

CUSTOMER VALUE OF MOBILE SERVICES

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## **ABSTRACT**

### **CUSTOMER VALUE OF MOBILE SERVICES**

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Mobile devices are becoming widely common today. As the number of mobile devices continue to grow all around the world, its functionality is extending and mobile technologies are gaining more popularity in every aspect of our life. Today, wide range of mobile services is offered to people. The purpose of our study is examining the customer value of mobile services for individuals or citizens. A value model for mobile services has been proposed with five dimensions: Functional Value, Social Value, Emotional Value, Epistemic Value and Economic Value. The effect on each value dimension on Intention to Use (ITU) is aimed to be determined. A survey instrument for mobile Internet services and short message services (SMS) has been developed to validate the proposed model. After assuring the reliability of instrument with a pilot

study, data was collected from 303 people working in information and communication technologies (ICT) sector in Turkey. For analyzing proposed model variance-based structural equation modeling (partial least squares) was used. Before evaluating model, exploratory factor analysis (EFA) was conducted to indentify underlying constructs. Based on EFA results, Functional Value was found to have sub-dimensions namely: Ubiquity Value, Performance Value and Security Value. The measurement model was analyzed using confirmatory factor analysis (CFA). The structural model was analyzed using predictive power. For both mobile Internet and SMS, moderate predictive power has been gathered. Finally, the effect of each value dimension on intention to use (ITU) has been evaluated. Ubiquity Value, Performance Value and Epistemic Value have significant effect on ITU for mobile Internet. On the other hand, Economic Value and Performance Value have significant effect on ITU The indications of this research will be valuable for providing information about customer value of current mobile services.

**Keywords:** mobile Internet, mobile services, customer value

## ÖZ

### MOBİL SERVİSLERİN KATMA DEĞERİ

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Mobil cihazların kullanımı, günümüzde oldukça yaygınlaşmaktadır. Mobil cihazların sayısı dünya genelinde arttıkça, cihazların fonksiyonları da artmakta ve mobil teknolojileri hayatımızın her alanında önem kazanmaktadır. Günümüzde, mobil servisler çok geniş çapta insanların kullanımına sunulmaktadır. Çalışmamızın amacı mobil servislerin kattıkları değeri araştırmaktır. Mobil servislerinin kattığı değer beş boyutta incelenmiştir: İşlevsel Değer, Sosyal Değer, Duygusal Değer, Bilgi Değeri ve Ekonomik Değer. Her değer boyutunun Kullanmayı İsteme üzerine etkisinin belirlenmesi hedeflenmektedir. Hedeflenen modeli mobil Internet ve kısa mesaj servisleri (SMS) için değerlendirmek amacıyla bir anket geliştirilmiştir. Anketin güvenilirliği pilot çalışmayla

sağlandıktan sonra, Türkiye’de bilişim ve iletişim teknolojileri sektöründe çalışan 303 kişiden asıl çalışma için veri toplanmıştır. Amaçlanan modeli analiz etmek için varyansa dayalı yapısal denklem modeli (parçalı en küçük kareler yöntemi) kullanılmıştır. Modeli değerlendirmeden önce, verinin sağlayacağı faktörleri ortaya çıkarmak amacıyla açımlayıcı faktör analizi uygulanmıştır. Faktör analizi sonuçlarına göre İşlevsel Değerin Erişilebilirlik Değeri, Performans Değeri ve Güvenlik Değeri olmak üzere alt boyutlarının olduğu gözlenmiştir. Ölçüm modeli doğrulayıcı faktör analizi kullanılarak analiz edilmiştir. Yapısal model tahmin gücü kullanılarak analiz edilmiştir. Mobil Internet ve SMS için orta dereceli tahmin gücü elde edilmiştir. Son olarak, her değer boyutunun ileride servisi kullanmayı isteme üzerine etkisine bakılmıştır. Erişilebilirlik Değeri, Performans Değeri ve Bilgi Değerinin mobil Internet servisleri için servisi kullanmayı isteme üzerinde önemli etkisi olduğu gözlenmiştir. SMS için ise Ekonomik Değer ve Performans Değerinin servisi kullanmayı isteme üzerinde etkisi olduğu gözlenmiştir. Bu çalışmaya ait bulgular, mobil servislerin kullanıcıları için sağladığı değerle ilgili bilgiler vermesi açısından değerlidir.

**Anahtar Kelimeler:** mobil Internet, mobil servisler, katma değer

*To my husband*



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## **LIST OF ABBREVIATIONS**

ABI	Allied Business Intelligence
AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
EDA	Exploratory Data Analysis
EFA	Exploratory Factor Analysis
ITU	Intention to Use
ICT	Information and Communication Technologies
MMS	Multimedia Message Services
SMS	Short Message Services
PLS	Partial Least Squares
PLS-PM	PLS-Path Modeling
SEM	Structural Equation Modeling

# **CHAPTER 1**

## **INTRODUCTION**

In this section, objectives and motivation of the study are explained. Additionally, overall design of the study is described.

### **1.1 Objectives and Motivation of the Study**

Mobile devices are becoming widely common today. Almost everyone has a mobile device (such as PDA or mobile phone). The Informational Technologies and Communication Authority Report (2010) based on the electronic communication industry in Turkey showed that the number of mobile phone users is about 61.5 million in Turkey in the first quarter of 2010. This number is remarkable when Turkey's population is considered. Furthermore, report gives the signs of mobile service's usage intention of people. The number of mobile Internet users is reported over 640,000 and the number of 3G subscribers is reported about 8.7 million.

Also, another study from Allied Business Intelligence (ABI) Research draws attention to the increase of mobile handsets (about 3.7 billion mobile handsets) having mobile web browsers by the year 2015 (ABI, 2010).

As the number of mobile devices continue to grow all around the world, its functionality extends. Also, there is an important development in wireless mobile networks to be considered, which results in an increase in accessibility. The evolution of mobile technologies changes the possibilities for everyone to reach the information ubiquitously. The demand for mobile technologies increases and people integrates mobile technologies in their daily life. Development of mobile technologies also affects development of mobile services (M-Commerce, M-Health, and M-Learning). Today, a wide range of mobile services is offered to people.

The reason why people use their mobile phones for accessing the Internet or use mobile services in their daily life is worthy to study. For understanding how the people integrates mobile services into their daily lives, this study started with the question “what does affect customer decision?”. There are several studies showing that “value” is highly related with customer satisfaction. According to a study (Eggert & Ulaga, 2002) conducted on the satisfaction and value relationship, satisfaction and value are distinct concepts. Perceived customer value leads to satisfaction and satisfaction affects purchase intention.

In this study, it is aimed is to develop a model for explaining customer value of mobile services (mobile Internet and SMS). Understanding customer value of mobile services plays a crucial role in predicting purchase behavior. To create customer value, it is important to know the value added by these services to customer life.

## **1.2 Overall Design of the Study**

In this research, there are six main steps. These steps are shown in Figure 1.



**Figure 1** Organization of Research

In the **first step**, mobile services, especially mobile Internet services, and concept of value introduced with a detailed literature review. The literature review is presented in Chapter 2.

In the **second step**, research model for customer value based on literature review is introduced with five dimensions: (1) Functional Value, (2) Social Value, (3) Emotional Value, (4) Epistemic Value, and (5) Economic Value. Also in this step, the hypotheses for the value model are stated. The model and hypotheses are explained in Chapter 3.

**Third step** is covering the methodology of research. In this step, information about preparation of the survey instrument, data collection process and information about participants of the research is given. Furthermore, structural equation modeling (SEM) is introduced. The methodology of study is given in Chapter 4.

In the **fourth step**, preliminary data analysis is conducted. Reliability and validity are studied. Furthermore, for identifying the dimensions of model exploratory factor

analysis is conducted as a part of SEM. In addition, evaluation of structural model and measurement model are conducted in this step. The results of data analysis are presented in Chapter 5.

In the **fifth step**, statistical analyses results are discussed based on literature review. The discussion is given in Chapter 6.

In the **last step**, contributions and summary of this study are presented. Furthermore, limitations of this study and suggestions for future research topics are addressed. The conclusion is given in Chapter 7.

## **CHAPTER 2**

### **LITERATURE REVIEW**

In this chapter, information about “mobile services”, literature review on “value” concept. and literature review concerning “value” and “mobile services” together are presented.

#### **2.1 Mobile Services**

Changing technology gives direction to diverse applications and services. One of those services is m-services, an abbreviation for mobile services. Over twenty years, mobile voice service is offered to people. About ten years ago, people introduced with SMS. Statistics of year 2008 show that more than 3 billion people use mobile Internet all over the world (O'Farrell et al., 2008). Mobile messaging services and mobile Internet services are studied in detail in the following subsections

##### **2.1.1 Mobile Messaging Services**

Primary mobile messaging services are SMS and multimedia message service (MMS). In the following subsections, these messaging services are studied in detail.

#### 2.1.1.1 SMS (Short Message Services)

Minges (2005) define SMS as “transmitting text messages over mobile telephones”. It is also stressed that it is not an Internet application. Minges (2005) thinks that sending and receiving text messages shows the user adaption to mobile telephone. As a result, SMS usage can be used to predict further mobile services usage.

#### 2.1.1.2 MMS (Multimedia Message Service)

MMS can be seen as an extension of SMS. Compared to text-based SMS, MMS enables mobile phone users to transmit pictures, audio and video files on their mobile devices (Minges, 2005; Hsu, Lu & Hsu, 2006). As a result , MMS is more entertaining than text-based SMS. Since MMS is carrying more complex activities, it is expected to require high-speed mobile access (Minges, 2005). Also it is noted that, MMS can also be sent to other users through Internet content providers (Hsu, Lu & Hsu, 2006).

The success of MMS is low when compared with SMS. The reason behind this may be the result of habituate of people which has a strong effect on the choice of messaging (Bouwman, et al., 2007)

### **2.1.2 Mobile Internet Services**

Mobile Internet is defined differently by different researchers:

*“The use of the Internet via hand-held devices such as mobile phones or personal digital assistants”* (Kim et al. 2002)

*“The mobile Internet refers to mobile commerce activities, including mobile telecommunication, mobile content, entertainment service and e-commerce relying on a mobile platform.”* (Hsu, Lu & Hsu, 2006)

*“An activity or set of activities of intangible nature, which occur when the consumer is mobile, the activity or set of activities are supported by a mobile telecommunication provider who makes use of a combination of mobile and Internet networks, enabling activities between customers, and a provider of a service or a system supporting the service”* (Bouwman et al., 2007).

*“Mobile Internet is an enabling technology for all kinds of mobile activities and a mobile device can be deemed as a smart and light tool to deliver new information to the other users “(Wang et al., 2010).*

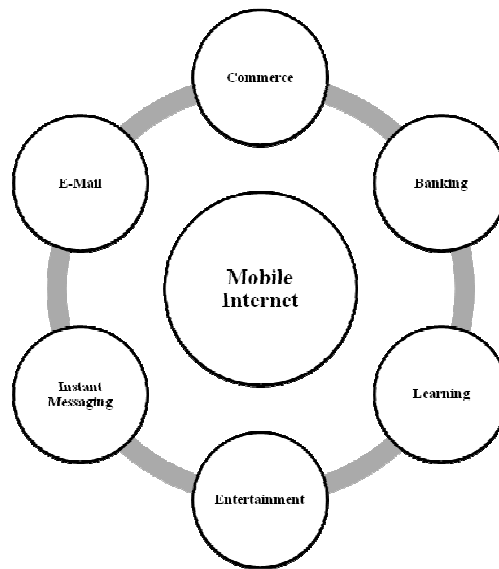
*“Mobile Internet refers to accessing wireless Internet anytime and anywhere via palm-sized mobile devices including mobile phones, personal digital assistants (PDAs), and smart phones” (Wang & Wang, 2010).*

O'Farrell et al. (2008) state that mobile internet is more than wireless Internet. They consider that mobile Internet covers mass-media communication channels such as newspapers, magazines, internet web browsers. Also, it is noted that mobile Internet is has advantages compared to stationary Internet (O'Farrell et al., 2008; Kim et al., 2002; Gerpott, 2010). First, mobile Internet can be used in diverse use contexts (for example; on the road), whereas stationary Internet is generally used in predetermined (for example; in office or at home) environments (Kim et al. 2002, Gerpott, 2010). Second, mobile Internet has limited system capabilities compared to the stationary Internet. These system capabilities may be small screen sizes, power or slower networks (O'Farrell et al., 2008). As a result these result in usability problems (Kim et al., 2002).

Mobile Internet enables for all kinds of mobile activities (Wang & Wang, 2010; Wang et al., 2010). Lots of various Internet activities that can be carried through mobile Internet.

Primary mobile Internet services are shown in Figure 2 and explained in detail in the following subsections.





**Figure 2** Mobile Internet Services

#### 2.1.2.1 M-Commerce

There are different perspectives for describing mobile commerce services.

*“M-commerce refers to the mobile character of wireless devices that support electronic service transactions”* (Kleijnen, Ruyter & Wetzels, 2007).

M-commerce is considered as a combining service which *“adds mobility and convenience to the Internet and creates a whole new set of opportunities in business”* (Mahatanankoon, Wen & Lim, 2004).

M-commerce is considered as *“an extension of e-commerce”* that provides greater flexibility, accessibility and mobility (Wang & Wang, 2010; Luo et al., 2010; Wang et al., 2010).

Mahatanankoon et al. (2004) classifies operation modes of m-commerce in two categories. One of them is content delivery, which is based on using mobile web for notifying and reporting content messages such as weather reports, sports news or games. The other category is transaction mode. In the transaction mode, wireless Internet is used to conduct business operations; for example, customer may order products online or follow electronic catalogs via mobile phone.

#### 2.1.2.2 Mobile Banking

Mobile banking is defined as a method for accessing banking services via a mobile device (e.g., mobile phone or personal digital assistant). Mobile banking offers a great deal of promise in its ability to provide ubiquitous banking (Luo et al., 2010).

#### 2.1.2.3 Entertainment Sites

Mobil TV, watching the soap operas or reality TV shows, picture uploading to blogs or favorite websites can be counted as ubiquitous entertainment services (O'Farrell et al., 2008).

Also there are favorite mobile games that make people addictive to mobile phones (O'Farrell et al., 2008).

#### 2.1.2.4 E-Mail and Instant-Messaging

Using mobile devices, personal and business e-mails can be reached everywhere. People keep themselves in touch any time by sending and receiving mails (O'Farrell et al., 2008).

#### 2.1.2.5 Mobile Learning

Mobile learning is an interesting approach to mobile Internet access as an opportunity for learning (O'Farrell et al., 2008). Mobile Internet can change the nature of teacher and student, also the communication channel.

Some of the content examples from UK ( [www.m-learning.org](http://www.m-learning.org)) are rich media resources including animation, sound and photography. Also they offer SMS quizzes.

## **2.2 Literature Review on Value**

Value has very large dimension in economics, marketing, psychology, social psychology and so on. Being such an interdisciplinary term, there are several studies for describing value in different disciplines. Also in different studies, value is studied with different names; i.e.; consumption value (Sheth et al., 1991), perceived value (Zeithaml, 1988).

Zeithaml (1988) stated that it is very difficult to define value because everyone describes value differently.

In 1994, Albrecht defined value as *“It’s the “mindware” created by the hardware and software you provide. It’s the customer’s perception of specific need fulfillment. It’s the end condition that the customer considers worthy of his or her approval.”* He concludes that *“the value is in the result perceived by the customer”*.

Zeithaml (1988) made an exploratory study about perceived value. According to this study, value is concluded with four statements: *“Value is low price.”*, *“Value is whatever I want in a product.”*, *“Value is the quality I get for the price I pay.”* and *“Value is what I get for I give.”* These four definitions are concluded by Zeithaml as: *“Perceived value is the consumer’s overall assessment of the utility of a product based on perceptions of what is received and what is given.”*. Tridib (1993) extends Zeithaml’s conclusion by equating value as:

Perceived Value = Perceived Benefits- Perceived Sacrifices

Tridip (1993) classifies the benefits as “intrinsic product attributes” and “extrinsic cues”. “Intrinsic product attributes” are additional attributes that should satisfy user; that may be added features, increased functional capability or economic savings. “Extrinsic cues” refers to the properties that are not directly related to physical attributes; that may be expert or reference group opinion or brand name. Also, Zeithaml (1988) suggests the way to add value to a product by adding intrinsic attributes and using extrinsic signals to value.

On the other hand, Tridip (1993) classifies the sacrifices as “Product price”, “Post-purchase monetary costs”, “Cost of learning” and “Cost of replacement”. “Product price” is accepted as major determinant of sacrifice. According to Tridib (1993), consumers evaluate the product price by considering certain product attributes. Therefore it is noted that low price is not always expected by consumers. “Post-purchase monetary costs” includes maintenance costs of products. When a new product introduced, learning to use product takes time and effort, therefore “Cost of learning” is

related with learning how to use the product. Finally, “Cost of replacement” is associated the costs while changing a new product with an old product.

Zeithaml(1988) studied the relationship between value and quality; stated that value differs from quality in being individualistic. As a result, value should be in a higher level than quality. Also, a model is developed by Bolton and Drew (1991) based on the relationship between quality and value. They evaluated quality as a consequence of perception, expectation and satisfaction. They agreed with Zeithaml (1988) in considering value as a broader concept than quality which is also covering personal behaviors and intentions.

Stowell (1992) equates value as:

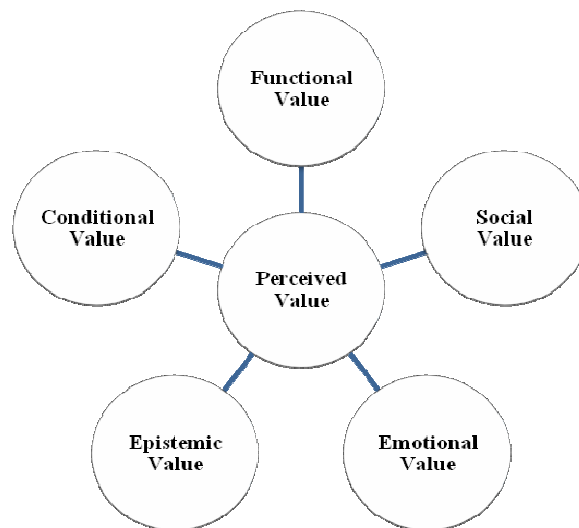
Value= Features + Quality + Delivery + Service + Price

He describes “Features” as performance capabilities; “Quality” as fitting with standards; “Delivery” as how the product is delivered to customer; “Service” as warrant after sell; and “Price” as acceptable price. Although he identifies five dimensions for value, it is also noted that weight of “feature” and “quality” are much more than other. Therefore, it can be said that Stowell’s analysis agrees with previous studies (Zeithaml, 1988; Bolton & Drew, 1991) in relating value with quality. In addition, Albrecht (1994) put emphasize that improving quality does not solely enough; every quality improvement should add value for customer. Therefore identifying what customer value should be first step in quality improvements.

Sweeney, Soutar and Johnson (1997) again worked on the value and quality relationship. They were consistent with previous studies in accepting quality as an indicator of value. According to their study, quality of technical service, quality of product and relative price are indicators of value. Also they accept value as an indicator of “willingness to buy”.

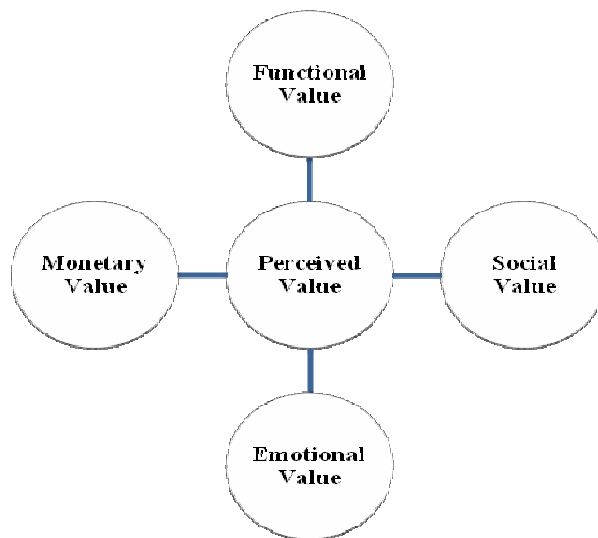
Sheth et al. (1991) worked on a value model which has five dimensions: (1)Functional Value, (2) Conditional Value, (3) Social Value, (4) Emotional Value, (5) Epistemic

Value and (6) Conditional Value. This model is summarized in Figure 3. They studied functional value in a utilitarian perspective and thought that functional value based on physical attributes. They associated social value with group belongingness and they put emphasize on socioeconomic and cultural groups. They described emotional value as the degree that a product arise feelings. They describe epistemic value as the capacity to arise wonder and satisfy a need for knowledge. Finally, they defined conditional value as a set choices; that means one product has “A” characteristic and another product has “B” characteristic and consumer wants both of the characteristics. Then consumer should choose one of them.



**Figure 3** Value Dimensions (Sheth et al., 1991)

Similar to model of Sheth et al. (1991), Sweeney and Soutar (2001) proposed the four dimensions of perceived value: (1) Functional Value, (2) Emotional Value, (3) Social Value, and (4) Monetary Value. This model is summarized in Figure 4. Functional value is identified as the gain gathered from the perceived quality and expected performance of using the service. Emotional value is related with the feelings. Social value is related with what consumers feel when they are in connection with others. Monetary value is related to cost. This cost might be either price cost, or time, or effort spent using the service.



