

Assessment Of the Various Technology ‘Tools Which Offered by University to The Students According to Technology Acceptance Model 3 (TAM3)

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Abstract

The target of this study is to measure the satisfaction of graduate and Ph.D. students with some of the educational and technical aspects of universities and their services to them by using the theory of TAM3. Conversely, the Technology Acceptance Model 3 (TAM3) technicality was employed with the (Xl STAT) program to explain the adoption process to measure user behavior. The total number of students is 261 male and female students in different universities in Turkey. (TAM3) was adopted in the present study to construct study tools and to evaluate user behavior. Seventeen factors were tested which are (“Perceived Usefulness (PU), Perceived Ease Of Use (PEOU), Self-Efficacy (SE), Perceptions of External Control (PEC), Playfulness (PLAY), Perceived Enjoyment (ENJ), Objective Usability (OU), Anxiety (ANX), Subjective Norm (SN), Voluntariness (VOL), Image (IMG), Job Relevance (REL), Output Quality (OUT), Result Demonstrability (RES), Behavioral Intention (BI), and Actual Use (AU)”) [20]. The results showed that the TAM3 model was fit for this kind of problem. Moreover, the results of the statistical analysis show that the magnitude or volume relationships of variables by the model were significant and precise except for the subjective norm from Result demonstrability that was not supported, and users are satisfied with the performance of the technology tools that are used in their universities.

Keywords: Technology, Information technology, Technology in education, Theory of reasoned action, Theory of planned behaviour, Technology acceptance model.

1. Introduction

In the last centuries, human has created a new world called a world of technology. Recently technology has made big advances in the recently, and it has become necessary for modern life to deal with all obligations of life such as medical, business, education, economy, and many other fields [1]. In this context, technology is working worldwide to achieve scientific goals where collects intellectual skills and technical devices together to change traditional work and reduce barriers faced by humans [2]. Today, technology has become dramatically popular in meeting social needs which have many good

impacts such as providing tools to analyze and understand complex systems of technology and to achieve our targets [3]. In addition, technology is more useful to society where it allows people to interact freely on the global scale [4].

Developing countries are using technology to advance a big step with the world that is changing and developing rapidly [5] when technology was founded, some scientists saw the use of technology in education as so important and essential for all students and teachers [6]. Applying the technology method to teaching also helps students to educate their thinking process too much toward a future orientation, and they allow them to focus on the right basic learning, so this method will not be as threatened by the modern technology changes that still continue to develop [6].

This study chooses to use technology tools in the education study context and apply TAM3 as a theoretical foundation. TAM3 is one of the famous tech models in the Info Systems (IS) area [7]. According to previous studies, TAM is a widely recognized theory between IS to study, evaluate, and forecast how users interact with the acceptance of information technology TAM has been implemented in several different fields such as education, economy, and websites of the internet, and others that explain to the users how to know using new tools of technology and to deal with it. TAM by Fred Davis in 1986 was tailored for modeling user acceptance of IS, and it is based on two main assumptions: (PU), (PEOU) which are two key factors affecting operators' acceptance of technology [9].

As a result, the target of TAM is a good theoretical model that explains to humans how they can use technology, and it identifies any particular system that may be unacceptable to get an appropriate step for it [10]. Moreover, experts have shown TAM is flexible and not complicated for the users which gives them a positive effect, and they can help them better predict how to use the smart electronic equipment of education system [11].

Finally, technology has become a major and important center in the literature department of technical education. There is a strong relationship between TAM and the didactic circle that has worked together to attempt, improve, and foster traditional learning, as well as, it can provide new skills to students and help them to solve their problems through technology [12].

2. Aims

The object of this present work is to analyze the relationship between Graduate and Ph.D. students' intention to use technology tools with TAM3 variables which are their "perceived usefulness, perceived ease of use, self-efficiency, Perceptions of external control, Playfulness, Perceived Enjoyment, Objective usability, Anxiety, subjective norm, Voluntariness, Image, Job Relevance, Output quality, Result demonstrability, Behavioral intention, Experience, Use Behavior". In addition, the objective of information will be used to advance the output of the feature quality of technology in education and to reach the university to a high level of global competitiveness.

