852
PEOU1	124.65	407.068	.518	.756	.855
PEOU2	124.26	405.283	.617	.753	.853
PEOU3	124.51	408.164	.513	.729	.856
ATU1	123.62	416.774	.659	.578	.855
ATU2	124.40	400.084	.631	.581	.852
ATU3	124.33	396.257	.683	.701	.850
SI1	124.38	403.431	.612	.612	.853
SI2	124.19	406.544	.636	.694	.853
SI3	124.15	402.388	.655	.672	.852
FC1	124.55	413.054	.356	.363	.861
FC2	124.90	405.236	.526	.671	.855
FC3	123.99	421.723	.357	.430	.860
ANX1	126.39	453.303	-.145	.448	.878
ANX2	126.11	441.317	-.012	.666	.874
ANX3	126.56	457.174	-.182	.742	.881
ANX4	127.16	461.500	-.238	.697	.881
SS1	125.34	399.290	.468	.484	.857
SS2	124.96	399.479	.551	.553	,854
SS3	124.16	401.875	.672	.585	.852
BI1	125.09	400.425	.560	.695	.854
BI2	125.53	398.492	.534	.727	.854

Based on the results of reliability analysis, each construct has a Cronbach's alpha value greater than .07 which indicates that all of the constructs are reliable to conduct further analysis. The values of Cronbach's alpha for each construct are given table in Table 7.

Table 7. Reliability statistics of scale constructs (Senior Citizens)

Construct	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Perceived Usefulness(PU)	.914	.915	4
Perceived Ease of Use (PEOU)	.912	.913	3
Attitude towards Use (ATU)	.797	.813	3
Social Influence (SI)	.869	.872	3
Facilitating Conditions (FC)	.687	.696	3
Anxiety (ANX)	.877	.877	4
Self-Satisfaction (SS)	.766	.775	3
Behavior Intention (BI)	.884	.885	2

The item-total statistics for scale items forming each construct are given in Table 8.

Table 8. Item-total statistics based on dimensions (Senior Citizens)

Perceived Usefulness - 4 items; Cronbach's Alpha: .914					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PU1	17.57	18.168	.787	.638	.896
PU2	17.69	17.437	.875	.774	.863
PU3	17.57	18.081	.850	.738	.872
PU4	17.31	21.521	.723	.534	.917
Perceived Ease of Use - 3 items; Cronbach's Alpha: .912					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PEOU1	11.22	8.776	.821	.675	.878
PEOU2	10.82	9.774	.817	.670	.882
PEOU3	11.07	8.847	.839	.704	.861
Attitude Toward Use - 3 items; Cronbach's Alpha: .797					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ATU1	11.25	9.359	.601	.363	.807
ATU2	12.03	5.748	.696	.488	.668
ATU3	11.97	5.536	.720	.519	.639
Social Influence - 3 items; Cronbach's Alpha: .869					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted

SI1	11.64	7.503	.718	.539	.848
SI2	11.45	7.807	.813	.661	.764
SI3	11.41	7.724	.728	.561	.837
Facilitating Conditions - 3 items; Cronbach's Alpha: .687					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
FC1	11.09	7.385	.482	.234	.638
FC2	11.44	7.875	.552	.311	.528
FC3	10.53	9.713	.496	.260	.616
Anxiety - 4 items; Cronbach's Alpha: .877					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ANX1	10.16	33.370	.624	.405	.885
ANX2	9.88	30.638	.759	.622	.834
ANX3	10.32	28.635	.807	.714	.814
ANX4	10.92	31.457	.760	.617	.834
Self-Satisfaction - 3 items; Cronbach's Alpha: .766					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
SS1	10.87	9.103	.593	.379	.714
SS2	10.48	9.801	.698	.489	.568
SS3	9.69	13.351	.548	.334	.752
Behavioral Intention - 2 items; Cronbach's Alpha: .884					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
BI1	4.46	3.946	.794	.631	.
BI2	4.91	3.350	.794	.631	.

4.2.1.4. Validity Analysis for Questionnaire Conducted with Senior Citizens

The validity analysis was used to investigate whether the measured data indicates correct implications from sample which may be generalized for the entire population. To test the validity of the study constructs, "*exploratory factor analysis (EFA)*" and "*confirmatory factor analysis (CFA)*" was utilized. Exploratory factor analysis aims to investigate the relationships between variables which are not previously specified; that is, constructs are described based on the results of exploratory factor analysis. Confirmatory factor analysis, on the other hand, is used to examine the associations between variables forming pre-determined constructs; that is, the referred theory is tried to be proved with the measured data.

In the present study, the main goal is to confirm technology acceptance model (TAM) and its constructs fit with data collected from Turkish senior citizens. Therefore, confirmatory factor analysis was principally used for the validity of instrument. However, the results of the Kaiser-Meyer-Olkin (KMO) and Barlett's Test as an output of exploratory factor analysis were also given since the instrument was originally developed in English and it was translated into Turkish in the scope of the study. Thus, the validity of the instrument was aimed to be proved with two analysis method to eliminate any concern about misunderstanding.

Exploratory factor analysis (EFA) is a preliminary analysis technique in which similar variables are grouped and dimensions of the scale are verified. At first, Kaiser-Meyer-Olkin (KMO) and Barlett's Test were used to examine how the observed data fit for factor analysis. KMO and Bartlett's Test measures each variable to determine the appropriateness of sampling. KMO measure varies between 0 and 1; In particular, the higher the KMO value, the more suitable data for factor analysis. The value for sampling adequacy in KMO should be minimum 0.6 to be acceptable; however, KMO values greater than 0.8 are strongly suitable for further analysis (Cerny & Kaise, 1977; Kaise, 1974). On the other hand, Barlett's Test index should be less than 0.05 to be accepted as suitable for analysis. In the present study, KMO value was found .897 and Barlett's value was found .000; that is, the observed data was proved to be suitable for factor analysis. The results of the KMO and Bartlett's Test were given in Table 9.

Table 9. KMO and Bartlett's test (Senior Citizens)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.897
Bartlett's Test of Sphericity	Approx. Chi-Square	4039.570
	df	300
	Sig.	.000

In the scope of exploratory factor analysis, the factor loadings of each item were calculated to see how it was suitable to the build assigned construct. "Principal component analysis" was used as extraction method and "varimax with Kaiser Normalization" was used as rotation method. According to Tabachnick & Fidell (2007), the values greater than 0.30 for factor loading are considered acceptable for significance in exploratory factor analysis. All of the items had factor loading value of greater than 0.4; therefore, none of the items was removed for further analysis.

Confirmatory factor analysis (CFA) is a multivariate statistical analysis technique similar to exploratory factor analysis (EFA). Confirmatory factor analysis is conducted to prove that observed variables forms the determined constructs. Different from the exploratory factor analysis, confirmatory factor analysis evaluates the association between variables and specified number of constructs. In other words, confirmatory factor analysis is used to confirm or reject the measurement theory as well as to assess how the observed data fits the referred theory. Convergent and discriminant validity

of the instrument were tested for confirmatory factor analysis by using SmartPLS 3.2.6 in the present study.

Convergent validity implies that the items forming a single construct are strongly correlated. To prove the convergent validity of instrument, factor loadings for each item must be greater than 0.70; composite reliability value for each construct must be greater than 0.70 and every construct must have a value of 0.50 for Average Variance Extracted (AVE) (Gefen & Straub, 2005; Tabachnick & Fidell 2007). Based on the results after the execution of PLS algorithms, all of the items had a factor loading greater than 0.70. Factor loadings of items are given in Table 10.

Table 10. Cross factor loadings of items (Senior Citizens)

	ANX	ATU	BI	FC	PEOU	PU	SI	SS
ANX1	**.769**	-.267	-.130	-.273	-.324	-.256	-.130	-.136
ANX2	**.834**	-.133	-.038	-.334	-.282	-.165	-.018	-.076
ANX3	**.901**	-.307	-.143	-.427	-.371	-.311	-.169	-.177
ANX4	**.904**	-.357	-.161	-.488	-.500	-.366	-.169	-.185
ATU1	-.215	**.826**	.357	.367	.538	.655	.416	.486
ATU2	-.236	**.861**	.433	.326	.424	.590	.480	.527
ATU3	-.388	**.891**	.469	.544	.627	.640	.592	.517
BI1	-.084	.468	**.948**	.309	.294	.393	.383	.470
BI2	-.198	.460	**.946**	.456	.320	.358	.395	.461
FC1	-.217	.292	.332	**.700**	.272	.248	.263	.322
FC2	-.459	.515	.397	**.909**	.684	.457	.332	.375
FC3	-.366	.287	.219	**.772**	.421	.228	.363	.352
PEOU1	-.454	.541	.270	.625	**.930**	.519	.432	.330
PEOU2	-.389	.629	.327	.582	**.935**	.593	.454	.383
PEOU3	-.425	.568	.309	.558	**.937**	.505	.408	.302
PU1	-.327	.583	.356	.381	.449	**.874**	.364	.413
PU2	-.312	.661	.338	.372	.541	**.932**	.415	.437
PU3	-.317	.634	.333	.372	.557	**.918**	.404	.388
PU4	-.262	.728	.389	.380	.519	**.859**	.497	.489
SI1	-.163	.518	.412	.401	.424	.382	**.891**	.524
SI2	-.104	.533	.345	.328	.375	.435	**.935**	.514
SI3	-.156	.540	.371	.357	.462	.473	**.916**	.538
SS1	-.091	.450	.362	.237	.213	.338	.372	**.777**
SS2	-.129	.442	.384	.323	.272	.390	.451	**.870**
SS3	-.203	.573	.469	.479	.392	.465	.582	**.858**

The composite reliability and Average Variance Extracted (AVE) values of constructs are given Table below. All constructs were found to have composite reliability index

greater than 0.70 and AVE value greater than 0.50. Therefore, the convergent validity of the instrument was proved. The convergent validity scores are given in Table 11.

Table 11. Convergent validity scores (Senior Citizens)

	Composite Reliability	Average Variance Extracted (AVE)
ANX	.915	.729
ATU	.894	.739
BI	.946	.897
FC	.839	.637
PEOU	.954	.873
PU	.942	.803
SI	.939	.836
SS	.874	.699

On the other hand, discriminant validity indicates that items belonging to different constructs are not correlated. To approve the discriminant validity of the instrument, the square root of AVE value must be much greater than the correlation between that construct and any other construct (Gefen & Straub, 2005). The results of the discriminant validity of the construct are given Table below. The cells of the table indicate the square root of AVE values while the cells below that AVE values demonstrate the correlations. As seen below table, all the top diagonal values (the square root of AVE) were found to be greater than the values (correlations) below it. Therefore, the discriminant validity of the instrument was proved. The discriminant validity scores are given in Table 12.

Table 12. Discriminant validity scores (Senior Citizens)

	ANX	ATU	BI	FC	PEOU	PU	SI	SS
ANX	**.854**							
ATU	-.330	**.860**						
BI	-.148	.490	**.947**					
FC	-.461	.486	.403	**.798**				
PEOU	-.451	.621	.324	.630	**.934**			
PU	-.339	.732	.396	.420	.579	**.896**		
SI	-.155	.581	.411	.395	.462	.472	**.914**	
SS	-.178	.593	.492	.433	.364	.484	.575	**.836**

4.2.2. Structural Model Analysis for Senior Citizens

Structural model indicates the model which demonstrates how hypothesized constructs are related to each other. To test the structural model of the present study, Smart PLS 3.2.6 was used since it is easy to use and it provides limitless trial version for relatively long period of time comparing other tools.

