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Contribution of technology innovation acceptance and organizational innovation climate on innovative teaching behavior with ICT in indonesian education

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Abstract

This study aimed to test a reflective model involving Technology Innovation Acceptance (TIA) and Organizational Innovation Climate (OIC) as predictors for Innovative Teaching Behavior with Information and Communication Technology (IT-ICT) among 533 pre-service teachers from 3 Indonesian universities. Four hypotheses were proposed in the current model. A survey instrument was developed and validated through face and content validity. The validation also involved the assessment of the measurement model through partial least square structural equation modeling (PLS-SEM). The assessment of the structural model to determine path coefficient (β) as well as t and *p* values of the 4 hypotheses was also computed through PLS-SEM. Findings informed that TIA possesses a positive correlation with OIC and that OIC is statistically significant affecting IT-ICT. The role of

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the moderating variable (OIC) is also significant in mediating TIA with IT-ICT for hypothesis However, TIA is insignificant in predicting IT-ICT.

Keywords: TIA; OIC; IT-ICT; Pre-service teachers; Indonesia

Introduction

In the 21st century education, recommendation to establish new ideas and approaches that can be adapted and used by teachers or schools on daily basis should always be proposed (Agyei & Voogt, 2014). Teachers including pre-service teachers use new perspectives, methods, design of curriculum, and educational technologies to better the teaching quality (Prasojo, Mukminin, Habibi, Hendra, & Iqroni, 2019; Thurlings, Evers, & Vermeulen, 2015). Teachers' use of ICT facilitates easiness in accessing learning resources and schools supported by sufficient ICT tools could improve students' interest in learning (Chou, Shen, Hsiao, & Shen, 2018). In addition, teachers' participation and role through innovative teaching could motivate their students to have their own experience and knowledge (Habibi, Yusop, Razak, 2019). Information and communication technology (ICT) is one form of technologies that can be implemented in the teaching and learning process for innovative teaching. Innovative Teaching Behavior with Information and Communication Technology (IT-ICT), including the implementation of creative learning, provides students with a full penetration of ICT into all curriculum aspects (Thurlings et al., 2015).

The identification of factors predicting ICT implementation is one of the many reasons to understand why several teachers might welcome the use of technology while others do not embrace it. Regarding IT-ICT, previous researchers focused their study on performance expectancy as one of the significant predictors (Elstad & Christophersen, 2017; Nikolopoulou & Gialamas, 2016). Other researches regarding human behavior have recommended self-efficacy to be one of the significant factors predicting IT-ICT (Bray-Clark, & Bates, 2003; Nie,

Tan, Liau, Lau, & Chua, 2013). However, not many studies involved Technology Innovation Acceptance (TIA) and Organizational Innovation Climate (OIC) (Hornstra, van der Veen, Peetsma, & Volman, 2015; Thurlings et al., 2015). Therefore, we conducted a survey to report the predictive power of both TIA and OIC to IT-ICT in Indonesian context through Partial Least Square Structural Equation Modeling (PLS-SEM).

Innovation, teachers, and school organization

There are various innovative instructional strategies introduce in education. For instance, the use of audio-tutorial, technology-assisted instruction, blended learning, instructional video and television, outdoor learning, gaming and simulation, online-video meeting, and other strategies (Ellis, 2015; Sharif, 2019). Even though these strategies have been very popular and widely used in educational instruction, the question regarding their effectiveness and efficiency still emerge. Many of the instructional techniques utilize the development of technology and science. Some of them are signed by focusing more responsibility on the student in the process of learning. Others are just for time spending in instructional practices. More importantly, majority of the strategies are similarly the replacements for the traditional lecture strategy (ASHE-ERIC High. Edu. Rept, 1973). In many attempts to replace the traditional teaching methods, the use of ICT or other instructional activities is dominating (Ala-Mutka, Punie, & Redecker, 2008; Habibi, Yusop, & Razak, 2020; Muhaimin, Habibi, Mukminin, Pratama, Asrial, & Harja, 2019).

