Modern Applied Science; Vol. 8, No. 6; 2014
ISSN 1913-1844 E-ISSN 1913-1852
Published by Canadian Center of Science and Education

Academic Researchers' Absorptive Capacity Influence on Collaborative Technologies Acceptance for Research Purpose: Pilot Study

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Received: July 22, 2014 Accepted: August 2, 2014 Online Published: October 23, 2014
doi:10.5539/mas.v8n6p161 URL: http://dx.doi.org/10.5539/mas.v8n6p161

Abstract

A wide variety of Collaborative Technologies (CT) emerged to facilitate the collaboration among peers. Despite the extensive literature of CT adoption in various contexts, a massive lack exists in CT adoption by academic researchers. Consequently, this study concerns the CT adoption by academic researchers. The study investigates how academic researchers' Absorptive Capacity (ACAP) impacts the acceptance of CT for research purpose. The authors have extended Technology Acceptance Model (TAM) to explain how academic researchers' ACAP of CT impacts the academic researchers' Behavioral Intention (BI) to accept those technologies for researching purpose. The extended model was empirically evaluated using a survey data collected from 72 researchers in the academic fields from a leading university in Malaysia. The quantitative analysis indicated that the researchers' differences represented by ACAP influence their behavioral intention towards CT acceptance. Except insignificant impacts of ACAP for understanding and ACAP for assimilating dimensions on Perceived Usefulness (PU), and ACAP for applying on Perceived Ease of Use (PEOU).

Keywords: absorptive capacity, TAM, technology acceptance model, collaborative technologies acceptance, researchers adoption

1. Introduction

The recent advancement in technologies change the way of how academic researchers carries the research activities. Academic researchers' awareness and actual usage of the recent technologies will improve the productivity of their research outputs (Bamasoud, Iahad, & Rahman, 2013). Pasupathy and Siwatu (2013) and Lucas and Murry (2007) emphasize the necessity of productivity in research in higher education. Hence in order for academic researchers to compete and seek productivity, the adoption of such technologies becomes substantial.

Extant study carried by Lucas and Murry (2007) identified that the academic researchers uses technologies for collaboration with their peers, carrying out the research, and communicate the research findings. Lucas and Murry (2007) stated that enhancing the research through the recent technologies become a debate for researchers and practitioners. However, the factors affecting academic researchers' adoption of such technologies are poorly understood (Bamasoud et al., 2013; Pearce, 2010).

Among the usage purposes of technologies in research activities is the collaboration with other researchers. Many existing technologies emerged for facilitating the collaboration among two or more parties electronically. Those types of technologies are recognized as Collaborative Technologies (CT). CT that help researchers in conducting their research activities are gaining importance (Rowlands, Nicholas, Russell, Canty, & Watkinson, 2011; Nández & Borrego, 2013). However, as collaboration in research is gaining interest (Liao & Yen, 2012; Bullinger, Renken, & Moeslein, 2011), lacks exist in investigating the behavior of CT adoption for research purposes (Bullinger et al., 2011; Cheung & Vogel, 2013; Gruzd, Staves & Wilk, 2012).

IT knowledge of potential adopters is important in adopting a technology (Bamasoud et al., 2013; Rogers, 2003), where a potential adopter goes through several stages before the actual adoption of a technology (Rogers, 2003; Wang & Qualls, 2007). Hence, each individual has his/hers own IT skills and knowledge, which it differs from other individuals. Thus, the behavioral intention towards the adoption differs from a person to another. This perspective is consistent with Cohen and Levinthal's (1990) concept of ACAP. Where ACAP is defined as the ability to identify, assimilate, and apply external knowledge (Cohen & Levinthal, 1990).

Consequently, the contributions of this study are two-fold. The first contribution is to fill the gap of lacking studies of CT adoption in research workflow (Cheung & Vogel, 2013; Gruzd et al., 2012) by investigating the adoption of CT by academic researchers. The second contribution is to investigate the influencing role of academic researchers' individual differences, represented by ACAP, on adopting CT for research purpose. In fact, in voluntary context the individual's differences play a major role in the decision of either to adopt a technology or not. TAM is one of the most robust widely used adoption models at the individual level in various contexts (Al-ajam & Khalil, 2013). The main determinants of TAM are perceived usefulness and perceived ease of use, which is considered as the most critical determinants for individuals to adopt a technology. Thus, TAM forms a suitable theoretical base for the study, where external variables can be added to original TAM to explain the individual's behavior towards technology adoption.

