ANALYSES OF FACTORS AFFECTING ACCEPTANCE OF HOMECARE TECHNOLOGIES BY PATIENTS WITH CHRONIC DISEASES

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ABSTRACT

ANALYSES OF FACTORS AFFECTING ACCEPTANCE OF HOMECARE TECHNOLOGIES BY PATIENTS WITH CHRONIC DISEASES

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In this study, the factors affecting the acceptance of mobile homecare system were examined. These factors were assessed by taking *Unified Theory of Acceptance and Use of Technology* (UTAUT) as a theoretical model. The main feature of this thesis (differing from the other studies in the literature) is that the user acceptance study model is analyzed on a system that is not realized yet. So, this study has two

different perspectives. The first one is the examination the results of UTAUT for a system in the design phase. The other one is the investigation of the relations of factors that affect the acceptance of mobile homecare by patients with chronic diseases. For these purposes, a homecare system model was formulated based on similar studies in the literature. A quantitative research was conducted on this formulated system. The results were evaluated by Structural Equation Model. According to the results of structural model, all hypotheses were supported and consistent with the earlier study results, which were based on completed and in-use systems. Therefore, this study shows that, for systems in the design level, the acceptance models can also be applicable and may give similar results.

The results also show that performance expectance was the most significant predictor for patients' intention to use the system. For the proposed system UTAUT was able to provide a reasonable prediction of patients' acceptance of mobile homecare technology for behavioral intention with variance (R2) of 68%.

Keywords: Technology Acceptance Model (UTAUT), Homecare, Chronic Disease,

ÖZ

KRONİK HASTALIĞI OLAN BİREYLERİN EVDE BAKIM TEKNOLOJİLERİNİN KABULÜNÜ ETKİLEYEN FAKTÖRLERİN ANALİZİ

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Bu tez çalışmasında kronik hastalığı olan bireylerin taşınabilir evde bakım sistemlerini kullanımını etkileyen faktörler incelenmiştir. Bu faktörler *Teknoloji Kabullenme ve Kullanımı Birleşik Teorisi* (*Unified Theory of Acceptance and Use of Technology* - UTAUT) temel alınarak incelenmiştir. Bu çalışmayı literatürdeki

benzerlerinden ayıran temel özelliği, teknoloji kullanım ve kabul modelinin henüz hayata geçmemiş bir sistem üzerinde uygulanmış olmasıdır. Bu sebeple, bu tez çalışmasının iki faklı bakış akışı bulunmaktadır. Bunlardan ilki, UTAUT"un sistem tasarım aşamasındaki sonuçlarının değerlendirilmesidir. Diğeri ise, kronik hastalığı olan bireylerin taşınabilir evde bakım sistemini kabulunü etkileyen faktörler arasındaki ilişkiyi incelenmesidir. Bu amaçla, örnek bir taşınabilir evde bakım sistemi literatürdeki örnekleri temel alınarak formüle edilmiştir. Bu sistem üzerinden nicel bir araştırma yürütülmüştür. Araştırma sonuçları Yapısal Eşitlik Modeli kullanılarak değerlendirilmiş olup, sonuçta faktörler arası ilişkiyi gösteren yapısal model oluşturulmuştur. Yapısal modele göre, oluşturulmuş olan tüm hipotezler kabul edilmiş ve tamamlanmış sistemler üzerinden yapılan araştırmalar ile benzer sonuçların elde edildiği görülmüştür. Bu sebepledir ki, bu tez çalışması teknoloji kullanım ve kabul modellerinin sistem ön tasarım aşamasındayken de uygulanabilir olduğunu ve belirleyici sonuçlar ürettiğini göstermiştir.

Bu çalışma sonuçları taşınabilir evde bakım sistemi kullanıcılarının sistemi kullanmasındaki davranışsal niyeti için en güçlü belirleyicinin beklentisi olduğunu göstermiştir. Ayrıca, yine bu sonuçlara göre, UTAUT önerilen sistemi kullanmak için davranışsal niyeti %68 varyans ile tahmin edebilmiştir.

Anahtar Kelimeler: Teknoloji Kabullenme ve Kullanımı Birleşik Teorisi (UTAUT), Evde Bakım, Kronik Hastalık

To my family

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LIST OF ABBREVIATIONS

ACHD – Adult Congenital Heart Disease
APHS – Acceptance of Patient Homecare System
AVE – Average Variance Extraction
CATV – Community Antenna Television
CDMA – Code Division Multiple Access
CFA – Confirmatory Factor Analysis
COPD – Chronic Obstructive Pulmonary Disease
ECG – Electrocardiograph
FEV1 – Forced Expiratory Volume
FVC – Forced Vital Capacity
IDT – Innovation Diffusion Theory
IT – Information Technologies
IS – Information System
NBI –Native Body Index
PFT – Pulmonary Function Test
POTS – Plain Old Telephone Service
SPO2 – Blood Oxygen Saturation
SysML – System Modeling Language
TAM – Technology Adoption Model
TAM2 – Technology Adoption Model 2
TOC – Table of Contents
TPB – Theory of Planed Behavior
TRA – Theory of Reasoned Action
UTAUT – Unified Theory of Acceptance and Use of Technology
WHO – World Health Organization

CHAPTER 1

INTRODUCTION

Following chapter provides background information and outline of the study.

1.1. Background of The study

World Health Organization (WHO) defines Chronic diseases as 'diseases of long duration and generally slow progression'. The list of chronic diseases is quite long. Heart diseases, stoke, cancer, chronic respiratory diseases, Chronic Obstructive Pulmonary Disease (COPD) and diabetes are the most significant members of this list.

Chronic diseases are *'the most leading cause of mortality in the world by representing 60% of all deaths. According to WHO, out of the 35 million people who died from chronic disease in 2005, half were under 70 and half were women*.'[1]

According to the Ministry of Health's General Directorate of Curative Services' "Chronic Diseases Report", dated February 16, 2006, there are about 22 million people live under the influence of chronic diseases in Turkey and the number of patients with such diseases are increasing. In the report, the most important risk factors for the group of chronic diseases, namely cardiovascular diseases, high blood pressure, diabetes and COPD, are emphasized as smoking and alcohol use, unhealthy diet, stress and sedentary life style. In addition, the report states that protective measures can be taken for chronic diseases, which otherwise leads to early death and adversely affecting the quality of life.

Chronic disease is an ongoing long-term condition. The complications of this condition are costly to the health system and cause lost of productivity. Due to the increase in both the prevalence of the patients with chronic diseases and the elderly population, the cost of the complications is about to reach to dramatic levels.

Usually, these patients do not heal, but if appropriate measures are taken, their adverse disease progression can be prevented [12], and complications are kept to minimum. To achieve this goal, the health care services are being changed from treatment to prevention [11] .

Thanks to the progress in medical sciences and information technologies (IT), now it is possible manage patients within their living area via homecare technologies.

Homecare provides a new way of management for patients with chronic disease by continuously monitoring their conditions using diagnostics and healthcare devices. Such systems typically have two units: a home care unit on patient's home and a base unit in health care center. Vital biosignals, like Electrocardiograph (ECG), blood oxygen saturation (SPO2), native body index (NBI) and temperature, are transmitted to the base unit. The base unit in a health care center analyses the patients biosignals, and takes necessary actions as need [5].

Home care system has many benefits. First of all, using a homecare system helps to reduces health care costs due to the possible complications of chronic disease. For example, long term complications of diabetics may affect the central or peripheral nervous system and gives rise to nephropathy, neuropathy, or cause blindness [6], which results in extra costs for the health system. Continuous monitoring of patients remotely has the potential of decreasing such complications. In addition, long stays in hospitals can be also reduced. By minimizing the hospital stays and frequency of hospital visits, quality of life will improve. Shepperd and Iiffe pointed out in their study that even if the duration of hospital stay is not reduced much, allocation of care from hospital to home increases the overall time of care, which causes patient's greater satisfaction with care than those in hospital [4].

The demographic structure of Turkey is changing. According to estimates for 2030, Turkey is likely to have demographic structure similar to European countries [3],

which means that the elderly population and indices of chronic disease will increase. Homecare can be an alternative system to support this population.

In spite of the benefits of homecare, there are still limitations due to resistance of patients to such technologies. In order to make effective use of homecare technologies, it is necessary to investigate patients' perception and the factors affecting their behaviors.

In the literature, there are different models trying to reveal the aspects for acceptance of end user. Unified technology acceptance model (UTAUT) is one of these models [43]. UTAUT was used in many context, one of which was e-health. This study proposes a model for patient technology acceptance by taking UTAUT as a base model.

1.2. Purpose of The Study

(1) To identify contributions of applying of technology acceptance model during pre-design phase.
(2) To identify the factors effecting the mobile homecare model and the perception of patients for mobile homecare model,

1.3. Outline Of the Thesis

This thesis is organized in 5 chapters which is described as follows:

Chapter 1: Chronic diseases, chronic disease management and rationality of homecare systems in chronic disease management are discussed as background information. Then the significance and purposes of the study are listed.

Chapter 2: This chapter contains the literature review of the study. The literature review of the this study is introduced in two parallel way. The first one is the review of the literature in terms of the mobile homecare systems and the second one is the review of UTAUT and the studies performed by this model on homecare systems.

Chapter 3 : In this chapter methodology of the study is introduced. The first part of the chapter contains detailed description of the formulation of homecare system model used in this study. Then the study model formulated based on UTAUT is introduced and the hypothesis are generated. The research methodology, data collection and statistical analyses methods are described.

Chapter 4 : The chapter contains the statistical analyses of the data collected from patients with chronic diseases. All the steps of the statistical analyses provided with details. Finally, the results of this analyses are given and hypothesis are tested according to the results gathered.

Chapter 5 : This final chapter discussion and conclusion of the study is explained. Limitations for the study and the future works are also introduced.

CHAPTER 2

LITERATURE REVIEW

In this chapter, information on homecare systems, UTAUT and previous studies conducted on homecare and acceptance of patients homecare system (APHS) are provided.

2.1. Chronic Diseases

As discussed before, chronic diseases are 'diseases of long duration and generally slow progression' [1]. The Most significant chronic diseases are:

- **COPD** is a group of lung diseases. The most common members of this group are emphysema and chronic bronchitis.[55]
- **Diabetics**. WHO defines Diabetes as *"a chronic disease, which occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. This leads to an increased concentration of glucose in the blood (hyperglycaemia)"*
- **Asthma** WHO defines Asthma as " *a chronic disease characterized by recurrent attacks of breathlessness and wheezing, which vary in severity and frequency from person to perso*n".
- **Hypertension:** High blood pressure.

- **Coronary heart disease** is a condition in which plaque (plak) builds up inside the coronary arteries [56]
- **Fat Metabolism (Cholesterol):** Cholesterol is produced in the liver for formal body functions. However, the risk of developing heart disease increases with increasing the level of cholesterol in the blood.[57] .

All of the chronic diseases need to be followed based on diagnostic evidence provided by laboratory, medical imaging or the collection of vital signs, for better management of the diseases. However, such evidence cannot be performed at a healthcare center daily. Instead, chronic disease management is has to be carried out at home, at work or any other area of life. As an example, a diabetic patient has to perform several tests per day to adjust the blood glucose level with medication. This is the only way to identify if the diet, period or dose of medication are right for their blood glucose level.

2.2. Homecare Systems

Patients with chronic diseases need a special way of health care. It is regular that, such patients (who are often elderly individuals) have more than one chronic disease. The size of this group is also growing causing a rapid growth in health care resource consumption. Moreover, the rate of hospitalization and prevalence of disability is also high among this group [5].

Recent development in IT and medical sciences make it possible to create virtual care environment that responds the needs of such patients [7]. Within the environment, called as homecare systems, patients are assisted remotely, reducing the need for hospital visits [10]. In addition, home care systems provide patient-centric disease management in which patients have opportunity to handle their disease management.

In the following paragraphs, the general architecture of a homecare system is discussed.

2.2.1. Architecture

Homecare is a hot research topic that attracts many researchers' attention. While most of the researcher share similar baseline, they have proposed different systems. Table 1 summarizes some of these studies.

Table 1- Homecare Systems From Literature

Study	Summary
Kim K.H et al 2008[6]	Proposes smartphone based system, integrates Bluetooth and Code Division Multiple Access (CDMA) network for communication.
Li& Istepanian 2003[7]	This paper presents a conceptual model for diabetics management program based on the third generation mobile system.
Ojesanmi OA et al. 2010[8]	The paper presents a framework for a homecare system enabling health delivery to HIV/AIDS patients.
Koutkias, et al. 2002 [9]	The paper presents a multi-agent system that is integrated in homecare telemedicine system within Citizen Health System European project.
Angius et al 2008 [10]	The paper presents a system based on DVB-T technology
LIN et al. [11]	The paper presents homecare solution implemented on ZigBee based wireless.
Kyriacou et al. 2003 [12]	The paper presents a combined telemedicine solutions one of which is the home tele-monitorin
Maglaveras 2003[13]	The PANACEIA-TV project is based on the DVB-S technology, patients who suffer from Adult Congenital Heart Disease (ACHD) monitored from their home.
Miao 2006[14]	This paper describes the design and implementation of a pervasive computing based multimodal tele-home healthcare

Table 1(Cont.)

Study	Summary
	system.
Lee 2000[15]	The paper presents a homecare service system based on Community Antenna Television (CATV) and RF Modem.
Hung 2003 [16]	The paper describes the homecare system based on wireless application protocol (WAP).
Traver, et al [17]	Paper presents a homecare solution for patients with cardiac diseases.
Korsakas1 et al [18]	The paper describes a wireless ECG and motion activity system developed for homecare patients.
LEE et al 2005 [19]	A role-based intelligent diabetes mobile care system with an alert mechanism for full diabetic care environment is proposed and implemented.

The study represent by Kim K.H et al (2008)[6], proposes a system, uses a Smartphone as a portable gateway. The gateway integrates Bluetooth and Code Division Multiple Access (CDMA) network for communication. The messages transmitted to the main server in HL7 standard. The system suggests solution to fixed gateway at home, which causes people to have difficulty in checking their health conditions outside home[6].

The other study conducted by Li & Istepanian (2003)[7] presents a conceptual model for diabetics management program based on the third generation mobile system. The conceptual model is based on 3G mobile agents for an environment that provides intelligent and personalized monitoring services to patients, best-practice decision support to physicians, and wellness maintenance for cost control[7].

Another study[8] presents a framework for a homecare system enabling health delivery to HIV/AIDS patients. The system proposed is based on 3G mobile

technology with use of agents. The actors of the system are the agents in the system each of which uses a mobile phone to communicate with the server anywhere and anytime without restrictions.

The study by Ojesanmi et al (2010) [8] presents a multi-agent system that is integrated in homecare telemedicine system within Citizen Health System European project which is functioning as a central contact point for patients with diabetic and congestive heart failure. The purpose of the system is to generate mechanism form alert or notifications based on patient's condition.

Another study conducted by Koutkias, et al.(2002)[9] presents a multi-agent system that is integrated in homecare telemedicine system within Citizen Health System European project which is functioning as a central contact point for patients with diabetic and congestive heart failure. The purpose of this system is to generate mechanism form alert or notifications based on patient's condition

Another study[10] presents a system based on DVB-T technology. In the system, patients interact with the health-monitor device through a TV screen and the remote controller of the set-top box. System is defined as cost effective and easy to use because it is built up on TV SET which is easy to use by most patients and exists in every house[10].

The other study[11] presents homecare solution implemented on ZigBee based wireless device by integrating the biosensors to monitor the vital signals like body temperature, blood pressure, heart rate and SPO2. The proposed homecare system raises alerts if the vital data is abnormal and can send an email and a simple message to notice specified family members[11].

Kyriacou et al.(2003) [12] presents a combined telemedicine solutions one of which is the home tele-monitoring. In the system, telemedicine unit is installed at patient's home and the base unit is installed at the physician's office or hospital. Communication is performed by GSM mobile telecommunication network satellite links or Plain Old Telephone Service (POTS) links in collection of vital signals and still images. Using the system, doctor can monitor the patient at home[12].

The PANACEIA-TV project[13] is a home care system that enables patients to monitor their health and to access health information and guidance. System is based on the DVB-S technology, patients who suffer from Adult Congenital Heart Disease (ACHD) monitored from their home. The system aims to evaluate the attitude at use of new technologies such as interactive TV in remote health care for disease management[13].

Another paper[14] describes the design and implementation of a pervasive computing based multimodal tele-home healthcare system.

Lee (2000) [15] presents a homecare service system based on Community Antenna Television (CATV) and RF Modem. The service provides 'real-time and high-quality video and audio that supports interactive communication between the healthcare provider and patient'. The RF modem part of the system provides transmission of vital body signals like ECG.

Hung (2003) [16] describes the homecare system based on wireless application protocol (WAP). WAP devices are used as mobile access terminals for general inquiry and patient-monitoring services. Based on authorization, the users of the system can browse the patients' general data, monitored blood pressure (BP), and electrocardiogram (ECG) on WAP devices.

Traver, et al [17] presents a homecare solution for patients with cardiac diseases. The system is available on platforms like : a Personal Digital Assistant, a Set-Top-Box (STB), a laptop and a Personal Computer (PC). In the system, intensive homecare autonomous monitoring, home hospitalization scenarios are implemented. First of all, home intensive homecare is a synchronous service mainly for patients having surgical operations who need a very close follow up. Secondly, autonomous monitoring is an asynchronous service where the patient's vital biosignals are monitored. Finally, home hospitalization unit is a scenario which provides a set of tools for medical staff to manage all of the patients visited by them daily.

Another study[18] describes a wireless ECG and motion activity system developed for homecare patients. System is composed of a three channel ECG recorder device

with Bluetooth module that communicates with the PC software that maintains real-time signal analyses and a warning mechanism. Software detects harmful situations for patient and sends a warning signal to the patient and also sends the results of analysis to physician.

LEE et al (2005) [19] presents, a role-based intelligent diabetes mobile care system with an alert mechanism for diabetic care environment. Patients, physicians, nurses, and home care assistant are all actors of the system. Each of these actors use a mobile device (a mobile phone or a PDA with GSM module is used to communicate with the server). The system provides alert mechanism by using an automatic urgency strategy.

