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EXAMINATION OF CONSUMERS' INTENTION TO USE TOWARDS SMART MIRROR SYSTEMS WITHIN FRAMEWORK OF TECHNOLOGY ACCEPTANCE MODEL[1]

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ABSTRACT

The aim of this study is to examine the factors that affect the intention to use smart mirror systems within the framework of technology acceptance model (TAM). Thus, data was collected between May 28 and June 10, 2020 by adopting via convenience sampling method with a survey through Google forms in social media environments with different demographic characteristics. A total of 430 questionnaires were filled out, and after the unsuitable ones were eliminated, analyzes over 346 questionnaires were carried out using SPSS, SPSS Process and AMOS programs. According to the findings, it was determined that subjective norms, perceived usefulness and perceived ease of use were related to intention to use smart mirrors. In addition, subjective norms and perceived ease of use were found to be related to perceived usefulness. Another finding is that the perceived usefulness in the relationship between subjective norms and intention to use is a full mediating effect.

Key Words: *Intention to use; perceived easy of use; perceived usefulness; smart mirror; Technology Acceptance Model.*

TÜKETİCİLERİN AKILLI AYNA KULLANMAYA YÖNELİK NİYETLERİNİN TEKNOLOJİ KABUL MODELİ ÇERÇEVESİNDE İNCELENMESİ

ÖZET

Bu çalışmanın amacı, ülkemizde perakendecilik sektöründe henüz kullanılmayan ancak gelecekte önemli bir yere sahip olacağı düşünülen akıllı aynaların tüketiciler tarafından kullanımına yönelik niyetlerine etki eden faktörleri teknoloji kabul modeli çerçevesinde incelemektir. Bu bağlamda 28 Mayıs-10 Haziran 2020 tarihleri arasında Google formlar aracılığıyla demografik açıdan farklı özellikler gösteren sosyal medya ortamlarında anket ile kolayda örnekleme yöntemi benimsenerek veri toplanmıştır. Toplam 430 anket doldurulmuş olup, uygun olmayanlar elendikten sonra 346 anket üzerinden analizler SPSS, SPSS Process ve AMOS programları kullanılarak gerçekleştirilmiştir. Araştırma bulgularına göre, öznel normların, algılanan faydanın ve algılanan kullanım kolaylığının akıllı ayna kullanmaya yönelik niyetler ile ilişkisi olduğu tespit edilmiştir. Ayrıca, öznel normların ve algılanan kullanım kolaylığının algılanan fayda ile ilişkisi olduğu tespit edilmiştir. Bir diğer bulgu da,

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öznel normlar ile kullanıma yönelik niyet arasındaki ilişkide algılanan faydanın tam aracılık etkisi olduğudur.

Anahtar Kelimeler: *Teknoloji Kabul Modeli 2, akıllı ayna, kullanıma yönelik niyet, algılanan fayda, algılanan kullanım kolaylığı.*

1. INTRODUCTION

Today, paralleling the increasing importance of digitalization, advances in technology rapidly continue to facilitate human life and business models. One of these advances is smart mirrors, one of the most important applications in retailing. Smart mirrors make a great contribution to the shopping environment for both the consumer and the business. Not only does it eliminate the challenges of trying on clothes and making decisions in clothes shopping for consumers, but also bring advantages to businesses by eliminating excess labor costs and enabling customers to have shopping experiences like controlling the inventory and. In addition, smart mirrors are technologies that will eliminate the drawbacks of trying clothing products in stores during crisis periods such as the current pandemic period we are experiencing.

Considering that smart mirror technologies have not yet become widespread, it is necessary to determine what factors are effective in the adoption of these systems by users. Thus, the aim of this study is to examine the consumer intentions in using the newly-emerging smart mirror technologies in retailing within the framework of the TAM. The fact that there has been no research on the acceptance of smart mirror systems in the Turkish literature and the limited number of studies on smart mirrors in the international literature make the current study unique.

For the purpose of the study, firstly, the reliability analysis of the scales was performed. Then, the exploratory and confirmatory factor analysis were applied. Afterwards, by performing multiple regression analysis and Sobel test, conclusions regarding the acceptance of smart mirror technologies were reached.

2. THEORETICAL FRAMEWORK

2.1.Technology Acceptance Model (TAM)

The TAM is a model developed to explain the acceptance of the use of information technologies in the business environment. This model was first proposed by Davis in 1986 (Davis et al. 1989). Later, it was developed as TAM2 and TAM3 (extended TAM) by adding various other variables. The fundamental basis of this model is the theory of reasoned action (Ajzen and Fishbein, 1980; Davis et al. 1992). According to the theory of reasoned action, intentions precede behavior. In other words, a person first intends to use, purchase, or make something, and then turns it into a behavior. As such, the TAM basically investigates the effects of the perceived usefulness and ease of use of individuals towards new technological systems on their attitudes and intention to use.

