

ORIGINAL RESEARCH

Predicting the intention to use social media among medical students in the United Arab Emirates: A machine learning approach

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Abstract

Aim: The volume of research being conducted on the acceptance of social media platforms is rising. But the factors influencing the acceptance for academic reasons are still not properly identified. This study's goal is two-fold. Initially, by including Technology Acceptance Model (TAM) and external variables, analyze the students' intention to use social media networks. Secondly, to employ Machine Learning (ML) algorithms and Partial Least Squares-Structural Equation Modeling (PLS-SEM) to verify the proposed theoretical model.

Methods: The focus of this research is to create a conceptual model by supplementing TAM with a subjective norm to assess students' adoption of social media in the classroom. Students currently at one private university in the United Arab Emirates (UAE) provided a sum of 627 acceptable questionnaire surveys out of 700 distributed corresponding to 89.6%. The collected data were evaluated using ML and PLS-SEM.

Results: According to the research findings, students' intention to utilize social media networks for learning is significantly predicted by “subjective norms, perceived usefulness, and perceived ease of use”. These findings illustrated how crucial it is for students to feel capable and secure using social networks in their academic work. For validation using machine learning classifiers, the results showed that J48 (a decision tree) typically outperformed other classifiers.

Conclusion: According to the empirical findings, "subjective norm," "perceived usefulness and ease of use" all significantly increase students' intention to use social networks for learning. These results were in line with earlier research on social network acceptability. Lawmakers and managers of social media platforms in education must therefore concentrate on those factors that are crucial to promoting education and enhancing students' capacity for developing and implementing successful social media applications.

Keywords: Social media networks; Acceptance; Technology Acceptance Model; PLS-SEM.

Conflicts of interest: None declared.

Introduction

Facebook and Twitter are social media networking platforms that was originally invented keeping college students in mind. A social network is an online community where members post their images, news, videos, and happenings to bring people their shared opinions, likes, experiences, and pursuits (1–3). Users can communicate with one another on the internet via email and instant messaging via these online communities (4–6). On Facebook, users build profiles for themselves and add images, videos, and personal information. Facebook is a one-way communication tool that is effective for information sharing (7,8). Additionally, it enables students to work remotely with their classmates. Individuals can also join Facebook groups, where individuals do not need to be friends (2,9,10). These groups' users have free access to instantaneous upload and share of a file, article, link, information, and video (11,12). The widespread usage of social media is largely due to technological developments, such as the expansion of broadband service accessibility, improved software applications, and the creation of more robust computers and mobile phones (13,14). In truth, this type of media has spread widely and has become a crucial component of the daily lives of many individuals all over the globe (15). Since instructors and learners make up most internet users, social media appears to have had a significant role in how we instruct and study (16,17). The acceptance of social media in academia could be affected by many factors. Finding these factors continues to be difficult and varies from one region to the next.

The majority of technology acceptance research typically evaluates the theoretical models using the Structural Equation Modeling (SEM) methodology. In keeping with the body of current literature, there is limited empirical research on the usage of social media in schools in the United Arab Emirates (UAE) and knowledge of the factors influencing students' actual use. Consequently, this study's goal

is two-fold. Initially, by including the Technology Acceptance Model (TAM) (18) and external variables, analyze the students' intention to use social media networks. Secondly, to employ PLS-SEM and ML algorithms to verify the proposed theoretical model.

Research hypotheses

The research model is shown in Figure 1. The main goal of the present research is to develop a conceptual model centered on the TAM. The correlations between the constructs in the model are described in the ensuing subtopics.

1. Subjective Norm (SJ)

SJ, defined as "the degree of belief associated with the improvement in his or her job performance likely to be brought about by the use of a specific system by any person," was shown to have a positive influence on social media usage (18). A significant determinant of user intent to use social media networks, according to the study, is the aspect of the subjective norm. Thus, it is evident that:

H1: Subjective Norm (SJ) would predict the Perceived Usefulness (PU).

H3: Subjective Norm (SJ) would predict the intention to use Social Media Sites (ISM).

