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Comparing the Relationship between Perceived Characteristics of Innovation (PCI) and Adoption of Computer Based Training among Trainer and Trainees

Hashim Fauzy Yaacob[a*], Mohd Zarir bin Yusoff[a]

[a]Universiti Teknologi Malaysia, Johor Bahru 81310, Johor, Malaysia

Abstract

The purpose of this study is to examine the factors associated with the adoption of innovation perceived by trainer and trainees namely "perceived characteristics of innovation (PCI)" in using CBT and also to compare this relationship among trainer and trainees. The data were collected by using a set of questionnaire. The questionnaire has been designed by adopting the instruments of Perceived Characteristic of Innovation (PCI) and Adoption Questionnaire. Then, the collected data have been analyzed by using Pearson's Correlation, regression and Z-Fisher. The finding shows that there is positive relationship between PCI and adoption, and there is a significant different in relation on compatibility factor and the adoption level on computer based training between trainers and trainees.

1. Introduction

Technological revolution influenced the field of communication to the birth of the term *communication technology* which also influenced the interest of many scholars to study this phenomenon from the perspective of innovation. Revolution in communication technology also facilitates the training activities within the organization.

* Corresponding author.
  E-mail address: hfauzy@outlook.com

Currently employees training are delivered through Technological Based Training (TBT), Computer Based Training (CBT) and Web Based Training (WBT) either synchronous or asynchronous communication for instance through the use of the web, virtual classroom, mobile learning, podcast etc. Training becomes easier for individuals or organizations to share and communicate information as well as to make interaction are more effective, faster, easy and economical, compared with traditional training that requires direct engagement between trainers and trainees.

In traditional training trainer will transfer knowledge to trainees through verbal description and distribution of notes or printed materials, especially textbooks or manual (Wagner & Flannery, 2004). These methods are no longer able to help the organization to maintain its competitive edge in the global market (Aragon & Johnson, 2002). Therefore, many organizations are now more emphasis on providing training to use ICTs to promote the acquisition and sharing of knowledge and skills among workers in a more economical and effective without requiring them to sit together in training room. A part of the communication technology adopted by all organizations currently is a computer based training or CBT (Wisdom et al, 2008). It was proven as referring to the 2010 United States Training Industry report whereas 30.8% of training hours for employees are delivered through CBT. An increase of 10.8 % clearly shows that the comparative advantage of CBT has influenced the widespread use of communication technology in training activities (ASTD, 2010).

However, there is a question about the level of adoption to the CBT and what is the factors that influence the adoption for difference organizations and groups because it involves the acceptance by the various parties such as organizations, trainers and trainees. Based on this premise the purpose of this study is to examine the factors associated with the adoption of innovation perceived by trainer and trainees namely "perceived characteristics of innovation (PCI)" in using CBT and also to compare this relationship among trainer and trainees.

2. Literature review

2.1. Theoretical model and framework

There are several theories that could be best explained the diffusion or adoption of innovation in one society. For example, Theory of Structuration which was introduce by Anthony Giddens, Kirton Adaption-Innovation (KAI) by M.J. Kirton, F.D. Davis Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI) by Everett M. Rogers.This research is based on DOI theory introduced by E.M. Rogers (1962, 1986, 2003) who are recognized by scholars as the 'godfather' of scientific research about the diffusion of innovation (Bouwman et al 2005) and Perceived Characteristics of Innovation (PCI) by Moore and Benbasat (1991). The development of the theory of DOI was stimulated in the 1960s whereas most of the researchers were starting to use this theory in explaining their studies even though in different field of studies such as marketing, culture and anthropology. According to DOI, the rate at which different innovations get adopted by members of a social system can vary strongly and depends, among other things, on a number of characteristics of the innovation itself namely relative advantage, compatibility, complexity, trialability and observability, what called by Rogers as perceived attributes innovation (PAI).

