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Changes in User Attitudes and User Expectation: A Longitudinal Study of a Thai State Owned Enterprise

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ABSTRACT

With a paucity of longitudinal studies done in the stream of Technology Acceptance Model, a longitudinal case study research was conducted with a large state Owned enterprise (SOE) in Thailand that has gone through an ERP implementation project. To provide a more comprehensive perspective of the process of user acceptance of ERP, data were collected from two phases of the implementation process in order to capture the change of user attitudes and user expectation and examine how these two constructs are related to intention to system usage. This study presents a prospective combining view of Technology Acceptance Model (TAM) and the expectancy theory to examine how ERP users form their attitudes and expectations throughout the course of ERP implementation.

Keywords

ERP Implementation, TAM, Longitudinal Case Study.

INTRODUCTION

An adoption of an Enterprise System (ES) generally leads to numerous expectations within an organization. With the promises to help improve the way that business was done by making it possible to integrate all functions along their value chain to provide a better way for communication and decision-making (Gupta, 2000), stakeholders are convinced that they will have a seamlessly integrated system with the adoption of a new Enterprise Resource Planning (ERP). The so-called ERP is known best to ease the pain of disparate workflow in an organization. Every business function will be connected through the ERP system. Accounting transactions are automatically recorded at a time which the business transaction is undertaken. This seems to bring joys to every organization member. However, not every ERP adoption initiative has ended well.

There is an on-going concern about the high failure rate of ERP implementation (Kim et al., 2005). ERP implementation often requires a substantial amount of resources. When an implementation project does not follow the plan, it usually results in budget overrun and subsequently brings both financial and non-financial loss to an organization. The delay of an implement project could lead to frustration among employees, an opportunity loss for an organization and other negative consequences. Even though organizations have successfully implemented and deployed an ERP, they still face risks of failing to achieve adoption objectives. Over fifty percent of ERPs being implemented failed to meet their original expectations (Yu, 2005). After an ERP is deployed, it is not certain that employees would realize benefits from its usage and might stop using the system eventually. One of the examples is Allied Waste Industries, Inc. that decided to abandon their SAP R/3 after having invested around \$130 million (Kim et al., 2005).

This paper reported the empirical study employing the renowned theories, Technology Acceptance Model (TAM) and Expectancy Theory, in order to gain more insightful understandings about the ES adoption, specifically ERP. By taking a different approach from most previous research dealing with TAM, this study presents a prospective view to examine how ERP users form their attitudes and expectation throughout the course of ERP implementation at one of the state-owned enterprise within the energy sector in Thailand. Data were collected at two different points in time; at design stage and before the system deployment stage.

The remaining of this manuscript is organized into four sections. The next section covers a brief overview of the constructs being examined in this research. Factors influencing the Intention to Use construct from two theoretical perspectives, TAM and the Expectancy Theory, will be reviewed. Research Method with the context of study is followed, including the general

background and face-to-face interview summary of the organization chosen for this longitudinal case study, the Energy Generating Authority of Thailand. The results of the two phases of data collection will be compared. The paper will be concluded with the discussion and conclusion.

THEORETICAL CONSTRUCTS AND RESEARCH FRAMEWORK

Enterprise Resource Planning

ERP can be defined as a business software system that allows an organization to share common data and practice across business functions (Marnewick et al., 2005). It consists of several generic modules such as finance, human resource, supply chain management, supplier relationship management, customer relationship management, business intelligence, for instance. One of the important components of ERP is the process flow since the ultimate goal of an ERP is, in general, the seamless integration. All business functions will be modeled and linked to create a smooth integration. Ultimately, data will be entered once into the system and shared across the entire organization. This helps to eliminate the problems of data inconsistencies and redundancies.

An attempt to implement an ERP system often requires a large amount of investment in terms of monetary and non-monetary resources. Since ERP projects are complex and need to be carefully managed, a selected group of organization members will need to invest their time to participate in system implementation activities. One of the theoretical constructs which are mostly used to measure the success of information system implementation during the early phases of project is an intention to use the system since it is assumed to be strongly correlated to an actual usage behavior (King et al., 2006).

Behavioral intention is a construct measuring individual intention to perform a particular behavior, as in this case, is an intention to use an ERP system (Davis et al., 1989). There have been some studies examining the behavioral intention of using an ERP system. However, the majority of these studies employed cross-sectional data and retrospectively assessed a users' intention after the ERP had been implemented. There are very fewer studies existed on a longitudinal timeline (Motwani et al., 2002; Motwani et al., 2005). Also, there is a need to follow and capture the changes in behavioral intention of system users throughout different stages of the implementation.

