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An Acceptance Model for the Adoption of Smart Glasses Technology by Healthcare Professionals

Abstract

In the recent years, there has been an increase in the interest from different industries in the adoption of smart wearable devices in the light of their inevitable ubiquity. One type of these devices is the Augmented Reality Smart Glasses (ARSGs), which can have great effect in different areas through providing timely information to users. One of the industries that can significantly reap the benefits of this technology is healthcare. However, as healthcare is a very multi-dimensional industry, there is a need for a multifaceted look into the adoption and acceptance of smart glasses by health professionals. This study tends to examine the acceptance of smart glasses by healthcare professionals based on Technology Acceptance Model (TAM) as there is an imperative for empirical studies on user perceptions, attitudes, and intentions. For this purpose, five external factors are extracted from the literature and field study, being integration with information systems, external effects, hands-free feature, technological compatibility, and documentation. The model is examined by using PLS-SEM methodology. This study found documentation to have the strongest impact on intention due to the substitution of paperwork by mobile devices and facilitation of continuous documentation.

Keywords: Augmented Reality Smart Glass, Healthcare, Technology Adoption, Technology Acceptance

1. Introduction

Emerging countries take advantage of high technology possibilities with aim to increase competitiveness, absorptive capacities, knowledge, and internationalization on two ways: by creating new technology or by early adoption of new technology. The organizational capability to adopt a high-quality product or service has been recognized as a critical intangible resource that is important to health care performance. The selection of Turkey for this research is relevant for different reasons. First, Turkey is an emerging country characterized by shift from horizontal focus to sectoral focus in Turkish R&D and innovation policy. Another extraordinary transformation is the move from research to innovation. In general, research and innovation started to play a more significant role in the policy mix and there is now an enhanced commitment to develop and implement strategic, coherent and integrated strategic framework toward development and adoption of high tech products and services. The importance of high tech and application of varying information technology in Turkish healthcare has been recognized and supported since the beginning of 2010. Turkey's healthcare expenditure has been steadily growing with 10% per annum since 2009, reaching to TL 105 billion in 2015, without any dramatic changes in sector dynamics (TOBB, 2017). The IT investment in Turkish healthcare has remained much less than 1% of the total investment in healthcare (Turan and Palvia, 2014). Healthcare expenditure share in GDP has been stabilized around 5.4% since 2009 it is still lower than that of other OECD countries but showing further growth potential (TOBB, 2017).

The boundaries of wearable technologies are limited to the creativity of their developers. Augmented Reality Smart Glasses (ARSGs), smart glasses for short, have potential to touch so many lives. ARSGs are face worn devices just like regular glasses. However, they can combine virtual and physical information and demonstrate these information to users without any need for screen (Ro et al., 2018) . This easy interaction with digital sources of information has the potential to improve efficiency of healthcare organizations, where access to timely information is crucial in most cases(Armstrong et al., 2014; Monroy et al., 2014; Moshtaghi et al., 2015) for it can find place in different kinds of treatment and rehabilitation processes. An extraordinary smart glasses example is Blink, which is developed for facial paralysis therapy. This device monitors the eye on normal side of the face and synchronize blinks of both eyes by stimulating the paralyzed side (Sijie et al., 2017). Evana medical launched a point of care ultrasound in the form of smart glasses (Evanmed.com). Besides these examples, cases about the use of smart glasses in professional settings are available in literature (Borchers, 2014; Chau and Hu, 2002; Mitrasinovic et al., 2015; Yu et al., 2009). Healthcare industry seems to be one of the industries that professionals may highly benefit from smart glasses if necessary improvements can be managed (Amft et al. 2015; Göken et al., 2017; Muensterer et al., 2014).

Acceptance of technologies needs to be considered multi-dimensionally. Although the effects of these dimensions are not necessarily equal, they all are significant. In healthcare settings, there are mainly organizational, personal, social and technical dimensions (Ducey and Coovert, 2016; Hsiao and Chen, 2016). This study generally covers personal, social, and technical dimensions whereas organizational dimension is excluded consciously. Organizational dimension is highly influenced by legal arrangements, and organizational strategies. In our knowledge there are no legal arrangements on smart glass usage in healthcare settings, and the usage of smart glasses in healthcare settings is not in the agenda of any healthcare organization in Turkey.

The paper is structured as follows. The next section describes the theoretical background of the technology acceptance in healthcare and reviews the literature, by the development of the hypotheses. This is followed by the methodology section, model development and presenting results from a survey. The paper concludes with the discussion and limitations of the study and offers possible streams for future research.

2. Technology Acceptance in Healthcare

In the field of health care (especially health information technology), there is an escalation in curiosity towards end users' reaction in technologies (Holden and Karsh, 2010). Technology acceptance model (TAM) was initiated in the 80s where companies were interested in learning more about the ways they can increase technology acceptance and use by inquiring employees about their intentions of the targeted technologies (F. Davis and Bagozzi, 1989; F. D. Davis, 1989). In other words, an employee's intentional or voluntarily usage of technology is referred to as technology acceptance. Initially, the goals of TAM model are to clarify, predict, and control the certain technology's acceptance from a certain demographic. One of the areas lagging in terms of technology adoption has been the healthcare industry. This slow adoption has been causing problems and dissatisfaction both for physicians and patients (Kassirer, 2000; Mechanic, 2003; Meyer, 200AD). Yarbrough and Smith (2007) attempts to improve the understanding revolving physicians' technology acceptance by proposing theoretical framework in information systems and healthcare management research.

There are some barriers in the adoption of technologies in healthcare field's employees (such as physicians) such as the inertia and reluctance to change. Many physicians hesitate to adopt new technologies as they see the adoption process hindering to the flow and smoothness of their practice (Overhage et al., 2001). Moreover, it seems to be difficult to convince some physicians of the benefits of the acceptance and adoption of new technologies beyond the temporary decrease in time effectiveness and efficiency cause by the learning curve (Lee et al., 1996). Yarbrough and Smith (2007) conclude that factors such as time/practice-related issues, organizational issues, personal issues, and system-specific characteristics have impact on the physicians and healthcare employee's acceptance of new technologies. Also, different types of employees have different priorities that would act as a catalyzer in their acceptance of the respective technology. One of the other important things that should be taken into account is the organization's stance towards innovation in terms of culture and organizational structure as there is an imperative to redesign and reshape Company's organizational culture in order to fit into the new mold made by introduction of new technologies. Different parties that are involved with healthcare projects can strongly benefit from using the TAM to bolster the design or purchasing process, training, and application, among other exercises. To the extent that the factors predicting acceptance are controllable, they can be strong levers for acceptance and use.

3. Smart Glass Technology Acceptance

In the recent years, the ubiquity of smart devices is being redefined in terms of mobility versus wearability. In other words, the meaning of the word "mobility" is shifting from portable devices to wearable technology (Kim and Dong-Hee, 2015). There are some examples of research into the adoption and acceptance of wearable technology by different demographics existing in the literature for different wearable devices. Kim and Dong-Hee (2015) have included factors such as affective quality and relative advantage, which are leading to perceived usefulness, followed by mobility and availability, leading to perceived ease of use, subcultural appeal, and cost in the user experience model for the adoption of smart watches. Shaygan et al. (2017) evaluate the adoption criteria of activity wristbands for university students. The mentioned research stresses on the multi-dimensionality of the adoption and diffusion process of smart wearable devices. It should be taken into account that different demographic may be affected by different criteria at different rates. As an example, the younger demographic may prefer the accuracy and design of devices while the older demographic consider the user-friendliness as a priority.