In the scope of structural equation model analysis, the initial structural model was specified based on technology acceptance model (TAM) proposed by Davis (1989). The structural paths between the constructs of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude toward Using (ATU), Social Influence (SI), Facilitating Conditions (FC), Anxiety (ANX), Self-Satisfaction (SS) and Behavioral Intention (BI) were drawn with single headed-arrow which indicates relationships.

The path coefficients and t-values were calculated using bootstrap method of the PLS. Bootstrap method is a statistical way of creating randomly chosen subsamples from the observed data set to confirm the stability of data. With bootstrapping, subsamples drawn at random are repeatedly involved in estimation with PLS-SEM algorithm. In order to get significant estimates for entire population, the number of subsamples should be large (Streukens & Leroi-Werelds, 2016). The recommended number of bootstrapping samples varies between the magnitude of measured sample size and a number of 10,000 (Hair et al., 2012; Streukens & Leroi-Werelds, 2016). However, the larger the bootstrapping sample cases the more computation time and resource. Therefore, in the present study, bootstrapping procedure was executed for 1000 subsample with 300 iterations (the default number of iterations given by SmartPLS).

For initial structural model generated for senior citizens, path coefficients, R^2 values of latent constructs and outer item factor loadings are demonstrated in Figure 21.

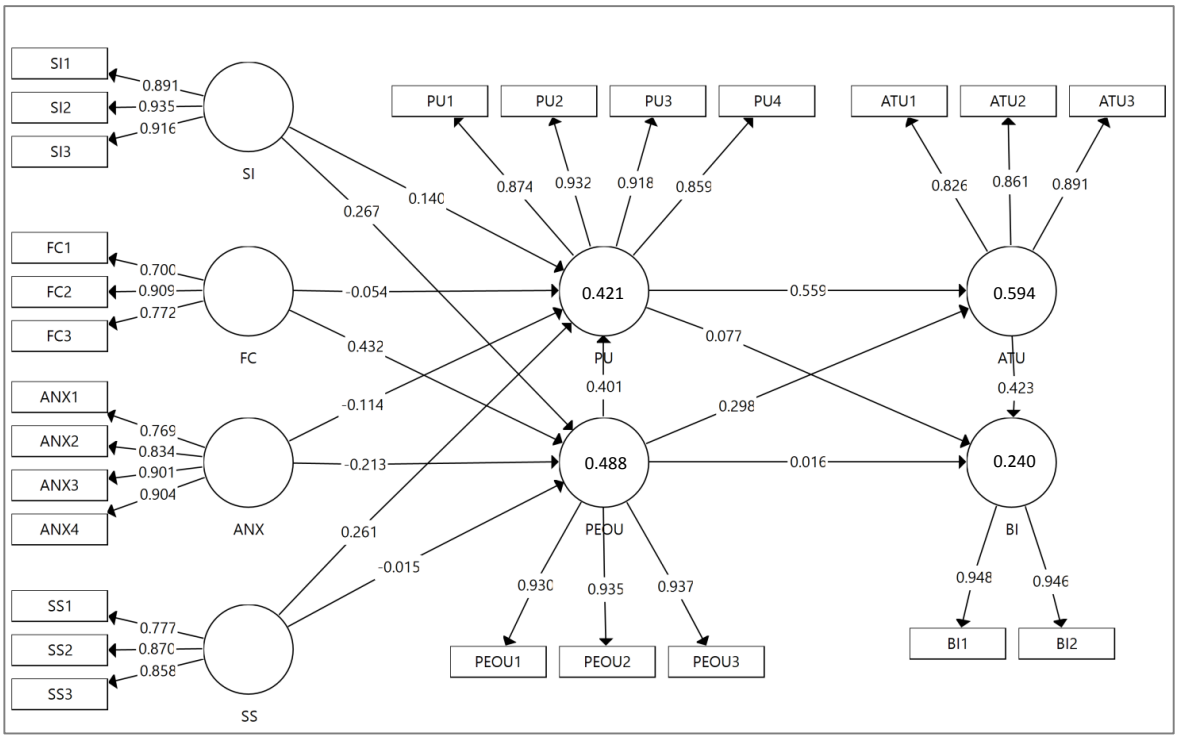


Figure 21. Path coefficients, R^2 values and outer factor loadings for initial research model for Senior Citizens

The detailed results of the bootstrapping analysis for structural model are given in Table 13.

Table 13. Results of bootstrap analysis of initial model (Senior Citizens)

	Path Coefficient	Sample Mean (M)	Standard Deviation (STDEV)	T values	P Values	Significance (p<.01)
ANX -> PEOU	**-.213**	-.213	.061	3.472	**.001**	**Significant**
ANX -> PU	-.114	-.113	.059	1.934	.053	Not significant
ATU -> BI	**.423**	.425	.084	5.023	**.000**	**Significant**
FC -> PEOU	**.432**	.436	.067	6.415	**.000**	**Significant**
FC -> PU	-.054	-.050	.068	.788	.431	Not significant
PEOU -> ATU	**.298**	.294	.065	4.558	**.000**	**Significant**
PEOU -> BI	.016	.016	.085	0.189	.850	Not significant
PEOU -> PU	**.401**	.398	.082	4.892	**.000**	**Significant**
PU -> ATU	.559	.563	.061	9.109	**.000**	**Significant**
PU -> BI	.077	.079	.092	0.843	.399	Not significant
SI -> PEOU	**.267**	.263	.070	3.797	**.000**	**Significant**
SI -> PU	.140	.142	.082	1.714	.087	Not significant
SS -> PEOU	-.015	-.010	.070	0.216	.829	Not significant
SS -> PU	**.261**	.261	.063	4.135	**.000**	**Significant**

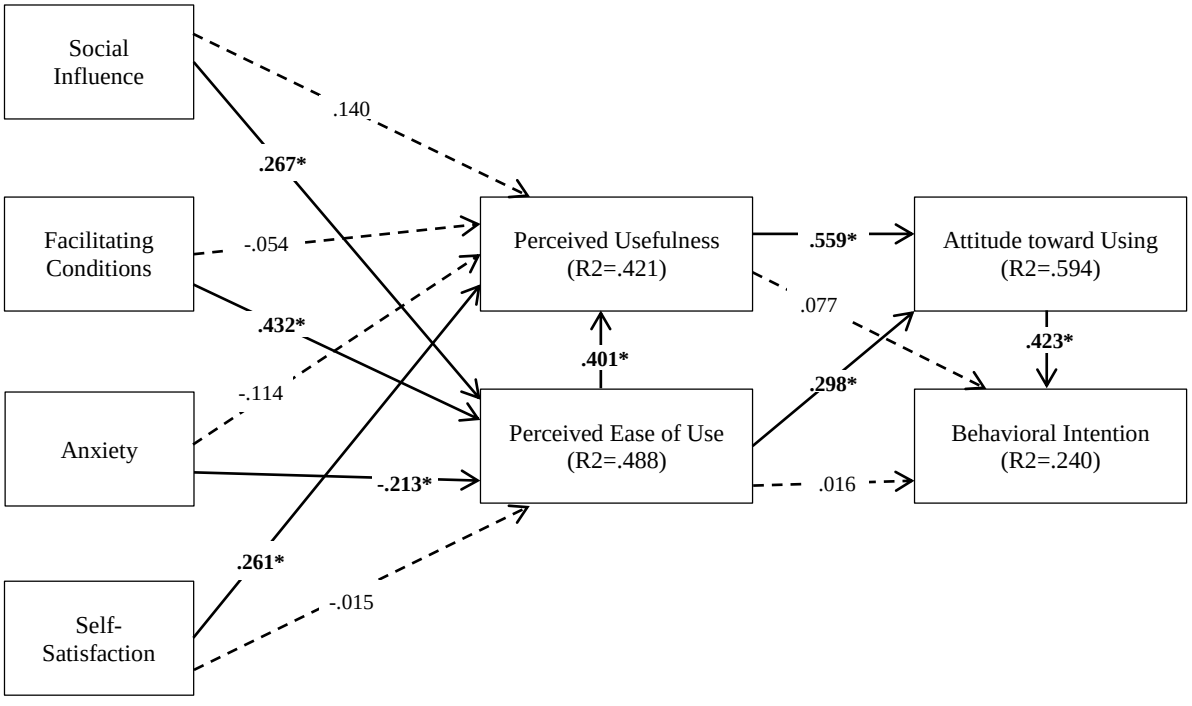
Bootstrap analysis indicated that the constructed cause-effect relationships for ANX->PEOU, ATU->BI, FC->PEOU, PEOU->ATU, PEOU->PU, PU->ATU, SI->PEOU and SS->PU were found significant at p<.01 level. On the other hand, hypothesized relationships for ANX->PU, FC->PU, PEOU->BI, PU->BI, SI->PU and SS->PEOU were found non-significant. Accordingly, the hypothesis H1.1, H2.1, H2.3, H3, H4.2, H5.2, H6.2 and H7.1 were supported while H1.2, H2.2, H4.1, H5.1, H6.1 and H7.2 were not supported for senior citizens. The details of hypothesis testing results are given in Table 14.

Table 14. The results of hypothesis testing (Senior Citizens)

Relation	Hypotheses	Results
PU -> ATU	**H1.1:** Perceived usefulness (PU) has a positive impact on attitude towards using (ATU).	**Supported**
PU -> BI	**H1.2:** Perceived usefulness (PU) has a positive impact on behavioral intention (BI).	Not supported
PEOU -> ATU	**H2.1:** Perceived ease of use (PEOU) has a positive impact on perceived usefulness (PU).	**Supported**
PEOU -> BI	**H2.2:** Perceived ease of use (PEOU) has a positive impact on attitude towards using (ATU).	Not supported
PEOU -> PU	**H2.3:** Perceived ease of use (PEOU) has a positive impact on behavioral intention (BI).	**Supported**
ATU -> BI	**H3:** Attitude towards using (ATU) has a positive impact on behavioral intention (BI).	**Supported**

SI -> PU	**H4.1:** Social influence (SI) has a positive impact on perceived usefulness (PU).	Not supported
SI -> PEOU	**H4.2:** Social influence (SI) has a positive impact on perceived ease of use (PEOU).	**Supported**
FC -> PU	**H5.1:** Facilitating conditions (FC) has a positive impact on perceived usefulness (PU).	Not supported
FC -> PEOU	**H5.2:** Facilitating conditions (FC) has a positive impact on perceived ease of use (PEOU).	**Supported**
ANX -> PU	**H6.1:** Anxiety (ANX) has a negative impact on perceived usefulness (PU).	Not supported
ANX -> PEOU	**H6.2**: Anxiety (ANX) has a negative impact on perceived ease of use (PEOU).	**Supported**
SS -> PU	**H7.1:** Self-satisfaction (SS) has a positive impact on perceived usefulness (PU).	**Supported**
SS -> PEOU	**H7.2:** Self-satisfaction (SS) has a positive impact on perceived ease of use (PEOU).	Not supported

The non-significant relationships were demonstrated as dashed lines. The final research model with the path coefficients and R^2 values of latent constructs are shown in Figure 22.



Significant at p < .01 level

Figure 22. Final research model for Senior Citizens

4.3. TAM Questionnaire Results for Younger Adults

The questionnaire was conducted with 235 younger adults (between 19-40 years old) who were 110 females (46.81%) and 125 males (53.19%). To make comparison with senior citizens, the data collected from younger adults were analyzed using the same procedures. To eliminate redundant replication, only the results of analysis were given for younger adults. Detailed explanations about analysis procedures were indicated in previous sections.

4.3.1. Measurement Model Analysis for Younger Adults

4.3.1.1. Normality Statistics for Questionnaire Conducted with Younger Adults

The values for skewness and kurtosis were given in Table 15.