Behavioral Intention: A View from Technology Acceptance Model

It is believed that an intention to use a particular system is determined by an individual perception toward the system. If the system is perceived to be useful and easy to use, an individual will intend to use that system. This seems to be the main premise of TAM, the renowned framework in the area of evaluating success of an information system. The model has been tested to the great extent proving that perceived usefulness and perceived ease of use are two fundamental theoretical constructs influencing an intention to use system.

Originally, this model was adapted from Theory of Reasoned Action which is the theory explains how individual intention to perform a specific voluntary behavior. The theory theorizes that an individual intention is determined by a person's attitude and subjective norm (Ajzen et al., 1980; Fishbein et al., 1975). In this version of TAM, it was postulated that attitudes are influenced by salient beliefs concerning the outcome of the behavior in evaluation. Perceived usefulness and perceived ease of use are two salient beliefs theorized as determinants of user's attitude towards using system. Perceived usefulness is defined as "...the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context..." (Davis et al., 1989). Whereas, Perceived ease of use refers to "...the degree to which the prospective user expects the target system to be free of effort..." (Davis et al., 1989). With the numerous attempts to validate and refine TAM, these two theoretical constructs have proved to be the robust determinants of the behavioral intention.

Behavioral Intention: A View from Expectancy Theory

"...Two important measures that proved highly predictive of ERP implementation project success were the 'the arduousness of the consultant-client relationship' and the degree of 'shared understanding' – the similarity in work values, norms, and problem-solving approaches between consultant and client team members," affirmed by King (2005 p. 83) from his extensive observations of ERP implementation projects. Due to the integrated nature of the ERP sub-systems, the implementation process is quite complex and involved not only knowledge works but also professional consultants. Therefore, it is inevitably that ERP users, both key users and end users, will develop a certain set of expectations towards their consultants (Wang et al., 2005).

Although it may seem that TAM is a very useful framework in explaining an individual behavioral intention to use a particular system (Fishbein et al., 1975; Jackson et al., 1997), other stream of research, the Expectancy Theory, is a longer established framework that has been adopted widely in studies related to socio-technical systems. The interactions between professional consultants and key users, if managed effectively, can lead to better project management (Yourdon, 1999) and successful information system implementation, ERP including.

Vroom (1964) in his famous work, outlined the expectancy theory and argued that individuals are molded by their expectation and often formed their attitudes and behaviors accordingly. It was found that individual's expectation has been one of the very important social constructs that are most likely to predict individual's behaviors. People appear to rely on their innate instincts and social expectations when confronting with complex task. ERP implementation is no exception. It is conceivable that each individual constituency of the implementation team will develop his or her individual expectations, resulting in different sets of behavior toward the people and the systems. Thus, the scope of what is argued in the present study is only from a user's standpoint, a behavioral intention is influenced by his or her expectation of the ERP professional consultants, for instance; expected work-value, expected professional courtesy, and so forth. Also, while expectations can change through time, the behavioral intention is likely to follow.

By combining the two precursory groups of constructs, the conceptual framework of this study can be illustrated as shown in Figure 1.

