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Influence of Cognitive Style on Usage of Online Knowledge Sharing Technology

KOMATHI MUNUSAMY
Universiti Tunku Abdul Rahman
Email: komathi@utar.edu.my

THILAGESWARY ARUMUGAM
Asia Pacific University of Technology and Innovation
Email: dr.thilages@apu.edu.my

Abstract

The aim of this study is to investigate the influence of cognitive style as a moderator, on the factors that affect academic staffs' adoption and usage of online knowledge sharing technology in the context of research universities in Malaysia. To do so, the study integrated technology acceptance model, hedonic consumption model and cognitive style theory as the theoretical model in understanding the acceptance and usage of online knowledge sharing technology. The study was empirically evaluated using quantitative data from a sample of 321 academics from five research universities. Relevant information were collected through online survey submitted to all the chosen academics from the five research universities. In this study, cognitive style was used to explain its moderation effect on academics usage of online knowledge sharing technology. The result indicates that cognitive style failed to influence the relationship between perceived usefulness, perceive ease of use and usage of online knowledge sharing technology. However, the findings of the study showed that cognitive style is a moderator for the relationship between arousal and usage of online knowledge sharing technology. The finding of the study contribute both to the academic research, by making available to scholars on the empirical evidence on the moderating effect of cognitive style on factors that influence the usage of online knowledge sharing technology. To practice some guidelines to management team of research universities in particular and in general all universities on how to encourage academics to engage in using knowledge sharing technologies.

Key Words: *Usage of Knowledge Sharing Technology, Knowledge Sharing, Cognitive Style, Tam, and Research Universities.*

Introduction

The rapid change in the business environment that is increasingly driven by technology change has required the organisation to be equipped with a competent workforce who can stay abreast of the latest innovations. A change in technology will radically transform how employees communicate, collaborate and create in an organization. As such, this has called the need for Human Resource Development (HRD) practitioners to improve the performance of its members by supporting organization's business strategies with sophisticated Information and Communication Technologies (ICT) capabilities. HRD's main goal has always been to enhance and improve organizational effectiveness by developing individual knowledge, skills, and expertise (Wang, 2012). Of these, technology has the most reflective impact on organisations. With that, organizations are believed to be able to seek production, service, and innovation advantages to enhance organizations' performance.

The revolution of technology is seen in various sectors, including the education field. Malaysia has significantly transformed itself from an input-driven growth strategy to one that is increasingly driven by the knowledge based thus leading towards a knowledge society and stable economy. In this situation, the widespread diffusion of ICT and enhances networking capabilities have significantly modified learning and teaching activities within the institutions of higher learning (Wagner et al, 2008). Nevertheless, the incorporation of ICT in the field of education has considerably changed academic involvement in teaching, as well as research activities. The progress of educational technology infrastructure and facilities has provided an opportunity for academics around the world to collect and share valuable knowledge, information, and ideas across functions, divisions and geographical boundaries, consequently transforming the country education sector into a knowledge based- society.

Many knowledge-sharing initiates rely on information technology as an important enabler (Zailani et. al, 2006; Wang & Noe, 2010, Hislop, 2003; Ipe, 2003; Osterloh & Frey, 2000; Liebowitz, 2007). The progress of educational technology infrastructure and facilities has provided an opportunity for academics around the world to collect and share valuable knowledge, information, and ideas across functions, divisions and geographical boundaries.

This effort consequently transforms the country education sector into a knowledge-based society. Thus, to enhance the application and accessibility of knowledge that was shared, research universities (RUs) use various repositories as enabler for online knowledge sharing. These online repository technologies help academics to create systematically, store, apply and manage knowledge within the institutions and the society (Ramachandran et al., 2013). With a use of a technology, academics can engage with a range of external partners through research and publication activities. Hence, a successful adoption and usage of online knowledge technology will facilitate the intensity and knowledge exchange undertaken by universities.

Five universities in Malaysia have obtained RU status. These universities are Universiti Malaya (UM), Universiti Kebangsaan Malaysia (UKM), Universiti Putra Malaysia (UPM, Universiti Sains Malaysia (USM) and Universiti Technology Malaysia (UTM). RUs hold a prominent task to enhance further and strengthen research and development activities. Thus, academicians in RUs are required to contribute new ideas, knowledge, and concepts or theories leading to new discoveries and innovations in a range of disciplines, which subsequently produce a knowledge-based society. Sue-Chen (2014) said that most of the RUs in Malaysia are still lacking in terms of knowledge sharing behaviour and needed major change. With a radical change, it is believed that RUs will lead among others in research and publications (Sirajuddin et. al., 2006).