Although the communication means are different, all of the systems described above have two separate components which can be called as a base unit at the care center and a monitoring system at the patient's home. The monitoring system is where data is collected and the base unit is where data is analyzed.

In addition, all of the systems shares same conceptual model. Li and Istepanian (2003) [7] has described this basic architecture of the system in a raw scenario. The scenario is shown as a flow chart in Figure 1.

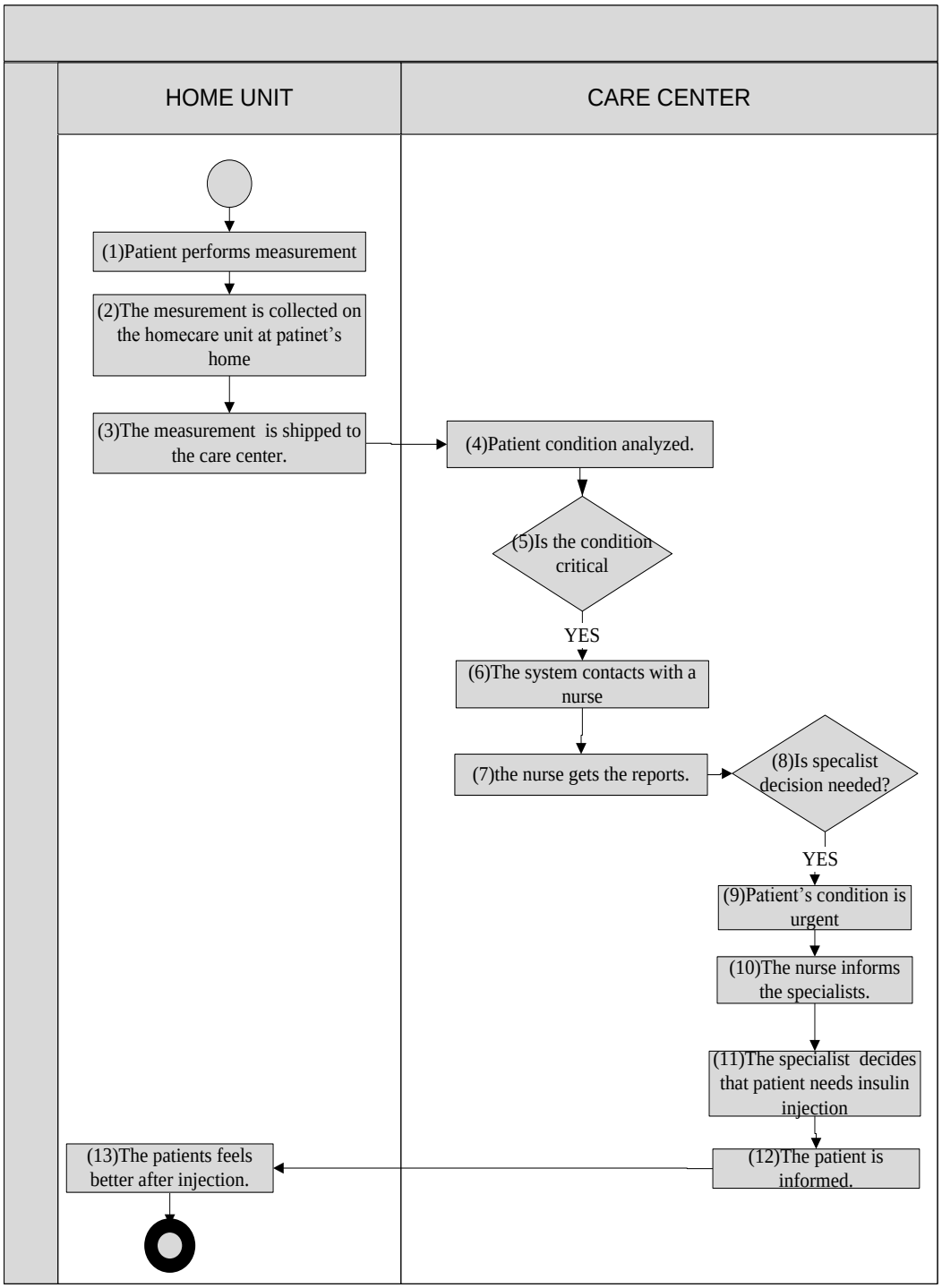


Figure 1. Conceptual model of a basic architecture of a homecare system as a raw scenario. Adapted from Li and Istepanian (2003)[7]

The figure describes the two separate sides of the system which are the home unit and care center. Moreover, inner operations of the units and their relationships with each other can be seen on the diagram. In this conceptual model, patients vital signals are collected with special devices (Figure1 - Step 1). The devices are specialized for vital signal type. Thanks to these devices, vital parameters of patients can be obtained outside the hospital. Some of the parameters that can be observed via these devices are listed below.

- *Anticoagulants and Thrombosis level,*
- *Blood glucose level ,*
- *The heart's electrical activity (ECG),*
- *Peak Flow Measurement of exhaled ,*
- *Spirometry (lung capacity) ,*
- *Blood oxygen pressure (Level of INR),*
- *Levels of blood cholesterol ,*
- *Level of INR (coagulation index),*
- *Blood Pressure ,*
- *Body weight*

According to the disease type, vital signals may differ. A generic cross-match of vital signals with diseases is summarized in Table 2.

Table 2- Disease-measurements cross-match table

	CARDIAC DISORDERS			LUNG		DIABETES
	THROMBOSIS	HEART AND CARDIAC DISORDERS	HYPERTENSION, HYPOTENSION	ASTHMA	COPD	
Anticoagulants and Thrombosis Meter	**X**			**X**	**X**	
Spirometry(Lung Capasity)				**X**	**X**	
Meter-Detector Arrhythmias		**X**	**X**			
ECG Electro-Cardiogram		**X**				
Peak Flow Meter, PFM				**X**	**X**	
Blood Oxygen Pressure PO2					**X**	
Blood Pressure	**X**	**X**	**X**	**X**	**X**	**X**
Blood Glucose Level						**X**
Levels of Blood Cholesterol	**X**	**X**	**X**			**X**
Level of INR (coagulation index)	**X**	**X**				

The parameters listed above are collected via special meters and transferred to an access point at patient's home via different communication technologies (Figure 1 – Step 2). Each time the patient performs the measurement data collection process is also performed.

The data collected through the measurements is sent to the base unit at the health care center (Figure 1 – Step 3). The data gathered is analyzed at the care center (Figure 1 – Step 4) and any urgent situation is handled (Figure 1 – Steps 5 to13).

The majority of the systems described in Table 2 is based on mobile technologies which promotes patient mobility. It clear that mobile technology adaption in healthcare has significant benefits. Standing et al (2008) [27] has described the benefits in their article based on several studies. Table 3 summarizes their findings.

Table 3- Benefits associated with mobile-technology adoption in the health sector Adapted from Standing et al (2008)[27]

Benefit of mobile-technology	Reason for benefit	Mobile-technology application examples	Reference
Improved communication	More timely communication of information	E-mail, voice, SMS	Heinzelmann et al., 2005
Reduce costs	Direct data input at source	Inventory management	Bhattacherjee et al., 2007; Freudenheim, 2004; Mitchell and Sullivan, 2001
Reduce errors	Patient data input at source avoids transcription errors	Patient records	Bates et al., 1998
More data	Patient monitoring can capture more data	Patient records	Haverstein, 2005
Better patient care	Access to up-to-date medical records	Patient records	Dwivedi et al., 2007
	Improved monitoring of patients	Patient records	Puentes et al., 2007; Kirsch et al., 2007
	Fewer errors in patient data		
Better system load	Allows more decentralised/community patient care	Hardware and telecommunication mode	Fitch and Adams, 2006; Kirsch et al., 2007
Cost effectiveness	Mobile technology is less expensive than PC technology and wireless less expensive than hardwire technology	Telecommunication mode	Dwivedi et al., 2007

Standing et al (2008)[27] lists improved communication, reduced costs, reduced error, more data, better patient care, better system load, cost effectiveness and leverage expertise as benefits of mobile technology adoption.

Standing et al (2008)[27] also points out that such an adoption cannot be occur without problems. Table 4 summaries the barriers listed the study.

Table 4 Barriers associated with mobile-technology adoption in the healthcare sector Adapted from Standing et al (2008)[27]

Barrier	Implication of barrier	Organizational impact	Reference
Lack of system integration	Data exchange between systems is poor	Reduced service to patient Duplication of input	Dwivedi et al., 2007
Centralized systems	Strain on central hospitals	Long waiting lists for patient care	Von Lubitz and Wickramasinghe, 2006
High reliability requirement for patient care	Costly systems	Systems do not get implemented	Freudenheim, 2004
Conservatism	Lack of innovation	Fails to meet patient expectations	Haverstein, 2005
Lack of expertise	Lack of technology champions	Lost opportunities for cost reduction and service improvement	Wickramasinghe et al., 2008
	Poor change management skills	Rejection or partial use of technology	Wiredu and Sorenson, 2006; Wiredu, 2007
Lack of training and support	People do not use systems fully	Partial or low levels of adoption	Zheng and Yuan, 2007
Security and privacy issues	Added complexity in system design	Risk aversion	Meletis et al., 2007

2.3. Models on Technology Adoption

As it is mentioned by Venkatesh (2003) [43] there are various models to determine technology acceptance models in the literature.

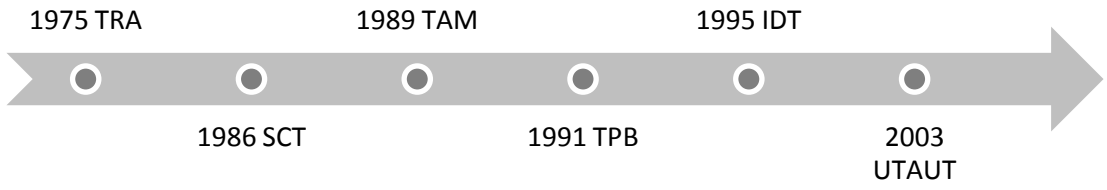


Figure 2- Timeline for Model on Technology Adoption Adapted from Venkatesh (2003) [43]

In 1975 one of the most fundamental theories of the human behavior called “Theory of Reasoned Action (TRA)” is proposed by Fishbein and Ajzen [31].

Social Cognitive Theory is developed in 1986 by Bandura. In time, many other studies have contributed to SCT such as Compeau & Higgins 1995a[32]; Compeau & Higgins, 1995b[33]; Compeau, Higgins & Huff, 1999[34].

In 1986 Davis [35] utilized TRA in information system (IS) context for individual’s acceptance of technology and usage on job. Based on Technology Adoption Model (TAM), Technology Adoption Model 2 (TAM2) is developed by Venkatesh and Davis in 2000[36]. With this study the subjective norm is included in original model.

In 1991 Ajzen[37] extended TRA by adding Perceived Behavioral Control and presents Theory of Planed Behavior(TPB). Later, TPB applied in individual acceptance and usage of many different studies such as Harrison, 1997[38]; Mathieson 1991[39], Taylor&Todd 1995[40].

The history of Innovation Diffusion Theory (IDT) reaches up to 1960s. In 1996 Moore and Benbasat[42] used IDT in IT context for individual technology acceptance.

The Unified Theory of Acceptance and Use of Technology (UTAUT) were proposed by Venkatesh(2003)[43]. UTAUT aims to explain user intentions to use an information system and usage behavior.

UTAUT is the recent study which developed by filtering all above acceptance models on its own context. Therefore this study will take UTAUT as theoretical base.

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

The Unified Theory of Acceptance and Use of Technology is a model that describes users intention to use an information system and their consequent usage behavior. The theory was developed by review and combination of the constructs of eight earlier research models, namely:

- Theory of Reasoned Action (TRA),
- Technology Acceptance Model (TAM),
- Motivational Model (MM),
- Theory Of Planned Behavior (TPB),
- A Combined Theory Of Planned Behavior/Technology Acceptance Model,
- Model of Personal Computer Utilization,
- Diffusion Of Innovations Theory (DIT),
- Social Cognitive Theory

The theory has four key constructs as direct determinates of usage intention and behavior which are (1)performance expectancy, (2)effort expectancy, (3)social influence, and (4)facilitating conditions. In the theory also proposes gender, age, experience, and voluntariness are proposed as median factors for the four key constructs.

Relationship between UTAUT variables are shown in the Figure 3.

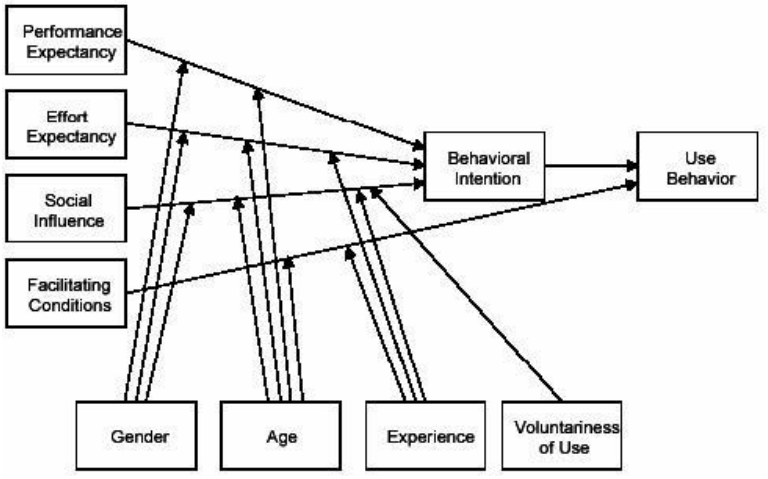


Figure 3-Determiants of UTAUT from Venkatesh, 2003[43].

2.4.1. Direct determinants

2.4.1.1. Performance Expectancy

Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance[43].

In the study of Venkatesh (2003)[43] performance expectancy is the construct that have the strongest predictor of intention in both mandatory and voluntary settings. In this study Venkatesh also points out that, the influence of performance expectance is moderated by gender and age. Indeed, this effect is significant for men and younger workers. With different names, performance expectance also takes place as determinates for the other models which is summarized in Table 5.

Table 5- Cross reference of Performance expectance

Construct	**Study**
Perceived usefulness	TAM (Davis et al 1989) [35]
Extrinsic Motivation	Motivational Theory(Davis et al 1992)
Job-fit	Thompson et al 1991
Relative Advantage	Moore and Benbasat 1991[42]
Outcome Expectation	Compeau and Higgins 1995b[33]; Compeau et al 1999[34]

2.4.1.2. Effort Expectancy

Effort expectancy is defined as the degree of ease associated with the use of the system [43].

In the study of [43], effort expectancy is qualified as the significant determinants that have influence on first time period which defined as post training. After post training period, the construct becomes non-significant over periods of extended and sustained usage.

Venkatesh also points out that the influence of effort expectancy on intention to use changes by gender age and experience, such that the effect is stronger for women, particularly younger women, and particularly at early stages of experience.

With different names, effort expectancy also takes place as determinants for other models which is summarized in Table 6.

Table 6- Cross Referance of Effort Expectance

Construct	**Study**
Perceived Ease of Use	Davis et al. 1989[35]
Complexity	Thompson et al. 1991
Ease of Use	Moore and Benbasat 1991[42]

2.4.1.3. Social Influence

Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new system [43].

In the study it is points out that the social influence constructs are significant in voluntary contexts. Venkatesh also adds that social influence whose role in technology acceptance decisions is complex and subject to a wide range of contingent influences, has influence on individuals behavior in three mechanism namely compliance, internalization, and identification.

The influence of social influence on behavioral intention is manipulated by gender, age, voluntariness, and experience. This effect will be stronger for women[43].

With different names, effort expectancy also takes place as determinants for other models which is summarized in Table 7.

Table 7- Cross Reference of Social Influence

Construct	**Study**
Subjective Norm	Ajzen 1991[37]; Taylor and Todd 1995a[40], 1995b[41]; Fishbein and Azjen 1975[31]; Mathieson 1991[39], Davis at al. 1989[35]
Social Factors	Thompsone t al. 1991
Image	Moore and Benbasat 1991[42]

2.4.1.4. Facilitating Conditions

Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.

In the study of [43] facilitating conditions is the construct that have the influence of intention in both mandatory and voluntary settings on post training phase. After this period, the influence disappears.

Facilitating conditions also takes place as determinates for other models which is summarized in Table 8.

Table 8- Cross Reference of Performance Expectance

Construct	**Study**
Perceived Behavioral control	Ajzen 1991[37]; Taylor and Todd 1995a[40], 1995b[41];.
Facilitating Conditions	Thompson et al. 1991
Compatibility	Moore and Benbasat 1991[42]

2.4.2. Constructs Theorized Not to Be Direct Determinants of Intention

UTAUT does not include self-efficacy and anxiety as direct determinants. Instead, their effect is captured by effort expectancy .

2.4.3. Previous Studies on Homecare Technology Acceptance By using UTAUT

As the homecare is developing area of medical informatics, some of the authors have started to conduct researches on acceptance of homecare technologies. In order to find these, electronic databases of PUBMED, MEDLINE, Google Academic are searched for with the keywords *Homecare, *Acceptance, and *UTAUT.

Articles founded are analyzed based on these set of criteria:

1. *The article was based on complete study.*

2. *The research area was Homecare.*
3. *The article was written in the English*

Although two of the article (YE Chae et al. 2001[24], C. Liddy et al(2010)[25]) are not a systematic study on the technology acceptance, they are included in literature discussion. Because these articles have focused on important factors like barriers and benefits of technology adoption for target patient group

Moreover, the article of Or, C.K.L.et al (2009) [21] is also included because it is an systematic review study.

C.K.L. Or et al. (2008).[20] presents the study on exploring the potential characteristics of consumer health information technology acceptance by home care patients with chronic illness. The study explores potential characteristics of CHIT acceptance among patients with heart disease. Also the Correlations between the study variables and acceptance were presented. In the study the relationships between several acceptance factors and intention to use and self-reported use are presented. 102 participants with heart disease were administered the technology acceptance survey 56 were through phone interview, 61 were via mail. Results of the study are listed below **:**

1. Higher health care knowledge was associated with increased acceptance.

2. Subjective norm and acceptance has strong reaction that is Patients were more likely to accept the Web-based health technology if they thought that their important others.