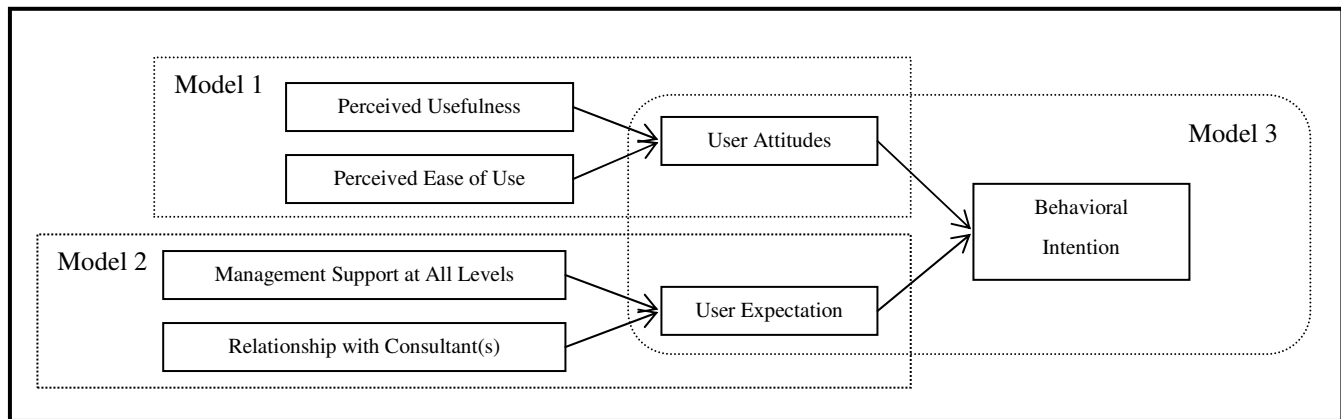


Figure 1 Conceptual Framework and Analysis Models

Three important research questions for this study are as following.

1. How much does User Attitudes relate to Behavioral Intention? How much does User Expectation relate to Behavioral Intention?
2. To what extent User Attitudes and User Expectation influence Behavioral Intention?
3. Whether User Attitudes and User Expectations at two different phases of implementation differed in their extent of contribution to Behavior Intention?

RESEARCH METHOD

Using Gersick's landmark article on the Punctuated Equilibrium paradigm (Gersick, 1991), Sabherwal, Hirschheim, & Goles (2001) followed three case studies that explain how information systems strategy profiles have changed over a long period of time. They argued that longitudinal case study research appeared to be the only logical way to observe the dynamic of revolutionary as well as evolutionary changes in these strategic alignment profiles. This inductive theoretical development is very useful in explaining the organizational phenomena on a macro level. Yet, there is still a need to observe how ERP participants have changed their behavior intention throughout each stage of the ERP implementation. This research adopted a longitudinal case study method in order to examine the changes in users' behavioral intention as well as their expectations. With the merit of a case study method, it allows researchers to gain first-hand information in a real natural setting (Moore et al., 1991). A holistic picture of the changes taken place during the implementation along with rich details can be acquired.

Data Collection

The site of main data collection is the Energy Generating Authority of Thailand (EGAT), one of the largest State Own Enterprises (SOEs) in the country. EGAT divides the stakeholders in ERP implementation into four groups: Management, Key Users, End Users and External Organizations. Only the first three stakeholder groups will be part of the research sampling frame. Based on existing life cycle models, vendors' implementation methodologies, and previous studies, Ahituv et al. (2002) proposed a generic model for ERP implementation life cycle. This includes four important phases; selection phase, definition phase, implementation phase, and operation phase. Of four phases of ERP implementation identified in earlier, data will be collected from two phases; implementation phase and operation phase. This would omit the selection phase and definition phase because the first phases involve high-level activities. It appears to impact users only a little. Users will start to discern the impact of the implementation in the implementation phase. Data were collected twice: during the business requirement analysis phase (T1) and before deployment (T2). EGAT follows the ASAP methodology in its ERP implementation.

As for the first stage of the longitudinal study, a total of 396 questionnaires were distributed to key users and project development group. Of these, 134 were returned (34%). Then, questionnaires with the same constructs except for the part dealing with the relationship with consultant were sent to approximately 3,000 management and end users. The latter group does not have direct contacts with the consultants, the view toward the ERP implementation project was asked instead. The distribution of questionnaires is done by the change management group of the ERP implementation project. Due to long weekends and the country holiday seasons at the time, it took about 2 months to for the group to go to all sites around the country to collect 1,590 set of questionnaires from end-users.

As for the second stage, data collection followed the approach of the previous stage. A total of 400 questionnaires were sent out to key users with 74 usable questionnaires returned (18.50%). The number of end users participating in the second stage was less than the previous stage because a clearer and more concrete group of actual end users had been defined by EGAT. A total of 376 questionnaires were acquired in this stage.

Qualitative data is considered to be vital to understand changes of users' attitudes, expectations, and behavioral intentions. A total of 28 key users and 9 consultants representing all 14 modules were interviewed. In addition to interview data, company documents, news and informal interviews were included to triangulate research findings.

Survey Instruments

The primary data was collected using self-administered questionnaires. Questionnaire items were developed based on previous research. To measure Perceived Usefulness, original items in TAM (Davis et al., 1989) as well as items from Moore & Benbasat (1991) that extends the perception to cover Relative Advantage, Compatibility and Image were used. These items were concluded to measure Perceived Usefulness in three main areas which are usefulness for the organization, for the job and for the self. Perceived Ease of Use was measured in two aspects including Easy to Use and Easy to Learn. Questionnaire items were applied from the original items in TAM (Davis et al., 1989) and the items from Taylor & Todd (1995).