Teachers' innovation in instructional technology used of electronic and mechanical devices assisting teachers in teaching and learning process, such as computer-assisted and ICT-managed pedagogy, internet-based learning, social media use, technology simulation, online leaning, pedagogical video broadcasting, audio or video resources, visual recordings, and etc (Gagne, 2013). With the use of technology, teachers have significant potentiality to extend innovation for more powerful pedagogy. With its use, the productivity of both students and

teacher can be facilitated (Johnson, 1991). It also exceeds teachers' flexibility of instructional process regarding time and space through e-learning and m-learning (Al-Emran, Elsherif, & Shaalan, 2016). In addition, it also decreases many administration tasks of teachers to maximize the essence of instruction. Technology has also improved independent learning among students and speeds the rate of learning, as well as increases the teachers' opportunities for communication, supervision, and discussion through social media (Habibi et al., 2018). It further provides opportunity for responses and feedbacks with Podcast (Cooper, 2008).

Supports from educational organization for teachers are needed for innovative teaching. The supports, such as supportive classroom environment, beneficial school development and leadership, and availability pedagogical materials, will impact on the increase of teachers' performance for innovation (Cobb, Jackson, Henrick, & Smith, 2018; Skott, 2013). These supports should also be encouraged by sufficient tools and human resource for teachers' IT-ICT. The roles of organization is very significant in supporting the technology-based teaching implemented by teachers in schools. Facilitating condition that was established by a supportive educational organization was one of the key factors affecting teachers use of technology in teaching and learning process (Nikou & Ecomides, 2019; Rahimi, van den Berg, & Veen, 2015; Teo, Sang, Mei & Hoi, 2018).

Technology Innovation Acceptance (TIA) to predict Innovative Teaching Behavior with ICT (IT-ICT)

IT-ICT is considered as the intentional behavior of teachers including pre-service teachers that make efforts to use ICT into their teaching. The efforts involve innovation which affects students' behavior to innovate. IT-ICT includes purposive actions to stimulate ideas and daily behavior using technology (Hornstra et al., 2015). On the other hand, TIA was defined as the technological acceptance in a subjective sense (Chou et al., 2018; Teo, 2014), namely teachers' possession of positive attitudes towards technology, intention to use technology, and percep-

tion of the usefulness perception as well as control of technology used in teaching. TIA affects teachers' willingness to use the technology in teaching and learning processes at any phase. It has also been revealed that teachers can obtain information or learn new things comfortably if they have good acceptance of new teaching practices, such as the technology-infused instruction (Nikolopoulou & Gialamas, 2016).

Two sub-variables included in TIA in this study were innovation compatibility and benefits of innovation. Innovation compatibility refers to the ease of integrating ICT into teaching and mastering the introduction of ICT into their teaching activities (McInerney, Ganotie, King, Moring, & Mardsh, 2015; Nikolopoulou & Gialamas, 2016). Benefits of innovation refers to the awareness of teachers of the beneficial factors of ICT for innovative teaching. Teachers' innovation compatibility contains the extent to which innovative teaching practices confirm to individual merits, prior experiences, and current condition of students' needs. When the innovation compatibility is perceived better, the possible way of the adoption of teaching with innovation behavior will be more sustainable (Abdullah & Ward, 2016). Based on innovation compatibility, effective teachers can do better in adjusting their communication. They can address a good introduction of technology to the students and elaborate complex subjects to better students' understanding. Teachers with a good level of innovation compatibility have been proved to be better in problem-solving and in choosing appropriate teaching approaches (Gerick, Eickelmann, & Bos, 2017). In addition to innovation compatibility, benefits of innovation which is part of TIA have also strongly linked with IT-ICT. TIA needs a link between new knowledge for innovative teaching and prior experiences of benefits of innovation. The acknowledgment of the benefits of innovation with the agreement of the innovation concept improve teachers' TIA that affect to their IT-ICT (Hernandez-Ramos, Martinez-Abad, Garcıa Penalvo, Garcıa, & Rodriguez-Conde, 2014).

