The Technology Acceptance Model (TAM): Case Study of Knowledge Sharing Among Lecturers at Universities in Vietnam

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Abstract

𝕿his study research develops and tests a theoretical extension of the Technology Acceptance Model (TAM) that explains behavioral intention to use ICTs for knowledge sharing. In addition, there are different impacts on knowledge donating and knowledge collecting under the influences of demographic variables. The paper utilized structural equation modeling and cross-sectional design to test hypotheses in the proposed research model based on using data collected from 447 lecturers from 13 Vietnamese universities. The findings informed that (1) the TAM-based proposed scale has successfully explained factors predicting the use of ICTs in knowledge sharing among lecturers at universities in Vietnam. (2) the significant relationships among core components of TAM were found, except for the relationship between perceived usefulness and behavioral intention. (3) the finding of significant relationships between behavioral intention and using ICTs in knowledge sharing was reported. In addition, there are different impacts on knowledge donating and knowledge collecting under the influences of demographic variables (age, expertise type). New variables should be explored to better explain the behavioral intention of lecturers to use ICTs for knowledge sharing. Further research should test mediating roles of knowledge sharing's constituents by adding new variables such as knowledge self-efficacy, job involvement, trust, attitude, motivation, barriers, and the like. This study provides a theoretical basis, which can be used to analyze relationships among knowledge-sharing factors and to discuss the implications of these factors for developing universities' strategies that encourage and foster knowledge sharing among lecturers at universities in Vietnam. Most of the studies on knowledge sharing have been conducted in an organizational context. Only limited work has been done on the knowledge sharing among university lecturers. This study contributes to knowledge-sharing literature that suffers from a paucity of research on the empirical examination of this subject.

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1. Introduction

Knowledge is considered to be an invaluable asset, a major source of national development and knowledge management (Anantatmula, 2007), and therefore inevitably becomes an issue that needs to be addressed in order to achieve the goals of organizations, particularly knowledge creation centers like universities. In today's dynamic and competitive world, the success of educational institutions depends largely on their ability to manage knowledge (Raj Adhikari, 2010; Nunes et al., 2017). To attain this success, academic institutions are expected to have an effective knowledge management strategy (Wu et al., 2010), well-defined knowledge management policies and procedures (Romano et al., 2014) and an integrated knowledge management culture (Essawi & Tilchin, 2013; Mahmoud et al., 2014). Many management processes in universities have considered knowledge management, such as management of training activities, management of science-technology activities, personnel management, training and updating new knowledge for lecturers, creation of e-governance systems, knowledge sharing among lecturers, etc. The knowledge gained by lecturers and researchers is regularly published in scholarly journals and books, but knowledge is often scattered without the necessary association and interrelationships. It is the task of the knowledge management team to establish links and correlations and systematically manage knowledge. However, grasping the tacit knowledge of not only the teachers and researchers but also of other employees and students poses a challenge to the universities. Modern universities are complex organizations, with departments, faculties, laboratories, and research laboratories. When a lecturer retires, a gap is created. The person who is replaced in that position is often compared to his predecessor, and in many cases, the results are inappropriate. Knowledge is usually gained through study and research over a long period of time. Therefore, it cannot automatically be transferred to others quickly. However, when experience and knowledge are shared with others, and this sharing takes place in an appropriate context to the rules, procedures, and technology that support it, we can say that shared knowledge has appeared. Knowledge sharing is really important with organizations in general and universities in particular.

Knowledge sharing creates opportunities to maximize organizational ability to meet those needs and generates solutions and efficiencies that provide a business with a competitive advantage (Reid, 2003). Knowledge sharing can be defined as a social interaction culture involving the exchange of employee knowledge, experiences, and skills throughout the whole department or organization. Knowledge sharing comprises a set of shared understandings related to providing employees access to relevant information and building and using knowledge networks within organizations (Hogel et al., 2003). A firm can successfully promote a knowledge-sharing culture not only by directly incorporating knowledge in its business strategy but also by changing employee attitudes and behaviors to promote willing and consistent knowledge sharing (Connelly & Kelloway, 2003; Lin & Lee, 2004). Moreover, various studies focused on the relationship between knowledge sharing enablers and processes (Van Den Hooff & Van Weenen, 2004; Bock et al., 2005), while others have focused on the relationship between knowledge sharing enablers and innovation performance (Calantone et al., 2002). However, researchers and practitioners have not tried an integrative model that explores the influence of factors on the two central processes of knowledge sharing (knowledge donating and knowledge collecting) from a holistic perspective, and there is not much empirical research that has examined the relationships between the factors that support knowledge sharing among lecturers at universities.

To fill this gap, this study develops a research model that links knowledge sharing. The study examines the influence of the behavioral intention factor on the use of ICTs for knowledge sharing (knowledge donating and knowledge collecting). Based on a survey with 447 participating lecturers from 13 universities in Vietnam. This study applies structural equation modeling (SEM) to investigate the research model. Additionally, the study adapted the Technology Acceptance Model (TAM) (Davis et al., 1989) as a guiding academic model to understand the relationships between exogenous and endogenous constructs, because TAM has enjoyed growing acceptance and has proven to be a reasonably accurate predictor of both users' intentions to use an ICT, and ICT usage (Money & Turner, 2005).

