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Measuring Acceptance of Erp Solutions in Organizations

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ABSTRACT

Enterprise resource planning (ERP) solutions have been implemented in most companies recently, but it seems that they are unable to point out the most important contributions of their ERP systems. One of the reasons for this might be that users do not accept and use the ERP solution properly. The technological acceptance model (TAM) proposed by Davis (1989) has been the most widely used model for researching user acceptance and usage of IT/IS. We aim to make additional contributions to the existing body of literature: (1) we focus on ERP system use in companies' maturity phase and (2) we expose and examine three groups of external factors which influence ERP usage. We empirically tested the using data collected from a survey in 44 companies in European Union. Enterprise Resource Planning (ERP), Tehnological Acceptence Model (TAM), maturity phase

KEYWORDS: Enterprise Resource Planning (ERP), Tehnological Acceptence Model (TAM), maturity phase

1. Introduction

Enterprise resource planning (ERP) solutions have been implemented in most organisations recently, but it seems that these companies are unable to point out the most important contributions of their ERP systems. Much of the success of ERP implementation lies in the operational phase of the ERP lifecycle. After the stabilisation stage, companies enter a maturity stage during which time they should put more effort into people and process improvements (Bradford, 2008). The impact of ERP systems on users and their acceptance have been recognised as key factors of ERP implementation success. To improve the efficiency and effectiveness of ERP system use, organisations need to research the factors that impact user satisfaction. In this area, the technological acceptance model (TAM) (Davis, 1989) is one of the most widely used models for explaining the actual usage and can improve our understanding of how influence on actual usage could help increase efficiency and effectiveness of ERP system use (Shih & Huang, 2009). A review of the literature indicates that, in recent years, only a few studies examining users' adoption of ERP systems through TAM have been published (for the latest research, see Calisir, Gumussoy, & Bayram, 2009; Lee et al., 2010; Shih & Huang, 2009; Sun, Bhattacherjee, & Ma, 2009; Youngberg, Olsen, & Hauser, 2009). However, all of them examine a few contextual factors that influence the intention to use an ERP system or ERP use in the stabilisation stage. In addition, very few studies have been conducted regarding technology acceptance of ERP systems (i.e., Sun, Bhattacherjee, & Ma, 2009). Researchers have recognised that the generality of TAM and their research of small numbers of additional factors that impact TAM fail to supply more meaningful information on users' opinions about a specific system—especially an ERP system, which is considered a strategic IS in organisations. Therefore, the need exists to incorporate additional factors or integrate it with other IT acceptance models for improvement of its specificity and explanatory utility (i.e. Lu Chun-Sheng, Liu, & Yao, 2003).

The purpose of this paper is to extend the original TAM with groups of external factors which impact actual ERP system use. Survey data have been collected from ERP users who have been exposed to an ERP system which has operated for more than one year. The proposed research model is analysed using the PLS approach.

2. Literature Review

Compared to competing models, the technology acceptance model (TAM; Davis, Bagozzi, & Warshaw, 1989) is believed to be more parsimonious, predicative, and robust (Lu, Liu & Yao, 2003; Venkatesh & Davis, 2000); consequently, among the theoretical models, it is the most widely used by IS/IT researchers (Amoako-Gyampah & Salam, 2004; Davis, 1989; Davis et al., 1989; Lee et al., 2010). The key purpose of TAM is to provide a basis for tracing the impact of external factors on internal beliefs, attitudes, and intentions (Davis et al., 1989). TAM posits that two beliefs—perceived usefulness (PU) and perceived ease of use (PEOU)—are of primary relevance for computer acceptance behaviour (Davis et al., 1989). PU is defined as 'the degree to which a person believes that using a particular system would enhance his or her job performance' (Davis, 1989, p. 320). In contrast, PEOU refers to 'the degree to which a person believes that using a particular system would be free of effort' (Davis, 1989, p. 320). The two central hypotheses in TAM state that PU and PEOU positively influence an individual's attitude towards using a new technology (AT), which in turn influences his or her behavioural intention (BI) to use it. Finally, intention is positively related to actual use (AU). TAM also predicts that PEOU influences PU; as Davis et al. (1989, p. 987) explained, 'effort saved due to improved perceived ease of use may be redeployed, enabling a person to accomplish more work for the same effort'.