This study used semantic differential to measure attitude constructs. Adjective pairs were drawn from previous work (Bailey et al., 1983; Hartwick et al., 1994; Louis, 1985; Tanlamai, 1990; Tanlamai et al., 1989) to measure users' attitude toward system, system usage and change. For Management Support, items were applied from the work of Jarvenpaa & Ives (1991) to measure participation and involvement. In addition, items were developed to measure commitment of management. Fullerton & West (1996) studied to identify dimensions of the relationship between consultants and clients. Items from their work were used for Relationships with Consultant. Items for User Expectation were applied from Szajna & Scamell (1993) and Taylor & Todd (1995). Since EGAT has used ERP as a mandatory system, researchers then modified some items to measure the Behavioral Intention that matches with the characteristics of the system.

DATA ANALYSIS

This section provides the background of the case being studied along with the brief summary of the interview data. The data from questionnaire survey will be included in the next sub-section.

The Case Background: Energy Generating Authority of Thailand

Energy Generating Authority of Thailand (EGAT) is one of the largest state owned enterprises under the Ministry of Energy with more than forty thousand employees. With the plan to modernize its operations, ERP adoption is initiated in 2006 to replace silos of legacy system in order to develop a single source of data. After the software and vendor selection process, SAP R/3 was selected with twenty-seven month implementation timeframe.

The company operation was sectioned into 8 departments creating clear boundaries among business units. In this silo organization, a number of legacy systems were developed independently to serve requirements of each department. There were problems of data redundancy and data integrity. A total of 9 SAP modules were implemented. EGAT was reclassifying them into 14 modules to match its business nature. The implementation timeframe was set to be 27 months. EGAT took a big bang approach implementing all chosen modules simultaneously.

Key users were selected from all business operations to participate in the implementation process. During business blueprint phase, key users were working closely with consultants in order to define workflow process and business rules. There were disagreements among key users in different modules about clear boundaries of work responsibilities. The relationship between users and consultants appeared not to be favorable. Key users in some modules complained about the role of consultants and their performance.

When asked about the new system, participants believed that the system was useful and should be implemented. They expected that the new system would cease the problem of disintegration and data redundancy. However, some participants stated that they had lowered their expectations about the system because there a lot of obstacles.

Some participants thought that the new system could serve their requirements. The problem which they found was that their consultants could not find the way to make the system satisfying the requirements. They expected their consultants to provide them best practices. Some were convinced that consultants did not fully understand the nature of the business. The interviews with consultants show that the operations of EGAT were in a form of decentralization. Key users could not provide the whole picture of the organization. With the complex nature of a bureaucratic state owned enterprise, practices among departments were different.

In terms of system usage, users stated that the usage is mandatory. They were required to use the system to perform their jobs. There was a concern that people would use the system because it is compulsory not voluntary. In this case, the system would not be fully utilized to its full extent since users will use the system with minimum efforts.

Survey Data

Descriptive statistics of all constructs at T1 and T2 are presented in Table 1A to Table 1D. Most constructs measured by multiple items were found to have Cronbach's alpha in an acceptable level (>0.70). Detailed measures for each construct will be furnished upon requested. The notion ** depicts that the statistic is significant at the .01 at level of significance, $p \leq .01$.

At T1, the perception of usefulness appeared to be considerably high. Both groups of users perceived the system to be not difficult to use. As briefly indicated in the methodology section, semantic differential measures with the scale -3 to +3 were used in three of the constructs, user attitude, management support, and relationship with consultants. While key users had a positive relationship with their consultants, end users who did not have direct contact with consultants rated their attitude towards the project quite moderate. In terms of their expectation and behavioral intention, both key users and end users gave very high rating. The relationships among constructs as conceptualized in the framework of this study were found to be in a positive direction. The correlation coefficients between Behavioral intention and user attitude as well as user expectation are relatively high at a 0.01 statistical significant level.

