

# A STUDY ON ERP SYSTEM ACCEPTANCE BASED ON TECHNOLOGY ACCEPTANCE MODEL

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## ABSTRACT

User reluctance or unwillingness to adopt or use the newly implemented ERP system is often cited as one of the main reasons for ERP failures. To examine important antecedents leading to the lack of user acceptance towards the implemented ERP systems, this research reviewed the literature related to ERP adoption by users, developed hypotheses to explain ERP user acceptance, and conduct a survey to test the hypotheses. This research adapted the ERP acceptance model developed by Nan, et. al. (2004) and included five more constructs as the antecedents of ERP adoption. These new added variables are related to individual characteristics and the organizational contexts in which the ERP implementation takes place. Nine constructs comprises of ERP Ease of Use, ERP Usefulness, ERP Compatibility, ERP Business Fit, Shared Belief in The Benefit of ERP System, Facilitating Condition, ERP Self-Efficacy, Argument for Change and Personal Innovativeness of IT were hypothesized as antecedents to ERP systems symbolic adoption. This research uses 176 data set from several divisions of an Indonesian telecommunication company (Telco). Using structural equation modeling analysis, the result from the examined questionnaire shows that ERP Compatibility and Attitude Toward ERP System Use have direct effects on ERP Symbolic Adoption, while ERP Business Fit and ERP Usefulness influences ERP Symbolic Adoption by being fully mediated through Attitude.

## KEY WORDS

Enterprise Resource Planning (ERP), Acceptance, Symbolic Adoption, Technology Acceptance Model (TAM).

## 1. Introduction

ERP system is integrated business solutions that support organizations in gaining their competitive goals because it supports the organisations to manage their resources

across the enterprise and enable integration of many different business functions [2]. In relation to IS, enterprise system package is “a configurable IS package that integrates information and information-based processes within and across functional areas” [3].

ERP systems enable organizations to integrate business functions into unified and integrated business processes. Many organizations spent more than 20\$ billion for ERP suppliers and consulting firms in their ERP implementation [4]. ERP implementation process is in this research defined as the process that begins with the managerial decision to install and use an ERP package and is complete when the system is used and operating as an integral part of the organisation’s IS [5].

Despite the huge investments by organizations, there found many implementation failures and less than satisfactory productivity improvements [2]. End-users’ reluctance or unwillingness to adopt or use the newly implemented ERP system is one of the commonly cited reasons for these ERP failures [1]. The lack of user acceptance can lead to partial use of the system and lots of morale problems in the organization. A good understanding of end-users’ acceptance of ERP system is vital to ERP implementation success. A literature review on past ERP studies indicates that few studies were already done on the end-users’ acceptance of ERP systems ([6], [7], [8], [9], [1], [10]). This study aims at improving previously published model on ERP acceptance [1] by incorporating the that a few factors that are related to individual characteristics and organizational contexts may also influence the ERP system acceptance. Thus this study attempts to contribute to the development of knowledge on ERP success, or ERP acceptance in particular, and its antecedents.

## 2. The State of The Art of ERP Acceptance Research

In response to problems in previous section, a substantial body of research has been concerned with user acceptance of newly adopted enterprise resource planning and information technology (IT) in different technology contexts such as mandatory and voluntary contexts ([11], [12], [13], [6], [7], [8], [14], [15], [9], [1], [16], [10], [17], [18]). In the area of IS and ERP implementation, recently Technology Acceptance Model (TAM) is often used to explain the complex adoption issues that are closely related to some involved stakeholders and end-users [9]. TAM is one of most widely used model that could explain end-user adoption of IT ([13], [7], [9], [16]) based on original relationships among ease of use, usefulness, attitude toward use and behavioral intention.

Several researchers ([7], [19]) provided conceptual rational and empirical support that behavioral intention is not an appropriate construct for assessing users' acceptance of newly implemented information technology or information systems in which implementation is done in a mandatory context, as in the case of ERP. For that reason they replaced the traditional behavioral intention with a new construct called symbolic adoption. The use of TAM in the context of ERP implementation is complex, since ERP implementation involves many organizational as well as individual issues.

