JOURNAL OF BALTIC SCIENCE EDUCATION
ISSN 1648-3898 /Print/
ISSN 2538-7138 /Online/

PREDICTING FACTORS AFFECTING INTENTION TO USE WEB 2.0 IN LEARNING: EVIDENCE FROM SCIENCE EDUCATION

Muhaimin,
Akhmad Habibi,
Amirul Mukminin,
Robin Pratama,
Asrial,
Harlina Harja

Abstract. *Teachers' intention to use technology is a major factor in its effective use in learning including in developing countries. This research empirically investigated on factors that influence Pre-Service Science Teachers' (PSSTs) intention to use Web 2.0 in learning through Technology Acceptance Model (TAM) in Indonesia. The goals of the research were to (a) report if the TAM is a valid and reliable model to explain PSSTs intention to use Web 2.0, and (b) inform the factors of PSSTs' intention to use Web 2.0 in learning. Seven hundred and five PSSTs from five universities completed a 24-item online questionnaire based on the TAM constructs comprising perceived usefulness, perceived ease of use, subjective norm, facilitating conditions, attitudes, and intention to use Web 2.0. Results obtained using Partial Least Square Structural Equation Modeling (PLS-SEM) informed that (a) facilitating condition and subjective norm significantly influenced perceived ease of use; (b) subjective norm significantly affected perceived usefulness; (c) both perceived ease of use and perceived usefulness was a significant factor predicting attitude; and (d) attitude, perceived ease of use, and perceived usefulness significantly influenced intention to use Web 2.0. Overall, the TAM is a valid model to help explain Indonesian PSSTs' intention to use Web 2.0 in learning.*

Keywords: *Web 2.0, technology acceptance model, pre-service science teachers.*

Muhaimin, Akhmad Habibi, Amirul Mukminin, Robin Pratama, Asrial, Harlina Harja
Jambi University, Indonesia

Introduction

Tools of the Web 2.0 ease users in enabling collaboration for many functionalities such as communication, social interaction, and networking. In education, Web 2.0 tools have been reported to improve learning experiences through various strategies as well as provide good facilitation for teaching activities and contribute to the establishment of various learning and teaching models (Bharuca, 2018; Kompen, Edirisingha, Canaleta, Alsina, & Monguet, 2019). The Web 2.0 has also been informed for its potential to facilitate many opportunities for teachers and students to explore new sources of teaching and learning (Kompen et al., 2019; Zheng, Niiya, & Warschauer, 2015).

Kwok and Yang (2017) reported that Information and Communication Technologies (ICT) use in education including Web 2.0 technologies have been very popular for students' everyday activities. In addition, Web 2.0 tools could function to support users' participation in any engaging activities in learning including the production of knowledge (Zheng et al., 2015). These technologies have the potential to revolutionize the way teachers teach from teacher-center teaching to student-participatory learning as well as from individual-focused learning to community-based learning. However, Teo, Sang, Mei & Hoi (2018) argued that Web 2.0 technologies have resulted in teachers' distraction from the main goals of the teaching and learning they planned. Therefore, research in this focus, Web 2.0 in education, should always be conducted in various settings and contexts to determine how it can specifically support learning transformation.

Recently, research aiming at exploring factors affecting the intention to use Web 2.0 technologies in education have been enormous (e.g. Abrahim, Mir, Suhara, & Sato, 2018; Venkatesh, Rabah, Fusaro, Couture, Varela, & Alexander,

https://doi.org/10.33225/jbse/19.18.595

ISSN 1648–3898 /Print/
ISSN 2538–7138 /Online/

2016; Rahimi, van den Berg, & Veen, 2015). In teacher education programs of some developed countries, related findings to this topic highlighted that pre-service teachers' attitude and beliefs toward Web 2.0 as well as their intentions to use the technology have been the most dominant factors affecting the success of their learning using Web 2.0 (e.g. Abrahim et al., 2018 in Japan; Rahimi et al., 2015 in the Netherlands; Teo et al., 2018 in China). These findings concluded recommendation on designing effective teaching and training to improve pre-service teachers' learning using Web 2.0 technologies. However, little published research has been conducted in developing countries (e.g. Elkaseh, Wong, & Fung, 2016; Habibi, Mukminin, Riyanto, Prasojo, Sulistiyo, Sofwan, & Sudagar, 2018). For example, Indonesia with more than 107 million users of the Internet who mostly are students in higher education has the potential for the use of Web 2.0 in education. Therefore, this research was conducted aiming to elaborate factors affecting Indonesian PSSTs' intention to use Web 2.0.

Literature Review

The use of ICT in education including Web 2.0 is important in bringing teaching and learning transformation (Kompen et al., 2019; Bharuca, 2018) where Web 2.0 technologies can function as transformation tools for teachers, students, and other educational stakeholders to be active users of educational technology (Abrahim et al., 2018). The use of Web 2.0 technologies into the teaching and learning process can establish a good learning environment and support innovative teaching. It is therefore associated with the concepts of communities, practice, content syndication, creative learning, peer learning, and personal learning establishment for formal and informal education (Teo et al., 2018). Having these uses and functions, the research on the technological integration in education should be continually conducted and developed especially on the factors affecting the integration.