3. Perceived usefulness and perceived ease of use has positive influence on acceptance. Indeed, patients were more likely to accept the technology if they believed that the technology was useful. Similarly, patients tended to be more likely to accept the technology if they perceived that the technology was easy to use.

4. Perceived ease of use was associated with perceived usefulness.

5. Perceived behavioral control was associated with increased acceptance and influenced by internal and external constraints like :

- *Being able to use the technology,*
- *Availability of resources.*

"In other words, patients are more likely to accept the technology if they believed that they are able to use the technology and has the resources to support the use"[20]

6. Perceived behavioral control was associated with self-reported use that is patients who believes that they has higher control and ability to use the technology tends to be more likely to use the technology.

Another study presents [21] a review study of 52 Research study. The study is A systematic literature review that aims to identify variables promoting consumer health information technology (CHIT) acceptance among patients. In the study the electronic bibliographic databases such as: Web of Science, Business Source Elite, CINAHL, Communication and Mass Media Complete, MEDLINE, PsycArticles, and PsycInfo were searched.

Authors had reviewed these data bases with terms such as:

patient, senior*, elder*, old*, disabilit*, accept*, abandon*, intent*, intention to use, reject*, satisf*,use*, utiliz*, computer*, eHealth, e-health, e-mail, health*informat*, Internet, technolog*, web*, telemedicine, (and*

combinations of them like patient e-Health use).

52 out of 1871 initial article had founded valid for the criteria set:

1. the study was empirical with a substantive focus on quantitatively determining variables associated with acceptance of CHITs;

2 the objective of the CHIT was to promote health, well-being, or quality of life or facilitate the care delivery process or self-care of individuals;

3 individuals studied in the research were patients;

4 article was written in the English language;

5 the article was published in a peer-reviewed journal or one of the following conference proceedings, selected because of their high likelihood of containing relevant research: proceedings of American Medical Informatics Association symposium, the International Congress on Medical Informatics (MEDINFO), and ACM/ SIG Computer-Human Interaction.

Another study presented by Or 2010[22] describes, the factors affecting home care patients' acceptance of a web-based interactive self-management technology. The study uses the UTAUT and integrated variables related to health to examine the acceptance of a web-based, interactive self-management technology among home care patients. In the study**,** 48 of the 101 surveys were through phone interview and 53 were via mail. Results of the study are listed below **:**

1. Healthcare knowledge had no significant impact on behavioral intention, but it positively predicted perceived effective use.

2.Perceived usefulness was the most important factor that explained a significant proportion of the variance in behavioral intention.

3 perceived ease of use had no significant direct effect on behavioral intention because users learn to use a technology, ease of use of the technology becomes less salient.

4 Perceived usefulness, health care knowledge, and behavioral intention accounted for 68.5% of the variance in perceived effective use.

Study of Wilson et al (2004) [23] on "Modeling Patients' Acceptance of Provider-delivered E-health" proposes that patients' acceptance of provider-delivered e-health can be modeled by measuring the effects of several key antecedents to e-health use and applying models of acceptance developed in the information technology field. The study uses two theoretical models of IT acceptance -namely TAM, Motivational

Model- and integrated model of two are among patients e-health. Study conducted via online questionnaire with 163 participants. In the study Effectiveness of Acceptance Models and Importance of Antecedent Factors are measured. The results of the study can be listed as follows:

1. Model fit is assessed using a set of metrics. All models show good fit on some metrics(goodness of fit; adjusted goodness of fit; comparative fit index; norm-fit index; Tucker-Lewis index.) but they are outside target limits on other metrics root mean square error of approximation)

2. All the acceptance models performed reasonably well in the tests.

3. Authors also suggest that health care providers have flexibility in choosing which model to apply to e-health acceptance.

YE Chae (2001) [24] presents the study on "Patient satisfaction with telemedicine in home health services for the elderly". Telsee-phone mobile systems had located at the Kwachun CHPC and in each patient's home. In this system telemedicine system to allow the doctor and nurse to view the same patient summary during the teleconferencing. Study is conducted with 50 randomly selected participants. the results of the study can be listed as follows:

1. Telemedicine was effective in terms of reducing the number of clinic visits from0.64 to 0.42 per month.

2. In a study of patient satisfaction with telemedicine for prison inmates, patient location was also the only significant factor influencing patient satisfaction.

Another Study was presented by *C. Liddy et al (2010)[25]*. The aim of the study is to examine the feasibility and efficacy of integrating home health monitoring into a primary care setting. In the study, 22 patients chosen from the experimental group of 120 patients with chronic illnesses and were identified as being at risk based on objective criteria and physician assessment.

Standing S & Standing C 2008[27] conducted their study on "An Investigation of Clinician Acceptance of a Guideline Based Patient Registry System for Chronic Disease Management". The study has 17 participants(15 female, 2 male). 11 participants out of 17, also participated to interview. The results of the study can be listed as follows:

1. Facilitating conditions is an important criteria for technology adoption.

Indeed, The users did not have the knowledge to use the system.

2. Self-efficacy and computer anxiety has influence on acceptance.

3. Improved communication , Reduce costs ,

Reduce errors , More data , Better patient care , Better system load , Cost effectiveness , and Leverage expertise are Benefits of mobile-technology adoption.

4.Lack of system integration , centralized systems , high reliability requirement for patient care , conservatism , lack of expertise , lack of training and support and Security and privacy issues are barriers aganinst mobile-technology adoption.

K Cranen et al. (*2011) [28]* presents the study on "exploring of the patients perceptions regarding prospective tele-rehabilitation services and the factors that facilitate or impede patients intentions to use these services". The study tries to relate patients perceptions of prospective home by using the UTAUT as organizing structure. The study conducted with 25 participants with chronic pain. These related themes are:

1. Quality of feedback, Fellow sufferer contact, Transition knowledge,

Alienation has influence on performance expectance

2. Ease of use has effect on Effort Expectance.

3 Physician influence and partner influence has effect On social influence.

4. Treatment motivation, flexibility of exercise times, travel issues, availability of resources, social isolation has Influence on facilitating conditions.

Chiu (2008)[29] examined, the Usage and non-usage behavior of e-health services among Chinese Canadians caring for a family member with dementia. In addition to technology acceptance, the study focuses on intention to use and patterns of usage. the study was conducted with 35 caregivers. According to results of the study:

1. Effort Expectancy, Performance Expectancy, Perceived Caregiver Burden has influence on intention to use.

2. Perceived Caregiver Burden has influence on Initiation of use.

3. The items such as:
Age, Gender, Education, Year of immigration, Years of care, Hours of care, Relationship with care-recipient, Care-recipient functioning level, Care-recipient problem behavior frequency, Caregiver reaction to problem behaviors, Caregiver perceived burden, Self-rated health Attitude Towards Technology - TPI and Caregiver Competence Measure - CCM
have influence on frequency of use.

Table 9 summarizes these studies and the constraints tested.

Table 9 - Technology Acceptance Studies on Homecare Application

STUDY	CONSTRAINTS	
C.K.L. Or et al. (2008).[20]	Perceived visual functional ,	Perceived upper extremity function ability
	Health care knowledge	Health information seeking preference
	Perceived usefulness	Perceived ease of use
	Perceived visual functional	Perceived upper extremity function ability
	Health care knowledge	Health information seeking preference
	Perceived usefulness	Perceived ease of use
	Subjective norm	Perceived behavioral control
	Intention to use	Self-reported use
	Computer anxiety	Computer self-efficiency
	Organizational Support	Perceived satisfaction with training
Or, C.K.L. 2009[21]	**Approaches Used to Measure Acceptance in the 52 Studies:**	
	-Prior experience or exposure to computer/health technology 20 of 52)	
	-Self-reported interest in using or intention/willingness to use(8 of 52)	
	-Self-reported acceptability/satisfaction level (6 of 52)	
	-Both self-reported use and intention to use (2of 52)	
	-Self-reported use (30 of 52)	
	-Objective measure of use (5 of 52)	
	-intention to use (1 of 52)	
	-Computer anxiety (3 of 52)	
	- objective measure of use and self-reported use	
	-Demand on User, -Time Spent -education level	
	- Age -gender , -computing experience,	
	-voluntariness of use	
C.K.L Or 2010[22]	-Perceived Behavioral Control	-Subjective norm
	-Perceived Ease Of Use	-Perceived usefulness
	-Perceived visual functional	-Perceived upper extremity function ability
	-Health care knowledge	-Health information seeking preference

Table 9 (Cont.)

WILSON et al 2004 [23]	-Satisfaction with medical care -Internet dependence -Number of physicians seen during the past 6 months -Number of visits to physician during the past 6 months -Chronic disease that requires special medical attention	-Health care knowledge -Information-seeking preference	
YE Chae 2001 [24]	-Sex -Patient Location -Computer Experience -Type of service -Quality of verbal communication	-Age -Education -Severity -Set –Up time -Quality Of image	
C. Liddy et al (2010)[25]	-Sex -Community service Client	-Living Arrangement -Education	
PM Fortin 2005 [26]	-Performance expectancy -Social Influence -Voluntarism -Attitude	-Effort Expectance, -Facilitating conditions -Behavioral Intention, -Self Efficacy	-Anxiety
Standing S & Standing C 2008[27]	-Performance expectancy -Social Influence -Behavioral Intention,	-Effort Expectance, -Facilitating conditions -Self Efficacy,	-Anxiety
K Cranen et al. *2011 [28]*	-Performance expectancy -Social Influence -Behavioral Intention,	-Effort Expectance, -Facilitating conditions	
Chiu (2008) [29]	-Perceived Burden -Performance Expectancy -Effort Expectance, -Facilitating conditions	-Effort Expectancy -Effort Expectancy -Social Influence	

CHAPTER 3

METHODOLOGY

This chapter describes the methodology of the study. As it is reviewed in the 'Literature Review' chapter, Technology Acceptance Studies for Homecare Systems are generally conducted on complete system. This study aims to apply such acceptance studies on pre-design phase of system development.

The first thing to do, to achieve this goal was, to formulate a "Homecare System Model". This model was based on the defined systems on the 'Literature Review' chapter. After this formulation phase, research model for study was generated based on UTAUT. Finally research material was generated by composing homecare system model and Technology Acceptance study model.

3.1. Formulation of Homecare System Model

In order to formulate a model for homecare system it is necessary to define home care system components and features. Existing homecare system models on literature were analyzed to identify specification of the system. Then, System Modeling Language (SysML) was used in block diagram stretches to model specifications of the system. After all, requirements of the home care system were identified and a paper based prototype of the system was produced.

The details of the this system model formulation process is explained on following paragraphs.

3.1.1. Use Cases

Because this study is focused on the Homecare System on patient side two use-cases related with the "Patient" was realized.

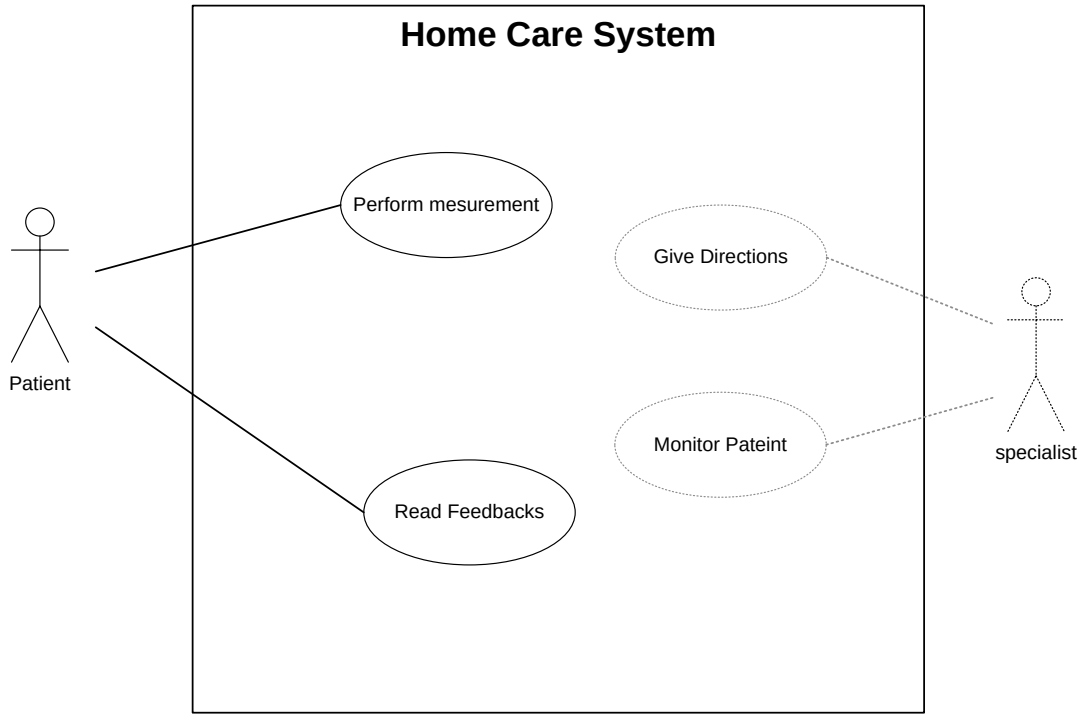


Figure 4 Use Case Diagram

Perform Measurement: Patient request to perform a new measurement. System presents the vital signal measurement list. Patient selects the measurement type. System gives direction of measurement preparations. Patient prepares the measurement device according to give directions. System asks to start device synchronization. Patient waits the measurement device synchronized with the system. System gives direction to start measurement. Patient starts the measurement. System collects the signal data and sends it to care center. System gives directions to complete the measurement. Patient completes the measurement according to give directions.

Read feedback: Patient requests to read specialist's feedback. System lists the received directions. Patient selects the desired direction. System lists the detailed text message of specialist direction.

3.1.2. System Components and Domain Model

A homecare system has two separate sides one of which is at patients home and the other is at care center.

In this system, patient's health data is delivered from one side to other. The diagram below demonstrates these two parties of the system and their interactions.

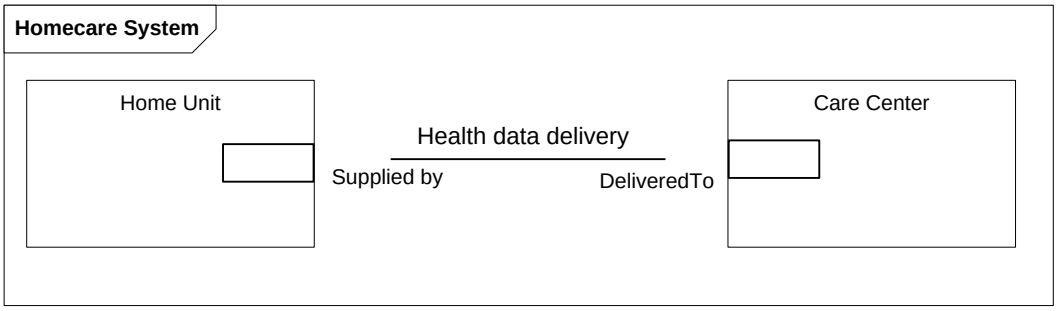


Figure 5 Home Care System Block diagram

As is clear on the block diagram, health care data delivery is occurred from home unit to care center. In this system, home unit is the supplier of the health data and the care center is the destination. To maintain this data delivery this health data must be collected at home side. At the home side of the system patients health data is collected via measurement devices. In the system, patients performs measurement for vital signals via one of measurement devices. Each device is specific for one type of vital signal. Demonstration of these components are shown in the Figure 6.

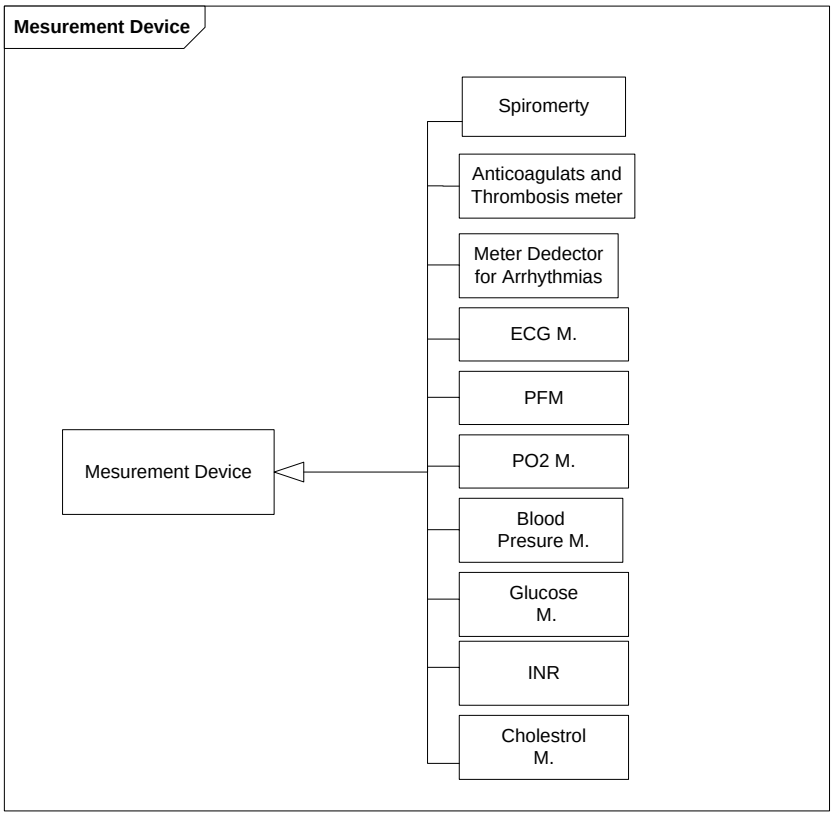


Figure 6 Measurement Device Block Diagram

The data collected via these devices are transported to the care center via a gateway. On the care center patient's condition is analyzed. Based on the emergency level, feedbacks, alerts and notifications are generated. This communication path is illustrated on the block diagram below.

