EXTENDING TECHNOLOGY ACCEPTANCE MODEL (TAM) WITH THE THEORY OF TECHNOLOGY READINESS

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Abstract

Technological developments provide numerous advantages for users; yet, competition conditions, investment costs, and consumer expectations make it challenging to hold products in the market. Hence, research in technology acceptance and dissemination gains importance day by day, and they are carefully followed not only by the researchers but also by the application community. The primary purpose of this study is to evaluate the Technology Acceptance Model (TAM) and Technology Readiness Indices (TRI), which are among the most frequently used sources in the acceptance of innovations and in evaluating the technological susceptibility of individuals within the scope of an expanded model. The technology mentioned in the items was Online Attendance Systems (OASs), used in higher education. The extended model has been tested using Multiple Linear Regression (MLR) procedures. The data set was composed of 389 faculty members' responses from seven different universities in Turkey. According to the analysis results, the combination of TAM and TRI variables scored a 58,6% explanation rate for Behavioral Intention, which is regarded as high predictive performance in technology acceptance literature.

Keywords: *TAM, TRI, Model Suggestion, Regression Analysis, Academicians, Survey*
Jel Classification: *C83, O33*

TEKNOLOJİ KABUL MODELİNİN (TKM) TEKNOLOJİYE HAZIR OLMA TEORİSİYLE GENİŞLETİLMESİ

Öz

Teknolojik gelişmeler kullanıcılar için sayısız avantaj sağlarken, rekabet koşulları, yatırım maliyetleri ve tüketici beklentileri ürünlerin tutunmasını zorlaştırmaktadır. Bu nedenle, teknoloji kabulü ve yayılması alanında yapılan araştırmalar gün geçtikçe önem kazanmaktadır ve sadece araştırmacılar değil uygulama camiası tarafından da dikkatle takip edilmektedir. Bu çalışmanın temel amacı, yeniliklerin kabulünde ve kişilerin teknolojik yatkınlıklarının değerlendirilmesinde en sık başvurulan kaynaklardan olan Teknoloji Kabul Modeli (TKM) ve Teknolojiye Hazır Olma İndekslerinin (THİ) birleştirilerek genişletilmiş bir model kapsamında değerlendirilmesidir. İfadelerde konu edinilen teknoloji eğitim alanında kullanılan çevrimiçi yoklama sistemleridir. Genişletilmiş model Çoklu Lineer Regresyon (ÇLR) Analizi kullanılarak test edilmiştir. Araştırmanın veri seti Türkiye'deki yedi farklı üniversiteden 389 akademisyenin görüşleri ile oluşturulmuştur. Analiz sonuçlarına göre, TKM ve THİ değişkenlerinin birleştirilmesi, Davranışsal Niyeti %58,6 açıklama oranına erişerek, teknoloji kabul literatüründe yüksek olarak değerlendirilebilecek bir tahmin performansı ortaya koymuştur.

Anahtar Kelimeler: *TKM, THİ, Model Önerisi, Regresyon Analizi, Akademisyenler, Anket*
Jel Sınıflandırması: *C83, O33*

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1. Introduction

Technology Acceptance Model (TAM) and the extension, validation, derivation, or merging of TAM serve a structured basis for the technology acceptance literature. Many theoretical models have been proposed with high explanation power since TAM was introduced. The model has gained a reputation for being able to assess the adaption of many products. Thousands of studies have been tested in different nations, cultures, and products, and their validity and reliability have been verified repeatedly.

Although technology readiness is not examined as much as the adoption of technology, it has an original perspective since technology readiness is evaluated under various structures. Then, the subjects are divided into segments, referring to different readiness characteristics. On the other hand, the technology readiness index examines the acceptance phenomenon in the context of characteristic features such as Innovativeness, Optimism, Discomfort, and Insecurity.

The effects of the concepts of Innovativeness, Optimism, Insecurity, and Discomfort, which stand for technology readiness, cannot be ignored in adopting technologies. Since if an individual is not ready for new technologies, further acceptance of technologies cannot be considered. Hence, we thought that the variables included in the technology readiness research would have an essential role in technology adoption behavior. Burton-Jones ve Hubona, 2006: 706) emphasized that new technologies sometimes cannot reach the desired full capacity; hence, they are rejected. Thus, it is essential to explain and predict end-users ' adoption of new technologies. Many studies involve the extension of TAM and sub-dimensions of TRI variables. Some critical issues on these studies are based on stimulating TRI drivers to use technological services better and blocking TRI inhibitors' effects (Lin and Chang, 2011, Koivisto et al.,2016; Blut and Wang, 2019).

This research aims to combine the constructs in the TAM with the technology readiness constructs and expand the original TAM model. To our best of knowledge, this is one of the first studies employing MLR analysis for testing the combination of TAM and TRI constructs at the same time. Also, the research differs from the limited number of similar comprehensive studies in the literature by the data set, which comprises faculty members' responses. The sample of the study consists of faculty members from seven Turkish Public and Private Universities. We employed Online Attendance Systems (OASs) scale. The structures in the technology readiness index reveal the state of technology readiness of the faculty members, and the technology acceptance model contains expressions regarding the level of adoption of technology by faculty members.

2. Theoretical Framework

2.1. Technology Acceptance Model

As a result of developing ideas that Davis explained for the first time in his doctoral thesis, he argued that new technologies adoption by individuals depends on the Perceived Usefulness (PU) and Perceived Ease of Use (PEoU) variables (Davis, 1986). His model poses that the success of information systems is not only evaluated by technical and managerial qualifications, but it may also change by the personal characteristics, expectations, and perceptions of the users that may affect the success of adoption primarily. The theoretical foundations of the model underlie the Theory of Reasoned Actions (TRA), created by Fishbein and Ajzen (1975). TAM is largely believed to be simplistic, predictive, robust, and comparable (Venkatesh and Davis, 2000).