Technology Acceptance

Having its origin from the Theory of Reasoned Action (TRA) proposed by Fishbein & Ajzen (1975), technology acceptance research has had its momentum for the popularity in 1980s (Davis, Bagozzi, & Warshaw, 1989). However, many researchers still use this approach in their research including in educational sector (e.g. Binyamin, Rutter, & Smith, 2019; Elkaseh et al., 2016; Scherer, Siddiq, & Tondeur, 2019). Teo (2011) explained that technology acceptance in education is defined as the intention of users, mainly teachers and students, to integrate technology for any activity which is supported by the integration. Considering the rapid technological establishment and innovation, research for technological acceptance in education must be improved and updated (Scherer et al., 2019).

Users' belief is the basic thing for technology acceptance research affecting the intention to use technology in education (Taylor & Todd, 1995; Venkatesh et al., 2003). Prior studies have elaborated the connections between intention to use technology and actual use. It is evidence that the intention has been a predictor for actual behavior (Ajzen, 1991; Davis, 1993). Therefore, in the research linked with technology acceptance, intention to use is considered as a key factor to predict the actual technology integration.

Technology Acceptance Model (TAM)

TAM firstly introduced by Davis (1989) was adapted the TRA (Fishbein & Ajzen, 1975). Theoretically, the TAM consists of three core variables; perceived ease of use (PEU), perceived usefulness (PU), and attitudes toward technology (AT). It also comprises two outcome variables; behavioral intentions (BI) and technology use (TU). Maragunic and Granic (2015) informed that PU and PEU are the main variables that affect the outcomes. These main variables were often completed by some external variables (Scherer et al., 2019) supporting their elaboration such as Subjective Norms (SN), Self-Efficacy (SE), and Facilitating Conditions (FC). The variables are considered as the representation of personal capabilities besides contextual factors (Table 1). The concepts, however, are different across studies and therefore require clear definitions for each study. In this research, PU and PEU were supported by two external variables; FC and SN.

Table 1. The concepts of TAM variables for this research.

TAM-main variables	Concepts
PEU	The level to which a person believes that using Web 2.0 would be easy
PU	The level to which a person believes that using Web 2.0 would enhance work performance

https://doi.org/10.33225/jbse/19.18.595

ISSN 1648–3898 /Print/
ISSN 2538–7138 /Online/

TAM-main variables	Concepts
AT	A person's certain behavior linked with the use of Web 2.0
Outcome variable	
Intention to use Web 2.0 (IUW)	A person's intention to use Web 2.0
External variable	
SN	A person's perception that his or her peers, teachers, and family support or do not support the use of Web 2.0 in learning
FC	The degree to which a person believes that organizational and technical resources exist to support the use of Web 2.0

Hypotheses of the Research

Ten hypotheses were proposed for this research (Figure 1). As elaborated earlier, six variables; PEU, PU, AT, SN, FC and IUW were adapted from previous studies. As an external variable in the TAM, FC has been reported to include infrastructure availability, professional development, technical support and guidance, and policies promoting the use of technology in education. In research focusing on teachers' use technology, Nikou and Ecomides (2019) elaborated significant correlation between FC and PEU (β = .243). In addition, Rahimi et al. (2015) in their qualitative study reported that with the existence of technical support, it was easier for students to use technology in their learning. However, Teo et al (2018) through their research informed that there was no significant correlation between FC and PU. Therefore, this research investigated the relationship between FC to PU and PEU; FC has a positive influence on PU (H1) and FC has a positive influence on PEU (H2).

Previous findings indicated that people from a collectivist-culture background were more likely to comply with the standard of group expectations or authorities (Buabeng-Andoh, Yaokumah, & Tarhini, 2019; Rejón-Guardia, Polo-Peña, & Maraver-Tarifa, 2019; Teo et al., 2018). As a country that has a cultural tradition of advocating respects to other people, it seems that Indonesian PSSTs' SN has a vital role to influence PE and PEU. Therefore, two hypotheses were included in this research; SN has a positive influence on PU (H3) and SN has a positive influence on PEU (H4).