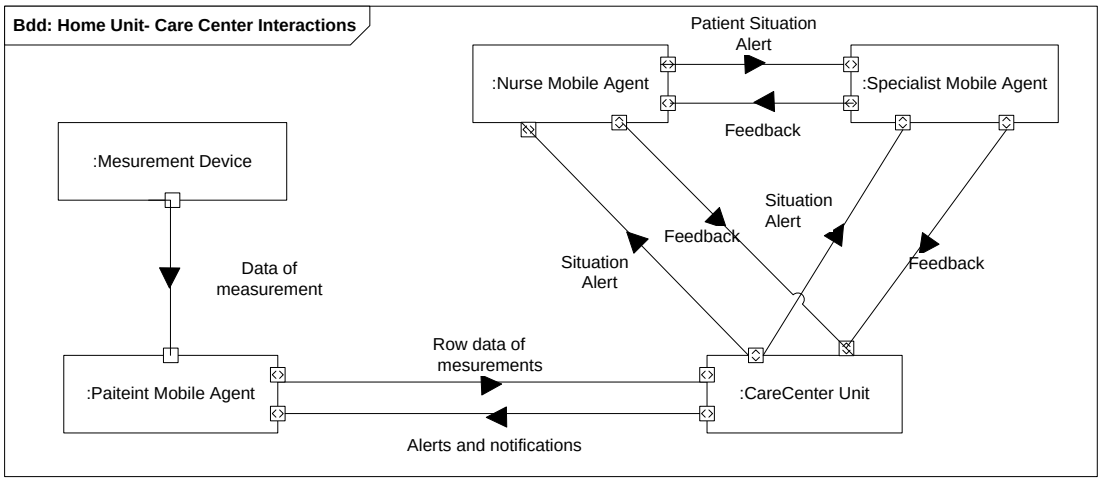


Figure 7 Home Unit- Care Center Interactions

Visualization of all these domain objects is given on the Figure 8.

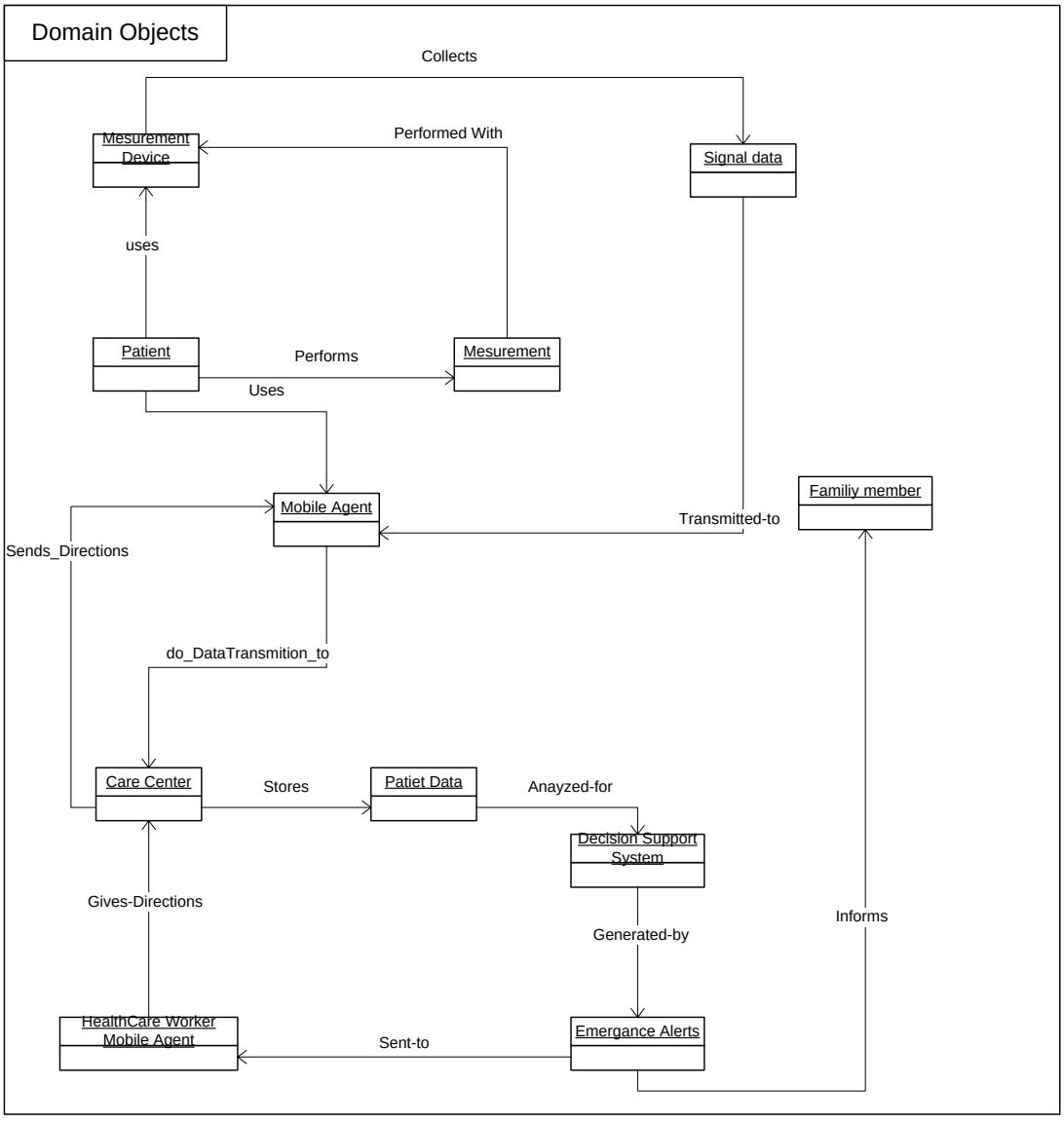


Figure 8 Domain Objects and Their Interactions

3.1.3. Requirements Generated From Literature

As it is previously underlined on literature review section chronic disease management with homecare system is a hot topic. Hence, there were many studies on this topic in literature. Section 2.2 (Homecare Systems) mentions those studies.

By combining the system features analyzed on literature review (chapter 2, section 2.2.1) with the further system analyses in this chapter, functional requirements of the system can be defined. These requirements are listed in the Table 10. The Table shows each requirement by matching it with the reviewed systems (This matching is done base on described features on literature chapter.)

Table 10- Requirements Generated From Literature

No	Requirement	Literature
1	The system should provide mechanism for collecting vital signals of patient	NH Kim et al , 2008[6] M. Li & R. S. H Istepanian, 2003[7] OA Ojesanmi et al., 2010 [8] VG. Koutkias, et al, 2002 [9] G. Angius et al, 2008 [10] CS LIN et al.[11] E Kyriacou et al. , 2003[12], N Maglaveras, 2003[13] Z Miao, 2006[14] R.G Lee 2000[15] K Hung 2003 [16] V Traver et al [17] S Korsakasl et al [18] Ren-Guey Lee Et Al 2005 [19]
2	The system should provide monitoring services for patients health situation.	NH Kim et al , 2008[6] M. Li & R. S. H Istepanian, 2003[7] OA Ojesanmi et al., 2010 [8] VG. Koutkias, et al, 2002 [9] G. Angius et al, 2008 [10] CS LIN et al.[11] E Kyriacou et al. , 2003[12], N Maglaveras, 2003[13] Z Miao, 2006[14] R.G Lee 2000[15] K Hung 2003 [16] V Traver et al [17] S Korsakasl et al [18] Ren-Guey Lee Et Al 2005 [19]
3	The system should have a mobile gateway that provides patient handle his/her health situation outside the home.	NH Kim et al , 2008[6] M. Li & R. S. H Istepanian, 2003[7] OA Ojesanmi et al., 2010 [8] E Kyriacou et al. , 2003[12], K Hung 2003 [16] Ren-Guey Lee Et Al 2005 [19]

Table 10 (Cont.)

No	Requirement	Literature
4	The system may provide mechanism for notification e-mail and simple message servises of patients family members	CS LIN et al[11]
5	Using the system health workers (nurses, doctor) can monitor the patient at home	NH Kim et al , 2008[6] M. Li & R. S. H Istepanian, 2003[7] OA Ojesanmi et al., 2010 [8] VG. Koutkias, et al, 2002 [9] G. Angius et al, 2008 [10] CS LIN et al.[11] E Kyriacou et al. , 2003[12], N Maglaveras, 2003[13] Z Miao, 2006[14] R.G Lee 2000[15] K Hung 2003 [16] V Traver et al [17] S Korsakasl et al [18] Ren-Guey Lee Et Al 2005 [19]
6	The system should provide mechanisms for alert generation and notifications.	NH Kim et al , 2008[6] M. Li & R. S. H Istepanian, 2003[7] OA Ojesanmi et al., 2010 [8] VG. Koutkias, et al, 2002 [9] G. Angius et al, 2008 [10] CS LIN et al.[11] E Kyriacou et al. , 2003[12], N Maglaveras, 2003[13] Z Miao, 2006[14] R.G Lee 2000[15] K Hung 2003 [16] V Traver et al [17] S Korsakasl et al [18] Ren-Guey Lee Et Al 2005 [19]

3.1.4. Screen Prototypes

By combination of use-cases and requirements in Table 10, it is possible to generate screen prototypes.

According to the requirement one "The system should provide mechanism for collecting vital signals of patient". Moreover, requirement number six indicates that " The system should provide mechanisms for alert generation and notifications".

Therefore the main screen prototype must have links that starts measurements and alert review. In addition to these base features, some additional ones can be added: such as a link that starts textual (SMS) or phone communication link with care center and that gives opportunity to review old measurements. These additional requirements are shown in Table 11.

Table 11- Requirements -1

No	Requirement
7	The system may provide opportunity to review old measurement.
8	The system may provide opportunity to start communicate with health care center.

Prototype for the main screen, old measurements screen and care center communication screen are given in the figures below.

Figure 9-Main Screen

Figure 10-Old Measurements Screen

Figure 11-Care Center Communication Screen

It is also necessary to review use-case *perform measurement* that may generate an additional requirements. In this use-case it is said that ".... System presents the vital signal measurement list. Patient selects the measurement type... ". An additional requirement listed in Table 12 can be added from this part of the use case.

Table 12- Requirements -2

No	Requirement
9	The system should provide list for vital signals any of which starts specific measurements.

The prototype for the Measurement Selection Screen is given in the figure below. This screen provides lists of vital signals. So, patient can select the measurement type.

Figure 12 -The Measurement Selection Screen

In the ongoing part of the use-case "perform measurement" the guidance for patient for measurement phase is mentioned. (See use-case: ".....System gives direction of measurement preparations. Patient prepares the measurement device according to give directions. System asks to start device synchronization. Patient makes the measurement device synchronized with the system. System gives direction to start measurement....."). This guidance feature can be added as another requirement(see Table 13).

Table 13- Requirements - 3

No	Requirement
10	The system should provide guidance for patient during his/her measurement.

The prototype for the guidance screens of measurement are described on following paragraphs in detail.

In *measurement device block diagram* (see Figure 6) it is seen that 10 types of measurement was analyzed to be used with Mobile Homecare System. Moreover, the chronic diseases and related the vital signals was previously summarized in Table 2.

By maintaining the existence of least one vital signal (Device), related with each of chronic disease, 4 (four) of 10 (ten) measurement devices were selected to prepare the screen prototypes. So that, each patients with varying chronic disease would able to find at least one scenario matches with his own situation.

1- INR Measurement:

Before going further, it is necessary to give background information for INR .

INR stands for International Normalized Ratio. It is one of the derived ratio of prothrombin time. INR is the measurement for coagulation level of blood. Such a measurement is conducted with special equipment. A test strip is plugged into this

equipment. 1 (one) drop of blood is dropped onto special area on middle of the test strip. The test results is prepared in one or two minute after starting the test.

The normal range of INR is between 0.9–1.3 for health person. The high levels such as INR=5 indicates the high probability of bleeding and low levels of INF such as INR=0.5 indicates the high probability of having cold. [50]

By contribution of this background information. The prototype of INR Measurement screen was prepared (based on the "Perform Measurement" Use Case). The INR level measurement flow is designed in three-stepped screen flow.

1 - Prepare device and drop the blood

2 - Wait for test results

3- Start measurement device and mobile phone communication to receive test results.

The screen prototypes of INR measurement is given on following figures.

Figure 13 -INR Measurement Screen 1

Figure 14 -INR Measurement Screen 2

Figure 15 -INR Measurement Screen 3

2- Spirometry

Spirometry, a most common kind of a pulmonary function tests (PFTs) , can be helpful for diagnosis of various lung conditions, two of which is Chronic Obstructive Pulmonary Disease (COPD) and Asthma. This test which is conducted with measurement device called Spirometer, give information how the lung works. By spirometry the amount (volume) and/ the speed (flow) of air which can be inhaled and exhaled is measured. Forced Expiratory Volume in one second (FEV1) , forced vital capacity (FVC), the total amount of air that can be inhaled in one breath (FEV1/FVC Ratio) are the most common measurement of Spirometer. Normal range of measurement varies, depending on your age, size, and sex. If the airways are narrowed then the FEV1 is decreases and the ratio of FEV1/FVC is lower than normal. (Adapted from [51] and [52]).

In the general test pattern:

1 - The patient is asked to take a deep breath

2 - Then the patient exhale into the sensor as hard as possible, for 6 seconds or more.

The spirometry measurement flow can be designed in three-stepped screen flow.

1 - Prepare device.

2 - Start measurement according to test pattern.

3- Start measurement device and mobile phone communication to receive test results.

Figure 16 -Spirometry Measurement Screen 1

Figure 17 - Spirometry Measurement Screen 2

Figure 18 - Spirometry Measurement Screen 3

3- Blood Glucose Level Measurement:

The blood glucose level measurement is a test that can detect the concentration of glucose in the blood. This concentration level is an important value for diabetics. Such a measurement is conducted with special equipment. A test strip is plugged into this equipment. 1 (one) drop of blood is dropped onto special area on middle of the test strip. The test results are prepared in one or two minute after starting the test.

The both of the patients with Type 1 and Type 2 diabetes are advised to performs blood glucose level measurement. The patient with type 1 diabetes performs this measurement at least one per day. On the other hand the Diabetic who use insulin performs this measurement three or more times per day. So that they are be able to achieve both the assessment of the effectiveness of their prior insulin dose and determination of the next insulin dose.

With the help of this background information, a prototype of Blood glucose level measurement screen prototypes was prepared (based on the "Perform Measurement" Use Case.) This measurement is similar with the flow of INR level measurement.

1 - Prepare device and drop the blood

2 - Wait for test results

3- Start measurement device and mobile phone communication to receive test results.

The screen prototypes of blood glucose level measurement is given on following figures.

Figure 19 - Blood Glucose Level Measurement Screen 1

Figure 20 - Blood Glucose Level Measurement Screen 2

Figure 21 - Blood Glucose Level Measurement Screen 3

4 - ECG Measurement:

Electrocardiography (ECG) is an interpretation of the electrical activity of the heart over a period of time. This the electrical activity is detected by electrodes attached to the chest. This measurement produces a graph like a wave form.

Different from the previous three measurement devices the home-use ECG devices are in varying types that is continuously developing. Two kinds of those devices can be listed as follows.

1- ECG Sensors with Cell Phone Attachment Suit: This form of the measurement devices directly attached to the mobile phone. With the help of a electrodes attached to the phone and application running on mobile phone the real time detection of electrical activity is maintained.

2- The stand alone device that have capability of data transmission: Such devices are stand alone devices that performs measurements with electrodes. After the measurement is performed, data is transmitted to communication devices like mobile phone, PC or Laptop.

The prototype of the ECG measurement is developed based on the devices on the first category. While the ECG device type in second category have similar characteristics with previous three detection equipment (namely INR level meter, spirometer and blood glucose level meter), the device on the first category is differs in providing and interface for mobile device directly perform and control the measurement process. This feature makes this category of devices more mobile system centered. Because of this difference the following screen prototype is prepared based on the first category device.

The prototype of ECG measurement screen prototypes was prepared base on the "Perform Measurement" Use Case. The ECG measurement flow is designed in three-stepped screen flow.

1 - Prepare ECG devices and attach electrodes on chest.

2 - Start measurement on phone.

The screen prototypes of ECG measurement is given on following figure.

Figure 22 - ECG Measurement Screen

In addition to use-case "perform measurement", it is necessary to review the second use-case "Read feedback". According to this use-case it is necessary to add feedback or alerts receiving and displaying features to the system. Table 14 lists these requirments.

Table 14- Requirements - 4

No	Requirement
11	The system should get feedback and alerts of his/her doctor.
12	The system may highlight difference in the level of feedback and alerts with colorful or textual images.

The prototype for the alert screen is given in the figure below.

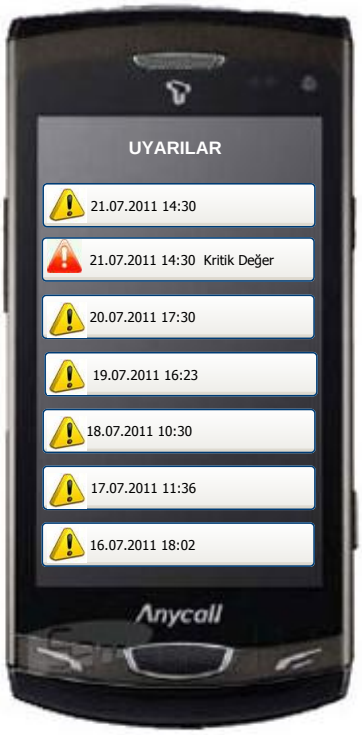


Figure 23 - The Alert Screen

3.2. Formulation of Research Technology Acceptance Model

On section 3.1 homecare system model is formulated. In this second formulation step proposed acceptance model for the study will be explained.