2. Theoretical background, literature review and hypotheses

2.1. Knowledge and knowledge sharing

Knowledge may exist in two different forms, namely, explicit and tacit knowledge (Nonaka, 1994; Shariq et al., 2019). Explicit knowledge is objective knowledge that can be formulated, codified, and transferred through formal language (Che et al., 2019; Nonaka, 1994; Shariq et al., 2019). In contrast, tacit knowledge is subjective knowledge that is difficult to be formulated, codified, and transferred (Che et al., 2019; Nonaka, 1994). Although it is challenging to transfer tacit knowledge, supervisors can share such knowledge through interacting with their subordinates (Che et al., 2019), socializing with their subordinates (Borges et al., 2019), or training their subordinates (Abualoush et al., 2018). The sharing of knowledge between individuals and departments in the organization is considered to be a crucial process here (O'Dell & Grayson, 1998; Osterloh & Frey, 2000). Only when individual and group knowledge are translated to organizational knowledge can the organization start to effectively manage this resource. Therefore, determining which factors promote or impede the sharing of knowledge within groups and organizations constitutes an important area of research.

Van Den Hooff, B, & A. de Ridder, J (2004) definition of knowledge sharing implies that every knowledge sharing process consists of both bringing (or "donating") knowledge and getting (or "collecting" knowledge), in line with a number of other authors. Ardichvili et al. (2003) for instance, noted that knowledge sharing consists of both the supply of new knowledge and the demand for new knowledge. Weggeman (2000) distinguished between a "knowledge source" and a "knowledge receiver" in knowledge sharing processes, and Oldenkamp (2001) discussed how knowledge sharing involves both a "knowledge carrier" and a "knowledge requester." We combine these perspectives in labeling the two central processes as follows: (1) knowledge donating, communicating to others what one's personal intellectual capital is; and (2) knowledge collecting, consulting colleagues in order to get them to share their intellectual capital. In what follows, the study first argues that there will be a positive relationship between lecturers' knowledge donating and colleagues' knowledge collecting, as lecturers are more likely to collect knowledge from colleagues when they are the recipients of colleagues' knowledge donation. Then, the study argues the relationship between what knowledge was donated and what knowledge was actually collected between lecturers and their colleagues.

Lecturers' knowledge donation requires that the lecturers actively communicate knowledge to their colleagues. Still, it is likely that the more proactive and willing the knowledge donators are, the more ease the knowledge collectors can experience. Furthermore, lecturers who explicitly communicate their knowledge to their colleagues (knowledge donating) may be more likely to be recognized for their efforts and

intellectual capacities. This should, in turn, make the colleagues more inclined to consult these lecturers to learn what they know (knowledge collecting).

2.2. Technology Acceptance Model (TAM)

TAM is a TRA derivative tailored to the study of a broader range of user behavior in the context of information technology acceptance (Davis, 1989). TAM includes two primary belief constructs hypothesized by Davis to affect a potential user's attitude and intention to use an information technology: perceived usefulness ("the degree to which a person believes that using a particular system would enhance his or her job performance") and perceived ease of use ("the degree to which a person believes that using a particular system would be free of effort") (Davis et al., 1989). Perceived usefulness and perceived ease of use and other TAM constructs relevant to this research will be discussed briefly next. Figure 1 shows the Technology Acceptance Model of Davis (1989).

Figure 1: Technology Acceptance Model (Davis, 1989)
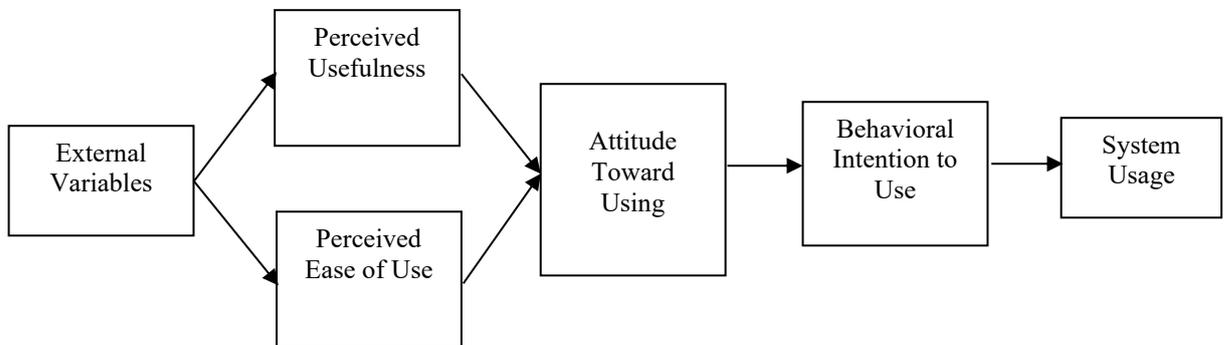
Source: Davis, 1989

2.2.1 Perceived Usefulness

In developing TAM, Davis theorized that an individual's perception of usefulness would influence intention to use the technology primarily through the creation of a positive attitude. This was consistent with TAM's theoretical precursor, the TRA, which held that attitude (an individual's positive or negative feelings (evaluative affect) about performing a target behavior) mediated the effects of beliefs (and subjective norm) on behavioral intention. In a departure from the TRA, a direct effect of perceived usefulness on intention to use was also included in Davis' original TAM. Davis rationalized this effect by theorizing users may decide to accept and use a technology, regardless of their affective attitude towards it, if they have a sufficiently strong perception that it will contribute positively to their job performance (Davis et al., 1989). Given the importance of perceived usefulness to the formation of a positive intention to use an IT, subsequent research has been directed to developing an understanding of the antecedents of usefulness. Venkatesh and Davis (2000) examined job relevance, output quality, and result demonstrability as antecedents to perceived usefulness. All three constructs were positively related to perceptions of information and communication technology tools' usefulness.