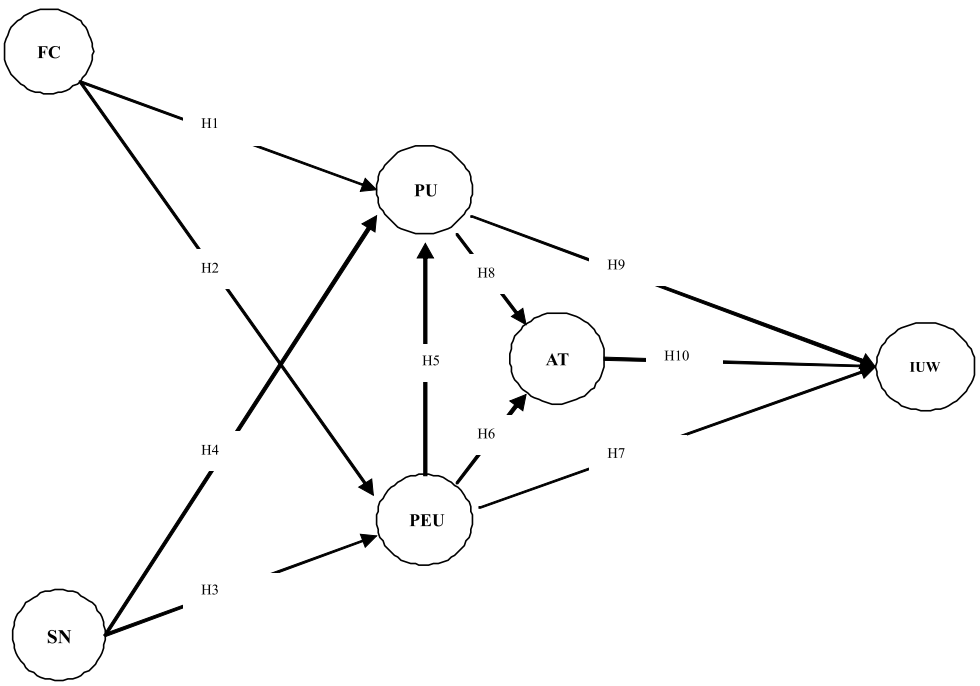

Figure 1. Research model.

https://doi.org/10.33225/jbse/19.18.595

ISSN 1648–3898 /Print/
ISSN 2538–7138 /Online/

The role of PEU in TAM has also been reported. Studies have informed that when a technology is perceived as easy to use, the PU and intention to use technology increases (Nikou & Ecomides, 2019; Rejón-Guardia et al., 2019; Teo et al., 2018). For example, Nikou and Ecomides (2019) found that PEU significantly influenced PU (β = .432) and intention to use technology (β = .408). Meanwhile, Buabeng-Andoh et al. (2019) in their study in Ghana found that PEU significantly predicted AT with a path coefficient of .227. In this research, three hypotheses were informed in relation to the role of PEU to PU, AT, and IUW; PEU has a positive influence on PU (H5), PEU has a positive influence on AT (H6), and PEU has a positive influence on IUW (H7)

Numbers of previous studies on TAM have reported that PU affected the integration of technology in education such as fostering students; achievement, promoting sharing of knowledge and information, and facilitating students' learning. Therefore, some researchers informed that intention to use technology would more likely to be implemented in actual behavior when PU is high (Rejón-Guardia et al., 2019; Teo et al., 2018). In addition, PU was also reported to predict AT (β = .227) towards the use of technology in education (Buabeng-Andoh et al., 2019). In this research, the hypotheses related to PU were PU has a positive influence on AT (H8) and PU has a positive influence on IUW (H9).

AT to technology use, despite not influential in technology adoption contexts (Davis, 1989), was argued to become relevant for students' voluntary use of technology in learning (Saadé & Galloway, 2005). Studies on students' intentions to technology integration did find that AT was an key driver predicting intention to use technology (Buabeng-Andoh et al., 2019; Lai, Wang, & Lei, 2012; Teo et al., 2018) Hence, this construct was also included in the model as a potential significant predictor; AT has a positive influence to IUW (H10).

Research Methodology

General Background

The researchers used a survey, non-experimental research that has been in many fields of knowledge (Fowler, 2013). The target population of this research is Indonesian PSSTs who used Web 2.0 in their learning. The population of this research was all Indonesian PSSTs or more than 200,000 PSSTs (Ministry of Research, Technology, and Higher Education, MoRTHE, 2018).

Sample

Simple random sampling was applied for this research. As a result, the researchers distributed the questionnaire to 1000 PSSTs in three universities from three Indonesian cities using online and offline resources. Seven hundred and five sample data were measurable and analyzed (Table 2) after the data screening process. The research was done from September 2018 to May 2019. A few of the respondents were awarded a token of financial incentive (Dillman, Smyth, & Christian 2014) as it was previously informed in the distribution.

Table 2. Demographic information.

	Characteristics	Frequency (*f*)	Percentage (%)
Gender	Female	566	8.3
	Male	139	19.7
Age	17-19	112	15.9
	19-21	526	74.6
	22-24	63	8.9
	>24	4	.6
Study program	Biology education	222	31.5
	Mathematics education	164	23.3
	Physics education	104	14.8
	Chemistry education	215	3.5

https://doi.org/10.33225/jbse/19.18.595

ISSN 1648–3898 /Print/
ISSN 2538–7138 /Online/

	Characteristics	Frequency (*f*)	Percentage (%)
Year in university	1st	74	1.5
	2nd	127	18
	3rd	265	37.6
	4th	213	3.2
	5th	26	3.7
Smartphone ownership	Yes	701	99.4
	No	4	.6
Laptop and/or personal computer ownership	Yes	666	94.5
	No	39	5.5

Regarding the Web 2.0 skill levels, most of the respondents were proficient users of social media such as Facebook, Twitter, and Instagram. They were also familiar with a video-sharing application like Youtube. Unlike social media and video-sharing application, most respondents were novice for the podcast (Table 3).

Table 3. Web 2.0 skill levels.