Given the importance on technology as enabler, technology acceptance and rejection has been the focus of many information system (IS) researchers. The advancement in information and communication technologies (ICT) has attracted many IS researchers to examine the individual acceptance or rejections of a technology. Thus, a number of theories have been developed over the last few decades to understand users acceptance and usage of a technology in various fields (Lee & Lehto, 2013; Farahat, (2012); Lee, Yiong & Hu, 2012; Son, Parl, Kim & Chao, 2012; Hsia & Yang, 2011; Venkatesh et al. 2007; Venkatesh 2003; Bagozzi, 2007; Adam, Nelson & Tood, 1992; Szajna, 1996; Venkatesh, 1999).

Prior studies have used some technology adoption and usage theories, including Theory of Reason Action (TRA), Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT). The above theories are used in various technology adaption and usage research to explain or predict a person's technology usage behaviour. Among these theories, TAM emerges as the dominant model for understanding the individual behaviour towards acceptance and usage of a technology (Lee & Lehto, 2013; Hsiao & Yang, 2011; Sumak, Hericko, & Pusnik, 2011). Moreover, Kim and He (2007) has acknowledged that TAM is a valid and robust model, which is applied in various field.

Literature Review

A well-researched model and theory that has been proven successful in predicting users acceptance or rejection against the use of a technology is the Technology Acceptance Model (TAM) proposed by Davis (1989) (Marangunic & Granic, 2015; Chau & Hu, 2001; Gefen, 2000). TAM is accepted widely and have been applied extensively in predicting employees' adoption, acceptance and actual usage of a technology (Marangunic & Granic, 2015; Agarwal & Karahanna, 2000; Chen & Tseng, 2012; Schepers & Wetzels, 2006; Sumak, Hericko & Pusnik, 2011; Hassanzadeh, Kanaani & Elahi, 2012). Derived from the theory of reasoned action (assumes that a person has complete control over behavior) and theory of planned behavior, TAM takes the leading role to explain the antecedents that influence technology acceptance or rejection. At large, TAM researchers have empirically proven it as a successful model in predicting about 40% of a system use (Lee & Lehto, 2013; King & He, 2006; Hu, Chau, & Seng, 2002). In fact, the model has been used extensively over the decades, as it was powerful in predicting a particular behaviour towards technology adoption and usage (Cheung & Vogel, 2013; Lee & Lehto, 2013; Chow, Herold, Choo & Chan, 2012; Davis, 1989; Agarwal & Prasad, 1999; Mathieson, 1991). In fact, all the existing TAM constructs are well researched and are the most influential ones in explaining technology adoption and usage behaviour (Mathieson, 1991).

Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) are the two most important construct in the TAM that is more likely increases users' willingness to utilize a technology (Rosen, Whaling, Rab, Carrier & Cheever, 2013). Perceived usefulness (PUE) and perceived ease of use (PEOU) are also known as behavioral beliefs that predict technology adoption or actual usage (Adams et al., 1992; Davis, 1993). PUE is defined as "the extent to which a person believes that using a system would enhance his or work productivity. PEOU, on the other hand, is defined as "the extent to which a person believes that using a system would be free of mental effort". Jogiyanto (2007) described that perceived usefulness is the value that the user has on the system. Here, when the user perceived a high value of the system, the decision to use the technology is higher; whereas, perceived ease of use can be interpreted as, "no compulsion for the user to use the technology". Here, it describes how the user becomes attracted to the system just because it's easy to use it. However, understanding on the online usage of technology cannot be accomplished just by examining PEOU and PU (Edwards et al, 2003; Handzic, Lazaro and Torn,, 2004). Moreover, Holsapple and Wu (2007) mentioned that there is a need to examine the element of emotion in relation to behavior. Studies have shown that the role of emotion has a constant effect on decision making and behavior (Ding, Chai & Hin, 2015; Han, Lerner, Keltner, 2007). Here, the research responds by adapting the perspective of hedonic theory as the potential theory to improve the viability and predictive nature of TAM. This is because the hedonic theory is very much relevant in explaining behaviour from the perspective of human factors; furthermore, the users of IT are not only technology users but also consumers of that technology (Holsapple & Wu, 2007).