2.2.2 Perceived Ease of Use

Davis (1989) and Davis et al. (1989) argued for the inclusion of ease of use as a separate belief construct based largely on the concept of self-efficacy (an individual's judgment of his/ her ability to organize and execute tasks necessary to perform a behavior). They also cited factor analyses showing that usefulness and ease of use are

statistically distinct constructs. Venkatesh (2000, p. 344) noted that a "vast body of research in behavioral decision-making and information system demonstrates that individuals attempt to minimize efforts in their behaviors, thus supporting a relationship between perceived ease of use and usage behavior, albeit through intention as suggested by TAM," and that "other theoretical perspectives studying user acceptance have also employed similar constructs."

Szajna (1996) found perceived ease of use influenced intentions only through usefulness and suggested that a single version of the TAM with this causal path was sufficient. Szajna (1996) interpreted these findings to imply that unless individuals perceive a technology to be useful, its perceived ease-of-use characteristics are not critical. However, once an individual perceives a technology to be useful, then increased perceived ease of use contributes to its usefulness. Gefen & Straub (2000) contributed another interesting perspective to the perceived ease of use discourse: that the effect of perceived ease of use on user acceptance would be task dependent. They noted most research had failed to address the nature of the task to be performed, focusing only on use or intent to use. Their research, performed in the context of e-commerce technology, investigated the hypothesis that when a task was "extrinsic" to the information technology (e.g., buying from an e-commerce site), ease of use was not a determinant of adoption. In contrast, when the task performed was "intrinsic" to the information technology (e.g., gathering information), the individual's ease of use perception would affect his or her decision to adopt. Their findings supported this hypothesis, providing a potentially new interpretation of the effect of ease of use on information technology acceptance that merits further investigation.

Most TAM research has substantiated Davis et al. (1989), who concluded that perceived usefulness is a "major determinant" of individuals' intention to use computers and that perceived ease-of-use is a "significant secondary determinant" of usage intentions. This logic is rationalized with the argument that users will tolerate ease of use shortcomings if they perceive the system is useful in their job. Conversely, users will not accept and use a system that is not useful —regardless of how easy it is to use. Davis (1993) found evidence that perceived usefulness, perceived ease of use, and attitude fully mediated the effects of system design features on intention to use and usage.

2.2.3 Behavioral Intention

Behavioral intention (a measure of the strength of one's intention to perform a specified behavior (Davis et al., 1989)) is a construct borrowed from the discipline of social psychology. Behavioral intention has been an important construct in most previous TAM research. The significance of behavioral intention derives from the theoretical perspective that intentions - as determined by a combination of attitudes and subjective norm - are the best predictor of an individual's behavior (Jackson et al., 1997). Davis et al. (1989) validated the notion that behavioral intention to use information technology is a reasonably reliable predictor of use. Venkatesh et al. (2003, p. 427) noted, "The role of intention as a predictor of behavior (e.g., usage) is critical and has been well established in information technology systems and the reference disciplines". Evidence substantiating the hypothesized positive relationship between intentions and behavior is found in a meta-analysis of 86 TRA studies conducted by Hartwick, and Warshaw (1988) that found a mean correlation of .54 between intentions and actions. As Straub et al. (1995) observed, the purpose in measuring intention is to predict future behavior. Thus, in research scenarios associated with a brief introduction of an IT to predict future acceptance and usage, the TAM intention to use construct is particularly critical.

2.3. Information and communication technology tools (ICTs) usage

System usage is a construct of some controversy in information technology acceptance research. With relatively few exceptions (e.g., Straub et al., 1995; Szajna, 1995; Taylor & Todd, 1995; Venkatesh, 2002), most TAM-related research has measured the effect of the perceived usefulness and perceived ease of use constructs on intention to use (e.g., Jackson et al., 1997) and/or self-reported usage (Davis et al., 1989), as opposed to objective (actual) usage data. This widespread practice notwithstanding, there remain significant questions regarding its effect on research findings and a number of researchers who value actual usage over self-reported usage. The research of Taylor & Todd (1995), using actual usage data, supported previous TAM research based on self-reported usage, concluding that an assessment of the usefulness of TAM in predicting usage behavior requires exploration of the model using objective actual usage data.

Straub et al. (1995) found self-reported usage and actual usage constructs were not strongly related. Their findings also suggested the fundamental TAM constructs, perceived usefulness, and perceived ease of use, were more strongly related to self-report usage data than to actual usage data. However, Huysman & Wulf (2006) showed that information and communication technology usage and knowledge sharing are closely linked, because ICT usage can enable rapid search, access, and retrieval of information and can support communication and collaboration among organizational employees. Within knowledge sharing, the use of ICT development facilitates new methods and applications (such as groupware, online databases, intranets, virtual communities, etc.) and allows firms to expand available social networks by overcoming geographical boundaries and thus achieving more effective collaborative activities (Pan & Leidner, 2003). Moreover, Zack (1999) believed that ICTs play the following three different roles in knowledge management activities:

1. Obtaining knowledge.

2. Defining, storing, categorizing, indexing, and linking knowledge-related digital items.

3. Seeking and identifying related content.

In addition, according to Yeh et al. (2006), effective knowledge management requires employees sharing their knowledge through ICT facilities, because ICTs can provide communication channels for obtaining knowledge, correcting flow processes, and identifying the location of knowledge carriers and requesters. In fact, some studies found that ICTs had a detrimental impact on knowledge sharing (Riege, 2005; Kim & Trimi, 2007).