TIA has been previously related to technology implementation (Chou et al., 2018; Hornstra et al., 2015; Lau & Yuen, 2014). For example, Chou and colleagues (2018) through a survey in Taiwan reported a significant correlation between acceptance of technological innovation and innovative teaching behavior with technology. In ad-

dition, Hornstra and colleagues (2015) through auto regression found significant relationship between innovative learning and motivation to use technology in learning. Besides, TIA in this study was also analyzed to predict organizational innovation climate (OIC) (Chou et al.; 2018 Elstad & Christophersen, 2017; Gerick et al., 2017). Chou and colleagues (2018) reported that acceptance of technological innovation significantly predicted OIC (β = 828). Similarly, Gerick and colleagues (2017) found that TIA had a strong relationship with OIC. Besides the direct relationship examined in this study, the indirect relationship between TIA and IT-ICT thorough innovation climate of organization was also proposed. Previously Chou and colleagues (2018) reported significant and positive indirect correlation between innovation in TIA and innovative behavior to use ICT in Taiwan. Three hypotheses were submitted relating to TIA role in predicting OIC and IT-ICT in this study:

1. H1: TIA directly affects the OIC.
2. H2: TIA directly influences IT-ICT.
3. H3: TIA indirectly influences IT-ICT through OIC.

Organizational Innovation Climate (OIC) as a predictor of IT-ICT

OIC is defined as teachers' perceptions towards the educational organization or school they work to motivate innovative teaching activities, creative and critical thinking, and facilitating teacher's teaching with ICT tools. The measurements to assess OIC are organizational learning, culture of innovation, job autonomy, and group cohesion and learning, and other factors (Thurlings et al., 2015). Teachers' decisions to implement IT-ICT are influenced by factors within this organization climate.

In the theory of planned behavior (Ajzen, 1991), intention decides behavior. One of the determinants of the actual behavior is attitude (e.g. TIA), subjective norm (e.g. OIC), and perceived behavior control (e.g. IT-ICT). Therefore, the more positive a person perceives about a particular act, the better OIC will encourage the perceived behavior of the activities, and the engagement of the individual's intention will

also be more significant (Chou et al., 2018). In this study context, pre-service teachers perceive that IT-ICT might be more convenient than traditional teaching. When OIC is considered more powerful, it will get easier to encourage teachers for their commitment to IT-ICT. The environment and ambiance of the schools (e.g., group learning, group cohesion, job autonomy, and innovative culture) encourage teachers to apply innovation and creation in their teaching to manage students' attention, motivation, and productivity (Agyei & Voogt, 2014; Thurlings et al., 2015).

Besides exploring the relationship between TIA and OIC as well as IT-ICT. The current study also focused on OIC as one of the determinants that might explain the reason teachers decide to do IT-ICT in education. Further, it could be considered to predict IT Studies have recommended that the more useful the technology is perceived and the easier used by teachers, the more likely teachers' IT-ICT will increase (Chou et al., 2018; Obiri-Yeboah, Kwarteng, & Kyere-Djan, 2013). Teachers' perceptions of OIC regarding technology implementation in education was previously informed to have a significant influence towards IT-ICT (Chou et al., 2018). Obiri and colleagues (2013) did a mix method study and recommended that management of Institutions should have a clear ICT integration model to help improve the implementation of ICT in their institutions. In brief, the organizational climate in this study is expected to support innovation in teaching process with technology. It aims at promoting cutting-edge technology for teachers IT-ICT.

4. H4: OIC directly influences IT-ICT.

Research methods

This research was part of projects conducted for 2 years by researchers of 2 universities from Indonesia and Malaysia. The method of this study was based on PLS-SEM analysis tool that was ascertained using the SmartPLS 3.0 software (Hair, Risher, Sarstedt, & Ringle, 2019). Figure 1 performs the model of the study. PLS-SEM is utilized because the algorithm allows the unlimited computation of cause-and-