Furthermore, individual differences plays an important role in influencing a behaviour. Chen, Chen & Kinshuk, (2009) state that there is a need to examine the potential impact of user's cognitive traits to understand its influence on technology usage behavior. The statement is based on the evidence from past researchers who argued that the extent to which individual make a decision on technology acceptance, and usage might vary depending on individual characteristics like personality, cognitive ability/style and individual motivation (Kim, Shin, Shin & Miller, 2016). However, less is understood, on how the above mentioned individual traits may have a potential impact on user's interpretation of technology usage (Chakraborty, Hu & Cui, 2007). Conceivably, individual vary in their cognitive style and such differences can affect their technology acceptance and usage decision. Therefore, the researcher argued that it is important to investigate the influence of cognitive style on the usage of online knowledge sharing technology.

Kirton (1976) developed the Adoption-Innovation (A-I) theory which is used to explain cognitive preferences of individuals. In general, A-I theory describes individual differences, specifically how one

person's preferences differ from another's and it was applied widely in various settings (Buffington, Jablokow & Martib, 2002; Butterner & Gryskiewicz 1993; Carland, Casland & Stewart, 2000). In fact, cognitive style is a specific psychometric component, which helps researchers and practitioners to understand and explain the differences on how individuals accept and use a particular technology. Thus, these cognitive characteristics of individuals may affect their behaviour towards accepting and using the technology to the greatest benefit. Kirton's cognitive style theory predicts that individuals can be positioned on a continuum that ranges from a more adaptor cognitive style to a more innovative cognitive style (Kirton, 2003). The theory described high adoption as those individuals who prefer to do things better, very focused on the details of the task at hand, and prefer to work within a highly defined structure. As such, individuals who are categorized as adaptors choose to integrate change systematically with the intention that they can adapt their current paradigm to fit the new circumstances, while, high innovators are those individuals who are more divergent than adapters. These people will prefer to 'do things differently', as such, they tend to accept a new change just because the change is something new and different.

From the above discussion, the researchers argued that there is a need to study on arousal and cognitive style as one of the determinants in the technology acceptance model, which was identified as the limitation of previous studies. To bridge this gap, the study extends the technology acceptance model by incorporating the emotion contracts of arousal to predict the usage of online knowledge sharing technology. Furthermore, the technology acceptance model is further extended by examining the moderating effect of cognitive style on the relationship between PEU, PEOU, arousal and usage of online knowledge sharing technology. Based on these issues, the researcher proposed the following research questions.

(a) Is there any moderating effect of cognitive style on the relationship between perceived usefulness, perceived ease of use, arousal, and usage of online knowledge sharing technology?

The conceptual framework of this study is derived from the theories reviewed above. Based on the above, the interconnectivity between the concepts of individual beliefs, emotion, knowledge sharing technology, and individual differences are drawn in order to provide a clear understanding of the nature of this study. Figure 1 below illustrates the dependent, the independent, and moderating variable of this study.

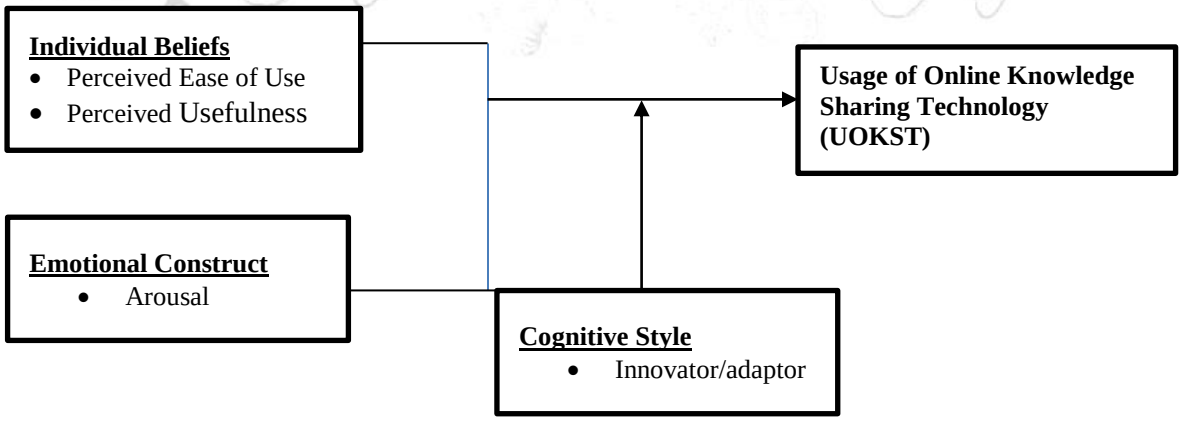

Figure 1: Conceptual Framework of the Study

Methodology

The target population of this study comprises of the academic staff that is currently employed in RUs. According to the National Education Statistics (2013) data, the total number of academic staff employed in research universities in Malaysia is 11,190. This sample was calculated based on Hair et al. (2010)