T1(Business Requirement Analysis Phase): Key Users (N= 134)									
	Conbrach's Alpha	Mean	SD	Pearson Correlation Coefficients					
				PU	PEOU	UA	MS	RC	UE
PU	0.909	3.61	0.468						
PEU	0.731	2.88	0.511	0.372**					
UA	0.893	0.93	0.741	0.654**	0.364**				
MS	0.762	1.36	0.858	0.306**	0.164	0.392**			
RC	0.873	1.07	0.800	0.410**	0.159	0.528**	0.290**		
UE	0.881	3.70	0.555	0.652**	0.391**	0.666**	0.450**	0.506**	
BI	0.870	3.74	0.571	0.588**	0.419**	0.699**	0.345**	0.494**	0.687**

Table 1A Descriptive Statistics and Pearson Correlation Coefficients of Key Users at T1

T1 (Business Requirement Analysis Phase): End Users (N= 1,590)									
	Conbrach's Alpha	Mean	SD	Pearson Correlation Coefficients					
				PU	PEOU	UA	PROJ	RC	UE
PU	0.938	3.48	0.550						
PEU	0.862	3.09	0.511	0.591**					
UA	0.970	0.95	0.741	0.670**	0.594**				
MS	0.928	1.03	1.247	0.508**	0.490**	0.509**			
PROJ	0.965	0.52	1.071	0.567**	0.541**	0.745**	0.588**		
UE	0.917	3.46	0.665	0.673**	0.528**	0.721**	0.509**	0.611**	
BI	0.900	3.54	0.644	0.666**	0.522**	0.739**	0.459**	0.631**	0.681**

Table 1B Descriptive Statistics and Pearson Correlation Coefficients of End Users at T1

T2 (Before Deployment): Key Users (N= 74)									
	Conbrach's Alpha	Mean	SD	Pearson Correlation Coefficients					
				PU	PEOU	UA	MS	RC	UE
PU	0.912	3.52	0.501						
PEU	0.646	3.09	0.447	0.592**					
UA	0.897	0.79	0.726	0.685**	0.603**				
MS	0.596	0.32	1.009	0.439**	0.517**	0.493**			
RC	0.558	0.56	0.621	0.479**	0.388**	0.615**	0.342**		
UE	0.887	3.48	0.617	0.613**	0.570**	0.708**	0.460**	0.570**	
BI	0.876	3.55	0.661	0.570**	0.565**	0.677**	0.312**	0.500**	0.700**

Table 1C Descriptive Statistics and Pearson Correlation Coefficients of Key Users at T2

T2(Before Deployment): End Users (N= 376)									
	Conbrach's Alpha	Mean	SD	Pearson Correlation Coefficients					
				PU	PEOU	UA	MS	RC	UE
PU	0.932	3.40	0.565						
PEU	0.757	3.06	0.521	.633**					
UA	0.923	0.57	0.818	.720**	.633**				
MS	0.787	0.35	1.120	.445**	.428**	.584**			
RC	0.950	0.32	1.024	.437**	.423**	.533**	.578**		
UE	0.913	3.37	0.640	.690**	.545**	.684**	.502**	.483**	
BI	0.883	3.02	0.634	.635**	.611**	.671**	.459**	.450**	.701**

Table 1D Descriptive Statistics and Pearson Correlation Coefficients of End Users at T2

Abbreviations:

- UA = User Attitudes
- PU = Perceived Usefulness
- PEU = Perceived Ease of Use
- UE = User Expectation

- MS = Management Support at All Levels
- RC = Relationships with Consultants
- PROJ= Attitudes toward Project
- BI = Behavioral Intention

At T2, while the relationships among constructs were found to be positively related, it appeared that users rated their relationship with their consultants, management and attitude towards project quite neutral. For the rest of constructs, user perceptions, user expectation, and their behavioral intention are rated relatively high. Behavioral intention is correlated to user expectation slightly higher than user attitude from both the key users' and end users' standpoints.

To compare the means of all constructs between T1 and T2, t-test was performed with the results shown in Table 2. Besides perceived usefulness and perceived ease of use, the means of all the constructs from both user groups between T1 and T2 are statistically different at a 0.05 level. The mean difference found in perceived usefulness is only significant with end users while only key users appeared to perceive the ease of use differently across the change of time. Before the system is fully deployed, key users' perception regarding the system ease of use had increased whereas end users perceived the system to be less useful. From the expectancy theory, the relationship between key users and consultants as well as the end users' attitude towards project were better at the earlier phase of the project implementation as compared to the time before the system was fully deployed.