**Figure 4** Value Dimensions (Sweeney & Soutar, 2001)

Patterson and Spreng (1997) studied the relationship between satisfaction and value. They confirmed that satisfaction and value are important for predicting repurchase intentions. Also, Eggert and Ulaga (2002) researched on the satisfaction and value relationship. They concluded that satisfaction and value are supplementary, however different concepts. Their study agrees with Patterson and Spreng (1997) in predicting purchase behavior. Although Patterson and Spreng (1997) admitted that the value does not only have functional dimension, they only made their study on the functional value. They concluded that there exists a direct relationship between value and satisfaction. Not studying on other dimensions of value may be considered as deficiency of their study.

Cronin, Brady, and Hult (2000) worked on the relationship between value, quality, satisfaction and behavioral intentions. They considered quality as a primary factor in behavioral intentions since they confirmed that quality is an indicator of value, satisfaction and behavioral intentions. Meanwhile they thought that value and satisfaction also contributes behavioral intentions.

McDougall and Levesque (2000) researched on the effect of quality and value on the customer satisfaction. They put forward that there is a direct relationship between value

and customer satisfaction. Similar to them, a study conducted with the same hypothesis that value and quality have direct affect on customer satisfaction (Caruana, Money & Berthon 2000). However, their findings are different from their hypothesis in that quality is also related with that value. As a result, accepting quality as an indicator of value agrees with previous studies (Bolton & Drew, 1991; Zeithaml, 1988)

Oh (2000) conducted a study on the value generation in lodging sector. “Brand Awareness” and “Price Fairness” are accepted as the two dimensions of value model. This model yielded predictive results in terms of the customer’s preference on one hotel to another. If several companies on one sector needed to be compared in terms of value, this value would fit well.

### **2.3 Mobile Services and Customer Value**

In the previous researches, consumer value has been studied as the determinant of consumers’ behavioral intention to purchase a product or use a certain service (Sweeney & Soutar, 2001; Sheth et al., 1991; Zeithaml, 1988). Past studies of mobile service usage are examined in terms of added value, user adaption and user perception.

Kim, Chan and Gupta (2007) worked on value-based adoption of mobile Internet. According to them, value maximization would arouse adoption of mobile Internet. They proposed a value adoption model. Their model starts with benefit and cost analyses. Their model confirmed that perceived value leads to adoption intention. According to their model, benefits (such as usefulness and enjoyment) and sacrifices (such as technicality and perceived fee) are predictors of perceived fee. In their study, they do not take into account the social value. For this reason unlike them, in our study perceived value is studied with an extension of Sheth et al. (1991) value model.

Furthermore in 2009, Pederson and Nysveen conducted a study for value proposition of value services. They applied Theory of Planned Behavior as a value model. After applying this model, they concluded that there are five potential value driver dimensions: ‘Ease of Use’, ‘Usefulness’, ‘Attitude’, ‘Subjective Norm’ and ‘Behavioral Control’.

According to Kargin, Basoglu and Daim (2008) consumers only use new technologies such as mobile services “*if they see value or are positively affected in some way by a service*”. A study conducted in Taiwan showed that perceived value positively influences on both customer satisfaction and post-purchase intention (Kuo, Wu & Deng, 2009)

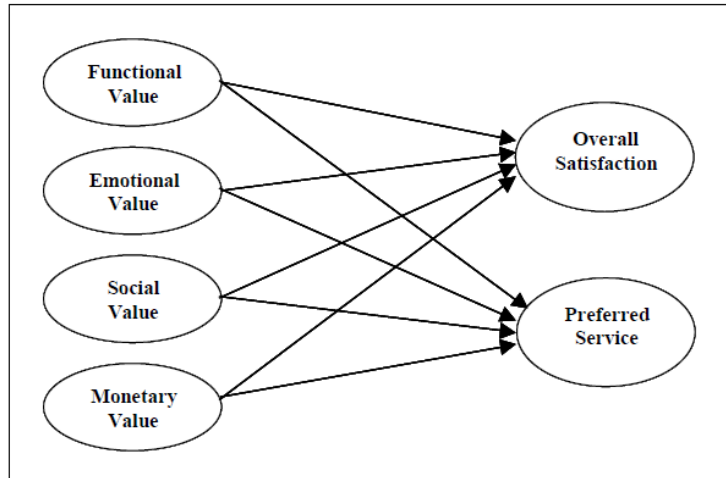
A study conducted in Taiwan for measuring mobile Internet acceptance showed that perceived value has significant influence on mobile Internet acceptance (Wang & Wang, 2010). Again, in 2010, another study conducted in Taiwan for measuring mobile Internet adoption (Wang et al., 2010). Researchers claim that perceived value is needed to be studied as a factor for adoption.

Olla and Patel (2002) develop a value chain model for mobile services based on Lancaster and Walters’ value chain model. In this model it is important that the value chain starts with customer value. They list criteria for customer value as:

- Competitive data transfer rates
- Cheap voice calls
- Secure accesses to services
- Fast Network services
- Multimedia applications
- Fast Internet Access
- Good customer service

Lee et al. (2002) conducted a study for comparing consumer value of mobile Internet services in Korea and Japan. Their research model was based on value model of Sweeney and Soutar (2002) as can be seen in Figure 5. Their research showed that in Japan, functional value has more significant effect on satisfaction. On the other hand, emotional value has more significant effect on satisfaction in Korea. Monetary value and social value have less effect on satisfaction in both of countries.

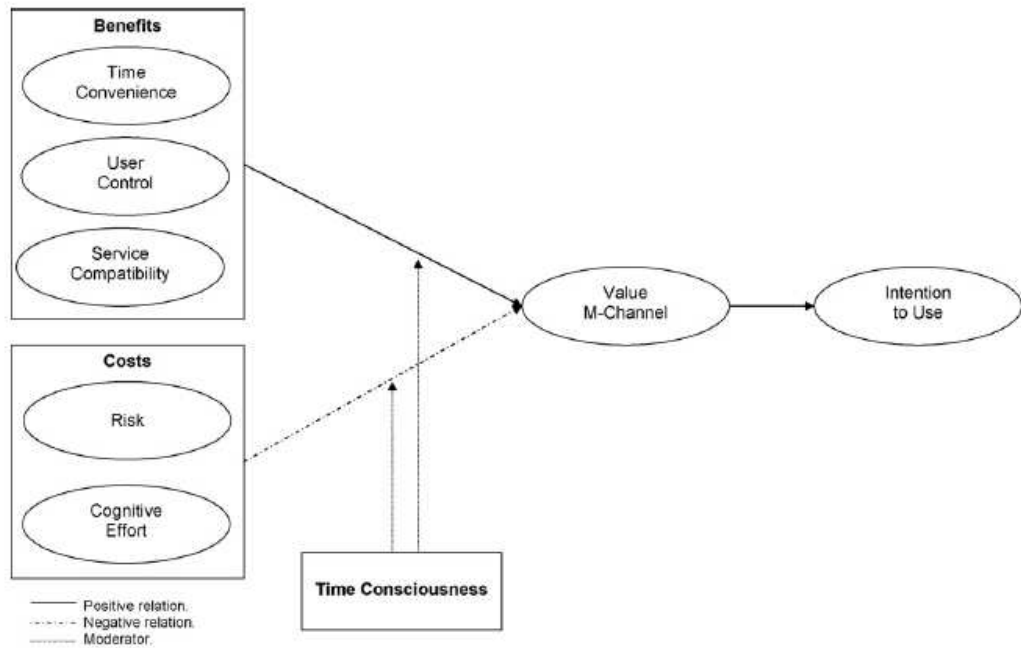




**Figure 5** Customer Value of Mobile Internet (Lee et al., 2002)

Serenko and Turel (2006) developed a model from American Customer Satisfaction Model for measuring satisfaction in mobile services. According to their model, there is a positive relationship between perceived customer expectations and perceived quality. Also, there is a positive relationship between perceived value and satisfaction. In their model, perceived value is considered as only perceived value for money.

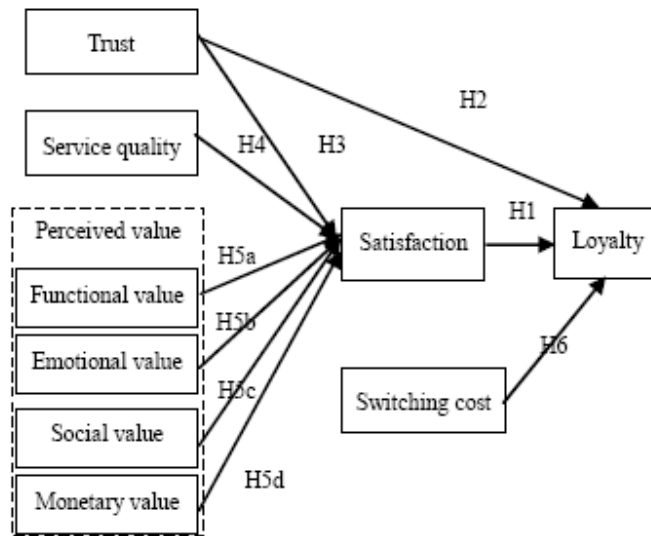
In 2007, Kleijnen et al. developed a value chain model (given in Figure 6) for mobile services delivery.



**Figure 6** Value Chain for Mobile Services (Kleijnen et al., 2007)

According to their model value is classified as benefit and costs. Their theoretical model for value is consistent with Tridib (1993) extends Zeithmal(1988).

A study conducted in China based on customer satisfaction for mobile instant message service (Deng et al., 2009). As seen in their model (given in Figure 7), perceived value is tested as a predictive factor of satisfaction as well as trust, and perceived quality. For perceived value, a value model with four dimensions derived from Sheth et al., (1991) is used.



**Figure 7** Value Model (Deng et al., 2009).

The results showed that customer satisfaction is predicted by trust, perceived service quality, functional value, and emotional value. On the other hand, no significant effect of social value and monetary value is found on customer satisfaction.

A study conducted for comparing consumer value of mobile data services in Korea and US (Yang and Jolly, 2009). Their perceived value model was based on value model of Sweeney and Soutar (2002). Their research showed that emotional value has significant effect on consumer value in both of the countries. On the other hand, they found that social value does not have any affect. Also, monetary value found to have negative effect on customer intention.

In a study conducted in German, whether significantly positively influences mobile Internet use intensity is tested (Gerpott, 2010). According to their result, value assessment has significantly positive impacts on mobile Internet use intensity.

## **CHAPTER 3**

### **THE CUSTOMER VALUE MODEL**

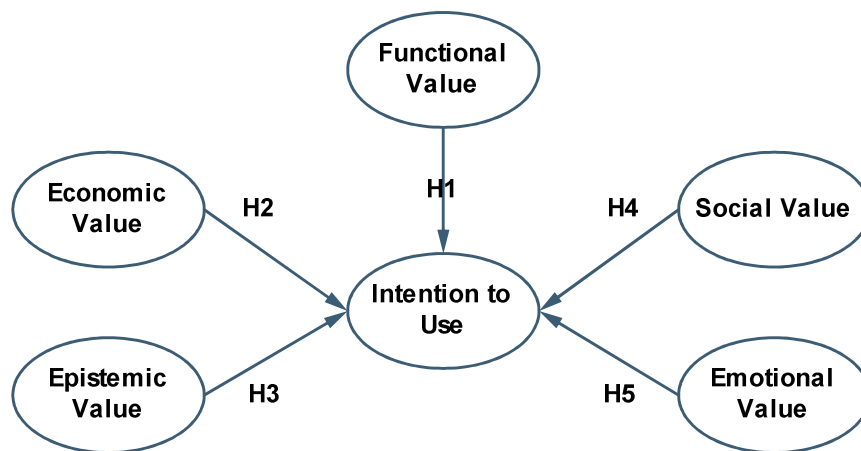
In this chapter, the proposed research model on customer value is presented with model objectives and model development. Furthermore, dimensions of the model are introduced with the research hypotheses that are based on literature review.

#### **3.1 Model Objectives**

The main objective of the research model is to identify customer value dimensions for mobile services . Although mobile technology is playing an important role in our lives, little research has conducted on value of mobile services. The customer value model is proposed to contribute the literature by providing insight for both concept of value and mobile services . Furthermore, this research will be the first study that focus on the value of mobile services in Turkey.

### 3.2 Development of Model

The proposed value model as shown in Figure 8, is based on the studies of Sheth et al. (1991) and Sweeney and Soutar (2001). The proposed research model is aimed to measure the dimensions of Functional Value, Social Value, Emotional Value, Epistemic Value and Economic Value and Intention to Use (ITU).



**Figure 8** Proposed Research Model.

The research hypotheses (H1 through H5) related to the value dimensions are explained in the following subsections.

#### *Functional Value*

H1. Functional value has direct effect on ITU.

A detailed literature survey shows that functional value can be examined in different aspects such as performance and security.

Performance expectancy is defined as the extent to which individuals believe that utilizing the information system will enable them to obtain gains in job performance (Venkatesh et al., 2003). Wang and Wang (2010) extends this definition for mobile

Internet as “mobile users will think mobile Internet beneficial because it enables them to accomplish their daily jobs faster and with more flexibility, or even helps Performance expectancy increase their work productivity”. Also, Wang and Wang (2010) made a measurement on the effect performance expectancy on mobile Internet expectancy and they showed that it has positive effect on usage intention. In addition, in 2007, Kleijnen et al. put forward that consumers place emphasis on time-related benefits in mobile service delivery.

Security and privacy can be considered as functional property because any type of communication requires personal information. While you use mobile phone, you can be reached by others, because mobile Internet or voice calls comes to people via mobile phone (O'Farrell et al., 2008). Also it is noted, when mobile phone is gathered by others, most of the personal information can be reached.

According to Wang, Zhang, and Cao (2003), security and privacy in M-service systems are very critical, especially for mobile consumers. Also, they think that customers have to trust the system (e.g. with their credit card numbers and with personal information).

Also, mobile services due to nature of themselves are ubiquitous services. As a result, functionally, they should be reachable every where and every time needed.

#### *Economic Value*

H2. Economic value has direct effect on ITU.

Serenko and Turel (2006) showed that there exists a positive association between perceived quality and perceived value for money. Both of them contribute to satisfaction. According to a study conducted in Turkey, cost is found to be an important factor in user preference because users prefers low cost (Kargin et al., 2008)

#### *Epistemic Value*

H3. Epistemic value has direct effect on ITU.

Cui and Roto (2008) find out that people use mobile Internet for gaining knowledge. People gather specific information on the Internet and they browse Internet for entertainment.

#### *Social Value*

H4. Social value has direct effect on ITU.

Mobile Internet is often used in social contexts (Cui & Roto, 2008). The results of a study based on mobile service acceptance show that social factors have a significant effect on people's adoption to advanced mobile services (López-Nicolás, Molina-Castillo & Bouwman, 2008).

Venkatesh et al. (2003) describe social influence as what the consumer perceives based on other people's beliefs for using a new system. From this perspective, it can be considered that social value can be result of social influence. Also, Ishii (2004) claims that the mobile Internet serves distinctly different social functions from the PC Internet. The mobile Internet has positive effects on sociability with friends, while the PC Internet does not have such effects. Furthermore, a study carried in Taiwan based on mobile Internet acceptance showed that social influence was found to have a significant impact on usage intention of mobile Internet (Wang & Wang, 2010).

#### *Emotional Value*

H5. Emotional value has direct effect on ITU.

Mobile devices are extremely personal. Being such a personal device, it becomes an inseparable part of daily life. People don't want to leave it just for one day (O'Farrell et al., 2008). On the other hand, it is not possible to use mobile phone everywhere or any time for some social responsibilities to others, people also use mobile phones just because they want and they want to make fun. (O'Farrell et al., 2008). Many of the services offered by mobile Internet such as mobile games, mobile TV enable people enjoy. Also, entertainment plays a role in the future use of mobile services such as, GPRS (Bouwman et al., 2007). A study conducted in Korea showed that people most

often use mobile Internet when they feel pleasant and are in an uneventful environment. (Kim et al. 2002).

A study conducted for comparing consumer value of mobile data services in Korea and US showed that emotional value has significant effect on consumer value (Yang and Jolly, 2009).



## **CHAPTER 4**

### **RESEARCH METHODOLOGY**

In this section, survey instrument development, data collection in pilot and main study, data analysis and SEM are explained.

#### **4.1 Background Information**

In this research, the following methods are used for main data analysis:

- Exploratory Data Analysis (EDA)
- Reliability Assessment
- Validity Assessment
- Structural Equation Modeling (SEM)

Since these methods are used in the main data analysis, it is important to understand them. Therefore, in the following subsections these methods are described in detail.

#### **4.1.1 Exploratory Data Analysis (EDA)**

The first step before conducting inferential statistic is doing EDA; i.e. get to know the collected data. EDA is essential to understand if there are errors with data (such as outliers and missing value) (Morgan, et al., 2004, pg 51) EDA is also important in decision making process of hypothesis-testing analyses because it enables to examine the relationships between variables (Morgan, et al., 2004, pg 51). For this purpose EDA is used for assumption checking.

The steps suggested for doing error checking and assumption checking are listed below (Morgan et al. 2004, pg 53; Leech, Barrett & Morgan, 2005, pg 26; Schumacker & Lomax, 2004, pg 14):

- Looking over the raw data
- Checking the minimum and maximum coding for each variable
- Checking missing data
- Looking for outliers
- Checking normality
- Checking multicollinearity

These steps are described in the following subsections.

##### **4.1.1.1 Looking over the raw data**

It is important to look over the raw data whether there are inconsistencies, double coding or obvious errors. Leech et al. (2005, pg 25) suggest that incomplete, blank, unclear, or double answer, questions should be checked.

##### **4.1.1.2 Checking the minimum and maximum coding for each variable**

According to Leech et al. (2005, pg 24), coding is the process of assigning numbers to the values or levels of each variable. They suggest that a codebook should be prepared for accurate coding. Even if the data is not numeric, the data should be converted to numeric formats; ie. Female 1, male 0. Applying coding accurately to every participant is seen as a must.

#### 4.1.1.3 Checking missing data

Missing data can create problems in later data analysis. According to Schumacker and Lomax (2004, pg 25), the researcher has the options of deleting subjects who have missing values, replacing the missing data values, and using robust statistical procedures that accommodate for the presence. Also, Leech et al. (2005, pg 25) suggest that, there should be rule such as if half the items were blank or invalid, whole questionnaire can be thrown out as invalid. It is suggested to replace missing values using techniques such as multiple imputations, inserting a mean or median of nearby values (Leech et al., 2005, pg 199). Mean substitution is suggested when only a small number of missing values is present in the data (Schumacker & Lomax (2004, pg 26).

#### 4.1.1.4 Looking for outliers

Outliers can be defined as data values that are extreme or atypical. Outliers can be seen as a result of data entry errors, instrument errors based on layout or instructions, or actual extreme values from self-report (due to responsive) data. Outliers can affect the mean, the standard deviation, and correlation coefficient values. Therefore, they must be explained, deleted, or accommodated by using robust statistics (Schumacker & Lomax (2004, pg 32). Outliers can be identified by checking the boxplots and stem-and-leaf plots (Leech et al., 2005, pg 36). The circles out of whiskers show the outliers. If there are stars, that means there are very extreme values that can cause severe problems in further analysis. Field (2009, pg 153) suggests ways for dealing with outliers: Removing the case, transforming the data or changing the score. If there are no or few outliers, it can be assumed that data is normally distributed (Leech et al., 2005, pg 36).

#### 4.1.1.5 Checking normality

In most of the parametric statistics, it is assumed that certain variables are distributed approximately normal. In some cases, the result can be skewed either positively or negatively. If skewness is less than plus or minus one, the variable accepted as normal (Leech et al., 2005, pg 43). Also, it is suggested that If the mean, median, and mode are approximately equal, it can be assume that the distribution is approximately normal (Leech et al., 2005, pg 31). On the other hand, it is noted that normality is important only to the extent that skewness or outliers affect the observed correlations or if significance tests

are performed and it is stressed that it is rare for exploratory factor analyses (Leech et al., 2005, pg 76). Also kurtosis affects normality. If a frequency distribution is more peaked than the normal curve or distribution is flat it is said to have kurtosis (positive or negative). Since kurtosis does not significantly affect results of statistical analysis, it is not suggested to calculate it (Leech et al., 2005, pg 21-22).

#### 4.1.1.6 Checking multicollinearity

When there are high intercorrelations ( $>.85$ ) among some set of the predictor variables, multicollinearity occurs (Kline, 2005, pg 56). Multicollinearity shows that two or more predictors contain much of the same information. A correlation matrix can be used to determine whether multicollinearity exists (Leech et al., 2005, pg 90).

### 4.1.2 Reliability of the Instrument

According to Field (2009, pg 673), if factor analysis is conducted, it is important to control the reliability of the scale. Reliability is degree of scale consistency. For multiple item scales like likert-type scales, Cronbach-Alpha is used to assure internal consistency reliability (Gliem and Gliem, 2003). For assuring reliability, alpha should be greater than 0.7 (Leech et al., 2005, pg 63, 67).

### 4.1.3 Validity of the Instrument

Validity can be defined as the extent to which any measuring instrument measures what it intends to measure (Carmines and Zeller, 1979, pg 17). There are different types of validity:

- *Criterion-Related Validity*: It is simply based on criterion of instrument. The criterion may be either predictive (predicting future) or concurrent (reflecting the current situation) (Blanche et al., 2008, pg 147). The deficiency of this method is that it is sometimes not possible define criterion for some attributes (like trait) (Carmines & Zeller, 1979, pg 18, pg 19).
- *Content Validity*: It is related with how much of content is reflected in the instrument (Carmines & Zeller, 1979, pg 20).