In summation, while there remain some inconsistent findings and beliefs surrounding the stream of TAM-centered research, a significant and growing body of work has tended to confirm the model's usefulness as an information technology acceptance research tool. As human knowledge has been recognized as an organization's most valuable resource and as a foundation of competitive advantage, there is widespread interest and investment in information technology KMS systems (Kankanhalli et al., 2001). TAM research to date has focused on individual use of information technology and has been largely conducted in educational environments. Individual acceptance and usage of information technology implemented to support KM objectives in an organizational scenario represents a more complex phenomenon. Empirical research is required to determine if past TAM research can help inform the understanding of factors affecting individual acceptance and use of information technology implemented to support organizational KM objectives.

2.4. Research model & research hypotheses

The research model is presented in Figure 2. It supports the specific objective of this research to assess the relationships between TAM's two primary belief constructs: perceived usefulness and perceived ease of use, and users' intention to use and their usage of the target knowledge management system. The research model is similar to Davis' original TAM (Figure 1). In accordance with the findings of Davis et al. (1989), the attitude construct is not included. The "external variables" constructs are also not included in the research model since there is no intention here to investigate antecedents to perceived usefulness and ease of use. The research hypotheses investigated in this study are:

H1: Perceived usefulness of the ICTs is positively related to behavioral intention to use the ICTs.

H2: Perceived ease of use of the ICTs is positively related to behavioral intention to use the ICTs.

H3: Behavioral intention to use the system will exhibit a significant positive relationship with ICT usage.

H4a: Information and communication technology tool usage is positively related to knowledge donating.

H4b: Information and communication technology tool usage is positively related to knowledge collecting.

Figure 2: Proposed TAM2 - Extension of the Technology Acceptance Model
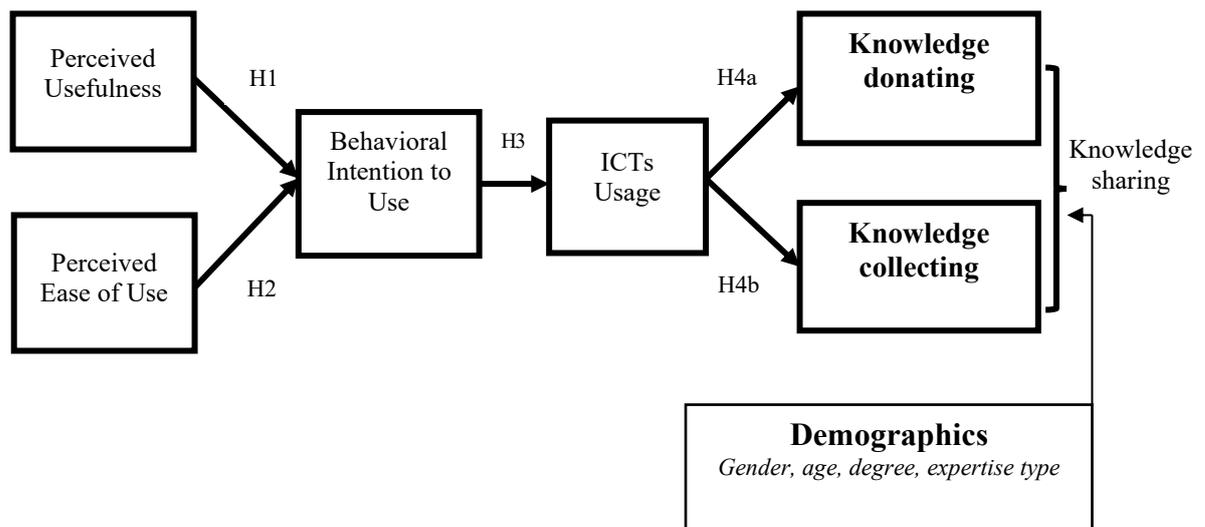
Source: Authors' elaboration

Figure 2 shows the research model, which includes seven latent variables: Perceived Usefulness; Perceived Ease of Use; Behavioral Intention to Use; ICT Usage; Knowledge donating and Knowledge collecting (Knowledge sharing) and Demographics.

3. Research Methods

3.1 Sample and procedure

The research samples are from university lecturers in the Hanoi area. From the list of 15 Hanoi universities, open invitations were sent using internal email systems to every university in the list. Thirteen universities agreed to join the survey, and 50 lecturers were selected from each participating university on a random basis. The first lecturer from the staff list is selected, and the next sample is with 5 units difference (the 6th) then the 11th in the list, and so on. The only exception is at home university where 60 invitations were sent out using the same selection method. In total, the study used a sample size of 600, with the survey subjects being lecturers from 13 universities in Hanoi, Vietnam. Likert's 5-point scale was used in research questionnaires ranging from 1 (totally disagree) to 5 (totally agree). A total of 510 responses were collected and eliminated the biased observations, making 447 observations valid for further analysis. Of these academic and teaching staff, approximately 59.5% were male; more than half were 40 years old or above; three-fourths obtained doctorate qualifications; and around 84% had been working in the current institution for more than ten years. Moreover, the highest proportion of respondents was from 40 to 49 years old (51.2%), and just 3.6 % of respondents were aged below 30 years . In terms of degree, 40.9% of the lecturers are at a master's degree level, and 59.1% of lecturers are Ph.D. Regarding academic rank, 85.2% of the lecturers have no academic rank, and 14.8% of the lecturers are Associate Professor/ Professor. In addition, 49% of respondents are in Economic Science, 27.1% are in Science Engineering- Technology, 10.3% are in Humanities and Social Sciences, and only 8.1% are in Sports Science. The respondents' demographic information is shown in Table 1.