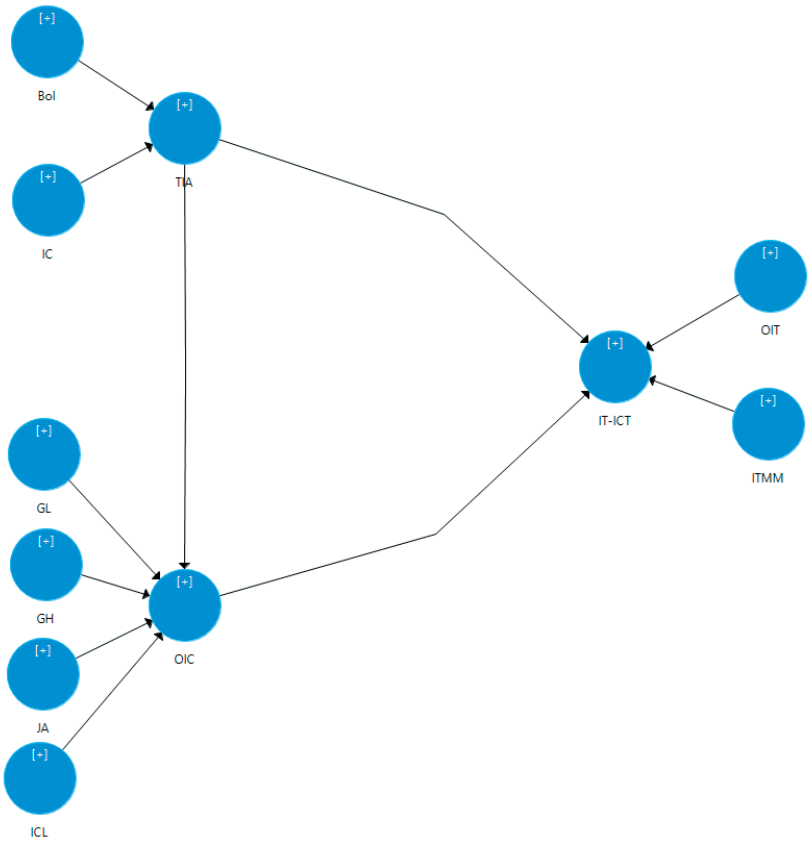

Figure 1. Proposed model

effect models that can be implemented for reflective and formative measurement models (Hair et al., 2019).

Scale and development of the questionnaire

In developing a questionnaire, there are steps of forms depending on what and why a researcher wants to measure. Experts propose that the questionnaire is common and acceptable for future research. For

instance, the statements included in the questionnaire should be easily comprehended by the study participants (Sekaran, 2010). Besides, researchers are recommended to maximize the reliability and validity of the questionnaire indicators, to minimize the stress level of the respondents in responding to the indicators and to be economical for data collection costs (Taofeeq, Adeleke, & Lee, 2020). Therefore, this study adopted a Likert scale. Likert scale is a psychometric type of scale used in instruments to tap respondents' extent of agreement or otherwise in a given statement. In this study, the selection of a 7-point scale from very disagree (1) to very agree (7). The scale is appropriate since it will foster data reliability and decrease social desirability bias (Taofeeq et al., 2020).

We adapted indicators from previous studies (Table 1). Three main variables include eight constructs, with every construct containing five to six indicators. In the validation process, some improper

Table 1. Main variable, source, definition, and sample of the indicator

Main variable	Source	Definition	Indicator sample
TIA	Chou et al., 2018; Teo, 2014	Pre-service teachers possess a more positive attitude towards ICT and their intention to use ICT than their perceptions of the usefulness of the ICT and their control of ICT	(Bo1) Lessons with ICT innovation are more interesting.
OIC	Bouckenooghe, Devos, & Van den Broeck, 2009; Chou et al., 2018	Pre-service teachers shared perceptions of organizational events, practices, and procedures in supporting a good climate for innovative teaching	(GC4) I have sufficient resources to use ICT for creative teaching
IT-ICT	Chou et al., 2018; Teo, 2014	Pre-service teachers' self-assessment towards the results of innovative teaching using ICT	(ITMM2) I can prepare ICT teaching materials and tools for different units of materials.

indicators were dropped. In the beginning, there were 40 indicators included in TIA, OIC, and IT-ICT. The 40 indicators were discussed with five experts in educational technology. Besides, we invited ten users, pre-service teachers who have done their teaching practices to review the overall indicators for their clarity, simplicity, and relevance. Based on the processes, six indicators were dropped since they were improper in terms of context, setting, and statements. Thirty-four indicators were included for the main data collection.

The procedure of data collection

The whole population covers more than 1 million student teachers in Indonesian form 374 universities in Indonesian (Habibi et al., 2019). However, our target population includes all Indonesian pre-service teachers in Jambi, a province where the three universities located. Through stratified random sampling proposed by Creswell (2014). Six hundred copies of questionnaire were distributed to the identified respondents at three Indonesian universities in Indonesia. The pre-service teacher must be attending or have attended teaching practices since this study aims to measure their IT-ICT during or after teaching practices. The process of data collection spends a five-week time. The questionnaire was prepared in Indonesian language to help the pre-service teachers respond in the most convenient way. Through the process of data screening and data preparation for non-normality data, missing data and outliers, 533 responses are measurable and proceeded for further data analysis process. The detail of the respondents' demographic information of the current study is shown in Table 2.