Rauschnabel and his colleagues look into the role of personality in forecasting media usage by examining smart glasses such as Google Glass and Microsoft HoloLens. They conclude that users who notice the potential for smart benefits and social conformity of smart glasses are the ones with the highest adoption probability (Rauschnabel et al., 2015). Hofmann et al. give a list of factors such as privacy, safety, justice, change in human agency, accountability, responsibility, social interaction, power and ideology which slow down the adoption rate (Hofmann et al., 2017). Kalantari and Rauschnabel (2018) state that unlike many other mobile devices hedonic factors do not support to the acceptance of smart glass. Wang advises to stress the potential of efficiency and effectiveness improvement which may be realized by the use of smart glasses while marketing smart glasses (Wang, 2015). Göken et al. introduce a number of external factors affecting smart glass adoption in medical industry; these are compatibility, ease of reminding, speech recognition, ease of learning, ease of medical education, external influences, and privacy (Göken et al., 2016; Göken et al., 2017). Many of the studies in the growing body of literature in smart wearables stress the importance of multi-criteria nature of adoption in this area.

3.1.External Effects

Social norms, independent from technology itself, usually significantly impact the adoption either directly or indirectly. It can be in the form of perceived approval such as other people's positive thoughts and speeches, or following behaviors of forerunners in a specific community (Lazuras and Dokou, 2016; Viswanath Venkatesh and Zhang, 2014). In some cases, just like the case of smart glasses, people get information about a new product from written media only before the real interaction with the product. In this cases written media creates a preconception, thus it is the only source of external effects.

Furthermore, one of the issues highly discussed in literature is patient privacy, which may create negative attitude as an external effect (Monroy et al., 2014; Hong, 2013). Moshtaghi et al. (2015), discuss the ethical issue behind the use of glasses in terms of protecting patient privacy. With the burgeoning of smart wearable recording devices, the risk for health information security violations and unintended share of patient identity is increased.

When use of technology is a choice made voluntarily, social norms do not affect intention directly. In TAM2, effect of social norms theorized through PEoU and PU (Venkatesh, and Davis, 2000) (V Venkatesh and Davis, 2000). External effects have the power of setting new rules and obligations. For example, Oremus marked google glass as social disaster, and as a result it was not highly accepted by the society (Oremus, 2015).

H1: *External effects significantly affect perceived ease of use.*

3.2. *Hands-Free Feature*

As the time passes, mobile devices are getting smaller. Miniaturization of mobile devices brings so many advantages into applications and improves mobility, yet interaction with these small devices becomes a new challenge for technology developers. One frequently mentioned problem with smart glasses is interface quality; they are criticized as error prone, and difficult to use. There are different options available for interaction with these devices such as gesture recognition, and voice control (Ni and Baudisch, 2009). The term hands-free implies the use of voice or gesture for operating the device. In general, the hands-free characteristic of smart glasses can have significant positive effects on the quality of communication, education, and workflow in different areas such as healthcare, maintenance, and even insurance. Other fields that can be bolstered in terms of education such as cardiology, autopsy, forensics medicine and augmented reality related medical solution are discussed in the literature (Albrecht et al., 2013; Albrecht et al., 2014; Brusie et al., 2015; Friedman, 2016; Moshtaghi et al., 2015; Quint and Loch, 2015; Rowe et al., 2013; Vallurupalli, Paydak et al., 2013; Zheng et al., 2015).

Moshtaghi et al. (2015)discuss the feasibility and benefits of Google Glass in otolaryngology surgery in terms of education and remote intraoperative consultation. The mentioned paper concludes that Google Glass can have beneficial effects in of surgical workflow, remote supervision, and improved surgical education. The hands-free attribute of these smart wearable devices would be more suitable for the sterile environment of surgery room.

According to Başoğlu, Ok, and Daim's research, hand gesture interaction is more favored than voice recognition for general purpose smart glasses (Basoglu et al., 2017). In another study in healthcare setting, voice recognition was used in data exchange processes, and the service provided was sufficiently satisfying (Ruminski et al., 2016). According to Czuszynski and his colleagues, base interface with smart glasses should exactly free both hands of surgeons, as they always need to use their both hands during operations. Thus voice recognition is more advantageous in healthcare settings, yet it is better to have other optional interfaces besides voice recognition (Czuszynski et al., 2015). Combining different interfaces for human behavior recognition is another option for more trustworthy systems (Cheng et al., 2013).

H2: *Hands-free feature of smart glasses affect perceived ease of use*.

3.3. *Technological Compatibility*

According to Roger's Diffusion of Innovation theory, compatibility is one of the determinants of diffusion. It taps into the context to which the system is in line with existing values, experience, and needs of potential user (Rogers and Everett, 1983). Any system causing decrease in efficiency, and productivity may also cause resistance, and rejection (Lapointe and Rivard, 2005; May et al., 2001). On the contrary, compatibility improves usefulness (Chau and Hu, 2002).

As David proposed "job relevance" as an external factor of TAM2 (Legris et al., 2003), and Roger's Diffusion of Innovation theory forms a strong basis (Rogers and Everett, 1983), many researchers explore the effect of compatibility on constructs of TAM . Karahanna et al describe compatibility with four constructs, namely “compatibility with preferred work style”, “compatibility with existing work practices”, “compatibility with prior experience”, and “compatibility with values". All this constructs are related with each other, usefulness, and ease of use (Karahanna et al., 2006). There is a rich literature on compatibility in technology acceptance domain. Researchers have proposed and tested direct and indirect effects of compatibility on TAM constructs in different settings including healthcare systems, and their findings have formed an extensive evidence pool supporting their hypotheses (Bhattacherjee and Hikmet, 2007; Daim et al., 2013; Hung et al., 2014; Township and District, 2017; Wu et al., 2007) .

H3*: Technological compatibility affects perceived ease of use.*

H4*: Technological compatibility affects perceived usefulness.*

3.4.Integration with IS

Smart wearables are different than the conventional mobile and computer systems as they can be handled without or with minimal hindrance in user activity (Lukowicz et al., 2004). Gathering high quality data has critical importance in healthcare industry. Developers aim to design simple and reliable systems enabling easy access to required information such medical history, test results or some specific information without interrupting physician patient interaction while saving time (Monroy et al., 2014; Zak et al., 2002). High computer utilization brings extra work into clinicians’ work environment who are already multi-tasking. A study by Ratanawongsa et al. demonstrates that inpatients are less satisfied with clinicians who highly use computers during examination. Computer utilization worsens communication between patient and clinician, and as a consequence it harms trust and satisfaction (Ratanawongsa et al., 2015). Smart glasses on the other hand, can automatically exchange data with other information systems and provide necessary information about patient without interruption (Gregg, 2014a; Ruminski et al., 2016).

H5: *Integration with IS affects perceived usefulness*.

3.5.Documentation

Smart glasses are new tools for organizational knowledge management. Hand-held mobile devices previously removed the burden of dealing with paper based documentations. Smart glasses go a step forward by freeing hands of their users, and easing data and information transfer. There is a huge potential for creative applications in different industries by the adoption of smart glasses (Hein and Rauschnabel, 2016; Moon and Seo, 2015; Quint and Loch, 2015). As the potential of smart glasses are considered in every industry, there are also recent studies discussing feasibility and acceptability of smart glasses in healthcare settings. These studies find place in both academic publications and public media. These publications are generally concluded with promising findings for wide adoption of smart glasses (Feng et al., 2014; Gregg, 2014a; Kolodzey et al., 2017; Richardson et al., 2014; Shaoa et al., 2014). The features making smart glasses outstanding among all other mobile devices are rapid, hands-free communication and documentation. With these features, smart glasses improve efficiency, patient safety, and communication among healthcare professionals (Armstrong et al., 2014).