	Social media (e.g. Facebook, Twitter, Instagram)	Blog	Wiki	Video sharing (Youtube)	Chatting and calling application (WhatsApp, Line)	Podcast
	f (%)	*f* (%)	*f* (%)	*f* (%)	*f* (%)	*f* (%)
Proficient	127 (18)	64 9.1)	65 (9.2)	203 (28.8)	149 (21.1)	16 (2.3)
Comfortable	462 (65.5)	510 (72.3)	334 (47.4)	444 (63)	496 (7.4)	121 (17.2)
Novice	116 (16.5)	117 (16.6)	245 (34.8)	54 (7.7)	52 (7.4)	413 (58.9)
Never use	-	14 (2)	61 (8.7)	4 (.6)	8 (1.1)	155 (22)

Instrumentation

The questionnaire for the research consisted of three sections. The 1st section was used to collect information about respondents' demographic information while the 2nd section inquired about the respondents' level of familiarity with various Web 2.0 technologies. The 3rd section was used to have the respondents' responses to 24 statements measuring respondents' level of agreement with six constructs drawn from prior TAM studies. The questionnaire statements were first adapted from previous studies (Davis, 1989; Teo et al., 2018; Valaei & Rezaei, 2017; Venkatesh & Davis, 2000). A 4-point Likert scale was adopted to measure the level of familiarity from "proficient" to "never use while a 5-point Likert scale was used for the level of agreement from "strongly disagree" to "strongly agree".

Before the collection of the main data in order to examine the model and confirm the research hypotheses, the thirty-five questionnaire statements were examined through the process of content validity and pilot test. For the content validity, the questionnaire was assessed through the processes of discussion and content validity index (CVI) involving a panel of 10 Indonesian experts of educational technology and science education. Through the discussion process, there were seven items dropped after the discussion while through CVI that measure the Item-CVI (I-CVI), the probability of chance occurrence (Pc) and modified kappa (k), two items were then eliminated from the questionnaire.

The reliability of the data after the pilot test of the research was also examined. The instruments were through the process of the pilot test stage involving 117 science student teachers of one school of education. These respon-

https://doi.org/10.33225/jbse/19.18.595

ISSN 1648–3898 /Print/
ISSN 2538–7138 /Online/

dents were included in the pilot test in order to develop and validate the survey instruments. Cronbach's alpha was applied to measure the reliability of the scale. The internal consistency of the scale ranged from .801 to .913. No construct was dropped since all constructs' alpha was acceptable.

Data Analysis

For the data analysis, the raw data were calculated using SPSS 23 in performing the data screening process; missing data, outliers, normality, and unengaged responses (Hair et al., 2010). In the most process, this research used the PLS-SEM using SmartPLS 3 software for the data analysis of the research proposed model. The reason why the PLS-SEM was performed for the data analysis was that it is conveniently done when the goal of the research is the extension of an existing theory which is the TAM in this research context (Hair et al., 2017).

Common Method Variance

Common Method Variance (CMV) is required to examine to make sure that there is no bias that can systematically affect the data (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In this research, the entire constructs were entered into one principal component factor analysis. The extraction method of the principal component of one fixed factor with none rotation method was done through SPSS. Results of the analysis process showed that only one factor emerged explaining less than 50% of the variance. In addition, the correlation between constructs is from .611 to .783 (see Table 4), which is below .900 that indicates no evidence of CMV. As a result, CMV is not an issue in this research.

Research Results

Construct Validity

Multicollinearity happens if the model predictors are correlated and provide redundancy of the response. Multicollinearity was measured by variance inflation factors (VIF). If VIF value exceeding 4.0, there is a problem with multicollinearity (Hair et al., 2017). In this research, none of the VIF values is exceeding 4.0 (Table 4) meaning that multicollinearity is not an issue in this research.

Composite Reliability (CR) and Cronbach's alpha values were examined accompanied by Average Variance Extracted (AVE) in order to evaluate the reliability of the assessment model. All values of CR, Cronbach's alpha, and AVE are reported in Table 4. CR and Cronbach's alpha should be more than .700 while AVE should be equal to or more than .700 (Hair et al., 2017). The Cronbach's alpha for all constructs ranged between .818 to .919 values. The CR values varied from .891 to .943. In addition, AVE value varied from .732 to .821. All values in this research, CR, Cronbach's alpha, and AVE were acceptable.

Table 4. Measurement model.

Constructs	Items	VIF	Loading	AVE	Cronbach's alpha	CR
Attitude	AT1	1.598	.835	.732	.818	.891
	AT2	2.007	.853			
	AT3	2.040	.879			
Facilitating condition	FC1	2.441	.864	.736	.881	.918
	FC2	2.676	.871			
	FC3	2.323	.872			
	FC4	1.979	.824			
Intention to use Web 2.0	IUW1	2.824	.886	.805	.919	.943
	IUW3	3.643	.915			
	IUW4	2.741	.883			

https://doi.org/10.33225/jbse/19.18.595

Constructs	Items	VIF	Loading	AVE	Cronbach's alpha	CR
	IUW5	3.409	.904			
Perceived ease of use	PEU1	1.783	.841	.768	.848	.908
	PEU2	2.272	.884			
	PEU4	2.384	.902			
Perceived usefulness	PU1	2.647	.900	.821	.891	.932
	PU3	2.540	.908			
	PU4	2.681	.909			
Social norm	SN1	2.533	.905	.792	.868	.919
	SN2	2.796	.915			
	SN4	1.938	.848			

The discriminant validity criteria were addressed by Fornell–Larcker and loading and cross-loading criterion. The off-diagonal values informed in Table 5 show the correlations between the constructs while diagonal values inform square values of AVEs demonstrating AVE value on its own construct were informed to be greater than that of all other constructs'. Additionally, Table 5 shows the cross-loading values informing the loading on its own construct is greater than that of other constructs'.