suggestion. Hair et al. (2010) explained that a minimum sample size of 300 is required if the research model of the study consists of seven or less latent constructs, where some constructs have less than three items. As per the conceptual model of this research, as seen in Figure 1, the study consist of five constructs (PUE, PEOU, Arousal, cognitive style and UOKST); thus the minimum sample size required is 300 samples. Further, this study employed a multistage cluster sampling technique. The data was collected from selected faculties, from the research universities listed in Malaysia. A multistage cluster sampling was more appropriate for the current study because it involves two levels of sample selection; and this particular sampling technique suits well to a large scaled sampled survey (Preston, 2009). A self-administrated questionnaire was used as a tool for data collection. In this study, data was generated from a structured questionnaire comprising items from five constructs. The constructs measured in this study are Perceived Usefulness (PU), Perceived Ease Of Use (PEOU), Arousal (Aro), cognitive style and Usage of Online Knowledge Sharing Technology (UOKST). The items of this questionnaire were adapted from previous validated items to suit the needs of this study. The questionnaires were administrated to the respondents in English, as all the respondents were academic staff who are proficient in the language.

Analysis

In Structural Equation Modeling (SEM), there are three levels of analysis namely: Confirmatory Factor Analysis (CFA), Measurement Model and Structural Model. The first two are for data preparation while the last one is for full pledge SEM. Thus, CFA and Measurement Model were analyzed.

The CFA is more or less a prerequisite for Measurement Model in which both the number of factor loadings and their corresponding indicators are clearly defined (Kline, 2011). To test for convergent validity and construct relativity, Confirmatory Factor Analysis (CFA) was assessed. Therefore, Table 1 below illustrates the first and the modified CFAs of the construct's items in which all the items that did not meet the cut-off point of 0.5 were cut off from the path diagrams of CFAs, and the Average Variance Extracted (AVEs) and Construct Reliability (CRs) were also calculated. As shown in Table 1 below, from the beginning, Perceived Usefulness (PUE) has six items, and after the first order CFA, however, the items were cut down to four with AVE = .635 and CR = .874. Perceived Ease of Use (PEOU) has six items, and after conducting first order CFA, one item was eliminated which reduced the items to five with AVE = .746 and CR = .936. However, Usage of Online Knowledge Sharing Technology (UOKST) has eight items and after the first order CFA seven items were retained with AVE = .628 and CR = .920. Lastly, Arousal (ARO) has six items and after the original CFA all the six items were maintained with AVE = .555 and CR = .882.

Table 1: Convergent Validity and Construct Reliability

		Factor Loading ≥ 0.5			
CONSTRUCTS	**ITEMS**	**Original CFA**	**Modified CFA**	**AVE ≥ .5**	**CR ≥ .7**
Perceived Usefulness (PUE)				**.635**	**.874**
	PUE 1	.74	.76		
	PUE 2	.29	–		
	PUE 3	.73	.74		
	PUE 4	.81	.81		
	PUE 5	..89	.87		
	PUE 6	.42	–		
Perceived Ease of Use (PEOU)				**.746**	**.936**
	PEOU 1	.89	.89		
	PEOU 2	.89	.89		
	PEOU 3	.76	.76		
	PEOU 4	.90	.90		
	PEOU 5	.87	.87		

	PEOU 6	.48	–		
Usage of Online Technology (UOKST)	**Knowledge Sharing**			**.628**	**.920**
	UOKST 1	.61	.62		
	UOKST 2	.87	.87		
	UOKST 3	.88	.88		
	UOKST 4	.89	.90		
	UOKST 5	.88	.89		
	UOKST 6	.74	.72		
	UOKST 7	.69	–		
	UOKST 8	63	.60		
Arousal (ARO)				**.555**	**.882**
	ARO 1	.78	–		
	ARO 2	.81	–		
	ARO 3	.68	–		
	ARO 4	.75	–		
	ARO 5	.73	–		
	ARO 6	.71	–		

Note: AVE: Average Variance Extracted; CR: Critical Ratio

Therefore, the proposed Measurement Model of the study after several adjustments had been made; the researcher came up with modified Measurement Model in Figure 2. Therefore, Goodness-of-Fit indices for the modified Measurement Model are as follows; Chi-Square (χ^2) = 489.913, df =203, p = .000, Relative χ^2 (χ^2/df) = 2.413, AGFI = .849, GFI = .879, CFI = .945, IFI = .945, NFI, .910, TLI = .937, RMSEA = .066. From these Goodness-of-Fit indices, the researcher concluded that the Measurement Model fits the data because, Hair et al. (2009) suggested that, if any 3 – 4 of the Goodness-of-Fit indices meets the requirement, then the model is acceptable as measurement model or structural model.