- *Construct Validity*: This is the extent that a measure of construct is related to other constructs (Blanche et al., 2008, pg 151). For assuring construct validity, researcher should firstly determine theoretical relationships between the concepts; i.e. hypothesis formation. Then, prepare appropriate measures and test hypothesized empirically (Carmines and Zeller, 1979, pg 23). Confirmatory factor analysis (CFA) of SEM is suggested as valuable tool for assessing construct validity. (see part for details of CFA part 4.6.2)

#### 4.1.4 Structural Equation Modeling

Structural equation modeling (SEM) is a statistical methodology which has widespread use in many scientific fields; i.e. in social, behavioral, and educational sciences as well as biology, economy, marketing, and medical researches (Raykov & Macoulides, 2006). SEM is used to test theoretical assumptions with empirical data (Haenlein & Kaplan, 2004). SEM is different from other multivariate analysis in that;

- a) SEM assumes that not all variables are observable; some can be predicted from other variables. There are three different types of unobservable variables (latent variables):
  - I) unobservable in principle (e.g., theoretical terms);
  - II) unobservable in principle but either imply empirical concepts or can be inferred from observations (e.g., attitudes, which might be reflected in evaluations);
  - III) unobservable variables that are defined in terms of observables.

Since any of these unobservable types can be observed directly, indicators are used measuring unobserved variables. Indicators are divided into two for their purposes: *Reflective* indicators and *Formative* indicators. Reflective indicators depend on the construct and formative indicators that cause the changes in unobservable variable. (Haenlein & Kaplan, 2004).

- b) SEM enables modeling effects of variables on each other. The researcher specifies the measurement model to define the relationships between the latent variables and the observed variables (Schumacker & Lomax, 2004, pg 200).

When an observed variable or indicator “Y” is used for predicting latent variable “X”; the model is depicted as:  $Y \rightarrow X$

c) SEM accepts that like in real life, models can yield errors.

There are two approaches to estimate the parameters of an SEM: *the covariance-based approach* and the *variance-based approach*. In the covariance-based approach, difference between the sample co-variances and those predicted by the theoretical model are aimed to be minimized. Variance based SEM, also called as *partial least squares (PLS)*, aims maximizing the variance of the dependent variables explained by the independent ones. For this purpose, it reproduces covariance matrix empirically (Haenlein & Kaplan, 2004). In PLS path model (PLS-PM), there are two important parts: structural part and measurement component. Structural part projects the relationships between the latent variables while measurement component indicates how the latent variables and their indicators are related. In addition to these, PLS-PM also has a third component, the weight relations. By using these weights, it is possible to determine a value for each unobservable variable, simply by calculating a weighted average of its indicators (Haenlein & Kaplan, 2004).

PLS is more preferable method when distributions are highly skewed and when sample size is small (Henseler, 2009). Covariance based SEM method requires 400 observations for evaluating measurement models and when the sample size is below 250, it is suggested to use PLS-PM (Reinartz, Haenlein & Henseler, 2009). Furthermore, PLS is preferred to test and validate exploratory models (Henseler, Ringle & Sinkovics, 2009).

A four-step approach is suggested to be followed for building and evaluating SEM models (Mulaik & Millsap, 2000; Schumacker & Lomax, 2004, pg 107):

- Conducting exploratory factor analysis (EFA)
- Conducting confirmatory factor analysis (CFA)
- Identifying relationships between variables and assessing the model fit
- Testing hypothesis

Götz, Liehr-Gobbers and Krafft (2009), suggests two steps for evaluating models:

- Evaluation of Measurement Models
- Evaluation of Structural Models

While doing the data analysis, these steps can be combined to represent analysis meaningfully. In the four-step approach, the first step is based on EFA to build or revise SEM. The other three steps are related with evaluation of model. Confirmatory factor analysis (in four-step approach) conducts the similar statistics as in “Evaluation of Measurement Models”. The third and fourth steps (in four-step approach) are similar to the methods in “Evaluation of Structural Models”. As a result, in this study SEM will be done in three steps.

- EFA
- Evaluation of Measurement Model
- Evaluation of Structural Model

In the following parts, these steps are explained in detail.

#### 4.1.4.1 Exploratory factor Analysis (EFA)

EFA is conducted to determine the number of factors (latent variables) that fit the variance-covariance matrix of the observed variables. By factor analysis, it is aimed to identify sets of observed variables that share common variance-covariance characteristics to specify theoretical constructs (Schumacker & Lomax, 2004, pg 107).

For extracting factors, there are two suggested methods (Ho, R. 2006, pg 205): eigenvalue and scree plot test. Eigenvalue is defined as “*the ratio between the common (shared) variance and the specific (unique) variance explained by a specific factor extracted*” (Ho, R. 2006, pg 205). Scree plot is gathered by plotting the eigenvalues (on the Y axis) against the number of factors in their order of extraction (on the X axis). The plot generally shows a steep slope between the large factors and there occurs very low slope between the rest of the factors. Those factors above this point of declination are accepted meaningful, and those below are not. In general, the scree test results in at least

one and sometimes two or three more factors being considered significant than does the eigenvalue criterion.

#### 4.1.4.2 Evaluation of Measurement Models

For evaluating measurement model, Confirmatory Factor Analysis (CFA) is used. CFA tests hypotheses in the model about certain relations among indicator variables and latent variables. For doing CFA, evaluation of indicator reliability, composite reliability, convergent validity and discriminant validity is suggested to be investigated (Götz, et al., 2009; Henseler et al., 2009).

*Indicator reliability* is used to identify the parts of an indicator's variance that are represented by underlying latent variable. For loadings 0.7 of the latent constructs on an indicator are acceptable. Weak loadings are seen mostly as a result of newly developed scales. It is stressed that reflective indicators should be eliminated from measurement models if their loadings are smaller than 0.4(Götz et al., 2009).

*Composite reliability* ( $\rho_c$ ) is a measure of internal consistency. It is suggested to be greater than 0.6 (Henseler et al., 2009).

$$\rho_c = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum Var(\varepsilon_i)}$$

$$\sum Var(\varepsilon_i) = 1 - \lambda_i^2$$

$\lambda_i$  = component loading to an indicator

The evaluation of *convergent validity* and *discriminant validity* is seen as important part of CFA. A set of variables that are assumed to measure the same construct should assure convergent validity i.e. their correlations should be very high. In contrast, a set of variables assumed to measure different constructs should assure discriminant validity i.e. their correlations should not be high.



*Average variance extracted (AVE)* is suggested to be used for assuring convergent validity.

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum Var(\epsilon_i)}$$

$$\sum Var(\epsilon_i) = 1 - \lambda_i^2$$

$\lambda_i$  = component loading to an indicator

An AVE value of at least 0.5 is required to assure convergent validity because this value shows that a latent variable is able to explain more than half of the variance of its indicators on average (Henseler et al., 2009).

On the other hand, for proving discriminant validity, a latent variable's AVE value is compared with the common variances (squared correlations) of this latent variable with other latent variables. If AVE value is greater than the squared correlations, discriminant validity is assured. (Götz et al., 2009).

#### 4.1.4.3 Evaluation of Structural Models

Evaluation of structural model involves specifying relations among the latent variables in the structural model and assessing model fit. Unlike to covariance-based SEM, PLS-PM does not measure goodness of fit since it is non-parametric. The main objective of PLS is the minimization of error (or, equivalently, the maximization of variance explained) in all endogenous constructs. This objective is ensured by analyzing the predictive power ( $R^2$ ) values for the dependent (endogenous) constructs and the path coefficients ( $\beta$ ) (Götz et al. 2009).  $R^2$  values of 0.67, 0.33, and 0.19 in PLS-PM path models accepted as substantial, moderate, and weak (Henseler et al., 2009).

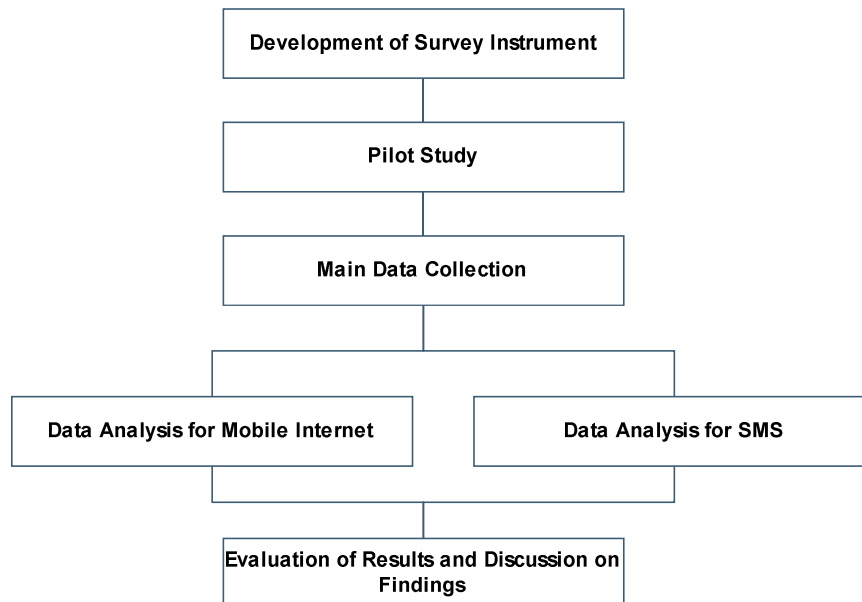
In order to estimate the precision of the PLS estimates (for path coefficient), nonparametric techniques of re-sampling should be used. The nonparametric *bootstrap* can be used in PLS-PM to provide confidence intervals for all parameter estimates. By

bootstrapping observed sample is assumed to represent the population (Henseler et al., 2009).

In structural model evaluation model, testing hypothesizes plays an important role. Based on the bootstrapping results, hypotheses are tested in a given confidence interval by using significance levels.

## 4.2 Methodology of the Research

In this research, after the model development based on the literature review, a survey instrument is prepared to analyze model for mobile Internet and SMS. The pilot study is conducted for ensuring reliability of the instrument. After ensuring that the instrument's reliability, main data is collected. For analyzing data and analyzing model the statistical methods given part 4.1 are used. Same analysis is conducted for both mobile Internet services and SMS. The overall methodology of the study are given as a chart in the Figure 9.



**Figure 9 Methodology of Research**

In the following subsections the steps given in Figure 9 are explained in detail.

#### 4.2.1 Survey Instrument Development

Study started with a detailed literature review on “value” concept. In order to develop an instrument for mobile services, the attributes that add value to mobile services also studied in detail. After a detailed literature review, survey instrument was developed (Appendix A). In the cover part of instrument aim of the study is introduced to participants.

Validity is the first aspect to consider when building instrument since it is important to decide whether the instrument measure what it intends to do (Carmines & Zeller, 1979, pg 17). As stated earlier, instrument was developed based on literature review. The items were assessed by an assessment and evaluation expert who has a master degree from Mersin University. Then, the items were studied with Advisor of thesis study. Also, face validity is suggested to be considered for assuring readability and understandability (Cohen, Manion and Morrison, 2003). For assuring readability and understandability two master students studied on the items.

The final version of the survey is composed of three parts. In the first part of the survey instrument, there are questions related with demographic information (such as age and gender). In the second part, there are 25 likert-type scale questions and two questions regarding mobile Internet usage. In the third part, there are 25 likert-type scale questions and two questions regarding short message service usage. The measurement items of the likert-type items for mobile Internet services are shown in Table 1.

**Table 1** Survey Items with References

<b>Dimension</b>	<b>Item #</b>	<b>Item</b>	<b>Literature</b>
<b>Functional Value</b>	<b>Item 1</b>	This service is available whenever I need.	El-Kiki and Lawrence, 2007 Cho, Lee and Yun, 2007
	<b>Item 2</b>	This service is available wherever I need.	El-Kiki and Lawrence, 2007 Cho, Lee and Yun, 2007
	<b>Item 3</b>	Using this service is clear and understandable.	Pedersen and Nysveen, 2009

Table 1 (cont.)

Dimension	Item #	Item	Literature
Functional Value	Item 4	This service makes my life easier.	Mathwick, Malhotra and Rigdon, 2001 Pedersen and Nysveen, 2009
	Item 5	This service provides an efficient way to manage my time.	Mathwick, Malhotra and Rigdon, 2001 Pedersen and Nysveen, 2009
	Item 6	This service reduces the effort time for particular purpose.	Kim, Chan, Gupta, 2007;
	Item 7	The offerings of this service are of high quality.	Sweeney and Soutar, 2001 Wang, et al. 2004.
	Item 8	This service is useful to me.	Pedersen and Nysveen, 2009
	Item 9	I feel that this service keeps my privacy.	El-Kiki and Lawrence, 2007
	Item 10	I think this service has adequate security features.	El-Kiki and Lawrence, 2007
Social Value	Item 11	Using this service I feel more acceptable and active in the society.	Sweeney and Soutar, 2001 Wang, et al. 2004. Yang and Jolly, 2009
	Item 12	This service would improve the way I am perceived.	Sweeney and Soutar, 2001 Wang, et al. 2004 Yang and Jolly, 2009
	Item 13	People important to me think I should use this service.	Pedersen and Nysveen, 2009
Emotional Value	Item 14	I think this service is very entertaining.	Sweeney and Soutar, 2001; Yunjie and Shun, nd; Mathwick, Malhotra and Rigdon, 2001 Kim, Chan, Gupta, 2007; Yang and Jolly, 2009
	Item 15	I get so involved when I use this service that I forget everything else.	Mathwick, Malhotra and Rigdon, 2001
	Item 16	I feel free to use this service if I like to.	Pedersen and Nysveen, 2009

**Table 1 (cont.)**

<b>Dimension</b>	<b>Item #</b>	<b>Item</b>	<b>Literature</b>
<b>Epistemic Value</b>	<b>Item 17</b>	This service enables to learn new things.	Cho, Lee and Yun, 2007
	<b>Item 18</b>	This service satisfies a desire for knowledge.	Cho, Lee and Yun, 2007
	<b>Item 19</b>	This service arouses my curiosity.	Cho, Lee and Yun, 2007
	<b>Item 20</b>	This service canalizes me to use new services.	Cho, Lee and Yun, 2007
<b>Economic Value</b>	<b>Item 21</b>	This service would save me	Yunjie and Shun, nd;
	<b>Item 22</b>	I am happy with this service's prices.	Mathwick, Malhotra and Rigdon, 2001; Sweeney and Soutar, 2001; Kim, Chan, Gupta, 2007;
<b>Intention to Use</b>	<b>Item 23</b>	I intend to use this service in the future.	Mathwick, Malhotra and Rigdon, 2001; Kim, Chan, Gupta, 2007; Pedersen and Nysveen, 2009 Yang and Jolly, 2009
	<b>Item 24</b>	The next six months I intend to use this service frequently.	Pedersen and Nysveen, 2009
	<b>Item 25</b>	I would recommend this service to friends or relatives.	Sweeney and Soutar, 2001;

#### **4.2.2 Pilot Study: Data Collection and Participants**

Pilot studies are preliminary studies conducted on small samples for identifying the problems within the research especially in research instruments (Blanche, Durrheim and Painter, 2008, pg 94). According to Cohen et al. (2003), pilot study has important functions in increasing validity, reliability and practicability of instrument. A pilot study should be conducted to ensure validity; i.e. observational categories are appropriate, detailed and effectively reflects the research. Also, by pilot study, wording, contents of the instrument can be refined.

Before conducting main study, a pilot study was carried with 35 people working in ICT sector in METU TECH in two different companies. Since 5 of the participants did not

provide adequate information, only 30 questionnaire could be used for analysis. A sample size of thirty is accepted as the minimum number for a research (Cohen et al., 2003). As a result, pilot study analyses conducted based on these responses. The range of participant age changes between “22-37”. 63.3% of participants was male and 36.7% participants was female.

#### 4.2.3 Main Study: Data Collection and Participants

The survey is prepared in electronic media using an online website. Participant informed by e-mails to contribute to survey.

In total, 303 questionnaires are collected from ICT sector workers, in about 1 and half month. 75 responds were not accurate or not completed in overall of the survey; therefore these data did not taken into account. As shown in table 2, 93.4% of participants use mobile Internet services, 80.6% of participants use short message services and 36.5% of respondents use multimedia message services.

**Table 2** Mobile Service Usage of the Participants

Mobil Service Usage	Response	Number of Cases	Percentage (%)
Mobil Internet Usage	Yes	211	93.4
	No	15	6.6
SMS Usage	Yes	166	80.6
	No	40	19.4
MMS Usage	Yes	80	36.5
	No	139	63.5

Table3, Table 4 and Table 5 show the demographic profile of the participants, including service usage based on gender and age

**Table 3** Demographic Profile of Participants for the Mobile Internet Usage

Mobil Internet usage		Yes	No	Total
Gender	Male	93%	7%	56%
	Female	92%	8%	44%
Age	20-29	92%	8%	62%
	30-39	92%	8%	34%
	40-49	88%	2%	3%
	50-plus	100%	-	1%

**Table 4** Demographic Profile of the Participants for SMS Usage

SMS usage		Yes	No	Total
Gender	Male	77%	23%	56%
	Female	86%	14%	44%
Age	20-29	76%	24%	60%
	30-39	73%	27%	34%
	40-49	75%	25%	4%
	50-plus	100%	-	2%

**Table 5** Demographic Profile of the Participants for MMS Usage

MMS usage		Yes	No	Total
Gender	Male	36%	64%	56%
	Female	38%	62%	44%
Age	20-29	40%	60%	63%
	30-39	31%	69%	33%
	40-49	22%	78%	4%
	50-plus	-	-	-

It is important to note that, MMS is analyzed for seeing the usage rate of MMS descriptively.

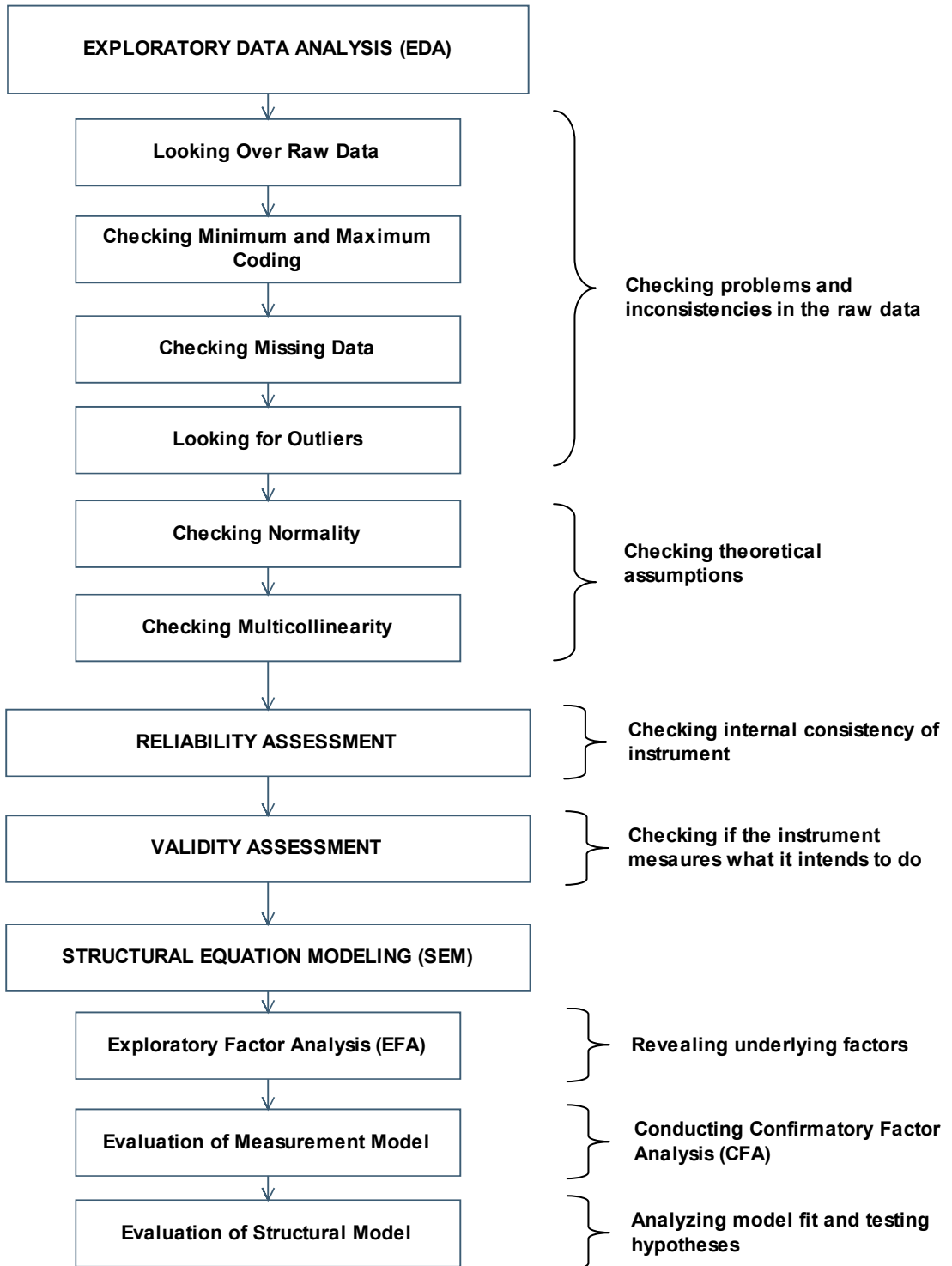
#### 4.2.3.1 Ethic Clearance

This research requires human participation in the data collection phase. For this reason, ethic clearance related to data collection of the research has been gathered by the approval of Practical Ethics Research Board at the Middle East Technical University.