Table 15. Skewness and Kurtosis values for TAM construct (Younger Adults)

	Skewness	Kurtosis	Std. Deviation
Perceived Usefulness(PU)	-.809	-.336	.66598
Perceived Ease of Use (PEOU)	-.909	-.307	.61582
Attitude towards Use (ATU)	-.787	-.437	.81217
Social Influence (SI)	-.499	-.352	1.20658
Facilitating Conditions (FC)	-.775	-.134	.74653
Anxiety (ANX)	.646	-.336	1.47776
Self-Satisfaction (SS)	.056	-.582	1.49565
Behavior Intention (BI)	-.195	-.893	1.82243

4.3.1.2. Correlation Analysis for Questionnaire Conducted with Younger Adults

The Pearson correlation coefficients for constructs are demonstrated in Table 16.

Table 16. Correlation between TAM constructs (Younger Adults)

(n=235)	PU	PEU	ATU	SI	FC	ANX	SS	BI
PU	**1**							
PEU	.428**	**1**						
ATU	.574**	.457**	**1**					
SI	.417**	.239**	.513**	**1**				
FC	.385**	.465**	.349**	.409**	**1**			
ANX	-.253**	-.400**	-.364**	-.171**	-.282**	**1**		
SS	.258**	.090	.356**	.349**	.218**	-.079	**1**	
BI	.357**	.195**	.441**	.347**	.149*	-.191**	.548**	**1**

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

The results of correlation analysis between TAM constructs and demographics for younger adults were given in Table 17.

Table 17. Correlation between TAM constructs and demographics

(n=235)	Age	Gender	Education Level	Monthly Income
Perceived Usefulness(PU)	.084	.090	.082	.184**
Perceived Ease of Use (PEOU)	-.005	-.028	.049	.081
Attitude towards Use (ATU)	-.002	.110	.032	.100
Social Influence (SI)	.054	-.045	.086	.071
Facilitating Conditions (FC)	.099	.023	.144**	.341**
Anxiety (ANX)	.067	-.065	-.222**	-.165*
Self-Satisfaction (SS)	-.056	.050	-.031	.083
Behavior Intention (BI)	-.011	.182**	-.013	.018

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

4.3.1.3. Reliability Statistics for Questionnaire Conducted with Younger Adults

The results of reliability analysis for whole scale and item-total statistics for younger adults are shown in Table 18.

Table 18. Reliability statistics of scale (Younger Adults)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.788	.839	25

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PU1	123.62	174.844	.439	.575	.781
PU2	124.14	169.856	.436	.511	.777
PU3	123.79	172.339	.445	.455	.778
PU4	123.73	173.755	.475	.581	.779
PEOU1	123.63	177.406	.286	.593	.784
PEOU2	123.76	176.986	.259	.528	.785
PEOU3	123.73	178.573	.188	.503	.787
ATU1	123.78	172.017	.466	.508	.778
ATU2	124.07	169.033	.508	.635	.775
ATU3	124.00	168.107	.539	.680	.773
SI1	124.70	163.535	.537	.722	.770
SI2	124.63	161.139	.605	.827	.766

SI3	124.66	161.611	.584	.730	.767
FC1	124.21	175.254	.206	.373	.787
FC2	123.73	177.419	.263	.536	.785
FC3	124.01	170.906	.367	.292	.780
ANX1	127.02	185.948	-.129	.463	.815
ANX2	127.24	180.635	-.022	.536	.806
ANX3	128.07	183.089	-.060	.634	.803
ANX4	128.11	179.846	.017	.635	.799
SS1	127.06	156.308	.468	.523	.772
SS2	126.56	155.247	.469	.575	.772
SS3	124.66	160.381	.525	.396	.769
BI1	125.94	153.898	.530	.728	.767
BI2	125.95	153.348	.555	.717	.765

The values of Cronbach's alpha for each construct are given in Table 19.

Table 19. Reliability statistics of scale constructs (Younger Adults)

Construct	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Perceived Usefulness(PU)	.820	.839	4
Perceived Ease of Use (PEOU)	.794	.797	3
Attitude towards Use (ATU)	.835	.833	3
Social Influence (SI)	.915	.916	3
Facilitating Conditions (FC)	.572	.614	3
Anxiety (ANX)	.840	.850	4
Self-Satisfaction (SS)	.742	.737	3
Behavior Intention (BI)	.904	.904	2

The item-total statistics for scale items forming each construct are given in Table 20.

Table 20. Item-total statistics based on dimensions (Younger Adults)

Perceived Usefulness - 4 items; Cronbach's Alpha: .820					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PU1	18.94	4.676	.699	.504	.762
PU2	19.47	3.506	.630	.417	.804
PU3	19.11	4.230	.620	.413	.783
PU4	19.06	4.514	.713	.516	.751
Perceived Ease of Use - 3 items; Cronbach's Alpha: .794					

	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PEOU1	12.91	1.812	.648	.425	.715
PEOU2	13.04	1.614	.612	.374	.750
PEOU3	13.01	1.594	.659	.441	.695
Attitude Toward Use - 3 items; Cronbach's Alpha: .835					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ATU1	12.32	3.399	.598	.359	.861
ATU2	12.61	2.623	.743	.590	.722
ATU3	12.54	2.548	.763	.607	.701
Social Influence - 3 items; Cronbach's Alpha: .915					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
SI1	11.11	6.261	.803	.693	.900
SI2	11.04	5.776	.894	.800	.824
SI3	11.06	6.171	.794	.670	.908
Facilitating Conditions - 3 items; Cronbach's Alpha: .572					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
FC1	12.66	2.294	.395	.236	.462
FC2	12.18	3.190	.519	.282	.373
FC3	12.46	2.634	.309	.116	.600
Anxiety - 4 items; Cronbach's Alpha: .840					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ANX1	7.18	18.199	.602	.385	.838
ANX2	7.40	18.241	.667	.479	.802
ANX3	8.23	19.862	.729	.584	.780
ANX4	8.28	19.654	.737	.571	.776
Self-Satisfaction - 3 items; Cronbach's Alpha: .742					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
SS1	9.18	8.919	.638	.463	.570
SS2	8.68	8.218	.678	.490	.515
SS3	6.77	13.167	.422	.183	.806
Behavioral Intention - 2 items; Cronbach's Alpha: .904					
	Mean of Scale if Item Deleted	Variance of Scale if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
BI1	4.25	3.573	.825	.680	.
BI2	4.26	3.708	.825	.680	.

4.3.1.4. Validity Analysis for Questionnaire Conducted with Younger Adults

KMO value was found .859 and Barlett's value was found .000; that is, the observed data was proved to be suitable for factor analysis. The results of the KMO and Bartlett's Test were given in Table 21.

Table 21. KMO and Bartlett's test (Younger Adults)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.859
Bartlett's Test of Sphericity	Approx. Chi-Square	3215.383
	df	300
	Sig.	.000

All of the items had factor loading value of greater than 0.4; therefore, none of the items was removed for further analysis. After the execution of PLS algorithms, Factor loadings of items are given in Table 22.

Table 22. Cross factor loadings of items (Younger Adults)

	ANX	ATU	BI	FC	PEOU	PU	SI	SS
ANX1	**.783**	-.342	-.162	-.195	-.308	-.250	-.173	-.096
ANX2	**.804**	-.218	-.113	-.229	-.264	-.180	-.159	-.001
ANX3	**.882**	-.308	-.093	-.314	-.331	-.321	-.173	-.012
ANX4	**.892**	-.234	-.087	-.307	-.394	-.271	-.050	.063
ATU1	-.301	**.864**	.366	.412	.474	.606	.482	.293
ATU2	-.257	**.902**	.367	.321	.372	.567	.578	.340
ATU3	-.319	**.914**	.457	.344	.353	.525	.570	.389
BI1	-.140	.417	**.953**	.138	.161	.310	.333	.542
BI2	-.112	.430	**.957**	.176	.167	.340	.398	.516
FC1	-.225	.218	.062	**.702**	.235	.225	.266	.093
FC2	-.323	.409	.128	**.895**	.569	.363	.212	.173
FC3	-.134	.234	.183	**.651**	.306	.260	.392	.345
PEOU1	-.323	.343	.144	.497	**.867**	.407	.169	.122
PEOU2	-.352	.392	.163	.455	**.866**	.431	.241	.091
PEOU3	-.328	.426	.131	.417	**.835**	.208	.155	.077
PU1	-.259	.509	.221	.372	.364	**.879**	.353	.262
PU2	-.289	.552	.373	.320	.383	**.856**	.398	.312
PU3	-.284	.535	.274	.316	.321	**.846**	.433	.296
PU4	-.241	.597	.300	.335	.368	**.883**	.422	.272
SI1	-.146	.549	.346	.333	.196	.388	**.932**	.412

SI2	-.130	.599	.388	.322	.194	.446	**.969**	.435
SI3	-.174	.577	.356	.350	.239	.480	**.944**	.364
SS1	.103	.237	.407	.142	.042	.168	.319	**.738**
SS2	.025	.281	.499	.098	.043	.226	.324	**.801**
SS3	-.080	.357	.433	.314	.146	.338	.365	**.844**

The composite reliability and Average Variance Extracted (AVE) values of constructs are given Table below. All constructs were found to have composite reliability index greater than 0.70 and AVE value greater than 0.50. Therefore, the convergent validity of the instrument for younger adults was also proved. The convergent validity scores are given in Table 23.

Table 23. Convergent validity scores (Younger Adults)

	Composite Reliability	**Average Variance Extracted (AVE)**
ANX	.906	.709
ATU	.922	.798
BI	.954	.912
FC	.797	.572
PEOU	.892	.733
PU	.923	.750
SI	.964	.900
SS	.838	.633

The results of the discriminant validity of the construct are given Table below. As seen in table, all the top diagonal values (the square root of AVE) were found to be greater than the values (correlations) below it. Therefore, the discriminant validity of the instrument for younger adults was also proved. The discriminant validity scores are given in Table 25.

Table 24. Discriminant validity scores (Younger Adults)

	ANX	**ATU**	**BI**	**FC**	**PEOU**	**PU**	**SI**	**SS**
ANX	**.842**							
ATU	-.328	**.894**						
BI	-.132	.444	**.955**					
FC	-.316	.403	.165	**.756**				
PEOU	-.391	.450	.171	.534	**.856**			
PU	-.310	.635	.340	.387	.415	**.866**		

SI	-.159	.607	.383	.354	.223	.465	**.948**	
SS	-.010	.381	.554	.261	.114	.330	.424	**.796**

4.3.2. Structural Model Analysis for Younger Adults

For initial structural model generated for younger adults, path coefficients, R^2 values of latent constructs and outer item factor loadings are demonstrated in in Figure 23.