The TAM has been confirmed to successfully explain the positive and negative aspects

of technology use and therefore has been utilized in many different studies that focus on various information technologies. It has been used in studies on smart cards used for Internet, intranet, e-commerce, wireless technologies, mobile games, text message technology, e-learning, and many others (Erdem, 2011: 29). However, there are also some criticisms brought for this model. It is criticized for reasons such as being oriented towards users but not being effective in organizational use, not including the system features that affect the perceived usefulness and perceived ease of use, and not including social factors. As a result of these criticisms, the TAM was revised and the more comprehensive TAM2 and TAM3 models were introduced. First, by adding variables such as subjective norms, image, adaptability to the job, demonstrability of results, and output quality, the TAM2 was revealed (Venkatesh and Davis, 2000). Later, by elaborating the ease of use component, the TAM3 was developed and computer-self-efficacy, computer anxiety, computer acting, perception of external control, perceived pleasure and objective usability variables were added to this highly detailed model (Venkatesh and Bala, 2008). Attempting to create new models by comparing these technology acceptance models (Geldmacher et al. 2019), some studies are still under way to develop the TAM.

Perceived usefulness (PU) is one of the basic elements of the TAM and is defined as the belief that the system used increases the work performance of the individual (Venkatesh and Davis, 2000). According to this definition, the perceived usefulness is high in a system where people's technology use-performance relationship is positive. The perceived usefulness variable has a direct effect on behavioral intention and is a strong determinant of behavioral intention and also affects behavioral intention through perceived ease of use (Lee et al. 2003; Ko et al. 2009). Perceived ease of use (PEU) is also one of the basic elements of the TAM like perceived usefulness. Perceived ease of use means that an individual does not have difficulty in using a system or technology. According to the TAM, perceived usefulness and perceived ease of use affect the individual's attitude towards new technology. The increase in perceived ease of use is effective in increasing the performance of the person and thus the perceived usefulness (Davis, 1993). Subjective norms (SN), on the other hand, are influenced by the opinions of others about the use of a technological system. A person values and is influenced by the views of people who are valuable to him/her about this technological system, as a result of which he/she exhibits similar attitudes and behaviors (Davis et al. 1992; Venkatesh and Davis, 2000).The reason for including only the subjective norms among the variables in the TAM2 model within the scope of the present study is that these subjective norms are very influential especially in clothing shopping and the effect of these mirrors used in clothing shopping will be high due to the fact that people go shopping with others. The intention of use (INT) is the measure of the individual's effort and requests to realize the behavior in question (Al-Gahtani and King, 1999). According to the TAM, the intention of use is the stage just before the behavior and it directly affects the behavior.

2.2.Smart Mirror Systems

Smart stores have gained increasing popularity with the use of the Internet of Things (IoT) technologies in the retail sector. Smart stores are equipped with applications such as smart mirrors and interactive test booths. Smart mirrors, the subject of this study, use RFID technology to display the products on the mirror screen so that the customers remember the products they have previously bought from that brand. This system also gives the customer the opportunity to see the sizes and colors of other products and provides advice (Kaymak, 2016). Although there are only a limited number of smart stores in the world, according to Wagner's (2019) analysis, the smart mirror market, which was 2.8 billion dollars in 2018, is expected to grow by 9.41% each year and reach 4.42 billion dollars in 2023.

The purposes of using smart mirrors are ensuring customer satisfaction by making sure that customers access products quickly and easily, providing customers with a shopping experience in which they can manage all the steps themselves without communicating with salespeople and cashiers, and enabling customers who have difficulty in making decisions to see the different colors and sizes of the product in the mirror (Kaymak, 2016; Sakarya, 2019).

3. RESEARCH METHOD

Since this study investigates the effect of the subjective norm, perceived usefulness and perceived ease of use variables on the intention of using smart mirror technology, it is possible to say that it is a study based on cause-effect relationship.

Using an online questionnaire form designed on Google forms, the data were collected from 430 people between 28 May and 10 June 2020, from groups and pages that differ in demographic terms in social media environments, using the convenience sampling method, which is one of the non-probabilistic sampling methods. After the questionnaires thought to be filled in an unreliable way were eliminated, the remaining 346 questionnaires were analyzed by the using SPSS, SPSS Process, and AMOS programs.