2. TAM constructs

PE indicates "the degree to which the person believes that adopting a given system will be effortless" (19). The term "degree to which the individual believes that employing a particular system would improve his/her job performance" is PU (19) and alludes to this belief. It is thought that PU and the Perceived Ease of Use (PEOU) make it easier for people to accept new technology. The behavioral intention to use social networks is significantly positively influenced by these two factors, according to a study (20,21). PE was also

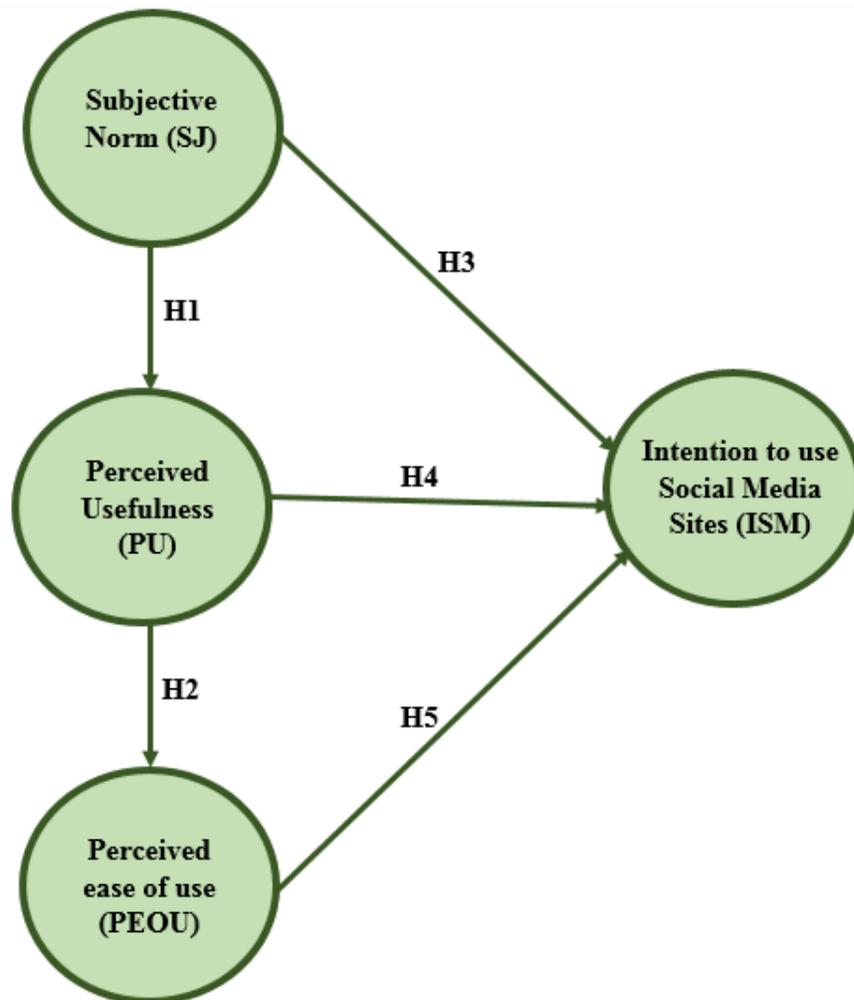
thought to have a significant positive effect on PU. As a result, we propose the following:

H2: Perceived Usefulness (PU) would predict the Perceived Ease of Use (PEOU).

H4: Perceived Usefulness (PU) would predict the intention to use Social Media Sites (ISM).

H5: Perceived Ease of Use (PEOU) would predict the intention to use Social Media Sites (ISM). These hypotheses form the foundation of the proposed research model, as shown in Figure 1. A structural equation model is initially used to represent the theoretical model, and it is then evaluated employing machine learning methods.

Figure 1. The research model.



Methodology

Context and subjects

The data was collected between January and April of 2022 using self-administered surveys. Students studying at one private university in the United Arab Emirates (N = 1.500) make up the original study population. The survey participants volunteered to participate, and they received no remuneration for doing so. The data for this study were collected using a convenience sampling method. Students who are interested in participating in the research have received an e-mail with the research's goal and a link to the survey. The survey link was also shared on the university's respective Facebook and WhatsApp groups to increase response rates. The students' participation was entirely voluntary. Out of the 700 surveys that were sent, 627 students satisfactorily completed the whole survey, yielding an 89.6 percent response rate (22). The total quantity of proper responses of 627 was an appropriate sample size for the research, as stated by Krejcie & Morgan (1970) because the required sample size for a population of 1500 would be N=306 respondents.