A review of past ERP studies regarding TAM indicates that few studies have investigated ERP user acceptance and usage, and only a small number of articles have been published. Furthermore, all of them expose small numbers of external factors which could influence ERP acceptance and usage in different phases of an ERP system lifecycle (see Nah et al. 2004, Amoako-Gyampah & Salam 2004, Hsieh & Wang 2007, Kwahk & Lee 2008, Uzoka, Abiola, & Nyangeresi 2008, Sun et al. 2009, Shih & Huang 2009, Calisir et al. 2009, Youngberg et al. 2009, Lee et al.2010). As several studies (i.e., Nah, Tan, & Teh, 2004; Umble, Haft, & Umble, 2002) have revealed, a common reason for ERP failures can be attributed to users' reluctance and unwillingness to adopt and use the implemented ERP system. A better understanding of the factors leading ERP users' acceptance of ERP systems is necessary to facilitate successful ERP usage (Nah et al., 2004). In the current study, we aim to identify factors leading users to better use of their ERP system. Thus, the goal of our research is to expand the basic TAM with more generic contextual factors and examine their influence on PU and PEOU.

In the context of ERP systems, in prior research we exposed that external factors include three groups of factors: personal characteristics and information literacy (PCIL), system and technological characteristics (STC), and organisational-process characteristics (OPC). PCIL includes personality characteristics that can influence individuals' perceptions of ERP system acceptance and usage. PCIL factors include: experience with computer, computer self-efficiency, personal innovativeness toward IT and computer anxiety. We have not found any research that has examined SCT upon the ERP system user acceptance. Surveying different studies of external factors has exposed: data quality, ERP system functionality, ERP system performance and user manuals (help). OPC capture various social processes and mechanisms and support organisations that guide individuals to facilitate the use of an ERP system. OPCs include: social influence, fit with business processes, zraining and education on ERP system, ERP support andERP communication.

3. ERP solution acceptance model

To examine ERP users' use of ERP systems, we need to extend the TAM model. Synthesizing prior research on TAM and research on ERP systems, a conceptual model that represents the cumulative body of knowledge from TAM and ERP research over the years has been developed (see Fig-

ure 1). The grey area within the dotted line denotes the original TAM. Because our research is focused on a group of external factors which influence the current usage of ERP system in the maturity stage, there is no need to examine the behavioural intention on use and actual use; thus, behavioural intention and actual use were dropped from purposed research model. According to Davis (1989) and Davis et al., (1989) PEOU influences PU while both PU and PEOU influence AT.

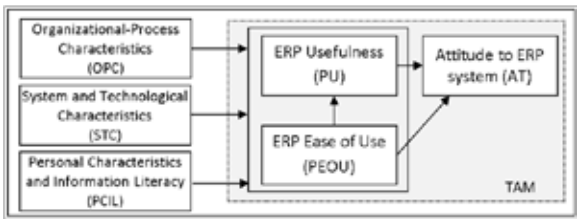

Figure 1: Conceptual Model

The problem of TAM research is that most researchers investigate small numbers of external factors that influence user acceptance and usage. In the context of ERP systems, more external factors exist that can influence users' acceptance. Thus, the conceptualisation of higher-order factors (in our case second-order factors), in which more external factors jointly have to be included, have to be investigated if we want to extend our understanding of user behaviour in ERP settings. On that presumption we hypothesise that group of external factors influence use of the ERP system through the conceptual factor PCIL, the conceptual factor STC and the conceptual factor OPC.

4. Research Methodology and Results

We tested our model empirically using a field survey of users of ERP systems in the maturity stage. Organisations were selected using two criteria: (1) the organisations must have implemented one of the two most popular global ERP solutions in Slovenia: SAP or Microsoft Dynamics; and (2) the organisations must have used the ERP system for more than one year at the time of the study. Questionnaires from 44 companies from European Union were properly filled out by respondents and used for the purpose of analysis.