Table 1: Demographic variables information (N = 447)

Demographic variables	Group category	Frequency	%
Gender	Male	266	59.5
	Female	181	40.5
Age	Below 30 years	16	3.6
	30–39 years	172	38.5
	40–49 years	229	51.2
	Above 50 years	30	6.7
Degree	Master	183	40.9
	PhD	264	59.1
Academic rank	No Academic rank	381	85.2
	Associate Professor/ Professor	66	14.8
Expertise type	Engineering - Technology Science	146	32.7
	Economic Science	219	49
	Humanities and Social Sciences	46	10.3
	Sports Science	36	8.1

Source: own study

3.2. Analysis

We performed a regression analysis to assess the contribution of factors: Perceived Usefulness of ICTs and Perceived Ease to Behavioral Intention factor; Behavioral Intention to ICTs Usage; ICTs Usage to knowledge donating and knowledge collecting. Structural equation modelling (SEM) was implemented to test the hypothesized relationships, and the analysis process includes three main steps. Firstly, Cronbach's alpha and explorative factor analysis (EFA) were used to assess the reliability of variables. Secondly, confirmatory factor analysis (CFA) was employed to test the empirical validity of the research model and each measure. Thirdly, the structural equation modelling (SEM) was then applied to estimate path coefficients for each proposed relationship in the conceptual framework. Finally, multi-group structural analysis was performed to examine the influence of demographic variables on knowledge sharing of lecturers at universities in Vietnam. In addition, the statistical analysis was carried out using SPSS 22.0 and AMOS 22.0 software.

3.3. Measures

All scales used in our study were adapted from past research including Perceived Usefulness of ICTs (Davis, 1989); Perceived Ease of Use of ICTs (Money & Turner, 2005); Behavioral Intention (Kraft et al., 2005); ICTs usage (Cyril Eze et al., 2013), Knowledge donating (Cyril Eze, 2013) and Knowledge collecting (Van Den Hooff, B, 2004). The scales were scored in a 5-point Likert-type format from strongly disagree to strongly agree. All scales were subjected to exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) for the purpose of scale testing and purification.

Perceived Usefulness of ICTs (Cronbach's Alpha = 0.907). The scale developed by Davis (1989), which is comprised of 7 items, including 'The knowledge storage capacity is significantly increased' (0.748), 'The knowledge transmission capacity is significantly increased' (0.751), 'The speed of exchanging information is significantly increased' (0.733), 'The accessibility to the wide range and depth of information is significantly increased' (0.752), 'The process of exchanging knowledge is more convenient' (0.690), 'The location and time constraints in communication are overcome' (0.726), 'Overall, the IT tools support a lot for the process of exchanging knowledge among people in the company' (0.734).

Perceived Ease of Use of ICTs (Cronbach's Alpha = 0.834). The scale developed by Money & Turner (2005), which is comprised of 4 items, including 'There is a clear guideline for using ICTs' (0.789), 'Interaction with available IT tools does not require a lot of mental effort' (0.903), 'It is easy to manage the use of available IT tools' (0.850), and 'Overall, people find the use of available IT tools easy' (0.818).

Behavioral Intention (Cronbach's Alpha = 0.851). The scale developed by Chen & Lee (2008), which is comprised of 3 items, including 'I will use ICTs to share knowledge in the future' (0.839), 'I plan to use ICTs to share knowledge in the future' (0.861), 'I would recommend using ICTs to share knowledge in the future' (0.855).

Information and communication technology tools usage (Cronbach's Alpha = 0.888). The scale developed by Cyril Eze et al. (2013), which is comprised of 7 items, including 'our organization introduces new technology platforms to them and enables knowledge sharing for more effective operations' (0.848) 'our organization has expertise in the usage and maintenance of critical information infrastructure, e.g., intranet, internet, groupware' (0.822), 'our organization system infrastructure is updated regularly to facilitate effective knowledge sharing and creation' (0.835), 'our extranet system facilitates coordination of tasks between our organization and our stakeholders' (0.834), 'Social network system enables the search and sharing of ideas and information within the organization and with our stakeholders' (0.852), 'our groupware system enable

knowledge sharing among employees' (0.792), 'our intranet system enables the sharing of ideas and critical documents' (0.881).

Knowledge donating (Cronbach's Alpha = 0.888). The scale developed by Cyril Eze et al. (2013), which is comprised of 5 items, including 'I would like to share my personal experiences with my close colleagues' (0.688), 'I would like to share the knowledge I gained from outside my organization with my colleagues' (0.653), 'I would like to share my expertise on work processes with my colleagues who support my work activities' (0.651), 'I would like to share my knowledge from the training I have attended with my colleagues' (0.695), and 'I would like to share ideas and thoughts with my colleagues to allow for better work processes and performance' (0.654).

Knowledge collecting (Cronbach's Alpha = 0.879). The scale developed by Van Den Hooff, B (2004) which is comprised of 4 items, including 'colleagues within my department tell me what they know when I ask them about it' (0.706), 'colleagues within my department tell me what their skills are when I ask them about it' (0.730), 'colleagues outside of my department tell me what they know when I ask them about it' (0.781), and 'colleagues outside of my department tell me what their skills are when I ask them about it' (0.773).

4. Results and Distribution

4.1. Exploratory Factor Analysis (EFA)

After assessing the reliability of scales by Cronbach's alpha,a total of 30 items were used in the exploratory factor analysis (EFA). The first results of testing the reliability of scales by the exploratory factor analysis show that KMO = 0.937, Sig. (Bartlett's Test) = 0.000 < 0.005, and Initial Eigenvalues = 67.998 > 50%. The results of the exploratory factor analysis are presented in Table 2.