## 3. Research Model and Hypotheses

Figure 1 presents the proposed research model. In addition to the constructs used in TAM model [1], which include: perceived ease of use, perceived usefulness, perceived fit, perceived compatibility, attitude toward system use and symbolic adoption, this study includes five more constructs as the antecedents of ERP adoption. The additional constructs are: personal innovativeness of IT, computer self-efficacy, argument for change, shared belief in the benefit of ERP system, and facilitating condition. As can be seen in Figure 1, the additional constructs are grouped into two parts called the individual characteristics and organizational context.

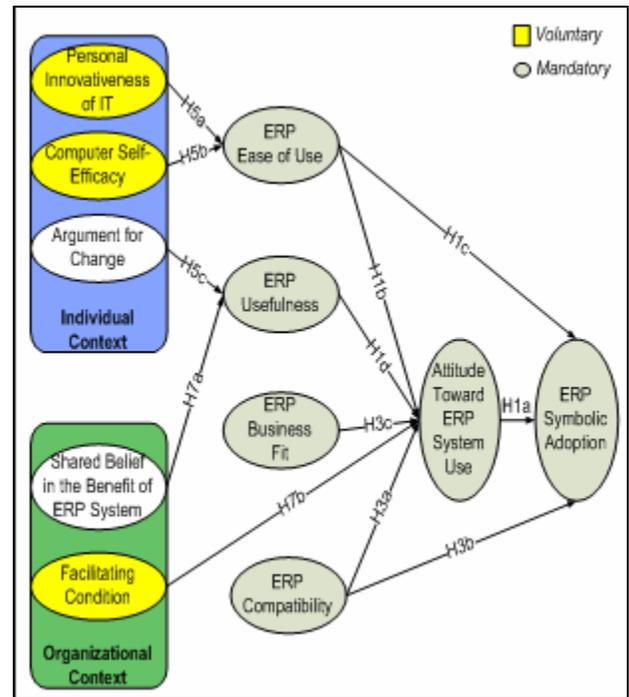


Figure 1: Proposed Research Model

Constructs that are within the individual characteristics include personal Innovativeness of IT, computer self-efficacy and argument for change. Two constructs, personal Innovativeness of IT and computer self-efficacy, had been tested in a voluntary context. The other construct, argument for change, had been tested in earlier research on IT adoption within a mandatory context. Within the organizational context, facilitating condition had been tested in IT adoption study within a voluntary context while shared belief had been tested for a mandatory adoption context.

### 3.1 Attitude Toward ERP System Use, ERP Symbolic Adoption, ERP Ease of Use, and ERP Usefulness

#### Attitude toward ERP system use and ERP symbolic adoption

Attitude toward ERP system use is the the behavioral tendency of users to like or dislike the usage of the implemented information systems [20]. Several studies on IT and IS adoption within a voluntary context have highlighted the correlation between attitude towards system use and behavioral intention. However, it may not be the case in mandatory context, such as in the case of ERP implementation. [7] shows that attitude is not related to behavioral intention in a mandatory context. Other studies ([21], [22]) reported results which support the

significant effect of attitude toward system use on behavioral intention in a mandatory context. [19] suggested an alternative variable as a substitute of behavioral intention to be used for modeling the user acceptance within a mandatory context, which is symbolic adoption. Symbolic adoption is defined as one's mental acceptance of an innovation, distinct from actual adoption which refers to the actual use of technology [1].

An empirical evidence that user attitude toward system use is a significant predictor of symbolic adoption [19]. [1] in a study of enterprise system (ES) acceptance in the developing countries also provides an empirical evidence for the direct effect of attitude toward system use on symbolic adoption. In this study it is argued that in the context of ERP implementation in which the adoption is mandatory, attitude toward system use will have a direct effect on symbolic adoption. Here it is believed that the role of user's attitude in a mandated environment is important and should not be overlooked. [7] also specifically noted that excluding the attitude construct would not provide an accurate representation of user's acceptance of IT in the mandated adoption context. Based on the explanations above, in this study it is hypothesized that user's mental acceptance of an ERP system (symbolic adoption) is influenced by users' attitude toward system use. In other words, it is hypothesized that *there is a positive influence of attitude toward ERP system use on ERP symbolic adoption*.