There were 297 men and 330 women in the sample, 73% of the participants were between the ages of 18 and 29. In addition, 64% of participants were pursuing a bachelor's degree, while 24% a master's, 9% a Ph.D., and 3% were pursuing a diploma.

Study Instrument

The first section will focus on gathering participant demographic data, while the second is intended to get feedback on the factors of the conceptual model. This study's research instrument is divided into two parts as mentioned. The second section's elements were measured employing a "5-point Likert scale." The PEOU and PU measurement items were adapted from Choi & Chung, Davis, and Venkatesh (18,23,24). The items employed to measure social media usage intentions and the items for the subjective norm were modified accordingly (18,23). Table 1 contains a listing of the constructs and the underlying items for each. The 11 items will be assessed using a five-point Likert scale, which includes the following weights: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agreed (5).

Table 1. Constructs, indicators, and their sources.

Construct	Items	Instrument	Source
“Intention to use social media sites “	ISM1	Facebook and Twitter both encouraged networking and the growth of social bonds.	(18,23)
	ISM2	Twitter and Facebook help individuals build stronger social bonds.	
“Perceived Ease of Use”	PEOU1	I have been able to communicate clearly and easily using Twitter and Facebook.	(18,23,24)
	PEOU2	Twitter and Facebook's user-friendly interfaces make communication quick and easy without taxing the brain.	
	PEOU3	I find it simple to learn how to navigate Facebook or Twitter.	
“Perceived Usefulness”	PU1	Information can be found more readily on Twitter or Facebook.	(18,23,24)
	PU2	I will keep using Twitter and Facebook.	

	PU3	I will utilize Twitter and Facebook for purposes other than information research.	
“Subjective Norm”	SN1	Individuals think Twitter or Facebook is necessary and inescapable.	(23,25)
	SN2	Almost all my friends and colleagues assume that I frequently use Facebook or Twitter.	
	SN3	If I stop using Twitter or Facebook, I might face opposition from others.	

Results

Data Analysis

This research takes advantage of the SmartPLS software with partial least squares-structural equation modeling (PLS-SEM) (26,27). The primary justification for using PLS-SEM in this work is that it offers contemporaneous evaluation for both the measurement and structural model, which yields more precise results (28). The second technique is used in this research to predict the dependent variables in the conceptual model by employing machine learning algorithms via Weka (29). The developed theoretical model is evaluated in this research using these two mentioned separate techniques.

Measurement model assessment

The “Cronbach's alpha and composite reliability (CR)” measures were employed for reliability analysis. Each of these measurements should have a value of ≥ 0.70 (30). The reliability is corroborated by the findings in Table 2, which show that both measures' numbers are satisfactory. The validity and reliability of the measurement model are evaluated (30). The “average variance extracted (AVE)” and factor loadings were evaluated for convergent validity. While the numbers of factor loadings ought to be ≥ 0.70 (31), the values of AVE must be ≥ 0.50 (32). The convergent validity is established based on the findings in Table 2 and the acceptable numbers for both measures.

Table 2. Convergent validity.

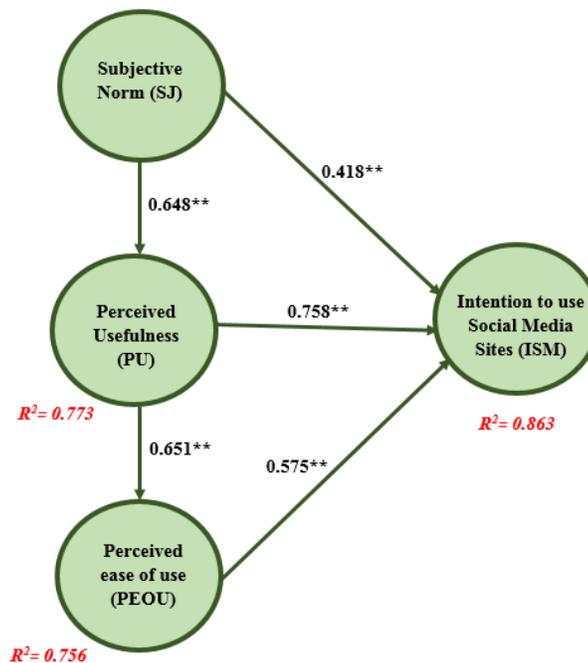
Constructs	Items	Factor Loading	Cronbach's Alpha	CR	AVE
“Intention to use social media sites”	ISM1	0.887	0.896	0.824	0.609
	ISM2	0.721			
“Perceived Ease of Use”	PEOU1	0.767	0.882	0.786	0.621
	PEOU2	0.780			
	PEOU3	0.889			
“Perceived Usefulness”	PU1	0.756	0.774	0.860	0.732
	PU2	0.751			
	PU3	0.706			
‘Subjective Norm’	SN1	0.747	0.898	0.774	0.674
	SN2	0.779			
	SN3	0.868			