Since the technology used in the study is available only in a few stores in Turkey, and thus not well-known by the public, the participants were given a scenario to facilitate their understanding of this technology, and were asked to give answers by imagining this scenario. This scenario is as follows:

"Unlike traditional stores, imagine entering a store with smart dressing rooms with smart mirror systems. Imagine that you are looking at the products you are trying on in the mirror, while at the same time you are given the opportunity to see the products you have checked before in the mirror with the color and size options, and you have a shopping where you are given advice on your choices without the need for sales people."

The scales used in the study were taken from the study of Venkatesh and Davis's (2000) TAM2 model and adapted to the smart mirror technology.

As the researchers followed the scale items, the subjective norms were measured with

two statements, perceived usefulness and perceived ease of use with four statements, and intention to use with two statements. Participants were asked to specify their agreement of the items stayed by 1: Strongly Disagree; 2: Disagree; 3: Neutral; 4: Agree and 5: Strongly Agree. The research model and hypothesis are below:

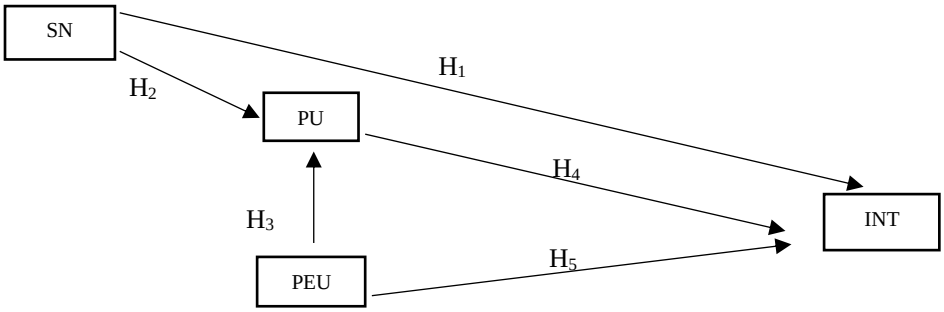

Figure 1: Research Model and Hypothesis

H_1: Subjective norm has influence on intention to use of smart mirror systems.
H_2: Subjective norm has influence on perceived usefulness of smart mirror systems.
H_3: Perceived ease of use has influence on perceived usefulness of smart mirror systems.
H_4: Perceived usefulness has influence on intention to use of smart mirror systems.
H_5: Perceived ease of use has influence on intention to use of smart mirror systems.
H_6: Perceived usefulness has influence mediating effect between subjective norm and intention to use of smart mirror systems.

4. FINDINGS

4.1.Demographic Characteristics of Participants

The sample size of a total of 346 participants was analyzed in terms of age, gender, marital status, education level, occupation and income level. 66.2% of the sample is female and 33.8% is male and 53,8% is married and 46,2% is single. Looking at the age distribution of the participants 29,8% is range of 30-35, 24,3% is range of 24-29 and 16,2% is range of 36-41. According to the education level 62,2% of the respondents have at least a bachelor degree. When the information about the total monthly income of the participants is questioned, it has been seen that 26% has 2000 TL and lower, 18,2% has range of 2001-3000 TL and 17,3% has range of 4001-5000 TL total monthly income. Regarding occupational groups, it is possible to say that 24% of the participants are students, 23,7% are civil servants, 20,6% are workers and other occupational groups show a balanced distribution.

4.2.Reliability and Validity Analysis of Scales

Table 1 below contains the exploratory factor analysis results of the scales. Because of the variables of subjective norm and intention to use variables are measured two each statements, KMO values are 0,5. As seen in Table 1, the KMO value for the variable of subjective norm and intention to use is 0.5, which is satisfactory as being grater than or equal 0.5 (Field, 2000) and Bartlett's Test of Sphericity is significant. Variables of perceived usefulness and perceived ease of use's KMO values are respectively 0,810 and 0,745. Also, since Bartlett's Test results are meaningful, it can be said that the structures are suitable for exploratory factor analysis. When looking at the reliability values, the Cronbach's Alpha coefficients of the structures are 0,929 for the subjective norm; 0,897 for perceived usefulness; 0,912 for perceived ease of use and 0,896 for intention to use.