Table 2: The results of exploratory factor analysis (EFA) (N=447)

			Pattern Matrix[a]			
			Factor			
	PU	**ICTS**	**KSO**	**KSI**	**PEU**	**BI**
PEU1					.613	
PEU2					.765	
PEU3					.756	
PEU4					.741	
PU1	.692					
PU2	.743					
PU3	.860					
PU4	.746					
PU5	.883					
PU6	.765					
PU7	.612					
ICTS1		.598				
ICTS2		.656				
ICTS3		.755				
ICTS4		.862				

Pattern Matrix[a]

	PU	ICTS	KSO	KSI	PEU	BI
			Factor			
ICTS5		.772				
ICTS6		.610				
ICTS7		.802				
BI1						.811
BI2						.932
BI3						.539
KSO1			.914			
KSO2			.730			
KSO3			.802			
KSO4			.610			
KSO5			.632			
KSI1				.593		
KSI2				.794		
KSI3				.839		
KSI4				.877		

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

Source: Authors' elaborations based on research study

4.2. Confirmatory factor analysis (CFA)

In order to assess measurement validity, the authors performed the confirmatory factor analysis (CFA) by using AMOS 22.0 (Hair et al., 1988). The results generally presented a good level of fit for the measurement models. After assessing each construct, the full measurement model was analyzed in Figure 2. The results of CFA exhibited a reasonably good level of fit: Chi-square = 847.876, df = 390; p = 0.000. CMIN/df = 2.174 < 0.5 (Kettinger et al., 1995), CFI = 0.942 > 0.9, GFI = 0.887 > 0.8, TLI = 0.936 > 0.9, RMSEA = 0.051 < 0.08. Also, standardized regression weights of all items are higher than 0.5. Thus, the convergent validity is determined at all scales. Figure 3 shows the results of confirmatory factor analysis.

In addition, Table 3 shows the results of testing the discriminant validity between variables. The correlation of each couple of variables (r) and standard deviation (SE) are different from 1 (P-value = 0.000 < 0.05) (Gerbing & Anderson, 1998). Thus, the discriminant validity between variables is proved.

Figure 3. The results of confirmatory factor analysis
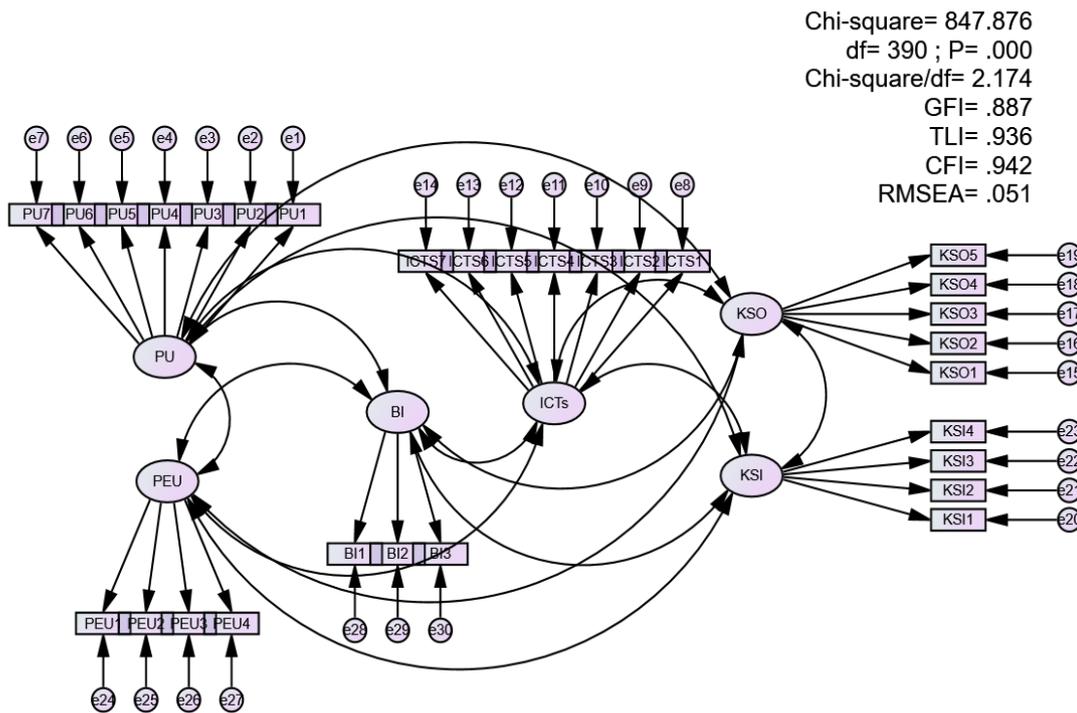
Source: Own work

Table 3. The results of testing the discriminant validity between variables (N=447)

Correlations			Estimate	S.E.	C.R.	P
PU1	<---	PU	1.000			
PU2	<---	PU	1.001	.058	17.239	***
PU3	<---	PU	.997	.056	17.681	***
PU4	<---	PU	.981	.058	16.824	***
PU5	<---	PU	.974	.053	18.493	***
PU6	<---	PU	.932	.056	16.505	***
PU7	<---	PU	.874	.058	15.101	***
ICTS1	<---	ICTs	1.000			
ICTS2	<---	ICTs	.838	.067	12.484	***
ICTS3	<---	ICTs	1.075	.068	15.737	***
ICTS4	<---	ICTs	1.093	.068	16.017	***
ICTS5	<---	ICTs	1.060	.070	15.226	***
ICTS6	<---	ICTs	.889	.065	13.741	***
ICTS7	<---	ICTs	1.088	.072	15.093	***
KSO1	<---	KSO	1.000			
KSO2	<---	KSO	.981	.060	16.479	***
KSO3	<---	KSO	1.024	.059	17.323	***
KSO4	<---	KSO	1.054	.063	16.629	***