Borgmann et al assess utilization of smart glasses in urological surgeries. According to findings of this research, “recording for documentation and teaching purposes” is evaluated as the most useful feature, and followed by “rapid access to patients’ medical record”. “Reviewing patients’ image” and “internet search” options are relatively less useful than aforementioned features (Borgmann et al., 2017). In the article by Davis and Rosenfield, importance of visual data in emergency plastic surgery is emphasized. First assessment of the patients in these cases are usually made by non-plastic surgeons which may result in misrepresentative reports. smart glasses can enable timely transfer of visual data to expert who can provide instantaneous advice before action is taken (C. R. Davis and Rosenfield, 2015). Monroy et al. assess Google Glass for primary care offices. Smart glasses minimize interruption by allowing physicians to check medical records while they are interaction with their patients (Monroy et al., 2014). Aldaz et al compare SnapCap System, compatible with Google Glass, with Epic Haiku, available on smart phones. They conclude that SnapCam system is more favorable for wound care management with “hands-free digital photography, tagging, speech-to-text image annotation, and the transfer of data to an electronic medical record” features (Aldaz et al., 2015). Modifications made on smart glasses are also adding new features to these devices. Ruminski et al. (2016) assess system architecture for use of smart glasses as “source of medical data”, “viewer of information”, and “filter of information”. They show that smart glasses provide reliable vital sign measurements, and fast information retrieval service (Ruminski et al., 2016).

H6: *Documentation feature of smart glasses affects perceived usefulness.*

The proposed research model is demonstrated in Figure 1.

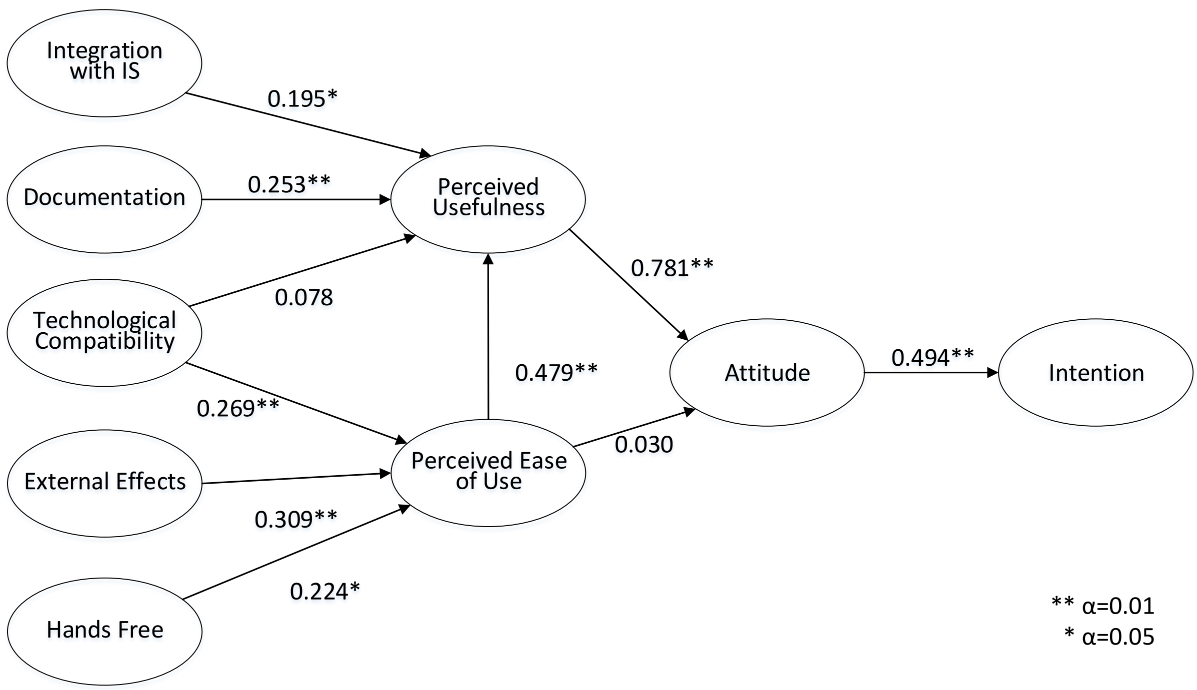

Figure 1: Research Model

4. Model Testing

4.1.Research Method

For the test of proposed model, PLS-SEM was used. The data, required to test the proposed model, was collected through a web-based data collection instrument in three months period. The survey has two parts. With the first part, it is intended to introduce smart glass technology to targeted group, and three videos introducing the use of smart glasses in healthcare settings are presented. The second part is the questionnaire which is a collection of five point Likert scaled questions related to proposed model and demographic questions. For the Likert scaled questions, 1 stands for "total disagree", and 5 represents "total agree".

This research uses the data collected by Göken et al. (Göken et al., 2016, 2017). Physicians and medicine students were invited to contribute to the research by answering web-based survey in December 2015. The total number of participants was 119. Reponses collected from 104 participant were found to be eligible for testing the proposed model. Demographic data of participants is summarized in Table 1, and survey questions are in Appendix 1.

Table 1: Profile of Participants

Range	Frequency	Percentage	Cumulative Percentage
Gender			
Female	28	26.9	26.9
Male	76	73.1	100.0
Age			
24 or less	4	3.8	3.8
25-29	20	19.2	23.1
30-34	21	20.2	43.3
35-39	16	15.4	58.7
40-44	18	17.3	76.0
45-49	12	11.5	87.5
50-54	4	3.8	91.3
55 or more	9	8.7	100.0
Education			
Medicine Student	6	5.8	5.8
Undergraduate	20	19.2	25.0
Graduate	17	16.3	41.3
PhD	61	58.7	100.0
Expertise			
Surgeon	33	31.7	31.7
Internal Specialist	4	3.8	35.6
Pediatrician	4	3.8	39.4
Other	63	60.6	100.0

4.2.Method of Measurement and Structural Model Analysis

SEM is a valuable technique for testing of causal models. It enables parameter assessment and hypothesis testing simultaneously, and outperforms first generation statistical analyses. Partial Least Square (PLS) SEM methodology, which is a substitute methodology of well-known covariance based structural equation modeling (CB-SEM), does not have strong preconditions such as distribution, sample size or measurement scale as CB-SEM has. It is also useable for relatively smaller sample size which does not satisfy CB-SEM precondition (Cenfetelli and Bassellier, 2009; Chin, 2000, 2010; Joe F. Hair et al., 2011; Joseph F. Hair et al., 2012; V. E. Vinzi et al. 2010).

PLS-SEM methodology is applied in two steps which are assessment of measurement model and structural model. Measurement model and structural model are also named as outer model and inner model respectively. In the first step, researchers need to get satisfactory results from assessment of measurement model to continue with the second step. Outer model is expected to have higher values than thresholds for a number of assessment criteria. R^2 values and significance of path coefficients are examined in the second step. In the second step bootstrapping process is used get required statistics (Chin, 2010; Joseph F. Hair et al., 2012; Sanchez, 2013). In this research PLS-PM package in R is used for running the tests.