Table 5. Discriminant validity. Fornell-Larcker criterion.

	AT	FC	IUW	PEU	PU	SN
AT	.856					
FC	.726	.858				
IUW	.752	.722	.897			
PEU	.684	.682	.707	.876		
PU	.612	.611	.678	.783	.906	
SN	.747	.706	.766	.762	.745	.890

The acceptable level of discriminant validity threshold is also obtained seen from HTMT value which is < .90 as suggested by Hair et al., (2017). All HTMT values were lower than .9. The highest value of the HTMT was .899 (Table 7). In addition, through the bootstrapping process for HTMT, the confidence intervals perform that the upper confidence interval is less than 1. The HTMT demonstrates that all HTMT values differed significantly from the value of 1. Therefore, it establishes the discriminant validity. In conclusion, the data of the constructs of this research are reliable and valid.

Table 6. Discriminant validity, cross loading.

	AT	FC	IUW	PEU	PU	SN
AT1	.835	.584	.67	.565	.598	.627
AT2	.853	.615	.564	.547	.434	.600
AT3	.879	.663	.683	.637	.526	.685
FC1	.628	.862	.586	.628	.529	.681
FC2	.564	.869	.549	.513	.457	.547
FC3	.657	.873	.721	.637	.562	.613
FC4	.631	.827	.607	.546	.537	.569

https://doi.org/10.33225/jbse/19.18.595

ISSN 1648–3898 /Print/
ISSN 2538–7138 /Online/

	AT	FC	IUW	PEU	PU	SN
IUW1	.699	.646	.885	.658	.605	.687
IUW3	.690	.646	.915	.633	.590	.706
IUW4	.678	.681	.883	.644	.660	.671
IUW5	.625	.614	.904	.596	.571	.684
PEU1	.538	.581	.564	.841	.702	.628
PEU3	.607	.559	.614	.884	.661	.666
PEU4	.648	.649	.674	.902	.697	.707
PU1	.499	.500	.568	.649	.900	.670
PU3	.594	.632	.607	.747	.908	.703
PU4	.564	.522	.663	.727	.909	.651
SN1	.640	.665	.708	.742	.694	.905
SN2	.690	.609	.679	.694	.668	.915
SN4	.670	.610	.657	.588	.623	.848

Table 7. HTMT ratio.

	AT	FC	IUW	PEU	PU
AT					
FC	.851				
IUW	.860	.796			
PEU	.816	.782	.797		
PU	.708	.683	.746	.899	
SN	.886	.803	.857	.883	.845

Structural Model

The bootstrapping done in this study aims at informing the significant level of the paths of each construct through 5000 resampling to report the significance. Figure 2 and Table 8 informed the path value (β) and (p) value. The results indicate that nine out of the ten hypotheses were statistically significant (Figure 2). PEU is driven by both SN ($\beta = .283$, $p < .001$) and FC ($\beta = .260$, $p = .000$); SN has been more significant to influence PU than FC does. Among the factors (FC, SN, and PEU) influencing PU, FC has not significantly affected PU ($\beta = .047$, $p = .656$) while SN ($\beta = .580$, $p < .001$) and PEU ($\beta = .570$, $p <. 001$). In short, PU was more driven by PEU than SN but not influenced by FC.

Table 8 and Figure 2 also inform the key driving construct influencing AT and IUW. Between the factors influencing AT, both PU and PEU were statistically significant. PU ($\beta = .197$, $p = .002$) is less powerful in predicting AT than PEU ($\beta = .530$, $p < .001$). In addition, IUW that was hypothesized to be influenced by PU, PEU, and AT has also been driven by the three factors. IUW was significantly influenced by PU ($\beta = .228$, $p < .001$), PEU ($\beta = .205$, $p = <.001$), and AT ($\beta = .472$, $p < .001$) also predict IUW in this study. As a consequence, AT has more significance than PU and PEU in influencing IUW. The structural model of this study was also obtained by measuring R^2 value. According to Hair et al. (2017), R^2 values that should be resulted in PLS-SEM are .75 (substantial), .50 (moderate), and .25 (weak). The R^2 value of PU, PEU, AT and IUW ranged from .483 to .666. It can be understood that the R^2 of this study is in the level of "moderate".