#### **4.2.4 Data Analysis**

For conducting data analysis, the statistical methods introduced in part 4.1 are used. Same data analysis procedure is followed for analyzing the data for both mobile Internet and SMS. The methods used in the analysis are shown in succession with their purposes in Figure 10.





**Figure 10** Methods Used in Data Analysis

### **4.3 Evaluation of Results and Discussion on Findings**

Based on data analysis results, the proposed model is evaluated for both mobile Internet services and SMS. Furthermore, a comparative discussion on customer value of mobile Internet services and SMS is conducted.

### **4.4 Limitations**

The primary limitation of this study is the generalization of the results to whole population. Participants are only the people working in ICT sector in Ankara. Their ages are changing between 21 and 55. Therefore, these results can not be generalized to other people in different age groups (ex. teenagers). Furthermore, the participants are computer literate, since they are working in ICT sector. As a result, results of this study can not be generalized to whole population in Turkey.

## **CHAPTER 5**

### **RESULTS**

In this section, data analysis results are given based on statistical methods given in Chapter 4.

#### **5.1 Pilot Study**

For assuring reliability of the survey instrument, a pilot survey was conducted. As stated earlier in Cronbach Alpha is suggested to be used for reliability (see Part 4.1). For mobile Internet part Cronbach-alpha value was found as 0.868 and for SMS part Cronbach-alpha value was found as 0.865. Since both of the values are greater 0.7, reliability of the instrument is ensured. Also there no multicollinearity between any variables occurred that show two or more predictors contain much of the same information. Therefore the items were not revised after pilot study.

## 5.2 Main Study

For EDA and EFA, SPSS is used. For PLS-PM, PLS-Smart is used. Every step of analysis is repeated for both mobile Internet usage and SMS usage.

### 5.2.1 Exploratory Data Analysis (EDA)

EDA is conducted based on the steps given in Part 4.1. The results of the steps are given in Table 6.

**Table 6** EDA Results

Raw Data	Raw data is checked for inconsistencies. Since the sample size is not very large, the overall data is checked by skimming. The inconsistent or incomplete questionnaires are deleted.
Coding	Maximum and minimum coding for each variable is controlled for all data. Since the data gathering was in electronic form, no coding problem is encountered.
Missing Data	There is not a variable that has missing value more than 50%, as a result none of the variables were deleted (see Appendix B). Since there are few missing values, mean substitution is used.
Outliers	As suggested by Leech et al. (2005, pg 36), outliers are detected with box-plots (see Appendix C). Since there were few outliers in the analysis, none of the questionnaires are removed.  On the other hand, box-plots showed that the Item-16 for mobile Internet usage is problematic in distribution. It is considered as a result of understandability problem. Therefore, this item is not used for further analysis.

**Table 2 (cont.)**

Normality	Normality is checked based on skewness values (see Appendix D). For the skewness values that are nearer to plus or minus one, it is accepted that the distribution is approximately normal. For mobile Internet services usage Item 4, Item 5, Item 8 and Item 23; for SMS usage Item 1 and Item 2 show high skewness. Due to fact that PLS does not strict for normal distribution as stated earlier, these data is used without any transformation.
Checking multicollinearity	Multicollinearity is checked using the correlation matrix (see Appendix E). There exists no intercorrelation greater than .85.

### **5.2.2 Reliability Assessment**

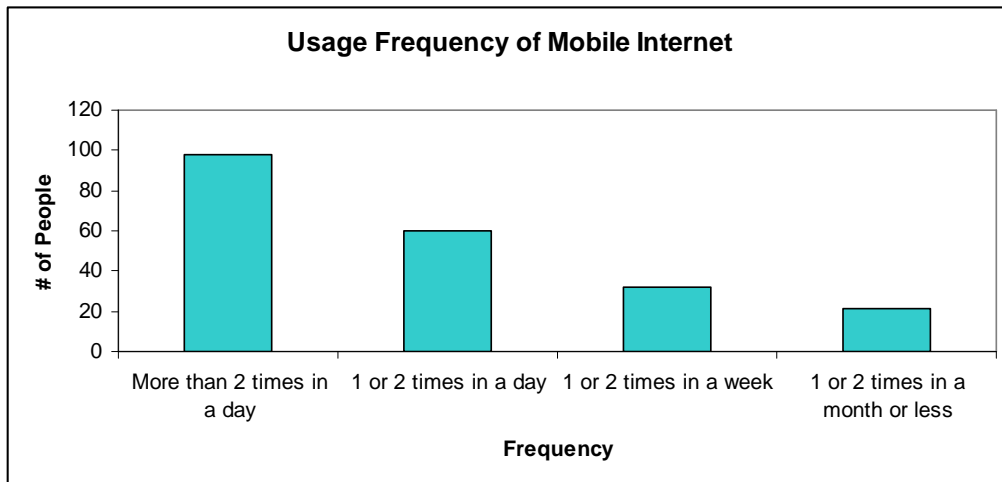
Cronbach Alpha value of mobile Internet part of survey is 0.901; and Cronbach Alpha value of SMS part of survey is 0.914. These results can be considered as good for reliability assessment since at least 0.7 is required to ensure reliability.

### **5.2.3 Validity Assessment**

The content validity of the instrument is based on the literature review. Also, face validity is confirmed based on review of advisor, two master students and an assessment and evaluation expert. Also, construct validity is examined in parts 5.2.4 and 5.2.5.

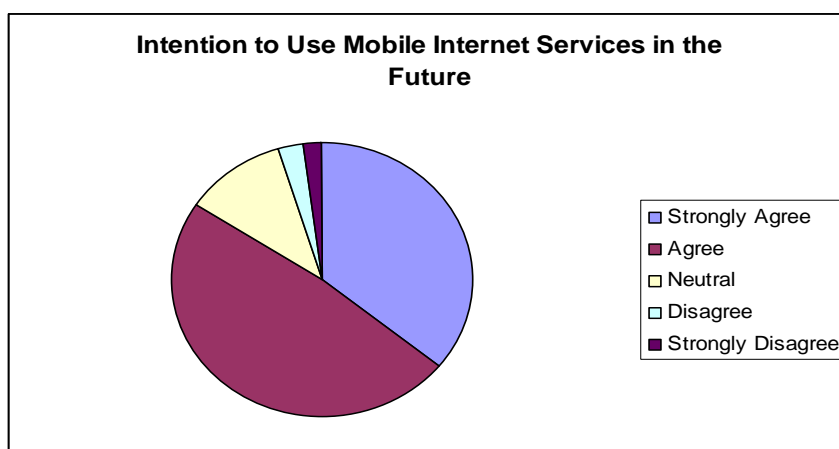
### **5.2.4 Analysis of the Proposed Research Model for Mobile Internet Services Usage**

The preliminary analysis is conducted based on the usage statistics of the mobile Internet. This data is important for the reliability of the study. Descriptive analysis based on the frequency of usage for mobile Internet (shown in Figure 11) shows that, participants of the study are using mobile Internet in their daily life frequently.



**Figure 11** Usage Frequency of Mobile Internet

One of the primary assumptions for evaluating model is that intention of using mobile Internet service. When items that involved in ITU dimension are analyzed descriptively, it is seen (shown in Figure 12) that people are intent to use mobile Internet services.



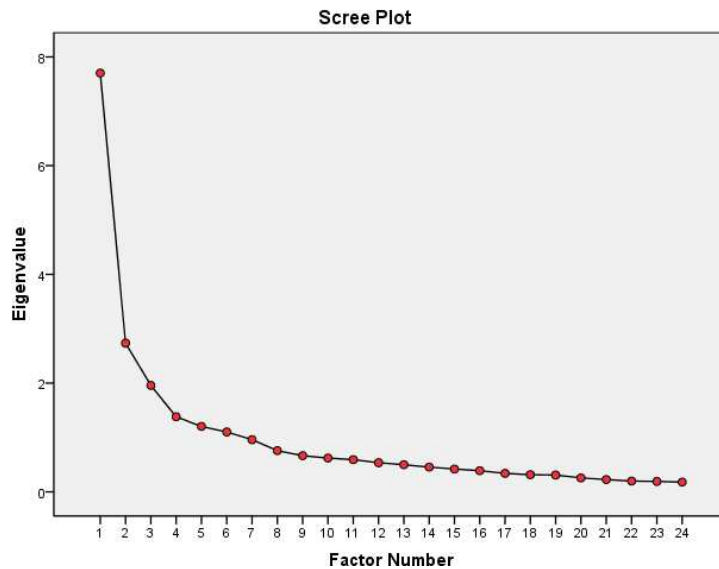
**Figure 12** Usage Intention for Mobile Internet

Satisfying the primary assumptions based on usage frequency usage intention, the model is assessed based on the steps given in part 4.6:

#### 5.2.4.1 EFA for Mobile Internet Services Usage

EFA is conducted to determine a model that fits the data. In this study, scree test is used to extract factors. For defining number of factor, scree plot is tested (Figure 13).

According to scree plot, after the 8<sup>th</sup> factor there is no factorial variance.



**Figure 13** Scree Plot for Mobile Internet

Therefore, 8 factors is determined that fit the data appropriately. Since maximum likelihood estimation requires multivariate normality, principal axis factor analysis is used which is based on correlations. Also, direct oblimin is used due to the correlation between factors (Ho, R. 2006, pg 206).

According to Leech et al. (2005, pg 82), the Bartlett test should be significant (i.e., a significance value of less than .05). The Bartlett test shows that the variables are correlated highly enough to provide a reasonable basis for factor analysis. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) should be greater than 0.7; showing sufficient items for each factor (Leech et al., 2005, pg 80). The results of factor analysis satisfies both Barlett test(with value .000) and KMO (with value 0,817).

In the analysis Item 3, Item 19, Item 20, Item 7 (given in Table 1) did not fit to any of factors due to inappropriate factor loadings or low loadings. Only the items having

loading 0.4 or larger accepted as factor. Factors are formed with at least two variables based on the two-indicator rule: Standard model with two or more factors should have at least two indicators per factor (Kline, 2005, pg 172). The result of the exploratory factor analysis with item loadings is given in Table 7:

**Table 7** Factor Loadings of Constructs for Mobile Internet Usage

Construct / Item	Factor Loading
<i>INTENTION TO USE (ITU)</i>	
ITU1: I intend to use mobile Internet services in the future.	.582
ITU 2: The next six months I intend to use this mobile Internet services frequently.	.508
ITU 3: I would recommend mobile Internet services to friends or relatives.	.922
<i>SOCIAL VALUE (SOC)</i>	
SOC1: Using mobile Internet services I feel more acceptable and active in the society.	.646
SOC2: Mobile Internet services would improve the way I am perceived.	.935
SOC3: People important to me think I should use mobile Internet services.	.610
<i>SECURITY VALUE (SEC)</i>	
SEC1: I feel that mobile Internet services keep my privacy.	.866
SEC2: I think mobile Internet services have adequate security features.	.840
<i>UBIQUITY VALUE (UBIQ)</i>	
UBIQ1: Mobile Internet services are available whenever I need.	.632
UBIQ2: Mobile Internet services are available wherever I need.	.770
<i>PERFORMANCE VALUE (PERF)</i>	
PERF1: Mobile Internet services make my life easier.	-.688
PERF2: Mobile Internet services provide an efficient way to manage my time	-.752
PERF3: Mobile Internet services reduce the effort time for particular purpose.	-.622
PERF4: Mobile Internet services are useful to me.	-.500
<i>ECONOMIC VALUE (ECO)</i>	
ECO1: Mobile Internet services would save me money.	.552
ECO2: I am happy with mobile Internet services' prices.	.761
<i>EMOTIONAL VALUE (EMO)</i>	
EMO1: I think mobile Internet services are very entertaining.	.491
EMO2: I get so involved when I use mobile Internet services that I forget everything else.	.607



**Table 3 (cont.)**

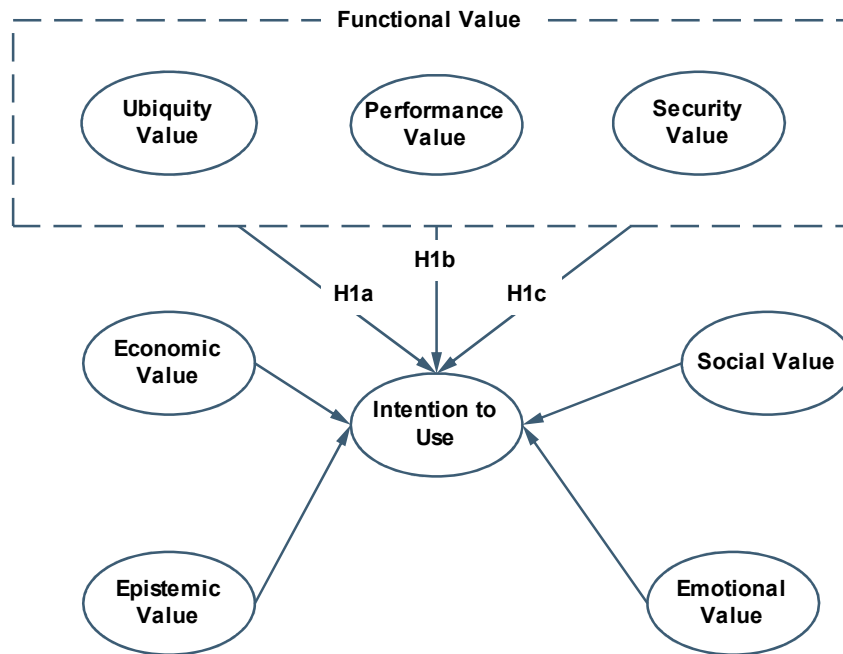
<b>Construct / Item</b>	<b>Factor Loading</b>
EPISTEMIC VALUE (EPIS)	
EPIS1: Mobile Internet services enable to learn new things.	.739
EPIS2: Mobile Internet services satisfy a desire for knowledge.	.863

EFA showed that Functional Value could be identified under three factors: Ubiquity Value, Security Value and Performance Value. Since being ubiquitous is a nature of mobile services, it is seen as an important factor for describing ITU. Also, performance and security of mobile services is seen as determinant for describing ITU. Therefore, before conducting CFA, proposed model and research hypothesis are revised (as can be seen in Figure 14) in EFA stage. H1 is described in terms of H1a, H1b and H1c hypotheses.

H1a. Ubiquity value has direct effect on ITU.

H1b. Performance value has direct effect on ITU.

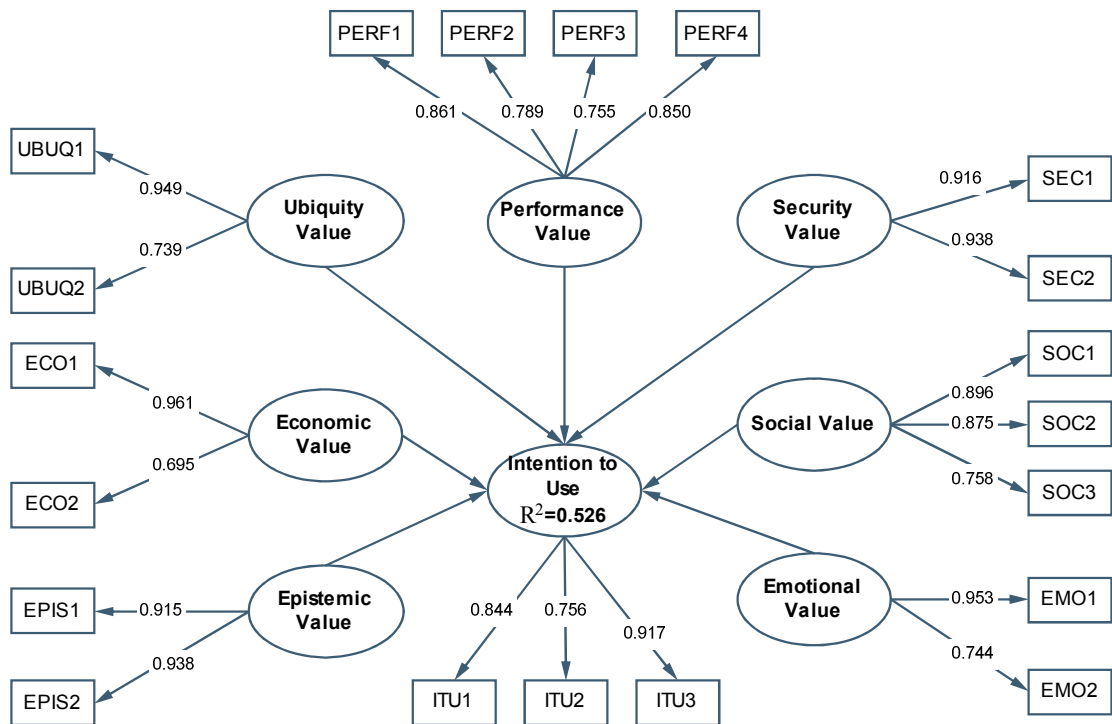
H1c. Security value has direct effect on ITU.



**Figure 14** Revised Customer Value Model for Model Internet Services

#### 5.2.4.2 Evaluation of Measurement Model for Mobile Internet Services Usage

For conducting CFA, PLS-Smart program is used. Indicator reliability, composite reliability, convergent and divergent validity are examined to assess measurement model.



**Figure 15** Path Diagram of the Model for Mobile Internet Services Usage

*Indicator reliability* is the consistency of the indicators with the latent construct. As shown in the Figure 15, except ECO2 indicator, loadings are greater than 0.7 for all indicators; which is suggested as ideal. Since value of ECO2 (.695) is greater than 0.4 and approximate to 0.7, it is also acceptable factor loading.

Composite reliability ( $\rho_c$ ) is a measure of internal consistency and must not be lower than 0.6; given in Table 8, all the values are greater than 0.6, showing internal consistency.

It is suggested to use the average variance extracted (AVE) as a criterion of convergent validity. An AVE value of at least 0.5 indicates sufficient convergent validity; since AVE values (given in Table 8) are all greater than 0.5, all latent variables are able to explain variance of its indicators on average.

**Table 8** Composite Reliability and AVE Values for Customer Value Model for Mobile Internet Services

	<b>Composite Reliability</b>	<b>AVE</b>
<b>ECO</b>	0.822	0.703
<b>EMO</b>	0.842	0.731
<b>EPIS</b>	0.924	0.858
<b>PERF</b>	0.888	0.665
<b>SEC</b>	0.924	0.860
<b>SOC</b>	0.882	0.714
<b>UBIQ</b>	0.837	0.723
<b>ITU</b>	0.879	0.708

Discriminant validity is proven if a latent variable's AVE is larger than the common variances (squared correlations) of this latent variable with any other of the model's constructs (Götz et al., 2009). In Table 9, squared correlations with latent variables and AVE values are shown. It is concluded that discriminant validity is assured.

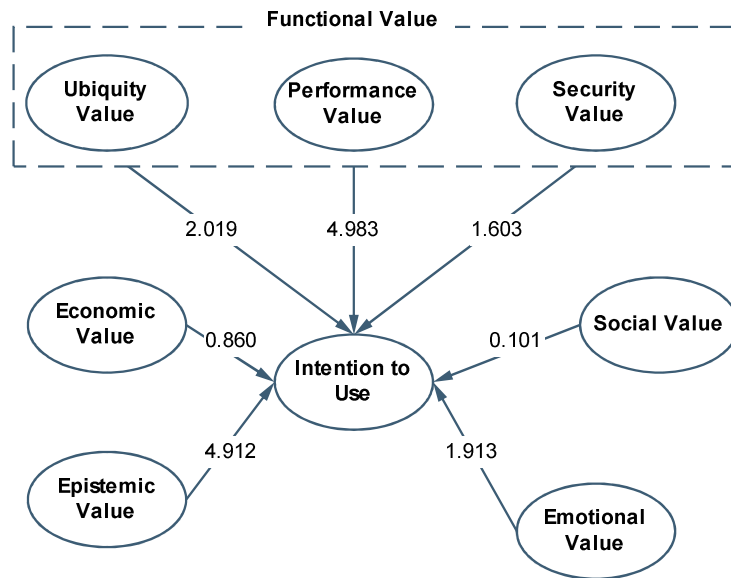
**Table 9** Squared Correlations between Latent Variable and AVE Values for Mobile Internet Services

	<b>ECO</b>	<b>EMO</b>	<b>EPIS</b>	<b>ITU</b>	<b>PERF</b>	<b>SEC</b>	<b>SOC</b>	<b>UBIQ</b>
<b>ECO</b>	1.000							
<b>EMO</b>	0.089	1.000						
<b>EPIS</b>	0.076	0.187	1.000					
<b>ITU</b>	0.099	0.142	0.344	1.000				
<b>PERF</b>	0.089	0.050	0.202	0.366	1.000			
<b>SEC</b>	0.151	0.052	0.035	0.087	0.076	1.000		
<b>SOC</b>	0.132	0.203	0.135	0.105	0.068	0.183	1.000	
<b>UBIQ</b>	0.008	0.004	0.034	0.125	0.197	0.012	0.013	1.000
<b>AVE</b>	<b>0.703</b>	<b>0.731</b>	<b>0.858</b>	<b>0.708</b>	<b>0.665</b>	<b>0.860</b>	<b>0.714</b>	<b>0.723</b>

#### 5.2.4.3 Evaluation of Structural Equation Modeling for Mobile Internet Services Usage

For the evaluation structural equation modeling  $R^2$  values for the dependent (endogenous) constructs and the path coefficients ( $\beta$ ) are measured. As seen in Figure 15,

$R^2$  value of the model is found to be 0.526. As stated earlier, 0.67, 0.33, and 0.19 in PLS-PM path models accepted as substantial, moderate, and weak (Henseler et al., 2009). Based on this assumption, the proposed model is accepted as moderate.