The study reviews related literature, followed by study model and the hypotheses. After that, the adopted methodology for the study is explained. Next, a data analysis and a discussion is presented. Finally, a conclusion remarks are stated at the end of the study.

2. Literature Review

2.1 Absorptive Capacity (ACAP)

The ACAP construct emerged more than twenty years ago, yet it has recently used in Information Systems (IS) research (Roberts, Galluch, Dinger & Grover, 2012). ACAP was introduced by (Cohen & Levinthal, 1990). In their seminal work, they defined ACAP as "the ability to identify, assimilate, transform, and apply external knowledge to commercial ends. Cohen and Levinthal (1990) asserted that the exploitation to external knowledge along with the ability to combine newly acquired knowledge with prior knowledge is critical to create innovation.

ACAP has been conceptualized as a capability that is classified into 3 dimensions (Lane, Koka & Pathak, 2006; Park, Suh & Yang; 2007) as follow: i) ACAP for understanding, ii) ACAP for assimilating, and iii) ACAP for applying. ACAP for understanding refers to the ability of understanding the exact value of an object. ACAP for assimilating refers to the ability to internalize the new knowledge of an object into previous knowledge. Finally, ACAP for applying refers to the ability to apply the newly acquired knowledge of an object with prior knowledge to the tasks.

ACAP has shown interest in previous studies (Park et al., 2007), particularly in IS research (Roberts et al., 2012). However, few studies focused on ACAP importance on technology adoption at the individual level (Lin, 2013). The rapid emergence of new technologies and its status as a strategic asset, Roberts et al. (2012) affirmed that the individuals need to react to new technologies by building and increasing their own technology knowledge and capabilities, thus their technology ACAP will be increased. Consequently, individuals with high ACAP toward technology will be more able to employ the technology innovatively to their tasks and activities.

In this study, the term ACAP refers to the ability of the academic researchers to understand, assimilate, and apply the newly acquired knowledge of CT to prior related knowledge into their research tasks and activities. ACAP for understanding refers to the ability of academic researchers to understand the exact value of CT. ACAP for assimilating refers to the ability of academic researchers to internalize the new knowledge acquired of the CT into their previous related technology knowledge. Finally, ACAP for applying refers to the ability of academic researchers to apply the newly acquired knowledge of CT with prior related technology knowledge to their research tasks and activities.

2.2 Collaborative Technologies and Adoption

Technology adoption has gained a huge attention from researchers and practitioners due to the technology's role in enhancing individuals' competitiveness and success. Thus, extensive literature investigated the role of various factors influencing technology adoption. However, technology specific influencing factors have given less attention (Brown, Dennis & Venkatesh, 2010).

Rowlands et al. (2011), Gruzd et al. (2012), and Procter et al. (2010) affirmed that CT is gaining interest among academic researchers. However, despite of the importance of CT in research workflow, a lack exists in studying the researchers' adoption of CT (Gruzd et al., 2012; Procter et al., 2010). In addition, previous studies focused more on identifying the most widely used tools of CT by academic researchers (Gruzd et al., 2012). Focusing on what tools that are being used by academic researchers. Subsequently, the authors take a step further to study to what extent does the individual differences of the academic researchers influence the their adoption of CT in the research workflow.

2.3 Technology Acceptance Model (TAM)

The study aims to investigate the impacts of academic researchers' ACAP of CT on CT adoption for research purpose. In technology adoption studies, TAM is the most popular model used and widely empirically tested (Abbasi, Chandio, Soomro & Shah, 2011). Thus, the study was built on TAM (Venkatesh & Davis, 1996) as a theoretical foundation for accomplishing the study's objective.

TAM was introduced by (Davis, 1989), TAM was derived from Fishbein and Ajzen's (1975) theory of reasoned action (TRA). TAM explains the perception of the individuals by Perceived Eease of Use (PEOU) and Perceived Usefulness (PU), which influences the individual's Intention and usage Behavior towards certain technology (Davis, 1989). Davis (1989) defined PU as "the degree to which a person believes that using a particular system would enhance his or her job performance". In contrast, Davis (1989) defined PEOU as "the degree to which a person believes that using a particular system would be free of effort". Figure 1 depicts TAM.