1.1 Hypotheses testing and coefficient of determination

Each path's variance description (R^2 value) and each connection's path relevance in the research model were evaluated. Figure 2 and Table 3 show the formalized path coefficients and path significance. The combination assessment of the nine stated hypotheses was conducted using the structural equation modeling (SEM) method. All hypotheses were validated by the data. According to Figure 2, “the perceived usefulness, perceived ease of use, and intention to use social media networks” all had R^2 values that varied from 0.756 to 0.863. As a result, these constructs seem to have

high predictive power (33). All the constructs from earlier studies were confirmed in the model (SN, PU, PEOU, and ISM). The empirical data supported hypotheses H1, H2, H3, H4, and H5, according to the data analysis. The findings supported hypothesis H1 by demonstrating that PU greatly impacted SN ($\beta= 0.648, P<0.001$). The finding that perceived ease of use (PEOU) significantly influences PU ($\beta= 0.651, P<0.001$) validates hypothesis H2. Consequently, H3, H4, and H5 are validated since “the intention to use social media networks (ISM)” greatly impacts SN ($\beta= 0.418, P<0.01$), PU ($\beta= 0.758, P<0.001$), and PEOU ($\beta= 0.575, P<0.01$).

Table 3. Test results.



H	Relationship	Path	t-value	p-value	Direction	Decision
H1	SN -> PU	0.648	18.528	0.000	+	S**
H2	PU -> PEOU	0.651	15.546	0.000	+	S**
H3	SN -> ISM	0.418	12.651	0.002	+	S**
H4	PU -> ISM	0.758	15.743	0.000	+	S**
H5	PEOU -> ISM	0.575	10.715	0.001	+	S*

Note: +, positive; S, Supported. “p**=<0.01, p* <0.05 Significant at p**=<0.01 , p* <0.05”.

Figure 2. The Structural Model of the Study.

1.2 Hypotheses testing using machine learning algorithms

The “BayesNet, AdaBoostM1, LWL, Logistic, J48, and OneR” classifier-based predictive model was employed using Weka (version 3.8.3) (34). To predict the correlations in the proposed theoretical model, this study utilizes machine-learning classification algorithms by employing a variety of methodologies, such as “Bayesian networks, decision trees, if-then-else rules, and neural networks”.

The 10-fold cross-validation showed that the Decision Tree Algorithm J48 successfully predicted the PU with an accuracy of 92.2 percent. As can be seen from the findings in Table 4, J48 outperforms the other classifiers in estimating the PU of social media networks. H1 is therefore supported. In comparison to the other classifiers, this one performed higher in regard to TP rate (.921), precision (.919), and recall (.920).

Table 4. Predicting the PU by SN.

Classifier	CCII (%)	TP ² Rate	FP ³ Rate	Precision	Recall	F-Measure
BayesNet	85.31	.853	.320	.854	.851	.854
Logistic	85.44	.854	.381	.855	.853	.859
LWL	86.36	.863	.334	.865	.866	.867
AdaBoostM1	86.38	.864	.431	.868	.862	.866
OneR	87.30	.873	.476	.875	.874	.874
J48	92.19	.921	.895	.919	.920	.921

¹CCI: “Correctly Classified Instances, ²TP: True Positive, ³FP: False Positive”.

J48 predicted the PEOU with a 79.90% accuracy rate utilizing the criteria of perceived usefulness (PU). The results also showed better classifier performance by J48

when predicting the PEOU when opposed to other classifiers, as seen in Table 5 As a result, H2 received support.