3. Research Hypotheses

- In order to verify the object of this paper, where it must be following and testing the eight research hypotheses to investigate from it:

- H1: self-efficiency of Graduate and Ph.D students is influenced by their (perceived usefulness) (H11),(perceived ease of use) (H12).
- H2: Perceptions of external control of Graduate and Ph.D students is influenced by their Experience (H21), Perceived Enjoyment (H22).
- H3: subjective norm of Graduate and Ph.D students is influenced by their perceived usefulness (H31), self-efficiency (H32).
- H4: Image of Graduate and Ph.D students is influenced by their perceived usefulness (H41), self-efficiency (H42), subjective norm (H43), Voluntariness (H44).
- H5: Job Relevance of Graduate and Ph.D students is influenced by their perceived ease of use (H51), self-efficiency (H52), subjective norm (H53), Voluntariness (H54), Image (H55).
- H6: Output quality of Graduate and Ph.D students is influenced by their subjective norm (H61), Voluntariness (H62), Image (H63), Job Relevance (H64).
- H7: Result demonstrability of Graduate and Ph.D students is influenced by their subjective norm (H71), Perceptions of external control (H72), Image (H73), Job Relevance (H74), Output quality (H75).
- H8: behavioral intention of Graduate and Ph.D students is influenced by their Image (H81), Result demonstrability (H82).

4. Theoretical framework of kinds TAM and literature review

Adoption of (TAM) and different studies where the quick progress in (IT) is considered one of the most important reasons for the development of (TAM), where acceptance and usage are considered the most important behavioral rules that helped to develop the (TAM) [13]. Davis in 1989 developed a model known as TAM which explains how modern technologies are acceptable to users. Moreover, TAM explains the behavioral intentions of end-users [14].

In addition, TAM has two chief key factors which are PU or the opinion of users around using a particular technology and PEOU or using particular technologies with less effort to measure user attitude [15]. TAM has been used as a theoretical basis in several different studies around modern technologies and to evaluate TAM toward using IT in a wide range of fields [14, 15]. As a result, TAM factors have been applied to a wide of IT studies; also previous research has focused on using TAM in education as researchers have shown in their studies:

Park in 2009 specifically evaluated e-learning in academic education by using the theory of TAM. The questionnaire of this study was distributed to many of the students of higher institutes, and the number reached 628 students. On the other meaning, the structural equation (SE) of e-learning was developed on the theory of TAM using the SE with the LISREL program which includes three main factors, and this equation are e-learning SE, system accessibility, SN that affects PU, PEOU, e-learning attitude, and AU of e-learning. The result of this study showed that TAM is a great model where e-learning contributed to the increase of students' productivity.

In another study, Masrom in 2007 tested the TAM and applied it to new educational programs, and methods in Malaysia which is an e-learning program, especially in academics of higher education, and the reason for selecting this study is the rapid development of technologies. Also, the aim of the study is to apply TAM to know how satisfied students accept e-learning within a framework of higher learning.

Based on information that got from 122 students who participated at (the University of Science and Technology of Malaysia) which is known as UTM City Campus the results show that TAM can be applied to adopt and explain the students' acceptance of e-learning technology where was found the PU have a big influence on (attitude and intention of users) towards using tech of e-learning. The results show that TAM can be applied to adopt and explain the student's acceptance of e-learning technology where was found PU that influence (attitude and intention of users towards using the tech of e-learning) [17].

The researcher Al-Aulamie 2013 studied the acceptance of users of learning management systems (LMSs) in three different Saudi Arabia universities and used structural equation modeling (SEM) with statistical analysis IBM AMOS to explain the adoption of the acceptance to users of (LMSs). The equation includes the following variables: extrinsic variables (information quality, functionality, accessibility, and user interface design), and the intrinsic variable (computer playfulness, enjoyment, and learning goal orientation) [13]. These variables are related to the three major variables of TAM (PU, PEOU, and BI); on the other meaning, the variables have been developed based on the technology acceptance model [13]. The researcher found that the TAM is a great theoretical tool for understanding user acceptance (LMSs). The outcomes of the study revealed that female students' acceptance of LMSs was lower than male students. Additionally, the extrinsic variables have a big effect on the major variables of TAM [13].