### **Perceived Ease of Use and Perceived Usefulness**

Perceived ease of use (PEOU) and perceived usefulness (PU) are two important constructs in TAM. Perceived ease of use and perceived usefulness have been widely studied in general IT adoption settings. [23] proposed that the effects of PEOU and PU on symbolic adoption are mediated by attitude. [19] provide empirical support for the direct effect of PEOU on ERP symbolic adoption. [1] proposed the direct effect of PEOU on attitude and symbolic adoption. [1] found the indirect effect of PEOU and PU on symbolic adoption. In this study it is proposed that perceived ease of use and perceived usefulness will have an indirect effect on symbolic adoption through attitude while perceived ease of use will also have a direct effect on symbolic adoption.

In this section the hypotheses generated are as follow:

- H<sub>1a</sub>**: Attitude toward ERP system use will have a positive direct effect on ERP symbolic adoption.
- H<sub>1b</sub>**: ERP ease of use will have a positive direct effect on attitude toward ERP System Use.
- H<sub>1c</sub>**: ERP ease of use will have a positive direct effect on ERP symbolic adoption.
- H<sub>1d</sub>**: ERP usefulness will have a positive direct effect on attitude toward ERP system use.

- H<sub>2</sub>**: ERP ease of use will have a positive indirect effect on ERP symbolic adoption (mediated by Attitude).

## **3.2 ERP Compatibility and ERP Business Fit**

### **Perceived Compatibility**

Perceived compatibility is an important construct that influences end-user's attitudes in adopting or using new IT applications (adapted from [24], [19]). In the ERP context, [1] refer to perceived compatibility as the degree to which the ERP system is perceived to be consistent with past business process that users have been accustomed to. As ERP implementation usually involve business process engineering, end-users of ERP systems are likely to display strong variance in perceived compatibility, which in turn affects their attitude and symbolic adoption [1]. The direct effect of perceived compatibility on attitude toward system use and symbolic adoption [1]. Here we proposed that perceived compatibility will have a positive direct and indirect effect on symbolic adoption.

### **Perceived Fit**

The extent to which an ERP package encompasses the desired business process for an organization is referred to as fit ([25], [26]). Perceived fit from an end-user's perspective as the degree to which the ERP software is perceived by a user to meet his/her organization's needs [1]. Due to the nature of ERP software, organizations will try to customize the software as little as possible. Hence, the issue of perceived fit is likely to take on heightened importance and relevance in influencing end-user's attitude and symbolic adoption. [1] found the direct effect of perceived fit on attitude toward system use. We proposed that perceived fit will have direct effect on attitude and indirect effects on symbolic adoption.

In this section the hypotheses generated are as follow:

- H<sub>3a</sub>**: ERP Compatibility will have a positive direct effect on Attitude Toward ERP System Use.
- H<sub>3b</sub>**: ERP Compatibility will have a positive direct effect on ERP Symbolic Adoption
- H<sub>3c</sub>**: ERP Business Fit will have a positive direct effect on Attitude Toward ERP System Use.
- H<sub>4a</sub>**: ERP Compatibility will have a positive indirect effect on ERP Symbolic Adoption (mediated by Attitude).
- H<sub>4b</sub>**: ERP Business Fit will have a positive indirect effect on ERP Symbolic Adoption (mediated by Attitude).

### 3.3 Personal Innovativeness of IT, Computer Self-Efficacy, and Argument For Change

#### Personal Innovativeness of IT

Personal innovativeness of IT (PIIT) is defined as the willingness of an individual to try out any new information technology applications (adapted from [24]). [18] provides an empirical support for direct effect of PIIT on perceived ease of use in a voluntary context. [17] found the direct effect of personal innovativeness of IT on perceived ease of use in a mandatory context. [17] only focused on examining the effects of PIIT on perceived ease of use. We hypothesize that PIIT will have indirect effects on attitude and symbolic adoption. These indirect effects have not been empirically tested in a mandatory context.