4.3.Assessment of Measurement Model

In order to be confident with the results of any structural model, the first step is to be sure of measurement model quality. In structural models, outer models are usually accepted as reflective, as a result variables of any construct are expected to change in the same direction with the construct. There are a number of measures used to measure unidimensionality of latent variables. Cronbach's Alfa (CA), Dillon Goldstein's Rho, first and second eigenvalues of correlation matrix (Sanchez, 2013), average variance extracted (AVE), and composite reliability (CR) (Chin, 2010; Joseph F. Hair, Ringle, and Sarstedt, 2013) are the commonly used indices to check unidimensionality of latent variables. For CR, CA and DG. rho threshold value is accepted as 0.7. In the measurement model of this research model, there are no construct failing to satisfy all three indices. For AVE, the threshold value is 0.5, and it is satisfied by all constructs (Chin, 2010; Joseph F. Hair et al., 2013; Sanchez, 2013). Another way for examining unidimensionality is to check the difference between the first and second eigenvalues. Large difference is a sign of unidimensionality. Besides the second eigenvalue has to be below 1. For the constructs of this research model, all second eigenvalues are below 1, and first eigenvalues are at least twice larger than the second eigenvalues (see Table 2). Latent variables, and their values of loading, communality and redundancy are given in Appendix 1.

Table 2: Blocks' Unidimensionality

	MVs	C.A.	DG.rho	eig.1st	eig.2nd	AVE	CR
Integration with IS	3	0.648	0.810	1.760	0.690	0.586	0.649
Documentation	2	0.897	0.951	1.810	0.186	0.906	0.910
External Effects	2	0.776	0.899	1.630	0.366	0.811	0.827
Hands Free	3	0.779	0.872	2.080	0.536	0.690	0.728
Technological Compatibility	2	0.564	0.821	1.390	0.607	0.696	0.733
Perceived Ease of Use	2	0.555	0.818	1.380	0.615	0.683	0.722
Perceived Usefulness	3	0.847	0.908	2.300	0.434	0.766	0.789
Attitude	2	0.811	0.914	1.680	0.318	0.840	0.851
Intention	3	0.724	0.845	1.930	0.564	0.949	0.684

Constructs in structural models are anticipated to be unrelated with each other in order to be adequate for representing different concepts. This issue is check with discriminant validity. According to Fornell and Lacker, discriminant validity is accepted to be satisfied for any construct if square root of this construct's AVE value is larger than correlation values between the construct and all the other constructs in the model (Fornell and Larcker, 1981; Kwong and Wong, 2013). Discriminant validity criterion is satisfied as well.

Table 3: Correlation values and Square Roots of AVE values

Constructs	1	2	3	4	5	6	7	8	9
Integration with IS - 1	0.974								
Documentation - 2	0.489	0.952							
External Effects - 3	0.391	0.383	0.901						
Hands Free - 4	0.69	0.556	0.361	0.831					
Technological Comp. - 5	0.391	0.448	0.318	0.276	0.835				
Perceived Ease of Use - 6	0.415	0.383	0.476	0.41	0.43	0.826			
Perceived Usefulness - 7	0.549	0.567	0.481	0.509	0.474	0.691	0.875		
Attitude - 8	0.486	0.507	0.437	0.425	0.539	0.57	0.802	0.917	
Intention - 9	0.597	0.541	0.434	0.565	0.349	0.393	0.457	0.494	0.974

4.4.Assessment of Structural Model

In the second step, inner model is tested. Although it cannot be considered as a standard, R^2 values below 0.3 are accepted as low, R^2 values above 0.6 are accepted as high, and the interval between 0.3 and 0.6 is taken as moderate usually. Redundancy measure on the other hand is a measure which reflects the explained variation of dependent construct by independent constructs. Higher redundancy demonstrates the higher ability to explain variation. As an overall performance indicator, goodness of fit demonstrates prediction performance of the model (Sanchez, 2013). In this research predictive power of the model is 58% which can be considered as moderate.

Table 4: Hypothesis Testing

INNER MODEL	Estimate	Std. Error	t value	Pr(>|t|)	Hypothesis
Dependent Construct: Perceived Ease Of Use (R^2=0.355, Mean Redundancy=0.243)					
Intercept	0.000	0.080	0.000	1.000	
External Effects	0.309	0.088	3.500	0.001	**H1
Hands Free	0.224	0.087	2.570	0.012	*H2
Technological Compatibility	0.269	0.086	3.140	0.002	**H3
Dependent Construct: Perceived Usefulness (R^2=0.619, Mean Redundancy=0.474)					
Intercept	0.000	0.062	0.000	1.000	
Technological Compatibility	0.078	0.074	1.070	0.289	H4
Integration with IS	0.195	0.075	2.620	0.010	**H5
Documentation	0.253	0.075	3.360	0.001	**H6
Perceived Ease Of Use	0.479	0.072	6.630	0.000	
Dependent Construct: Attitude (R^2=0.643, Mean Redundancy=0.540)					
Intercept	0.000	0.059	0.000	1.000	
Perceived Ease Of Use	0.030	0.082	0.366	0.715	
Perceived Usefulness	0.781	0.082	9.540	0.000	
Dependent Construct: Intention (R^2=0.244, Mean Redundancy=0.154)					
Intercept	0.000	0.086	0.000	1.000	
Attitude	0.494	0.086	5.760	0.000	
GOODNESS-OF-FIT: 0.5799					
** significant at α=0.01, * significant at α=0.05					

All the hypotheses are supported except H4 "Technological capability affects perceived usefulness".H1, H3, H5, and H6 are supported at α=0.01 significance level whereas H2 is are supported at α=0.05 significance level.

As it is more convenient to run resampling methodologies instead of pure trust in distributional assumptions. PLS-PM provides bootstrapping resampling methodology to test the validity of parameter estimates. The results of bootstrapping procedure are demonstrated in Table 5. Direct, indirect, and total effects can be seen in Table 5. The significance of effects of external constructs on TAM constructs are tested and demonstrated in Table 5 as well.

Table 5: Direct, Indirect, and Total Effects

Sign. Level
.010**
.011**
.017**
.000**
.006**
.008**
.013**
.035**
.048**
.046**
.068*
.059*
.060*
.072
.005**
.039**
.038**
.050**
.000**
.000**
.000**
.000**
.000**
.000**
**

AFFECTING CONSTRUCT	AFFECTED CONSTRUCT	Direct	Indirect	TOTAL	Mean. Boot	Std. Error	perc. 2.5	perc. 97.5
Documentation	Perceived Usefulness	.253	.000	.253	.250	.092	.062	.410
Documentation	Attitude	.000	.198	.198	.196	.072	.047	.334
Documentation	Intention	.000	.098	.098	.101	.040	.022	.174
External Effects	Perceived Ease of Use	.309	.000	.309	.309	.076	.168	.443
External Effects	Perceived Usefulness	.000	.148	.148	.151	.051	.067	.263
External Effects	Attitude	.000	.125	.125	.128	.045	.055	.230
External Effects	Intention	.000	.062	.062	.067	.025	.023	.127
Hands Free	Perceived Ease of Use	.224	.000	.224	.235	.106	.036	.426
Hands Free	Perceived Usefulness	.000	.108	.108	.112	.054	.016	.224
Hands Free	Attitude	.000	.091	.091	.095	.045	.014	.193
Hands Free	Intention	.000	.045	.045	.050	.026	.007	.110
Integration with IS	Perceived Usefulness	.195	.000	.195	.193	.098	.005	.367
Integration with IS	Attitude	.000	.153	.153	.152	.078	.003	.291
Integration with IS	Intention	.000	.075	.075	.079	.043	.001	.169
Technological Compatibility	Perceived Ease of Use	.270	.000	.270	.271	.090	.096	.473
Technological Compatibility	Perceived Usefulness	.078	.129	.208	.206	.095	.030	.422
Technological Compatibility	Attitude	.000	.170	.170	.174	.080	.037	.352
Technological Compatibility	Intention	.000	.084	.084	.090	.044	.020	.187
Perceived Ease of Use	Perceived Usefulness	.479	.000	.479	.482	.083	.306	.623
Perceived Ease of Use	Attitude	.030	.374	.404	.410	.079	.271	.553
Perceived Ease of Use	Intention	.000	.200	.200	.213	.052	.115	.321
Perceived Usefulness	Attitude	.781	.000	.781	.784	.067	.635	.896
Perceived Usefulness	Intention	.000	.386	.386	.406	.068	.300	.533
Attitude	Intention	.494	.000	.494	.518	.070	.378	.639

5. Findings

Findings of this research are generally in aligned with the existing literature. Documentation is pointed as the most important feature of smart glasses by Borgmann et al (Borgmann et al., 2017). Conclusions of Davis, and Rosenfield support Borgmann et al by highlighting the severity of documentation in emergency plastic surgery (C. R. Davis and Rosenfield, 2015). In this research documentation has the highest effect on both the attitude and the intention among all external factors.