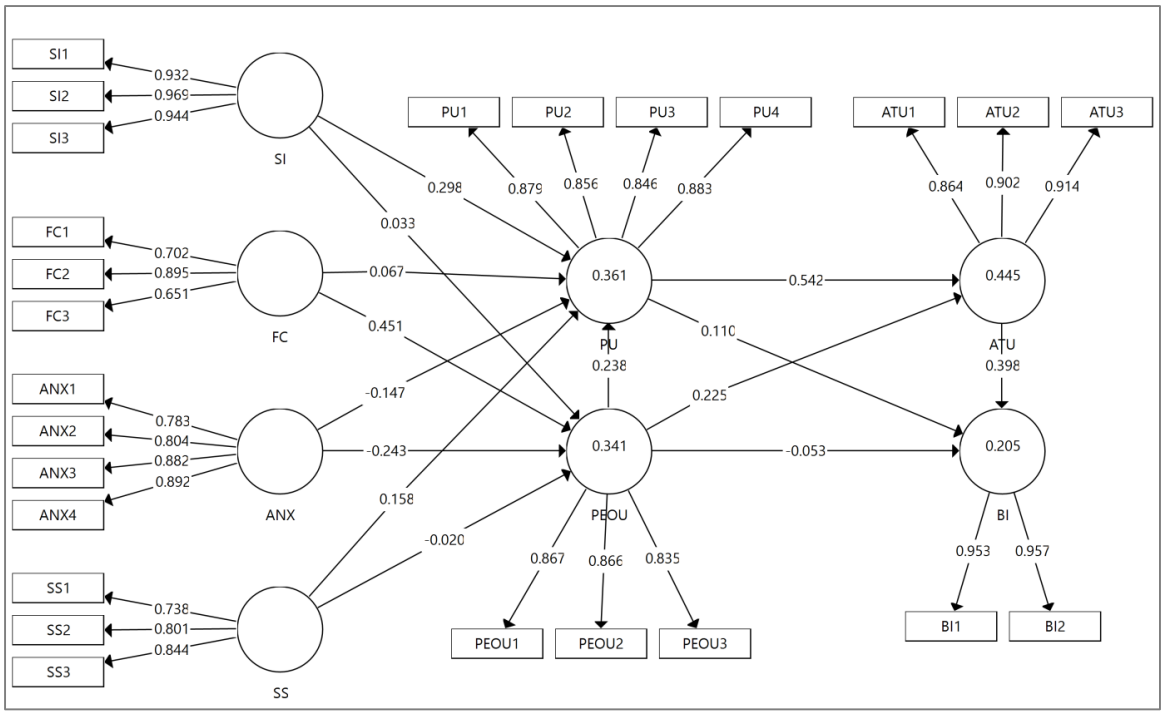


Figure 23. Path coefficients, R^2 values and outer factor loadings for initial research model for younger adults

The detailed results of the bootstrapping analysis for structural model are given in Table 25.

Table 25. Results of bootstrap analysis of initial model (Younger Adults)

	Path Coefficient	Sample Mean (M)	Standard Deviation (STDEV)	T values	P Values	Significance (*p<.01; **p<.05)
ANX -> PEOU	**-.243**	-.244	.065	3,730	.000	**Supported***
ANX -> PU	**-.147**	-.143	.070	2,089	.037	**Supported****
ATU -> BI	**.398**	.402	.070	5,699	.000	**Supported***
FC -> PEOU	**.451**	.456	.064	7,009	.000	**Supported***
FC -> PU	.067	.068	.069	.968	.334	Not supported
PEOU -> ATU	**.225**	.228	.061	3,655	.000	**Supported***

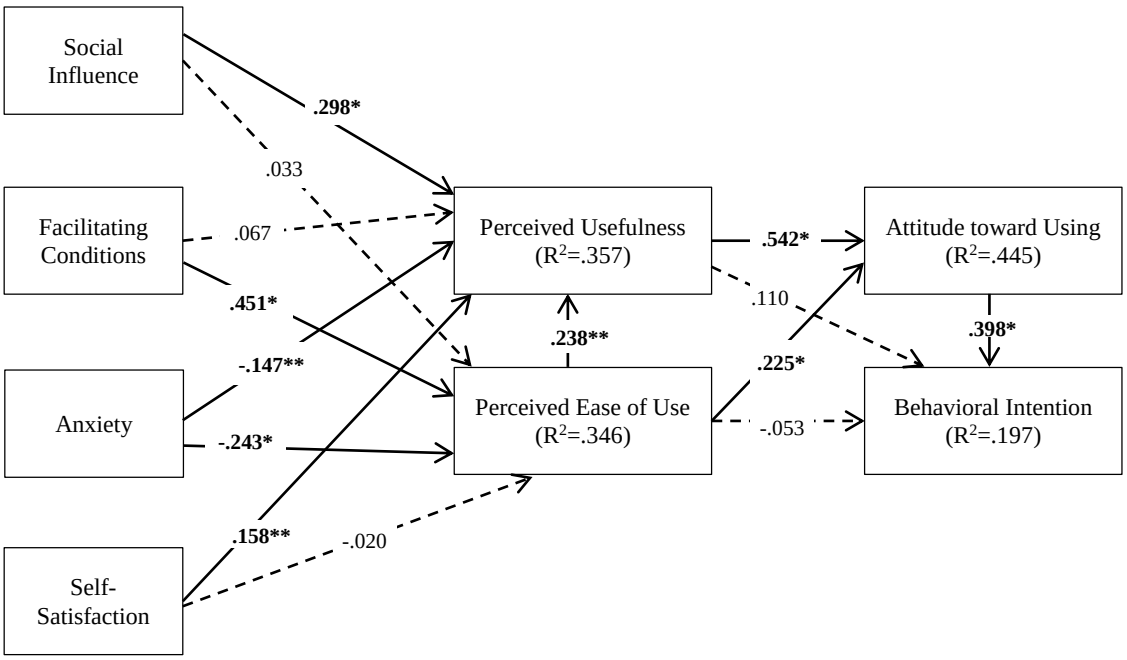
PEOU -> BI	-.053	-.060	.067	.798	.425	Not supported
PEOU -> PU	**.238**	.242	.099	2,413	.016	**Supported****
PU -> ATU	**.542**	.541	.072	7,509	.000	**Supported***
PU -> BI	.110	.112	.083	1,327	.185	Not supported
SI -> PEOU	.033	.034	.072	.457	.648	Not supported
SI -> PU	**.298**	.291	.084	3,544	.000	**Supported***
SS -> PEOU	-.020	-.017	.054	.375	.707	Not supported
SS -> PU	**.15**8	.168	.065	2,449	.014	**Supported****

Bootstrap analysis indicated that the constructed cause-effect relationships for ANX->PEOU, ATU->BI, FC->PEOU, PEOU->ATU, PU->ATU and SI->PU were found significant at p<.01 level and ANX -> PU, PEOU->PU and SS->PU were found significant at p<.05 level. On the other hand, hypothesized relationships for FC->PU, PEOU->BI, PU->BI, SI->PEOU and SS->PEOU were found non-significant. Accordingly, the hypothesis H1.1, H2.1, H2.3, H3, H4.1, H5.2, H6.1, H6.2 and H7.1 were supported while H1.2, H2.2, H4.1, H5.1, H6.1 and H7.2 were not supported for younger adults. The details of hypothesis testing results are given in Table 26.

Table 26. The results of hypothesis testing (Younger Adults)

Relation	Hypotheses	Results
PU -> ATU	**H1.1:** Perceived usefulness (PU) has a positive impact on attitude towards using (ATU).	**Supported**
PU -> BI	**H1.2:** Perceived usefulness (PU) has a positive impact on behavioral intention (BI).	Not supported
PEOU -> ATU	**H2.1:** Perceived ease of use (PEOU) has a positive impact on perceived usefulness (PU).	**Supported**
PEOU -> BI	**H2.2:** Perceived ease of use (PEOU) has a positive impact on attitude towards using (ATU).	Not supported
PEOU -> PU	**H2.3:** Perceived ease of use (PEOU) has a positive impact on behavioral intention (BI).	**Supported**
ATU -> BI	**H3:** Attitude towards using (ATU) has a positive impact on behavioral intention (BI).	**Supported**
SI -> PU	**H4.1:** Social influence (SI) has a positive impact on perceived usefulness (PU).	**Supported**
SI -> PEOU	**H4.2:** Social influence (SI) has a positive impact on perceived ease of use (PEOU).	Not supported
FC -> PU	**H5.1:** Facilitating conditions (FC) has a positive impact on perceived usefulness (PU).	Not supported
FC -> PEOU	**H5.2:** Facilitating conditions (FC) has a positive impact on perceived ease of use (PEOU).	**Supported**
ANX -> PU	**H6.1:** Anxiety (ANX) has a negative impact on perceived usefulness (PU).	**Supported**
ANX -> PEOU	**H6.2**: Anxiety (ANX) has a negative impact on perceived ease of use (PEOU).	**Supported**
SS -> PU	**H7.1:** Self-satisfaction (SS) has a positive impact on perceived usefulness (PU).	**Supported**
SS -> PEOU	**H7.2:** Self-satisfaction (SS) has a positive impact on perceived ease of use (PEOU).	Not supported

The non-significant relationships were removed from the initial structural model and bootstrapping analysis was executed again. The final research model for younger adults with the path coefficients, R^2 values of latent constructs and t-values are shown in Figure 24.



Significant at p < .01 level
****Significant at p < .05 level***

Figure 24. Final research model for Younger Adults

4.4. Analysis of Answers to Open Ended Questions

Participants asked what they think about the information technologies and information and communication technologies use of elderly and younger adults. Content analysis is made to analyze the answers of those open-ended questions. Content analysis is a qualitative research method for systematic analysis and interpretation of given content based on the several dimensions or themes (Duriau, Reger & Pfarrer, 2007). The aim of the content analysis is to get replicable and meaningful inferences from a content considering the context of use.

To make a content analysis, all the answers given by the participants are transcribed and reviewed to see general themes. Then, keywords are drawn from the answers for each participant. Based on the keywords, specific themes are determined and frequencies are counted.

Firstly, senior citizens asked about their opinion on the ICT. They usually stated about their eagerness about using ICT. On the other hand, they expressed their need of being included into social life. One of the participants said that "We need to keep in touch with our children and to be cared by younger people rather than technology or something." Another participant expresses that "I don't want to be excluded from active life and I would like to feel myself beneficial to society as in the times when I was young." The themes and frequencies of the answers are demonstrated in Figure 25.