#### Computer Self-Efficacy

Self-efficacy is defined as people's judgment of their capabilities to organize courses of action required to attain designated types of performances. It concerns not with the skills one has, but with the judgments of what one can do with whatever skills one possesses [27]. Computer self-efficacy is defined as people's judgment of their capabilities to operate computers/IS/IT [28]. [29] provides an empirical support for direct effect of computer self-efficacy on perceived ease of use in a voluntary context. [17] found that computer self-efficacy has a direct effect on perceived ease of use in a mandatory context. [17] only focused on examining the effect of computer self-efficacy on perceived ease of use. [17] has not tested the indirect effect of computer self-efficacy on attitude and user's acceptance in a mandatory context.

#### Argument For Change

The arguments advanced for changing the technology from the prior one are likely to influence the perception on the usefulness of the technology. Argument for change is defined as the users's understanding about the reasons why the technology was being implemented, the technology's ability to enhance customer service and handle new business opportunities, and its ability to allow greater coordination among functional units within the organization. The arguments for changing the technology are likely to originate from top management and others more intimately familiar with the new technology with regard to the benefits that it is supposed to offer the organization. Therefore it is important for top management to articulate a clear business vision with quantifiable objectives for an ERP implementation [30]. Furthermore, informing members of the organization about the technology and its impact on the organization

reduces uncertainties around the technical changes as well as the organizational transformation required for success [31].

[10] provides an empirical support for the direct effect of argument for change on perceived usefulness and the indirect effect of argument for change on behavioral intention. In this research we will examine the indirect effect of argument for change on attitude and symbolic adoption that have not been empirically tested in earlier works.

Thus, in this section we proposed the following hypothesizes:

- H<sub>5a</sub>**: Personal Innovativeness of IT will have a positive direct effect on ERP Ease of Use.
- H<sub>5b</sub>**: ERP Self-Efficacy will have a positive direct effect on ERP Ease of Use.
- H<sub>5c</sub>**: Argument For Change will have a positive direct effect on ERP Usefulness.
- H<sub>6a</sub>**: Personal Innovativeness of IT will have a positive indirect effect on Attitude Toward ERP System Use (mediated by Ease of Use).
- H<sub>6b</sub>**: Personal Innovativeness of IT will have a positive indirect effect on ERP Symbolic Adoption (mediated by Ease of Use and Attitude).
- H<sub>6c</sub>**: ERP Self-Efficacy will have a positive indirect effect on Attitude Toward ERP System Use (mediated by Ease of Use).
- H<sub>6d</sub>**: ERP Self-Efficacy will have a positive indirect effect on ERP Symbolic Adoption (mediated by Ease of Use and Attitude).
- H<sub>6e</sub>**: Argument For Change will have a positive indirect effect on Attitude Toward ERP System Use (mediated by ERP Usefulness).
- H<sub>6f</sub>**: Argument For Change will have a positive indirect effect on ERP Symbolic Adoption (mediated by ERP Usefulness and Attitude).

### 3.4 Shared Belief in the Benefit of ERP System and Facilitating Condition

Because ERP systems cut across functional boundaries and organization-wide IS is designed to provide a unified view of organizational processes, many users at different organizational levels are involved in their implementation. To be able to achieve a success in ERP implementation, a sense of mutual trust and commitment must be developed among various participants to ensure a free exchange of beliefs and opinions [32]. It is this shared sense of belief about IS project benefits that allows organizational participants to find common grounds and a shared sense of purpose [33].

Shared belief in the benefit of ERP system is defined as the extent to which users believe that ERP system brings benefits to the whole organization (adapted from [9]). This type of belief differs from individual beliefs that relate to the performance of individuals and how a particular system would enhance his or her performance [33]. Indirect effect of shared belief on user's attitude and indirect effect of shared belief on behavioral intention in the context of ERP implementation have not been empirically studied in previous works.

Facilitating condition concept is adopted from resource-based facilitating condition [34]. In the context of mobile payment adoption in Korea, [16] defined resource based facilitating condition as the users' belief about the accessibility to resources necessary to facilitate any service which help new IT usage. In this research facilitating condition is defined as the user's belief about the existence of necessary resources that facilitate any service that support the proper operation (usage) of ERP systems (adapted from [16]). The necessary resources that could support the usage of ERP systems within an organization may include appropriate hardware provided for user, reliable helpdesk, and staffs or external consultant made available by the organization for the education needed by users.