Documentation is followed by technological compatibility. Compatibility is a highly mentioned and generally accepted external factor of TAM. It is usually significantly and directly effective on both perceived ease of use and perceived usefulness (Bhattacherjee and Hikmet, 2007; Daim et al., 2013; Ducey and Coovert, 2016; Hung et al., 2014; Kuo, Liu, and Ma, 2013; Township and District, 2017; Wu et al., 2007). In this study its effect on perceived usefulness is insignificant. Yet its effects on the attitude and the intention through perceived ease of use are significant.

Integration with IS is one of the two affecting factors of perceived usefulness. Easy and fast access to information in healthcare setting has crucial importance (Monroy et al., 2014; Zak et al., 2002) with minimum interruption of work (Ratanawongsa et al., 2015). Automated data exchange feature of smart glasses enables ease access to information sources, and eliminate interruptions in the work flow (Gregg, 2014a; Ruminski et al., 2016). Reminding option can prevent undesired outcomes (Göken et al., 2017). This result is again consistent with previous research.

External effects and hands-free features are the other two factors which are both effective on perceived ease of use. External factors may take root from different sources such as written media, experts in a specific field, reliable acquaintances (Lazuras and Dokou, 2016; V Venkatesh and Davis, 2000; Viswanath Venkatesh and Zhang, 2014). In Turkey, smart glasses were not in the market during data collection period. Thus information about smart glass were available through media mostly. Even so it is powerful enough to effect perceived ease of use significantly.

The last factor affecting perceived ease of use is hands-free feature. Its innovativeness and advantageousness is highly discuss in both scientific and public publications. Discussion on devices to be used in sterilized environments is always a moot point. In our knowledge there is no technology exists to sterilize mobile devices such as smart phones, tablets, or smart glasses. Thus is more valuable for healthcare professionals not to touch these devices during operations or in their work flow (U.-V. Albrecht et al., 2013; U. V. Albrecht et al., 2014; Brusie et al., 2015; Czuszynski et al., 2015; Friedman, 2016; Moshtaghi et al., 2015; Quint and Loch, 2015; Rowe et al., 2013; Vallurupalli et al., 2013; Zheng et al., 2015). As a result hands-free construct affects perceived ease of use directly and all other TAM constructs through perceived ease of use significantly.

TAM is a well-known and useful model in technology management field. Therefore connections in TAM are not projected as hypotheses in this research. If a quick look is taken, the effect of perceived ease of use significant through perceived useful, and it has not significant direct effect. R^2 value of attitude is 0.643, which can be considered as high enough. On the other hand, R^2 value of attitude is 0.244, which is not a satisfying value. Clearly there are some other factors to be added to proposed research model to improve its explanatory power.

6. Discussions

In this research we examined the acceptance of smart glasses by healthcare professionals based on TAM. We proposed five external factors; namely integration with IS, external effects, hands-free feature, technological compatibility, and documentation which reflects our findings from existing literature and our observations from the field study. Documentation came forward with the highest total effect on intention. It is important, because paper work load is reduced by mobile devices. With smart glasses, it becomes easier to make documentation in every situation.

All other factors were significant as well. Perceived usefulness was affected by integration with IS and documentation. Technological compatibility did not appear as an external factor of perceived usefulness. Perceived ease of use is explained by technological compatibility, external factors, and hands-free feature.

Three external constructs which are documentation, integration with IS, and hands-free feature are supporting information management activities. In the light of our results, it can be said that the biggest effect of smart glasses will be on information management in healthcare organizations if it is properly deployed. Other factors, external effects and technological compatibility, can be considered as personal factors. They are primarily depended on personal understanding, values, and experience.

The model does not sufficiently explain the intention. Clearly there are some other factors hindering people to adopt these devices although they have positive attitude towards adopting them. Future research may concentrate on extending the model by defining and integrating missing external factors of TAM.

6.1.Implications for Practice

This study provides some influential insights for professionals in health information technology field. Clearly healthcare professionals are aware of the advantageous of smart glasses and the potential application areas in healthcare settings. They have positive attitude towards these devices. They find it compatible with their work environment even though smart glasses have a novel way of operating, and dissimilar to other mobile devices. Resistance is a vital handicap in deployment stage of newly developed HIS. Although it is not directly questioned in the survey, results provide some clues about non-existence of resistance. This a big opportunity for developers of health information technologies and systems. As long as they define the needs of healthcare professionals properly, their innovative solutions may be accepted without serious resistance issue.

In construct with positive attitude, intention appears to be very low. Obviously some encouragement is required to increase adoption. There are many actors playing active role in health technology adoption. Turkish Ministry of Health provides guide for hospital information management systems which does not cover the utilization of smart devices (“Procurement Guide for Hospital Information Management Systems,” 2010). Thus, the first step may be expected from the ministry of health.

Finally, it is understood that these devices are more appropriate for efficiency related issues in professional life than personal usage (Hofmann et al., 2017; Kalantari and Rauschnabel, 2018; Rauschnabel et al., 2015). Yet, technology provides newly started to target enterprises (Rubin, 2017). At organizational level, non-existence of business associate agreements is an issue (Gregg, 2014b), which can be overcome by technology providers.

6.2.Implications for Research

To the best of our knowledge, this is one of the a few study to theoretically specify and empirically test the acceptance of smart glasses by healthcare professionals which uses a holistic view by applying SEM. Prior research covers mainly case studies, and examines the applicability of smart glasses in very narrow settings. Hence, we provide theoretical insights for researchers that may assist in encouraging healthcare professionals to use new technologies in their professional lives. Our results show that healthcare professionals do not consider these devices for specific purposes, instead they intend to use it for different purposes such as telemedicine, medical education, and diagnosis processes (see Appendix 1).

Smart glasses are relatively new in mobile devices family, enablers and inhibitors may considerably vary in different settings. More research has to be conducted to better understand the acceptance of smart glasses in healthcare settings. Our proposed model explains attitude towards new technology better than the intention to use it. Consequently factors affecting intention to use has to be explored.

In this research external factors are examined mostly from personal perspective. Legal, and organizational factors, which may play important role, are excluded intentionally as there are no attempt from governmental agencies or healthcare institutions in this domain. Yet the results show that positive attitude is not enough to create intention itself. Other facilitating factors are needed to be discovered.

Consequently, smart glasses has a potential to be accepted by healthcare professionals, but still more afford has to be put in understanding facilitating, and hindering conditions.

7. Limitation & Conclusion

It is better to clarify the limitations of this research while discussing the findings. The findings, more specifically our constructs, reflects our observations and inputs provided by healthcare professionals from our study site. Clearly there are other factors to be discovered in different healthcare settings. Secondly, our sample covers healthcare professionals who work in hospitals. Thus extending the findings to all healthcare professionals such as dentists, physicians in family health centers, or private offices.