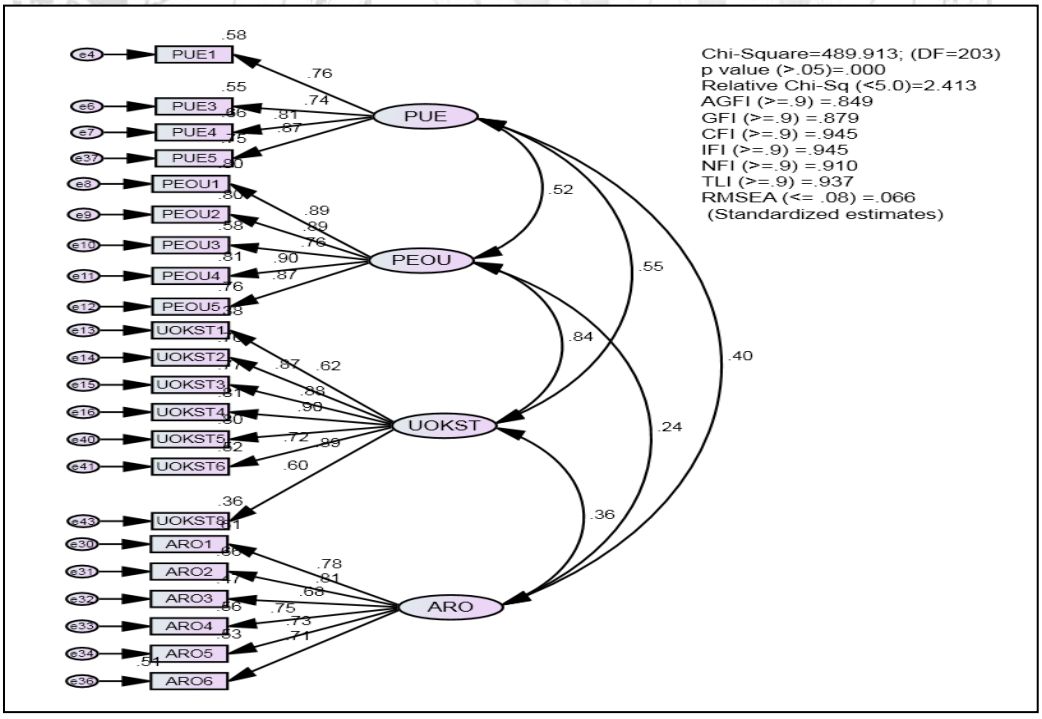

Figure 2: Modified Measurement Model

Next, the study performs a structural model analysis to examine the moderating effect of cognitive style on the relationship between perceived usefulness, perceived ease of use, arousal, and usage of online knowledge sharing technology. By default, AMOS has the facility of estimating the moderating effect through Multi-Group Analysis (Arbuckle, 2013). Therefore, in this case, the moderator variable must be a categorical variable. In this regard, cognitive style is the moderating variable which happens to be a continuous variable. This variable (cognitive style) was categorized into two groups namely; Adaptor Category and Innovative Category. Adaptor Category is assumed to be group '1' and Innovator is assumed to be group '2' respectively.

In order to test for the moderating effect of cognitive style on the relationship between perceived usefulness, perceived ease of use, arousal and usage of online knowledge sharing technology, the model fit has to be tested. Therefore, Figure 5 and 6 below, illustrates the Goodness-of-Fit indices of the Structural Models for testing the moderating effect of cognitive style on the relationship between perceived usefulness, perceived ease of use, arousal and usage of online knowledge sharing technology. Therefore, for estimating the moderating effect using AMOS, one has to test for a moderating role in the entire model. The Goodness-of-Fit indices for the Unconstrained Model for both groups (Adaptor and Innovator) are; Chi – Square χ^2 (CMIN) = 741.824 (df = 406), Relative χ^2 (CMIN/df) = 1.827, AGFI = .794, GFI = .835,

CFI = .909, IFI = .910, NFI = .821, TLI = .896, RMSEA = .051. According to Hair et al., (2010) if any 3 or 4 of the Goodness-of-Fit indices are within the threshold, then the entire model is fit. Therefore based on this reason, both the Structural Models for testing the moderating effect of the role of cognitive style, fit the data.