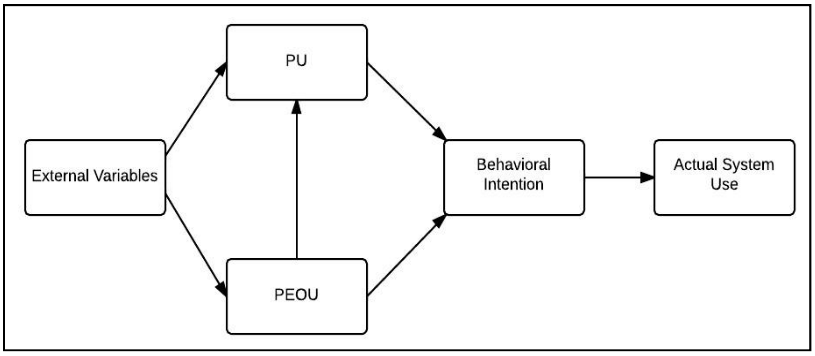

Figure 1. TAM (Venkatesh & Davis, 1996)

3. Research Model and Hypotheses

The research model of this study is presented in Figure 2. The hypothesized model was built on TAM as a theoretical base along with the ACAP construct. The study objective is to investigate the influence of academic researcher's ACAP of CT on his/her behavioral intention towards CT acceptance in their research workflow. The research significantly contributes to develop a model that is capable of explaining the academic researchers' acceptance of CT in their research workflow.

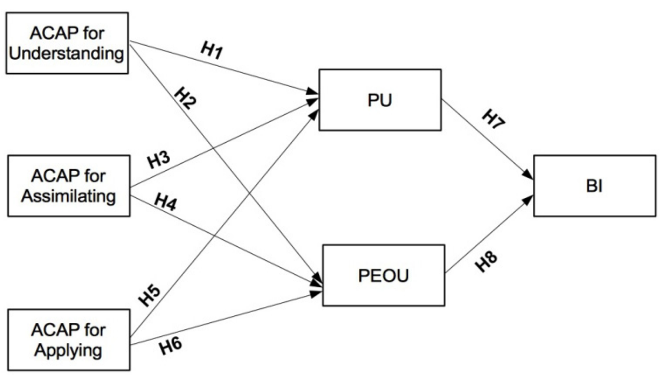

Figure 2. Research model

3.1 Academic Researchers' ACAP

The main concept of the researcher's ACAP of CT adopted by this study is that the academic researchers would have the ability to employ CT into their research workflow if they posses the prior relevant knowledge to CT; the internalization ability of prior related CT knowledge with newly identified CT knowledge; and the ability of applying the combined knowledge of CT, i.e. prior CT knowledge with newly identified CT knowledge, to the research activities. In conclusion, if academic researchers possess the aforementioned three abilities, their intention towards the acceptance of the CT in research workflow would be influenced.

Wang and Qualls (2007) identified several stages when adopting a technology, such as: searching, evaluating, and processing collected information about a technology. Knowledge has been identified as the first stage in adopting a technology (Rogers, 2003), followed by the evaluation of that knowledge (Rogers, 2003). Moreover, if a potential adopter lacks information of technology capabilities, this would inhibit the adopter from adopting that technology (Lin, 2013). Furthermore, Chen, Chen and Yen (2011) affirmed that the IT knowledge is important to the technology adoption and it plays a main role in the perception of individuals to easily and usefully is a technology to him/her.

Thus, the study hypothesizes the following:

H1: Academic researcher's ACAP for understanding CT positively influence the PU of CT in research workflow

H2: Academic researcher's ACAP for understanding CT positively influence the PEOU of CT in research workflow

H3: Academic researcher's ACAP for assimilating CT positively influence the PU of CT in research workflow

H4: Academic researcher's ACAP for assimilating CT positively influence the PEOU of CT in research workflow

H5: Academic researcher's ACAP for applying CT positively influence the PU of CT in research workflow

H6: Academic researcher's ACAP for applying CT positively influence the PEOU of CT in research workflow

3.2 TAM

TAM widely employed to test the technology acceptance in various technology contexts. Davis (1989) found that PU and PEOU influence directly the Behavioral Intention (BI) towards technology acceptance. In addition, extensive recent studies found that PU and PEOU influence positively the BI towards the technology acceptance (Abbasi et al., 2011; Chen et al., 2011; Lee, Park, Chung, & Blakeney, 2012).