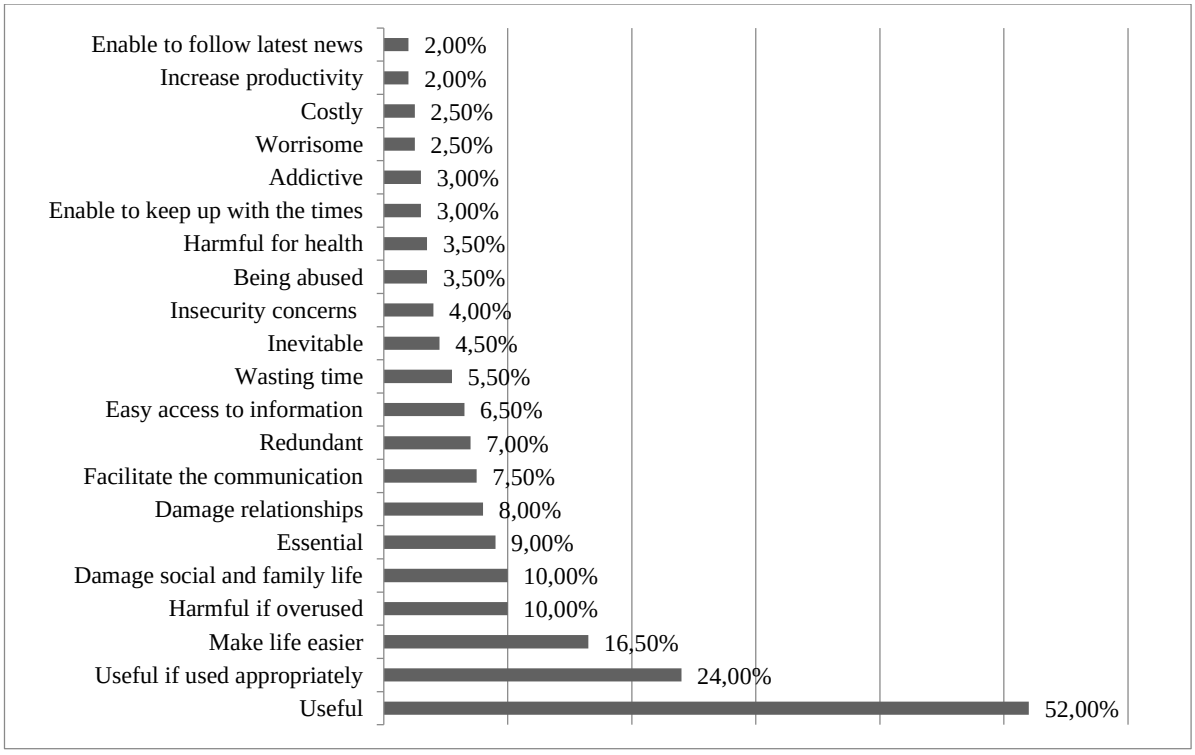


Figure 25. Opinions of senior citizens about ICT

According to the answers, senior citizens (52%) commonly find information technologies useful while some of them (24%) emphasized that information and communication technologies is useful only if it is used appropriately and for suitable purposes. Only 7% of the senior citizens consider information technologies as redundant. Senior citizens expressed that information technologies are essential (9%) and inevitable (4.5%) in this era by enabling them keep with the times (3%); nevertheless, those technologies are expensive (2.5) for them. Moreover, they think that information technologies make their life easier (16.5%), enable them to access information easily (6.5%), increase productivity (2%), enable them to follow latest news (2%) and facilitate communication with their children, grandchildren, relatives, friends wherever/whenever they need (7.5%). However, they complain about the overuse (10%) and the abuse of information technologies (3.5%) by younger adults. They consider information technologies as wasting time (5.5%), being addictive (3%), damaging social and family life (10%), destroying relationships between people (8%) and giving harm to the health by minimizing physical activity (3.5%). Senior citizens also stated they are worried about IT (2.5%) and they have concerns about insecurity related with phishing, cyber threats, fraud and privacy (4%).

The keywords compiled from the content analysis are shown as a word cloud in Figure 26. The size of the words in the word cloud varies based on the frequencies.

Figure 26. Word cloud for opinions of senior citizens about ICT

When the younger adults were asked about their opinion for information technologies, they gave similar answers with the senior citizens. The themes and frequencies of the answers are demonstrated in Figure 27.

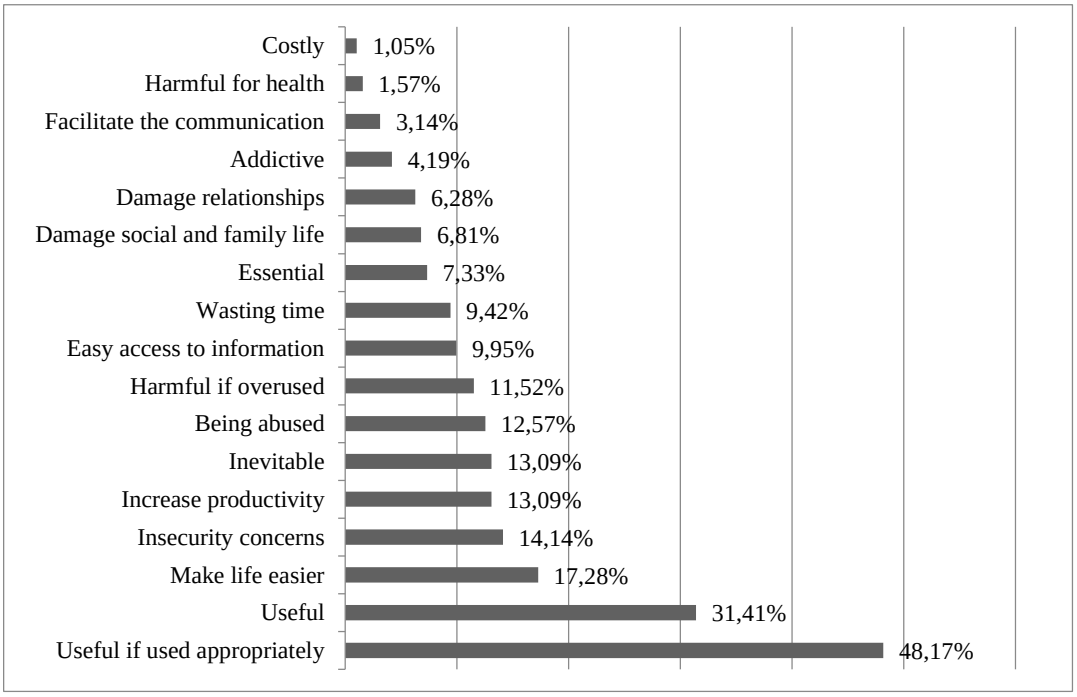


Figure 27. Opinions of younger adults about ICT

Younger adults seem to be more sensitive about the appropriate use of information technologies (48.17%) and they highly worry about the insecurity issues (14.14%). According to the answers, younger adults less complain about the negative effects of information and communication technologies on social life (6.81%) and relationships (6.28%) comparing with senior citizens. None of the younger adults found information technologies redundant as senior citizens do. However, they consider information technologies as being abused (12.57&), harmful if overused (11.52%), wasting time (9.42%), addictive (4.19%) and harmful for health (1.57%). Only 1.05% of the younger adults complain for the costs of information technologies they see IT as essential (7.33%) and inevitable (13.09%). In general, younger adults think that information technologies make their life easier (17.28%), increase productivity (13.09%), enable easy access to information (9.95%) and facilitate the communication (3.14%).

The keywords compiled from the content analysis are shown as a word cloud in Figure 28. The size of the words in the word cloud varies based on the frequencies.

Figure 28. Word cloud for opinions of younger adults about ICT

Senior citizens were also asked what they think about senior citizens' use of information technologies. The themes and frequencies of the answers are demonstrated in Figure 29.

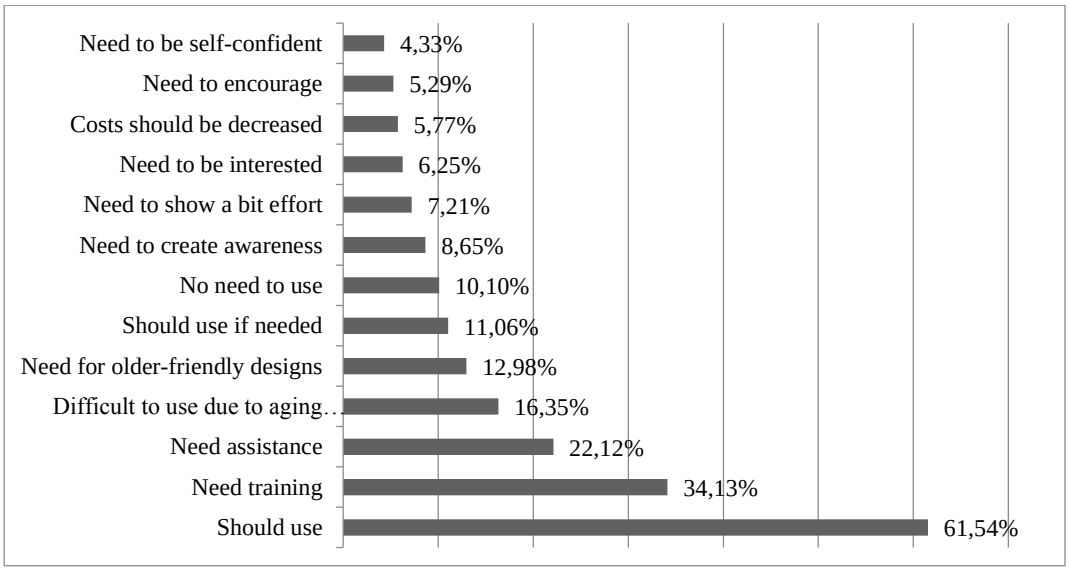


Figure 29. Opinions of senior citizens about use of ICT by elderly population

In general, senior citizens (29.91%) consider that they should use information technologies. However, some of the participants (5.73 %) stated that it is not necessary for all senior citizens but those who specifically need may use information technologies. Similarly, 4.91% of the participants find information technologies

unnecessary for elderly population. Senior citizens (7.94%) generally complain about the difficulties of learning and using information technologies due to aging affects like shaking hands, impaired eyes and forgetfulness. They request more elderly-friendly designs such as bigger buttons, easier flows and speech input options (12.98%). Senior citizens state that they need training (34.13%) and assistance (22.12%) to be able use information technologies. They also express that senior citizens need to gain awareness (8.65%), to show a bit effort (7.21%), to be interested (6.25%), to be encouraged (5.29%) and to be self-confident (4.33%) for using information technologies.

The keywords compiled from the content analysis are shown as a word cloud in Figure 30. The size of the words in the word cloud varies based on the frequencies.

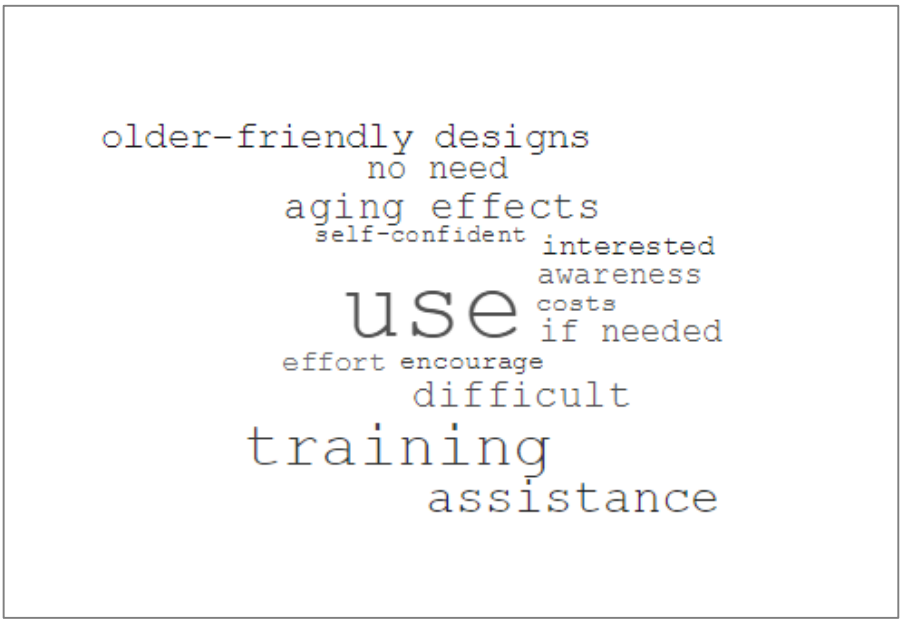


Figure 30. Opinions of senior citizens about use of ICT by elderly population

Younger adults asked what they think about younger adults' use of information technologies. The themes and frequencies of the answers are demonstrated in Figure 31.