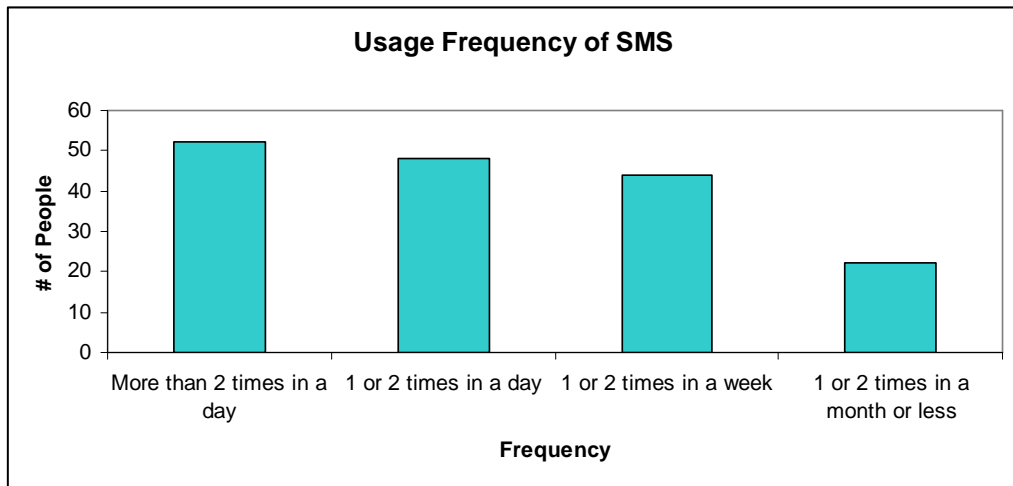


**Figure 16** Evaluation of Research Model for Mobile Internet

For getting path coefficients, bootstrapping method is used. In Figure 16, the path coefficients are seen. Based on the bootstrapping results, hypotheses are tested in given significance levels ( $p < 0.05$ ,  $\beta > 1.96$ ). As stated earlier in exploratory phase H1 hypotheses are examined as H1a, H1b and H1c hypotheses. H1c is rejected while H1 and H1b are accepted. H4 is accepted while H2, H3 and H4 are rejected.

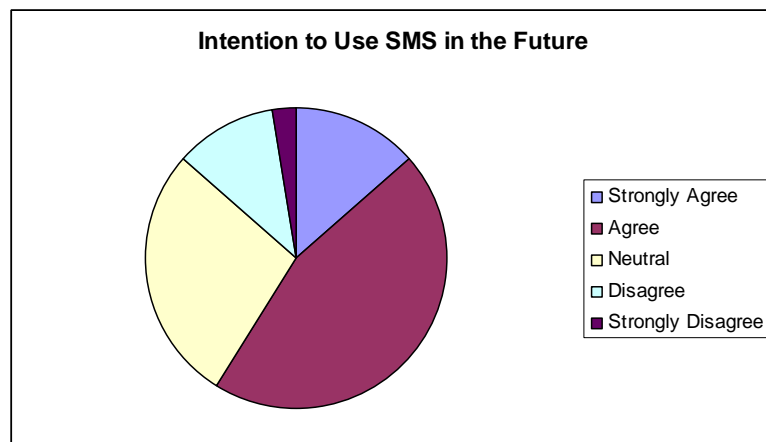
### 5.2.5 Analysis of the Proposed Research Model for SMS Usage

The preliminary analysis is conducted based on the usage statistics of SMS. This data is important for the reliability of the study. Descriptive analysis based on the frequency of usage for SMS (shown in Figure 17) shows that, most of participants of the study are using SMS in their daily life.



**Figure 17** Usage Frequency of SMS

The primary assumption for evaluating model is that intention of using SMS is high. When items that involved in ITU dimension are analyzed descriptively, it is seen (shown in Figure 18) that people are intent to use SMS in the future.



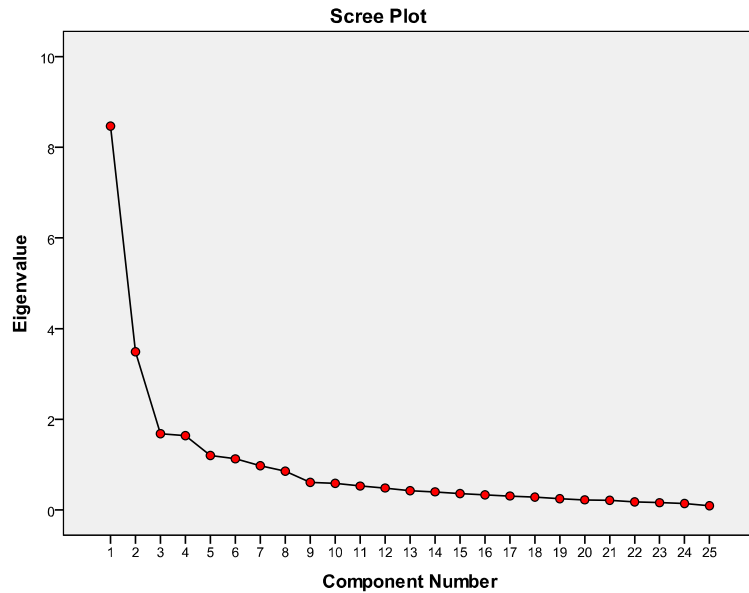
**Figure 18** Intention to Use SMS

The model is analyzed based on the steps given in part 4.6:

#### 5.2.5.1 EFA for SMS Usage

To determine the number of factors scree plot test used. As can be seen in Figure 19, after the 9<sup>th</sup> factor, variance is low. Since for the mobile Internet usage 8 factors used, for SMS usage 8 factors are tried to be extracted using principal axis factor and direct

oblimin. One of the factors was poor with one variable. Therefore, 7 factors could be extracted that could fit the data appropriately.



**Figure 19** Scree Plot for SMS

Bartlett test (with value .000) is significant (significance value of less than .05) showing that the variables are correlated highly enough to provide a reasonable basis for factor analysis. KMO (with value 0.800) is greater than 0.7; showing sufficient items for each factor (Leech et al., 2005, pg 80).

In the analysis Item 3, Item 14, Item 15, Item 16, Item 7 (given in Table 1) did not fit to any of factors due to inappropriate factor loadings or low loadings. Only the items having loading 0.4 or larger accepted as factor. As stated earlier, factors are formed with at least two variables based on the two-indicator rule.

The result of the exploratory factor analysis with item loadings is given in Table 10:

**Table 10** Factor Loadings of Constructs for SMS Usage

Construct / Item	Factor Loading
<i>INTENTION TO USE (ITU)</i>	
ITU1: I intend to use short message services in the future.	-.751
ITU2: The next six months I intend to use short message services frequently.	-.641
ITU3: I would recommend short message services to friends or relatives.	-.864
<i>SOCIAL VALUE (SOC)</i>	
SOC1: Using short message services I feel more acceptable and active in the society.	.587
SOC2: Short message services would improve the way I am perceived.	.879
SOC3: People important to me think I should use short message services.	.754
<i>SECURITY VALUE (SEC)</i>	
SEC1: I feel that short message services keep my privacy.	.913
SEC2: I think short message services have adequate security features.	.825
<i>UBIQUITY VALUE (UBIQ)</i>	
UBIQ1: Short message services are available whenever I need.	.899
UBIQ2: Short message services are available wherever I need.	.826
<i>PERFORMANCE VALUE (PERF)</i>	
PERF1: Short message services make my life easier.	-.802
PERF2: Short message services provide an efficient way to manage my time	-.937
PERF3: Short message services reduce the effort time for particular purpose.	-.612
PERF4: Short message services are useful to me.	-.527
<i>ECONOMIC VALUE (ECO)</i>	
ECO1: Short message services would save me money.	.670
ECO2: I am happy with short message services' prices.	.853
<i>EPISTEMIC VALUE (EPIS)</i>	
EPIS1: Short message services enable to learn new things.	.672
EPIS2: Short message services satisfy a desire for knowledge.	.689
EPIS3: Short message services arouse my curiosity.	.654
EPIS4: Short message services canalize me to use new services.	.620

EFA showed that any of the items formed a construct related with Emotional Value. Furthermore, Functional Value could be identified under three factors: Ubiquity Value, Security Value and Performance Value. Ubiquitous, usability in everywhere and every time, is seen as an important factor for describing ITU. Also, performance and security

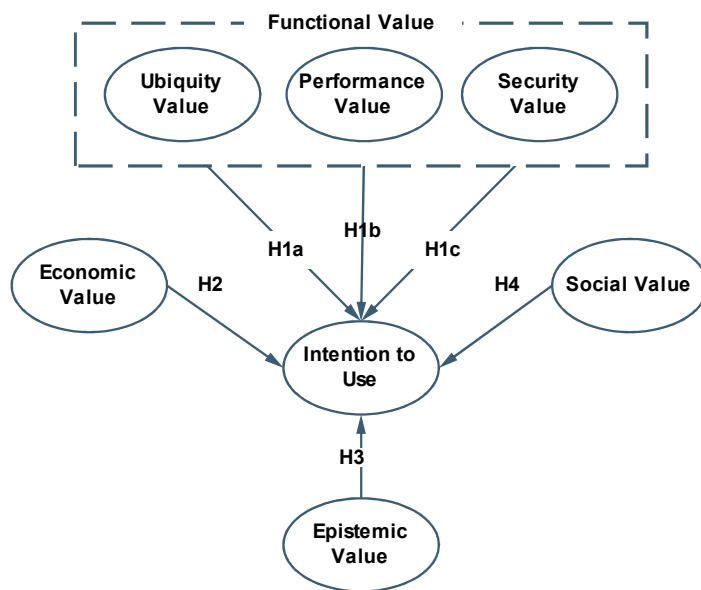


of mobile services is seen as determinant for describing ITU. Therefore, before conducting CFA, proposed model and research hypothesis are revised (as can be seen in Figure 20) in EFA stage. H1 is described in terms of H1a, H1b and H1c hypotheses.

H1a. Ubiquity value has direct effect on ITU.

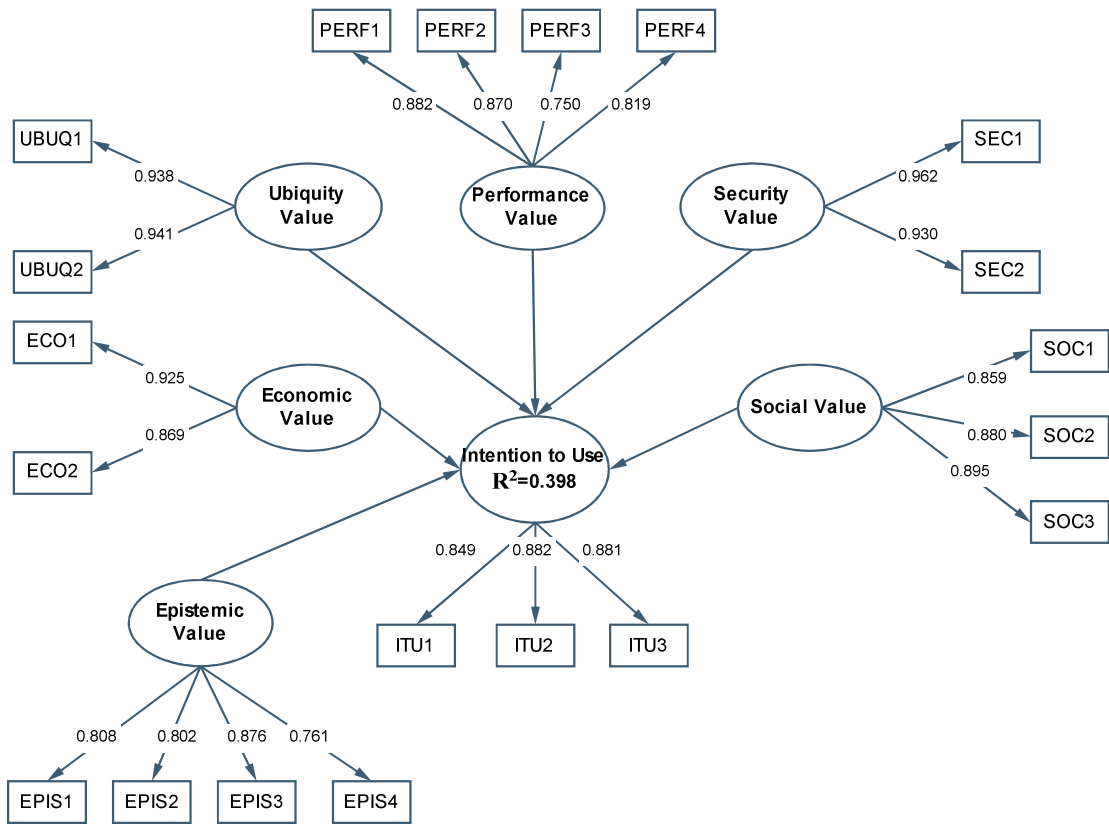
H1b. Performance value has direct effect on ITU.

H1c. Security value has direct effect on ITU.



**Figure 20** Revised Customer Value Model for SMS

### 5.2.5.2 Evaluation of Measurement Models for SMS Usage



**Figure 21** Path Diagram of the Model for SMS Usage

*Indicator reliability* is proven in the factor loadings (shown in Figure 21) since loadings are greater than 0.7 for all indicators; that shows consistency of the indicators with the latent construct.

As depicted in Table 11, both *composite reliability* ( $\rho_c$ ) and AVE are ensured. Composite reliability; as a measure of internal consistency and must not be lower than 0.6. AVE as a criterion of convergent validity also ensured, since AVE value of at least 0.5 indicates sufficient convergent validity. As a result, all latent variables are able to explain variance of its indicators on average.

**Table 11** Composite Reliability and AVE Values for Customer Value Model for SMS

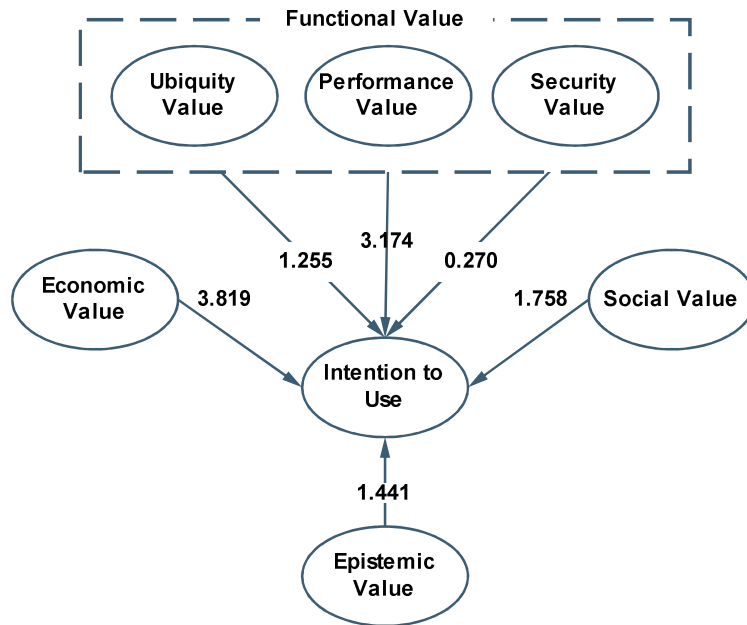
	<b>Composite Reliability</b>	<b>AVE</b>
<b>ECO</b>	0,892566	0,806129
<b>EPIS</b>	0,885955	0,660686
<b>PERF</b>	0,899605	0,692204
<b>SEC</b>	0,944559	0,894969
<b>SOC</b>	0,909813	0,770832
<b>UBIQ</b>	0,937759	0,882812
<b>ITU</b>	0,903859	0,758149

Discriminant validity is proven; since a latent variable's AVE is larger than the common variances (squared correlations) of this latent variable with any other of the model's constructs (Götz et al., 2009). In Table 12, squared correlations with latent variables and AVE values are shown. None of the squared correlations are greater than AVE value of related latent variable.

**Table 12** Squared Correlations between Latent Variable and AVE Values for SMS

	<b>ECO</b>	<b>EPIS</b>	<b>ITU</b>	<b>PERF</b>	<b>SEC</b>	<b>SOC</b>	<b>UBIQ</b>
<b>ECO</b>	1.000						
<b>EPIS</b>	0.178	1.000					
<b>ITU</b>	0.215	0.193	1.000				
<b>PERF</b>	0.064	0.101	0.205	1,000			
<b>SEC</b>	0.052	0.104	0.071	0.046	1,000		
<b>SOC</b>	0.123	0.372	0.220	0.176	0.479	1.000	
<b>UBIQ</b>	0.001	0.001	0.038	0.479	0.028	0.003	1.000
<b>AVE</b>	<b>0.806</b>	<b>0.661</b>	<b>0.758</b>	<b>0.692</b>	<b>0.895</b>	<b>0.771</b>	<b>0.883</b>

### 5.2.5.3 Evaluation of Structural Models for SMS Usage



**Figure 22** Evaluation of Research Model for SMS

As shown in Figure 21,  $R^2$  value for the dependent (endogenous) constructs is found to be 0.398 which is accepted as moderate (Henseler et al., 2009).

Path coefficients are calculated using bootstrapping method. In Figure 22, the path coefficients are seen. Based on the bootstrapping results, hypotheses are tested in a given significance levels ( $p < 0.05$ ,  $\beta > 1.96$ ). As stated earlier in exploratory phase, H5 hypothesis could not be tested for SMS usage. Also H1 hypothesis are examined as H1a, H1b and H1c hypothesizes. H1 and H1c are rejected while H1b is accepted. H2 is accepted while H3 and H4 are rejected.

## CHAPTER 6

### DISCUSSION

In this chapter, the results and findings of the research are discussed with respect to the literature. Also the results of customer value of mobile Internet and SMS are compared with the results of quantitative data analyses.

#### *Functional Value*

The proposed model' first dimension was Functional Value. During the exploratory studies, it is found out that the Functional Value could be studied by dividing in to three: Ubiquity Value, Security Value, and Performance Value.

The Ubiquity Value had a positive effect and significant relation with ITU for mobile Internet. However, for SMS, Ubiquity Value did not result a significant relation with ITU. According to these findings, it can be inferred that ubiquity is an important aspect of mobile Internet.

On the other hand being an asynchronous type of communication, SMS doesn't require ubiquity actions.

The Performance Value showed strong relation with ITU (with high significance) for both SMS and mobile Internet. This result is important, since users of both SMS and mobile internet gives importance to performance; whether the service do what it should do. This result is consistent with findings of Yang and Jolly (2009). They stated some performance attributes (such as efficiency, time) as Functional Value. Therefore, their findings on Functional Value can be compared with this study's findings on Performance Value. Similar to the results in our study, their study also showed Functional Value in terms of performance has significant effect on user attitude towards mobile data services in both US and Korea.

Also, the result of Deng et al.(2009) study shows that Functional Value has significant effect on mobile instant messaging service in China. They define Functional value as the practical and technical benefits gained from anywhere and anytime services. By this description, they describe Functional Value as a complement of both Ubiquity Value and Performance Value. As a result, findings of our study are in concordance with their study for mobile Internet. Since Ubiquity Value for SMS is not significant, SMS is partially consistent with their findings.

The Security Value did not yield a significance relation with ITU for mobile Internet and SMS. This result showed that people are not satisfied with security and privacy precautions.

#### *Economic Value*

The proposed model's second dimension was Economic Value. Economic Value did not show a significant relation with ITU for mobile Internet usage. This might be due to the high packet transfer prices of operators. These results are parallel to previous studies conducted for mobile data services in Korea and US (Yang and Jolly, 2009); and mobile instant messaging in China (Deng et al., 2009). On the contrary, for the SMS usage, Economic Value had the highest significance. This result might be the sign of communication type of people.

### *Epistemic Value*

The proposed model' third dimension was Epistemic Value which was the strongest predictor of ITU for mobile Internet with a high significance. Although Epistemic Value was not measured in previous studies for mobile services, it is obvious that it is an important dimension for ITU. This shows that people use mobile Internet for reaching information ubiquitously. On the contrary, Epistemic Value did not show significant effect on ITU for SMS.

### *Social Value*

Social Value being the fourth dimension of proposed model did not show significant relation with ITU for both mobile Internet and SMS. This shows that people do not use these services due to social influence such as acceptance by social environment or obligatory from others. These results are consistent with previous studies conducted for mobile data services in Korea and US (Yang and Jolly, 2009); and mobile instant messaging in China (Deng et al., 2009). Social Value is found to have no significance relation with attitude towards using services. Since these survey is applied to adults who are in already work life, this results could be accepted as descriptive. If the age of people that joined the questionnaire was lowered to teenagers, the social effect could take place differently.

### *Emotional Value*

The last dimension was Emotional Value which was based on the enjoyment and feelings of users. The results showed that for mobile Internet, Emotional Value does not have direct effect on ITU. Furthermore, Emotional Value could not be investigated as a construct for SMS usage. Therefore, no relation could be identified or evaluated with ITU for SMS and Emotional Value.

These results contradict with the study conducted in US and Korea (for mobile data service), also in China (for mobile instant message service), since Emotional Value has

significant effect on intention to use mobile services (Yang & Jolly, 2009; Deng et al., 2009).

### *ITU*

The model fit is acceptable with moderate value ( $R^2=.526$ ) for mobile Internet services. Although mobile Internet service usage intention is high, it is seen that Social Value, Economic Value, Security Value and Emotional Value does not have significant effect on ITU. Ubiquitous Value, Performance Value and Epistemic Value have significant effect on ITU.