2.2. Perceived characteristics of innovation (PCI)

DOI face with several critiques by other researchers such as Down and Mohr (1976) and Tornatzky and Klein (1982) regarding the inconsistent of Rogers attributes in influencing the diffusion and adoption of an innovation. It is for the reason that Rogers more focused on the primary attributes of innovation which this attributes are focusing to the intrinsic of an innovation independent rather than perception of using an innovation by the potential adopters. Therefore, Moore and Benbasat (1991) had developed a new PCI which was the extension from Rogers's perceived attributes innovation (PAI). This PCI is able to predict the perception of using an innovation by the potential adopters since it is not focusing to the characteristics of innovation alone.

In this PCI, Moore and Benbasat (1991) had developed two additional characteristics which are image and voluntariness and separate the characteristics of observability into two different characteristics namely visibility and results to demonstrability and also renamed Rogers' complexity to the ease of use, while the other characteristics remain same as before.According to Rogers, an image was included in relative advantage as he believed the image could bring advantage for the adopters. However, based on the study which was done by Moore and Benbasat

(1991), the image should be separated as it could be referred as the degree to which use of innovation is perceived to improve image or social system and individual. It was argued by Tornatzky and Klein (1982) which they believed that the effect of that image is much more different to the relative advantage as it is more to demonstrate how this image may improve the reputation or prestige from social status to the adopter.

Voluntariness was defined by Moore and Benbasat (1991) as the degree to which use the innovation is perceived as being voluntary or of free will. According to Pysell (2010), the voluntariness reflects an important aspect of social influence and this influence occur through a means of compliance for example, doing what is required. When examining the diffusion of innovation, a consideration must also be given to individual whether they are free to implement personal adoption or rejection in their decision.

Observability which was separated into two new characteristics which resulted to demonstrability and visibility will provide difference meaning and affect among each other. Result of demonstrability is basically concerned on the tangibility of using the innovation and it is including their observability and communicability. According to Moore and Benbasat (1991), results of demonstrability are when the results of using an innovation in term of consequences and effect could be seen and communicated to others. It was agreed by Pysell (2010) which is this result demonstrability reflected the fact that the impact of an innovation might be more easily demonstrated than others. Visibility on the other hand is focusing more on the physical presence of an innovation in organization setting (Moore & Benbasat, 1991). This characteristic explains in which people could easily diffuse and adopt an innovation when they are able to see the existing of the innovation physically in an organization.

3. Methodology

This study is a quantitative study in which it helps the researcher to observe and describe the pattern of study in relation to variables as the researcher aims to study the relationship between the independent variables (IV) and the dependent variable (DV). The independent variables consist of eight Perceived Characteristics of Innovation (PCI) namely *relative advantage, compatibility, ease of use, results demonstrability, image, visibility, trialability* and *voluntariness* while the dependent variable consists of the adoption of computer based training. The questionnaire was distributed to the sample by means of simple random sampling in order to have most accurate information that may represent the whole population in Malaysian Co-operative Institution. The population of this study is divided into two groups which are trainers and trainees. The total population for the trainers is 460 and the trainees are 1106. Based on the Table for Determining Sample Size by Krejcie and Morgan's (1970), the sample of the study for trainers and trainees should be 210 for the trainers and 285 for trainees. Hence 495 respondents were selected from the both population.

The researchers obtain instrument's validity and reliability. The purpose of substantiating whether the items on the questionnaire were actually measuring the underlying variables, an instrument validating process has been conducted by the researcher. The reliability test was conducted using Cronbach's alpha. Preferably, the cronbach's alpha coefficient should be greater than 0.7. Therefore, the items with Cronbach's alpha greater than 0.70 is acceptable to this study and can be adopted and those who are below than 0.70 will be eliminated. The Cronbach's alpha value for all PCI variables is above 0.7. The Croanbach's alpha for acceptance of CBT is 0.92.

Pilot test was done prior to conducting the survey with the actual population. The pilot test is necessary to promote a higher response rate by anticipating and eliminating potential problem areas. The respondents in this Pilot test are from Malaysian Cooperative Institution. Furthermore, before we run inferential statistical test, normality, linearity, homoscedasticity and multi-collinearity test was done. From the normality test, data could be concluded comes from normal distribution. For linearity and homoscedasticity test, results show that all the independent and dependent variable had met the assumption of linearity and homoscedasticity. Furthermore result from Varian Inflation Factor (VIF) test is below than 10 and it means the data was qualified for regression test.