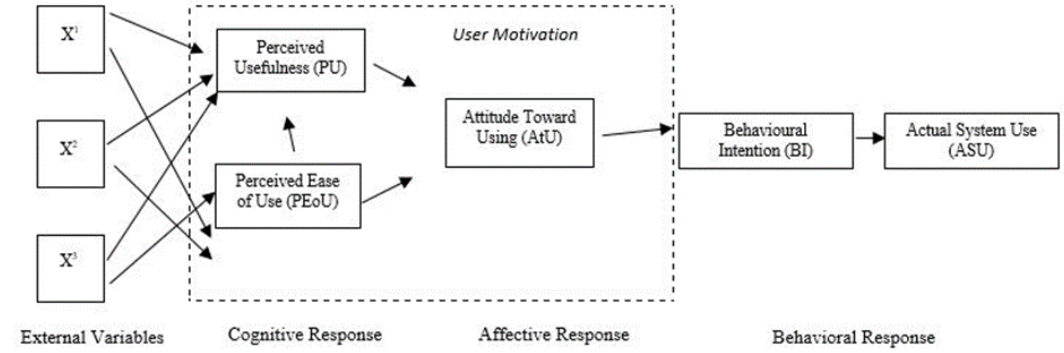
TAM consists of several causal relationships. Perceived Usefulness (PU) is defined as the possibility that an individual takes forward business productivity in an organizational context by using a particular system. Scoring high in Perceived Usefulness (PU) means users believe in the positive use-performance relationship. Thus, it enables users to have a more efficient system experience (Davis, 1989: 320). Perceived Ease of Use (PEoU) is identified as the level of individual belief, which he or she can get rid of physical and mental efforts using particular system. In the model, Perceived Ease of Use (PEoU) is assumed to show a significant immediate influence on Perceived Usefulness

(PU). Because when integral components are equivalent, a system that appears more comfortable to use will improve work performance (Davis, 1986: 26).

Consequently, attitude is a function of two underlying beliefs, as Perceived Benefit (PB) and Perceived Ease of Use (PEoU). Attitude towards Using (AtU) refers to the level at which a user is interpreted to harness the use of the target system in his work (Fishbein and Ajzen, 1975: 216). Therefore, the definition of attitude and measurement is consistent with the description of behavioral criteria proposed by Ajzen and Fishbein (1977). Behavioral Intent (BI) is a gauge of the power of a person's intention to perform a particular behavior (Fishbein and Ajzen, 1975: 288). Just like in TRA, TAM indicates that computer use is intentionally determined. However, it differs from the idea that the user's intention is defined in common with his AtU of the system and PU (Davis et al., 1989: 985).

On the other hand, actual system usage (ASU) means the direct use of a particular system individually. Therefore, it is a highly dynamic behavioral criterion, which is goal-specific, repetitive, non-specific to action, context, and timeframe. (Fishbein and Ajzen, 1975: 353).

Figure 1. **Technology Acceptance Model**



Source: Davis, Bagozzi and Warshaw 1989, p. 935

Prior studies found that PU, PEoU, and BI are significant factors to expect Behavioral use of various technologies (Davis and Venkatesh, 1996; Lee et al., 2003; Ke et al., 2012; Koul and Eydgahi, 2018). In particular, Venkatesh and Davis (2000: 186) stated that the model illustrated a meaningful portion of the variables (about 40%) in the system use behavior.

2.2. Technology Readiness Index

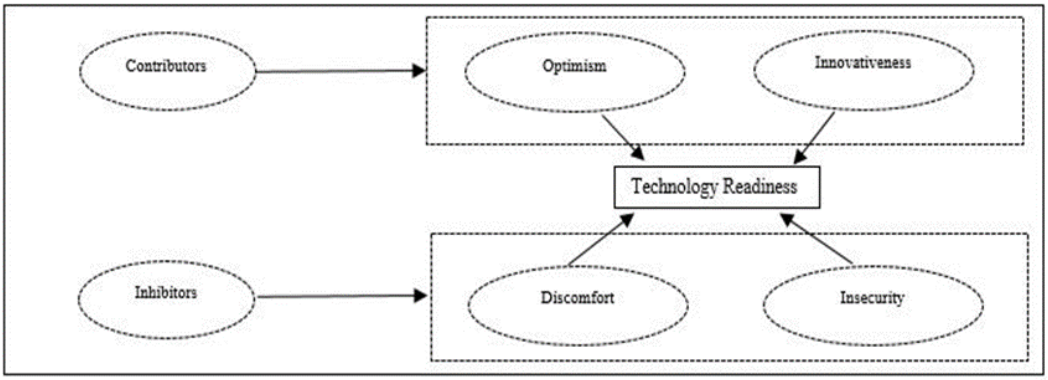
Parasuraman (2000) created the Technology Readiness Index (TRI) to comprehend the attitudes and behaviors of individuals in technology-related issues. Technology Readiness (TR) is simply identified by Parasaruman as individuals' leverage to unfold and use bleeding-edge technologies to reach objectives in their daily lives and workplaces (Parasaruman, 2000: 308).

TRI is a multiple-item scale to figure individuals' preparedness to interact with technology. The author divided the structure into two sides: positive and negative beliefs on technology and four distinct apparent technology readiness characteristics: Optimism, Innovativeness, Discomfort, and Insecurity.

Hence, thanks to ICTs (mobile technologies, social network sites, and cloud computing), which were in the age of their infancy approximately 20 years ago, they are now strongly influencing individuals' lives. Therefore, in 2015, Parasaruman and Colby (2015) embarked on a project to upgrade and regularize TRI; consequently, TRI v. 2.0 was formed.