The model fit is acceptable with moderate value ( $R^2=.398$ ) for SMS. It is seen that Social Value, Ubiquity Value, Security Value, Emotional Value and Epistemic Value do not have significant effect on ITU, while Economic Value and Performance Value have significant effect on ITU.



## **CHAPTER 7**

### **CONCLUSION**

In this chapter, summary of the study, contribution of the study are presented. In addition, suggestions for future research are given based on the limitations of the study.

#### **7.1 Summary of the Study**

This study proposed a customer value model for mobile services. In the model, five dimensions are proposed: Functional Value, Social Value, Emotional Value, Economic Value and Epistemic Value. To evaluate the model for mobile Internet usage and SMS usage, a scale is developed. Validity tests are conducted on the variables and their related dimensions yield different dimensions than proposed. The model is re-evaluated in the exploratory phase. Functional Value is sub-divided in to Security Value, Ubiquity Value and Performance Value.

Furthermore for SMS usage any of data fits with Emotional Value. Validity tests based on these changes shows that Epistemic Value, Ubiquity Value and Performance Value are significant for customer value for mobile Internet usage; while Economic Value, Performance Value and Social Value are significant for customer value for SMS usage. The final model for mobile Internet usage explains a moderate amount of the variance of customer value ( $R^2 = 0.526$  for mobile Internet usage;  $R^2 = 0.398$  for SMS usage). The results provide valuable information for value proposition of mobile service users.

## **7.2 Contribution of the Study**

Knowing what customer values enables to develop new (value-added) services and improve the current services. Also, the deficiencies that lead user dissatisfaction with a service can be found out due to low value proposition. This would result in more satisfied mobile service user and more deliberate service developers and providers.

This study enables to realize value factors for mobile services from user perspectives. Although SMS and mobile Internet services are both mobile services; there exists differences in value dimensions. Therefore, it is concluded that a single and straightforward model could not explain overall value for all mobile services. This study can be extended to gain valuable information for other mobile services to find out, what user wants.

In this study, two different dimensions are included in model: Ubiquity Value and Security Value. Since mobile services are ubiquitous in nature, it is seen as an important dimension to be studied. Also, security is seen as an important determinant for using mobile services (especially mobile Internet). Furthermore Epistemic Value is extended for mobile services.

## **7.3 Limitations of Study and Suggestion for Future Research**

During this study, some limitations were encountered and some of these limitations are seen as suggestion for further studies. First of all, sample size is not large. In literature 1:10 ratio (variable/sample size) is suggested to be achieved; but still 1:5 ratio is

acceptable (Kline, 2006, pg 111). Larger sample sizes could provide more beneficial and reliable results.

Secondly, the respondents of the study represent people who are working in ICT sectors, either university graduate or university student (also working in ICT sector as part time), aged between 21 and 55. Since participant are working in ICT sector, they are computer literate and technical people. Therefore, results of the study can not be extended to whole population. In further studies, study can be extended to younger people (attending university or high school) and people who are not working in ICT sectors.

In addition to these, the experimental study was conducted only in Turkey. As a result, the results could be highly affected by culture. Consumer perceived value may vary based upon culture (Sweeney & Soutar, 2001; Lee et al., 2002; Yang & Jolly, 2009) For example, study conducted in Japan showed that being a group-oriented nationality affected mobile Internet usage in social aspects (Ishii, 2004).

The services (banking, social sites) that are mostly used within mobile Internet services could be gathered to gain insight. In further studies, these information can be used to analyze the customer value of particular service in detail. Also, the major usage of SMS (data gathering or messaging for personal purposes) could be investigated. It would provide valuable information for usage analysis.

Furthermore, mobile device limitations (such as memory, processing time, small screens) are neglected, since people prefer to use different devices. This would change the direction of study to the customer value of mobile devices.

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## APPENDICES

### APPENDIX A : Survey Instrument

Merhaba,

Orta Doğu Teknik Üniversitesi Enformatik Enstitüsü Bilişim Sistemleri Anabilim Dalında yüksek lisans öğrencisiyim.

Bu anket Mobil Servislerin İnsan Hayatına Kattığı Değeri araştırmaya yönelik bir tez çalışmasının parçasıdır. Bu çalışmayla mobil internet ve kısa mesaj servislerinin insan hayatına kattığı değer fonksiyonel, sosyal, duygusal, bilgi ve ekonomi boyutlarıyla incelenmesi planlanmaktadır.

Bu anketten elde edilen veriler sadece akademik bir çalışmada kullanılacaktır. Yardımlarınız ve cevaplarınızdaki samimiyetiniz için teşekkür ederim.

Sinem Zubari

**Bu anketi kendi rızamla doldurdum.**

**İmza:**

Sorularınız ve önerileriniz için lütfen benimle irtibata geçin

email adresi: e128429@metu.edu.tr

**Cinsiyet:** K ( ) E ( )

**Yaş:**

**Eğitim Durumu:** İlköğretim ( ) Lise ( ) Lisans veya üstü ( )

**Mobil internet servislerini (internet, bankacılık, haber servisleri, sosyal paylaşım siteleri vs.) kullanıyor musunuz?** Evet ( ) Hayır( )

**Mobil internet servislerini (internet, bankacılık, haber servisleri, sosyal paylaşım siteleri vs.) kullanıyorsanız hangi sıklıkla kullandığınızı seçin.**

Günde 2 defadan fazla ( ) Günde 1 veya 2 defa ( )

Haftada 1 veya 2 defa ( ) Ayda 1 veya 2 defa ( )

**Mobil internet servislerini (internet, bankacılık, haber servisleri, sosyal paylaşım siteleri vs.) kullanıyorsanız aşağıdaki verilen her bir ifade ile ilgili görüşünüzü 1 (kesinlikle katılmıyorum) ve 5 (kesinlikle katılıyorum) aralığında olacak şekilde, size en uygun olan ifadeyi (X) ile işaretleyerek belirtiniz.**

1: Kesinlikle Katılmıyorum 2: Katılmıyorum 3: Kararsızım 4: Katılıyorum 5: Kesinlikle Katılıyorum

	1	2	3	4	5
Mobil internet servisleri, ihtiyacım olan her an kullanıma açıktır.					
Mobil internet servisleri, ihtiyacım olan her yerde kullanıma açıktır.					
Mobil internet servislerinin kullanımı açık ve anlaşılırdır.					
Mobil internet servisleri, hayatımı kolaylaştırmaktadır.					
Mobil internet servisleri, zamanı verimli biçimde kullanmamı sağlar.					
Mobil internet servisleri belirli bir amaç için harcanan çabayı azaltır.					
Mobil internet servislerinin sağladığı hizmetler oldukça yüksek kalitedir.					
Mobil internet servisleri, benim için yararlıdır.					
Mobil internet servisleri, kişisel bilgilerimi güvence altına almaktadır.					
Mobil internet servislerinin güvenlik önlemleri yeterlidir.					
Mobil internet servislerini kullandığımda kendimi toplumda daha etkin hissediyorum.					
Mobil internet servisleri, insanların beni algılama biçimlerini olumlu yönde değiştirebilir.					

Önem verdiğim kişiler, mobil internet servislerini kullanmam gerektiğini					
Mobil internet servisleri, oldukça eğlendiricidir.					
Mobil internet servislerini kullanırken zamanın nasıl geçtiğini unutuyorum.					
Mobil internet servislerini istediğim zaman kullanma konusunda kendimi özgür hissediyorum.					
Mobil internet servisleri, yeni bilgiler öğrenmemi sağlar.					
Mobil internet servisleri, bilgi edinme konusundaki ihtiyacımı karşılar.					
Mobil internet servisleri, bende merak uyandırıyor.					
Mobil internet servisleri, beni yeni servisler kullanma konusunda					
Mobil internet servisleri, para konusunda tasarruf yapmama yardımcı olur.					
Mobil internet servislerinin ücretlendirme sisteminden memnunum.					
Mobil internet servislerini ileride de kullanmak isterim.					
Bundan sonraki altı ay içerisinde mobil internet servislerini daha sık kullanmayı planlıyorum.					
Mobil internet servislerini yakınlarıma ve arkadaşlarıma öneririm.					

**Kısa mesaj servislerini(SMS, MMS, bilgi servisleri, hava durumu, güncel haber bilgilendirmeleri vb.) kullanıyor musunuz? Evet ( ) Hayır( )**

**Kısa mesaj servislerini(SMS, bilgi servisleri, hava durumu, güncel haber bilgilendirmeleri vb.) kullanıyorsanız hangi sıklıkla kullandığınızı seçin.**

Günde 2 defadan fazla ( ) Günde 1 veya 2 defa ( )

Haftada 1 veya 2 defa ( ) Ayda 1 veya 2 defa ( )

**Kısa mesaj servisini kullanıyorsanız aşağıdaki verilen her bir ifade ile ilgili görüşünüzü 1 (kesinlikle katılmıyorum) ve 5 (kesinlikle katılıyorum) aralığında olacak şekilde, size en uygun olan ifadeyi (X) ile işaretleyerek belirtiniz.**

1: Kesinlikle Katılmıyorum 2: Katılmıyorum 3: Kararsızım 4: Katılıyorum 5: Kesinlikle Katılıyorum

	1	2	3	4	5
Kısa mesaj servisleri, ihtiyacım olan her an kullanıma açıktır.					
Kısa mesaj servisleri, ihtiyacım olan her yerde kullanıma açıktır.					

Kısa mesaj servislerinin kullanımı açık ve anlaşılırdır.					
Kısa mesaj servisleri, hayatımı kolaylaştırmaktadır.					
Kısa mesaj servisleri, zamanı verimli biçimde kullanmamı sağlar.					
Kısa mesaj servisleri, belirli bir amaç için harcanan çabayı azaltır.					
Kısa mesaj servislerinin sağladığı hizmetler oldukça yüksek kalitedir.					
Kısa mesaj servisleri, benim için yararlıdır.					
Kısa mesaj servisleri, kişisel bilgilerimi güvence altına almaktadır.					
Kısa mesaj servislerinin güvenlik önlemleri yeterlidir.					
Kısa mesaj servislerini kullandığımda kendimi toplumda daha etkin hissediyorum.					
Kısa mesaj servisleri, insanların beni algılama biçimlerini olumlu yönde değiştirebilir.					
Önem verdiğim kişiler kısa mesaj servislerini kullanmam gerektiğini söylüyor.					
Kısa mesaj servisleri, oldukça eğlendiricidir.					
Kısa mesaj servislerini kullanırken zamanın nasıl geçtiğini unutuyorum.					
Kısa mesaj servislerini istediğim zaman kullanma konusunda kendimi özgür hissediyorum.					
Kısa mesaj servisleri, yeni bilgiler öğrenmemi sağlar.					
Kısa mesaj servisleri, bilgi edinme konusundaki ihtiyacımı karşılar.					
Kısa mesaj servisleri, bende merak uyandırıyor.					
Kısa mesaj servisleri, beni yeni servisler kullanma konusunda yönlendiriyor.					
Kısa mesaj servisi, para konusunda tasarruf yapmama yardımcı olur.					
Kısa mesaj servislerinin ücretlendirme sisteminden memnunum.					
Kısa mesaj servislerini ileride de kullanmak isterim.					
Bundan sonraki altı ay içerisinde kısa mesaj servislerini sıklıkla kullanmayı planlıyorum.					
Kısa mesaj servislerini yakınlarıma ve arkadaşlarıma öneririm.					

**MMS kullanıyor musunuz?** Evet ( ) Hayır ( )

**MMS kullanıyorsanız hangi sıklıkla kullandığınızı seçin.**

Günde 2 defadan fazla ( ) Günde 1 veya 2 defa ( )

Haftada 1 veya 2 defa ( ) Ayda 1 veya 2 defa ( )

## APPENDIX B: MISSING VALUE ANALYSIS

**Table 13** Missing Value Analysis for Mobile Internet

	N	Mean	Std. Deviation	Missing		No. of Extremes <sup>b</sup>	
				Count	Percent	Low	High
M1	211	4,07	,862	0	,0	12	0
M2	210	3,58	1,056	1	,5	3	0
M3	210	3,81	,854	1	,5	2	0
M4	210	4,21	,972	1	,5	14	0
M5	210	4,04	1,018	1	,5	14	0
M6	210	4,04	,994	1	,5	18	0
M7	211	3,39	,879	0	,0	2	0
M8	210	4,07	,864	1	,5	13	0
M9	209	2,89	,907	2	,9	0	7
M10	210	2,84	,903	1	,5	0	7
M11	210	3,00	1,151	1	,5	0	0
M12	211	2,85	1,061	0	,0	0	0
M13	211	2,83	1,159	0	,0	0	0
M14	210	3,35	,932	1	,5	8	0
M15	209	3,29	1,049	2	,9	11	0
M16	210	3,78	1,040	1	,5	.	.
M17	210	3,80	,894	1	,5	5	0
M18	211	3,76	,947	0	,0	6	0
M19	209	3,60	1,020	2	,9	7	0
M20	209	3,54	,995	2	,9	8	0
M21	210	2,79	1,164	1	,5	0	0
M22	211	2,65	1,073	0	,0	0	8
M23	210	4,13	,865	1	,5	9	0
M24	210	3,49	,974	1	,5	7	0
M25	211	3,96	,888	0	,0	14	0
a. . indicates that the inter-quartile range (IQR) is zero.							
b. Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).							

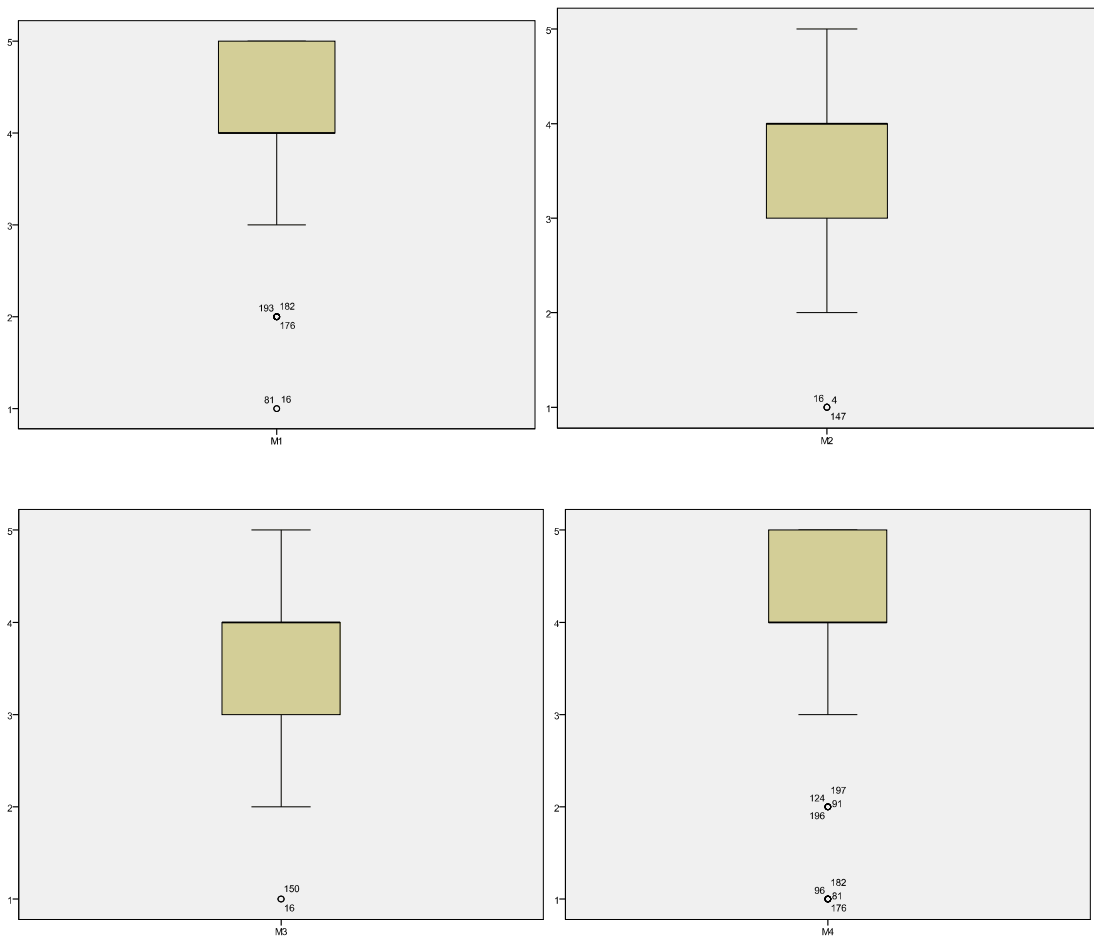
**Table 14** Missing Value Analysis for SMS Usage

	N	Mean	Std. Deviation	Missing		No. of Extremes <sup>a</sup>	
				Count	Percent	Low	High
S1	166	4,20	,969	0	,0	10	0
S2	166	4,08	1,005	0	,0	14	0
S3	166	3,98	1,044	0	,0	0	0
S4	166	3,84	1,017	0	,0	0	0
S5	166	3,49	1,100	0	,0	8	0
S6	166	3,48	1,072	0	,0	10	0
S7	165	3,22	1,019	1	,6	7	0
S8	166	3,56	,963	0	,0	6	0
S9	165	2,95	,980	1	,6	0	0
S10	166	2,99	,921	0	,0	0	0
S11	166	2,65	1,111	0	,0	0	9
S12	166	2,58	1,080	0	,0	0	8
S13	166	2,52	1,077	0	,0	0	8
S14	166	2,84	1,095	0	,0	0	0
S15	166	2,42	1,181	0	,0	0	0
S16	163	3,76	1,029	3	1,8	5	0
S17	166	3,00	1,067	0	,0	0	0
S18	165	3,01	1,033	1	,6	0	0
S19	165	2,65	1,087	1	,6	0	9
S20	166	2,89	1,075	0	,0	0	0
S21	166	2,80	1,258	0	,0	0	0
S22	166	2,55	1,168	0	,0	0	7
S23	164	3,58	,940	2	1,2	4	0
S24	166	3,15	1,031	0	,0	0	0
S25	166	3,40	,907	0	,0	4	0
<b>a. Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).</b>							

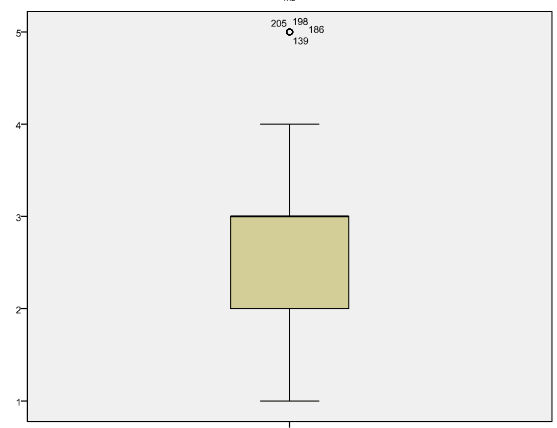
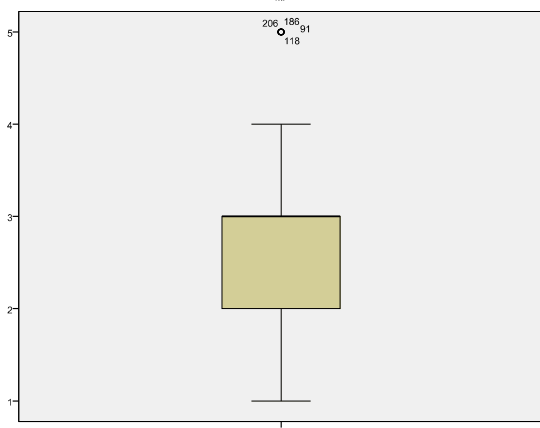
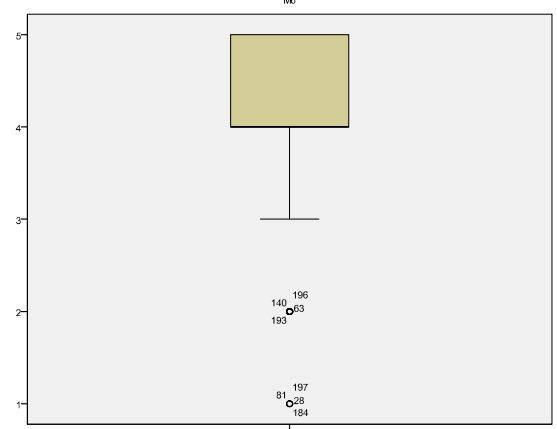
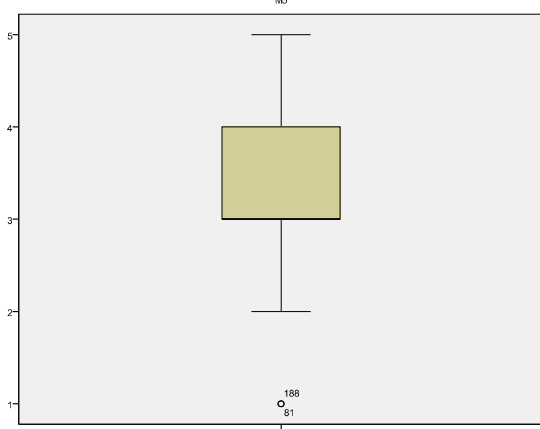
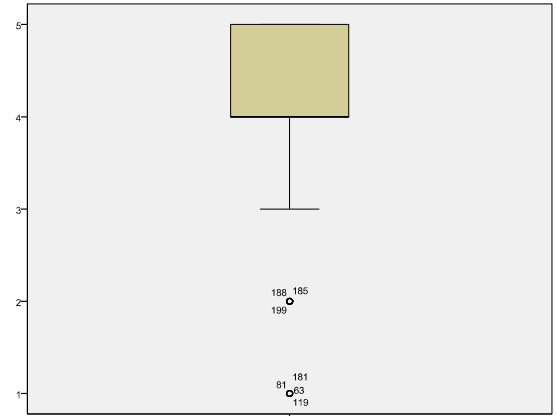
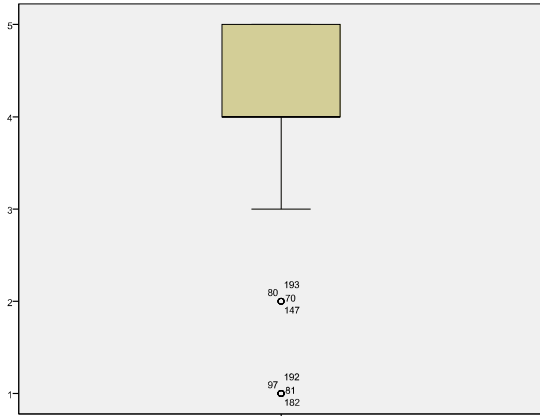
## APPENDIX C: OUTLIER DETECTION