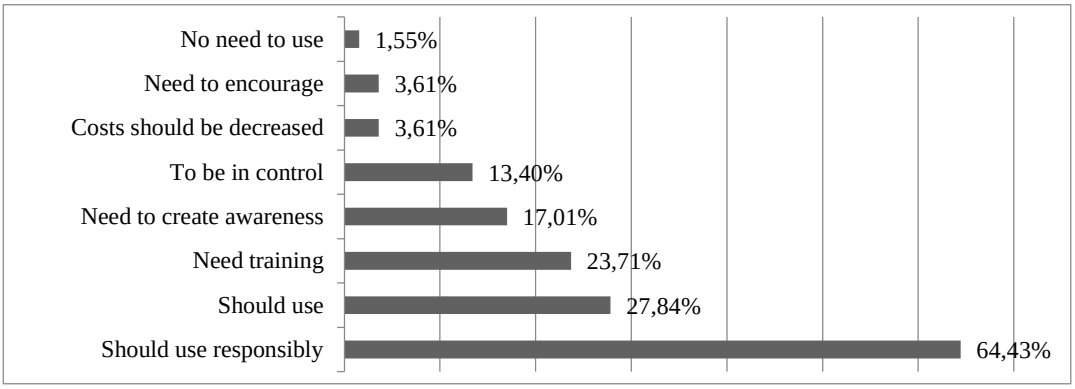


Figure 31. Opinions of younger adults about use of ICT by younger population

Almost all of the younger adults (92.27%) consider information technologies as useful but 64.43% of them emphasize that information technologies are useful only if they are used responsibly. Younger adults expressed the need for training (23.71%) and raising awareness (17.01%) to use information technologies in a more efficient and effective way. Some of the participants (13.40%) indicate the importance of controlling information and communication technologies use by authorities to eliminate harmful content and services. Participants (3.61%) suggest decreasing the costs of information technologies and encouraging younger adults to use information technologies. Only 1.55% of the younger adults state that it is not very necessary for younger adults to use information technologies.

The keywords compiled from the content analysis are shown as a word cloud in Figure 32. The size of the words in the word cloud varies based on the frequencies.

Figure 32. Opinions of younger adults about use of ICT by younger population

CHAPTER 5

DISCUSSION & CONCLUSION

In this chapter, the findings of the study were summarized and discussed within the scope of previous studies. Then the conclusions of the proposed research model were interpreted based on the results of hypotheses testing. Finally, the limitations of the study were reported and recommendations for future study were made.

5.1. Discussion

The present study mainly focused on the use and acceptance of ICT by senior citizens regarding the Technology Acceptance Model (TAM) framework proposed by Davis (1989). In addition, the technology use routines and daily activities were investigated to analyze the current profile of ICT use by senior citizens along with the comparison to younger citizens. At the end, answers to a set of open-ended questions, which were answered by the participants, were investigated to deeply examine their opinions about ICT and its use.

Based on the findings, the most frequent daily activity among senior citizens was reported *as watching TV followed by chatting with spouse/family* and spending time with friends. Analyzing the responses given to the open-ended questions, senior citizens were reported that they were watching TV for the purpose of staying up-to-date, having fun and killing time. On the other hand, younger adults stated that they spent most of their time by working in a job while following daily activities were expressed as chatting with spouse/family and spending time with friends in common with elderly.

Most of the senior citizens stated that they used non-smart mobile phones in daily life. Accordingly, a smaller group of participants reported that they were using Internet and smart phone. They frequently expressed a complain that they were not able to use ICT due to the lack of assistance, difficulty of learning and using ICT, as well as due to other constraints, such as aging and financial costs. They suggested that the government should provide senior citizens with affordable services, training facilities and assistance.

Among the senior citizens, contacting with family and friends, following news and latest developments, using social media accounts and learning for new information were the top reported motives to use ICT in daily life. These results may indicate that senior citizens were in need of making contact with others and being socially active. On the other hand, younger adults indicated that they were principally using ICT for following news and latest developments, for occupational purposes, sending e-mail, using banking services, using social media accounts, watching multimedia (video, film, TV series etc.), contacting with family and friends, learning new information and online shopping. The requirement of using ICT in professional life may be the most prominent reason behind wider range of ICT use among younger citizens.

According to the results of the present study, a high number of senior citizens reported to have a social media account. The most commonly used social media tools were reported as WhatsApp and Facebook. Younger citizens, on the other hand, were found to use social media tools more intensively compared to senior citizens. The top frequently used social media tools for younger citizens were stated as WhatsApp, Facebook, LinkedIn, Instagram and Twitter. Senior citizens usually expressed that their children or grandchildren created an account for them and they were not actively using those accounts. They explained their purpose of using WhatsApp as instant messaging and using Facebook as contacting with friends. Furthermore, the senior citizens emphasized that they had some concerns about using social media due to its obscurity and insecurity.

To investigate the acceptance of ICT by elderly and younger adults, TAM questionnaire were utilized. The responses given to TAM questionnaire items were analyzed through Structural Equation Modeling (SEM). The results of data analysis confirmed TAM model both for elderly and younger adults such that perceived usefulness (PU) and perceived ease of use (PEOU) has a positive impact on attitude towards using (ATU) which have positive influence on behavioral intention (BI). Moreover, perceived ease of use has a positive impact on perceived usefulness. As a consequence, it may be inferred that if a senior citizen considers ICT as easy to use then s/he will acknowledge ICT as useful for his/her daily life. Then, the perception of usefulness and easiness by a senior citizen determine how s/he feels about ICT. Besides, a senior citizen will be more eager to use ICT when s/he has positive feelings toward ICT use. Those findings are consistent with the original TAM model developed by Davis (1989). Only the proposed relationship between perceived usefulness and behavioral intention was not found to be significant in the present study. That is, being useful of ICT may positively influence the attitude of senior citizens toward use; however, it does not necessarily promise intention to use of ICT. That may be because of that the user intention is determined by several factors like social motives, perceived cost, expected short-term outcomes, self-efficacy and perceived need (Abdullah & Ward,2016; Chang & Cheung, 2001; Macedo, 2017). Correlatively, based on the responses given to open-ended questions, senior citizens consider using ICT as costly due to possessing new equipment, subscribing for Internet service and so on. Some of them also stated that they do not need to learn using ICT anymore because they are

over a certain age. However, a number of senior citizens expressed that they would use ICT if they are provided with technical assistance, training and financial support.

The role of external variables which are supposed to have influence on main TAM constructs (Bagozzi & Warshaw, 1989; Venkatesh et al., 2003), namely perceived usefulness and perceived ease of use, was also examined through the study. The results were found to be somewhat different but commonly similar for both senior and younger citizens. The summary of the hypotheses testing comparison between senior citizens and younger adults is given the Table 27.

Table 27. The hypotheses testing comparison between senior citizens and younger adults

Relationship	Hypotheses	Senior Citizens	Younger Adults
PU -> ATU	**H1.1:** Perceived usefulness (PU) has a positive impact on attitude towards using (ATU).	**Supported**	**Supported**
PU -> BI	**H1.2:** Perceived usefulness (PU) has a positive impact on behavioral intention (BI).	Not supported	Not supported
PEOU -> ATU	**H2.1:** Perceived ease of use (PEOU) has a positive impact on perceived usefulness (PU).	**Supported**	**Supported**
PEOU -> BI	**H2.2:** Perceived ease of use (PEOU) has a positive impact on attitude towards using (ATU).	Not supported	Not supported
PEOU -> PU	**H2.3:** Perceived ease of use (PEOU) has a positive impact on behavioral intention (BI).	**Supported**	**Supported**
ATU -> BI	**H3:** Attitude towards using (ATU) has a positive impact on behavioral intention (BI).	**Supported**	**Supported**
SI -> PU	**H4.1:** Social influence (SI) has a positive impact on perceived usefulness (PU).	Not supported	**Supported**
SI -> PEOU	**H4.2:** Social influence (SI) has a positive impact on perceived ease of use (PEOU).	**Supported**	Not supported
FC -> PU	**H5.1:** Facilitating conditions (FC) has a positive impact on perceived usefulness (PU).	Not supported	Not supported
FC -> PEOU	**H5.2:** Facilitating conditions (FC) has a positive impact on perceived ease of use (PEOU).	**Supported**	**Supported**
ANX -> PU	**H6.1:** Anxiety (ANX) has a negative impact on perceived usefulness (PU).	Not supported	**Supported**
ANX -> PEOU	**H6.2**: Anxiety (ANX) has a negative impact on perceived ease of use (PEOU).	**Supported**	**Supported**
SS -> PU	**H7.1:** Self-satisfaction (SS) has a positive impact on perceived usefulness (PU).	**Supported**	**Supported**
SS -> PEOU	**H7.2:** Self-satisfaction (SS) has a positive impact on perceived ease of use (PEOU).	Not supported	Not supported

Social influence (SI) refers the influence of social environment on the ICT use of the participant. Based on the findings, social influence has a positive influence on perceived ease of use while it has no significant influence on perceived usefulness for

elderly adults. Moreover, if senior citizens are supported by their social environment (e.g. family, friends, opinion leaders), they will more prone to perceive ICT as easy to use. On the contrary, the results were opposite for younger adults. That is, social influence (SI) had no significant influence on perceived ease of use while it had a positive influence on perceived usefulness.

Facilitating conditions (FC) indicates the participant's potential resources such as knowledge, money and skills to use ICT. The present study demonstrated that facilitating conditions positively affect perceived ease of use for both elderly and younger adults. Besides, facilitating conditions have no significant effect on perceived usefulness for both groups. That may be interpreted as both senior and younger citizens are prone to perceive ICT as useful and easy to use if they have necessary knowledge, skills and money to use ICT.

Anxiety (ANX) signifies the concerns of the participant toward using ICT. For senior citizens, anxiety had a negative impact only on the perceived ease of use. Nevertheless, anxiety has a negative impact on both perceived usefulness and perceived ease of use for younger adults. The difference may point out that the concerns of senior citizens determine the perceived easiness of ICT while their perception about usefulness of the ICT is not affected by those concerns. It may be due the usefulness of the ICT as an independent concept and it is not associated with skills and knowledge of elderly. On the other hand, senior citizens may have had concerns because it is difficult to learn and use ICT for them. Therefore, the more a senior citizen is concerned, the lower level of perception of easiness for ICT. On the other hand, the anxiety of younger citizens has a negative impact on their opinions on the usefulness and easiness of ICT. That may be interpreted as the concerns of the younger adults make them doubtful about the usefulness of ICT.

Self-satisfaction (SS) demonstrates the participant's fulfillment in ICT use. According to findings, self-satisfaction has a positive impact on perceived usefulness for both elderly and younger adults. Nevertheless, there is no significant cause-effect relationship between self-satisfaction and perceived ease of use. This may indicate that if a person feels fulfilled by using ICT, then s/he will prone to perceive it more useful for himself/herself.

The present study indicated that Technology Acceptance Model (TAM) was confirmed both for Turkish elderly and younger citizens. However, the external variables were found to have different impact technology use and acceptance among elderly and younger citizens. The comparison of final research model between senior and younger citizens is given in Figure 33 and Figure 34.