The following figure presents the most recent version of technology readiness index drivers and the relation among the drivers in terms of positive (optimism, innovativeness) or negative (discomfort, insecurity) effect.

Figure 2. **Technology Readiness Index Drivers**



Source: Ling and Moi, 2007, p. 88

Optimism (O) can be identified in the context of favorable aspects of technology and beliefs such as productivity, control, flexibility, and efficiency. The Innovativeness (In) indicates inclination be a pioneer and opinion leader in technology (Parasaruman, 2000: 311). Both O and In are the indicators that might enhance users' technology readiness. Discomfort (D) shows a deficiency of control in new technology and overwhelming. The model measures the threat and apprehensions, which individuals experience while encountering technology. Insecurity (I), as an inhibitor, refers to skepticism about deprivation of confidence in technology and the capability to work adequately. Insecurity (I) concentrates on the apprehensions of individuals when they face a new system or process (Parasaruman, 2000: 311). Discomfort (D) and Insecurity (I) can be counted as inhibitors that may compress TR. TRI provides a clear and scientific idea of whether the individual is ready for technology utilizing the scores obtained from these four dimensions.

Parasaruman divided people into five sections in terms of their technology readiness: Explorers (E), Pioneers (P), Skeptics (S), Paranoids (P), and Laggards (L). Individuals with high scores in O can adopt new technologies earlier, faster, and are called "explorers and "pioneers" (Parasuraman and Colby, 2001: 60). Explorers are strongly motivated and emphasize confidence in the use of technology. They mostly belong to younger age groups, and such individuals have a higher income and are more educated.

Pioneers (P) have above-average scores in contributors and inhibitors. Besides, they perform insufficient reluctance for new systems. Individuals who belong to this dimension have average revenue and education, and they are younger parts of the population (Parasuraman and Colby, 2001; Massey et al., 2007: 282).

Paranoids and laggards occupy discomfort (D) and Insecurity (I) dimensions of the index. Paranoids adopt technology, and they feel optimistic, but they do not tend to innovate about it. They accept technologies when the intensity of technological diffusion begins to diminish. Individuals belonging to this group are middle-aged or older, mostly women, and their welfare and educational levels are low (Parasuraman and Colby, 2001; Massey et al., 2007: 282).

Individuals in the segment of "laggards" were identified as the least likely group to adopt the technology. They have low scores for the dimensions of innovation and optimism. In a way, they are the opposite of explorers. Laggards are usually the oldest individuals, mostly women, and have the least income and education level (Parasuraman and Colby, 2001; Massey et al., 2007: 282).

There is another group in the middle of these four groups: Skeptics. Skeptics are not against technology and new systems; they just have a weak level of desire and enthusiasm. They generally do not tend to adopt what technology offers them to control more in their lives. Individuals who belong to this dimension have an intention to wait and see until the benefits of technology are proven. Contributors' and inhibitors' scores were usually very low. In this segment, individuals have

average ages, incomes, and education (Parasuraman and Colby, 2001; Massey et al., 2007: 282).

Table 1. **Characteristics of the Five Segments of TRI**

	Optimism	Innovativeness	Discomfort	Insecurity
Explorers	High	High	Low	Low
Pioneers	High	High	High	High
Skeptics	Low	Low	Low	Low
Paranoids	High	Low	High	High
Laggards	Low	Low	High	High

Source: Badri et al., 2014: 265

Rose and Fogarty (2010) found that mature consumers were less likely to be an early adopter (explorers and pioneers) and more likely to adopt at the late growth stage or decline (skeptics and laggards). Besides, it was seen that some individuals (even over the age of 69) belonged to the group of explorers and pioneers. In Badri et al.`s research (2014), teachers are classified under five segments that consist of "explorers" (21,48%)," pioneers" (15,45%), "skeptics" (22,49%), "paranoids" (15,82%) and "laggards" (24,45%) with the highest percentage of "laggards" and "explorers" in Abu Dhabi.

Some studies stated that the TRI index could capture relationships both in technology readiness and technology use behaviors (Pires et al., 2011; Gupta and Gark, 2015; Odlum, 2016; Penz et al., 2017; Smith et al., 2018). In addition, Sun et al. (2020) conducted a study combining TAM and TRI components in customer relationship management and analyzed with the SEM; Simiyu and Kohsuvan (2019) analyzed mobile banking adoption in the context of TAM&TRI; Kim and Chiu (2019) investigated wearable technology acceptance by integrating TAM&TRI.

These empirical studies found that technology readiness associates with factual use and intention to use technology-based products and services at various levels.

In particular, Nugroho and Fajar (2017) found that Optimism and Innovativeness had a great effect on adopting a web-based attendance system, while Discomfort and Insecurity had no impact on the intention to use it. They also found that organizational support has a powerful effect on the acceptance of imperative systems. Discomfort affects PEoU, and PU is not supported in the study because the users are not in peace and feel anxiety in using a web-based attendance system. Besides, the effect of Insecurity (I) on ease of use is not supported due to users' mistrust of a web-based attendance system. The users who are feeling insecure have a few reliance on the new technology characteristically. Said et al. (2008) investigated fingerprint-based attendance systems and found that Innovativeness and optimism have a positive effect on users' readiness. However, discomfort and Insecurity had a negative relevance to the faculty members. The author states that faculty members are cognizant of technology and optimist with the implementation in the organization. Incidentally, they still feel mistrustful and discomfort in justification and impact of implementation. On the other hand, in their scale development study, Wu et al. (2013) constructed a technology readiness scale to measure users' readiness to RFID door security systems. The constructed scale gained high GFI (0,96), AGFI (0,94), RMSEA (0,03), CFI (0,99) and PCFI (0,75) score. These indicators showed that the model was acceptable.

