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Participation and Psychological Ownership on Teachers' Beliefs of a Cloud-based VLE

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Abstract: Perceived usefulness and perceived ease of use constitute important belief factors when technology adoption decisions are made within a non-mandatory setting. This paper investigated the roles played by users' participation and psychological ownership on these beliefs about using a virtual learning environment (VLE). Participation is conceptualised as the extent of activities and behaviours teachers exhibit in a VLE, while psychological ownership refers to the feelings of ownership developed for it. As technology become ubiquitous, psychological ownership is increasingly becoming a relevant phenomenon in technology adoption research, where people can feel psychologically attached to a particular technology. It is proposed that such phenomenon can also occur when using a VLE. Hence, hypothesised relationships were tested with 67 Malaysian teachers from three schools who are using a cloud-based learning platform. Measures were adopted and adapted from established scales used in previous studies. Results from partial least square analysis found significant effect of participation on psychological ownership ($\beta = 0.661$, $p < 0.001$), while psychological ownership had significant effect on perceived usefulness ($\beta = 0.589$, $p < 0.001$) and perceived ease of use ($\beta = 0.632$, $p < 0.001$). This study provides initial evidence for participation and psychological ownership to be included in examining users' belief about educational technologies.

Keywords: Participation, Psychological ownership of VLE, Perceived usefulness, Perceived ease of use

1. Introduction

Cloud-based learning platforms are gaining popularity for its advantages in offering access to infinite on-demand resources, unlimited storage, and scalability in terms of bandwidth and computing functionalities (Stantchev, Colomo-Palacios, Soto-Acosta, & Misra, 2014; Hew & Kadir, 2016). Users are found to prefer this new platform to traditional Learning Management Systems (LMS), rating it favourably in terms of their perceived ease of use, perceived usefulness, and attitude towards the platform (Stantchev et al., 2014). The services offered by cloud-based learning platforms surpass traditional LMS (Shiau & Chau, 2016), with benefits such as the ability to be "omnipresent" to the access of content, and provision of powerful collaborative support (Park & Ryoo, 2013). Despite its advantages, the current cloud based learning platform in Malaysia, the Frog VLE, has received lukewarm application from teachers (Auditor General Report, 2013).

The Frog VLE platform was implemented in 2012 as part of 1BestariNet (1SmartNet) project, a signatory educational initiative to catapult technology-based teaching and learning in Malaysian public schools (Soon, 2014). Through this programme, Malaysia became the first nation in the world to connect all 10,000 public schools, 500,000 teachers, 5.5 million students, and 4.5 million parents using a single, cloud-based learning platform with high speed 4G internet connectivity (Hew & Kadir, 2016). This cloud-based VLE offers virtual equivalents of conventional educational concepts, wherein teaching and learning can be conducted virtually, parents can view their children's tests results and school news, while the school management can disseminate information via the platform (Soon, 2014). It is integrated with educational applications such as Khan Academy and Google Apps for Education, providing users with an array of functionalities through Widgets and built-in applications. Some of the functionalities include: assignments, e-mail, booking calendar for school resources, creation of learning

sites, quizzes, learning style reports, and Google Drive. There were also links to virtualized community and resources through forums, bookshelf, departmental sites for school subjects, the Pond, FrogStore, FrogAcademy, personal dashboard, and the school dashboard.

The first phase of implementation in 2013 to 2015 focused on infrastructural set-up and the equipment of teachers with VLE competency (Ministry of Education [MOE], 2013). Training of teachers were conducted in a 'train the trainers' manner, where teachers who have attended initial trainings would train their colleagues in their respective schools (Cheok & Wong, 2016). The second implementation phase which last from 2016 to 2020 concentrates on reviewing best practices, and using ICT for intervention of specific groups such as rural schools or under-enrolled schools (MOE, 2013). Teachers have cited the major success factors of the VLE depend on its physical attributes, tool for collaboration, and its functions as pedagogical tool (Soon, 2014). Usage of the VLE among teachers remain low, despite the realised benefits offered by the platform in enhancing students' learning (Cheok & Wong, 2016; Rajaendram, 2017).