Correlations			Estimate	S.E.	C.R.	P
KSO5	<---	KSO	.998	.060	16.756	***
KSI1	<---	KSI	1.000			
KSI2	<---	KSI	1.069	.061	17.551	***
KSI3	<---	KSI	1.162	.065	17.856	***
KSI4	<---	KSI	1.163	.064	18.095	***
PEU1	<---	PEU	1.000			
PEU2	<---	PEU	1.122	.082	13.673	***
PEU3	<---	PEU	1.177	.078	15.103	***
PEU4	<---	PEU	1.128	.075	15.055	***
BI1	<---	BI	1.000			
BI2	<---	BI	.971	.047	20.608	***
BI3	<---	BI	.825	.049	16.948	***

Source: Authors' elaborations based on research study

4.3. Structural and Meta-Analytic Path Analyses

The overall fit statistics of the model without the control variables illustrated an acceptable level of fit: Chi-square = 1200.597, df = 399; p = 0.000, CFI = 0.899 > 0.9, GFI = 0.851> 0.8, TLI = 0.890 > 0.9, RMSEA = 0.067 < 0.08. So, the original model was used to test the hypothesized relationships. Figure 4 shows the results of structural analyses:

Figure. 4. The results of structural analyses (standardized estimates)
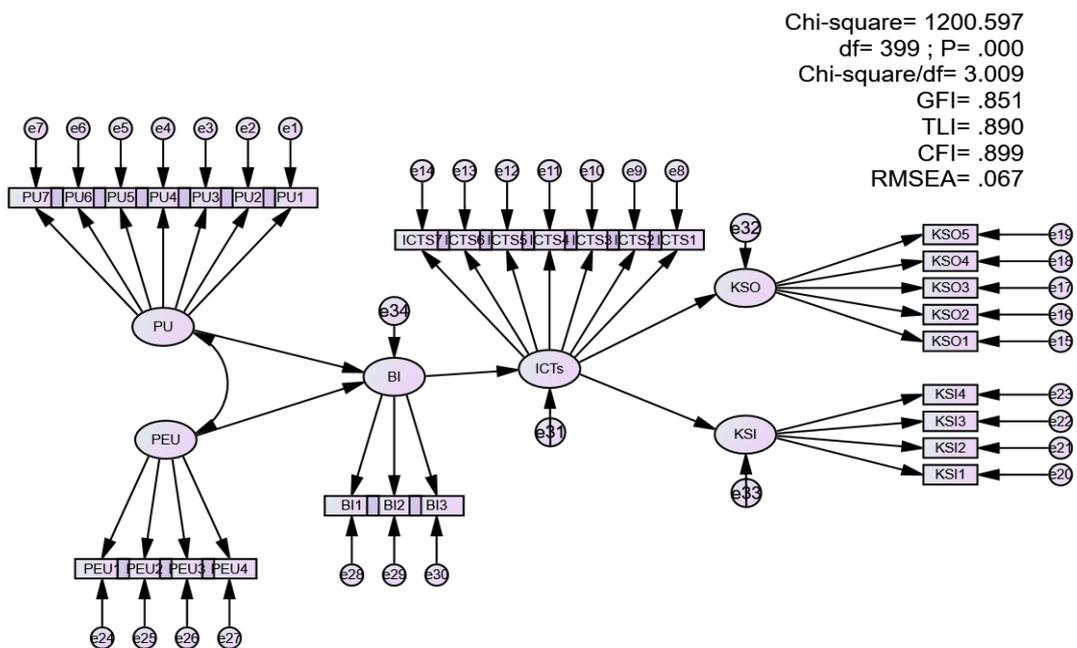
Source: Own work

A total of five proposed relationships were tested. Four of the ten hypothesized paths were statistically significant. One of five hypotheses was rejected because it was

not statistically significant. Specifically, the Perceived Ease of Use of ICTs (PEU) factor has the strongest effect on Behavioral Intention (BI) (Estimate = 0.690; p-value = *** < 0.05), followed by Behavioral intention (BI) effect on ICTs usage (ICTs) (Estimate = 0.522; p-value = *** < 0.05), the ICTs usage (ICTs) effect on donating knowledge (Estimate = 0.476; p-value = *** < 0.05) and collecting knowledge (Estimate = 0.503; p-value = *** < 0.05). Finally, there is no relationship between Perceived Usefulness (PU) and Behavioral Intention (BI) (p-value = 0.061 > 0.05). Table 4 shows the results of testing the research hypotheses.

Table 4. The results of testing the research hypotheses

	Hypotheses			Estimate	S.E.	C.R.	P	Conclusion
H1	PU	→	BI	.148	.079	1.875	.061	*Rejected*
H2	PEU	→	BI	.690	.092	7.491	***	*Supported*
H3	BI	→	ICTs	.552	.047	11.779	***	*Supported*
H4a	ICTs	→	KSO	.476	.050	9.478	***	*Supported*
H4b	ICTs	→	KSI	.503	.052	9.730	***	*Supported*

*Note: *** < 0.001; S.E: Standard Deviation; C.R: Critical Ratios.*

Source: Authors' elaborations based on research study

4.4. The difference between demographic variables

In this study, the author uses multi-group structural model analysis to compare the research model between demographic factors that affect knowledge sharing. The author uses a structural equation model (SEM) of two invariant models and variable models. In the variable model, the estimated parameters of the groups are not constrained. In the invariant model, the measure component is not constrained, but the relationships between the concepts in the constrained research model are equally valid for all groups. To test and select the invariant or variable model, the hypothesis is set up to test the difference between the two models.