The proposed model is configured up on the base research model of UTAUT. In the study of Venkatesh et al., 2003,[43] seven constructs found as significant for behavioral intension or usage behavior. Four of these constructs, namely *Performance expectancy*, *Effort Expectance*, *Social Influence* and *Facilitating Condition*, are categorized as direct determinants. Remaining 3 of the constructs - *Attitude Toward Using Technology, Self Efficiency* and *Anxiety*- are not modeled as direct determinants. Instead, *Self Efficiency* and *Anxiety* are qualified as fully moderated by *Effort Expectance*. In the same point of view, and the effect of third constraint *Attitude Toward using technology* is said to be captured by *Effort*

Expectancy and Performance Expectancy. As a result, at the study of Venkatesh et al[43] those three constraints are listed as indirect determinants of intentions and usage behaviors.

This study tries to investigate if the all these constraints are operating in the same way in the environment of Chronically Disease Management with Homecare Mobile System during pre-design phase of prototype of the system. The study Model is illustrated by giving cross reference of research items on the Figure 24.

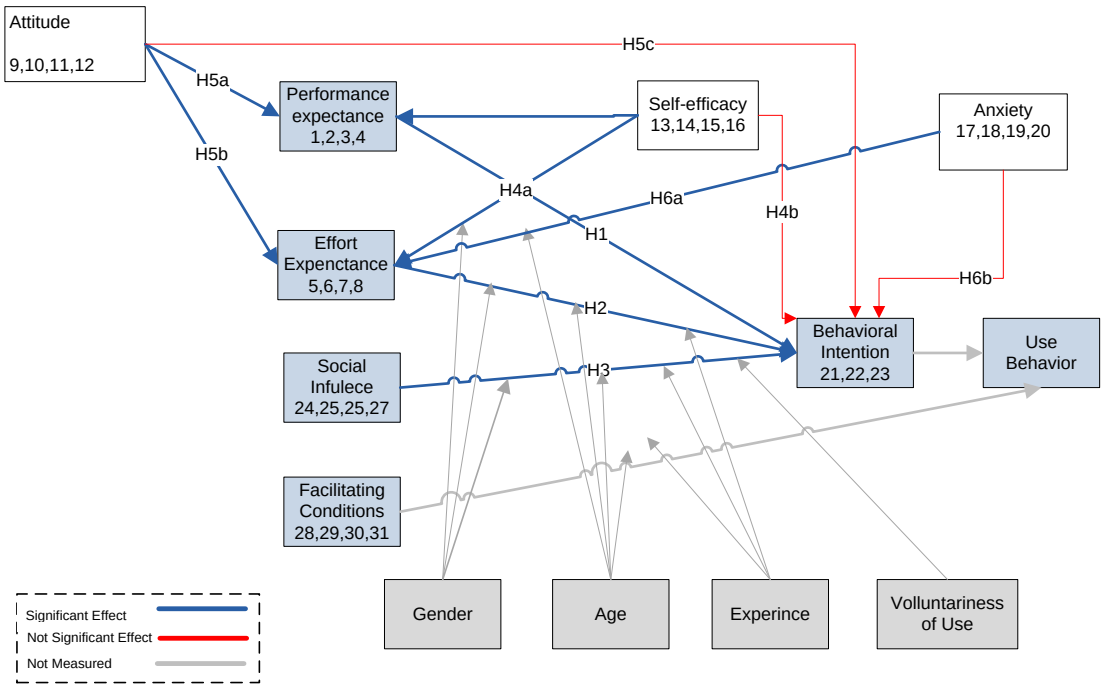


Figure 24- Study Model

3.2.1. Constructs within the study model:

The four main Constructs of the UTAUT -*Performance expectancy- Effort Expectance*, *Social Influence* and *Facilitating Condition*- has previously discussed with details in literature chapter (See chapter 2.4.1 Direct Determinants). On the other hand the indirect determinants, tested with in the study is described on following paragraphs:

Attitude Toward Technology: is defined as an individual's overall affective reaction to using a system [43].

With different names, *Attitude Toward Technology* is also takes place as determinates for other models which is summarized in Table 15.

Table 15- Cross Reference of Social Influence

Construct	Study
Attitude Toward Behavior	Taylor and Todd 1995a[40], 1995b[41]; Fishbein and Azjen 1975[31], Davis at al. 1989[35].
Intrinsic Motivation	Davis at al. 1992
Affect Toward Use	Thompson et al. 1991
Affect	Compeau and Higgins 1995b[32]; Compeau et al 1999[33]

Anxiety: *Anxiety* is defined as "the fear experienced when interacting with a computer or anticipating an interaction" [54].

Computer Self Efficiency: *Self Efficiency* defined as "the belief an individual has in his/her ability to successfully perform a certain behavior"[53].

Self Efficiency is also one of the main constructs of Social Cognitive Theory.

Table 16- Cross Referance of Social Influence

Construct	Study
Self Efficiency:	Fagan et al 2004,

3.2.2. Hypothesis:

This study aims to perform user acceptance tests based on the model proposed in pervious paragraphs in pre-design phase prototype. The system successes in the this study is not realized yet. So, *Use Behavior* cannot be tested based on this prototype level systems. Due to this limitation, while the base model of UTAUT describes both *Behavioral Intention* and *Use Behavior* in terms of four main determinants, this study only tries to investigate the determinants related with *Behavioral Intention*. So, relation of *Use Behavior* and *Facilitating Conditions* is not added as hypothesis.

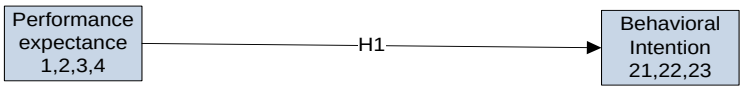


Figure 25- Hypothesis H1

H1: Performance Expectance(PE) will have positive effect on the behavioral intention of the Mobile Homecare System Users.

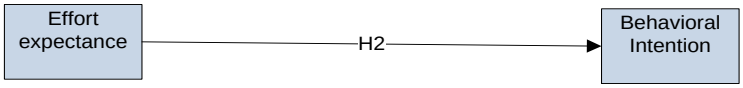


Figure 26- Hypothesis H2

H2: Effort Expectance (EE) will have negative effect on the behavioral intention of the Mobile Homecare System Users.

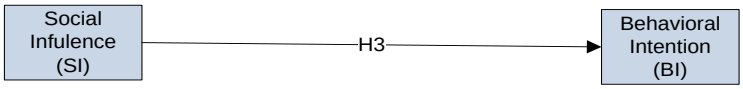


Figure 27- Hypothesis H3

H3: Social Influence (SI) will have positive effect on the behavioral intention of the Mobile Homecare System Users.

.

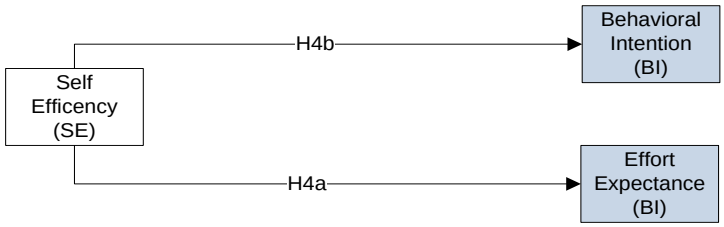


Figure 28- Hypothesis H4b and H4a

H4a Self Efficiency (SE) will have negative effect the Effort Expectance of the Mobile Homecare System Users.

H4b Self Efficiency (SE) will not have significant effect the behavioral intention of the Mobile Homecare System Users.

Figure 29- Hypothesis H5a , H5b and H5c

H5a Attitude (AT) will have positive effect on the Performance Expectance of the Mobile Homecare System Users.

H5b Attitude (AT) will have positive effect on the Effort Expectance of the Mobile Homecare System Users.

H5c Attitude (AT) will not have significant effect on the behavioral intention of the Mobile Homecare System Users.

Figure 30- Hypothesis H6a and H6b

H6a Anxiety (ANX) will have negative effect on will the Effort Expectance of the Mobile Homecare System Users.

H6b Anxiety (ANX) will not have significant effect on the behavioral intention of the Mobile Homecare System Users.

3.3. Instrument Development

For the data collection phase of the study quantitative research instrument was developed. In this study, quantitative research instrument was questionnaire. UTAUT research items is used as questions.

The system which is analyzed in terms of user technology acceptance is not realized yet. So there was also need for presentation material for the system. Moreover target user group of the system is patients with chronic diseases who are more likely to be at older ages. Conducting an ordinary questionnaire as in the original UTUAT study would be too hard to perform. Therefore interview method by using UTAUT questionnaire was more suitable for this study and target group. The Screen prototypes that has been previously developed are reorganized as supplementary material for interview to present the system architecture. This presentation step is prepared consistent with the use-cases which are previously discussed.

In this reorganization phase system design and screen prototypes are reviewed with two specialists (İmdat BEYAZPINAR, *General Practioner* and Yavuz AYMAN ,*Internal diseases*) in order to validate prototypes consistent with healthcare literature. Thanks to contributions of them sample scenario including INR level, Blood Glucose Level, ECG and Spirometry measurements were written as presentation material (see Appendix E)

The original items used in questionnaire was written in English form. These item are translated into Turkish. The translated form of questions were reviewed by 6 person whose age ranging between 25 to 65 in order to test understandability and clearness of questionnaire items. The necessary revisions were made according to their recommendations.

The questionnaire was prepared in two parts. The first part was composed of demographic questions. In addition to demographic properties - like age, gender, education - computer usage and chronic disease status has also questioned.

The second part of the questionnaire was composed of questions that inquires UTAUT constructs. Answers of the questionnaire items listed in this part has provided in 5 point scale. In this scale, conceptual equivalents is listed as, 5- Totally Agree, 4- Agree, 3- Indecisive, 2 Disagree, 1- Totally disagree.

The English and Turkish form of questionnaire and research items are provided as Appendix (A to D)

3.4. Ethical Clearance

This study included human participants. In order to collect data from the participants, it was needed to take permission from *Research Center for Applied Ethics* at METU to conduct the survey with human participants. The survey was approved by Research Center for Applied Ethics .

3.5. Study Sample

The target group of this research is the patients with chronic diseases. The study was conducted in two independent samples that have characteristics of this target group:

pilot study and *main study*. The aim of this pilot study is to test the reliability of the selected questioner items, before conducting the main study.

Pilot study was conducted with 20 participants (9m, 11f). This group of patients was selected among the close relatives and friends. In the main study, there were 51 participants (19f, 32m). The data was collected by face to face interviews. The main study group was selected by General Practitioner İmdat BEYAZPINAR, Nurse Fatma PAÇALI of Beyaz Pınar Tıp Merkezi, Yenimahalle, Ankara. No distinction was made of the chronic disease type that patient has. The interviews were conducted in Çubuk and Yenimahalle quarter of Ankara. Participant must have at least one chronic disease. The participation of the study was completely based on voluntariness. The detailed distribution of the main sample is provided in Table 17.

Table 17- Distribution of Sample

	Type	**N**
Gender	male	19
	female	32
Age	50-65	37
	65<	17
Disease count	1	4
	2	36
	more than 2	11
Disease Distribution	COPD	2
	Diabetics	12
	Asthma	0
	Hypertension	16
	Coronary heart disease	20
	Arrhythmias	5
	Fat metabolism	15
	Cancer	2
	Others	2
Homecare System	Yes	
	No	51
Technology experience	Not Exists	10
	Beginner	39
	Good	2

3.6. Data Analyses Method

Since our sample size is small, suitable statistical analyses methods that suits with study must be identified.

Structural Equation Model (SEM) is the one of the statistical methods that has general acceptance in studies in IS. SEM can be described as a statistical technique that is used to test or estimate cause-effect relations. There are two types of SEM: covariance based SEM and partial least square (PLS) based SEM.

Covariance based SEM has limitation on sample size. In order to apply this type of SEM 'item/sampling' ratio is recommended to be 1/10 or more. This type of SEM also requires normal distribution. On the other hand, PLS based SEM is more suitable for data with small sample size and does not require normal distribution. Thus, PLS based SEM is more suitable for this study.

The main study is analyzed with "Crobanch's Alpha" (coefficient of reliability) to measure internal consistency. Missing data analyses and outlier analyses are also conducted. Finally, relations are analyzed with PLS based SEM.

PLS analysis was performed by utilizing many sources in literature, e.g. Genef D. & Straub D. (2005) [49], Haenlein M, Kaplan A.M (2004) [47]. Moreover, tutorials, videos, guidance information provided on SmartPLS website [46] were reviewed. In addition, thesis by Nurcan Alkış (2010) [45] was also reviewed as a practical example for PLS Analysis.

The results of data analysis are presented in the next chapter.

CHAPTER 5

RESULTS

The analysis was conducted using SPSS 17.0 and SmartPLS software. SPSS 17.0 was used for reliability test, missing data analyses and outlier detection, so that the data was been optimized for subsequent analysis with SEM via SmartPLS. SmartPLS was used to evaluate structural model via SEM.

4.1. Pilot Study Reliability Analyses

The results were analyzed by "Crobanch's Alpha" (coefficient of reliability) value. By using Cronbach's alpha, internal consistency can be estimated. Table 17 summarizes the relation between Cronbach's alpha and internal consistency [29].

Table 18- Cronbach's alpha vs Internal consistency

Cronbach's alpha	Internal consistency
$\alpha \geq .9$	Excellent
$.9 > \alpha \geq .8$	Good
$.8 > \alpha \geq .7$	Acceptable
$.7 > \alpha \geq .6$	Questionable
$.6 > \alpha \geq .5$	Poor
$.5 > \alpha$	Unacceptable

In this study item, total coefficient of reliability was calculated on factor base. Although there were items whose removal increases the factor's Crobanch's Alpha value (see items A1, SE1, BI1 SF4), item-total Crobanch's Alpha values were

between or above the acceptable range of (.8, .7]. In addition, there was not a significant increase in "the Crobanch's Alpha" if item is deleted. Thus, no item was removed at this point, instead these items were included in research questions to be re-examined in the main study. After this pilot study, 27 out of 27 questions were selected and 10 demographic questions were added. The results are shown in Table 19.

Table 19- Pilot study reliability test results.

PERFORMANCE EXPECTANCE Cronbach's Alpha ,956				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
U6	11,73	13,645	0,927	0,933
RA1	11,5	16,02	0,896	0,942
RA5	11,54	15,138	0,931	0,93
OE7	12,08	15,674	0,829	0,96
EFFORT EXPECTANCE Cronbach's Alpha ,932				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
EOU3	9,65	15,675	0,852	0,912
EOU5	9,88	14,586	0,833	0,914
EOU6	9,62	13,606	0,847	0,912
EOU4	9,96	14,198	0,85	0,909
ATTITUDE Cronbach's Alpha ,880				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
A1**	11,85	10,295	0,521	0,919
AF1	12,35	6,555	0,924	0,765
AF2	12,31	7,502	0,883	0,787
Affect1	12,31	8,702	0,672	0,871
SELF EFFICENCY **Cronbach's Alpha ,912**				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SE1**	11,69	10,542	0,7	0,925
SE4	11,65	9,595	0,922	0,839
SE6	11,54	11,378	0,84	0,877
SE7	11,62	10,966	0,768	0,896

Table 19(Cont)

ANXIETY Cronbach's Alpha ,966				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
ANX2	6,85	20,535	0,888	0,962
ANX3	7,08	19,434	0,935	0,949
ANX1	7	20,8	0,906	0,957
ANX4	7,35	19,915	0,931	0,95
BEHAVIORAL INTENTION Cronbach's Alpha ,988				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
BI1**	7,15	7,495	0,962	0,99
BI2	7,12	7,226	0,988	0,973
BI3	7,19	7,442	0,971	0,984
SOCIAL INFLUENCE Cronbach's Alpha ,846				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SN1	12,58	3,614	0,818	0,743
SN2	12,58	3,614	0,818	0,743
SF2	12,62	5,446	0,613	0,838
SF4**	12,77	5,625	0,577	0,851

*** Items whose removal increases the factor's Crobanch's Alpha value. Item-total Crobanch's Alpha values were between or above the acceptable range of (.8, .7]. And also there was not a significant increase in "the Crobanch's Alpha" if item is deleted. Therefore, no item was removed at this point, instead these items were included in research questions to be re-examined in the main study.*

4.2. Main Study Analysis

In the main data set, there was no missing value recorded. Hence, there was no need to incorporate any missing data handling method.

4.2.1. Reliability Analysis

As previously discussed, Crobanch's Alpha value was used for reliability analysis (Table 20). As observed in Table 20, deleting of some of the items increases total factor's *Cronbach's Alpha*. For example, removing the *A1* item of *Attitude* construct increases the *Cronbach's Alpha* from 0.897 to 0.906. For three such cases, item-total Crobanch's Alpha values were between or above the good (.8, .9] range. In addition, there was not a significant increase in the *Initial Crobanch's Alpha* when deleted. Thus, non of then were removed. On the other hand, for *S6* item of *Self Efficiency*

construct, *Crobanch's Alpha* increased from 0.726 to 0,820 and the interval of consistence was increased from acceptable (.7, .8] range to good range (.8, .9]. Thus, the item *S6* was removed. The result are shown in the Table 20.

Table 20 - Main study reliability test results.