2. Literature Review and Objective of the Study

2.1 Perceived Usefulness, Perceived Ease of Use, Participation and Psychological Ownership

The Technology Acceptance Model (TAM) (Davis, 1989) is a theoretically justified and parsimonious model that makes a good ground theory for studying users' beliefs in using e-learning technology (Šumak, Heričko, & Pušnik, 2011; Teo, Lee, Chai, & Wong, 2009). Perceived usefulness and perceived ease of use constitute the two central variables in the TAM (Davis, 1989). Perceived usefulness (PU) describes the belief that using a particular technology will improve one's job performance, while perceived ease of use (PEOU) refers to the belief that using a target technology will be free of effort (Davis, 1989). Within the education milieu, these beliefs are found to have pronounced influence on users' attitude, intention and usage behaviours (Moses, Wong, Bakar, & Mahmud, 2013; Wong & Teo, 2011). In the present study, PU describes the degree to which teachers believe that using cloud based VLE can improve their teaching performance, while PEOU refers to the extent to which teachers believe such systems can be used easily (Wang & Wang, 2009).

Since its conception, TAM has evolved and extended with different external variables to explain its main constructs (Marangunić & Granić, 2015). When developing one of the final iterations of the model, the TAM 3, it was suggested that user participation be incorporated in future investigations of TAM (Venkatesh & Bala, 2008). User participation originally refers to the extent of activities, assignments, and behaviours that users undertake during the systems development and implementation process (Barki & Hartwick, 1994). However, scholars have advocated the examination of participation beyond the system development phase, to focus on post implementation to understand users' engagement in the system (Ju, Wei, & Tsai, 2016; Shen, Khalifa, & Almulla, 2013; Wagner & Newell, 2007). The present study was conducted in the end user domain, and end users' participatory activities are very much different from the developmental phase of a system. The literature has identified two broad categories of activities in system design that involve end-users: parameterization and tailoring (Ardito, Buono, Costabile, Lanzilotti, & Piccinno, 2012). Parameterization describes activities that allow end users to choose among alternative behaviours and mechanism that is available in the system to customize the particular system (Lieberman, Paternò, Klann, & Wulf, 2006). Tailoring involves the creation or modification of a particular software by end users to suit their needs (Ardito et al., 2012). As users become involved in participatory activities in the system, it becomes personally relevant and important to them, therefore inducing their ownership and buy-in of the particular system (Spears & Barki, 2010; Wu & Marakas, 2006). A similar dynamic may also occur in the context of cloud VLE, as one of the main services offered by cloud VLE, the software as a service (SaaS), provides various customizable applications that run through the cloud. These applications and programs such as Google App for Education offers high degree of tailoribility, providing teachers with choices to set parameters to build and design their VLE environment for instructional purposes (Shiau & Chau, 2016). Based on this contention, this study conceptualise participation as the extent of activities and behaviours teachers perform in the cloud VLE, as they tailor the applications and programs which run through the cloud for teaching and learning.

As technology becomes ubiquitous in daily lives, psychological ownership has become a

relevant phenomenon in technology adoption research (Klesel, Ndicu, & Niehaves, 2016). Psychological ownership is the possessive feeling of being psychologically attached to an object, where individuals feel as though an object's ownership or a part of that object is 'theirs' (Pierce, Kostova, & Dirks, 2001). Within the work context, the potential targets of ownership can include tangible and intangible objects, tangible objects can include one's workspace, or work tools, whereas intangible objects may include the organisation itself or a project that one leads (Pierce & Jussila, 2011). Technology can also be a target object for which psychological ownership can be developed, as evidenced by research carried out in contexts such as in virtual world (Lee & Chen, 2011), clinical information system (Barki, Paré, & Sicotte, 2008), and social media (Karahanna, Xu, & Zhang, 2015).

Psychological ownership has received attention as an important factor in affecting users' behaviour in technology adoption (Klesel et al., 2016; Lee & Chen, 2011). Pierce et al. (2001) proposed four human needs which give rise to the development of psychological ownership: to have a place, to have effectance, to be stimulated, and to have a self-identity. A cloud-based VLE as a target of ownership can potentially fulfil these needs as it present ample opportunities for teachers to develop psychological ownership for it. As VLE content and spaces are customized by teachers, they may feel psychologically attached to their ideas, design, and intellectual contribution. Such personalization of space promotes a sense of familiarity, satisfying the need of having a 'place' (Porteous, 1976). By using and tailoring the applications available, teachers exercise discretion in using resources available to enhance their teaching, satisfying the effectance need. Taking part in the VLE stimulates teachers with different functionalities and applications in the system, satisfying the need for arousal which can explain the dynamics of psychological ownership (Pierce & Jussila, 2011). The flexibility afforded to teachers to define their VLE space can satisfy the need for self-identity, as they express themselves through using the features available. With this, the current study positions Frog VLE as a target of ownership for which feelings of psychological ownership can be developed by the teachers who use it.