Thus, this study hypothesizes the following:

H7: Academic researchers' PU of CT positively influences the academic researchers' BI towards CT acceptance in research workflow.

H8: Academic researcher PEOU of CT positively influences the academic researchers' BI towards CT acceptance in research workflow.

4. Research Methodology

4.1 Questionnaire Development and Data Collection

A survey instrument was developed based on prior ACAP, and TAM literatures. The data was collected through paper-based and Web-based surveys. The survey was divided into 9 sections, each was assigned to each construct of the research model: ACAP for understanding CT, ACAP for assimilating CT, ACAP for applying CT, academic researcher PEOU, academic researcher PU and academic researcher's BI towards CT acceptance. To ensure the clarity and content validity of instrument, the instrument was validated by 3 experts. A 7-point Likert-type scale was used. The scale ranges from 1 (strongly disagree) to 7 (strongly agree). The survey was conducted among postgraduate students (research mode only) and freshly PhD holders in a leading university in Malaysia by distributing hard copies of the survey to them.

A total of 72 successful responses were used in the analysis. The collected data were examined for missing data and respondents test bias. A description of the sample is provided in Table 1.

Out of the 72 respondents, 34 are females (47.2%), and 38 are males (52.8%). 52.8% of the respondents ages between 20 and 30 years, 40.3% aged between 31 and 40 years, 5.6% aged between 41 to 50 years, and only 1.3% aged above 50 years. There is 94.4% of the respondents are postgraduate students (research mode only), 77.8% out of the 94.4% are PhD students, and 16.6% are at the master level, 2.8% are PhD holders, and 2.8% classified as other, such as research assistants that are not holders of a PhD degree. About 12.5% of the respondents have research experience for less than a year, 25% have research experience for 1 to 2 years, 30.6% have research experience for 2 to 3 years, 18.1% have research experience for 3 to 4 years, and 13.8% have research experience for more than 4 years.

Table 1. Demographic profile of the respondents

	Label	Frequency (N=72)	Percentage (100%)
Gender	Male	38	52.8
	Female	34	47.2
Age	20 – 30 Years	38	52.8
	31 – 40 Years	29	40.3
	41 – 50 Years	4	5.6
	Above 50 Years	1	1.3
Current Education Level	PhD Student	56	77.8
	Research Master Student	12	16.6
	PhD Holder	2	2.8
	Others	2	2.8
Research Experience	Less than a Year	9	12.5
	1 – 2 Years	18	25.0
	2 – 3 Years	22	30.6
	3 – 4 Years	13	18.1
	Above 4 Years	10	13.8

5. Data Analysis

IBM SPSS statistical software and the Partial Least Squares (PLS) - SmartPLS 2.0 (M3) software were employed to carry out the statistical analysis. The descriptive statistics of the data collected was assessed by SPSS. While SmartPLS 2.0 was used for assessing both of measurement and structural models. Haenlein and Kaplan (2004) stated that PLS provides analysis method that is valid and robust, due to minimum requirements of the sample size, and independence of data distributions. Moreover, Hair, Sarstedt, Ringle, & Mena (2011) affirmed that PLS focuses on prediction. Thus, the authors employed PLS as analysis technique due to its adequacy. The authors employed a bootstrapping resampling procedure with 72 cases and resamples of 1000 to assess the stability of estimates (Chin, Marcolin & Newsted, 2003).

5.1 Measurement Model

The authors used SmartPLS 2.0 (M3) (Ringle, Wende, & Will, 2005) to test the model. To validate the measurement model reliability, convergent validity, and discriminant validity tests were carried (Henderson, Sheetz, & Trinkle, 2012). Fornell and Larcker (1981) proposed a cut-off value of 0.70 and above to indicate the reliability of the indicator loadings and Cronbach's alpha. Table 2 depicts that all measure loadings met the threshold values and their scores ranged from 0.7587 to 0.9512. Also, Cronbach's Alpha of the constructs met the threshold value and its values ranged from 0.8097 to 0.9353.