3. Method

The survey instrument was used to collect the data in this study. The target group of respondents was from the seven state and private Turkish universities (Sakarya University, Bursa Technical University, Bilecik Seyh Edebali University, Bülent Ecevit University, Dumlupınar University, Fırat University, İstanbul Bilgi University, Recep Tayyip Erdoğan University). Since the authors of this study had access to academicians and Information Technology departments particularly, these institutions were chosen. In addition, these universities are currently offering online attendance systems as an option to their academicians, teaching online courses. This study focused on academics

who are using online attendance systems. Thus, using an online attendance system in university is necessary to complete the survey. The online survey was sent to approximately 2300 academicians working in seven universities via e-mail between February 1, 2019, and March 1, 2019.

The survey had four sections. The first section consists of six demographic questions. The second section is related to technology usage frequency, which involves four questions. The third section focused on technology readiness and had nineteen questions from Parasaruman's (2000: 312-313) TRI index (7-Optimism, 5-Innovativeness, 3-Discomfort, 4-Insecurity). The final part is about the technology acceptance model taken from Davis (1989) and consists of 10 questions (3-Perceived Usefulness, 3-Perceived Ease of Use, 4-Behavioral Intention). Five-Point-Likert scale (1-Strongly Disagree to 5-Strongly Agree) was used in the survey. The data were collected from 389 respondents, which formed approximately %20 of the whole. Snowball approach has been adopted in administering the survey, and all faculty members registered as instructors on any course previously and at the time of data collection have received an invitation e-mail from their respective Distance Education centers.

For the pilot testing, the survey was sent to 35 academicians to get their feedback and to measure and observe relationships among the items. The pilot test was carried out approximately three months (December 13, 2018) before initiating mass data collection efforts. The responses were positive, but the preliminary analysis results required minor revisions. The items OPT_1 (with .306 factor loading) (New information technologies contribute to having a better life quality), OPT_3 (with .393 factor loading) (I follow the latest technological developments in my interests), INN_3 (with .391 factor loading) (While using information technologies for my purposes, I realize that I face fewer problems than other people) and DIS_2 (with .363 factor loading) (Many new information technologies have health or safety risks which have not yet been discovered) had lower factor loadings. Thus, they were removed from the instrument. The analysis proceeded with 25 items.

The two factors, 'Discomfort' and 'Insecurity', have negative statements. Items in these two factors were recorded reverse for analysis. These two factors will be mentioned as 'Comfort' and 'Security' in the next parts of the study.

SPSS v25.0 was used to analyze demographics, validity and reliability, and factor analysis. MLR analysis was used to observe and measure the model and its latent variables.

Regression analysis and PLS are two different methods used in model-tested research. Many studies suggest that the MLR method gives healthier results compared to PLS in testing two-stage models containing single dependent variables (Aiken et al., 2003; Meyers et al., 2006; Urbina, 2004; Ho, 2006; Gray et al., 2007). According to Marill (2004: 94), the two advantages of MLR are that it leads to a more accurate and precise understanding of the association of each factor with the outcome and allows the investigator to account for all of these potentially important factors in one model. The main reason for preferring MLR in this study is that there is only one dependent variable in the model.

Comparing with Structural Equation Modelling (SEM), MLR can be more useful to define clear explanations in relationships. Stoel and Garre (2011: 102) state in their growth curve modeling analysis both in MLR and SEM that MLR is more flexible in the approach of the time variable and estimating a growth curve model within SEM will be a tedious exercise.

Tomarken et al. (2005: 55) emphasize that structural equation modeling cannot compensate for limitations in design and method, and even an entirely correct theoretical model can fit poorly and yield highly biased estimates if the study is poorly designed. Thus, we created a simple but effective model to explain the relationships in a given model based on MLR.

4. Findings

This section presents statistical findings regarding descriptive and factor analysis, reliability,

and correlations among variables. Results of Multiple Regression Analysis and model fit indices are also presented.

4.1. Descriptive Statistics

Table 2 presents that, respondents based on gender consisted of 215 (55,3%) male and 174 (44,7%) female. The study has five age groups that 20-30 (20,8%), 31-40 (52,2%), 41-50 (17,7%), 51-60 (6,2%) and 60+ (3,1%). 121 respondents are research assistants (31,1%). 260 respondents have a Ph.D. degree (66,9%). 115 respondents have 13+ years of experience (29,6%).

The sample was well distributed in terms of gender, graduation, and years of experience, where respondents older than 60 and bachelors were scored lower than 5% of the sample. However, the demographic ranges were found to be proper for further analyses.

Table 2. **Demographics**

		N	%
Gender	Male	215	55,3
	Female	174	44,7
Age	20-30	81	20,8
	31-40	203	52,2
	41-50	69	17,7
	51-60	24	6,2
	60+	12	3,1
Title	Instructor	101	26,0
	Research Assistant	121	31,1
	Assistant Professor	109	28,0
	Associate Professor	33	8,5
	Professor	25	6,4
Graduation	Bachelor	18	4,6
	Master	111	28,5
	Doctor of Philosophy	260	66,9
Experience	0-3 Years	69	17,7
	4-6 Years	72	18,5
	7-9 Years	90	23,1
	10-12 Years	43	11,1
	13+ Years	115	29,6
	Total	389	100

The following table presents the IT and OAS usage habits of the respondents. This data helps to gain insight into the technology familiarity of the sample. It is seen that 95 respondents (24,4%) reported that they are busy with IT applications more than 4 hours per day. One hundred sixty-two respondents (41,6%) define themselves as good at using IT components. It seems that 186 respondents (47,8%) are using the online attendance system for over a year.