Healthcare professionals are not as prejudiced against technology, in our case smart glasses, as they used to have in past. This may improve the success chance of innovative use of smart glasses in healthcare settings. For future research examining business model which covers organizational shortcomings, and legal gaps may provide fruitful insight for both technology suppliers and healthcare industry.

Compliance with Ethical Standards:

- This study was partially funded by TUBITAK in Turkey
- We have no conflicts of interest

- All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.
- This article does not contain any studies with animals performed by any of the authors.
- Informed consent was obtained from all individual participants included in the study.

References

Albrecht, U.-V., Folta-Schoofs, K., Behrends, M., & von Jan, U. (2013). Effects of Mobile Augmented Reality Learning Compared to Textbook Learning on Medical Students: Randomized Controlled Pilot Study. *Journal of Medical Internet Research*, *15*(8), e182. https://doi.org/10.2196/jmir.2497

Albrecht, U. V., Von Jan, U., Kuebler, J., Zoeller, C., Lacher, M., Muensterer, O. J., … Hagemeier, L. (2014). Google glass for documentation of medical findings: Evaluation in forensic medicine. *Journal of Medical Internet Research*, *16*(2). https://doi.org/10.2196/jmir.3225

Aldaz, G., Shluzas, L. A., Pickham, D., Eris, O., & Sadler, J. (2015). Hands-Free Image Capture , Data Tagging and Transfer Using Google Glass : A Pilot Study for Improved Wound Care Management. *PLoS ONE*, *10*(4), 1–21. https://doi.org/10.1371/journal.pone.0121179

Amft, O., Wahl, F., Ishimaru, S., & Kunze, K. (2015). Making Regular Eyeglasses Smart. *IEEE Pervasive Computing*, *14*(3), 32–43. https://doi.org/10.1109/MPRV.2015.60

Armstrong, D. G., Rankin, T. M., Giovinco, N. A., Mills, J. L., & Matsuoka, Y. (2014). A heads-up display for diabetic limb salvage surgery: a view through the google looking glass. *Journal of Diabetes Science and Technology*, *8*(5), 951–956. https://doi.org/10.1177/1932296814535561

Basoglu, N., Ok, E. A., & Daim, T. U. (2017). Technology in Society What will it take to adopt smart glasses : A consumer choice based review ? *Technology in Society*, *50*, 50–56. https://doi.org/10.1016/j.techsoc.2017.04.005

Bhattacherjee, A., & Hikmet, N. (2007). Physicians’ resistance toward healthcare information technology: a theoretical model and empirical test. *European Journal of Information Systems*, *16*(6), 725–737. https://doi.org/10.1057/palgrave.ejis.3000717

Borchers, C. (2014). Beth Israel to use Google Glass throughout emergency room - The Boston Globe.

Borgmann,H., Rodríguez, H. B. M., Salem, S. J., & Gomez, I. T. J. (2017). Feasibility and safety of augmented reality ‐ assisted urological surgery using smartglass. *World J Urol*, *35*, 967–972. https://doi.org/10.1007/s00345-016-1956-6

Brusie, T., Fijal, T., Keller, A., Lauff, C., Barker, K., Schwinck, J., … Guerlain, S. (2015). Usability evaluation of two smart glass systems. *2015 Systems and Information Engineering Design Symposium*, *0*(c), 336–341. https://doi.org/10.1109/SIEDS.2015.7117000

Cenfetelli, R. T., & Bassellier, G. (2009). Interpretation of Formative Measurement in INformation Systems Research. *MIS Quarterly*, *33*(4), 689–707.

Chau, P. Y. K., & Hu, P. J. (2002). Examining a model of information technology acceptance by individual professionals: An exploratory study. *Journal of Management Information Systems*, *18*(4), 191–230. https://doi.org/10.2307/40398548

Cheng, S.-T., Hsu, C.-W., & Li, J.-P. (2013). Combined Hand Gesture — Speech Model for Human

Action Recognition. *Sensors*, *13*, 17098–17129. https://doi.org/10.3390/s131217098

Chin, W. W. (2000). Partial Least Squares For Researchers : An overview and presentation of recent advances using the PLS approach. In *Int. Conf. Inf. Sys.* (pp. 741–742).

Chin, W. W. (2010). How to Write Up and Report PLS Analyses. In E. V. Vinzi, W. W. Chin, J. Henseler, & H. Wang (Eds.), *Handbooks of Computational Statistics Series* (pp. 655–690). Springer.

Czuszynski, K., Ruminski, J., Kocejko, T., & Wtorek, J. (2015). Septic safe interactions with smart glasses in health care. In *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS* (Vol. 2015–Novem, pp. 1604–1607). Milan, Italy. https://doi.org/10.1109/EMBC.2015.7318681

Daim, T. U., Basoglu, N., & Topacan, U. (2013). Adoption of health information technologies: The case of a wireless monitor for diabetes and obesity patients. *Technology Analysis and Strategic Management*, *25*(8), 923–938. https://doi.org/10.1080/09537325.2013.823150

Davis, C. R., & Rosenfield, L. K. (2015). Looking at Plastic Surgery through Google Evidence and the First Plastic Surgical Procedures. *Plastic and Reconstructive Surgery*, *135*(3), 918–928. https://doi.org/10.1097/PRS.0000000000001056

Davis, F., & Bagozzi, R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, *35*(8), 982–1003.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *Information Technolog MIS Quarterly*, *13*(3), 319–340.

Ducey, A. J., & Coovert, M. D. (2016). Predicting tablet computer use: An extended Technology Acceptance Model for physicians. *Health Policy and Technology*, *5*(3), 268–284. https://doi.org/10.1016/j.hlpt.2016.03.010

Eyes-On Glasses 3.0 - medical smart glasses. (n.d.).

Feng, S., Caire, R., Cortazar, B., Turan, M., & Wong, A. (2014). Immunochromatographic Diagnostic Test Analysis Using Google Glass. *ACS Nano*, *8*(3), 3069–3079.

Fornell, C., & Larcker, D. F. (1981). Evaluation Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50.

Friedman, E. (2016). Top Features of Smart Glasses: Hands-free Documentation. Retrieved September 12, 2017, from https://brainxchange.io/4-features-smart-glasses-hands-free-documentation/

Göken, M., Başoğlu, N. A., & Dabic, M. (2016). Exploring Adoption of Smart Glasses: Application in Medical Industry. In *PICMET*. Hawaii.

Göken, M., Başoğlu, N. A., Dabic, M., Özdemir Güngör, D., & Daim, T. (2017). Exploring Adoption of Augmented Reality Smart Glasses: Application in Medical Industry. *Frontiers of Engineering Management*, In Press.

Gregg, H. (2014a). 5 Hospitals Using, Piloting Google Glass.

Gregg, H. (2014b). Why Hospitals Are Hesitant to Use Google Glass. *Health IT & CIO Review*, 1–7.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *The Journal of Marketing Theory and Practice*, *19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2012). Partial Least Squares: The Better Approach to Structural

Equation Modeling? *Long Range Planning*, *45*(5–6), 312–319. https://doi.org/10.1016/j.lrp.2012.09.011

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial Least Squares Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance. *Long Range Planning*, *46*(1–2), 1–12. https://doi.org/10.1016/j.lrp.2013.01.001

Hair, J. F., Sarstedt, M., Pieper, T. M., & Ringle, C. M. (2012). The Use of Partial Least Squares Structural Equation Modeling in Strategic Management Research: A Review of Past Practices and Recommendations for Future Applications. *Long Range Planning*, *45*(5–6), 320–340. https://doi.org/10.1016/j.lrp.2012.09.008

Hein, D. W. E., & Rauschnabel, P. A. (2016). Augmented Reality Smart Glasses and Knowledge Management: A Conceptual Framework for Enterprise Social Networks. In *Enterprise Social Networks* (pp. 83–109).