The constructs' AVE values and CR were tested to assure the convergent validity of the model (Wang, Wang, & Yuan, 2013). Their values should exceed Fornell and Larcker (1981) criterion of 0.70, and 0.50, respectively. Table 2 shows that the AVE and CR met the minimum threshold.

Finally, the measurement model was assessed for discriminant validity. In discriminant validity, the square root of AVE should exceed the values of the correlated items within the same construct and among the other constructs. Table 2 shows that discriminant validity was confirmed. Figure 3 depicts the measurement model generated by SmartPLS.

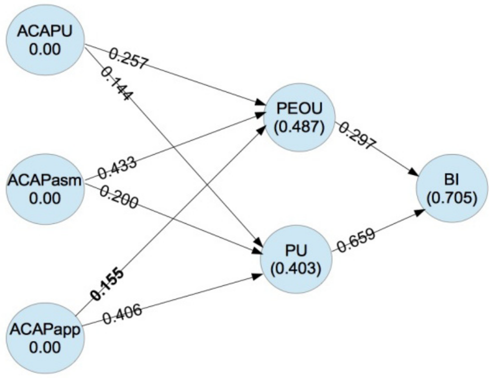

Figure 3. The measurement model

Table 2. The measures' loading, AVE, composite reliability, Cronbach's Alpha, and R^2

Construct	*Measure*	*Loadings*	*AVE*	*Composite Reliability*	*Cronbach's Alpha*
ACAP for Understanding (ACAPU)	ACAPU1	0.7587	0.6916	0.9179	0.8892
	ACAPU2	0.8797			
	ACAPU3	0.8399			
	ACAPU4	0.8568			
	ACAPU5	0.8178			
ACAP for Assimilating (ACAPAsm)	ACAPAsm1	0.7990	0.7256	0.8879	0.8097
	ACAPAsm2	0.8762			
	ACAPAsm3	0.8778			
ACAP for Applying (ACAPAPP)	ACAPApp1	0.8998	0.8375	0.9392	0.9029
	ACAPApp2	0.9203			
	ACAPApp3	0.9251			
ACAP for Understanding (ACAPU)	RchrPEOU1	0.8383	0.7741	0.9113	0.8539
	RchrPEOU2	0.9024			
	RchrPEOU3	0.8974			
PEOU (R^2= 0.4867)	RchrPU1	0.8981	0.8381	0.9539	0.9353
	RchrPU2	0.9317			
	RchrPU3	0.9512			
	RchrPU4	0.8791			
PU (R^2= 0.4031)	RchrBI1	0.8739	0.7868	0.9171	0.8641
	RchrBI2	0.9192			
	RchrBI3	0.8670			
BI (R^2= 0.7053)	ACAPAsm1	0.7990	0.7256	0.8879	0.8097
	ACAPAsm2	0.8762			
	ACAPAsm3	0.8778			

Table 3. Discriminant validity of the constructs

	ACAPAPP	ACAPAsm	ACAPU	BI	PEOU	PU
ACAPAPP	0.9152					
ACAPAsm	0.6622	0.8518				
ACAPU	0.4111	0.3919	0.8316			
BI	0.5792	0.5385	0.3809	0.887		
PEOU	0.5478	0.6367	0.4902	0.6054	0.8798	
PU	0.5971	0.5248	0.3893	0.7978	0.4681	0.9155

5.2 Structural Model

To assess the structural model, examination of path coefficients, t-values, and variance explained values (R^2) must be assessed (Maldonado, Khan, Moon & Rho, 2011). Bootstrapping method was employed with number of 72 cases and 1000 subsamples (Yi & Davis, 2003).

Overall, the structural model (Figure 4) shows 3 out of 8 hypotheses were not supported. While the rest of the hypotheses were significant and supported the research hypotheses. The insignificant relations exist between the path of researcher's ACAP for understanding and PU, the path of researcher's ACAP for assimilating and PU, and the path of researcher's ACAP for applying and PEOU. A possible explanation for the insignificant of ACAP for understanding on the usefulness of the CT is that the academic researchers who try to understand the CT and collect information about the CT as much as possible do not concern about the usefulness of CT at this stage, i.e. the stage of information gathering about CT and its concept. Another possible explanation for the insignificant of ACAP for assimilating on the usefulness of the CT is that the academic researchers who try to combine the recently gathered information and knowledge about the CT with the prior possessed related technologies knowledge do not concern about the usefulness of CT at this stage. Moreover, a possible explanation for the insignificant of ACAP for applying on the easiness of the CT usage is that the academic researchers who try to apply the CT to his or her research workflow do not concern about the CT usage easiness at this stage, due to the researchers' perception of the usefulness of the CT in the research workflow. Table 4 depicts the path coefficients, t-values, p-values, and the supported hypotheses.