On the contrary, even 186 of them use the online attendance system for over a year, only 26 of them (6,7%) are using it several times per day. Two hundred fourteen of them (55,0%) use it very few.

The statistics indicate that the online attendance system is not used frequently.

Table 3. **IT and OAS Usage**

		N	%
Usage of IT Apps (Hours)	1-2 per Week	46	11,8
	3-4 per Week	70	18,0
	1-2 per Day	108	27,8
	3-4 per Day	70	18,0
	4+ per Day	95	24,4
IT Usage Level	Very Few	17	4,4
	Enough	147	37,8
	Good	162	41,6
	Very Good	63	16,2
Using OAS Since When	Less Than 1 Month	119	30,6
	Between 1-3 Months	28	7,2
	Between 4-6 Months	17	4,4
	Between 7-12 Months	39	10,0
	Longer Than 1 Year	186	47,8
Usage of OAS Level	Very Few	214	55,0
	Once a Week	55	14,2
	Several a Week	83	21,3
	Once a Day	11	2,8
	Several a Day	26	6,7
	Total	389	100

4.2. Reliability

The reliability of the scale used in the study was analyzed with the Cronbach Alpha coefficient. Nunnally (1978: 245) stated that often associated with the assertion that instruments used in basic research should have the reliability of 0,70 or better.

Table 4. **Cronbach Alpha Scores**

TRI Variables	Cronbach's Alpha	Number of Items
Optimism	.800	5
Innovativeness	.825	4
Discomfort	.484	2
Insecurity	.722	4
TAM Variables		
Perceived Usefulness	.888	3
Perceived Ease of Use	.893	3
Behavioral Intention	.939	4

According to the 0,70 threshold, TRI components optimism (0,800), Innovativeness (0,825), and insecurity (0,722) have alpha scores more than the threshold. However, the "discomfort" component, which has a 0,484-alpha point, has turned out to be quite low, which can be because of misunderstood question statements. However, as Hair et al. (1995, 2013) stated, alpha scores between 0.4 and 0.5 could be marginally acceptable, and since we deemed that discomfort construct is still an important dimension in defining technology readiness perceptions of individuals', we decided to keep it. On the other hand, in Nughoro and Fajar's study (2017: 325), the component "discomfort" had a 0,666-alpha score, and Ling and Muhammad (2006: 154) was found an alpha value of 0,510. Besides, Pires et al. (2011: 223) reached a 0,740-alpha score for "discomfort". Lai (2008: 22) found a low "discomfort" alpha score as 0,620. Table 4 shows Cronbach's alpha scores. All TAM components gained high alpha scores, which means the scale's items are understood clearly by participants. Also, Iqbal and Bhatti (2015: 92) found high TAM components alpha score (PU=0,944, PEU=0,926, BI=0,933) in their study.

4.3. Factor Analysis

Factor loadings were analyzed with the Maximum Likelihood extraction model and Equamax rotation. According to Fabrigar et al. (1999: 277), if data have a normal distribution, the extraction model maximum likelihood is one of the most useful ways to achieve practical calculation on various indexes in the context of the goodness of fit. It enables a significance test for factors and their loadings and correlations among them and calculates confidence intervals. The rotation aims to provide an optimal and compact structure that attempts to have each variable load on factors and maximizes the count of high loadings on variables (Yong and Pearce, 2013: 84). In this study, the equamax rotation was used, which can be counted as a compromise between Varimax and Quartimax. As a mixed rotation type, Equamax reduces the items and the factors.

Additionally, it conducts ramblingly and must be used only when the factors have been explicitly defined (Pett et al., 2003: 143; Tabachnick and Fidel, 2001: 643). A thorough inspection of factors is warranted after factor extraction, and a kind of orthogonal rotation was used to gain more relative and correlated factors.

The scale's sampling adequacy was measured by the Kaiser-Meyer-Olkin (KMO) execution. KMO Sampling Adequacy Measurement is an index used to measure the sample size for factor analysis (Norusis, 1993: 53). It ranges from 0 to 1, where 0,50 is considered suitable for factor analysis. It refers to sample adequacy, and Bartlett's Test of Sphericity points out the item correlation matrix is not an identity matrix, then researchers can move forward with the Factor Analysis (Taherdoost et al., 2014: 377).

Table 5. **KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.888
Bartlett's Test of Sphericity	Approx. Chi-Square	6144.420
	df	406
	Sig.	.000

To determine whether the dependent measures are significantly correlated, we run Bartlett's test for sphericity. Bartlett's Test of Sphericity tests the correlations between dependent variables and independent variables, whether collectively and significant inter-correlation exists (Hair et al., 2010: 706). This test also shows the chi-square score. Inter-correlation between variables is significant (sig= ,000).

The KMO sample adequacy test result was found as 0,888 that Field (2009: 647) stated that the KMO values between 0,8 and 0,9 were great. This result shows that the variables in the scale are available for factor analysis. The Barlett test (Chi-Square=6144.420; p<0,00) results show significant relationships among the variables in the main mass.

Table 6 indicates that all variables in the study have statistically significant relationships with each other the scale's power of explaining total variances measured as 56,93%. According to Hair et al. (2010: 115), in a sample of 350 respondents, factor loadings over 0,3 can be considered meaningful. When the number of participants decreases to 200, this number increases to 0,4. Therefore, these scores are evaluated as sufficient and significant.

Eigenvalues greater than one are preferable and can be interpreted as a sign of that particular dimension or factor sufficient abilities to explain observed variables, yet Eigenvalues greater than zero and as close to as one can also be interpreted as a good sign of expletory power of that dimension (UCLA, n.d.).