PERFORMANCE EXPECTANCE Cronbach's Alpha ,882				
İTEM	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
U6	12,10	8,650	,810	,821
RA1	11,86	10,081	,790	,840
RA5	12,06	9,616	,719	,857
OE7	12,45	8,733	,693	,875
EFFORT EXPECTANCE Cronbach's Alpha ,950				
İTEM	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
EOU3	8,82	16,908	,859	,941
EOU5	9,02	15,140	,890	,930
EOU6	8,82	15,308	,892	,930
EOU4	9,04	15,718	,878	,934
ATTITUDE Cronbach's Alpha ,897				
İTEM	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
A1(**)	10,69	11,900	,657	,906
AF1	11,29	9,492	,861	,832
AF2	11,47	9,974	,842	,840
Affect1	11,20	10,401	,736	,881
SELF EFFICENCY **Cronbach's Alpha ,726**				
İTEM	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SE1	12,69	4,100	,734	,561
SE4	12,65	4,273	,659	,600
SE6(**R)	13,16	4,415	,292	,820
SE7	12,92	3,914	,512	,669

Table 20 (Cont)

ANXIETY Cronbach's Alpha ,974				
İTEM	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
ANX2	9,22	23,893	,946	,962
ANX3(**)	9,02	25,300	,881	,980
ANX1	9,27	22,603	,962	,957
ANX4	9,49	22,415	,952	,960
BEHAVIORAL INTENTION Cronbach's Alpha ,979				
İTEM	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
BI1	7,37	6,878	,942	,977
BI2	7,51	6,935	,950	,971
BI3	7,51	6,615	,969	,958
SOCIAL INFLUENCE Cronbach's Alpha ,934				
İTEM	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SN1	11,49	13,415	,843	,916
SN2	11,47	11,854	,880	,902
SF2	11,57	12,730	,897	,898
SF4(**)	11,94	12,536	,775	,938

***Removing the A1 item of Attitude construct increases the Cronbach's Alpha from 0.897 to 0.906. For three such cases, item-total Crobanch's Alpha values were between or above the good (8, 9] range. In addition, there was not a significant increase in the Initial Crobanch's Alpha when deleted. Thus, no of then was removed. On the other hand, for S6 item of Self Efficiency construct, Crobanch's Alpha increased from 0.726 to 0,820 and the interval of consistence was increased from acceptable (.8,9] range to good range (.8, .9]. Thus, the item S6 was removed.*

4.2.2. Outlier Detection

In this study, *mean and %5 trimmed mean* are observed to identify if there are any outliers to handle. The trimmed mean was calculated by eliminating certain percentage of maximum and minimum samples. Then mean and trimmed mean values were compared. Table 21 shows calculated values. For all items, there was not a significant difference between these two values. Therefore, it was decided that there are no outliers in the data set, and hence there is no need to correct/delete them for the further analysis.

Table 21-Mean and trimmed mean values calculated for all items.

			Statistic	Std. Error
U6	Mean		4,06	,169
	95% Confidence Interval for Mean	Lower Bound	3,72	
		Upper Bound	4,40	
	5% Trimmed Mean		4,12	
RA1	Mean		4,29	,135
	95% Confidence Interval for Mean	Lower Bound	4,02	
		Upper Bound	4,57	
	5% Trimmed Mean		4,38	
RA5	Mean		4,10	,157
	95% Confidence Interval for Mean	Lower Bound	3,78	
		Upper Bound	4,41	
	5% Trimmed Mean		4,21	
OE7	Mean		3,71	,184
	95% Confidence Interval for Mean	Lower Bound	3,34	
		Upper Bound	4,08	
	5% Trimmed Mean		3,78	
EOU3	Mean		3,08	,179
	95% Confidence Interval for Mean	Lower Bound	2,72	
		Upper Bound	3,44	
	5% Trimmed Mean		3,09	
EOU5	Mean		2,88	,207
	95% Confidence Interval for Mean	Lower Bound	2,47	
		Upper Bound	3,30	
	5% Trimmed Mean		2,87	
EOU6	Mean		3,08	,204
	95% Confidence Interval for Mean	Lower Bound	2,67	
		Upper Bound	3,49	
	5% Trimmed Mean		3,09	
EOU4	Mean		2,86	,198
	95% Confidence Interval for Mean	Lower Bound	2,46	
		Upper Bound	3,26	
	5% Trimmed Mean		2,85	
A1	Mean		4,20	,151
	95% Confidence Interval for Mean	Lower Bound	3,89	
		Upper Bound	4,50	
	5% Trimmed Mean		4,33	
AF1	Mean		3,59	,180
	95% Confidence Interval for Mean	Lower Bound	3,23	
		Upper Bound	3,95	
	5% Trimmed Mean		3,65	
AF2	Mean		3,41	,171
	95% Confidence Interval for Mean	Lower Bound	3,07	
		Upper Bound	3,75	
	5% Trimmed Mean		3,46	
Affect1	Mean		3,69	,176
	95% Confidence Interval for Mean	Lower Bound	3,33	
		Upper Bound	4,04	
	5% Trimmed Mean		3,76	

Table 21 (Cont)

SE1	Mean		4,45	,102
	95% Confidence Interval for Mean	Lower Bound	4,25	
		Upper Bound	4,66	
	5% Trimmed Mean		4,50	
SE4	Mean		4,49	,102
	95% Confidence Interval for Mean	Lower Bound	4,28	
		Upper Bound	4,70	
	5% Trimmed Mean		4,54	
SE 6	*REMOVED ON RELAIBİLİTY TEST*			
SE7	Mean		4,22	,135
	95% Confidence Interval for Mean	Lower Bound	3,94	
		Upper Bound	4,49	
	5% Trimmed Mean		4,33	
ANX1	Mean		3,12	,227
	95% Confidence Interval for Mean	Lower Bound	2,66	
		Upper Bound	3,57	
	5% Trimmed Mean		3,13	
ANX2	Mean		3,31	,218
	95% Confidence Interval for Mean	Lower Bound	2,88	
		Upper Bound	3,75	
	5% Trimmed Mean		3,35	
ANX3	Mean		3,06	,243
	95% Confidence Interval for Mean	Lower Bound	2,57	
		Upper Bound	3,55	
	5% Trimmed Mean		3,07	
ANX4	Mean		2,84	,248
	95% Confidence Interval for Mean	Lower Bound	2,35	
		Upper Bound	3,34	
	5% Trimmed Mean		2,83	
BI1	Mean		3,82	,185
	95% Confidence Interval for Mean	Lower Bound	3,45	
		Upper Bound	4,20	
	5% Trimmed Mean		3,90	
BI2	Mean		3,69	,183
	95% Confidence Interval for Mean	Lower Bound	3,32	
		Upper Bound	4,05	
	5% Trimmed Mean		3,76	
BI3	Mean		3,69	,189
	95% Confidence Interval for Mean	Lower Bound	3,31	
		Upper Bound	4,07	
	5% Trimmed Mean		3,76	
SN1	Mean		4,00	,163
	95% Confidence Interval for Mean	Lower Bound	3,67	
		Upper Bound	4,33	
	5% Trimmed Mean		4,08	
SN2	Mean		4,02	,191
	95% Confidence Interval for Mean	Lower Bound	3,64	
		Upper Bound	4,40	
	5% Trimmed Mean		4,13	
	5% Trimmed Mean		3,61	

Table 21 (Cont)

SF2	Mean		3,92	,170
	95% Confidence Interval for Mean	Lower Bound	3,58	
		Upper Bound	4,26	
	5% Trimmed Mean		4,02	
SF4	Mean		3,55	,193
	95% Confidence Interval for Mean	Lower Bound	3,16	
		Upper Bound	3,94	
	5% Trimmed Mean		3,61	

4.2.3. PLS Algorithm

By completing previous statistical analyses the data have been ready for PLS analysis. For this purpose, data was imported in to SmartPLS, and the path model was created. Then the measurement model was created by running PLS Algorithm. Following measurement model was created.

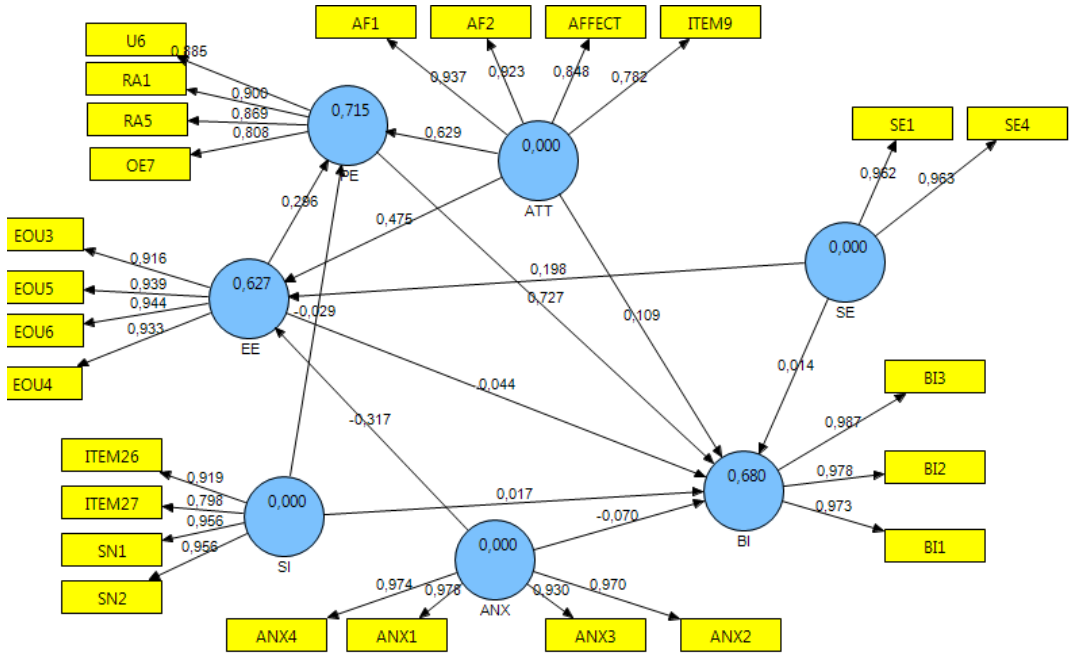


Figure 31- Measurement Model by PLS Algorithm

Using the results of measurement model, the validity of constructs were investigated (by checking convergent validity and discriminant validity [47]). The process and its results are given in the following section.

Convergent Validity

The Convergent validity is a measure of correspondence or convergence between similar constructs [44]. In PLS, in order to investigate convergent validity, the Average Variance Extraction (AVE) scores, reliability and the outer loading were analyzed [49]. For Convergent Validity:

REQ - A: The outer loading (factor loadings) should be greater than 0.7 [45]

REQ – B: The AVE score must be equal or greater than 0.5 [45]

REQ – C: the reliability must be equal or greater than 0.7 [45]

REQ -A

The outer loadings (factor loadings) are given in Table 22. According to the results given in table, the factor loadings of item "SE7" did not match with the requirement. Thus, this item was eliminated from the data set for further analyses.

Table 22 - The Outer Loadings (factor loadings)

	ANX	ATT	BI	EE	PE	SE	SI
ANX1	0,978445						
ANX2	0,970089						
ANX3	0,930326						
ANX4	0,973688						
A1		0,781612					
AF1		0,936933					
AF2		0,922553					
AFFECT		0,847676					
BI1			0,973461				
BI2			0,978293				
BI3			0,986823				
EOU3				0,913451			
EOU4				0,933584			
EOU5				0,938418			
EOU6				0,94557			
U6					0,885968		
OE7					0,809733		
RA1					0,898896		
RA5					0,868088		
SE1						0,964634	
SE4						0,951145	

Table 22(Cont)

SE7**						0,630677	
SF2							0,915912
SF4							0,797406
SN1							0,95689
SN2							0,957188

*** the factor loadings of item "SE7" did not match with the requirement. Thus, this item was eliminated from the data set for further analyses.*

After removing the SE7 item, PLS algorithm was recalculated. The factor loadings calculated are shown in the Table 23.

Table 23 - The Outer Loadings (Factor Loadings) after deleting the item

	ANX	**ATT**	**BI**	**EE**	**PE**	**SE**	**SI**
ANX1	0,978444						
ANX2	0,970089						
ANX3	0,930325						
ANX4	0,973688						
A1		0,781612					
AF1		0,936933					
AF2		0,922553					
AFFECT		0,847676					
BI1			0,973448				
BI2			0,978304				
BI3			0,986825				
EOU3				0,913404			
EOU4				0,933641			
EOU5				0,938352			
EOU6				0,945613			
U6					0,885968		
OE7					0,809733		
RA1					0,898896		
RA5					0,868087		
SE1						0,96171	
SE4						0,962647	
SF2							0,91591
SF4							0,797402
SN1							0,956891
SN2							0,957189

After removing the SE7 item, PLS algorithm was recalculated

Once achieving the goal on REQ-A, composite reliability values (REQ-C) and AVE scores (REQ-B) were checked. The AVE values and composite reliability values are listed separately in Table 24 for each constraint. All of the AVE scores were greater than 0.5 and the Composite reliability values were greater than 0.7.

Table 24 -AVE Scores And Composite Reliability Values

	AVE	Composite Reliability	R Square	Cronbach's Alpha	Communality	Redundancy
ANX	0,928	0,980965		0,974011	0,928	
ATT	0,764605	0,928196		0,89594	0,764605	
BI	0,959501	0,986125	0,680156	0,978884	0,959501	0,05005
EE	0,87017	0,964036	0,628588	0,950386	0,87017	0,264921
PE	0,750549	0,923175	0,669791	0,8887	0,750549	0,501068
SE	0,925788	0,961464		0,919842	0,925788	
SI	0,826648	0,949939		0,936295	0,826648	

Discriminant Validity

The discriminant value can be defined as a metric to show that each construct is different than the others [44]. The discriminant validity is evaluated by examination of the correlation among the constructs [49]. In order to investigate Discriminant Validity, the AVE squared root, the outer loading of each indicator are analyzed [49]. For discriminant validity, all Latent Variable Correlations should be lower than the AVE squared root [45] (**REQ-A**).

The latent variable correlations are shown in the Table 25. The table lists the square root of AVE values of each constructs (on the diagonal of the table) and the other cells of the column are the other correlation values among the constructs. The square root of AVE values are greater than the other correlation values among the constructs.
The results prove that all the constraints are unique.

Table 25 - Latent Variable Correlations

	ANX	ATT	BI	EE	PE	SE	SI
ANX	1						
ATT	-0,47317	1					
BI	-0,41895	0,710886	1				
EE	-0,64118	0,685578	0,596554	1			
PE	-0,44511	0,818408	0,81981	0,712051	1		
SE	0,489608	-0,30238	-0,21787	-0,49728	-0,25192	1	
SI	-0,52861	0,433959	0,356488	0,470126	0,38322	-0,22853	1

4.2.4. Structural Model By Bootstrap Algorithm

In order to define structural model the Bootstrap algorithm was run on SmartPLS. By this algorithm, the T-Statistic was examined for each path, in order to investigate the relations between latent variables. Following table demonstrates the path coefficients (O), Mean(M) and T Statistics.

Table 26 - Path Coefficients (Mean, STDEV, T-Values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)
ANX -> BI	-0,06982	-0,0509	0,095459	0,095459	0,73139
ANX -> EE	-0,3175	-0,31335	0,136041	0,136041	2,333827
ATT -> BI	0,109068	0,117814	0,108366	0,108366	1,006479
ATT -> EE	0,474874	0,4808	0,134737	0,134737	3,524448
ATT -> PE	0,628935	0,622427	0,100707	0,100707	6,245197
EE -> BI	0,044113	0,046156	0,186571	0,186571	0,236442
EE -> PE	0,295513	0,283282	0,107079	0,107079	2,759757
PE -> BI	0,727411	0,72018	0,218762	0,218762	3,325118
SE -> BI	0,014264	0,003322	0,100746	0,100746	0,141588
SE -> EE	0,198256	0,196473	0,084299	0,084299	2,351834
SI -> BI	0,017379	0,032214	0,115884	0,115884	0,149967
SI -> PE	-0,02852	0,002949	0,10755	0,10755	0,265174

The significance value of p is calculated with T-Statistics by T-Test. The latent variable relationships at significance level %99 ($p<0.001$), %95 ($p<0.05$), %90

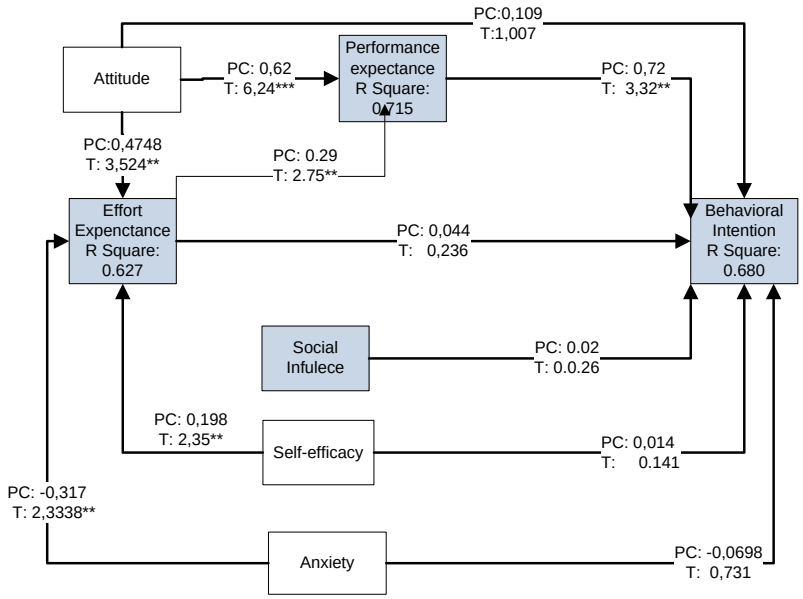
(p<0.1) were revealed. These relationships are listed in the Table 27 with the latent variables.

Table 27 -Coefficients , T-Statistics and P-value.

	Path Coefficient	T Statistics	P-Value (calculated over T Statistic)
ANX -> BI	-0,06982	0,73139	0.23
ANX -> EE**	-0,3175	2,333827	0.01**
ATT -> BI	0,109068	1,006479	0.17
ATT -> EE**	0,474874	3,524448	0.001**
ATT -> PE***	0,628935	6,245197	0.00000850***
EE -> BI	0,044113	0,236442	0.41
EE -> PE**	0,295513	2,759757	0.007**
PE -> BI**	0,727411	3,325118	0.002**
SE -> BI	0,014264	0,141588	0.444
SE -> EE**	0,198256	2,351834	0.01**
SI -> BI	0,017379	0,149967	0.44
SI -> PE	0,02852	0,265174	3.999

* p<0.1, ** p<0.05,*** p<0.001

The Figure 32 illustrates the path coefficients and t scores and significant and non-significant relations listed on the Table 27.



* p<0.10, ** p<0.05,*** p<0.001

Figure 32 - Structural Model

4.2.5. Hypothesis Testing

By using significant and non-significant relations founded in structural model, the hypothesis can be tested.

According to results of PLS analysis positive significant relation at $p<0.05$ was found between *Performance Expectance* and *Behavioral Intension*. Therefore, hypothesis H1 is supported.

