Factors affecting the acceptance of Enterprise Resource Planning software: a case study in a manufacturing company

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ABSTRACT

Every enterprise expects successful adoption of Information Technology (IT) to support their business process. While there has been many research conducted to establish the factors that lead to the successful adoption of IT in an enterprise, this research underlines the importance of accommodating external factors specific to the enterprise with regard to the acceptance of an Enterprise Resource Planning (ERP) software. A case study in a manufacturing company which utilizes ERP software to support their business process is presented to identify factors that drive its adoption.

During the conceptualization of the IT adoption model, we found that external factors that drive the adoption resemble the model of Decomposed Theory of Planned Behavior (DTPB). These factors are mapped into three main variables in the model: attitude, subjective norm, and perceived behavioral control that affect the intention of users to use the software. The Structural Equation Modeling and multiple regression method were employed to analyze the relation between factors within the model, and to identify which variables contribute to the acceptance of the software.

From the study we found that user's attitude toward the software significantly influence the intention to use the software (path coefficient = 0.9964) while it is interesting to see that subjective norms and perceive behavioral controls is not significant to the user's intention (path coefficient= -0.0225 and path coefficient= -0.0417, respectively). This concludes that the intention to use the ERP software in the enterprise is largely determined by positive attitudes toward the software, including understanding the benefits from its adoption.

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1. INTRODUCTION

Successful adoption of Information Technology (IT) has become important issues within enterprise business process [1]-[2]. While information technology serves its role to support business process, its adoption is complex and costly, e.g. Enterprise Resource Planning (ERP) system [3]. Managing the adoption of ERP system is challenging [4] from technical perspective, e.g. complexity of the new system, and management perspective, e.g. user acceptance toward the new system. The later factor becomes critical with regard to the adoption of new system, i.e. ERP system [5]-[6], since the users are more convenient using their current (legacy) system, and are more reluctant to use new system because it may have impact on day-to-day operations. The complexity of IT adoption arises when there is lack understanding toward the benefits of the

new system that can outperform the legacy system, and thus it can influence the behavioral intention of users when make use of the system within business process.

Buonanno et al [7] has discussed factors affecting ERP adoption in SMEs with respect to large companies, but the main study was directed to the identification of taxonomy of business and organizational factors. It is important to accommodate importance factors from the perspective of users in the company when adopting information technology. This has led a growing study of predicting the behavioral intention to use the information technology. Calisir et. al [8] studied the behavioral intention to use ERP system by combining model of IT adoption, i.e. technology acceptance model, theory of reasoned action and innovation diffusion theory in order to determine the factors that are important for the acceptance of ERP system. However, the study is limited to the assumption that the combined models is suitable for predicting user acceptance of ERP system, and has not yet accommodate specific factors (external factors) that can be driven from different enterprises.

In the light of understanding factors that drive the adoption of ERP system within a manufacturing company, this study aims at 1) identifying external factors that drive the adoption from the perspective of users, 2) predicting behavioral intention to use ERP system by employing the model of IT adoption that is suited the external factors, 3) understanding the relation among these factors by employing the model of IT adoption. To undertake this study, two methods will be employed, i.e. Structural Equation Modeling (SEM) and multiple regression method. This research contributes to the implementation of Decomposed Theory of Planned Behavior (DTPB) model that accommodate external factors specific to manufacturing company.

2. IT ADOPTION

IT adoption also plays prominent roles in business performance [9]-[10]. The basic purpose of adopting information technology is to achieve the most efficient use of resources, retain market share, and improve productivity. These goals can represent user's expectation when adopting new technology that can influence their behavioral intention toward the technology [11].

Previous studies have introduced the concept of behavioral theory to understand the factor that drive IT adoption from the perspective of end users [12]-[13]. The model of IT adoption includes *Theory of Reason Action, Theory of Planned Behavior, Task-Technology Fit Theory*, and *Technology Acceptance Model* (TAM) [14]. TAM is the most frequently used model when studying the IT adoption within enterprises [15]-[17]. However, these models are conceptual, yet implementation of the model needs to accommodate users' acceptance perspective that is specific in an enterprise. For instance, a manufacturing company that produces concrete blocks may not rely on IT when performing their core business process in producing concretes, and therefore have their own motivation in adopting information technology. In this study, we employ the Decomposed Theory of Planned Behavior (DTPB) model that has been widely studied [18]-[20] with respect to behavioral intention toward technology.