Research have linked and empirically found relationships between users' participation (Barki, et al., 2008; Paré, Sicotte, & Jacques, 2006; Shen et al., 2013) and psychological ownership (Klesel et al., 2016; Smith, Grant, & Ramirez, 2014) on users' beliefs towards technology. The logic is apparent as users participate and become involve in a system, the system become personally relevant and important to them, thereby inducing their feelings of ownership and buy-in for the particular system (Spears & Barki, 2010; Wu & Marakas, 2006). Transposing these relationships to the current context, the objective of the present study is to explore a model of users' belief (perceived usefulness and perceived ease of use) that incorporates participation and psychological ownership. Although research has advanced the understanding of TAM variables, the rapid and continuous development of new technologies such as cloud-based VLE may open new directions of research that can enhance understanding of users' beliefs.

2.2 Research Model

This study focused on the premise that teachers who participate in activities related to a VLE may be perceived to possess substantial influence on the VLE. This may elicit their feelings of psychological ownership for the VLE (POVLE) and influence their beliefs (PU and PEOU) towards the VLE. The study adapted the primary dimensions of overall responsibility, hands-on activities, and communication to measure participation (Barki et al., 2008; Paré et al., 2006). Examining these dimensions can greatly benefit any system, as participatory activities and assignments can be translated to actionable intervention beyond the initial phase of implementation (Venkatesh & Bala, 2008). With this, a research model is proposed in Figure 1.

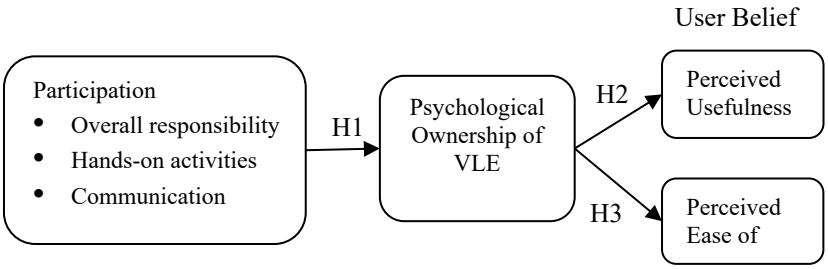

Figure 1. Research Model

The following hypotheses underpin the study:

H1: Participation has significant influence on psychological ownership of VLE.
H2: Psychological ownership of VLE has significant influence on perceived usefulness.
H3: Psychological ownership of VLE has significant influence on perceived ease of use.

3. Methods

3.1 Participants

Cluster sampling was employed where 67 teachers (female = 46, male = 21) from three secondary schools responded to the study. This sample size fulfilled the criteria required as calculated by G*Power 3.1 software, with a statistical power of 80%, significance at 0.05 alpha level, and effect size (f^2) of 0.15 (Faul, Erdfelder, Buchner, & Lang, 2009). Teachers' age ranged from 25 to 55, with a mean of 39 (SD = 8.55). Out of the 67 respondents, 62 of them had received training on the VLE. The average experience of using the system was 2.7 years (SD = 1.15), with usage experience ranging from one to five years. dnot Only teachers who had experience using the system were included in the study, where respondents were filtered with a question asking whether they had prior experience in using the system. Permissions for research were given by various departments of the Ministry of Education, the school authorities, and the university where the researchers are based.

3.2 Measures

Participation is measured as a formative construct contributed by overall responsibility, hands-on activities, and communication (Barki et al., 2008). Formative measurement in Information System research is encouraged as it can help practitioners identify the specific dimensions for improvement (Mathieson, Peacock, & Chin, 2001). Hence, findings can provide information about the critical dimensions of participation. In contrast, the constructs of POVLE, PU and PEOU use reflective measurement (Barki et al., 2008; Wang & Wang, 2009). As both formative and reflective scales are used, common method bias will be reduced (Hair, Hult, Ringle, & Sarstedt, 2017).

Questionnaires were used to collect demographic data and to measure the constructs. Participation was measured with three dimensions of overall responsibility, hands-on activities, and communication. Indicators were adapted from Barki et al. (2008) to measure the extent of participatory activities with seven-point Likert scale ranging from "1 = never" to "7 = every time". Psychological ownership of VLE was measured with items adapted from Barki et al. (2008), while user beliefs (perceived usefulness and perceived ease of use) were measured with items adapted from Wang and Wang (2009). Items were measured with a seven-point Likert scale with anchors ranging from "1 = strongly disagree" to "7 = strongly agree". The instrument was reviewed by three subject matter experts for content suitability.

4. Findings

Partial Least Square Structural Equation Modelling holds an advantage in this study as it allows combination of reflective and formative measurement in the same model (Becker et al, 2012). Hence, data were analysed with SmartPLS 3.0 software (Ringle, Wende, & Becker, 2015).