Yang in 2007 used TAM which developed by Davis (1989) in this study to test students satisfaction of WebCT program which used by many educational institutions especially the institutions that support the e-learning. Additionally, Yang in 2007 used addition variables to the main variables of TAM which are PEOU, PU, AU, computer SE, attitude, sociability, and social presence, SN, to know and to measure exam grades. Data was collected from students who registered in the business marketing course at the University of Central Florida (UCF) through questionnaire which distributed on the sample of selected study on the internet which supported by Advertising Standards Authority (ASA), and the study was conducted by different measuring tools as Analysis of Variance ANOVA and SPSS to analyze and explain data. The main result by using hypothesized model of study' WebCT was a great fit and that can a measurement of exams' degree and it had a great and good effect on the attitude of students and users. The researchers Khodami, Arghavan & Kashyzadehin 2014 tested and evaluated of user's' understanding to accept of the E-Learning at King Khalid University (KKU).

After many years of development of TAM, the researchers Bala and Venkatesh in 2008 done a new model which known as TAM3 as seen in Figure1 that the TAM3 had shown that the users can know a lot of information about the perceived ease of use when they have extra training on how to use the system [21].

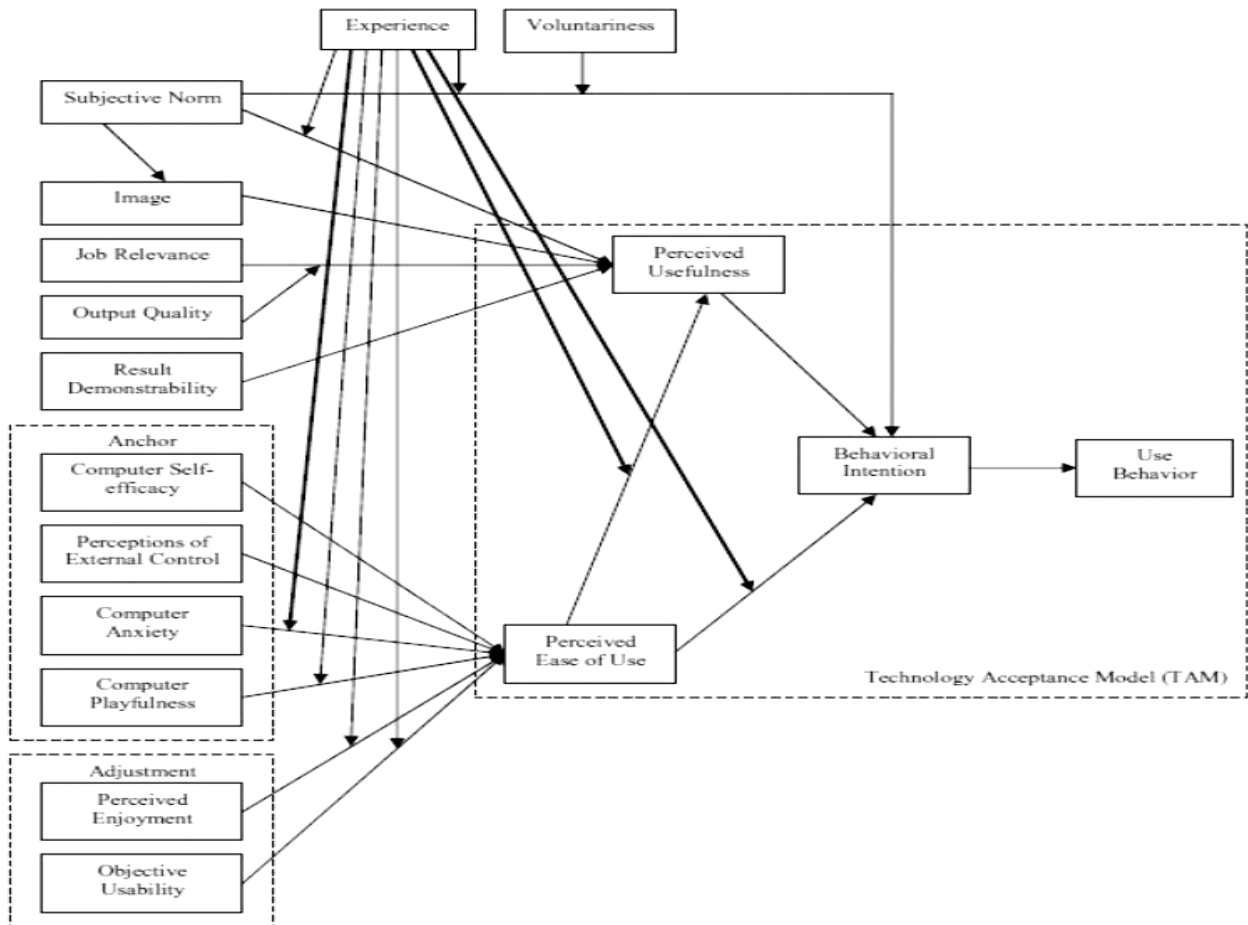


Figure1: TAM3

5. Method

The sample and procedure of this study

This study used the questionnaire as a tool for collecting data that have strong related to the subject of this study, and we designed questionnaire that based on previous studies of related to the subject of study. The questionnaire of this research study contained of two main sections:

First part was included a personal data (demographic questions) on students' respondents which consist of four paragraphs as Age, Gender, Education Level, Department of students that designed to get specific data and information about students.

The total of sample participates were 261 students where they are studying at Universities of Turkey. The results of demographic showed Master students more than Ph.D which thier were elevated percentage, and ranged of their age from 25 to 30 years (36.4%) and the rate of male participation (64.4%) is higher than females (35.6%). The percentage of participants' students in the master's degree was the highest where reached (72%) of the sample members of the study. Finally, the department of participants' students that show highest percentage more than other disciplines was department of Electrical and Computer Engineering (ECE) which reached (39.5%). Table 1 show the outline of the responses to the survey which collected from students.

Table1: Information of Demographic of Sample Study

Variables	# (N)	(%)
Age		
25 – 30	95	36.4
31 – 35	70	26.8
36 – 40	51	19.5
41 – 45	34	13
46 – 50	7	2.7
Above 50	4	1.5
Gender		
Male	168	64.4
Female	93	35.6
Education Level		
Graduate	188	72
Ph.D	70	28
Department of students		
Electrical and Computer Engineering	103	39.5
Information Technology	78	29.9
Mechanical Engineering	12	4.6
Industrial Engineering	14	5.4
pharmaceutical scientist	5	1.9
Financial Economy	10	3.8
Law Program	7	2.7
Chemistry	6	2.3
Other	24	9.4
Total	259.75	99.85

The second part refer to the level of the students’ agreement and knowledge on importance using of devices of technology in their universities based on the proposed model TAM3 of research study that include ((PU), (PEOU), (SE), (PEC), (PLAY), (ENJ), (OU), (ANX), (SN), (VOL), (IMG), (REL), (OUT), (RES), (BI), and (AU) [20]. These eighteen of variables which contain 31sub-question were measured by using five-points which knows “Likert-type scale”, and every point represents („Strongly Agree“, „Agree“, „Neutral“, „Disagree“, and the last point represent „Strongly Disagree“).

6. Results by measurement model

A reliability analysis has been conducted and calculated Alpha (α) which has different measurements to know the level of results' values Cronbach's Alpha as shown in table2:

Table2: Values and Rates of Cronbach's (α)

(Cronbach's (α))	(Internal consistency)
($\alpha \leq 0,00$) ($\alpha < 0,40$)	(Non-reliable)
($\alpha \leq 0,40$) ($\alpha < 0,60$)	(low reliability)
($\alpha \leq 0,60$) ($\alpha < 0,80$)	(High reliability)
($\alpha \leq 0,80$) ($\alpha < 1,00$)	(Very high reliability)

In addition, by during equation of Cornbach's Alpha ($\alpha = \frac{k}{1-k} (\frac{\sum_{i=1}^k \sigma_{yi}^2}{\sigma_x^2})$) is showing the measurements and real statistical analysis which used on XIStat program to get accurate and reliable' results, where (K) indicates to the number of components, items, or questions that is 31, ($\sum_{j=1}^k \sigma_{yj}^2$) indicates to the sum of components variances, and (σ_x^2) indicates to the variances of total scores [25]. As a result, by the equation of Cornbach's Alpha (α), the turns out that the total results of (α) are 0,939946 which means there is a high reliability in internal consistency.

Table3 is shown measurements of the composite reliability that has all of the items values of Croanbach's Alpha, and each item has a level. Other measurement is Cross-Loadings were executed to a check the converging's measurements and discriminate validity. Moreover, all results of Cross-Loadings are higher than 0.60 of particular factors. So, the converging's measurements are perfect, satisfactory, and desirable for it.