3. RESEARCH METHOD

The study is performed within several steps:

1) Gathering data by conducting interviews in order to identify external factors that contribute to the adoption of ERP system in enterprise
2) Developing a conceptual model by accommodating external factors to the model of IT adoption
3) Developing a questionnaire by structuring the external factors into likert-scale items (from 1 to 5 – strongly disagree to strongly agree)
4) Performing validity and reliability study for the external factors
5) Gathering data by distributing questionnaires to the users of ERP system
6) Processing data collection by employing SEM and multiple regression method using SmartPLS and SPSS tools, respectively

4. CONCEPTUAL MODEL

The first phase of data collection was performed by conducting interviews to 10 (ten) respondents in order to identify external factors, while the second data collection was conducted by distributing questionnaire to 40 respondents from 7 (seven) divisions in the manufacturing company under study. The questionnaires were to evaluate the adoption of ERP software that has already been recently implemented in company comparing to the legacy system, i.e. financial and reporting software. The external factors that are resulted from the interviews are as depicted in Table 1.

Table 1. External factors from interviews represent the model of *Decomposed Theory of Planned Behavior* (DTPB)

No.	External factors from interview	Factors in DTPB model
1.	Difficult to use because it is still easy to use Microsoft Excel	*Ease of Use*
2.	Easy to use because the impact from using the system is known	
3.	There is a certain level of ease of use	
4.	Can be accessed anywhere	
5.	More accurate compared to Microsoft Excel in the presentation of data	*Perceived Usefulness*
6.	Reduce the burden on preparing a financial report	
7.	Can be exported to Microsoft Excel format	
8.	Consume time and energy	
9.	To support career	
10.	Reward from the company	
11.	User access management	*Compatibility*
12.	Excel has higher error rate	
13.	Spreadsheet output for both system	
14.	Integrated ERP system	
15.	Linkages between departments	*Peer Influence*
16.	Enforcement from management	*Superior Influence*
17.	Job demands	
18.	Timely reports	
19.	High confidence in using the system as to be needed by work partner	*Self-efficacy*
20.	Lack of skills in human resource	*Resource facilitating condition*
21.	Lack of training	

According to Table 1, the external factors derived from the interview exhibit the factors in the DTPB model. These factors form the variables that determine the behavioral intention to use the software, and can be mapped to the variables conceptualized in the DTPB model. The intention to use software is determined by three variables: *attitude*, *subjective norm*, and *perceived behavioral control* as depicted in Figure 2.

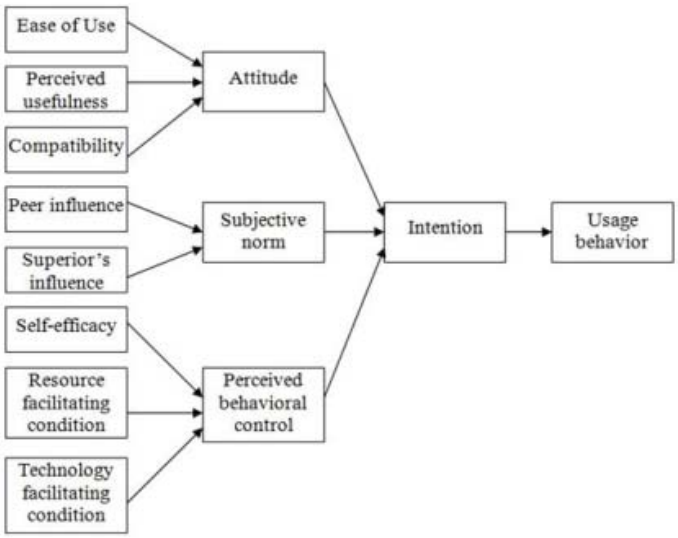

Figure 2. The DTPB model consists of three main variables that influence the behavioral intention in adopting technology (adapted from [21])

According to Figure 2, we developed 11 hypotheses to study the factors that influence the behavioral intention in adopting ERP system. These hypotheses are shown in Table 2.