	Key Users		End Users	
	t	p value	t	p value
PU	1.615	0.108	2.612	0.009
PEU	-2.588	0.010	1.541	0.124
UA	2.482	0.014	14.979	0.000
MS	8.397	0.000	10.060	0.000
RC	6.184	0.000		
PROJ			8.987	0.000
UE	3.091	0.002	2.603	0.009
BI	2.368	0.019	4.662	0.000

Table 2 Mean Comparison between the Two Phases (T1 and T2) of ERP Implementation

The patterns of bivariate relationship at T1 and T2 are quite similar. It seems that the correlation between perceived ease of use and user attitude became stronger. Behavioral intention is most likely to be more influenced from user expectation when the project is more progressed. Note that the values indicated in the table are un-standardized coefficients and the tests of all the coefficients are statistically significant.

In addition to the descriptive analysis and the bivariate relationship reported above, Table 3 summarizes the Simple Linear Regression Analysis results found according to the conceptual framework. All three sub-models provide relatively high adjusted R-Square statistics with all F-values being significant at a 0.001 level, supporting both the original TAM's proposition (UA and BI) and the Expectancy Theory (UE).

		T1		T2	
		Key Users	End Users	Key Users	End Users
Model 1					
Adjusted R Sqr.		0.436	0.508	0.417	0.569
F (df)		50.822 (2, 129)	754.806 (2, 1462)	40.555 (2, 72)	248.790 (2, 374)
p value		p=.000	p=.000	p=.000	p=.000
UA (dependent variable)					
	PU	0.97	0.89	0.73	0.77
	PEU	0.20	0.53	0.49	0.47
Model 2					
Adjusted R Sqr.		0.338	0.406	0.405	0.304
F (df)		32.861 (2, 123)	496.619 (2, 1453)	24.463 (2, 72)	82.771 (2, 372)
p value		p=.000	p=.000	p=.000	p=.000
UE (dependent variable)					
	MS	0.21	0.23	0.18	0.19
	RLC	0.28		0.47	
	PROJ		0.30		0.18
Model 3					
Adjusted R Sqr.		0.567	0.589	0.556	0.558
F (df)		84.045 (2, 124)	1051.131 (2, 1469)	61.848 (1, 73)	307.864 (1, 375)
p value		p=.000	p=.000	p=.000	p=.000
BI (dependent variable)					
	UA	0.33	0.33	0.33	0.28
	UE	0.41	0.29	0.47	0.45

Table 3 Summary of Regression Analysis

DISCUSSION AND CONCLUSION

This study explores the ERP implementation at one large state owned enterprise in Thailand. Case study method was employed to provide a whole scheme of how the relationships between theoretical constructs were established. Case data shows that user attitudes and user expectation in the early phase of the implementation differ from the later phase. The results also provide the answers to all three research questions. Although user attitude is related to behavioral intention as TAM suggested, user expectation does contribute additionally to the intention to use the ERP system.

With the complex nature of ERP implementation which typically requires involvement from a large number of people, it brings many challenges to the system adoption and acceptance. The findings of this study convey some interesting implications to both academia and practitioners. From a theoretical point, the extended model of TAM to include the user expectation construct, particularly the expected positive relationship with consultant has merit especially during the later stage of implementation. This supports King's contention that positive relationships with consultants can lead to ERP implementation success (King, 2005). Moreover, it is apparent that a longitudinal research is beneficial to study the process of user acceptance as Kwahk (2006) argued that the process should be conceptualized as a pattern of organizational change. For practitioners, it is important to note that user expectations play a pivotal role in determining an intention to use an ERP system. Mostly, a great deal of efforts has been paid to encourage user participation and involvement to enhance the success of the implementation. The findings suggested that expectations should be well managed. Over expectations could lead to disappointments which in turns would lower users' expectations and intentions when they are required to use the system.

Like any other case study research, generalizability is its basic limitation (Ward et al., 2005). Although it appears that the present SOE case is unique from the standpoint of mandatory usage environment, this type of ERP implementation is quite prevalent in Thai government agencies and companies and around the world (Rawstorne et al., 2000). Despite its limitation, the present study has a relatively rare findings of not just the before and after ERP implementation but the most turbulent

time implementation, just before the ERP is fully deployed. Regardless of what level of ease of use or usefulness the users think the new ERP may be, it is possible that their attitudes and intention to use might not be affected accordingly. However, the present findings show that The TAM model is still robust even with this mandatory setting in both phases of ERP implementation. After fifteen months from the original plan and adding various types of consultants by both individual departments and the SOE's executive boards themselves, the ERP had been fully deployed with a big bang changed-over. Thus far, no system operational problems were reported. What has yet to be seen is whether the users would be satisfied with the system usage (Adamson et al., 2003), the subject of our upcoming study.

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