4.1 Assessment of Reflective Measurement Model

The internal consistency of POVLE, PU and PEOU were verified with composite reliability of 0.886 to 0.915, and Cronbach's Alpha values of 0.829 to 0.873 (Hair et al., 2017). Indicators which did not meet the loading threshold of .708 were removed (Hair et al., 2017), resulting the final indicators to load highest for their designated construct (Refer to Table 1). Convergent validity was verified with average variance extracted (AVE) of larger than 0.50 (Hair et al., 2017). In terms of discriminant validity, Table

2 displays the Fornell-Larcker's (1981) criterion which were found that square roots of AVEs were greater than the correlations between the constructs and other constructs, denoting that these constructs are distinctively different from one another. This is further complemented in Table 3 with heterotrait-monotrait (HTMT) criterion which is more stringent that the Fornell-Larcker criterion (Henseler, Ringle, & Sarstedt, 2015) with values lower than HTMT$_{.85}$ (Kline, 2011).

Table 1: Measurement model assessment for reflective model

Construct	Indicators	Loadings	Composite Reliability	AVE	Cronbach's Alpha
Psychological ownership	PO1	0.732	0.902	0.699	0.855
	PO2	0.791			
	PO3	0.899			
	PO4	0.909			
Perceived usefulness	PU1	0.919	0.915	0.732	0.873
	PU2	0.704			
	PU3	0.918			
	PU4	0.868			
Perceived ease of use	PE1	0.823	0.886	0.667	0.829
	PE2	0.817			
	PE3	0.761			
	PE4	0.846			

Table 2: Fornell and Larcker criterion

	PEOU	POVLE	PU
PEOU	0.812		
POVLE	0.632	0.836	
PU	0.720	0.589	0.856

Table 3: HTMT criterion

	PEOU	POVLE	PU
PEOU			
POVLE	0.704		
PU	0.841	0.665	

4.2 Assessment of Formative Measurement Construct

Participation is constructed as a formative variable contributed by three dimensions (overall responsibility, hands-on activities, communication). The summated score for each dimension was used as a formative indicator for participation (Barki et al., 2008). The construct was subject to redundancy analysis, assessment of multicollinearity between formative indicators, and assessment of significance and relevance of indicators (Hair et al., 2017). Convergent validity was tested with redundancy analysis with a global item of participation (Chin, 1998). As shown in Figure 2, the path coefficient linking the formative and reflective construct of participation was 0.798, demonstrating sufficient convergent validity with value of greater than 0.700 (Hair et al., 2017). This showed that participation is well represented by the three dimensions of overall responsibility, hands-on activities, and communication.

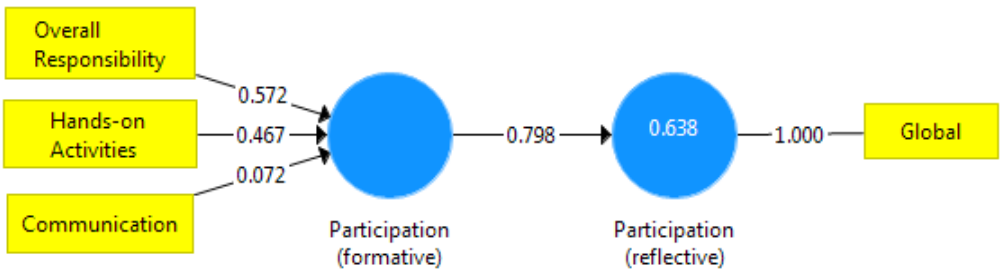

Figure 2. Redundancy Analysis for Assessing Convergent Validity

Collinearity between indicators may be a threat to the estimation of weights and statistical significance of the indicators as predictors of the formative constructs. Table 4 shows that variance inflation factor (VIF) values for each indicator are lower than 3.3, suggesting that the indicators measure different aspects of participation (Diamantopoulos & Siguaw, 2006). With this, bootstrapping of 5000 cases produced the outer weights of these indicators, which allows for the evaluation of their relative contribution to participation. Overall responsibility and hands-on activities were significantly related with participation (Table 4). Communication did not significantly contribute to participation, but potentially demonstrated absolute contribution with outer loading of more than 0.5 (0.675, $p < .001$) (Hair et al., 2017). Thus, communication is retained based on literature relevance to maintain the content validity of participation (Barki et al., 2008; Hartwick & Barki, 2001).