Table 1. Exploratory Factor Analyse Results

Factors	Factor Loadings	Explained Variance (%)	Cronbach Alpha Coefficient	KMO	Bartlett' s Test of Sphericity
SUBJECTIVE NORM					
SN1. People who influence my behavior may think that I should use the smart mirror system.	0,899	80,808	0,929	0,500	X^2=164,01; dF=1; p=0,000
SN2. People who are important to me may think that I should use the smart mirror system.	0,899				
PERCEIVED USEFULNESS					
PU4. I think it can be useful to use the smart mirror systems in my shopping.	0,895	71,935	0,897	0,810	X^2=696,29; dF=6; p=0,000
PU2. I think that I can buy more products for my needs by using the smart mirror system during shopping.	0,871				
PU3. I think using the smart mirror system will enhance my effectiveness in my shopping.	0,845				
PU1. I think using the smart mirror system during shopping will increase my willingness to buy.	0,777				
PERCEIVED EASY OF USE					
PEU4. I think My interaction with the smart mirror system will clear and understandable.	0,789	56,533	0,912	0,745	X^2=300,27; dF =6; p=0,000
PEU3. I think I will find the smart mirror system to be easy to use.	0,786				
PEU1. I think it will be easy to use the smart mirror system in shopping.	0,771				

PEU2. I think I will need help when using the smart mirror systems for shopping.	0,653				
INTENTION OF USE					
INT1. Assuming I have access to the smart mirrors, I intend to use it.	0,936	87,582	0,896	0,500	X^2=285,90 ; dF=1; p=0,000
INT2. When I think of a store that uses both the smart mirror system and a store that does not use the smart mirror system, I prefer a store that uses the smart mirror system.	0,936				

Table 2 contains the confirmatory factor analysis results of the variables in the model. After the exploratory factor analysis in order to reveal the construct validity of scales we conducted confirmatory factor analysis. According to the confirmatory factor analyse, goodness of fit values are CMIN / df = 2,618; CFI = 0,967; GFI = 0,940; AGFI = 0,903; NFI = 0,947; RMSEA = 0,068. It is seen that CFI and AGFI, which are among the goodness of fit values of the model, are in the good fit range, and the other indicators are in the acceptable fit range.

Table 2. Confirmatory Factor Analyse Results

Goodness of Fit	Good Fit	Acceptable Fit	Findings
CMIN/df	0≤CMIN/df≤2	0<CMIN/df≤3	2,618
AGFI	0,90≤AGFI≤1	0,85≤AGFI<0,90	0,903
GFI	0,95≤GFI≤1	0,90≤GFI≤0,95	0,940
CFI	0,97≤CFI≤1	0,95≤CFI≤0,97	0,967
NFI	0,95≤NFI≤1	0,90≤NFI≤0,95	0,947
RMSEA	0≤RMSEA≤0,05	0,05≤RMSEA≤0,08	0,068

Source: Bayram, N. (2010:78).

AVE (Explained Average Variance) and CR (Composite Reliability) values of the structures in the model are included in Table 3. According to Fornell and Larcker (1981), to ensure the convergent validity of a scale, some inequalities must have provided. These are CR> AVE; AVE> 0.5; CR> 0.7. In the table, it is seen that these inequalities are provided, in other words, the CR values are greater than the AVE values, they are also greater than 0.7 and the AVE values are greater than 0.5. Therefore, it is possible to say that convergence validity is provided.

Table 3. AVE and CR Values of Construct

Factors	Item Number	CR	AVE
SN	2	0,894	0,808
PU	4	0,911	0,719
PEU	4	0,838	0,565
INT	2	0,934	0,876

Table 4 contains the square roots of the AVE values and the correlation coefficients of the factors. The square roots of the AVE values are the values in parentheses, and the other values are the correlation coefficients of the variables with each other. Since the

square roots of the AVE values are greater than the correlation coefficients, it is possible to say that the discriminative validity is also provided.

Table 4. Square Roots of AVE Values and Correlations Coefficients of Factors

	SN	PU	PEU	INT
SN	(0,899)			
PU	0,629**	(0,848)		
PEU	0,487**	0,729**	(0,752)	
INT	0,554**	0,739**	0,668**	(0,936)

**p<0,01

4.3.Testing the Research Hypotheses

The Multiple Regression Analysis and Sobel test were applied to test the research hypotheses. According to the results of the regression analysis given in Table 5, there is a relationship between subjective norm (p=0,006), perceived usefulness (p = 0,000) and perceived ease of use (p=0,000) and the intention to use a smart mirror.
The subjective norms, perceived usefulness, and perceived ease of use explain the intention to use a smart mirror at a rate of 59.1% (F=161,623; p=0,000). The explanatory power of the variables on the intention to use a smart mirror are perceived usefulness (0.478); perceived ease of use (0.258), and subjective norms (0.124), respectively. Hence, the hypotheses H_1, H_4 and H_5 were accepted.