https://doi.org/10.33225/jbse/19.18.595

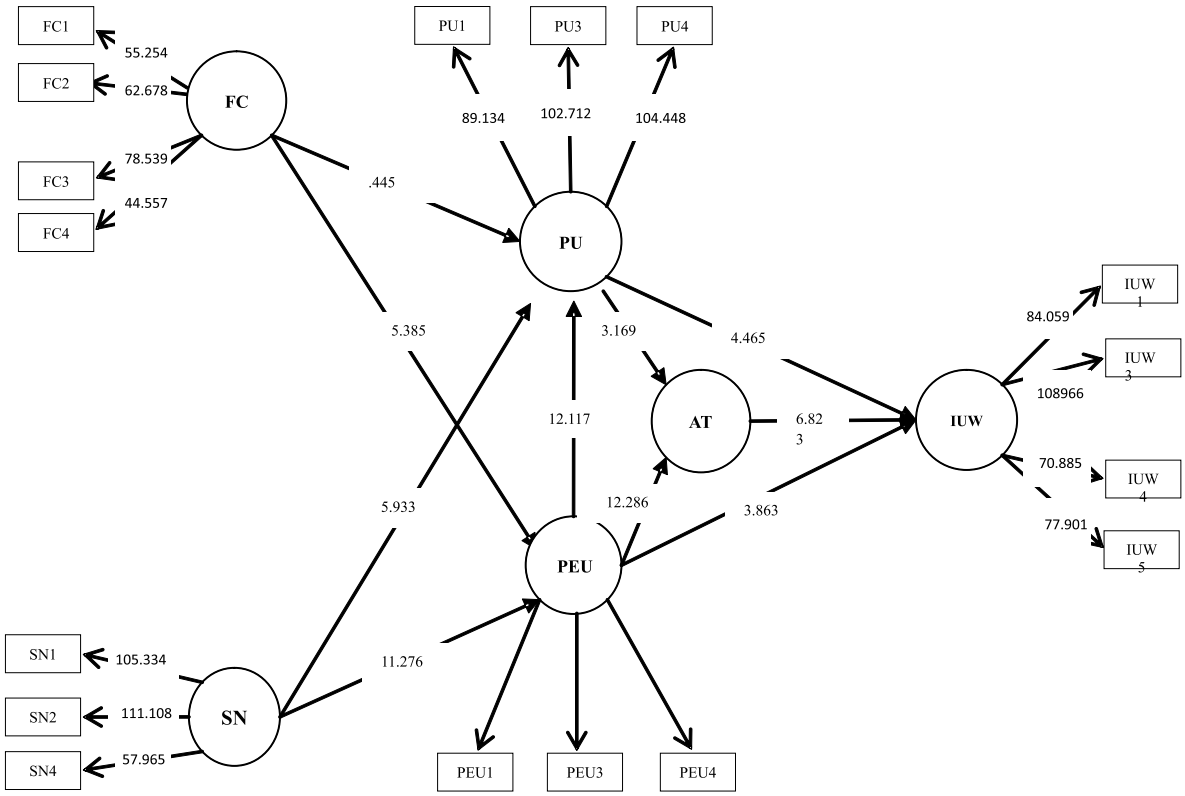

Figure 2. Path coefficient through bootstrapping.

Table 8. Hypothesis testing model.

	β	Sample Mean (M)	*t*- statistics	*p*	Decision
AT -> IUW	.472	.464	6.823	< .001	Supported
FC -> PEU	.286	.286	5.385	< .001	Supported
FC -> PU	.025	.025	.445	.656	Not supported
PEU -> AT	.530	.530	12.286	< .001	Supported
PEU -> IUW	.205	.209	3.863	< .001	Supported
PEU -> PU	.506	.503	12.117	< .001	Supported
PU -> AT	.197	.198	3.169	.002	Supported
PU -> IUW	.228	.232	4.465	< .001	Supported
SN -> PEU	.561	.560	11.276	< .001	Supported
SN -> PU	.342	.344	5.933	< .001	Supported

Discussion

The key objective of this research was to develop a model as well as to examine it to explain factors influencing Indonesian PSSTs' intention to use Web 2.0 technologies in their learning which has also been widely discussed by previous researchers in different settings and contexts (e.g. Buabeng-Andoh et al., 2019; Nikou & Ecomides, 2019;

https://doi.org/10.33225/jbse/19.18.595

ISSN 1648–3898 /Print/
ISSN 2538–7138 /Online/

Rejón-Guardia et al., 2019; Teo et al., 2018). The path analysis of the PLS-SEM shows that the analyzed model is fit to the data collected for Indonesian context. Using PLS-SEM, it was found that perceived usefulness, perceived ease of use, and attitudes were strong predictors for the intention to use Web 2.0 (see Table 8). Should Web 2.0 tools be perceived easy to use and beneficial for learning, Indonesian PSSTs will be more likely to use Web 2.0 in their learning activities which was similar to some studies (e.g. Nikou & Ecomides, 2019; Rejón-Guardia et al., 2019; Teo et al., 2018). Similarly, perceived usefulness also significantly predicted the intention to use Web 2.0 among Indonesian PSSTs as it was also reported by Rejón-Guardia et al. (2018). In addition, the more positive attitudes toward Web 2.0, the higher chance for the PSSTs to learn in their science education class using Web 2.0 (Buabeng-Andoh et al., 2019; Lai et al., 2012; Teo et al., 2018). The fact that attitudes towards Web 2.0 were also driven by perceived usefulness and perceived ease of use among the respondents indicates that the easiness of use and the benefits of Web 2.0 factors can improve their attitudes towards the use of Web 2.0 in learning. Previous studies also revealed similar results (Buabeng-Andoh et al., 2019; Teo et al., 2018) which support the results of this research.