Hence optimism dimension/factor with an Eigenvalue of 0.902, tough weaker than other dimensions, can still be useful to assess in technology readiness of academicians in adopting online attendance systems.

Table 6. **Factor Analysis**

Statement	Behavioral Intention	Innovativeness	Security	Perceived Ease of Use	Perceived Usefulness	Comfort	Optimism
BI_2	.779						
BI_4	.769						
BI_3	.769						
BI_1	.768						
INN_2		.791					
INN_1		.692					
INN_4		.583					
INN_5		.538					
SEC_2			.770				
SEC_3			.750				
SEC_4			.536				
SEC_1			.429				
PEU_2				.849			
PEU_3				.807			
PEU_1				.746			
PU_2					.836		
PU_3					.701		
PU_1					.619		
COM_1						.562	
COM_3						.487	
OPT_2							.678
OPT_7							.614
OPT_6							.588
OPT_4							.548
OPT_5							.508
Total Variance Explained 56,937	26, 237	10,667	6,272	5,704	2,810	2,752	2,495
Eigenvalues	8,379	3,419	2,358	1,752	1,451	1,177	0,902

4.4. An Evaluation of TAM and TRI Variables Based on MLR

Multiple Linear Regression (MLR) model is built relating the predictor variables to the response variables. MLR is a statistical regression method for determining linear relationships between multiple predictor variables and a single response variable (Kenton, 2019). It is widely used for its simplicity and the ease with which the resulting coefficients can be interpreted.

MLR assumes that the predictor variables are measured with little error and that the relationships between the two variables are approximately linear; MLR also supposes that the predictor variables are independent since MLR is simply a series of univariate regressions.

MLR is a simple yet powerful method for quick evaluation of data from complex systems. Despite several limitations, MLR's strength is its ability to provide information about the system by analyzing the resulting coefficients. Preliminary relationships can be identified between response variables and significant predictor variables, which could not easily be accomplished using more advanced regression methods.

Our main and single hypothesis is presented below:

H_0 = There is no statistically significant relationship between a higher education instructor's intention to use an online attendance system in his/her online courses and that person's innovativeness, optimism, discomfort, insecurity, perception for ease of use, and usefulness.

H_1 = There is a statistically significant relationship between a higher education instructor's intention to use an online attendance system in his/her online courses and that person's innovativeness, optimism, discomfort, insecurity, perception for ease of use, and usefulness.

Therefore, this research involves six independent variables (innovativeness, optimism, discomfort, insecurity, perceived ease of use, perceived usefulness) and one dependent variable, "behavioral intention". It is aimed to determine how these six factors might explain the variation in an instructor's behavioral intention to use online attendance systems.

The findings of this research could assist the estimation of an instructor's behavioral intention to use related systems based on the knowledge of his/her innovativeness, optimism, discomfort, insecurity, perceived ease of use, perceived usefulness.

This research also contributes to the concept of prediction and error reduction. The findings also claim how successfully predicted an instructor's behavioral intention is that his/her innovativeness, optimism, discomfort, insecurity, perceived ease of use, and perceived usefulness are known. Also, MLR claims if the relationship between the dependent variable and each of the six independent variables statistically significant or is any observed relationship due to chance.

Table 7. **Model Summary** [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson	Regression (p)
1	,765[a]	,586	,579	,57531	1,869	0,000[a]

a. Predictors: (Constant), PU, COMF, SECURE, INNO, PEU, OPT
b. Dependent Variable: BI

The resulting performance measures are presented in Table 7, where the model refers to the regression model and prefers regression significance. The coefficient of determination, R^2, is the proportion of variability in the response variable that the model explains. The proposed model scored 0,586 in R^2, where a value of one indicates that the model has perfect predictability, and a value of zero implies that the model has no predictability. R^2 can be increased by adding new variables even though the new variables add a little predictive capability to the model.

Table 8. **Coefficients** [a]

Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	**Std. Error**	**Beta**	**t**	**p**	**Tolerance**	**VIF**
(Constant)	,113	,123		3,892	,000		
Perceived Usefulness	,342	,011	,307	7,970	,000	,701	1,426
Innovativeness	,337	,023	,371	4,658	,000	,687	1,456
Perceived Ease of Use	,159	,018	,266	4,666	,000	,599	1,669
Comfort	,149	,011	,128	3,817	,004	,599	1,668
Optimism	,110	,025	,135	2,817	,000	,918	1,090
Security	,065	,021	,053	1,550	,000	,920	1,087

a. Dependent Variable: Behavioral Intention

In Table 8, the standard error, or standard deviation, of the coefficient value is used for hypothesis testing and constructing a confidence interval.

The t-statistic tests the hypothesis that the regression coefficient for the population is zero in the presence of the remaining predictor variables. The hypothesized value is set to zero to evaluate if the regression coefficient is zero in the presence of the remaining variables. The t-statistic is then mapped to a normal distribution to determine the P-value of the coefficient. The P-value is the observed significance levels for the t-statistic. The P-value is used to identify variables that could be removed without significantly reducing the model's predictive power. Insignificant variables should be removed one at a time since a variable that is insignificant in the presence of a set of variables may become significant when a variable from that set is removed. If a P-value has an

insignificant value (< 0,05), then that variable can be considered for removal. The F-value is a statistic used to evaluate the model as a whole.

The analysis results present a statistically significant relationship between a higher education instructor's intention to use an online attendance system in his/her online courses and that person's innovativeness, optimism, discomfort, insecurity, perception for ease of use, and usefulness. Accordingly, H_1 is rejected, and H_0 is accepted.