There was positive non-significant relation between *Effort Expectance* and *Behavioral Intension*. Because H2 mentions the directions of relation not the significance, Hypothesis H2 is supported due this positive effect. Similarly, *Social Influence* has positive non-significant effect on *Behavioral Intension*. Because H3 also mentions the directions of relation not the significance, Hypothesis H3 is also supported due this positive effect. However these relations was significant in study of Venkatesh et al(2003).

Positive significant relation at $p<0.05$ was found between *Self Efficiency* and *Effort Expectance*. S, H4a was supported. Moreover, the relationship between *Self Efficiency* and *Behavioral Intension* was not significant, which supports the H4b.

Positive significant relation at $p<0.05$ was founded between *Attitude* and *Effort Expectance*. Therefore the hypothesis H5b is supported. Similarly, the relationship between *Attitude* and *Performance Expectance* was positive significant, which supports H5a. Moreover, the relationship between *Attitude* and *Behavioral Intension* was not significant, which also supports the Hypothesis 5c.

Negative significant relation at $p<0.05$ was found between *Anxiety* and *Effort Expectance*. Thus, H6a was supported, too. Moreover, the relationship between *Anxiety* and *Behavioral Intension* was not significant, which also supports the Hypothesis 6b.

Finally, although it was not hypothesized a positive significant relation found between *Performance Expectance* and *Effort Expectance.*

The results of the relations are given in Table 28.

Table 28 Results and Hypotheses

Hypothesis		**Related Path**	**Path Coefficient**	**T Statistic**	**P Value**	**Result**
H1	Performance Expectance (PE) will have positive effect on the behavioral intention of the Mobile Homecare System Users.	PE-> BI	0,727411	3,325118	0.002**	Supported: PE has Positive significant effect on BI
H2	Effort Expectance (EE) will have positive effect on the behavioral intention of the Mobile Homecare System Users.	EE-> BI	0,044113	0,236442	0.41	Supported(U) EE has Positive non-significant effect on BI
H3	Social Influence (SI) will have positive effect on the behavioral intention of the Mobile Homecare System Users.	SI->BI	0,017379	0,149967	0.44	Supported(U) SI has Positive non-significant effect on BI
H4a	Self-Efficiency (SE) will have positive effect on the Effort Expectance of the Mobile Homecare System Users.	SE->EE	0,198256	2,351834	0.01**	Supported SE has positive significant effect on BI
H4b	Self-Efficiency (SE) will not have significant effect on the behavioral intention of the Mobile Homecare System Users.	SE->BI	0,014264	0,141588	0.444	Supported SE has Positive non-significant effect on BI
H5a	Attitude (AT) will have positive effect on the Performance Expectance of the Mobile Homecare System Users.	AT->PE	0,628935	6,245197	0.00000850***	Supported AT has Positive significant effect on PE
H5b	Attitude (AT) will have positive effect on the Effort Expectance of the Mobile Homecare System Users.	AT->EE	0,474874	3,524448	0.001**	AT has Positive significant effect on EE
H5c	Attitude (AT) will not have significant effect on the behavioral intention of the Mobile Homecare System Users.	AT->BI	0,109068	1,006479	0.17	Supported AT has Positive Non-significant effect on BI
H6c	Anxiety (ANX) will have negative effect on the Effort Expectance of the Mobile Homecare System Users.	ANX->EE	-0,3175	2,333827	0.01**	Supported ANX has negative significant effect on EE

Table 28 (cont)

H6b	Anxiety (ANX) will not have significant effect on the behavioral intention of the Mobile Homecare System Users.	ANX->BI	-0,06982	0,73139	0.23	Supported ANX has negative non-significant effect on EE

U- Unexpected non-significant relation was found. Tthe reasons for this findings are discussed in the following chapter.
** p<0.10, ** p<0.05,*** p<0.001*

4.3. More Results

Up to now the research results are analyzed with PLS and hypothesis are tested. This section includes quantitative distribution of mean values for research constructs with respect to behavioral intension is (Table 29). The scores of participants are divided in to two clusters as low(1 to 3) and high(4 -5) scores.

Table 29 The distribution of determinants

Behavioral Intension	Construct	(Mean)Score 1-3		(Mean)Score 4-5	
		N	%	N	%
Score 4-5 (N=32)	Performance expectance	1	0,03125	31	0,96875
	Effort Expectance	14	0,4375	18	0,5625
	Attitude	8	0,25	24	0,75
	Self-Efficiency	8	0,25	24	0,75
	Anxiety	22	0,6875	10	0,3125
	Social Influence	7	0,21875	25	0,78125
Score 1-3 (N=19)	Performance expectance	16	0,5	3	0,09375
	Effort Expectance	19	0,59375	0	0
	Attitude	14	0,4375	5	0,15625
	Self-Efficiency	0	0	19	0,59375
	Anxiety	6	0,1875	13	0,40625
	Social Influence	7	0,21875	12	0,375

By examining the table some additional estimations can be done:

- About 62% of participants were intended to use the system.

- About 66% of the participants believe the system is useful.
- All of the participants who did not have intension to use the system and about 43% of the participants who have intension to use the system did not found the system easy to use (about 64% of whole group).

CHAPTER 5

CONCLUSIONS AND DISCUSSION

In this study, the factors affecting the acceptance of mobile homecare system were examined. These factors were assessed by taking UTAUT as a theoretical model. The main feature of this thesis (differing from the other studies in the literature) was that the user acceptance study model was analyzed on a system that was not realized yet. According to results of the measurement and structural model of PLS based SEM, all hypotheses are supported. Following paragraphs discuss the results for each construct.

1- *Performance Expectance:*

Venkatesh (2003) [43] qualifies *Performance Expectance* as a stronger predictor of *Behavioral Intension*. In our study, *Performance Expectance* was also the most significant factor at p=0.001. Therefore, inference of Venkatesh (2003)[43] was also supported by our study. This relation implies that as the *Performance Expectance* is increased, the patients become more likely to use the system. From this point of view, we can conclude that when participants believe that system usage will help them in their chronic disease management, they would intend to use the system.

According to the results of our study *Attitude* was a significant predictor of *Performance Expectance*. These results show, if overall attitude of patient toward mobile system is positive then they are more likely to find the system helpful for

their chronic disease management. Venkatesh et al(2003)[43] also tested this effect of *Attitude* on the *Performance Expectance* and found that "*influence* of *Attitude Toward Using Technology is non-significant on intension due to its being captured by process expectancy and effort expectancy*". Our study also shows that, the effect of *Attitude* is not significant for intension of patients to use the mobile homecare system. Thus, it can be concluded that the results are consistent with Venkatesh et al(2003)[43] and the effect of Attitude *is captured* [43] by Performance Expectance.

2- *Effort Expectance:*

In our study, the relations of three constructs with respect to *Effort Expectance* were examined: (1) *Self-Efficiency; (2) Attitude Toward Using Technology*; (3) *Anxiety.*

First of all, there was a positive significant relation between *Effort Expectance* and *Self-Efficiency*. Indeed, the effect of *Self-Efficiency* was non-significant on *Behavioral Intension*. This results was consistent with Venkatesh's (2003)[43] study (hypothesis *H5a)* which states that "*The effect of Self-Efficiency over behavioral intension is non-significant due to its being captured by effort expectancy".* This result also implies that if the patient's belief on his/her individual abilities are at the degree of performing a certain behavior successfully, then the system becomes easier to use.

Moreover, while the effect of *Attitude Toward Using Technology* over *Effort Expectance* was positive significant, it was non-significant over behavioral intension. This result was matched with Venkatesh (2003) [43] hypothesis (H5c) which states that "*Attitude Toward Using Technology is non-significant due to its being captured by process expectancy and effort expectancy*". Moreover, the positive significant relation implies that if the patient overall attitude for using the technology increases, the degree for ease of use also increases.

Finally, while the effect of *Anxiety* over *Effort Expectance* was significant, it was non-significant over behavioral intension. This result was also consistent with Venkatesh (2003) [43] hypothesis (H5b) which states the effect of *Effort Expectance* is non-significant due to its being captured by effort expectancy. The negative

significant result between *Effort Expectance* and *Anxiety* means that if patient has a fear of using the mobile homecare system, he/she finds the system less easier to use.

For this study settings, in contrast to Venkatesh (2003)[43] the relation of the *Effort Expectance* with *Behavioral Intension* was surprisingly non-significant. This unexpected results may be revealed due to the weakness of paper based system. During interviews, the participants could not measure overall effort for using system via a paper based prototype. Therefore the significant path between *Effort Expectance* with *Behavioral Intension* could not be found.

On the other hand, there was a positive significant path, which was not hypothesized: *Effort Expectance* and *Performance Expectance.* So the effect of *Effort Expectance* might be captured by *Performance Expectance,* at this phase of mobile homecare system. Or et al. (2010) [22] used UTAUT as theoretical base in their study on ' *Factors affecting home care patients' acceptance of a web-based interactive self-management technology*'. They also found significant path between Perceived Usefulness (*Performance Expectance*) and Perceived ease of use (*Effort Expectance*). From this point of view our study was also consistent with Or et al. (2010) [22].

3- *Social Influence*;

The influence of *Social Influence* on *Behavioral Intension (p*=0,44*)* was not at significant level. According to prior research of Venkatesh et al(2000)[36], *Social Influence* appears to be significant only in mandatory settings. In our study the proposed system is not mandated system. Thus, it was normal for social influence become non-significant determinant for this setting. So, this non-significant result was consistent with Venkatesh et al(2003)[43].

5.1. Discussion

According to the structural model at Figure 31 (showing path coefficients, T-values, significance level and R^2) the model was able to explain 68 % of the variance(R^2) of *Behavioral Intention* to use the proposed mobile homecare system. Our study also shows that, for systems at design level, the acceptance models can also be applicable and may give valuable results with high variance.

This study also provides empirical data about the perception of patients with chronic diseases for mobile homecare system. It was revealed that patients may intend to use the system because they believed that using the (proposed) mobile homecare system can be help full for them. About 66 % of participants found the system useful (that is, *Performance Expectance* the most significant factor) (see Table 29). However, about 64 % of participants gave low scores to Effort Expectance (that is the factor has significant relation with *Performance Expectance*) , which means these patients do not find the system easy to use. So, the *Behavioral Intension* could be increased by promoting system's ease of use (by using indirect relation over *performance expectance*). According to these results, the proposed systems could be revised to promote *ease of use*. At this level, such a revision would be easier than for an in-use system. For most of the systems, such acceptance models are applied after the system has been realized. After that phase, making change a on the system might be more difficult requiring more time/effort and expenditures.

During the interviews some participants gave opinion:

They stated that, "Whereas as the next generations had ability of using technology, there were not have such capability. So, it is not an easy manner to use a system base on new technologies such as smart-phones"

%63 percentage of participants stated that in spite of the short-comings related with new technology such as smart phone, at least they want to try to the system due to the advantages of the system.

They also stated some benefits by saying "If I would have the opportunity to conduct some of tasks related with my illness at home there is no meaningful reason the hospital in snow". And many others stated that, "By this system I will have opportunity to detect health problems immediately.". Nevertheless they are also shares the same idea that they could not use such a system without help of other family members.

5.2. Contributions of the Study

The study was conducted with two main goals. First one was to examine the results of UTAUT in system the design phase, and the second one is to examine the factors that affect the acceptance of mobile homecare on patients with chronic diseases.

The study provides empirical data for application of UTAUT in the system design phase. From this point of view, this study also provides experimental results for the homecare systems that will be developed.

5.3. Study Limitations

Study limitations were as follows:

- To conduct questionnaire, participants had to be selected among volunteers selected by a health clinic in Ankara. Therefore, study sample size was quite small.
- The system studied/proposed was not realized yet. Therefore, face-to-face interviews were necessary in data collection (by first explaining/presenting the proposed system), which made the interview time quite long (approximately 15 min per patient). This factor also put a limit to the sampling size.
- Because of this small sample size co-variance based SEM analyses could not be used, So the results could not be generalized to the population.

5.4. Future Research

In the future, it is certainly necessary to conduct this study on a larger sample size by using co-variance based SEM in order to generalized the result to the population.. In addition, disease specific analysis can also be done. Moreover, moderators of UTAUT (like age, gender) were not assessed within this study. So, moderator specific analyses can also be conducted. In order to draw more specific conclusions this study can be repeated within three different time interval, with more than one group of participants who differ in age and gender.

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APPENDIXES

APPENDIX A : Questionnaire(Full Format-TR)

<table>
<tr><td>DEMOGRAFİK</td><td>1) Yaşınız
☐ <25
☐ 26-35
☐ 36-49
☐ 50-65
☐ >65</td><td>2) Cinsiyetiniz
☐ Bay
☐ Bayan</td><td>3) Eğitim Durumuz
☐ İlköğretim
☐ Lise
☐ Üniversite
☐ Yüksek Lisans
☐ Doktora</td></tr>
<tr><td rowspan="4">SAĞLIK BİLGİLERİ</td><td colspan="3">1) Halen tedavi gördüğünüz hastalıkları işarateleyizin.
☐ KOAH
☐ Şeker Hastalığı
☐ Astım
☐ Hipertansiyon
☐ Kroner Kalp Yetmezliği
☐ Aritmi
☐ Kolestrol
☐ Diğer:.....</td></tr>
<tr><td colspan="3">2) Sağlık kurumununa yapılan ziyaret sıklığınız nedir.
☐ Yılda 1 ya da 2 kere
☐ 3 Ayda 1 kere
☐ Ayda 1 kere
☐ Ayda 1’den daha sık</td></tr>
<tr><td colspan="3">3) Son bir yılda hastaneye yatmanızı gerektirecek durumla kaç kere karşılaştınız
☐ hiç
☐ 1
☐ 1’den fazla</td></tr>
<tr><td colspan="3">4) Aşağıdaki ölçüm cihazlarından hanginlerini kullanıyorsunuz.
☐ Tansiyon Ölçüm Cihazı
☐ Şeker Ölçüm Cihazı
☐ EKG ölçüm Cihazı
☐ INR ölçüm Cihazı
☐ Kalp Ritmi Ölçüm Cihazı
☐ Trombosit Ölçümü
☐ Parsiyel oksijen basınıncı (PO2) ölçümü</td></tr>
</table>

	5) Evde Bakım ve Hasta Monitörleme sistemeleri hakkında bilgliniz var mı? ☐ EVET ☐ HAYIR
	1)Bilgisayar,Akıllı telefon gibi teknolojilerin kullanımına ilişkin deneyimin seviyeniz nedir? ☐ Yok ☐ Başlangıç ☐ İyi ☐ Uzman

(Röpörtajın Bu Bölümünde Evde Bakım Sistemi örneği tanıtılacaktır: Bu amaçla BASILI GÖRSEL MATERYAL KULLANILACAKTIR.) Anketin bundan sonraki bölümünde size tanıtılan sistem tanıtılacaktır. Bu sisteme ilişkin aşağıdaki maddeler katılıp katılmadığınızı 1 ile 5 arasında puan veriniz.

1. *Kesinlikle katılmıyorum.*
2. *Katılmıyorum*
3. *Kısmen Katılıyorum*
4. *Katılıyorum*
5. *Tamamen katılıyorum*

	1	2	3	4	5
PERFORMANS BEKLENTİSİ					
1- Hastalığımın Tedavisinde Evde Bakım Sistemini kullamayı yararlı bulurum.					
2 - Evde Bakım sistemini kullanmak hastalığımın Tedavisine ilişkin yapmam gereken görevleri daha hızlı yerine getirmemi sağlar.					
3 - Evde Bakım sistemi kullanmak hastalığımın tedavisinin verimliliği artırır.					
4 - Bu sistemi kullanırsam, hastalığımın tedavi şansının daha yüksek olacağını düşünüyorum.					
ÇABA BEKLENTİSİ					
5 - Evde bakım sistemini kullanmak benim için açık ve anlaşılır olacaktır.					
6 - Evde bakım sistemi kullanmak için gerekli yetkinliğe kavuşmak benim için kolay olacaktır.					
7 - Ben bu sistemin kullanımını kolay buldum.					
8 - Evde bakım sisteminin kullanmayı öğrenmek benim için kolaydır.					
TEKNOLOJİYİ KULLANMAYA İLŞİKİN TUTUM					
9 - Evde Bakım Sistemi kullanmak iyi bir fikirdir.					
10 - Evde bakım Sistemi kullanmak hastalık tedavi sürecini daha ilgi çekici yapar.					
11 - Evde Bakım sistem ile hastalığımın tedavi süreci çok eğlencelidir.					
12 - : Evde Bakım sistemi kullanmayı seveceğimi düşünüyorum.					
ÖZ-YETERLİK					
13 - Evde bakım sistemi kullanırken bana ne yapacağımı söyleyen bir kimse olursa sistemini kullanarak benden istenen bir işi veya görevi tamamlayabilirim					
14- Problemle karşılaşırsam yardım için arayabileceğim biri olursa evde bakım sistemini kullanarak bir iş veya görevi tamamlayabilirim.					
15 - Bir Ölçüm tamamlamak için sisteminin sağlayacağından daha fazla zamanım olursa Evde Bakım Sistemini kullanarak bir iş veya görevi tamamlayabilirim.					

16 - Sistemin dahili bir yardım ve destek olanağı olursa sistemini kullanarak bir iş veya görevi tamamlayabilirim					
KAYGI					
17 - Evde bakım sistemini kullanma konusunda kendimi endişeli hissediyorum.					
18 - Yanlış Bir tuşa basarak bir çok bilgiyi kaybedeceğimi düşünmek beni endişelendirir.					
19 - Düzeltemeyeceğim hatalar yapma korkusu beni Evde bakım sistemini kullanmak konusunda tereddüte düşürüyor.					
20 - Evde bakım sistemi benim için biraz korkutucu geliyor.					
SİSTEMİ KULLANMAK İÇİN DAVRANIŞSAL NİYET					
21- Bu sistem hayata geçtiğinde, Evde Bakım Sistemini hastalığımın tedavisinde kullanmaya istekliyim.					
22- Bu sistem hayata geçtiğinde, Evde Bakım Sistemini kullanacağımı öngörüyorum.					
23- Bu sistem hayata geçtiğinde, Evde Bakım Sistemini hastalığımın tedavisinde kullanmayı planlıyorum.					
SOSYAL ETKİ					
24- Davranışlarımda etkis sahibi olan arkadaşlarım ve aile bireylerim evde bakım sistemini kullanmamam gerektiğini düşünür.					
25- Değer verdiğim insanlar Evde Bakım Sistemini kullanmam gerektiğini düşünür.					
26- Ailem veya doktorum sistemi kullanmamda yardımcı olur.					
27 - Genel olarak, sağlık kurumum sistem kullanımı desteklemiştir.					