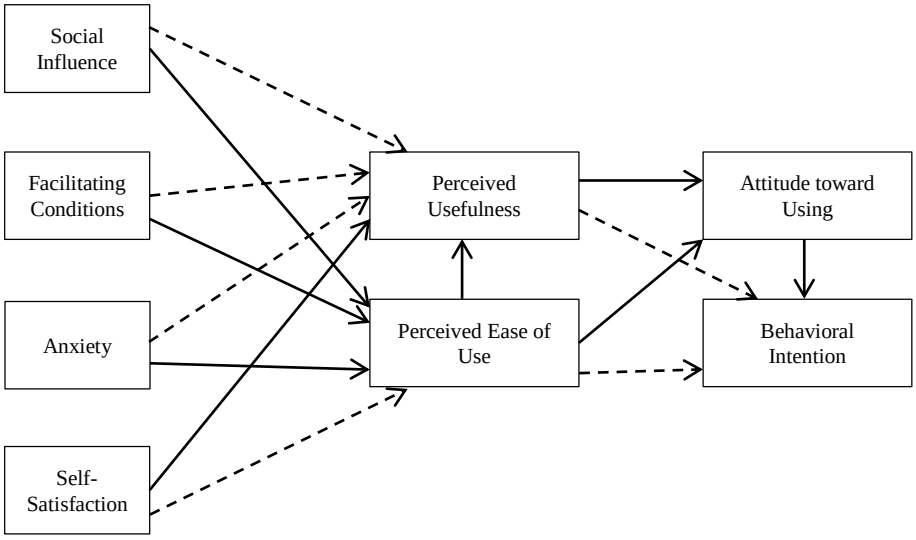


Figure 33. Final research model for Senior Citizens

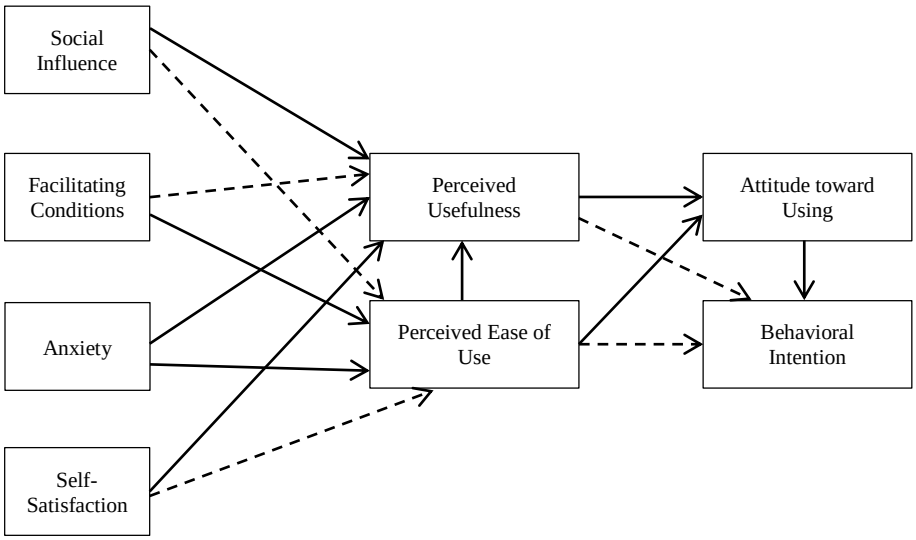


Figure 34. Final research model for Younger Citizens

5.2. Conclusion

Technology Acceptance Model (TAM) is a widely acclaimed model to investigate acceptance of ICT in Human Computer Interaction (HCI) research. In particular, the relationships between a number of factors and technology acceptance have been examined in the present study. The most frequently referenced four external variables, namely social influence, facilitating conditions, anxiety and self-satisfaction, for the acceptance of ICT by senior citizens were added to the original TAM proposed by Davis (1989). To generate the research model, 14 hypotheses were proposed and tested. Eight hypotheses for senior citizens and nine hypotheses for younger citizens were proved while others could not be supported for the study sample. The research model explained the perceived usefulness with R2 42%; perceived ease of use with R2 49%; attitude toward use with R2 60%; and behavioral intention with R2 24% for senior citizens. On the contrary, for younger citizens the research model explained the perceived usefulness with R2 36%; perceived ease of use with R2 35%; attitude toward use with R2 45%; and behavioral intention with R2 20%. The analysis signified that the developed research model fits more to describe acceptance of ICT by the senior citizens.

As the findings of the present study imply, the original TAM is confirmed both for senior and younger citizens in a similar way. That is, the perception on usefulness and easiness to use have significant impact on attitude and acceptance of ICT. Therefore, it may be interpreted that being useful and being easy to use are important features for both elderly and younger adults to have an intention to use ICT. On the other hand, external factors that may influence the acceptance of technology may differ among senior citizens and younger adults. The reasons behind that finding may be the generational characteristics as well as the individual differences.

In addition to the statistical analysis, based on the answers of open-ended questions, senior citizens usually expressed that they would like to learn and use ICT but they have several constraints to do so. Almost all of the elderly participants emphasized that they did not want to be excluded from the society. They usually complained about the lack of connection and communication with their children and younger people. Findings of the present study indicate that that senior citizens need to actively communicate with others via ICT and to be socially acknowledged through ICT. As a recommendation, activities and programs may be organized by authorities to support senior citizens to be more involved into society. ICT may be an efficient tool to reintegrate senior citizens into society, to benefit from their broad experience and to provide them with a healthy old age.

5.3. Limitations and Future Research

The present study was conducted with 232 elderly and 235 younger adults who were commonly resident in Ankara province. To reach larger samples, the data were collected through different channels such as nursery houses, associations for retired people, public gardens, and social media. The main challenges in the present study were practical difficulties, such as applying the questionnaire with elderly people, who were not familiar with filling a questionnaire, their reluctance to participate in the study, and unwillingness to share personal information.

As another limitation of the present study, the sample of the study may not be completely representing the entire senior citizens in Turkey. Therefore, more extensive research may be conducted including different provinces of Turkey for deeper explanation and inferences for elderly population in Turkey.

For future research, recently proposed age classifications with different chronological divisions for being elderly may also be taken into consideration.

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APPENDICES

APPENDIX A

TURKISH VERSION OF INSTRUMENT[1]

Değerli Katılımcı,

Bu çalışma, ODTÜ Bilişim Sistemleri öğrencisi Hacer GÜNER'in yüksek lisans tezi kapsamında Yrd. Doç. Dr. Cengiz ACARTÜRK'ün danışmanlığında yürütülmektedir. Çalışmanın amacı 60 yaşın üzerindeki vatandaşların bilgi teknolojileri kullanımı ve bakış açılarının incelenmesi ve gençlerle karşılaştırılmasıdır.

Çalışmada sizden alınan bilgiler isim verilemeden bu akademik çalışma kapsamında kullanılacak olup kesinlikle başka kişi ya da kurumla paylaşılmayacaktır. Çalışmaya katılımız gönüllük esasına dayalıdır ve istediğiniz zaman çalışmayı sonlandırabilirsiniz.

Çalışma sırasında ya da sonrasında bütün sorularınızı ve önerilerinizi araştırmacıya iletebilirsiniz.

İlginiz ve bilime sağladığınız katkı için teşekkür ederim.

Hacer GÜNER

GSM: *XXX XXX XX XX*

E-posta: guner.hacer@metu.edu.tr

[1] The ethical clearance was taken from Research Center for Applied Ethics at METU before data collection.

A. Aşağıdaki soruları dikkatli bir şekilde okuyarak cevaplayınız.

1. Yaşınız: _____

2. Cinsiyetiniz: ○ Kadın ○ Erkek

3. Eğitim Durumunuz:
○ Okur-yazar ○ İlkokul ○ Ortaokul ○ Lise ○ Üniversite ○ Y. Lisans & Doktora

4. Mesleğiniz: *(Örneğin; Ev Hanımı, Emekli Öğretmen, Doktor gibi.)* _____

5. Ortalama Aylık Geliriniz (*Aylık gelirinizi yaklaşık olarak işaretleyiniz.*)
☐ Gelirim yok.
☐ 1000 TL'den daha az
☐ 1000 TL – 2000 TL arasında
☐ 2000 TL – 3000 TL arasında
☐ 3000 TL 'den fazla

6. Aşağıdaki seçeneklerden size uygun olanı seçiniz. (Birden fazla seçenek işaretleyebilirsiniz.)
☐ Yalnız yaşıyorum.
☐ Eşim ve/veya çocuklarımla birlikte yaşıyorum.
☐ Ailemle (anne, baba, kardeş vb.) birlikte yaşıyorum.
☐ Arkadaşım / arkadaşlarımla birlikte yaşıyorum.
☐ Akrabalarımla birlikte yaşıyorum.
☐ Huzurevi/yaşlı bakımevinde yaşıyorum.
☐ Diğer: _____

7. Günlük zamanınızı genellikle nasıl geçirirsiniz? (Birden fazla seçenek işaretleyebilirsiniz.)

☐ Televizyon izleyerek	☐ Kitap okuyarak
☐ Eşimle /ailemle sohbet ederek	☐ Torunlarımla ilgilenerek
☐ Arkadaşlarımla sohbet ederek	☐ Gazete/dergi okuyarak
☐ İbadet ederek	☐ Gezerek
☐ Çalışarak (mesleki)	☐ Ders çalışarak
☐ Uyuyarak	☐ Kurslara/seminerlere katılarak
☐ Müzik, resim vb. sanatla uğraşarak	☐ Diğer _____

8. Cep telefonu, bilgisayar, internet gibi bilgi teknolojilerini günlük hayatınızda kullanıyor musunuz? (*Cevabınız hayır ise 9-10-11-12 numaralı soruları atlayabilirsiniz.*)
○ Evet ○ Hayır

9. Aşağıdaki teknolojilerden hangilerini günlük hayatınızda kullanırsınız? (Birden fazla seçenek işaretleyebilirsiniz.)

☐ Cep telefonu (akıllı olmayan) ☐ İnternet ☐ Tablet bilgisayar

☐ Akıllı telefon ☐ Bilgisayar

10. Aşağıdaki teknolojileri ne kadar süredir kullandığınızı işaretleyiniz.

	Kullanmıyorum	1 yıldan az	1 - 3 yıldır	4 - 6 yıldır	7 - 10 yıldır	10 yıldan fazla
Cep telefonu (akıllı olmayan)	☐	☐	☐	☐	☐	☐
Akıllı Telefon	☐	☐	☐	☐	☐	☐
İnternet	☐	☐	☐	☐	☐	☐
Bilgisayar	☐	☐	☐	☐	☐	☐
Tablet bilgisayar	☐	☐	☐	☐	☐	☐

11. Cep telefonu, bilgisayar, internet gibi bilgi teknolojilerini günlük hayatınızda hangi amaçlar için kullanıyorsunuz? (Birden fazla seçenek işaretleyebilirsiniz.)

☐ Hastane randevusu almak
☐ Yeni insanlarla tanışmak
☐ Dizi, film, video izlemek
☐ E-posta göndermek
☐ Güncel olayları / haberleri takip etmek
☐ Yeni bilgiler öğrenmek
☐ Alışveriş yapmak
☐ Ders çalışmak
☐ Diğer _____
☐ e-Devlet hizmetlerinden faydalanmak
☐ Bankacılık hizmetlerini kullanmak
☐ Sosyal medya (Facebook gibi) kullanmak
☐ Oyun oynamak
☐ Ailem ya da arkadaşlarımla görüşmek
☐ Müzik dinlemek
☐ E-posta göndermek
☐ Mesleki amaçla / işim için

12. Sosyal medya hesabınız varsa hangilerine sahip olduğunuzu işaretleyiniz. (Birden fazla seçenek işaretleyebilirsiniz.)

☐ Sosyal medya hesabım yok.