The constructs of the purposed model—PU, PEOU, and AT use for basic TAM of ERP systems—are influenced by constructs of external variables. The constructs of external variables are distributed among three second-level constructs: PCIL, STC, and OPC which incluede more first-order factors (see section 2). Thus, our model includes 17 first-order factors and 3 second-order factors.

All the items of factors were measured on a 7-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'; the scale was adopted from relevant prior research and adapted to relate to the context of ERP usage. In addition, demographic information was collected.

The empirical data were analysed in two stages involving a PLS technique, using Smart PLS 2.0 M3 (Ringle & Will, 2005). In the first stage, all measurement scales were examined for their psychometric properties; the second stage focused on hypothesis testing and analysis. Path significance was estimated using bootstrapping resampling techniques with 500 sub-samples. Detailed results and analyses can be obtained from the authors.

The final version of model is presented in Figure 2. Because all of the external factors did not meet assessment requirements of the measurement model, we excluded them from further analysis. These external factors included computer self-efficacy and experience with computer from PCIL group, ERP functionality from STC group and ERP support, ERP communications and ERP training, and education from OPC group (dotted shapes in Figure 2).

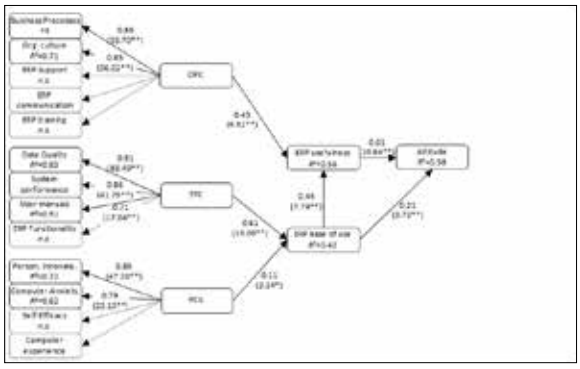

Figure 2: Results of structural model analysis [a]

Empirical research has shown support for original relationships of TAM in ERP settings in the routine stage (for example, see Hsieh & Wang, 2007; Lee et al., 2010; Shih & Huang, 2009; Sun et al., 2009). As shown in Figure 2, our research confirms their results of the influence of PEOU and PU on AT as well as influence of PEOU on PU.

Figure 2 also indicates that the loadings of the first-order factors on the second-order factors exceed 0.7, and second-order factors have significant positive effect on PU and on PEOU. PCIL has a weak but significant positive effect on PEOU ($b = 0.11$, $p<0.05$); STC has a strong positive effect on PEOU ($b = 0.61$. $p<0.01$), and OPC has a strong positive effect on PU ($b = 0.45$. $p<0.01$).

Based on the analytical results, this study found that it is possible to observe more external factors through second-order factors. External factors' personal innovativeness and computer anxiety, through second-order factor PCIL influence PEOU. Meanwhile, the external factors self-efficacy and computer experience were not significant. STC data quality, system performance, and user manuals have a strong impact on PEOU whereas ERP functionality was not statistical significant. Furthermore, business process fit and organisational culture from OPC have a strong impact on PU.

5. Conclusion

Although the most important contributions of ERP systems are that they significantly reduce the time to complete business processes, help organisations share information (Lee et al., 2010), and lead organisations to offer a better work environment for their employees as by providing them a more efficient system with which to work, ERP systems have been plagued with high failure rates and an inability to realize promised benefits (Kwahk & Lee, 2008) in the maturity phase. One of the most important reasons seems to be that ERP users do not use it properly. The aim of this research was to improve the understanding of how the influence of 13 external factors can increase the degree of attitude of ERP users toward the ERP system. This work extended previous research by incorporating groups of external factors which through conceptual factors influence PEOU and PU, which further influence AT. This study also employed structural equation modelling (PLS approach) to assess overall model fit to verify the causal relationships between factors. Studying the influence of more external factors on constructs not only contributes to the theory development, but also helps in designing organisations' interventional programs.

The implications for researchers and practitioners include an extended version of TAM through second-order factors to improve the explanatory power of ERP usage. By confirming external factors, organisations should work on their organisational culture and business process fit, and conversely on their ERP system, to ensure better data quality, system performance, and user manuals for their users, thereby improving the degree of attitude towards an ERP system.

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