Table 5. Regression Analyse Results-1

Independent Variables	**Non-Standardized Coefficients**		**Standardized Coefficients**	**t**	**p**
	B	**S.E.**	**Beta**		
Constant	0,225	0,159		1,420	0,157
SN	0,122	0,044	0,124	2,745	0,006
PU	0,498	0,060	0,478	8,273	0,000
PEU	0,336	0,067	0,258	5,032	0,000
Dependent Variable= Intention to Use R=0,771; R^2=0,594; Adjusted R^2=0,591; F=161,623; p=0,000					

The results of the regression analysis examining the relationship between subjective norms and perceived ease of use with perceived usefulness are shown in Table 6. Accordingly, there is a relationship between subjective norms (p=0.000) and perceived ease of use (p=0.000) and perceived usefulness. These two variables explain the perceived usefulness variable by 63% (F=285,835; p=0,000). The rate of perceived ease of use explaining the perceived usefulness (0,555) is higher than the subjective norms (0,363). Thus, H_2 and H_3 are also accepted.

Table 6. Regression Analyse Results-2

Independent Variables	Non-Standardized Coefficients		Standardized Coefficients	t	p
	B	S.E.	Beta		
Constant	0,090	0,144		0,626	0,532
SN	0,343	0,036	0,363	9,563	0,000
PEU	0,695	0,047	0,555	14,637	0,000
Dependent Variable= Perceived Usefulness R=0,795; R^2=0,633; Adjusted R^2=0,630; F=285,835; p=0,000					

In addition, according to the results of the Sobel test, the perceived usefulness has a complete mediation function in the relationship between subjective norms and intention to use smart mirrors (SNp1 <0.000; SNp2 <0.0049). In other words, in the relationship between subjective norm and intention to use (in single model) the Sobel test value is p <0.000. The Sobel test value for the effect of the relationship between subjective norm and intention to use (in multiple models) on perceived usefulness is p <0.0045. Although both values are significant, since the p value in the model in which the mediating effect is measured is mathematically greater than the subjective norm affecting the intention to use, it can be said that there is a full mediating effect. Thus, H_6 is also accepted.

5. CONCLUSION, SUGGESTIONS AND LIMITATIONS

This study aimed to determine the intention of consumers to use smart mirror systems within the framework of the TAM, and therefore used regression analysis and Sobel test to test the proposed theoretical model.

The subjective norms, perceived usefulness and perceived ease of use variables explain the intention to use a smart mirror at a rate of 59.1% (F=161.623; p=0,000), which shows that subjective norms, perceived usefulness, and perceived ease of use affect the intention to use a smart mirror. The subjective norms and perceived ease of use were found to explain the perceived usefulness of using smart mirrors by 63% (F=285,835; p=0,000), which shows that subjective norms and perceived ease of use affect the perceived usefulness of using smart mirrors.

Another finding of the study is that subjective norms have a full mediating effect on the intention to use smart mirrors. Although not yet much widely adopted in Turkey, it is possible to say that consumers will embrace the smart mirror systems used in retailing. All the hypotheses in the study were supported, yielding similar results to those of the previous studies (Rauschnabel and Ro, 2016; Obeidy et al., 2017; Shukla and Sharma, 2018) that used the TAM in terms of the adoption of various other technologies. Applying the TAM, this study is expected to contribute to both the literature and practice regarding the adoption of smart mirror technologies in retailing. Given the widespread use of smart mirror systems, the findings in the current study can be considered by future studies by applying the structural equation modeling for

the acceptance of this technology. In addition, similar studies can be conducted by adding different variables.

As is the case in all studies, this study was carried out under certain constraints as well. Firstly, as the smart mirror systems are still quite new in Turkey, using a scenario and thus asking participants to use their imagination to answer the questions could be considered as a limitation. Secondly, the fact that it was conducted by only including the smart mirror technology, which was given as a virtual application, prevented the inclusion of other variables within the framework of the TAM. Thirdly, the convenience sampling method was used while collecting data in the study, which constitutes another limitation because the data collected by convenience sampling method makes the generalizability of the research difficult. Fourthly, since the original scale items were used, the fact that the variables of subjective norms and intention to use were measured with only two items each prevented structural equation modeling. This was because, two-item scales may be insufficient in terms of parameter estimates. Fifthly, time constraints can be pointed out. In particular, the fact that the data were collected during the COVID-19 pandemic may have encouraged people to be more eager than usual to use such a smart system at a time when they frequently shop online and try to keep their social distance.

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