Data analysis

Data normality and Collinearity (VIF)

The data preparation was conducted to make sure the completeness and accuracy of the data and insurance that the data had no prob-

Table 2. Demographic information

N. 533	Characteristics	Frequency	Percentage (%)
Gender	Female	395	74.1
	Male	138	25.9
Major	Science education teachers	257	48.2
	Social science education teachers	52	9.8
	Language education teachers	122	22.9
	Pre-School and elementary education teachers	102	19.1
University	University A	318	59.7
	University B	151	28.3
	University C	64	12
ICT-based course	1	64	12
	2-3	393	73.7
	>3	76	14.3

lems with outliers, missing values, and non-normal distributions (Hair, Anderson, Babin, & Black, 2010). The skewness and kurtosis assessments were conducted. Based on the computation result, the skewness for TIA indicators ranged from -.251 to .170 with kurtosis values ranged from -.112 to .509. Similarly, skewness values for the OIC indicators were from -.224 to .315 (NB); the kurtosis values were from -.110 to .219. Finally, skewness for IT-ICT was in range value (. -129 to .110) with kurtosis of -.667 to .981. All the values are within the recommended ranges of -1 to +1 for skewness and -1.96 to +1.96 for kurtosis (Hair et al., 2010)

The multicollinearity test is suggested to apply for the constructs' examination before assessing the proposed structural model. Because of collinearity, it is difficult to ascertain the effect of any single variable. This study covered the use of variance inflation factors designated as VIF in examining multicollinearity. A value that is higher than 3 has the indication of multicollinearity (Hair et al.,

2019). Using the smartPLS 3.0, the VIF values of the current study were appropriate (VIF < 3) which indicate no multicollinearity issue has emerged.

Assessment of measurement model

The assessment of model measurement was computed based on 4 measurements through PLS-SEM (reflective indicator loadings, internal consistency reliability, convergent validity, and discriminant validity). Reflective indicators loadings should fulfill the value of >.700 (Hair et al., 2019). Through the computation with PLS-SEM procedure, some indicators that loading values are below .700 were dropped; ICL4 (.521), JA4 (.533), GC3 (.627), OIT1 (.489), OIT2 (.613), OIT3 (.570), and IOT4 (.676). As a result, 27 indicators remained for further process of the data analysis. In addition, the internal consistency reliability was applied to evaluate the consistency of the results. The reliability in this study was done by measuring the sub-variables' Cronbach's alpha that should be equal to or more than .700, composite reliability (CR) that should be between .708 and .950 (Hair et al., 2019). All values of Cronbach's alpha and CR fulfill the required threshold values (Table 3).

The convergent validity is described as the degree that a group of variables converge to measure a certain concept (Hair et al., 2019). In measuring convergent validity, average variance extracted (AVE) was used; the values should be ≥ .500 (Hair, Hult, Ringle, & Sarstedt, 2016). All AVE values are more than .500 meaning that all values exceed the threshold (Table 3). In confirming the construct validity, the establishment of the discriminant validity is especially important; the extent to which a construct is different from other constructs (Hair et al., 2016). Cross-loadings, Fornell-Lacker, and HTMT were examined for the discriminant validity (Hair et al., 2016). For cross-loadings, indicators' loading values are suggested to be higher on its respective variable than its values on other variables. No issue was reported in line with the cross-loading since the loading value of each indicator was greater on its respective load (Table 4).

Table 3. Loading, Cronbach's alpha, CR, AVE

Main variable	Construct	Indicator	Loading	Alpha	CR	AVE
TIA	Benefit of Innovation (BoI)	BoI1	.796	.882	.919	.74
		BoI2	.905			
		BoI3	.838			
		BoI4	.896			
	Innovation Compatibility (IC)	IC1	.840	.890	.924	.753
		IC2	.908			
		IC3	.899			
		IC4	.821			
OIC	Group Learning (GL)	GL1	.899	.904	.933	.778
		GL2	.919			
		GL3	.904			
		GL4	.800			
	Group Cohesion (GH)	GC1	.757	.792	.856	.512
		GC2	.767			
		GC4	.786			
	Job Autonomy (JA)	JA1	.877	.855	.912	.775
		JA2	.878			
		JA3	.886			
	Innovative Culture (ICL)	ICL1	.847	.820	.893	.735
		ICL2	.851			
		ICL3	.873			
IT-ICT	Innovative teaching material and method (ITMM)	ITMM1	.778	.867	.910	.717
		ITMM2	.815			
		ITMM3	.904			
		ITMM4	.884			
	Outcome of innovative teaching (OIT)	OIT5	.867	.786	.828	.706
		OIT6	.813			