This study conducted two kind of data analysis using descriptive statistic and inferential statistic. Descriptive statistics involves of percentage method of calculation, the frequency distribution and the mean scores. The percentage method and frequency distribution is used to analyzed the background of respondents while the means score is used to identify the level of adoption to CBT among the trainers and trainees. Inferential statistics is to investigate the relationship between the Perceived Characteristic of Innovation (PCI) and the adoption of CBT

among the trainers and trainees, to identify the difference of the relationship between the Perceived Characteristics of Innovation (PCI) and the adoption to CBT among the trainers and trainees, to evaluate the influence of Perceived Characteristics of Innovation (PCI) that are able to influence the adoption to CBT and to examine the most influential Perceived Characteristics of Innovation (PCI) on the adoption to CBT. There are several inferential analysis and test which suitable to be adopted by the researcher which are Pearson Correlation to test relationship. Because of the respondent in this study have two group of trainer and trainee, the comparison of relationship for the group was identified through Z-Fisher method. Z-fisher test is suitable to be adopted since this study involved two different group of sample which are trainer and trainee and two different sample size (trainer, n=210; trainee, n=285). The process of comparing two correlations involves several processes which are:

- Find the correlation or r-value of each group, trainers and trainees which the correlation of the second objective may be used.
- List all the r-values in a table according to their group.
- Transform r-value of each variable into z value using this formula in order to assess the significance of the differences between two correlation coefficients, ra (trainers) and rb (trainees).

$$Zr1= . [\log e (1+ r1)-\log e (1+ r1)] \tag{1}$$

- Next, in order to gain z value, each of variables in each group is calculated based on this Z-Fisher's formula:

$$z= \frac{Z1-Z2}{\sqrt{(1/(n1-3))} + (1/(n2-3))} \tag{2}$$

- When the z-value is completed, the critical value of t = 1.645 for a one tailed test at 0.05 level of significance was used as a basis to determine the significant different between the variable of PCI and the acceptance of ICT based training among the trainers and trainees.

To evaluate the influence of the Perceived Characteristics of Innovation (PCI) towards the acceptance of CBT based training among the trainers and trainees and to examine the most influential Perceived Characteristics of Innovation (PCI) on the adoption to CBT among the trainer and trainee, the researcher used the Multiple Regression test to analyze the data.

4. Findings

The sample for this study is 495 from 1560 population but only 487 (98.38%) has returned the questionnaire, 207 are trainer and 280 trainee. Most of the respondents are male 58.5% and female 41.5%. Educational level, 72.0 % is a bachelor degree holder and 28 % master and PhD. The level of adoption to CBT for trainer and trainee is at high level. The value of mean for trainer based on five scale is 3.74 and for trainee 3.76. Table 1 is the result from correlation test for the relationship between PCI and adoption to CBT separately for the trainer and trainee. All eight PCI variables showed a significant relationship to CBT for the both groups. All PCI variables also showed a difference in value between trainer and trainee. Although there are differences in the descriptive comparison based on two groups of correlation for all PCI factors in adoption to CBT among trainer and trainee, this method is not valid because of such factors such as the difference in the skewness and number of sample between two groups. Therefore, researches need to change the value of (r) for both groups to z before doing comparison. Table 2 shows the result after (r) values was transform to z. From eight factors   only *compatibility* have a difference because the value of z is -1.84 above the t value, t= 1.645.