The following hypothesis were tested in this study:

H_C1: Cognitive style moderates the relationship between perceived usefulness and usage of online knowledge sharing technology usage among the respondents.

The Structural Model showed that the standardized regression weight of perceived usefulness in relation to usage of online knowledge sharing technology was inconsistent with the hypothesis by indicating the moderating effect of cognitive style on the relationship between perceived usefulness and usage of online knowledge sharing technology. This means the relationship between perceived usefulness and usage of online knowledge sharing technology was not moderated by cognitive style [Adaptor ($\beta = .128$, $p > .05$) and Innovator ($\beta = .081$, $p > .05$)], so, H_C1 is not supported.

H_C2: Cognitive style moderates the relationship between perceived ease of use and usage of online knowledge sharing technology among the respondents.

Similarly, the analysis indicated that cognitive style did not moderate the relationship of perceived ease of use and usage of online knowledge sharing technology [Adaptor ($\beta = .733$, $p < .05$) and Innovator ($\beta = .552$, $p < .05$)]. This means that standardized regression weight of perceived ease of use in relation to usage of online knowledge sharing technology were both significant across the two categories which is no consistent with the Hair's et.al (2010) rule of thumb. Thus, H_C2 is not supported.

H_C3: Cognitive style moderates the relationship between arousal and usage of online knowledge sharing technology among the respondents.

However, the Structural Model analysis revealed that cognitive style is a moderator in the relationship between arousal and usage of online knowledge sharing technology [Adaptor ($\beta = .138$, $p < .05$) and Innovator ($\beta = .053$, $p > .05$)]; thus, H_C3 is supported.

Table 2: Result of Moderating Test of Cognitive style on Relationship between Perceived Usefulness, Perceived Ease of Use, Arousal, and Usage of Online Knowledge Sharing technology

Constructs	B	β	*p*
Perceived Usefulness (PUE)			
Adaptor	.139	.128	.082
Innovator	.053	.081	399
Perceived Ease of Use (PEOU)			
Adaptor	.726	.733	.000
Innovator	.417	.552	.000
Arousal (ARO)			
Adaptor	.230	.138	.028
Innovator	.043	.053	.531

Note: B:- Unstandardized Regression Weight Estimate; β:- Standardized Regression Weight Estimate; *p*:- p – value.