Table 4. Cross loading

	BoI	GC	GL	IC	ICL	ITMM	JA	OIT
BoI1	.796							
BoI2	.905							
BoI3	.838							
BoI4	.896							
GC1		.757						
GC2		.767						
GC4		.786						
GL1			.899					
GL2			.919					
GL3			.904					
GL4			.800					
IC1				.84				
IC2				.908				
IC3				.899				
IC4					.093			
ICL1					.847			
ICL2					.851			
ICL3					.873			
ITMM1						.778		
ITMM2						.815		
ITMM3						.904		
ITMM4						.884		
JA1							.877	
JA2							.878	
JA3							.886	
OIT5								.825
OIT6								.816

For the Fornell-Larcker criterion, Table 5 informs all the diagonal values are higher than the correlation among the variables, for well-established discriminant validity. Discriminant validity issues emerge when the values of HTMT (the main consideration for the discriminant validity) are higher than the threshold (< .900). All values are below .900 indicating no issue with discriminant validity (Table 6). After all the measurement processes were done, assessment of the structural model was further carried out.

Table 5. Fornell Larcker Criterion

	BoI	GC	GL	IC	ICL	ITMM	JA	OIT
BoI	.860							
GC	.250	.770						
GL	.142	.123	.882					
IC	.166	.095	.090	.868				
ICL	.189	.150	.080	.152	.857			
ITMM	.150	.235	.711	.141	.115	.847		
JA	.164	.289	.139	.142	.160	.282	.880	
OIT	.193	.250	.213	.039	.138	.299	.237	.840

Table 6. HTMT

	BoI	GC	GL	IC	ICL	ITMM	JA
BoI							
GC	.329						
GL	.159	.260					
IC	.186	.130	.205				
ICL	.220	.204	.094	.277			
ITMM	.172	.311	.407	.161	.536		
JA	.188	.379	.156	.163	.189	.326	
OIT	.263	.397	.284	.054	.192	.417	.337

Findings

Assessment of structural model

The assessment of the structural model of this study was conducted to examine the causal relationships of the factors affecting IT-ICT. In this context, path coefficients or beta values (β), t-value, and p-value are parameters indicated in determining how the data supported the hypotheses (Hair et al., 2016). A bootstrapping with a resampling of 5000 was done to generate the parameters to inform the statistical significance (Hair et al., 2019).

The results of the bootstrapping inform that hypothesis 1, TIA possesses a positive correlation with OIC (β = -.065; p <.001). For hypothesis 4, it is found that OIC is statistically significant affecting IT-ICT (β = -.425; p > .001). Based on these results, Hypotheses 1 and 3 are supported. In addition, the role of moderating variable (OIC) is significant in correlating TIA with IT-ICT for hypothesis 3 (β = .027; p < .01). Thus, hypothesis 3 is also confirmed. However, for hypothesis 2, the result of the data analysis suggests that TIA is insignificant in predicting IT-ICT (β = .026, p > .01). Therefore, the hypothesis 2 of this study is rejected. All details of the path correlation processed in this study can be seen from Figure 2 and Table 7.