[16] provides an empirical support for the direct effect of facilitating condition on attitude toward system use and indirect effect of facilitating condition on behavioral intention, in a voluntary context. Here we will investigate the direct effect of facilitating condition on attitude and also its direct effect on symbolic adoption, in the context of ERP implementation.

In summary, in this section we proposed the following hypothesizes:

- H<sub>7a</sub>:** Shared Belief in The Benefit of ERP System will have a positive direct effect on ERP Usefulness
- H<sub>7b</sub>:** Facilitating Condition will have a positive direct effect on Attitude Toward ERP System Use.
- H<sub>8a</sub>:** Shared Belief in The Benefit of ERP System will have a positive indirect effect on Attitude Toward ERP System Use (mediated by ERP usefulness).
- H<sub>8b</sub>:** Shared Belief in The Benefit of ERP System will have a positive indirect effect on ERP Symbolic Adoption (mediated by ERP usefulness and Attitude).
- H<sub>8c</sub>:** Facilitating Condition will have a positive indirect effect on ERP Symbolic Adoption (mediated by Attitude).

## 4. Methodology

### 4.1 Sample and Procedure

The case study was carried out in an Indonesian company Indonesia (TelCo). TelCo is a large company in Indonesia had implemented SAP/R3 with 1000 user licenses. TelCo was implementing several functional application modules of SAP/R3 that include Financial Accounting, Managerial Accounting, Treasury, IM-Investment Management, Material Management, and Workflow.

### 4.2 Measures

In operationalizing the research model, some of the theoretical constructs in the research model were measured with the items adopted or adapted from prior research, while some other are developed in this study. All the questionnaire items used a 6-point Likert-type-scale, where 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, and 6 = strongly agree. The items measuring ERP symbolic adoption were adopted from [1]. The two items measuring attitude toward ERP system use were adopted from [1] and one item was developed in this study. The two items measuring ERP business fit were adopted from [1] and one item was developed in this study. The items measuring ERP compatibility were adapted from, [35]. The items measuring shared belief in the benefit of ERP system were adapted from [33]. The items measuring facilitating condition were adapted from [13] and one item was adapted from [36]. The items measuring computer self-efficacy were adapted from [29]. The items measuring argument for change were adapted from [33] and [10]. The items measuring personal innovativeness of IT were adapted from [24]. The items measuring TAM constructs (ERP ease of use and ERP usefulness) were adapted from [12].

### 4.3 Pre-Tests

Although many items had been validated in previous works, the instrument used in this research which contains some adopted/adapted measures along with a number of new items developed in this research was examined to ensure the content validity, construct validity, and reliability of the model within an ERP context, in the specific context in which the empirical study was executed. The instrument was pilot tested with 30 users.

#### 4.4 Data Collection

The questionnaires were distributed to 200 SAP end-users and 176 usable responses were received. The majority of the SAP end-users were the members of Financial, Human Resources, and Logistic Departments.

#### 4.5 Data Analysis

LISREL 8.50 was used as the major statistical tool for model testing done in this research. The entire data analysis process involved a two-stage approach. At the first stage, we developed a measurement model using confirmatory factor analysis (CFA) to assess the extent to which indicators specified for each measure refer to the same conceptual construct. After an acceptable measurement model had been obtained, we built the structural equation model and examined the hypothesized causal paths among constructs by performing a simultaneous test. This test helped us to observe whether the proposed conceptual framework had provided an acceptable fit to empirical data.

### 5. Results and Discussion

Table 2 and Table 3 shows the direct effects of exogenous variables on attitude toward ERP system use and symbolic adoption.

**Table 2:** Direct Effects of Exogenous Variables on Symbolic Adoption

		Structural model		Interpretation
		$\gamma$	T	
(Exogenous)	Attitude Toward ERP System Use	0.50	2.11	Significant
	ERP Ease of Use	0.045	0.55	Not Significant
	ERP Compatibility	0.45	7.25	Significant

**Table 3:** Direct Effects of Exogenous Variables on Attitude toward ERP System Use

		Structural model		Interpretation
		$\gamma$	t	
Exogenous	ERP Business Fit	0.71	2.59	Significant
	ERP Ease of Use	-0.05	-0.95	Not Significant
	ERP Compatibility	0.49	1.29	Not Significant
	ERP Usefulness	1.64	2.20	Significant
	Facilitating Condition	0.42	1.50	Not Significant

Table 4 show the indirect effects of exogenous variables on symbolic adoption.