☐ WhatsApp
☐ Facebook
☐ Instagram
☐ Diğer _____
☐ Twitter
☐ Snapchat
☐ LinkedIn

B. Aşağıdaki ifadeleri okuyarak, kendi görüşünüze göre 1'den 7'ye kadar puan veriniz. 1: "Hiç katılmıyorum" 2. "Katılmıyorum" 3: "Biraz katılmıyorum" 4: "Kararsızım" 5: "Biraz katılıyorum" 6: "Katılıyorum" 7: "Tamamen katılıyorum"	**Hiç Katılmıyorum**	**Katılmıyorum**	**Biraz Katılmıyorum**	**Kararsızım**	**Biraz Katılıyorum**	**Katılıyorum**	**Tamamen Katılıyorum**
(Bilgi teknolojileri = cep telefonu, internet, bilgisayar gibi)	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. Bilgi teknolojilerini kullanmak, günlük hayattaki işlerimi daha hızlı bir şekilde yerine getirmemi sağlar.	○	○	○	○	○	○	○
2. Bilgi teknolojilerini kullanmak, günlük hayattaki işlerimde daha verimli olmamı sağlar.	○	○	○	○	○	○	○
3. Bilgi teknolojilerini kullanmak, günlük hayattaki işlerimi yapmamı kolaylaştırır.	○	○	○	○	○	○	○
4. Bilgi teknolojilerinin günlük hayattaki işlerimde faydalı olduğunu düşünüyorum.	○	○	○	○	○	○	○
5. Bilgi teknolojilerini kullanmayı öğrenmek, benim için kolaydır.	○	○	○	○	○	○	○
6. Bilgi teknolojilerini ihtiyaç duyduğum şekilde kullanabileceğimi düşünüyorum.	○	○	○	○	○	○	○
7. Bilgi teknolojilerini kullanmanın kolay olduğunu düşünüyorum.	○	○	○	○	○	○	○
8. Bilgi teknolojilerini kullanmak iyi bir fikirdir.	○	○	○	○	○	○	○
9. Bilgi teknolojilerini kullanmak eğlencelidir.	○	○	○	○	○	○	○
10. Bilgi teknolojilerini kullanmayı seviyorum.	○	○	○	○	○	○	○
11. Benim davranışlarım üzerinde etkisi olan insanlar, bilgi teknolojilerini kullanmamı destekliyor.	○	○	○	○	○	○	○
12. Benim için önemli olan kişiler, bilgi teknolojilerini kullanmam gerektiğini düşünüyor.	○	○	○	○	○	○	○

B. Aşağıdaki ifadeleri okuyarak, kendi görüşünüze göre 1'den 7'ye kadar puan veriniz. 1: "Hiç katılmıyorum" 2. "Katılmıyorum" 3: "Biraz katılmıyorum" 4: "Kararsızım" 5: "Biraz katılıyorum" 6: "Katılıyorum" 7: "Tamamen katılıyorum"	**Hiç Katılmıyorum**	**Katılmıyorum**	**Biraz Katılmıyorum**	**Kararsızım**	**Biraz Katılıyorum**	**Katılıyorum**	**Tamamen Katılıyorum**
13. Görüşlerine önem verdiğim kişiler, bilgi teknolojilerini kullanmamı tercih ediyor.	○	○	○	○	○	○	○
14. Bilgi teknolojilerini kullanmak için gerekli paraya sahibim.	○	○	○	○	○	○	○
15. Bilgi teknolojilerini kullanmak için gerekli bilgiye sahibim.	○	○	○	○	○	○	○
16. Bilgi teknolojileri ile ilgili yaşayacağım güçlükler konusunda yardımcı olabilecek kişilere sahibim.	○	○	○	○	○	○	○
17. Bilgi teknolojilerini kullanmak konusunda endişelerim var.	○	○	○	○	○	○	○
18. Bilgi teknolojilerini kullanırken yanlış bir işlem yaparak birçok bilgiyi kaybedebileceğim düşüncesi beni korkutuyor.	○	○	○	○	○	○	○
19. Düzeltemeyeceğim hatalar yapma korkusu nedeniyle bilgi teknolojilerini kullanmakta tereddüt ediyorum.	○	○	○	○	○	○	○
20. Bilgi teknolojilerini kullanmak bir şekilde gözümü korkutuyor.	○	○	○	○	○	○	○
21. Bilgi teknolojilerini kullanmak daha genç hissetmemi sağlıyor.	○	○	○	○	○	○	○
22. Bilgi teknolojilerini kullanmak başarılı olduğum hissini arttırıyor.	○	○	○	○	○	○	○
23. Bilgi teknolojilerini kullanmak, zamana ayak uydurmama yardımcı oluyor.	○	○	○	○	○	○	○
24. Günlük hayatımda bilgi teknolojilerini daha fazla kullanmayı istiyorum.	○	○	○	○	○	○	○
25. Günlük hayatımda bilgi teknolojilerini daha fazla kullanmayı planlıyorum.	○	○	○	○	○	○	○

C. Genel Değerlendirme

1. Genel olarak cep telefonu, internet, bilgisayar gibi bilgi teknolojileri ile ilgili ne düşünüyorsunuz?

2. Yaşlı insanlar / gençlerin cep telefonu, internet, bilgisayar gibi bilgi teknolojilerini kullanımı hakkındaki düşünceleriniz nedir?

Çalışmama sağladığınız katkı için çok teşekkür ederim ☺

APPENDIX B

ENGLISH VERSION OF INSTRUMENT[1]

Dear Participant,

This study, supervised by Asst. Prof. Dr. Cengiz ACARTURK, is being conducted in the scope of thesis research by Hacer GUNER who is a Master of Science student in Information Systems at METU. The purpose of the study is to investigate use and acceptance of information and communication technologies by senior citizens and its comparison with younger adults.

The data collected through this study will only be used for the academic purposes without giving personal detail and without sharing third-party people or organizations. Your participation in this study is based on voluntariness and you can quit whenever you want.

You are quite welcome to ask your questions and express your comments to the researcher both during and after the study.

Thank you so much for your kind attention and your contribution to science.

Hacer GÜNER

GSM: *XXX XXX XX XX*

E-mail: guner.hacer@metu.edu.tr

[1] The ethical clearance was taken from Research Center for Applied Ethics at METU before data collection.

A. Please answer the following questions properly.

1. Age: _____

2. Gender: ○ Female ○ Male

3. Education Status:
○ Literate ○ Primary School ○ Secondary School ○ High School
○ Bachelor's Degree ○ MSc. & PhD

4. Occupation: _____

5. Monthly Income (*Please select your approximate montly income.*)
☐ No income
☐ Less than 1000 TL
☐ Between 1000 TL – 2000 TL
☐ Between 2000 TL – 3000 TL
☐ More than 3000 TL

6. Please choose the most suitable option(s) for you. (You can pick more than one item.)
☐ I am living alone.
☐ I am living with my wife and/or my children.
☐ I am living with my family (e.g. mother, father, siblings etc.)
☐ I am living with my friend(s).
☐ I am living with my relative(s).
☐ I am living in a nursery house.
☐ Other: _____

7. What are your common daily activities? (You can pick more than one item.)

☐ Watching TV	☐ Reading book
☐ Chatting with my spouse/family	☐ Looking after my grandchildren
☐ Chatting with my friends	☐ Reading newspaper, magazine etc.
☐ Praying	☐ Walking around
☐ Working in job	☐ Studying
☐ Having a nap	☐ Participating courses and seminars
☐ Doing music, art etc.	☐ Other _____

8. Do you use information and communication technologies such as mobile phone, computer, Internet in your daily life? (*If no, please skip the questions 9-10-11-12)*
○ Yes ○ No

9. Which of the technologies given below do you use in your daily life? (You can pick more than one item.)

☐ Mobile phone (non-smart) ☐ Internet ☐ Tablet computer

☐ Smart phone ☐ Personal computer

10. Please fill the following table based on the duration of your use for given technology.

	Never	Less than a year	1-3 years	4-6 years	5-10 years	More than 10 years
Mobile phone (non-smart)	☐	☐	☐	☐	☐	☐
Smart phone	☐	☐	☐	☐	☐	☐
Internet	☐	☐	☐	☐	☐	☐
Personal computer	☐	☐	☐	☐	☐	☐
Tablet computer	☐	☐	☐	☐	☐	☐

11. What is your purpose to use information and communication technologies such as mobile phone, computer, Internet in your daily life? (You can pick more than one item.)

☐ Arranging hospital appointment
☐ Meeting new people
☐ Watching video, film etc.
☐ Sending e-mail
☐ Following latest news & developments
☐ Searching for new information
☐ Shopping
☐ Studying
☐ Using e-government services
☐ Using online banking services
☐ Using social media like Facebook
☐ Playing game
☐ Contacting with my family and friends
☐ Listening music
☐ For my job
☐ Other _____

12. Do you have social media account? If so, select the suitable choice(s). (You can pick more than one item.)

☐ I have no social media account

☐ WhatsApp ☐ Twitter

☐ Facebook ☐ Snapchat

☐ Instagram ☐ LinkedIn

☐ Other _____

B. Read the following statements and rate them from 1 to 7 based on your opinion. 1: "Definitely disagree" 2. "Disagree" 3: "Somewhat disagree" 4: "Neutral" 5: "Somewhat agree" 6: "Agree" 7: "Definitely agree"	**Definitely disagree**	**Disagree**	**Somewhat disagree**	**Neutral**	**Somewhat agree**	**Agree**	**Definitely agree**
(ICT= information and communication technologies such as mobile phone, computer, Internet etc.)	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. Using ICT would enable me to accomplish my daily life activities more quickly.	○	○	○	○	○	○	○
2. Using ICT would enhance my effectiveness on daily life.	○	○	○	○	○	○	○
3. Using ICT would make it easier to do my daily life activities.	○	○	○	○	○	○	○
4. I would find ICT useful in my daily life activities.	○	○	○	○	○	○	○
5. Learning to use ICT would be easy for me.	○	○	○	○	○	○	○
6. I would find it easy to get ICT to do what I want it to do.	○	○	○	○	○	○	○
7. I would find ICT easy to use.	○	○	○	○	○	○	○
8. Using ICT is a good idea.	○	○	○	○	○	○	○
9. Using ICT is enjoyable.	○	○	○	○	○	○	○
10. I like using ICT.	○	○	○	○	○	○	○
11. People who influence my behavior think that I should use ICT.	○	○	○	○	○	○	○
12. People who are important to me think that I should use ICT.	○	○	○	○	○	○	○

B. Read the following statements and rate them from 1 to 7 based on your opinion. 1: "Definitely disagree" 2. "Disagree" 3: "Somewhat disagree" 4: "Neutral" 5: "Somewhat agree" 6: "Agree" 7: "Definitely agree"	**Definitely disagree**	**Disagree**	**Somewhat disagree**	**Neutral**	**Somewhat agree**	**Agree**	**Definitely agree**
13. People whose opinions are valuable for me prefer me to use ICT.	○	○	○	○	○	○	○
14. I have the money necessary to use ICT.	○	○	○	○	○	○	○
15. I have the knowledge necessary to use ICT.	○	○	○	○	○	○	○
16. A specific person (or group) is available for me to give assistance with difficulties of ICT use.	○	○	○	○	○	○	○
17. I feel apprehensive about using ICT.	○	○	○	○	○	○	○
18. It scares me to think that I could lose a lot of information due to a wrong operation while using ICT.	○	○	○	○	○	○	○
19. I hesitate to use ICT for fear of making mistakes I cannot correct.	○	○	○	○	○	○	○
20. Using ICT is somewhat intimidating to me.	○	○	○	○	○	○	○
21. Using ICT makes me feel younger.	○	○	○	○	○	○	○
22. Using ICT increases my sense of achievement.	○	○	○	○	○	○	○
23. ICT help me to keep pace with the times.	○	○	○	○	○	○	○
24. I intend to use ICT more in my daily life.	○	○	○	○	○	○	○
25. I plan to use ICT more in my daily life.	○	○	○	○	○	○	○

C. Interview Part

1. What do you think of information and communication technologies such as mobile phone, computer, Internet etc. in general?

2. What do you think about the use of information and communication technologies such as mobile phone, computer, Internet etc. by senior citizens / younger adults?

Thank you so much for your contribution to my research ☺

TEZ FOTOKOPİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☐

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : .....
Adı : .....
Bölümü : .....

TEZİN ADI (İngilizce) : .....
.....
.....
.....
.....

TEZİN TÜRÜ : Yüksek Lisans ☐ Doktora ☐

1. Tezimin tamamı dünya çapında erişime açılsın ve kaynak gösterilmek şartıyla tezimin bir kısmı veya tamamının fotokopisi alınsın. ☐
2. Tezimin tamamı yalnızca Orta Doğu Teknik Üniversitesi kullancılarının erişimine açılsın. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☐
3. Tezim bir (1) yıl süreyle erişime kapalı olsun. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☐

Yazarın imzası ..... Tarih .....