In addition, facilitating condition and subjective norm were also included to predict the perceived usefulness and perceive ease of use of Web 2.0 among Indonesian science student teachers. It is revealed that facilitating condition was a significant factor influencing perceived ease of use. A similar finding was also reported by Nikou and Ecomides (2019). Similar to Teo's et al. (2018) finding, this research result also informed that facilitating condition did not have any significant influence on perceived usefulness. The researchers inferred that the supporting or facilitating condition such as appropriate facilities, good environment, and easy access of the Internet would ease Indonesian PSSTs' use of Web 2.0 in learning. On the other hand, subjective norm significantly influenced both perceived ease of use and perceived usefulness which agreed to similar findings (Rejón-Guardia et al., 2019; Teo et al., 2018).

The TAM has been widely used to examine technology integration in many developed countries (Abrahim et al., 2018; Rahimi et al., 2015; Teo et al., 2018); most variables were reported to be significant predictors for intention to use, perceived ease of use, perceived usefulness, as well as attitudes. However, a few researches have been done in developing countries. This research adds the model contribution for technology integration for a developing country context to understand factors predicting the intention to use technology in learning.

Conclusions and Implications

Nowadays, teachers' acceptance of the technology integration is unavoidable and complicated. Therefore, to optimize the investment for technology especially Web 2.0 in learning processes in higher education, the evaluation on factor affecting the intention to use Web 2.0 should be promoted for recommendation of effective use of Web 2.0 in education from various settings and contexts namely types of countries in which this research focused on its application for developing countries. By focusing on pre-service science teachers and based on some previous technology acceptance researches, the researchers reported some significant predictors of the respondents' intention to use Web 2.0 in their learning activities. The findings require to continue the support to the research of technology acceptance in education and the incorporation student-related factors through the process. It could also inform related stakeholders mainly teacher educators in developing countries on how to better prepare PSSTs for effective use of technology in learning as well as their future teaching. Facilitating PSSTs with adequate infrastructure for technology integration is vital as well as motivating them to learn using Web 2.0. The focus for perceived ease of use and perceived usefulness should be on the teacher educators since the PSSTs were perceived to have high values of these variables.

Although strong statistical support has been present, this research has some limitations. First, PSSTs in this research were only from three universities in Indonesia. There are more than forty universities in Indonesia conducting pre-service teacher training programs. As a country with more than 170 million users of the Internet dominated by millennial including students in higher education, a bigger-sample research is recommended. In this research, science student teachers were recruited; students from different kinds of majors might also be suggested to be the participants in the future research. Another interesting recommendation for future research is that future researchers may compare the use of Web 2.0 technologies between state and private universities or between universities in big cities and small cities.

https://doi.org/10.33225/jbse/19.18.595

Acknowledgement

The researchers would like to thank Jambi University and the Ministry of Research, Technology, and Higher Education of the Republic of Indonesia for funding this research (No. SP-DIPA-042.01.2.400950/2018).

References

Abrahim, S., Mir, B. A., Suhara, H., & Sato, M. (2018). Exploring academic use of online social networking sites (SNS) for language learning: Japanese students' perceptions and attitudes towards Facebook. *Journal of Information Technology and Software Engineering*, *8*(223), 2.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.

Bharucha, J. (2018). Exploring education-related use of social media: Business students' perspectives in a changing India. *Education + Training*, *60*(2), 198-212.

Binyamin, S. S., Rutter, M. J., & Smith, S. (2019). Extending the technology acceptance model to understand students' use of learning management systems in Saudi education. *International Journal of Emerging Technologies in Learning*, *14*(3), 4-21.

Buabeng-Andoh, C., Yaokumah, W., & Tarhini, A. (2019). Investigating students' intentions to use ICT: A comparison of theoretical models. *Education and Information Technologies*, *24*(1), 643-66.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Mis Quarterly, 13*(3), 319–34.

Davis, F. D. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies, 38*(1), 475–487.

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

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: the tailored design method*. New Jersey, NJ: Wiley Publishing.

Elkaseh, A. M., Wong, K. W., & Fung, C. C. (2016). Perceived ease of use and perceived usefulness of social media for e-learning in Libyan higher education: A structural equation modeling analysis. *International Journal of Information and Education Technology*, *6*(3), 192.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior.* Reading, MA: Addison-Wesley.

Fowler, F. J. (2013). *Survey research methods*. Thousand Oaks, CA: Sage Publications.

Habibi, A., Mukminin, A., Riyanto, Y., Prasojo, L. D., Sulistiyo, U., Sofwan, M., & Saudagar, F. (2018). Building an online community: Student teachers' perceptions on the advantages of using social networking services in a teacher education program. *Turkish Online Journal of Distance Education*, *19*(1), 46-61.