**Table 4:** Indirect Effects of Exogenous Variables on ERP Symbolic Adoption

		Structural model		Interpretation
		$\gamma$	T	
Exogenous	ERP Business Fit	0.88	2.51	Significant
	ERP Compatibility	-0.25	-1.26	Not Significant
	Shared Belief in The Benefit of ERP System	0.36	2.02	Significant
	Facilitating Condition	-0.22	-1.47	Not Significant
	Self-Efficacy	0.03	0.46	Not Significant
	Argument For Change	0.57	1.55	Not Significant
	Personal Innovativeness of IT	0.05	0.92	Not Significant

Based on results presented in Table 2, Table 3, and Table 4, findings of this research can be illustrated on Figure 2.



Figure 2: Final Model

Figure 2 indicates that perceived ease of use have no direct effects on attitude and no indirect effect on symbolic adoption. These findings does not support the result found in [1].

This study found that ERP compatibility has no direct effects on attitude and thus it has no indirect effect on symbolic adoption. On the other side, this research found that ERP compatibility has a significant direct effect on symbolic adoption. This finding is not in line with what has been resulted in [1]. [1] found that ERP compatibility has a direct effect on attitude.

ERP business fit has a significant direct effect on attitude and indirect effect on symbolic adoption. These findings support the result provided by [1].

Personal innovativeness of IT has a significant direct effect on perceived ease of use. However, personal innovativeness of IT has no indirect effects on symbolic adoption. These findings support the result of research done by [17]. Unfortunately, the direct effect of personal innovativeness on perceived ease of use could not be used to explain more about how symbolic adoption could be influenced by personal innovativeness because perceived ease of use has no direct effect on attitude and symbolic adoption.

ERP self-efficacy has no direct effect on perceived ease of use. These finding is opposite to what was concluded by [17] which is also a study of acceptance in a mandatory context. In other word, ERP self-efficacy has no indirect effect on attitude and symbolic adoption.

Argument for change has a significant direct effect on perceived usefulness [10]. Shared belief in the benefit of ERP system has a significant direct effect on perceived usefulness, but it has no indirect effect on attitude and symbolic adoption. These finding supports the result of research done by [9]. Finally, facilitating condition has no direct effect on attitude. This finding is not in line with the result of [16].

From the results of data analysis, a number of hypotheses were rejected. The rejected hypotheses are: hypothesis 1b, 1c, 2, 3a, 4a, 5b, 6a, 6b, 6c, 6d, 6e, 6f, 7b, and 8c. Among others, several possible explanations for the rejection of these hypotheses include:

- Computer or IT usage culture in the developed country is different from the usage in the context of developing country,
- Some of the independent variables which are related to the technology usage context, such as personal innovativeness of IT, ERP self-efficacy, and facilitating condition are more appropriate to be studied in a more voluntary usage context.

## 6. Conclusion

This study highlighted a number of important factors that influence end-users' acceptance of ERP implementation. Model in this research is based on technology acceptance (TAM) model [1], such as perceived ease of use, perceived usefulness, perceived fit, perceived compatibility, attitude toward system use and symbolic adoption, this study includes five more constructs as the antecedents of ERP adoption that related with individual an organizational contexts: personal innovativeness of IT, computer self-efficacy, argument for change, shared belief in the benefit of ERP system, and facilitating condition.

The result of this research generally supports [1]. This study found that end-users' acceptance of ERP implementation in a mandatory context is directly effected by perceived compatibility, attitude, and indirectly effected by perceived usefulness and ERP business fit. These findings also support [33] that shared belief in the benefit of ERP system has a significant direct effect on perceived usefulness and an indirect effect on attitude. Beside that, it also supports the result of research [17] which found that personal innovativeness of IT has a significant direct effect on perceived ease of use. Further,

the result of this research also supports [10] which found the direct effect of arguments for change on perceived usefulness.

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