Table 4. Path Coefficients, t-values, significance level, and hypotheses status

Path	β	t-value	Sig.	Hypothesis Supported
ACAPU → PEOU	0.2565	2.4318	*	Yes
ACAPU → PU	0.1443	1.1227	NS	No
ACAPAsm→ PEOU	0.4332	3.6173	***	Yes
ACAPAsm→ PU	0.1997	1.6319	NS	No
ACAPAPP →PEOU	0.1554	1.0959	NS	No
ACAPAPP → PU	0.4055	2.6254	*	Yes
PEOU → BI	0.297	3.8288	***	Yes
PU → BI	0.6587	8.9972	***	Yes

Note: *** p <0.001, ** p < 0.01, * p < 0.05, and NS: Not Significant.

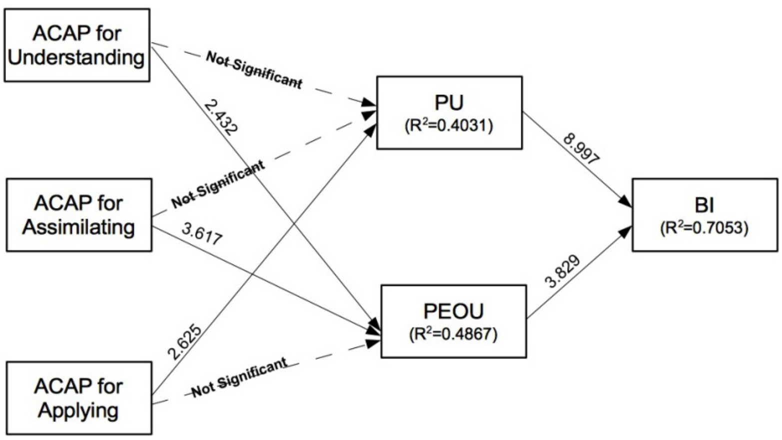

Figure 4. The structural model

6. Discussion

The significance of the findings demonstrates that the PEOU is being predicted by both of researcher's ACAPU and ACAPasm. Thus, the researcher who posses more understanding of related CT and is capable of assimilating CT would increase the PEOU of the CT. Another finding is that, PU is being predicted only by researcher's ACAPapp. Thus, researchers who are able to apply CT to their research workflow would perceive the usefulness of the CT more than their peers who do not. Moreover, the study shows that researcher's BI towards CT acceptance is predicted by both PEOU and PU. In other words, researchers who perceive the usefulness and ease of use of CT their BI towards using CT in research workflow would be higher than those who do not. On the other hand, the findings show that researchers' ACAPU and ACAPasm do not predict the PU of CT. Similarly, researchers' ACAPapp does not predict the PEOU of CT. This findings contrast what it has been proposed by (Lin, 2013). A reasonable explanation for the insignificant finding may be that the academic researchers did not heed much priority on retaining the perception of CT usefulness when they try to understand and assimilate the new knowledge of CT. Similarly, the academic researchers did not heed much priority on retaining the perception of CT ease of use when they apply CT to their research workflow.

7. Conclusion

The study extended TAM by combining the construct of ACAP to TAM. The study contributes to the IS body of knowledge on researchers' adoption and acceptance of CT in the research activities using TAM and ACAP. The study suggests that the differences of the researchers in academic fields may influence the acceptance and adoption of CT in their research workflow. Also the study suggests that the researchers in academic fields should increase their ACAP of related technologies to CT to improve their research productivity.

Acknowledgement

The first author would like to express her deep gratitude to the Ministry of Education Malaysia and the Scholarship Division for their financial support in pursuing her PhD study. The first author also would like to express her deep gratitude to the co-authors, who are assigned as supervisors, for their generous support and constructive suggestions during pursuing her PhD study.

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