Table3: measurements of the composite reliability & Croanbach's Alpha

	EXP	PU	PEU	SE	PEC	ENJ	OU	BI	SN	VOL	IMG	REL	OUT	RES	Alpha (α)
EXP1	1.000														
PU1		.832													.864
PU2		.916													
PU3		.910													
PEOU1			.892												.756
PEOU2			.901												
SE1				.829											.861
SE2				.876											
SE3				.897											
SE4				.755											
PEC1					.872										.664
PEC2					.858										

satisfactory, but if the value is negative or greater than 1, it is invalid or not fit [24]. Table4 shows the results of (GFI).

Table4: (GFI) Results Model

Models	(GFI)
Absolute	0.573
Relative	0.982
Outer model	0.997
Inner model	0.984

The Path coefficient of an exogenous variable is playing big role on the endogenous variable of the construct that means if one unit of path coefficient of an (exogenous variable) changed, it will be effecting directly on (endogenous variable) of the construct.

The magnitude or volume relationships of variables by the model were significant and clear except subjective norm from Result demonstrability that was not supported.

The hypotheses were examined by statistically significant to know the relationship of variables in estimated direction. In so far as self-efficiency is involved PU, and PEOU that were identified to be important. At terms of perceptions of “external control” is concerned experience, and “perceived enjoyment” were identified to be important.

SN had effected on PU, and SE. Furthermore, Job Relevance had important relationship with PEOU, SE, SN, VOL, and IMG.

Output quality is concerned SN, VOL, IMG, and JREL that were identified to be more significant. Result demonstrability had no effect on subjective norm, but had effect on perceptions of (external control), (Image), (Job Relevance), and (Output quality). Behavioral intention is supported the Image, and Result demonstrability. The results of hypotheses paths, the parameter estimates, and direct effect are summarized in table5:

Table5: Results of Hypotheses Paths, the Parameter Estimates, and Direct Effect

Hypotheses paths		Direct effect	Results of hypotheses
PU	SE(H ₁₁)	.443	Supported
PEOU	SE(H ₁₂)	.414	Supported
EXP	PEC (H ₂₁)	.283	Supported
ENG	PEC (H ₂₂)	.410	Supported
PU	SN (H ₃₁)	.291	Supported
SE	SN (H ₃₂)	.368	Supported
PU	IMG (H ₄₁)	.240	Supported
SE	IMG (H ₄₂)	.176	Supported
SN	IMG (H ₄₃)	.195	Supported
VOL	IMG (H ₄₄)	.239	Supported
PEOU	REL (H ₅₁)	.123	Supported
SE	REL (H ₅₂)	.193	Supported

SN	REL (H ₅₃)	.123	Supported
VOL	REL (H ₅₄)	.189	Supported
IMG	REL (H ₅₅)	.258	Supported
SN	OUT (H ₆₁)	.197	Supported
VOL	OUT (H ₆₂)	.172	Supported
IMG	OUT (H ₆₃)	.294	Supported
REL	OUT (H ₆₄)	.174	Supported
SN	RES (H ₇₁)	.075	Not supported
PEC	REC (H ₇₂)	.186	Supported
IMG	REC(H ₇₃)	.171	Supported
REL	REC (H ₇₄)	.169	Supported
OUT	REC (H ₇₅)	.295	Supported
IMG	BI (H ₈₁)	.384	Supported
REC	BI (H ₈₂)	.312	Supported

The strongest value was found in relationship between perceived usefulness and subjective norm (H₁₁= 443), followed by perceived ease of use (H₂₂= 414).

7. Conclusion and Future Work

Information technologies are becoming increasingly necessary in our lives. adoption of information technology and use can favorably influence these different fields as medicine, business, education, economy, and many other fields to achieve benefits [1]. In this context, IT has become the main key to education to fulfill the aim of students.

In this study, the technology tools of universities were evaluated with TAM3. The reliability results showed TAM3 model which was fit for this kind of problem. The participants in the questionnaire are 261 students from different cities in Turkey. The results of statistical analysis show that users are satisfied with the performance of the technology tools they use in their universities.

According to the results of this study, the following study can be done in the future. This work analysis should be applied again, and the results of the model should show the effects of the experience during the time period. Future studies also should have more participants from different countries for more reliable results.

8. Acknowledge

This work was supported by Assoc. Prof. Dr. Sefer Kurnaz, at the Altinbas University. I would like to thank him for initiating and finalizing this work.

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