Beta value refers to the prediction strength of the related independent variable. The estimation result of the regression model can be expressed as follows:

Behavioral Intention = 0,113 + 0,342 (Perceived Usefulness) + 0,337 (Innovativeness) + 0,159 (Perceived Ease of Use) + 0,149 (Comfort) + 0,110 (Optimism) + 0,065 (Security)

According to the results, Perceived Usefulness scored the highest with 34,2%, and after, Innovativeness scored to a prediction value of 33,7%. Security, which refers to Insecurity at the beginning of the data gathering process and then recoded and named security, scored the lowest value with the prediction rate of 6,5%.

Perceived Usefulness has been one of the most reliable and effective constructs mentioned in the technology acceptance literature. Its strength has also been verified through this study. On the other hand, Innovativeness refers to the easiness of welcoming technological changes, and the high B value is an expected result. However, security has been found as the least important (min. effect on BI) among the independent variables. Security or feeling secure is mentioned as the biggest barrier in technology dissemination, but it has been measured with the least significant value in recent research. This low value could reveal the change of minds of people in feeling insecure when using digital platforms. Overall, the results indicate that security is the least important variable for Behavioral Intention to adopt new technologies.

5. Conclusion

This research aims to explore factors and theoretical relationships by incorporating TAM and TRI variables. The relations among variables were observed via MLR analysis, and research data is gathered from faculty members of seven universities in Turkey. Four dimensions of TRI (Optimism, Innovativeness, Discomfort, Insecurity) and three variables of TAM (Perceived Usefulness, Perceived Ease of Use, Behavioral Intention) have been incorporated within a theoretical model and tested via SPSS. The model has been tested in the context of online attendance systems acceptance of several universities. The relations between the dependent and independent variables were statistically significant, and the proposed independent variables uncovered 58,6% of the dependent variable, Behavioral Intention. The research model can be identified as a highly predictive model for explaining power in social sciences research. Technology acceptance studies based on very famous acceptance models may predict intentions less successfully than expected (such as Ganciu and Niculescu's (2019:21) research based on the original TAM (explanation rate: 54,1%), Rondan-Cataluna et al. (2015:797) research on TAM-2 (44,1%), Mohammadi and Mahmoodi's (2019: 7) study on TAM-3 (57%), Dwivedi et al. (2019:727) paper on the original UTAUT (38%), and Raman and Don's (2013: 157) research on UTAUT2 (29,5%)). Also, the explanation power of the original research on these models can be assumed as low where the R-square value was 36% for TAM (Davis, 1993:475), 34%-52% for TAM-2 (Venkatesh and Davis, 2000: 195), and 35% for TAM-3 (Venkatesh and Bala, 2008: 292).

This research has both theoretical and practical contributions. It is always challenging to explain a variable, referring to human behavior, intention, or attitude. We, in short, suggest a significant combination by incorporating TAM and TRI constructs and propose high predictive performance together. Also, the MLR analysis we performed may give new promising ideas to other researchers. Researchers can keep the strong factors in this model in similar studies and replace weak constructs with different alternative variables. One of the findings that are thought to contribute to

the practice is that the security variable scored to have the lowest effect. In other words, while security was considered as the most critical factor in technology acceptance ten years ago, today, it seems no longer an obstacle or a concern in technology acceptance.

On the other hand, being innovative makes it easier to accept as expected. Technology companies should focus on attracting innovative people. As expected, this finding is in line with the marketing approach currently applied by technology companies. Perceived benefit is another issue that comes to the fore in terms of acceptance. Promotional activities for technology products can be prepared with slogans that clearly show the benefit that the product will offer to the user. Today, many technology products are marketed by highlighting the technical features that users may not understand. However, since individuals do not have a good command of technical terms, their perceptions of benefits may remain low. Satisfying the end-user about benefits has strategic importance for the adoption of ICTs. If companies can provide a clearer perception of benefit, they could make it easier to hold in the market.

Further research can focus on the relation between technology readiness and technology acceptance constructs. Sİnce technology readiness and technology acceptance are different issues and consist of different psychological structures, the relationships between these factors, derived from TRI and TAM, may shed light on our understanding of technology acceptance.

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Appendix

Survey[1]

Teknoloji Kullanım Sıklığı

Bilişim Teknolojisi uygulamalarını (Office, EBYS, Öğrenci Otomasyonu, İstatistik Programları vb.) kullanım sıklığı

- Haftada 1-2 Saat
- Haftada 3-4 Saat
- Günde 1-2 Saat
- Günde 3-4 Saat
- Günde 4 Saatten Fazla

Bilişim Teknolojisi uygulamalarını (Office, EBYS, Öğrenci Otomasyonu, İstatistik Programları vb.) kullanım düzeyi

- Çok Az Bilgim Var
- Bilgim Var
- İyi Derecede Bilgim Var
- Çok İyi Derecede Bilgim Var

Web Tabanlı Yoklama Sistemini Ne Zamandan Beri Kullanıyorsunuz?

- 1 Aydan Az
- 1-3 Ay Arasında
- 4-6 Ay Arasında
- 7-12 Ay Arasında
- 1 Yıldan Uzun Süredir

Web Tabanlı Yoklama Sisteminin Kullanım Sıklığı

- Çok Az Kullanıyorum

[1] The Survey was applied in Turkish.