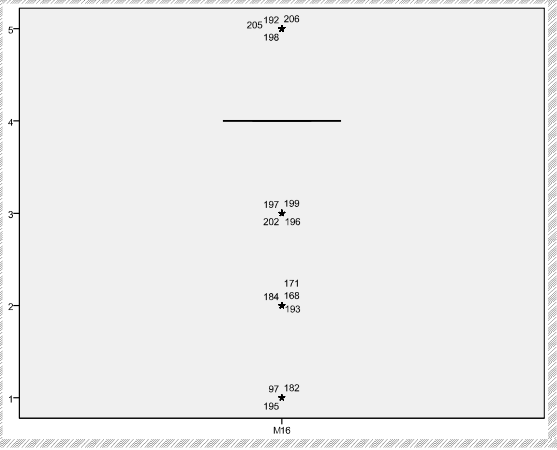
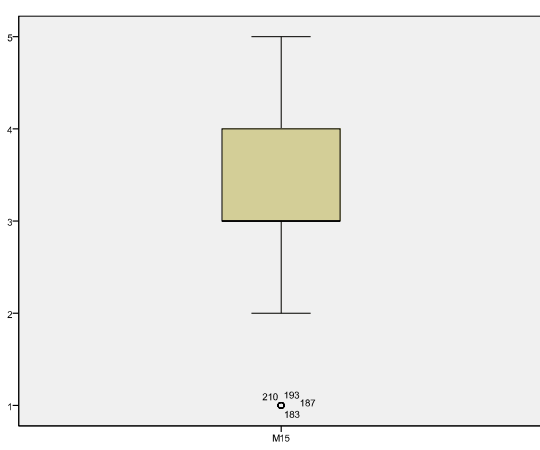
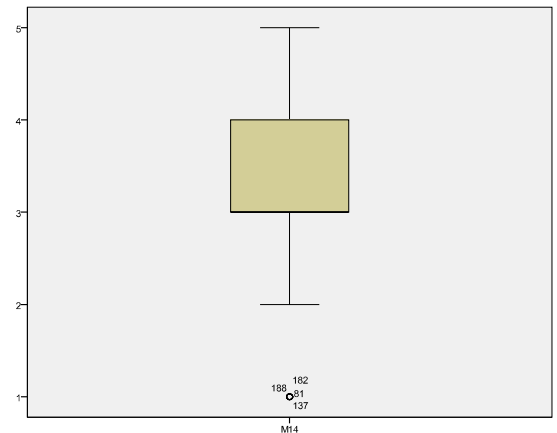
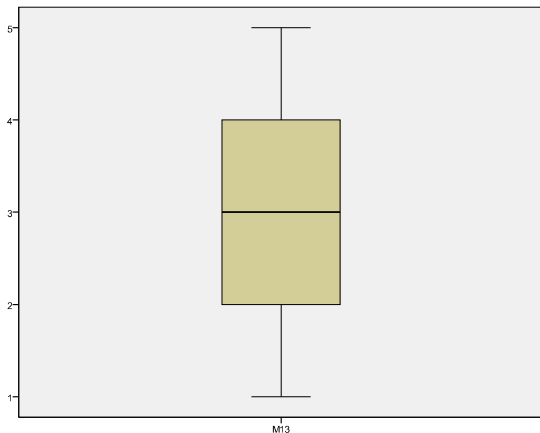
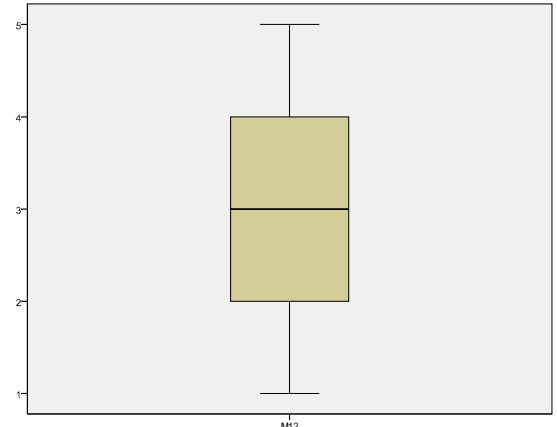
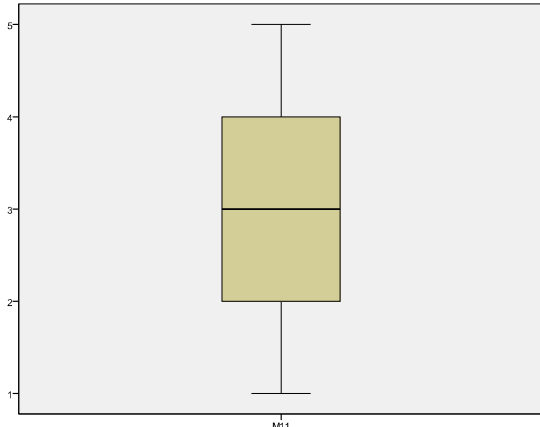
### Box-Plots for Mobile Internet Usage

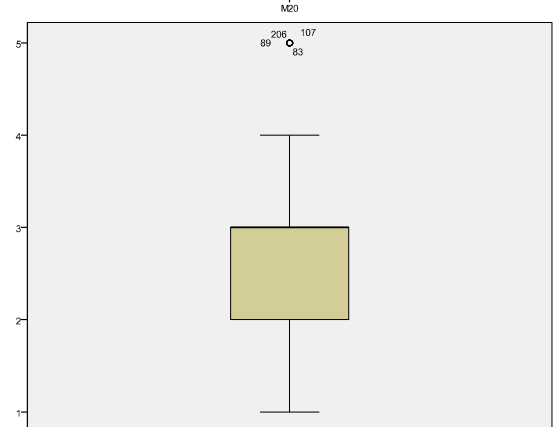
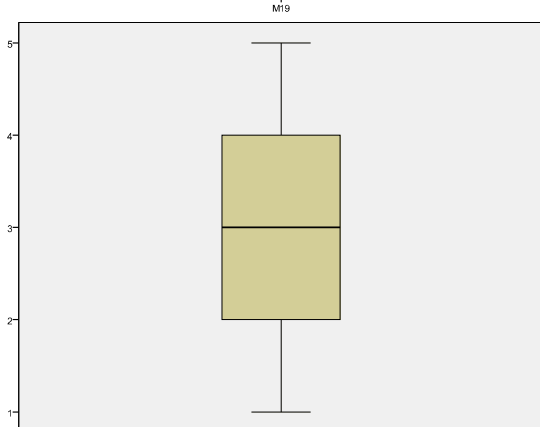
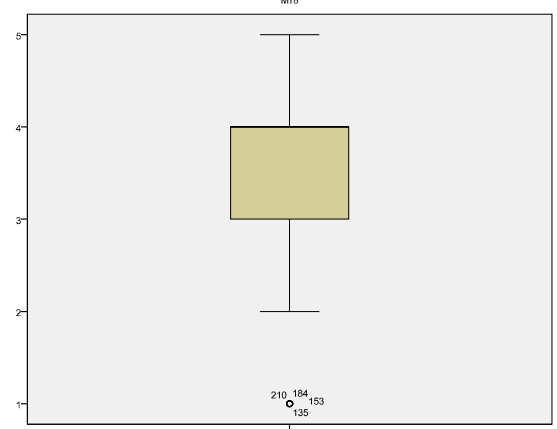
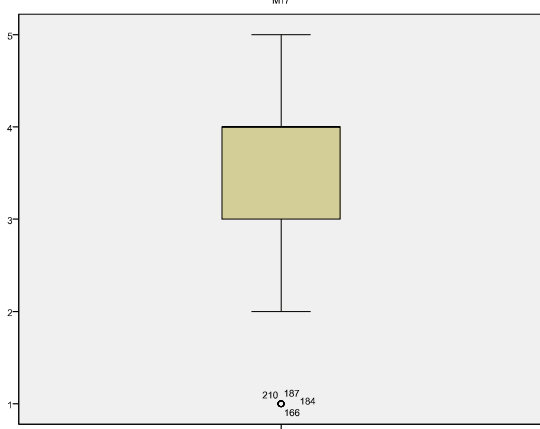
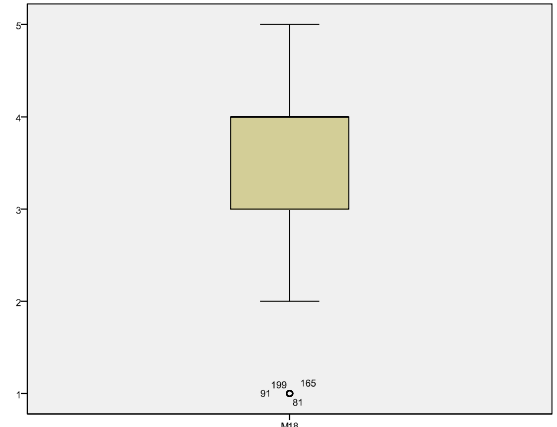
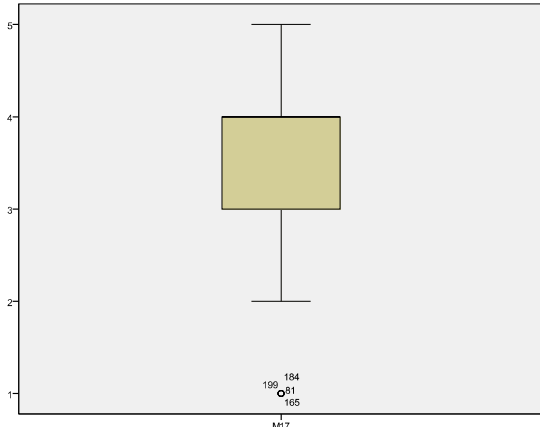
Outliers can be identified by checking the boxplots. The circles out of whiskers show the outliers. If there are stars, that means there are very extreme values that can cause severe problems in further analysis. The Item-16 (M16) for mobile Internet has very extreme values. The box- plots for all the items are given below.

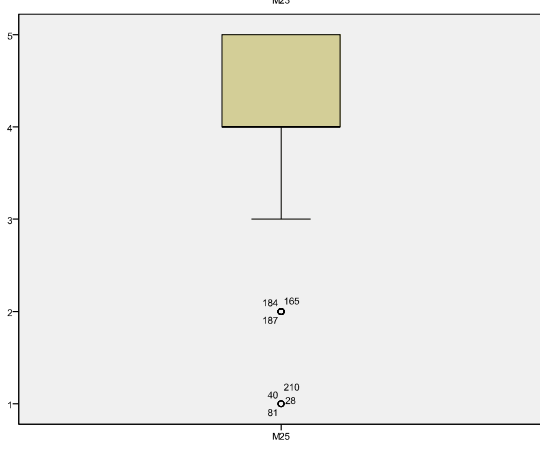
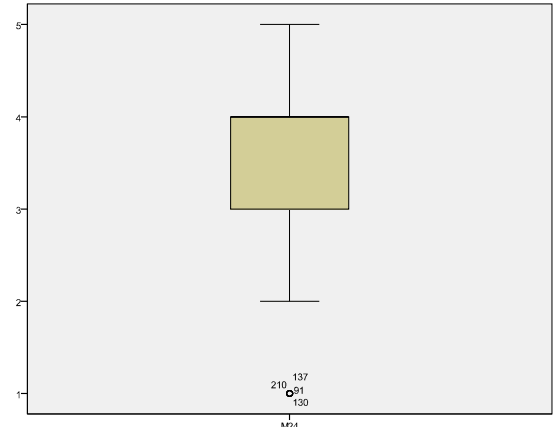
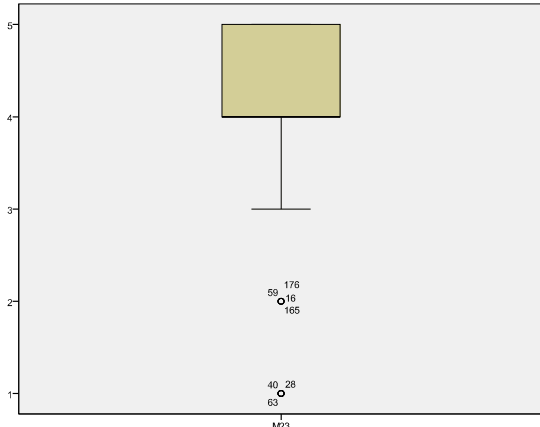






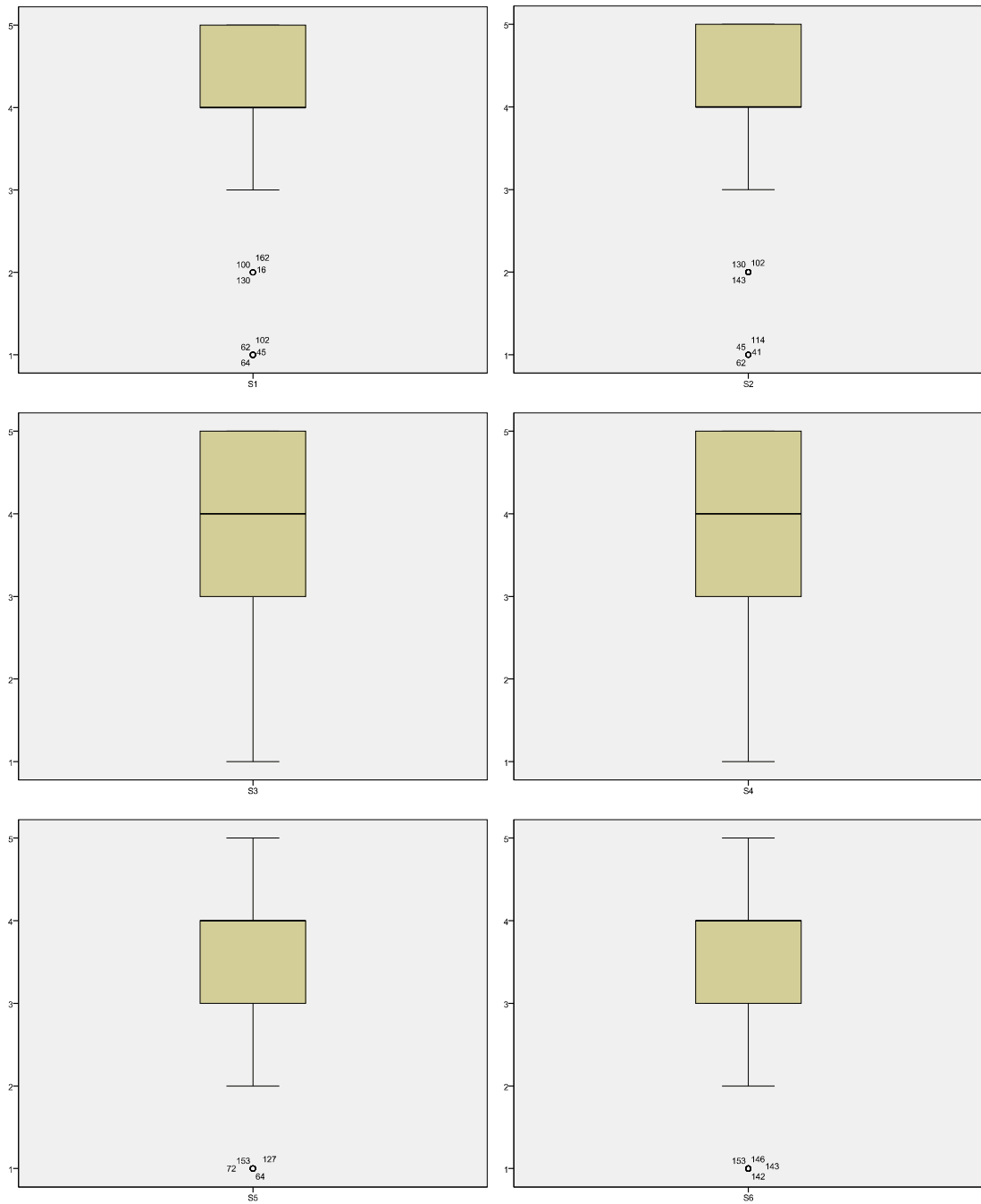


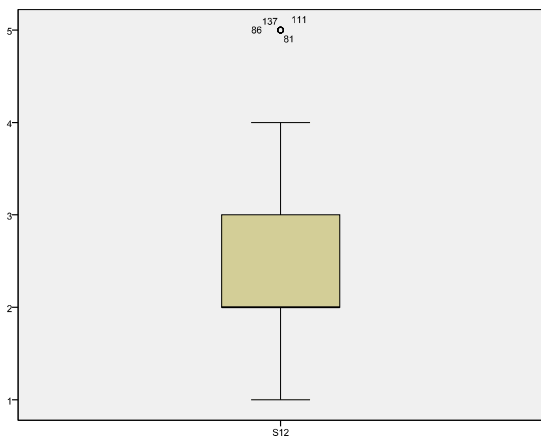
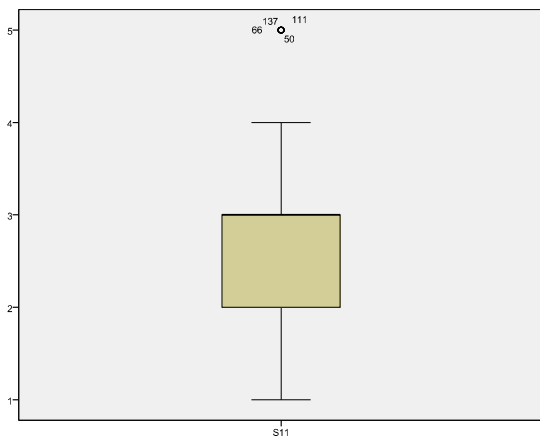
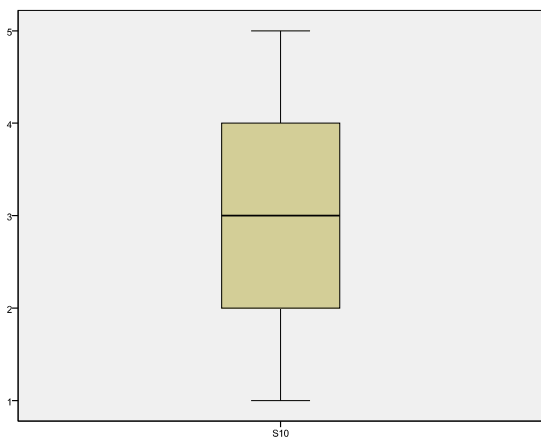
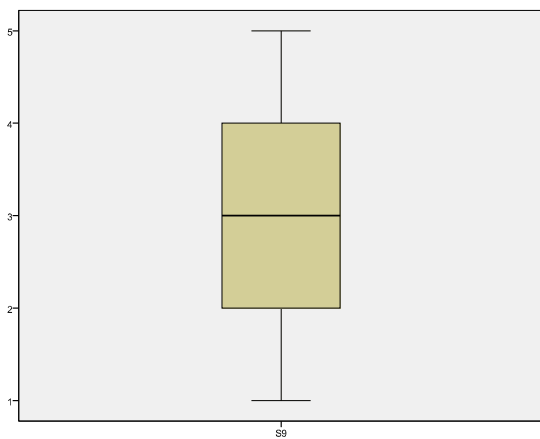
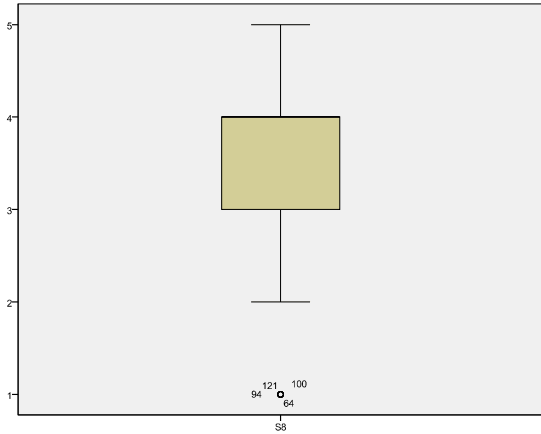
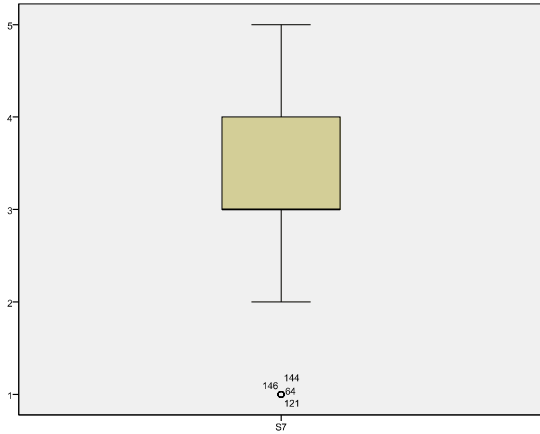