Table 7. Bootstrapping results

Hypotheses	Path	Coefficient	t-value	p-values	Significance
H1	TIA -> OIC	-.065	4.844	p <.001	Supported
H2	TIA -> IT-ICT	.026	.946	.344	Not supported
H3	TIA -> OIC -> IT-ICT	.027	3.254	p <.01	Supported
H4	OIC -> IT-ICT	-.425	4.430	p <.001	Supported

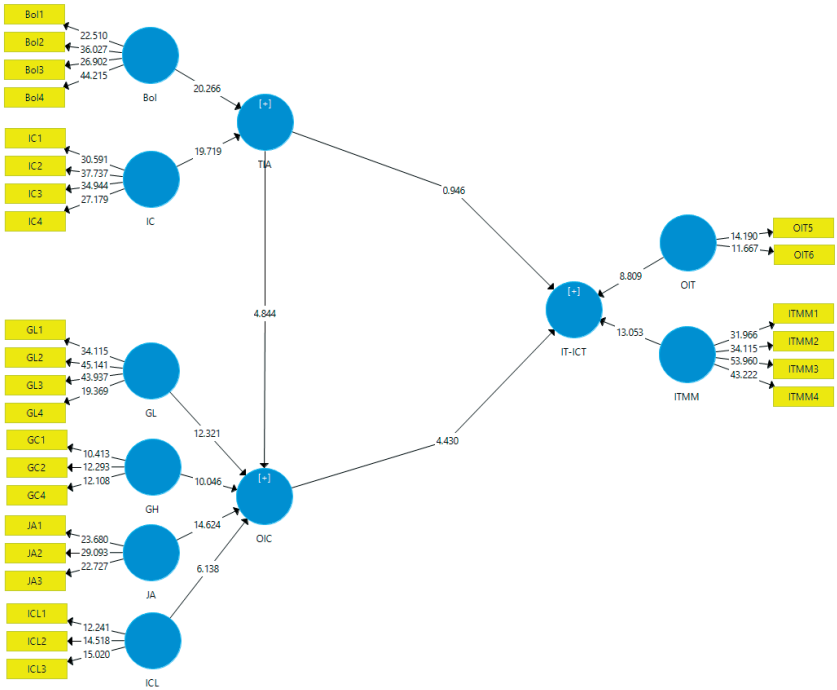

Figure 2. Bootstrapping results

The coefficient of determination (R^2)

The coefficient of determination was symbolized as R^2 which is the reflection of the variable quality included in the model (Hair et al., 2019). Many criteria can be used as references for the assessment of R2. However, we used Hair and colleagues' (2019) criterion that determined R2 value ≥ .670 as substantial, .330 as moderate, and .190 as weak. Table 8 depicts the R2 values of the two endogenous latent variables (IT-ICT and OIC). The research model explicates .544 (moderate) of the total variances in IT-ICT and .078 (weak) in OIC contractors' risk attitudes.

Table 8. R2 value

	R^2	Consideration
IT-ICT	.544	Moderate
OIC	.078	Weak

Effect size (f^2)

The effect sizes or f^2 explores the measurement of the impact of a predictor towards predicted construct assessing the alter R^2 when an exogenous construct is dropped from the model. We used a Hair and colleagues' (2019) criterion that informed that the effect size is .020 as small, .150 as a medium, and .350 as high. Table 9 shows that the effect size of OIC -> IT-ICT is large and TIA -> IT-CIT is small. However, no effect has resulted from the relationship between TIA and IT-ICT supporting the results of the path coefficient calculation.

Table 9. F2 value

	f^2 value	Effect size
OIC -> IT-ICT	.570	Large
TIA -> IT-ICT	.010	No effect
TIA -> OIC	.087	Small

Assessment of the predictive relevance (Q^2)

Hair and colleagues (2019) suggested that the predictive relevance denoted as Q^2 value is > 0. It indicates that the model possesses predictive relevance for the dependent construct.

In computing Q^2 value, we employed the use of Stone-Geisser test of blindfolding computation through PLS-SEM. Blindfolding measures the parameters with the remaining data points (Hair et al., 2019). The test of predictive relevance is generally utilized as an extending measurement of PLS-SEM goodness-of-fit. Table 10 exhibits the results of Q^2, the cross-validation redundancy measure $Q^2$for the two

dependent variables were above zero, suggesting the current model's predictive relevance or Q^2.

Table 10. Q^2 value

	Q^2
IT-ICT	.259
OIC	.021

Discussion

The influence pattern and empirical data for TIA and OIC towards IT-ICT are reported to have a good fit in the process of the measurement model. Through the bootstrapping result of 5,000 re-sampling, the current study informs that for Indonesian pre-service teachers, the influence of TIA on IT-ICT is insignificant. However, OIC is significant and positive in relation to IT-ICT. It can be concluded that being compared with TIA; OIC is more significant predicting Indonesian pre-service teachers' IT-ICT as reported by previous studies (Abdullah & Ward, 2016; Chou et al., 2018; Hornstra et al., 2015; Lau & Yuen, 2014).