Table 4: Assessment of formative construct

Construct	Items	Convergent Validity	Weights	SE	VIF	*t*-value	*p* value
Participation	Overall Responsibility	0.798	0.572	0.139	1.938	4.126**	0.000
	Hands-on Activities		0.467	0.16	2.248	2.927**	0.004
	Communication		0.072	0.125	1.72	0.571	0.568

Note: ** >1.96, (two-tailed)

4.3 Assessment of Structural Model

As shown in the research model (Figure 1), each construct is only explained by one construct, hence, collinearity assessment for the structural model is not applicable in this study. Table 5 shows the results of path co-efficient assessment with bootstrapping of 5000 cases. The hypothesised relationships were found to be significant as demonstrated by their *t*-values, *p* values, and also without a zero being straddled in between the 95% confidence intervals. Participation explained 43.8% of POVLE, while POVLE explained 34.7% and 39.9% of PU and PEOU respectively. These R^2 values were above 0.26 which could be considered substantial (Cohen, 1988).

Table 5: Assessment of Hypothesised Relationships

Hypothesis and Relationship	Direct Effect β	Standard Error	*t*-value	*p* value	Confidence Interval	Decision	R^2
HI: UP → POVLE	0.661	0.073	9.023**	0.000	[0.468, 0.773]	Supported	0.438
H2: POVLE → PU	0.589	0.094	6.278**	0.000	[0.370, 0.739]	Supported	0.347
H3: POVLE → PEOU	0.632	0.084	7.516**	0.000	[0.425, 0.761]	Supported	0.399

Note: ** >1.645, (one-tailed)

5. Discussion

This study incorporated participation and psychological ownership in examining the TAM constructs of PU and PEOU. Participation was found to have significant effect on the psychological ownership of a VLE. Findings concurred with studies which assert that users feel they have greater influence on a system, thereby developing feelings of ownership for the particular system (Barki et al., 2008; Paré et al., 2006). The present study differs from the earlier ones on user participation, because it was operationalised as the extent of activities and behaviours teachers perform in the cloud VLE, as they tailor the applications and programs which run through the cloud for teaching and learning.

Findings showed that overall responsibility and hands-on activities with the exception of communication have significant contribution in forming participation. Teachers' overall responsibility in the VLE include activities and assignment that entails their leadership and accountability for the system (Barki & Hartwick, 1994; Ju et al., 2016), while hands-on activities involve specific physical

design and implementation tasks performed by users (Barki et al., 2008; Hartwick & Barki, 2001). The main activities in a VLE include developing its virtual environment by building learning contents, and cloud-based VLEs allows high degree of versatility to do so, facilitated by seamless access to resources (Park & Ryoo, 2013; Stantchev et al., 2014). Such flexibility in tailoring and customizing may elicit teachers' sense of ownership for the VLE, as they have to invest their time and intellect when carrying out activities in it and the resultant content embodies their desired outcome. As such, additional hands-on activities that lead to more responsibility and accountability can also be incorporated to develop teachers' feelings of ownership.

Frog VLE as a target of psychological ownership was found to have significant effect on PEOU, and to a lesser extent, on PU. Indeed, this study implies the value of psychological ownership as a driver for these salient beliefs in technology acceptance and adoption. Interestingly, POVLE asserts greater effect on PEOU than PU. This suggests that psychological ownership may be more important to users' belief about the ease of operating a cloud based VLE. Such VLE differs from traditional LMS because they are innovative learning systems that offer greater complex functionalities in terms of course management features and learning activities (Shiau & Chau, 2016). Pyschological ownership may be useful in overcoming teachers' perception of the complexity of such systems, and can enchance its perceived usefulnes.

5.1 Conclusion and Future Investigations

This study explored the role of participation and psychological ownership on user beliefs about the cloud based VLE. Three relationships were hypothesised, and results concurred with previous studies which was carried out in previous information technology contexts. The hypothesised relationship suggested that the extent of teachers' participation in the VLE can elicit their feelings of ownerhip towards the VLE. These feelings of psycholgocial ownership for the VLE were found to have significant effect on teachers' perceived usefulness and perceived ease of use of the VLE. As POVLE is developed after having some experience using the system, this construct can be useful for examining post-adoption behaviours of existing systems.

In spite of the magnitude of the influence found from the hypothesized relationships, the current study has limitations which need to be addressed in future investigations. Only two main TAM variables of PU and PEOU were examined. Future investigations may incorporate these constructs to investigate the TAM in its totality, to enhance and test the predictive value of the model. In addition, even though the quantitative evidence obtained demonstrated defensible validity and reliability, future research which include interviews can further strengthen the validity of the findings. In short, this study provided evidence for future investigations to explore the construct of participation, psychological ownership, and user beliefs in other educational technologies.

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