- Haftada Bir Defa Kullanıyorum
- Haftada Birkaç Defa Kullanıyorum
- Günde Bir Defa Kullanıyorum
- Günde Birkaç Kez Kullanıyorum

Teknolojiye Hazır Olma

Bilişim Teknolojilerine Hazırlık - İyimserlik

	Kesinlikle Katılıyorum	Katılıyorum	Ne Katılıyorum Ne Katılmıyorum	Katılmıyorum	Kesinlikle Katılmıyorum
1) Yeni bilişim teknolojileri daha iyi bir yaşam kalitesine katkıda bulunur					
2) Bilişim teknolojileri bana daha fazla hareket özgürlüğü verir					
3) İlgi alanlarımdaki son teknolojik gelişmeleri takip ediyorum					
4) Bilişim teknolojileri, insanlara istedikleri yerde yaşama ve çalışma konusunda daha fazla özgürlük verir					
5) Bir şeyleri kendi ihtiyaçlarıma göre uyarlamama izin veren bilişim teknolojilerini severim					
6) Bilişim teknolojileri, mesleğimde beni daha verimli hale getirir					
7) Önemsediğim konularda güncel kalmak için bilişim teknolojilerine güveniyorum					

Bilişim Teknolojilerine Hazırlık - Yenilikçilik

	Kesinlikle Katılıyorum	Katılıyorum	Ne Katılıyorum Ne Katılmıyorum	Katılmıyorum	Kesinlikle Katılmıyorum
1) İlgi alanlarımdaki son bilişim teknolojileri gelişmelerini takip ederim					

2) Yeni bilişim teknolojisi ürünlerin kullanım özelliklerini keşfetmekten mutluluk duyarım	○	○	○	○	○
3) Bilişim teknolojilerini amaçlarım doğrultusunda kullanırken, diğer insanlardan daha az sorun yaşadığımı fark ediyorum	○	○	○	○	○
4) Mevcut en ileri bilişim teknolojilerini kullanmayı tercih ederim	○	○	○	○	○
5) Zihinsel olarak zorlayıcı ve geliştirici bilişim teknolojilerini keşfetmeyi severim	○	○	○	○	○

Bilişim Teknolojilerine Hazırlık - Rahatsızlık

	Kesinlikle Katılıyorum	Katılıyorum	Ne Katılıyorum Ne Katılmıyorum	Katılmıyorum	Kesinlikle Katılmıyorum
1) Yüksek bilişim teknolojisi ürünü veya hizmet sağlayıcısından teknik destek aldığımda, bazen benden daha fazla şey bilen birinden yararlanıyormuş gibi hissediyorum	○	○	○	○	○
2) Birçok yeni bilişim teknolojilerinin, henüz keşfedilmemiş sağlık veya güvenlik riskleri vardır	○	○	○	○	○
3) Arkadaş çevremde, en son model cihazlara veya bilişim teknolojilerine kim sahipse, ona insanlar tarafından daha çok saygı duyulur	○	○	○	○	○

Bilişim Teknolojilerine Hazırlık - Güvensizlik

	Kesinlikle Katılıyorum	Katılıyorum	Ne Katılıyorum Ne Katılmıyorum	Katılmıyorum	Kesinlikle Katılmıyorum
1) İnternet üzerinden sağladığım bilgilerin başkaları tarafından kötüye kullanılması konusunda endişeleniyorum	○	○	○	○	○
2) Bir firma ile iş yaparken insan ile etkileşim kurmak çok önemlidir	○	○	○	○	○

3) Bir iş sürecinde, otomatik bir sistemle etkileşim kurmak yerine bir kişiyle iletişime geçmeyi tercih ederim	○	○	○	○	○
4) Elektronik olarak yapılan tüm ticari işlemler daha sonra ayrı bir iletişim metodu ile teyit edilmelidir	○	○	○	○	○

Teknoloji Kabul Modeli

Bilişim Teknolojileri Kabul Modeli - Algılanan Fayda

	Kesinlikle Katılıyorum	Katılıyorum	Ne Katılıyorum Ne Katılmıyorum	Katılmıyorum	Kesinlikle Katılmıyorum
1) Web Tabanlı Yoklama Sistemi, devam durumunun daha hızlı kontrol edilmesini sağlar	○	○	○	○	○
2) Genel olarak, Web Tabanlı Yoklama Sistemini kullanmanın faydalı olduğunu düşünürüm	○	○	○	○	○
3) Web Tabanlı Yoklama Sisteminin faydalı olduğuna inanıyorum	○	○	○	○	○

Bilişim Teknolojileri Kabul Modeli - Algılanan Kullanım Kolaylığı

	Kesinlikle Katılıyorum	Katılıyorum	Ne Katılıyorum Ne Katılmıyorum	Katılmıyorum	Kesinlikle Katılmıyorum
1) Web Tabanlı Yoklama Sisteminin nasıl çalıştırılacağını/kullanılacağını öğrenmek kolaydır	○	○	○	○	○
2) Genel olarak, Web Tabanlı Yoklama Sisteminin anlaşılması kolay ve açıktır	○	○	○	○	○
3) Web Tabanlı Yoklama Sisteminin nasıl kullanılacağını hatırlamak kolaydır	○	○	○	○	○

Bilişim Teknolojileri Kabul Modeli - Davranış Niyeti

	Kesinlikle Katılıyorum	Katılıyorum	Ne Katılıyorum Ne Katılmıyorum	Katılmıyorum	Kesinlikle Katılmıyorum
1) Gelecekte ders vermeye yardımcı olmak için Web Tabanlı Yoklama Sistemini düzenli olarak kullanacağım	○	○	○	○	○

2) Gelecekte ders verme sürecini desteklemek için Web Tabanlı Yoklama Sistemini daha sık kullanacağım	○	○	○	○	○
3) Ders verme sürecini desteklemek için meslektaşlarıma Web Tabanlı Yoklama Sistemini kullanmalarını önereceğim	○	○	○	○	○
4) Gelecekte ders vermeye yardımcı olmak için Web Tabanlı Yoklama Sistemini kullanmayı planlıyorum	○	○	○	○	○