APPENDIX B : Questionnaire(Demographic- ENG)

<table>
<tr><td rowspan="1">Demographic</td><td>4) Age
☐ <25
☐ 26-35
☐ 36-49
☐ 50-65
☐ >65</td><td>5) Gender
☐ male
☐ female</td><td>6) Education
☐ Elementary School
☐ High School
☐ University
☐ Master
☐ PhD</td></tr>
<tr><td rowspan="5">Health Information</td><td colspan="3">6) Ongoing diseases
☐ COPD
☐ Diabetes
☐ Asthma
☐ Hypertension
☐ Coronary Hard Diseases
☐ Arrhythmias
☐ Cholesterol
☐ Other:.....</td></tr>
<tr><td colspan="3">7) Choose the frequency of hospital visits.
☐ 1 or 2 times per year
☐ 1 times per three month
☐ each month
☐ More than 1 per month</td></tr>
<tr><td colspan="3">8) How many times have you stay in hospital since past 1 year
☐ never
☐ 1
☐ more than 1</td></tr>
<tr><td colspan="3">9) select the measurement devices you use
☐ Blood Pressure
☐ Blood Glucose meter
☐ EKG
☐ INR meter
☐ The heart's activity
☐ Anticoagulants and Thrombosis level
☐ PO2 meter</td></tr>
<tr><td colspan="3">10)Have you ever heart about Homecare Systems
☐ EVET
☐ HAYIR</td></tr>
<tr><td></td><td colspan="3">11) Chose the level of experience for using technologies like computer, smart
☐ Non
☐ Beginner
☐ Average
☐ Expert</td></tr>
</table>

APPENDIX C : Items Used In The Survey (TR)

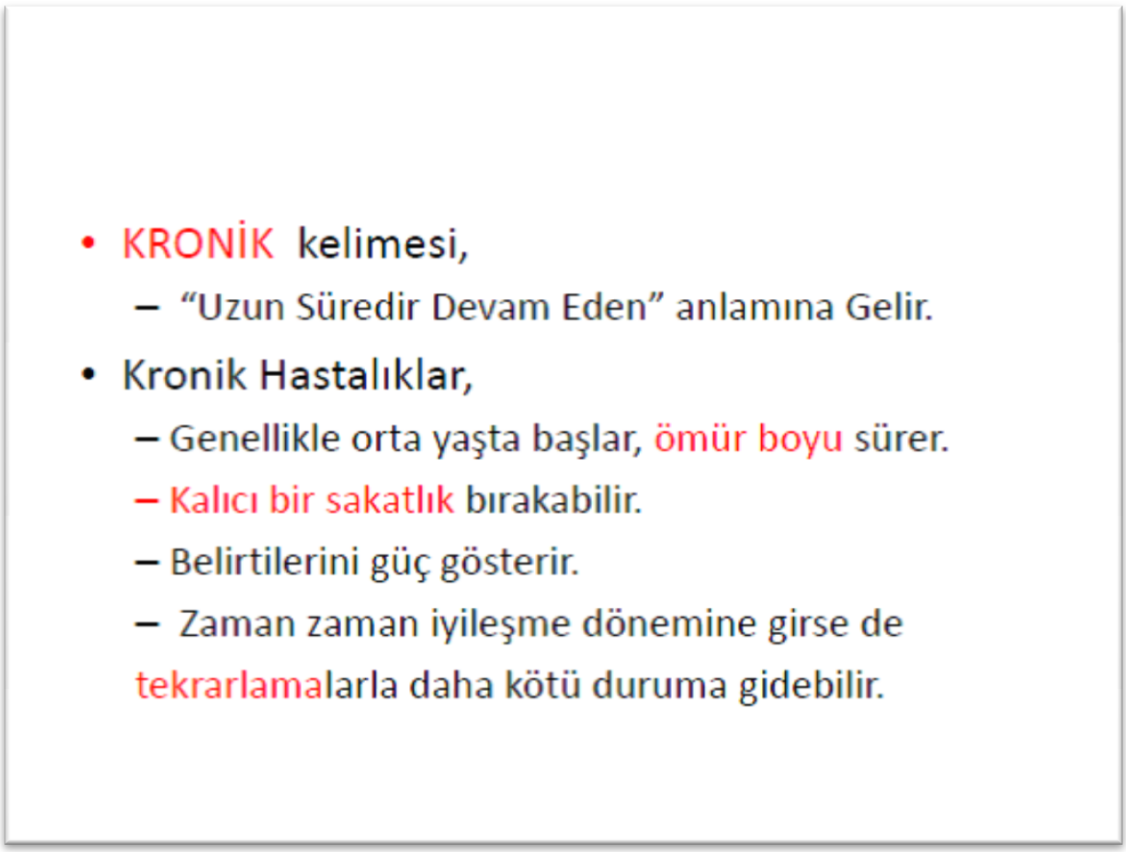
Performans beklentisi:	1	U6: Hastalığımın Tedavisinde Evde Bakım Sistemini kullamayı yararlı bulurum.
	2	RA1: Evde Bakım sistemini kullanmak hastalığımın Tedavisine ilişkin yapmam gereken görevleri daha hızlı yerine getirmemi sağlar.
	3	RA5: Evde Bakım sistemi kullanmak hastalığımın tedavisinin verimliliği artırır.
	4	OE7: Bu sistemi kullanırsam, hastalığımın tedavi şansının daha yüksek olacağını düşünüyorum.
Çaba beklentisi	5	EOU3: Evde bakım sistemini kullanmak benim için açık ve anlaşılır olacaktır.
	6	EOU5: Evde bakım sistemi kullanmak için gerekli yetkinliğe kavuşmak benim için kolay olacaktır.
	7	EOU6: Ben bu sistem kullanımını kolay buldum.
	8	EU4: Evde bakım sisteminin kullanmayı öğrenmek benim için kolaydır.
Teknolojiyi kullanmaya ilşikin tutum	9	Al: Evde Bakım Sistemi kullanmakak iyi bir fikirdir.
	10	AF1: Evde bakım Sistemi kullanmak hastalık tedavi sürecini daha ilgi çekici yapar.
	11	AF2: Evde Bakım sistem ile hastalığımın tedavi süreci çok eğlencelidir.
	12	Affect1: Evde Bakım sistemi kullanmayı seveceğimi düşünüyorum.
Öz-yeterlik	13	SE1: Evde bakım sistemi kullanırken bana ne yapacağımı söyleyen bir kimse olursa sistemini kullanarak benden istenen bir işi veya görevi tamamlayabilirdim.
	14	SE4: Problemle karşılaşırsam yardım için arayabileceğim biri olursa evde bakım sistemini kullanarak bir iş veya görevi tamamlayabilirdim.
	15	SE6: Bir Ölçüm tamamlamak için sisteminin sağlayacağından daha fazla zamanım olursa Evde Bakım Sistemini kullanarak bir iş veya görevi tamamlayabilirdim.
	16	SE7: Sistemin dahili bir yardım ve destek olanağı olursa sistemini kullanarak bir iş veya görevi tamamlayabilirdim.
Kaygı	17	ANX1: Evde bakım sistemini kullanma konusunda kendimi endişeli hissediyorum.
	18	ANX2: Yanlış Bir tuşa basarak bir çok bilgiyi kaybedeceğimi düşünmek beni endişelendirir.
	19	ANX3: Düzeltemeyeceğim hatalar yapma korkusu beni Evde bakım sistemini kullanmak konusunda tereddüte düşürüyor.
	20	ANX4: Evde bakım sistemi benim için biraz korkutucu geliyor.
Sistemi kullanmak için Davranışsal	21	BI1 Bu sistem hayata geçtiğinde, Evde Bakım Sistemini hastalığımın tedavisinde kullanmaya istekliyim.
	22	BI2 Bu sistem hayata geçtiğinde, Evde Bakım Sistemini kullanacağımı öngörüyorum.

niyet	23	BI3 Bu sistem hayata geçtiğinde, Evde Bakım Sistemini hastalığımın tedavisinde kullanmayı planlıyorum.
	24	SN1: Davranışlarımda etkis sahibi olan arkadaşlarım ve aile bireylerim evde bakım sistemini kullanmamam gerektiğini düşünür.
	25	SN2: Değer verdiğim insanlar Evde Bakım Sistemini kullanmam gerektiğini düşünür.
	26	SF2: Ailem veya doktorum sistemi kullanmamda yardımcı olur.
Sosyal Etki	27	SF4: Genel olarak, sağlık kurumum sistem kullanımı desteklemiştir.

APPENDIX D : Items Used In The Survey (ENG)

Performance Expectance	1	U6: I would find the system useful in my job.
	2	RA1: Using the system enables me to accomplish tasks more quickly.
	3	RA5: Using the system increases my productivity.
	4	OE7: If I use the system, I will increase my chances of getting a raise.
Effort Expectance	5	EOU3: My interaction with the system would be clear and understandable.
	6	EOU5: It would be easy for me to become skillfula t using the system.
	7	EOU6: I would find the system easy to use.
	8	EU4: Learning to operate the system is easy for me
Attitude Toward tech.	9	Al: Using the system is a bad/good idea.
	10	AF1: The system makes work more interesting.
	11	AF2: Working with the system is fun.
	12	Affect1: I like working with the system.
Selft Efficency	13	SE1: I could complete a job or task using the system, If there was no one around to tell me what to do as I go.
	14	SE4: I could complete a job or task using the system, If I could call someone for help if I got stuck.
	15	SE6: I could complete a job or task using the system, If I had a lot of time to complete the job for which the software was provided.
	16	SE7: I could complete a job or task using the system, If I had just the built-inh elp facility for assistance.
Anxiety	17	ANX1: I feel apprehensive about using the system.
	18	ANX2: Its cares me to think that I could lose a lot of information using the system by hitting the wrong key.
	19	ANX3: I hesitate to use the system for fear of making mistakes I cannot correct.
	20	ANX4: The system is somewhat intimidating to me.
Behavioral Intesion	21	BI1: I intend to use the system in the next <n> months.
	22	B12: I predict I would use the system in the next <n> months.
	23	B13: I plan to use the system in the next <n> months.
Socail Influence	24	SN1: People who influence my behavior think that I should use the system.
	25	SN2: People who are important to me think that I should use the system.
	26	SF2: The senior management of this business has been helpful in the use of the system.
	27	SF4: In general, the organization has supported the use of the system

APPENDIX E : Presentation Material



- Kronik Hastalıkların
  - Diyabet(şeker hastalığı),
  - KOAH,
  - Astım,
  - Kronik Kalp Yetmezliği,
  - Kronik böbrek yetmezliği,
  - Kanser,
  - Yüksek Tansiyon,

şeklinde uzayan bir listesi vardır.

Kronik hastalığınız varsa,

- Hastane ve toplum bakımına gerek vardır.
- Hastanın peryodik tıbbi bakımları olmalıdır.
- Oluşabilecek komplikasyonlara karşı koruyucu hekimlik kapsamında önlem alınmalırıdır.

- **EVDE BAKIM SİSTEMİ:**

Modern teknolojiler kullanılarak kurgulanan bir sistem içerisinde günlük yaşantınız içerisinde kronik hastalığınızın takibi ve kontrol altında tutulması sağlanabilir.

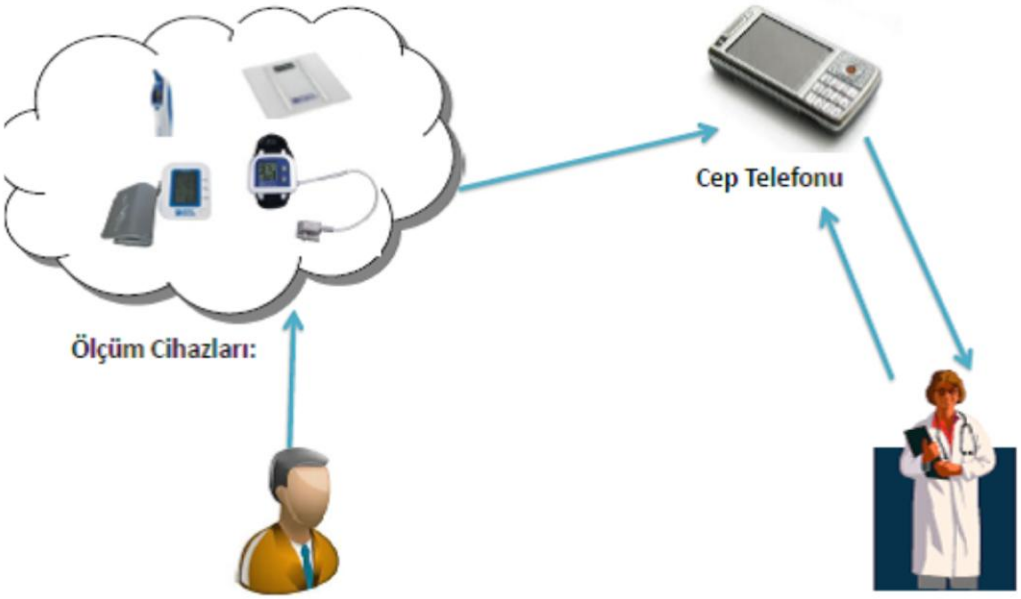
- **EVDE BAKIM SİSTEMİ:**

Yaşam alanlarının içerisinde kontrolü bir bakım alanı.

- **AMAÇ:**

Kronik hastalıklarını izleyebilme ve yönetebilme olanağı sunulabilmektedir.

Sistemin İçinde Neler Var



Bu sistemde hastaya düşen ağırlıklı iş ölçümleri zamanın yaparak Dokturna raporlanmasını sağlamaktır.

Yapılabilecek Ölçüm Teknikleri

- Elektro kalp Grafisi (EKG)
- Kan Şekeri,
- Akciğer kapasitesi,
- Tansiyon,
- Kolestrol,
- Vücut ağırlığı,
- Kan pıhtılaşması düzeyi,

Sistem Tanıtımı:

Bu aşamada tasarlanacak olan Evde Bakım sisteminin tanıtımı yapılacak ve bu sisteme dair görüşlerinize başvurulacaktır.

Tasarlanacak olan bu sisteme, akıllı cep telefonu üzerinden kontrol edeceksiniz.

Akıllı Cep Telefonu: Eski model cep telefonları yalnızca arama ve mesaj çekme olanağı sunarken yeni nesil cep telefonları içersinde tıpkı bilgisayarlarınızda olduğu gibi çok fonksiyonlu bir işletim sistemine sahiptir. Bu cihazlar dokunmatik ekran gibi ek özelliklerle donatılmıştır.

Ana ekranda, ölçüm tuşuna basılır.

Yapılabilecek olan ölçümlerin listesi açılır.

ÖRNEK _1

INR ölçümü için tasarlanmış olan iş akışı şu şekildedir:
1- test yapılır., 2- Ölçümün tamamlanması beklenir
3- ölçüm değerleri telefona aktarılır.

ÖRNEK 2

Spirometre için tasarlanmış olan iş akışı şu şekildedir:
1- Test cihazı hazırlanır 2- Ölçümün yönergeleri verilir.
3- ölçüm değerleri telefona aktarılır.

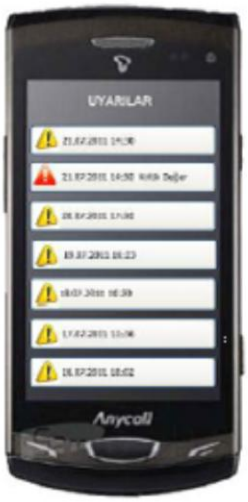
ÖRNEK 3

Şeker ölçümü için tasarlanmış olan iş akışı şu şekildedir:
1- Test yapılır., 2- Ölçümün tamamlanması beklenir
3- ölçüm değerleri telefona aktarılır.

- Bu aşamaya kadar tanımlanmış olan INR, Şeker, Spirometre gibi ölçümlere benzer şekilde listede adı geçen tüm ölçümleri yapabiliceksiniz.
- Sistem bu ölçümleri sizden bağımsız olarak sağlık merkezine incelenmek üzere gönderecektir

ÖRNEK 4

- EKG cihazı elektrot bağlantısı yapılır.
- Cihazın telefonla bağlantısı hazırlanır.
- Başta tuşuna dokunularak EKG ölçümü başaltılır.



- Toplanmış olan ölçüm verileriniz üzerinden yapılan analizler sonucunda, doktorunuz size geri bildirim yapabilecek ve bildirimleri telefon üzerinden görüntüleyebileceksiniz.
- Bu sayede Kritik durum değerlendirmeleri ilaç dozu ayarlamaları anlık olarak yapılabilecektir.

- Bu sistem üzerinden sağlık merkezinizle anlı iletişim kurma imkanına sahip olacaksınız.

- Geçmiş ölçümlere ait verileriniz kaybolmayacak sistem üzerinden erişilebilir olacaktır.

TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

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Uygulamalı Matematik Enstitüsü ☐

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YAZARIN

Soyadı: AYŞEGÜL .....

Adı : KUTLAY .....

Bölümü :SAĞLİK BİLİŞIMİ .....

TEZİN ADI (İngilizce): Analyses Of Factors Affecting Acceptance Of Homecare Technologies By Patients With Chronic Diseases

TEZİN TÜRÜ : Yüksek Lisans ☒ Doktora ☐

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☒
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☒
3. Tezimden bir (1) yıl süreyle fotokopi alınamaz. ☒

TEZİN KÜTÜPHANEYE TESLİM TARİHİ:.....