Hofmann, B., Haustein, D., & Landeweerd, L. (2017). Smart-Glasses: Exposing and Elucidating the Ethical Issues. *Science and Engineering Ethics*, *23*(3), 701–721. https://doi.org/10.1007/s11948-016-9792-z

Holden, R. J., & Karsh, B.-T. (2010). The technology acceptance model: its past and its future in health care. *Journal of Biomedical Informatics*, *43*(1), 159–72. https://doi.org/10.1016/j.jbi.2009.07.002

Hsiao, J., & Chen, R. (2016). Critical factors influencing physicians ' intention to use computerized clinical practice guidelines : an integrative model of activity theory and the technology acceptance model. *BMC Medical Informatics and Decision Making*, *16*(3), 1–15. https://doi.org/10.1186/s12911-016-0241-3

Hung, S., Tsai, J. C., & Chuang, C. (2014). Investigating primary health care nurses â€™ intention to use information technology : An empirical study in Taiwan. *Decision Support Systems*, *57*, 331–342.

Kalantari, M., & Rauschnabel, P. A. (2018). Exploring the Early Adopters of Augmented Reality Smart Glasses: The Case of Microsoft HoloLens. In T. Jung & M. C. T. Dieck (Eds.), *Augmented Reality and Virtual Reality* (pp. 1–17). https://doi.org/10.1007/978-3-319-64027-3

Karahanna, E., Agarwal, R., & Angst, C. (2006). Reconceptualizing Compatibility Beliefs in Technology Acceptance Research. *MIS Quarterly*, *30*(4), 781–804. https://doi.org/10.2307/25148754

Kassirer, J. P. (2000). Patients , physicians , and the Internet. *Health Affairs*, *19*(6), 115.

Kim, K. J., & Dong-Hee, S. (2015). An acceptance model for smart watches Implications for the adoption of future wearable technology. *Internet Research*, *25*(4), 527–541. https://doi.org/10.1108/MBE-09-2016-0047

Kolodzey, L., Grantcharov, P. D., Rivas, H., Schijven, M. P., & Grantcharov, T. P. (2017). Wearable technology in the operating room : a systematic review. *BMJ Innov*, *3*, 55–63. https://doi.org/10.1136/bmjinnov-2016-000133

Kuo, K. M., Liu, C. F., & Ma, C. C. (2013). An investigation of the effect of nurses' technology readiness on the acceptance of mobile electronic medical record systems. *BMC Med Inform Decis.*, *13*(8), 1–14. https://doi.org/10.1186/1472-6947-13-88

Kwong, K., & Wong, K. (2013). Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. *Marketing Bulletin, Technical Note*.

Lapointe, L., & Rivard, S. (2005). A Multilevel Model of Resistance to Information Technology

Implementation. *Mis Quarterly*, *29*(3), 461–491. https://doi.org/10.2307/25148692

Lazuras, L., & Dokou, A. (2016). Mental health professionals' acceptance of online counseling. *Technology in Society*, *44*, 10–14. https://doi.org/10.1016/j.techsoc.2015.11.002

Lee, F., Teich, J. M., Spurr, C. D., & Bates, D. W. (1996). Implementation of physician order entry: user satisfaction and self- reported usage patterns. *J Am Med Inform Assoc*, *3*(November), 42–55. https://doi.org/10.1136/jamia.1996.96342648

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, *40*(3), 191–204. https://doi.org/10.1016/S0378-7206(01)00143-4

Lukowicz, P., Kirstein, T., & Tröster, G. (2004). Wearable systems for health care applications. *Methods of Information in Medicine*, *43*(3), 232–8. https://doi.org/10.1267/METH04030232

May, C., Gask, L., Atkinson, T., Ellis, N., Mair, F., & Esmail, A. (2001). Resisting and promoting new technologies in clinical practice: The case of telepsychiatry. *Social Science and Medicine*, *52*(12), 1889–1901. https://doi.org/10.1016/S0277-9536(00)00305-1

Mechanic, D. (2003). Physician Discomfort Challenges and Opportunity. *Journal of the American Medical Association*, *290*(7), 941–946. https://doi.org/10.1001/jama.290.7.941.

Meyer, S. (200AD). Concierge medicine: Who really pays for gold standard access to doctors? *Trustee*. https://doi.org/10.1177/017084068800900203

Mitrasinovic, S., Camacho, E., Trivedi, N., Logan, J., Campbell, C., Zilinyi, R., … Connolly, E. S. (2015). Clinical and surgical applications of smart glasses. *Technology and Health Care*, *23*(4), 381–401. https://doi.org/10.3233/THC-150910

Monroy, G. L., Shemonski, N. D., Shelton, R. L., Nolan, R. M., & Boppart, S. A. (2014). Implementation and evaluation of Google Glass for visualizing real-time image and patient data in the primary care office. *Proc. SPIE*, *8935*, 893514–893519. https://doi.org/10.1117/12.2040221

Moon, S., & Seo, J. (2015). Integration of Smart Glass Technology for Information Exchange at Construction Sites. In *Proceedings of the International Symposium on Automation and Robotics in Construction* (pp. 1–2).

Moshtaghi, O., Kelley, K. S., Armstrong, W. B., Ghavami, Y., Gu, J., & Djalilian, H. R. (2015). Using google glass to solve communication and surgical education challenges in the operating room. *The Laryngoscope*, *125*(10), 2295–2297. https://doi.org/10.1002/lary.25249

Muensterer, O. J., Lacher, M., Zoeller, C., & Bronstein, M. (2014). Google Glass in pediatric surgery: An exploratory study. *International Journal of Surgery*, *12*(4), 281–289.

Ni, T., & Baudisch, P. (2009). Disappearing mobile devices. *Proceedings of UIST 2009*, 101–110. https://doi.org/10.1145/1622176.1622197

Oremus, W. (2015). Google Glass: The future's not very bright | Charlotte Observer.

Overhage, J. M., Perkins, S., Tierney, W. M., & McDonald, C. J. (2001). Controlled Trial of Direct Physician Order Entry. *Journal of the American Medical Informatics Association*, *8*(4), 361–371. https://doi.org/10.1136/jamia.2001.0080361

Procurement Guide for Hospital Information Management Systems. (2010). Ankara: TC Ministry of Health Administrative and Financial Affairs Department.

Quint, F., & Loch, F. (2015). Using Smart Glasses to Document Maintenance Processes. In *A. Weisbecker, M. Burmester & A. Schmidt (Hrsg.): Mensch und Computer 2015 Workshopband* (pp. 203–208). Stuttgart.

Ratanawongsa, N., Barton, J. L., Lyles, C. R., Wu, M., Yelin, E. H., Matinez, D., & Schillinger, D. (2015). Association Between Clinician Computer Use and Communication with Patients in Safety-Net Clinics. *Jama*, *176*(1), 125–127. https://doi.org/10.1001/jamainternmed.2015.6102.4

Rauschnabel, P. A., Brem, A., & Ivens, B. S. (2015). Who will buy smart glasses? Empirical results of two pre-market-entry studies on the role of personality in individual awareness and intended adoption of Google Glass wearables. *Computers in Human Behavior*, *49*, 635–647. https://doi.org/10.1016/j.chb.2015.03.003

Richardson, L., Keefe, K., Huber, C., Racevskis, L., Reynolds, G., Thourot, S., & Miller, I. (2014). Assessing the value of the Central Everglades Planning Project (CEPP) in Everglades restoration : An ecosystem service approach. *Ecological Economics*, *107*, 366–377. https://doi.org/10.1016/j.ecolecon.2014.09.011

Ro, Y. K., Brem, A., & Rauschnabel, P. A. (2018). Augmented Reality Smart Glasses: Definition, Concepts and Impact on Firm Value Creation (pp. 169–181). Springer, Cham. https://doi.org/10.1007/978-3-319-64027-3_12

Rogers, E. M., & Everett, M. (1983). *Diffusion of Innovation* (3rd ed.). New York: THE FREE PRESS. https://doi.org/82-70998

Rowe, M., Bozalek, V., & Frantz, J. (2013). Using Google Drive to facilitate a blended approach to authentic learning. *British Journal of Educational Technology*, *44*(4), 594–606. https://doi.org/10.1111/bjet.12063

Rubin, R. (2017). With Enterprise Edition, Google Glass finds its ROI calling | ZDNet.