Table 2. There are 11 hypotheses under study

No.	Relationship between variables	Hypotheses
1.	*Ease of Use* (EOU) → *Attitude* (A)	*Ease of use* will have a significant positive influence on *Attitude* (H1)
2.	*Perceived Usefulness* (PU) → *Attitude* (A)	*Perceived Usefulness* will have a significant positive influence on *Attitude* (H2)
3.	*Compatibility* → *Attitude* (A)	*Compatibility* will have a significant positive influence on *Attitude* (H3)
4.	*Peer Influence* (PI) → *Subjective Norm* (SN)	*Peer Influence* will have a significant positive influence on *Subjective Norm* (H4)
5.	*Superior Influence* (SI) → *Subjective Norm* (SN)	*Superior Influence* will have a significant positive influence on *Subjective Norm* (H5)
6.	*Self-efficacy* (SE) → *Perceived Behavioral Control* (PBC)	*Self-efficacy* will have a significant positive influence on *Perceived Behavioral Control* (H6)
7.	*Technology Facilitating Condition* (TFC) → *Perceived Behavioral Control* (PBC)	*Technology Facilitating Condition* will have a significant positive influence on *Perceived Behavioral Control* (H7)
8.	*Resource Facilitating Condition* (RFC) → *Perceived Behavioral Control* (PBC)	*Resource Facilitating Condition* will have a significant positive influence on *Perceived Behavioral Control* (H8)
9.	*Attitude* (A) → *Intention* (I)	*Attitude* will have a significant positive influence on *Intention* (H9)
10.	*Subjective Norm* (SN) → *Intention* (I)	*Subjective Norm* will have a significant positive influence on *Intention* (H10)
11.	*Perceived Behavioral Control* (PBC) → *Intention* (I)	*Perceived Behavioral Control* will have a significant positive influence on *Intention* (H11)

5. RESULTS AND ANALYSIS

We employ two methods to test the hypotheses, i.e. The Structural Equation Modeling (SEM) and multiple regression method. The rest of this section will discuss the result after performing these methods. The tool used for this study is SPSS and SmartPLS software. Prior to the hypotheses, validity and reliability testing have also been conducted for each factor, or indicator that constructs the variables in the model. All of the indicators are valid (Pearson Correlation value > 0.3) and reliable (Cronbach's Alpha > 0,7).

a. Hypothesis Testing with Multiple Regression in SPSS

Table 3 to Table 6 accommodates the result from testing hypothesis with multiple regression method. From Table 3, it is shown that only the relationship between the *Attitude* (A) and *Perceived usefulness* (PU) is found to be significant while only relationship between the *Subjective Norm (*SN) and *Superior Influence* (SI) is found to be significant as depicted in Table 4.

Table 3. Testing Hypothesis 1, 2, and 3 with SPSS

Variables	Coefficient	Std. Error	t	Sig.	Result
Constant	-1.371	1,719	-0.798	0.430	
EOU	0,089	0.125	0.714	0.480	Not significant
PU	0.546	0.074	7,332	0,000	Significant
CI	0.263	0.163	1,619	0.114	Not significant

Table 4. Testing Hypothesis 4 and 5 with SPSS

Variables	Coefficient	Std. Error	t	Sig.	Result
Constant	5.453	3,698	1.475	0.149	
PI	-0.271	0,318	-0.850	0.401	Not significant
SI	0.653	0.174	3,748	0,001	Significant

The results obtained from Table 5 and Table 6 are as follows: there is significant relationship between *Perceived Behavioral Control* (PBC) with *Self-efficacy* (SE) and *Facilitating Resource Condition* (FRC) while *Attitude* (A) is significantly influenced by *Attitude* (A), and (PBC).