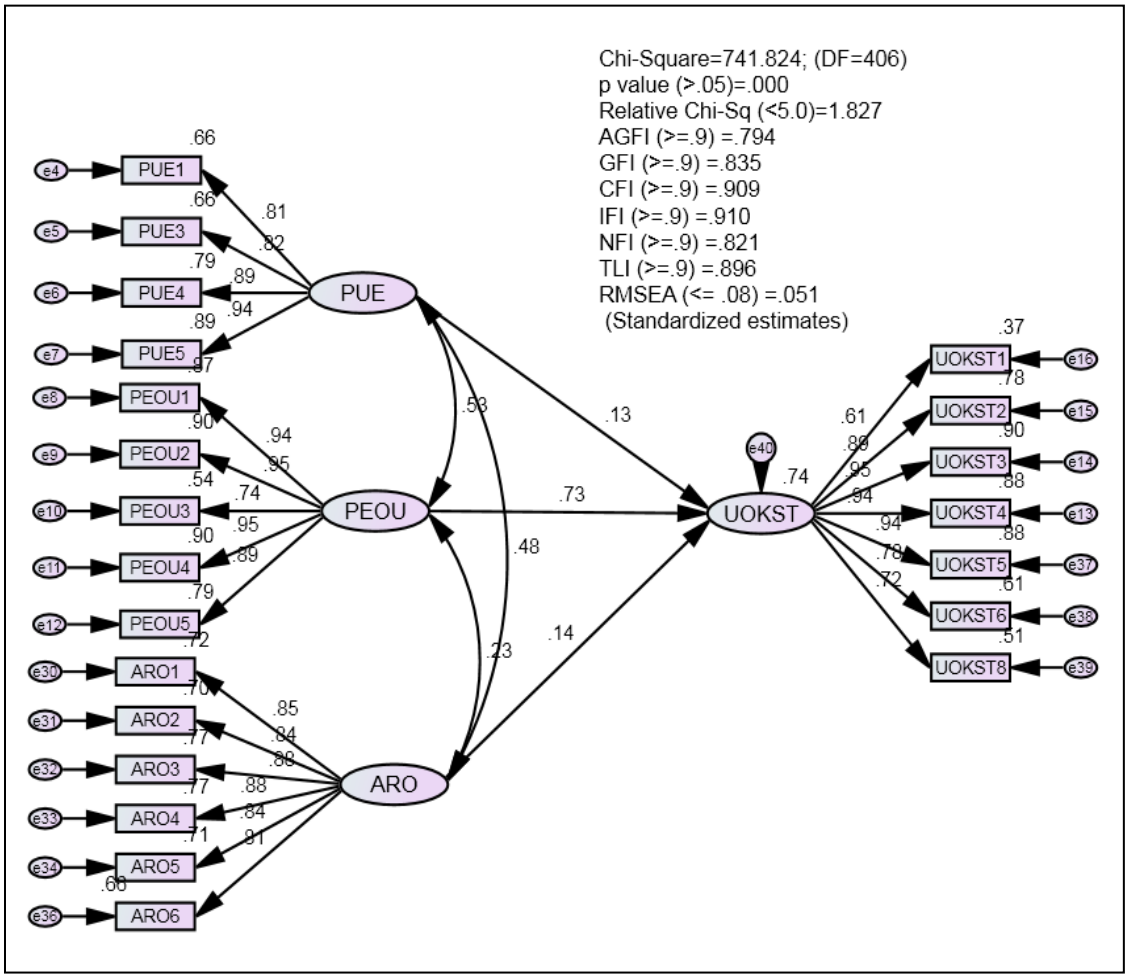

Figure 3: Unconstrained Model explaining the moderating effect of cognitive style (Adaptor Category) on the relationship between perceived usefulness, perceived ease of use, arousal and usage of online knowledge sharing technology (UOKST)