Hair, J. F., Hult, G. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM) (2nd ed.)*. Thousand Oaks, CA: Sage Publications.

Kompen, R. T., Edirisingha, P., Canaleta, X., Alsina, M., & Monguet, J. M. (2019). Personal learning Environments based on Web 2.0 services in higher education. *Telematics and Informatics*, *38*, 194-206.

Kwok, D., & Yang, S. (2017). Evaluating the intention to use ICT collaborative tools in a social constructivist environment. *International Journal of Educational Technology in Higher Education*, *14*(32). https://doi.org/10.1186/s41239-017-0070-1

Lai, C., Wang, Q., & Lei, J. (2012). What factors predict undergraduate students' use of technology for learning? A case from Hong Kong. *Computers & Education*, *59*(2), 569-579.

Marangunić, N., & Granić, A. (2015). Technology acceptance model: A literature review from 1986 to 2013. *Universal Access in the Information Society*, *14*(1), 81-95.

MoRTHE. (2018). *Grafik jumlah mahasiswa aktif berdasarkan kelompok bidang* [Active student graphic based on majors]. Retrieved from https://forlap.ristekdikti.go.id/mahasiswa/homegraphbidang

Nikou, S. A., & Economides, A. A. (2017). Mobile-based assessment: Investigating the factors that influence behavioral intention to use. *Computers & Education*, *109*, 56-73.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of applied psychology*, *88*(5), 879.

Rahimi, E., van den Berg, J., & Veen, W. (2015). Facilitating student-driven constructing of learning environments using Web 2.0 personal learning environments. *Computers & Education*, *81*, 235-246.

Rejón-Guardia, F., Polo-Peña, A. I., & Maraver-Tarifa, G. (2019). The acceptance of a personal learning environment based on Google apps: The role of subjective norms and social image. *Journal of Computing in Higher Education*, 1-31. https://doi.org/10.1007/s12528-019-09206-1

Saadé, R. G., & Galloway, I. (2005). Understanding intention to use multimedia information systems for learning. *Informing Science: International Journal of an Emerging Transdiscipline*, *2*, 287-296.

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education*, *128*, 13-35.

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research, 6*(2), 144-176.

https://doi.org/10.33225/jbse/19.18.595

ISSN 1648–3898 /Print/
ISSN 2538–7138 /Online/

Teo, T. (2011). Technology acceptance research in education. In T. Teo (Ed.), *Technology acceptance in education: Research and issues* (pp. 1-5). Rotterdam: Sense

Teo, T., Sang, G., Mei, B., & Hoi, C. K. W. (2018). Investigating pre-service teachers' acceptance of Web 2.0 technologies in their future teaching: a Chinese perspective. *Interactive Learning Environments, 27*(4), 1-17.

Valaei, N., & Rezaei, S. (2017). Does Web 2.0 utilization lead to knowledge quality, improvisational creativity, compositional creativity, and innovation in small and medium-sized enterprises? A sense-making perspective. *Technology Analysis & Strategic Management*, *29*(4), 381-394.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *Mis Quarterly, 27*(3), 425-478.

Venkatesh, V., Rabah, J., Fusaro, M., Couture, A., Varela, W., & Alexander, K. (2016). Factors impacting university instructors' and students' perceptions of course effectiveness and technology integration in the age of Web 2.0. *McGill Journal of Education / Revue Des Sciences De L'éducation De McGill*, *51*(1), 533-561.

Zheng, B., Niiya, M., & Warschauer, M. (2015). Wikis and collaborative learning in higher education. *Technology, Pedagogy, and Education*, *24*(3), 357-374.

Received: *April 04, 2019* Accepted: *July 11, 2019*

Muhaimin	PhD, Associate Professor, Jambi University, Doctoral Program in Education, jln. Raden Mattaher, Jambi, Indonesia. E-mail: muhaimin_73@yahoo.de Website: http://orcid.org/0000-0002-6269-5931
Akhmad Habibi *(Corresponding author)*	PhD Student, University of Malaya, Faculty of Education, 50603, Kuala Lumpur, Malaysia. E-mail: akhmad.habibi@unja.ac.id Website: https://orcid.org/0000-0001-7687-2858
Amirul Mukminin	PhD, Associate Professor, Jambi University, Doctoral Program in Education, Jln. Raden Mattaher, Jambi, Indonesia. E-mail: amirul.mukminin@unja.ac.id Website: https://orcid.org/0000-0002-6806-1315
Robin Pratama	PhD Student, Jambi University, Doctoral Program in Education, jln. Raden Mattaher, Jambi, Indonesia. E-mail: robin.pratama@unja.ac.id Website: https://orcid.org/0000-0002-1827-3045
Asrial	PhD, Professor, Faculty of Education, Jambi University, Mendalo Darat, Jambi Luar Kota, Jambi, Indonesia. E-mail: asrial@unja.ac.id
Harlina Harja	PhD Student, Jambi University, Doctoral Program in Education, jln. Raden Mattaher, Jambi, Indonesia. E-mail: lina.harja73@gmail.com

https://doi.org/10.33225/jbse/19.18.595