Table 5. Predicting the PEOU by PU.

Classifier	CCII (%)	TP ² Rate	FP ³ Rate	Precision	Recall	F-Measure
BayesNet	79.25	.793	.536	.794	.794	.798
Logistic	80.31	.803	.565	.810	.805	.807
LWL	81.19	.811	.595	.819	.812	.812
AdaBoostM1	82.35	.824	.598	.835	.829	.828
OneR	84.64	.846	.624	.849	.847	.848
J48	89.83	.898	.679	.899	.897	.895

The classifier J48 in Table 5 predicted the intention to use the social media networks (ISM) system with a 90.4 percent accuracy rate. According to the results presented in Table 6, J48 performed better than other

classifiers in estimating the intention to use social media networks (ISM) utilizing attributes of SN, PU, and PEOU. Therefore, H3, H4, and H5 had support.

Table 6. Predicting the ISM by SN, PU, and PEOU.

Classifier	CCII (%)	TP ² Rate	FP ³ Rate	Precision	Recall	F-Measure
BayesNet	84.30	.843	.624	.844	.845	.844
Logistic	85.37	.853	.644	.856	.852	.852
LWL	85.69	.857	.647	.858	.855	.856
AdaBoostM1	86.17	.862	.732	.864	.861	.863
OneR	88.31	.883	.719	.887	.884	.885
J48	90.35	.903	.772	.909	.903	.912

2. Discussion

Because this research is one of the rare efforts (give references here again) to implement machine learning algorithms in predicting the actual use of social media, it is hoped that the adoption of a parallel multi-analytical approach would bring a new addition to the literature on information systems (IS). This research employed “PLS-SEM and machine learning classification algorithms” in a parallel manner to assess the proposed model. It is significant to remember that PLS-SEM can be utilized for both dependent variable prediction and conceptual model validation depending on the extension of an existing theory (35-38). Similar to this, supervised machine learning algorithms can be implemented to predict a dependent variable by relying on independent variables (29). These methods have a pre-defined dependent variable. It is also intriguing to see how many varied classification algorithms with distinct methodologies, including “decision trees, Bayesian networks, association rules, neural networks, and if-then-else rules”, were used in the research. More particular, the results showed that J48 (a decision tree) typically outperformed other classifiers. It is important to note that the sample was divided into homogeneous sub-samples depending on the most important independent variable, and the decision tree (nonparametric) was adopted to classify both continuous (numerical) and

categorical variables (29). On the other side, PLS-SEM (a nonparametric procedure) was applied to generate a large number of sub-samples at random and verify the significant coefficients with substitutes from the sample. There has been a thorough investigation in the current research to assess the external variables associated with user’s behavioral intention to use social media sites among UAE students namely the “Subjective Norm, Perceived Usefulness, and Perceived Ease of Use”. However, it is also imperative to investigate and validate the technology acceptance by user with respect to the individual and organizational factors affecting technology. This calls for conducting a similar study with greater number of external variables which will help generalize the study outcomes. After this, we can use a longitudinal study to test the proposed argument. It is also possible to use a longitudinal study to comprehend the potential adoption of Social Media Sites by education workplaces in developing countries. This will require comparative analysis of the current research model at different time periods.

Conclusion and future works

The TAM was used and extended by "perceived playfulness" to accomplish this goal. From the students studying at reputable universities in the United Arab Emirates, a

record of 627 acceptable questionnaire surveys were gathered. By use of the “PLS-SEM and machine learning approaches”, the suggested model was verified. According to the empirical findings, "subjective norm," "perceived usefulness," and "perceived ease of use" all significantly increase students' intention to use social networks for learning. These results were in line with earlier research on social network acceptability (15,16,23,39,40). These findings illustrated how crucial it is for students to feel capable and secure using social networks in their academic work. The primary goal of this research was to explore the variables influencing students' acceptance of social networks in the classroom. Lawmakers and managers of social media platforms in education must therefore concentrate on those factors that are crucial to promoting education and enhancing students' capacity for developing and implementing successful social media applications. The statistics were only gathered from one private university in the UAE as a restriction. The findings might not generalize to other higher education schools in the UAE. To evaluate the commonalities and differences between government and private students concerning those factors that were proposed in the TAM model, more study on governmental students is required.

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