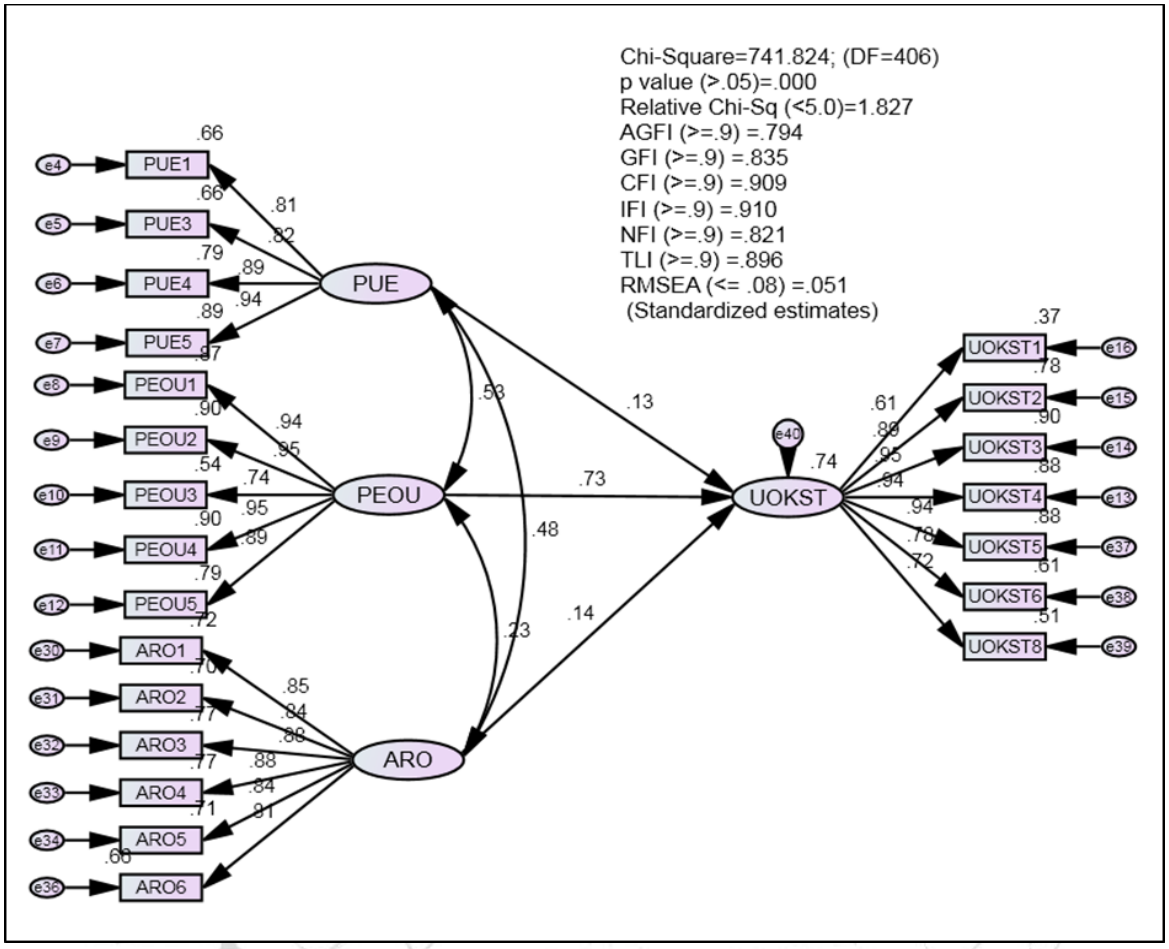

Figure 4: Unconstrained Model explaining the moderating effect of cognitive style (Innovator Category) on the relationship between perceived usefulness, perceived ease of use, arousal and usage of online knowledge sharing technology (UOKST)

Discussion

Firstly, the model comparison which tested the two separate models (innovator and adaptor category) as in Figure 5 and 6 showed that there is a form of moderating effect of cognitive style in the overall model. Secondly, moderating effect on the individual paths was tested. Here, hypothesis H_C1, H_C2, and HC3 were developed to test the moderating effect of cognitive style on the relationship between PUE, PEOU, ARO, and UOKST.

Table 3 showed that hypothesis H_C3 was supported and cognitive style was found to moderate the relationship between ARO and UOKST. The findings show that cognitive style under the adaptor category ($\beta = .138$, $p < .05$) influences the relationship between arousal and UOKST. The findings of this study failed to support the moderating effect of cognitive style on the relationship between PUE and PEOU.

Table 3: Hypothesis and Summary of the Results for Cognitive style as a Moderator.

Relationship between IVs and DV	Hypothesis	Results
H_C1	Cognitive style moderates the relationship between PUE and UOKST among the respondents	Not Supported
H_C2	Cognitive style moderates the relationship between PEOU and UOKST among the respondents	Not Supported
H_C3	Cognitive style moderates the relationship between ARO and UOKST among the respondents	Supported

The findings of the study are in line with most of the studies on technology usage and cognitive style. For instance, Kirton (2003); Armstrong (2000); Cools and Sadler-Smith (2012) have highlighted that the differences in cognitive style will have significant influence on technology adoption and usage. Similarly, their findings were also consistent with Saeed, Yang, and Sinnappan, (2009) Chakraborty, Hu, and Cui (2008), and, Zamzuri, Shahrom, Kasim, Nasir and Mamat (2011). In fact, Hong, Thong, Wong, and Tam (2002); Nov and Ye's (2008) stress that individual cognitive style and its influences on users' individual beliefs and technology usage is significant in technology research as individuals think and behave differently towards different situations due to differences in personality. However, it is important to note that the influence of cognitive style as moderator is only on arousal and UOKST. Cognitive style that moderate the relationship between arousal and knowledge repository usage, shows that the relationship between technology usage and arousal is strengthen by cognitive differences. Therefore, it can be said that feelings or emotional states do predict or explain why such behaviour occurs. However, influence of cognitive style as a moderator on the relationship between PUE, PEOU and UOKST could not be established in this study. Academic staff in general showed a cognitive style that does not influence the function effect of the technology when they have to make a decision to use the technology. Here, although the academic staff possessed some individual differences, these differences failed to affect the way they responded to the usage of technology for knowledge sharing.

Conclusion

The present study shows that cognitive style moderates the relationship between arousal and usage of online knowledge sharing technology. Therefore, here, cognitive style adds strength to the relationship. It is not surprising then to say that the emotional state of the academic staff influences the knowledge sharing behaviour and individual differences within them to a certain extent affects the relationship. As the findings of the study suggested that cognitive differences to certain extent affects the relationship between PEU, PEOU and arousal and usage behaviour, as such, by following up the possibility of investigating whether an academic position and ranking in university could determine or influence their knowledge sharing behaviour could lit to a new findings. This could possibly shed a better understanding on knowledge sharing behaviour as academics staffs in universities hold different positions and rankings.

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