Table 1. The correlation between PCI and adoption to CBT

Perceived Characteristics Innovation (PCI)	*Trainer*	*Trainee*
Relative advantage	0.33**	0.34**
Compatibility	0.47**	0.59**
Ease of use	0.45**	0.49**
Trialability	0.32**	0.25**

Results demonstrability	0.56**	0.62**
Images	0.47**	0.53**
Visibility	0.52**	0.55**
Voluntariness	0.37**	0.35**

Table 2. Comparison of correlation based on test of Z-Fisher

Perceived Characteristics Innovation (PCI)	Zr=. [log e (1+ r1)-log e (1+ r1)]		Value z = Zr1 - Zr2 $\sqrt{ \frac{1}{(n1-3)} + \frac{1}{(n2-3)} }$
	Zr1	Zr2	
Relative advantage	0.34	0.35	--0.16
Compatibility	0.51	0.68	-1.84*
Ease of use	0.48	0.53	-0.55
Trialability	0.34	0.26	0.83
Results demonstrability	0.64	0.72	--0.86
Images	0.52	0.59	-0.81
Visibility	0.58	0.62	-0.47
Voluntariness	0.39	0.36	0.26

To evaluate the influence of PCI towards the adoption of CBT among the trainers and trainees, multiple regression tests was done. The result shows only two variables in the regression equation emerged as statistically significant to predict the adoption to CBT which is *results demonstrability* (β=0.37, t=3.67, p$\leq$0.00) and *visibility* (β=0.23, t=2.87, p$\leq$0.01) for group of trainer.

On the other hand for group of trainees there are five variables in the regression equation emerged as statistically significant to predict the adoption to CBT which are c*ompatibility* (β=0.20, t=2.43, p$\leq$0.02), *trialability* (β=-0.24, t=-3.71, p$\leq$0.00), *result demonstrability* (β=0.33, t=3.71, p$\leq$0.00), *image* (β=0.13, t=2.13, p$\leq$0.03) and *visibility* (β=0.18, t=2.82, p$\leq$0.01). When comparing the results from the group of trainers with the group of trainees, only *result demonstrability* and *visibility* become a predictor for both group. Result demonstrability contributes 37% to adoption of CBT for trainers and 33% for trainee. Otherwise visibility contributes 23% for trainers and 18% for trainees.

Table 3. Regression test for PCI and adoption to CBT among trainer.

PCI	Adoption to CBT			
	B	β	t	Sig.
Relative advantage	-0.02	-0.02	-0.23	0.82
Compatibility	0.06	0.06	0.53	0.60
Ease of use	-0.03	-0.03	-0.26	0.80
Trialability	-0.11	0.11	-1.43	0.15
Results demonstrability	0.30	0.37	3.67	0.00*
Images	0.08	0.11	1.37	0.17
Visibility	0.18	0.23	2.87	0.01*
Voluntariness	0.09	0.10	1.44	0.04
(Constant)	0.86		2.08	0.04

R = 0.62 R^2 = 0.39   Adjusted R^2 = 0.36   F = 15.72   p = 0.00

Table 4. Regression test for PCI and adoption to CBT among trainee.

PCI	Adoption to CBT			
	B	β	t	Sig.
Relative advantage	-0.01	0.00	-0.04	0.97
Compatibility	0.24	0.20	2.43	0.02*
Ease of use	0.11	0.10	1.22	0.23
Trialability	-0.27	-0.24	-3.71	0.00*
Results demonstrability	0.27	0.33	3.71	0.00*
Images	0.11	0.13	2.13	0.03*
Visibility	0.14	0.18	2.82	0.01*
Voluntariness	0.04	0.05	0.81	0.42
(Constant)	0.26		0.48	0.63

R = 0.70 R^2 = 0.49   Adjusted R^2 = 0.48   F = 33.04   p = 0.00

5. Conclusion and suggestion

The results showed the inconsistent of PCI in influencing the diffusion and adoption of an innovation which is similar to that of PAI. Therefore a review of the PCI itself is required. The findings of the difference in two groups of correlations were also not consistent. This study showed no difference in seven factors of PCI when two correlations of trainers and trainees was compared except for *compatibility*. These are inconsistent with Intan (2012) finding that show significant differences among trainer and trainees in *result demonstrability* and *voluntariness*. However the study found that there are different influences on trainers and trainees when regression testing is done. Therefore, this study suggests that the statistical method should be developing to distinguish regression of two groups, as shown by Z-Fisher statistical method for correlation.

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