Ruminski, J., Bujnowski, A., Andrushevich, A., Biallas, M., & Kistler, R. (2016). The data exchange between smart glasses and healthcare information systems using the HL7 FHIR standard. In *2016 9th International Conference on Human System Interactions (HSI)* (pp. 525–531).

Sanchez, G. (2013). *PLS Path Modeling with R. R Package Notes*. https://doi.org/citeulike-article-id:13341888

Shaoa, P., Ding, H., Wang, J., Liu, P., Ling, Q., Chen, J., … Xu, R. (2014). Designing a wearable navigation system for image-guided cancer resection surgery. *Ann Biomed Eng.*, *42*(11), 2228–2237. https://doi.org/10.1007/s10439-014-1062-0.Designing

Shaygan, A., Ozdemir-Gungor, D. Kutgun, H., & Daneshi, A. (2017). Adoption Criteria Evaluation of Activity Tracking Wristbands for University Students. *Picmet*.

Sijie, X., Sujie, Z., Yisheng, J., Binyao, J., Xiaohua, T., Xuesheng, Z., & Xinbing, W. (2017). iBlink: Smart Glasses for Facial Paralysis Patients. In *MobiSys '17 Proceedings of the 15th Annual International Conference on Mobile Systems, Applications, and Services* (pp. 359–370). New York, USA. https://doi.org/10.1145/3081333.3081343

TOBB. (2017). Turkey Healthcare Landscape. Retrieved from https://www.tobb.org.tr/saglik/20171229-tss-genel-bakis-en.pdf

Township, D., & District, L. (2017). The Staffs ' Adoption Intention Of Knowledge Management System In Green Hospital — The Theory Of Technology Acceptance Model Applied. *Internation Journal of Organizational Innovation*, *9*(3), 27–36.

Turan, A. H., & Palvia, P. C. (2014). Critical information technology issues in Turkish healthcare. *Information & Management*, *51*(1), 57–68. https://doi.org/10.1016/J.IM.2013.09.007

Vallurupalli, S., Paydak, H., Agarwal, S. K., Agrawal, M., & Assad-Kottner, C. (2013). Wearable technology to improve education and patient outcomes in a cardiology fellowship program - A feasibility study. *Health and Technology*, *3*(4), 267–270. https://doi.org/10.1007/s12553-013-0065-4

Venkatesh, V., & Davis, F. (2000). A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204. https://doi.org/WOS:000086130700002

Venkatesh, V., & Zhang, X. (2014). Unified Theory of Acceptance and Use of Technology: U.S. Vs. China. *Journal of Global Information Technology Management*, *13*(1), 5–27. https://doi.org/10.1080/1097198X.2010.10856507

Vinzi, V. E., Trinchera, L., & Amato, S. (2010). PLS path modeling: from foundations to recent developments and open issues for model assessment and improvement. In V. Esposito Vinzi, W. W. Chin, J. Henseler, & H. Wang (Eds.), *Handbook of Partial Least Squares* (pp. 47–83). Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-540-32827-8

Wang, C.-H. (2015). A market-oriented approach to accomplish product positioning and product recommendation for smart phones and wearable devices. *International Journal of Production Research*, *53*(8), 2542–2553. https://doi.org/10.1080/00207543.2014.991046

Wu, J. H., Wang, S. C., & Lin, L. M. (2007). Mobile computing acceptance factors in the healthcare industry: A structural equation model. *International Journal of Medical Informatics*, *76*(1), 66–77. https://doi.org/10.1016/j.ijmedinf.2006.06.006

Yarbrough, A. K., & Smith, T. B. (2007). Technology acceptance among physicians: a new take on TAM. *Medical Care Research and Review : MCRR*, *64*(6), 650–72. https://doi.org/10.1177/1077558707305942

Yu, P., Li, H., & Gagnon, M.-P. (2009). Health IT acceptance factors in long-term care facilities: a cross-sectional survey. *International Journal of Medical Informatics*, *78*(4), 219–29. https://doi.org/10.1016/j.ijmedinf.2008.07.006

Zak, C., D'Aprix, T., & Billitier, A. (2002). Electronic Data Gathering for Emergency Medical Services. United States.

Zheng, X. S., Foucault, C., Silva, P. M. da, Dasari, S., Yang, T., & Goose, S. (2015). Eye-Wearable Technology for Machine Maintenance: Effects of Display Position and Hands-free Operation. *Proceedings of the ACM CHI'15 Conference on Human Factors in Computing Systems*, *1*, 2125–2134. https://doi.org/10.1145/2702123.2702305

Appendix 1: Variables Used in the Model Testing

Variable	Aver.	Weight	Load.	Com.	Red.
CONSTRUCT: Integration with IS					
I would like it to have voice to text converter software	4.343	0.406	0.780	0.608	0.00
I would like it to function synchronously with hospital IS	4.638	0.414	0.731	0.535	0.00
I would like it to improve physician patient communication	4.190	0.485	0.784	0.614	0.00
CONSTRUCT: Documentation					
I would like to use it in documentation of medical information	4.657	0.560	0.959	0.919	0.00
I would like to use it for screening medical information	4.714	0.490	0.945	0.894	0.00
CONSTRUCT: External Effects					
My friends advise me to use these devices	3.733	0.447	0.862	0.744	0.00
I have read many articles supporting the use of these devices in medical settings	4.028	0.655	0.938	0.881	0.00
CONSTRUCT: Hands Free					
I would like to give voice command	4.247	0.284	0.754	0.569	0.00
I would like to take photos hands-free	4.476	0.476	0.890	0.792	0.00
I would like to make hands-free documentation	4.409	0.430	0.842	0.709	0.00
CONSTRUCT: Technological Compatibility					
I can easily use technological devices	4.180	0.590	0.829	0.687	0.00
I find use of these kind of devices ethical	4.704	0.608	0.840	0.706	0.00
CONSTRUCT: Perceived Ease of Use					
It is hard to use (negative)	4.114	0.456	0.737	0.544	0.19
I can easily do my job with it.	4.257	0.732	0.907	0.823	0.29
CONSTRUCT: Perceived Usefulness					
It is useful.	4.304	0.342	0.83	0.689	0.43
It would save my time.	4.447	0.396	0.885	0.784	0.49
It would simplify my job.	4.419	0.403	0.908	0.825	0.51
CONSTRUCT: Attitude					
I think it is useful for my job.	4.390	0.505	0.904	0.817	0.53
I would advise other employees to use it.	4.371	0.585	0.929	0.863	0.56
CONSTRUCT: Intention					
I would use it in diagnostic processes.	4.257	0.366	0.775	0.6	0.15
I would use it for telemedicine purposes.	4.342	0.295	0.733	0.538	0.13
I Would use it in medical education.	4.590	0.573	0.872	0.761	0.19