Table 5. Testing Hypothesis 6, 7, and 8 with SPSS

Variables	Coefficient	Std. Error	t	Sig.	Result
Constant	0,510	1,215	0,420	0,677	
SE	0,374	0,060	6,204	0,000	Significant
RCF	0,417	0,119	3,499	0,001	Significant
TFC	0,125	0,079	1,580	0,123	Not significant

Table 6. Testing Hypothesis 9, 10, and 11 with SPSS

Variables	Coefficient	Std. Error	t	Sig.	Result
Constant	0,929	0,762	1,219	0,231	
A	0,745	0,039	19,147	0,000	Significant
SN	-0,015	0,028	-0,534	0,597	Not significant
PBC	-0,068	0,062	-1,094	0,281	Significant

b. Hypothesis Testing with SEM in SmartPLS

Structural Equation Modeling (SEM) covers the significance of each path coefficient value that states whether there is (significant) or the influence between the hypothesized construct variables in the model. The path coefficient value in each relationship in the model as shown in Figure 3 (under the 'Original Sample' column). It also shows the t-value of each construct, while significant value is shown by t-value > 2.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
A -> I	0.9964	1.005	0.0418	0.0418
C -> A	0.0649	0.0259	0.1408	0.1408
EoU -> A	0.1156	0.1473	0.1148	0.1148
PBC -> I	-0.0417	-0.055	0.0546	0.0546
PI -> SN	0.1982	-0.0402	0.3066	0.3066
PU -> A	0.7378	0.7503	0.0918	0.0918
RFC -> PBC	0.2888	0.2717	0.1257	0.1257
SI -> SN	0.5025	0.5427	0.1086	0.1086
SN -> I	-0.0225	-0.0239	0.0416	0.0416
Se -> PBC	0.5799	0.5993	0.1182	0.1182
TFC -> PBC	0.1791	0.1563	0.1053	0.1053

	T Statistics (|O/STERR|)
A -> I	23.8392
C -> A	0.4613
EoU -> A	1.0069
PBC -> I	0.765
PI -> SN	0.6466
PU -> A	8.0391
RFC -> PBC	2.2979
SI -> SN	4.627
SN -> I	0.5398
Se -> PBC	4.9082
TFC -> PBC	1.7012

Figure 3. Path coefficient and t-value of the Model DTPB with regard to the acceptance of ERP software in the manufacturing company under study

c. Discussion on the results

In this case study, it can be proven that the intention (*Intention*) of the user to receive and use applications that refer to the model DTPB only determined by the attitude of the users themselves (*Attitude*) that is influenced by their perceived benefits applications in ease his job (*Perceived usefulness*). Figure

So by looking at some of the hypothesis above it can be concluded that the attitude of the users towards ERP software is one of the key element in improving the acceptance of technology implementation by the company. Therefore, the company must build positive attitudes of potential users to accept and be able to use the software voluntarily. Understanding the perspective of users in accepting the software is necessary, and raising awareness of the benefits of implementing the system is required for the software to be successfully adopted in the company.

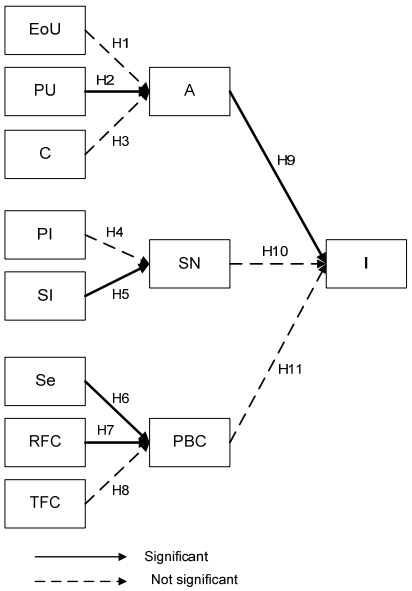

Figure 4. Factors affecting the acceptance of ERP software in a manufacturing company under study

6. CONCLUSION

From this study, the behavioral intention to use ERP software is largely determined by the attitude of users toward the software. This includes understanding the benefits that may be impacted after the implementation of the software. Therefore, company should focus on raising awareness on benefits of the software, providing supports on software training and implementation, and considering a reward mechanism for users. It is interesting to see that enforcement on using the software is likely not resulting in higher intention to use the software. Thus, if company can create a system wherein a user can voluntarily use the software, then the intention to use the software can be longer sustained.

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