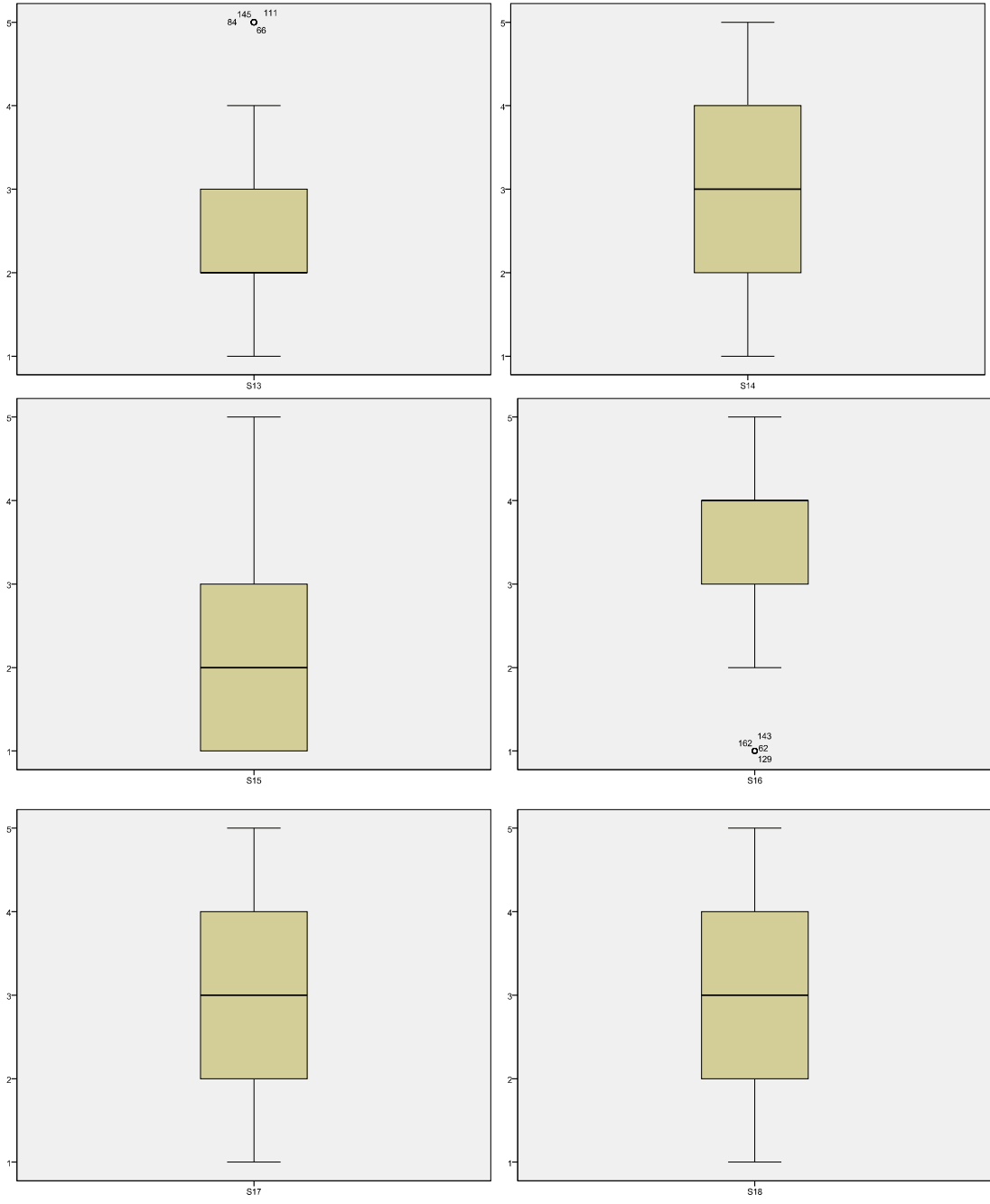


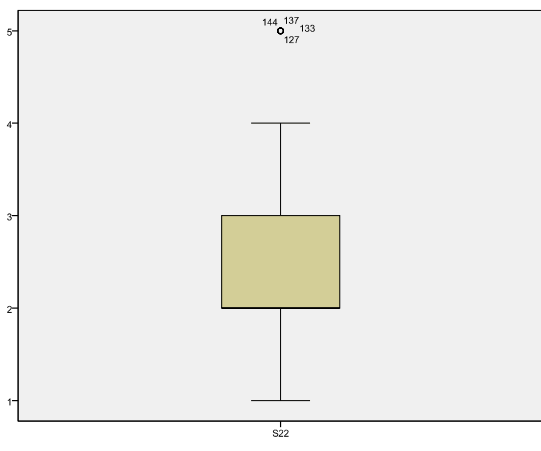
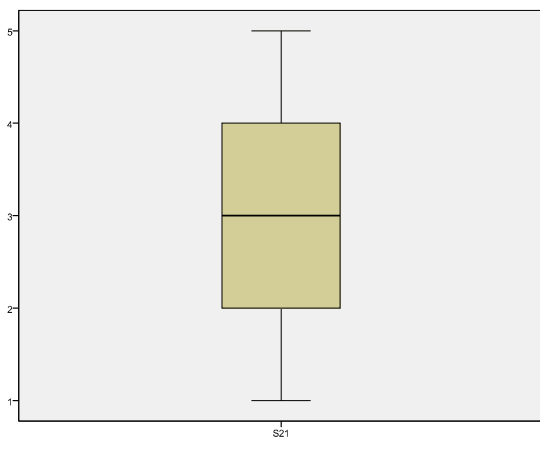
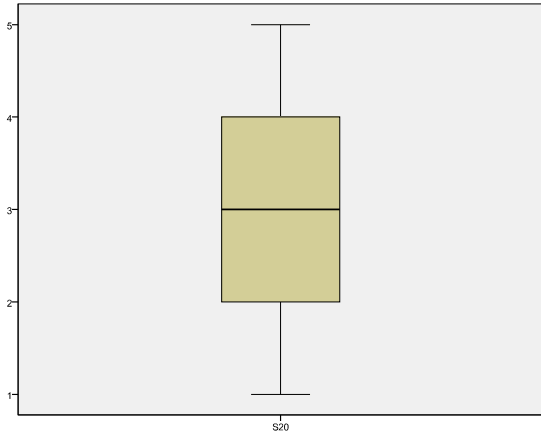
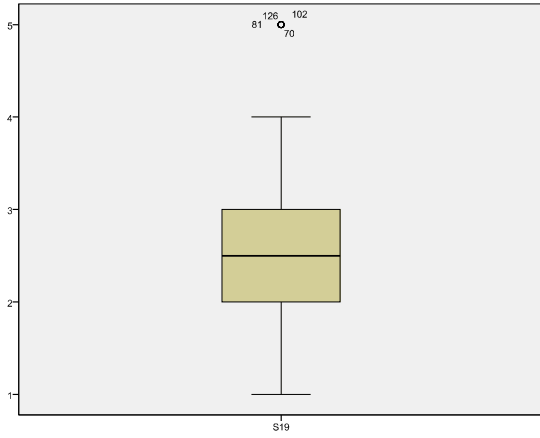
## Box-Plots for SMS Usage

As stated earlier, outliers can be identified by checking the boxplots. As shown below any of the item for SMS usage (from S1-S25) has very extreme values that can cause severe problems in further analysis.

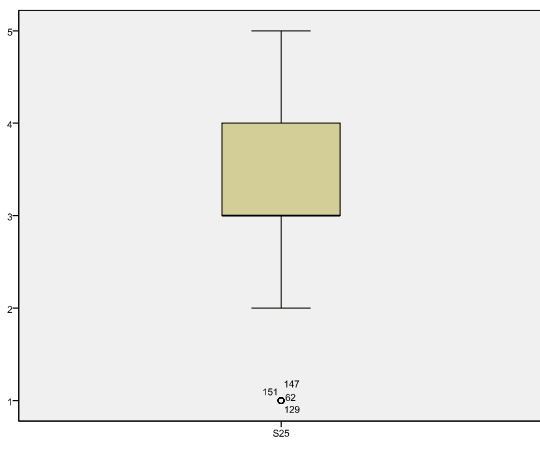
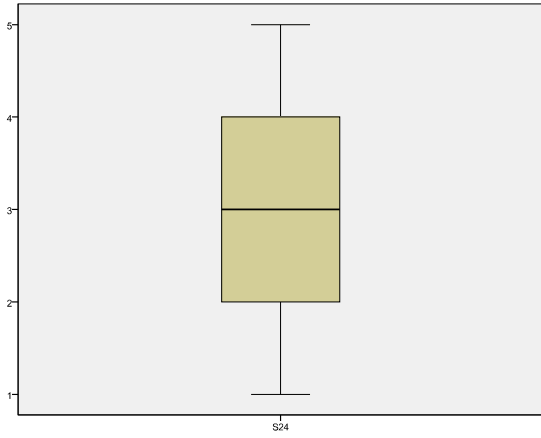
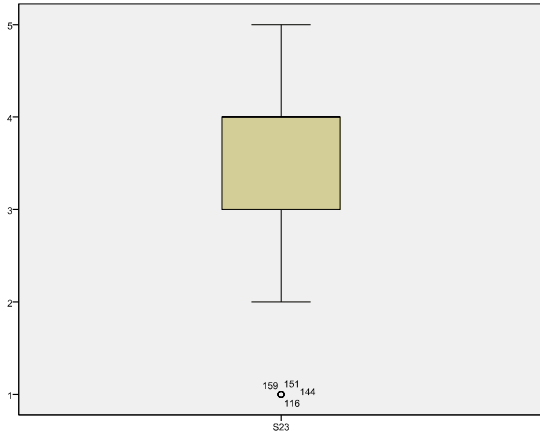












## APPENDIX D : SKEWNESS VALUES

**Table 15** Skewness Values for Mobile Internet

Mobile Internet Items	N	Skewness	
	Statistic	Statistic	Std. Error
M1	211	-,949	,167
M2	211	-,332	,167
M3	211	-,699	,167
M4	211	-1,642	,167
M5	211	-1,215	,167
M6	211	-1,150	,167
M7	211	-,180	,167
M8	211	-1,265	,167
M9	211	-,086	,167
M10	211	,009	,167
M11	211	-,219	,167
M12	211	-,065	,167
M13	211	,060	,167
M14	211	-,492	,167
M15	211	-,288	,167
M16	211	-1,051	,167
M17	211	-,949	,167
M18	211	-,938	,167
M19	211	-,652	,167
M20	211	-,644	,167
M21	211	-,017	,167
M22	211	,026	,167
M23	211	-1,338	,167
M24	211	-,345	,167
M25	211	-,996	,167
Valid N (listwise)	211		

**Table 16** Skewness Values For SMS

SMS Items	N	Skewness	
	Statistic	Statistic	Std. Error
S1	166	-1,554	,188
S2	166	-1,221	,188
S3	166	-1,051	,188
S4	166	-,753	,188
S5	166	-,441	,188
S6	166	-,611	,188
S7	166	-,026	,188
S8	166	-,709	,188
S9	166	-,060	,188
S10	166	-,117	,188
S11	166	,244	,188
S12	166	,335	,188
S13	166	,453	,188
S14	166	,288	,188
S15	166	,528	,188
S16	166	-,864	,188
S17	166	-,272	,188
S18	166	-,113	,188
S19	166	,358	,188
S20	166	,053	,188
S21	166	,117	,188
S22	166	,229	,188
S23	166	-,563	,188
S24	166	,063	,188
S25	166	-,381	,188
Valid N (listwise)	166		

## APPENDIX E : CORRELATIONS BETWEEN ITEMS

**Table 17** Correlations Between Items for Mobile Internet Services

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25
M1	1	,489	,479	,455	,318	,386	,309	,423	,078	,088	,081	,136	,122	,118	,078	,358	,185	,213	,212	,127	,077	-.020	,359	,266	,321
M2	,489	1	,373	,157	,204	,149	,142	,101	,060	,144	,057	,043	,016	-.061	-.069	,417	-.026	,101	,004	,041	,149*	,015	,108	,225	,125
M3	,479	,373	1	,389	,219	,359	,297	,278	,164	,165	,040	,069	,059	,221	,050	,276	,164	,163	,204	,202	,123	-.015	,307	,220	,230
M4	,455	,157	,389	1	,576	,540	,292	,649	,186	,214	,204	,105	,075	,282	,006	,331	,373	,336	,367	,329	,235	,007	,564	,254	,479
M5	,318	,204	,219	,576	1	,584	,333	,530	,187	,200	,237	,178	,039	,146	-.137	,262	,219	,204	,187	,175	,306	,136	,358	,148	,435
M6	,386	,149	,359	,540	,584	1	,390	,464	,160*	,221	,154	,151	,085	,211	-.003	,250	,316	,249	,206	,267	,235	,001	,372	,210	,402
M7	,309	,142	,297	,292	,333	,390	1	,397	,350	,387	,371	,333	,328	,345	,261	,319	,414	,290	,368	,392	,409	,312	,232	,350	,422
M8	,423	,101	,278	,649	,530	,464	,397	1	,231	,248	,341	,235	,136	,278	,073	,326	,477	,441	,430	,417	,305	,140	,564	,368	,588
M9	,078	,060	,164	,186	,187	,160	,350	,231	1	,721	,400	,385	,332	,262	,166	,202	,168	,113	,215	,240	,322	,259	,093	,263	,280
M10	,088	,144	,165	,214	,200	,221	,387	,248	,721	1	,364	,284	,229	,180	,079	,273	,168	,189	,247	,285	,363	,252	,162	,258	,314
M11	,081	,057	,040	,204	,237	,154	,371	,341	,400	,364	1	,653	,480	,324	,261	,189	,308	,387	,369	,391	,361	,225	,187	,360	,346
M12	,136	,043	,069	,105	,178	,151	,333	,235	,385	,284	,653	1	,611	,375	,304	,200	,277	,235	,334	,339	,276	,148	,141	,180	,272
M13	,122	,016	,059	,075	,039	,085	,328	,136	,332	,229	,480	,611	1	,431	,328	,116	,267	,202	,318	,206	,235	,228	,085	,179	,220
M14	,118	-.061	,221	,282	,146	,211	,345	,278	,262	,180	,324	,375	,431	1	,506	,143	,391	,359	,509	,399	,258	,249	,358	,304	,356
M15	,078	-.069	,050	,006	-.137	-.003	,261	,073	,166	,079	,261	,304	,328	,506	1	,101	,377	,266	,444	,411	,141	,297	,132	,220	,125
M16	,358	,417	,276	,331	,262	,250	,319	,326	,202	,273	,189	,200	,116	,143	,101	1	,314	,291	,234	,283	,317	,193	,309	,247	,342
M17	,185	-.026	,164	,373	,219	,316	,414	,477	,168	,168	,308	,277	,267	,391	,377	,314	1	,718	,582	,535	,305	,143	,467	,350	,441
M18	,213	,101	,163	,336	,204	,249	,290	,441	,113	,189	,387	,235	,202	,359	,266	,291	,718	1	,565	,463	,235	,102	,546**	,440**	,482
M19	,212	,004	,204	,367	,187	,206	,368	,430	,215	,247	,369	,334	,318	,509	,444	,234	,582	,565	1	,675	,271	,188	,501	,495	,537
M20	,127	,041	,202	,329	,175	,267	,392	,417	,240	,285	,391	,339	,206	,399	,411	,283	,535	,463	,675	1	,379	,223	,450	,427	,527
M21	,077	,149	,123	,235	,306	,235	,409	,305	,322	,363	,361	,276	,235	,258	,141	,317	,305	,235	,271	,379	1	,468	,204	,298	,347
M22	-.020	,015	-.015	,007	,136	,001	,312	,140	,259	,252	,225	,148	,228	,249	,297	,193	,143	,102	,188	,223	,468	1	,045	,088	,186

**Table 15 (cont.)**

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25
<b>M23</b>	,359	,108	,307	,564	,358	,372	,232	,564	,093	,162	,187	,141	,085	,358	,132	,309	,467	,546	,501	,450	,204	,045	1	,400	,703
<b>M24</b>	,266	,225	,220	,254	,148	,210	,350	,368	,263	,258	,360	,180	,179	,304	,220	,247	,350	,440	,495	,427	,298	,088	,400	1	,572
<b>M25</b>	,321	,125	,230	,479	,435	,402	,422	,588	,280	,314	,346	,272	,220	,356	,125	,342	,441	,482	,537	,527	,347	,186	,703	,572	1

**Table 18** Correlations Between Items for SMS

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
S1	1	,766	,747	,384	,291	,214	,324	,370	,081	,159	,011	,018	,013	,139	-,059	,423	,012	-,056	-,122	-,047	,074	-,025	,255	,157	,065
S2	,766	1	,666	,363	,313	,339	,362	,264	,183	,191	,043	,099	,065	,150	-,025	,521	,107	-,006	-,078	-,008	,023	-,003	,186	,204	,089
S3	,747	,666	1	,504	,375	,330	,462	,333	,177	,132	,024	,056	,081	,172	,067	,501	,038	-,028	-,029	,089	,162	,016	,257	,257	,228
S4	,384	,363	,504	1	,755	,517	,516	,620	,163	,082	,223	,264	,283	,309	,228	,348	,251	,192	,168	,210	,291	,024	,368	,371	,327
S5	,291	,313	,375	,755	1	,625	,511	,544	,158	,156	,341	,286	,312	,331	,266	,201	,222	,265	,222	,181	,332	,014	,289	,356	,264
S6	,214	,339	,330	,517	,625	1	,533	,477	,167	,202	,336	,295	,331	,338	,291	,226	,286	,299	,219	,164	,258	-,028	,243	,291	,226
S7	,324	,362	,462	,516	,511	,533	1	,557	,365	,320	,427	,387	,510	,445	,419	,365	,335	,335	,350	,311	,315	,175	,383	,414	,327
S8	,370	,264	,333	,620	,544	,477	,557	1	,222	,192	,337	,330	,352	,262	,194	,295	,260	,314	,142	,103	,286	,173	,422	,391	,313
S9	,081	,183	,177	,163	,158	,167	,365	,222	1	,794	,302	,383	,410	,270	,290	,286	,128	,199	,299	,323	,263	,177	,210	,272	,254
S10	,159	,191	,132	,082	,156	,202	,320	,192	,794	1	,333	,281	,306	,208	,272	,281	,197	,224	,330	,347	,191	,102	,163	,206	,180
S11	,011	,043	,024	,223	,341	,336	,427	,337	,302	,333	1	,636	,620	,428	,490	,109	,521	,489	,542	,377	,356	,158	,285	,454	,337
S12	,018	,099	,056	,264	,286	,295	,387	,330	,383	,281	,636	1	,715	,457	,497	,180	,373	,346	,450	,361	,321	,158	,266	,373	,300
S13	,013	,065	,081	,283	,312	,331	,510	,352	,410	,306	,620	,715	1	,640	,571	,190	,406	,347	,527	,387	,393	,194	,302	,436	,412
S14	,139	,150	,172	,309	,331	,338	,445	,262	,270	,208	,428	,457	,640	1	,692	,336	,399	,318	,546	,360	,364	,148	,386	,392	,399
S15	-,059	-,025	,067	,228	,266	,291	,419	,194	,290	,272	,490	,497	,571	,692	1	,207	,457	,441	,725	,539	,514	,273	,256	,421	,382
S16	,423	,521	,501	,348	,201	,226	,365	,295	,286	,281	,109	,180	,190	,336	,207	1	,256	,122	,150	,169	,151	,048	,361	,362	,370
S17	,012	,107	,038	,251	,222	,286	,335	,260	,128	,197	,521	,373	,406	,399	,457	,256	1	,579	,550	,449	,311	,175	,310	,320	,369
S18	-,056	-,006	-,028	,192	,265	,299	,335	,314	,199	,224	,489	,346	,347	,318	,441	,122	,579	1	,583	,493	,380	,244	,279	,250	,270
S19	-,122	-,078	-,029	,168	,222	,219	,350	,142	,299	,330	,542	,450	,527	,546	,725	,150	,550	,583	1	,647	,441	,282	,280	,444	,407
S20	-,047	-,008	,089	,210	,181	,164	,311	,103	,323	,347	,377	,361	,387	,360	,539	,169	,449	,493	,647	1	,350	,209	,157	,229	,283
S21	,074	,023	,162	,291	,332	,258	,315	,286	,263	,191	,356	,321	,393	,364	,514	,151	,311	,380	,441	,350	1	,617	,334	,454	,417
S22	-,025	-,003	,016	,024	,014	-,028	,175	,173	,177	,102	,158	,158	,194	,148	,273	,048	,175	,244	,282	,209	,617	1	,293	,339	,296
S23	,255	,186	,257	,368	,289	,243	,383	,422	,210	,163	,285	,266	,302	,386	,256	,361	,310	,279	,280	,157	,334	,293	1	,600	,653
S24	,157	,204	,257	,371	,356	,291	,414	,391	,272	,206	,454	,373	,436	,392	,421	,362	,320	,250	,444	,229	,454	,339	,600	1	,662
S25	,065	,089	,228	,327	,264	,226	,327	,313	,254	,180	,337	,300	,412	,399	,382	,370	,369	,270	,407	,283	,417	,296	,653	,662	1