Ho: The chi-square of the variable model is equal to the chi-square of the invariant model.

H1: There is a difference in chi-square between the variable model and the invariant model.

If the chi-square test shows that there is no difference between the invariant model and the variable model (P-value > 0.05), the invariant model will be selected (with higher degrees of freedom). On the contrary, choose the variable model (with higher compatibility) (Millsap, 2012).

The results shown in Table 5 that the influential demographic variables (P < 0.05) include: the age effect on knowledge collecting (KSI) and the expertise type effect on knowledge donating (KSO):

Table 5. The results of testing the demographic variables

Correlations			Estimate	S.E.	C.R.	P	Conclusion
ExpertiseType	→	KSI	-.012	.027	-.437	.662	*Rejected*
Gender	→	KSI	-.077	.047	-1.626	.104	*Rejected*
Age	**→**	**KSI**	**-.080**	**.035**	**-2.299**	**.022**	***Supported***
Degree	→	KSI	-.026	.030	-.846	.397	*Rejected*
ExpertiseType	**→**	**KSO**	**-.059**	**.027**	**-2.228**	**.026**	***Supported***
Gender	→	KSO	-.033	.047	-.701	.483	*Rejected*
Age	→	KSO	-.060	.035	-1.721	.085	*Rejected*
Degree	→	KSO	.013	.030	.444	.657	*Rejected*

Source: Authors' elaborations based on research study

Age:

The test results show that there is no chi-square difference between the invariant model and the variable model (Chidist(Delta(Chi-square)/df) = 0.388873959 > 0.05). Therefore, the study chooses the invariant model to read the results because it has higher degrees of freedom. Conclusion: As a result, there is no difference between age groups when assessing the influence of factors in the research model on donating knowledge and collecting knowledge among lecturers at universities in Vietnam.

Expertise type:

The test result is Chidist(Delta(Chi-square)/df) = 0.131377114 (> 0.05). Therefore, there is no difference between Expertise type groups when assessing the influence of factors in the research model on knowledge donating and knowledge collecting among lecturers at universities in Vietnam.

5. Conclusion

The main purpose of this study was to develop and test a theoretical extension of the Technology Acceptance Model (TAM) (Davis, 1989) that explained behavioral intention to usage of ICTs for knowledge sharing (donating knowledge and collecting knowledge). The findings above indicate interesting and mixed results. Overall, the results indicated a good fit to the data, and five hypotheses were supported. As hypothesized: Perceived ease of use of the ICTs is positively related to behavioral intention to use the ICTs; Behavioral intention to use the ICTs will exhibit a significant positive relationship with ICTs usage (Ramírez-Correa et al., 2015; Zhang et al., 2008); and Information and communication technology tools usage is positively related to donating knowledge (King & Marks, 2008; Podrug et al., 2017) and collecting knowledge (Lin, 2007). Besides, the results show that there is no positive significant relationship between Perceived usefulness of the ICTs and the behavioral intention to use the ICTs.

Vietnam university cases also suggest how ICTs can be effectively used for knowledge sharing. An effective ICT-based knowledge-sharing environment in essence makes use of specialized IT applications for digital collaboration. As evident from Vietnam's universities' cases, ICT is used at higher levels than computers and networks. Specialized knowledge-sharing platforms which are intended to accelerate and enhance knowledge sharing, have been implemented. The universities in Vietnam usually introduce new technology platforms that they provide for knowledge sharing to operate

more efficiently (Podrug et al., 2017). They have expertise in using the maintenance of critical information infrastructure, e.g., web portals, extranet systems, intranet systems, social network systems, groupware systems, wikis, etc., to bring to 'harness the hundred-headed brain.' They have a system infrastructure, which is updated regularly to facilitate effective knowledge sharing and creation, and an extranet system to facilitate tasks between universities and stakeholders. On the other hand, the lecturers at universities in Vietnam use social network system, e.g., Facebook, Twitter, Instagram, Viber, Zalo, etc., to search for and share ideas and information within the universities and with stakeholders. They use a groupware system and an intranet system to share ideas and critical documents. Finally, the research results show that age groups and expertise-type groups are statistically significant. However, there is no difference in the influence of age groups and expertise-type groups on the use of ICTs to share knowledge. It shows that the universities in Vietnam regularly update ICTs and always train, foster and guide the use of ICTs for teaching and research. On the other hand, when the university recruits new lecturers, they not only ensure lecturers' teaching expertise type but also require entry-level standard certificates in information technology. Therefore, there is no difference in the teaching expertise type (Engineering - Technology Science, Economic Science, Humanities and Social Sciences, Sports Science) and age of the lecturers when using ICTs to share knowledge.

Thus, five research questions were answered clearly. There are a number of limitations in this study. However, those limitations also provide direction for future studies. Firstly, the elaborated model is to explain the 67.998 per cent behavioral intention of lecturers to use ICTs for knowledge sharing. Even though it is quite high according to acceptance theories, new variables should be explored to better explain the behavioral intention of lecturers to use ICTs for knowledge sharing. Secondly, only lectures at universities in Vietnam are studied; therefore, the results may not be applicable to other regions because of different contexts and different cultural characteristics. Nevertheless, a starting point is provided to researchers to conduct similar research in other regions to find out the determinants of using ICTs for knowledge sharing in the university context. Also, further research can extend the research model by adding other factors, such as Attitude, Subjective norm, Perceived, Behavioral control or employing other theory to contribute more to knowledge sharing literature.

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