05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

# MOVING FROM EVALUATION TO TRIAL: THE CASE OF CLOUD ERP ADOPTION IN SMES

Submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

**Siti Aisyah Salim**

**MIT, University of Technology Sydney**

**BMIS, International Islamic University Malaysia**

Science and Engineering Faculty

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

# Abstract

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

The movement towards the computerisation of business activities (Wieder et al. 2006) among organisations has occurred as a result of the influences of globalisation and competitiveness. In an attempt to further understand this scenario, a large number of academic researchers have applied different theoretical lenses to an understanding of computerisation adoption (i.e., technology adoption). As a result, the topic of technology adoption has become a mature topic in the information systems research domain (Venkatesh 2006). Despite being a mature topic, the majority of researchers have focused predominantly on exploring technology adoption as a single action activity (i.e., a snapshot) (Aguirre-Urreta and Marakas 2012) without considering other actions that could occur during the adoption process (e.g., information search, evaluation and trial). Such a narrow discussion prevents a holistic understanding of the technology adoption process, especially for corporate-wide system adoption where the process needed to arrive at the final decision of adoption is a far more complex phenomenon (Damanpour and Schneider 2006). Only a few studies have conceived the importance of revealing technology adoption as a process.

Given the proliferation of corporate-wide system adoption in small and medium-sized enterprises (SMEs), the context of the study is concentrated on cloud-based enterprise resource planning (ERP). This is even more important knowing that the primary focuses of current corporate-wide system studies have been mostly on large organisations. Considering the cost and resource issues, the rate of adoption of cloud ERP among SMEs still remains low, raising the question of "What are the critical determinants that influence SME owners while making the decision to adopt cloud ERP?" To answer this general question and more specific questions which will be discussed in Chapter 1 (Section 1.4), we use cloud ERP as an example of corporate-wide systems and analyse the adoption decisions made by SMEs as potential major players in cloud ERP adoption.

This study is designed by utilising two theoretical lenses wherein critical adoption factors are identified through the theory of planned behaviour and the progression of each factor is observed through Ettlie's (1980) multi-stage adoption



UPO DONE MyTO SCAN

model. Employing a survey method, this study has employed data gathered from 162 owners of SMEs. The use of a linear approach in this study has shown that the level of importance of adoption determinants changes across different adoption stages. However, the employment of the linear approach - for example in this study using partial least squares (PLS) - could not demonstrate the relationship of these determinants working in combination. We furthered the investigation by using a non-linear approach - applying polynomial regression (Edwards and Parry 1993) and a response surface analysis method (Box and Draper 1987) — which facilitated the assessment of the combination of two predictor variables and related it to an outcome variable (Shanock et al. 2010). This approach demonstrates a tripartite relationship between attitude, subjective norms and intention respectively. In demonstrating these scenarios - linear and non-linear approaches - the two most critical adoption stages of Ettlie's model, namely, evaluation and trial are selected.

This study makes theoretical contributions to the body of technology adoption research specifically in the domain of technology adoption by SMEs. Accordingly, this study presents an intention model by which to explain and predict decision-makers' behaviour patterns regarding cloud ERP adoption. Further, this study contributes to the industry by providing guidance to the ERP ecosystem (vendors, consultants and communities) in an attempt to understand their potential buyers' behaviour patterns and perceptions towards the adoption of cloud ERP. It also highlights the role of external agencies (such as government or business partners) in triggering the continuity of cloud ERP adoption, especially in the early stages of the process. However, on the basis of our findings, we note that the decision-maker's attitude supersedes other determinants once the firm is using cloud ERP on a trial basis.