Further, OIC plays as a mediator that enhances IT-ICT for TIA. Based on the theories, individuals' recognition of the highlighting cultural dynamics that are available in their organizations has an especially important role for TIA (Chou et al., 2018). Lawrence and Tar (2018) studied a successful ICT integration in pre-service teacher program that was related to teachers' attitudes, perspectives, self-efficacy, and self-confidence in using ICT as well as the significance of training program and school culture regarding the use of ICT in education. At the level of the teacher training, factors like stakeholder encouragement, sufficient funding, much training, and well-established facilities both in the training programs and schools are among factors influencing pre-service teachers' decision to technology integration during teaching practices.

Previous studies have informed that pre-service teachers' attitudes towards ICT affect their acceptance of the benefits and the integration during teaching practice (Elstad & Christophersen, 2017). In

this study, TIA is a significant predictor to OIC, and the benefits of innovation (BoI) as part of TIA sub-variable is a key factor positively correlated to OIC (Daniels, 2015; Elstad & Christophersen, 2017; Gerick et al., 2017). OIC possesses a positive relationship with IT-ICT. Group learning (GL), group cohesion (GC) job autonomy (JA), and innovative culture (ICL) are significantly and positively related to IT-ICT. For Indonesian context through this study, IT-ICT needs teaching materials and methods in relation to ICT for producing more different results in a progressive way. The integration of ICT can improve willingness and contribution in creative learning and address positively for better achievement in educational goals (McInerney et al., 2015). The current findings were in line with Hernandez-Ramos and colleagues (2014) who recommended that individual creativity is created by organizational environment identification. Teo (2014) also indicated that attitudes can enhance IT-ICT.

Pre-service teachers will do innovative teaching and keep innovative responsibility by implementing innovative culture and job independence. Therefore, thereby achieving innovative teaching results and accomplish self-commitment. By working independently, pre-service teachers can have their commitment for innovative teaching with creativity and imagination. The findings can also be an evidence that IT-ICT is an advanced cognitive and heuristic concept in education that is related to technology integration. The major effect of ICT integration in Indonesian towards education has become the increase of pre-service teachers' innovative teaching. The success of ICT implementation in a country is also heavily dependent on related organizations' innovative prospects namely teacher training programs and schools, which is a dynamic process that include a systematic set of connected factors

Conclusion

This study investigated the correlation among Indonesian pre-service teachers' TIA, OIC, and IT-ICT. The findings of the study indicate that OCI possesses a significant and positive role in predicting IT-ICT. Besides, TIA is significantly and positively related to IT-ICT

with OIC as the mediator. This may indicate that OIC may be significantly related to IT-ICT, in other context and settings that need future studies to investigate. In this study, pre-service teachers' perception of OIC is the most important factor in predicting IT-ICT and mediating TIA to IT-ICT as TIA does not significantly predict IT-ICT in a direct way. On the other terms, pre-service teachers in this study are considered to be pushed to use ICT into their teaching practices; however, the attitude and readiness toward the use of ICT determine the effectiveness and efficiencies of the integration. We, therefore, recommend future studies to explore more organization roles in supporting the integration of technology in education or teaching and learning processes.

The findings of the study have important implications for educational field. In promoting teachers' TIA, it is important that school stake holders and teachers need to integrate innovative teaching into the school curriculum and facilitate a sharing session for innovative teaching. They also should update their teaching approaches in making students to be more interested and achieve more. The familiarity of technology for innovative teaching should also be promoted for technology-related subjects in the classroom.

Limitations of the study

This study has several limitations. This study investigated pre-service teachers' IT-ICT. Future studies can include in-service teachers. The participants of the study are still a general term of subject, more specific subject-related studies are suggested to conduct with a specific kind of technology. The variable of the current study model can be expanded since there might be still unidentified factors that result on insignificant explanatory power. In addition, the method of the study is limited to the elaboration of the quantitative data through survey. Qualitative approaches, such as interview, focus group discussion, and observation should be considered to obtain an in-depth information on the outcomes of innovative teaching behaviors through

ICT. Studies in different settings and contexts with more respondents should also be addressed to make a more comprehensible finding.

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