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

# Table of Contents

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

Keywords ..... i
Abstract ..... ii
Table of Contents ..... iv
List of Tables ..... vii
List of Figures ..... viii
List of Abbreviations ..... ix
List of Publications ..... i
Statement of Original Authorship ..... ii
Acknowledgements ..... iii
**CHAPTER 1: INTRODUCTION ..... 1**
1.1 Background ..... 1
1.2 Research Background and Motivation ..... 3
1.3 Research Context ..... 6
1.4 Purpose of the Study, Research Problem and Key Research Questions ..... 7
1.5 Research Scope, Definitions and Significance ..... 10
1.6 Unit of Analysis ..... 12
1.7 Research Design ..... 13
1.8 Thesis Outline ..... 14
**CHAPTER 2: LITERATURE REVIEW ..... 16**
2.1 Technology Adoption: The General Context ..... 17
2.2 Corporate-Wide System Adoption ..... 21
2.3 Enterprise Resource Planning ..... 24
2.4 ERP Adoption ..... 27
2.5 Issues with Existing ERP Adoption Studies ..... 28
2.6 Small and Medium-sized Enterprises ..... 29
2.6.1. Definitions of SME ..... 30
2.6.2. Characteristics of SMEs ..... 30
2.6.3. SME adoption studies ..... 31
2.6.4. SME decision-makers' characteristics ..... 32
2.6.5. Why SMEs need ERP systems ..... 32
2.6.6. The context: Cloud-based ERP ..... 33
2.6.7. Benefits of cloud ERP ..... 35
2.6.8. Why it is important to look at ERP adoption as a process ..... 36
2.6.9. Corporate-wide system adoption as a multi-stage process ..... 37
2.6.10. Adoption (prior to use) as the focus ..... 38
2.6.11. Behavioural adoption model ..... 40
2.6.11.1. Theory of reasoned action ..... 41
2.6.11.2. Technology acceptance model ..... 41
2.6.12. Unified theory of acceptance and use of technology ..... 42
2.7 Theory of planned behaviour ..... 43
2.7.1. TPB determinants ..... 44
2.7.1.1. Intention ..... 44

2.7.1.2. Attitude ..... 45
2.7.1.3. Subjective norms ..... 46
2.7.1.4. Perceived behavioural control ..... 47
2.7.2. Past studies on TPB ..... 47
2.7.3. TPB theoretical gap? ..... 50

2.8 Ettlie's Model ..... 51
2.8.1. Awareness stage ..... 51
2.8.2. Interest stage ..... 52
2.8.3. Evaluation stage ..... 52
2.8.4. Trial stage ..... 53
2.8.5. Commitment stage ..... 53
2.8.6. Why select the evaluation and trial stages ..... 53

2.9 Chapter Summary ..... 55

**CHAPTER 3: CONCEPTUALISATION, RESEARCH MODEL AND HYPOTHESES ..... 57**

3.1 Conceptualisation of Technology Adoption as a Multi-Stage Process ..... 57
3.1.1. Formative construct conceptualisation ..... 59
3.1.2. Reflective construct conceptualisation ..... 61
3.1.3. Developing a construct based on TPB ..... 63
3.1.4. Operationalising the multi-stage conceptualisation ..... 64

3.2 Research Model ..... 65

3.3 Hypotheses Development ..... 66

3.4 Extending and Polarising TPB into Evaluation and Trial Stages ..... 68

3.5 Chapter Summary ..... 69

**CHAPTER 4: RESEARCH DESIGN ..... 71**

4.1 Research Design ..... 71

4.2 Minimising the Common Method Variance ..... 73

4.3 Process of Survey Design ..... 73
4.3.1. Survey instrument design ..... 75
4.3.1.1. Designing the survey: formative constructs ..... 75
4.3.1.2. Designing the survey: reflective constructs ..... 76
4.3.2. Content validation of the survey instrument ..... 76
4.3.2.1. Strong literature review ..... 76
4.3.2.2. Face validation ..... 77
4.3.3. Development of measures ..... 77
4.3.4. General aspects of the survey design ..... 81
4.3.5. Full-scale survey deployment ..... 83
4.3.6. Sample selection for data collection ..... 84

4.4 Anonymity and Confidentiality of the Respondents ..... 85
4.4.1. Sample overview ..... 85

4.5 Chapter Summary ..... 86

**CHAPTER 5: DATA ANALYSIS AND RESULTS ..... 87**

5.1 Data Analysis Design ..... 87
5.1.1. Data preparation ..... 88
5.1.2. Descriptive statistics ..... 89
5.1.2.1. Demographic information ..... 90

5.2 Results ..... 91
5.2.1. Formative measurement model ..... 91
5.2.2. Reflective measurement model ..... 94
5.2.3. Respecification and final formative measurement model ..... 95
5.2.4. Respecification and final reflective measurement model ..... 99
5.2.5. Test of the structural model ..... 101
5.2.6. Hypotheses testing ..... 104

5.2.6.1. Testing Hypothesis 1 ..... 104
5.2.6.2. Testing Hypothesis 2 ..... 104
5.2.6.3. Testing Hypothesis 3 ..... 104
5.2.6.4. Testing Hypothesis 4 ..... 105
5.2.6.5. Testing Hypothesis 5 ..... 105
5.2.7. Other testing ..... 106
5.2.8. Non- linear approach ..... 106

5.3 Chapter Summary ..... 111

**CHAPTER 6: DISCUSSION, IMPLICATIONS, LIMITATIONS AND CONCLUSION ..... 113**

6.1 Discussion of the research findings ..... 113
6.1.1. Linear assumptions ..... 114
6.1.2. Non-linear assumptions ..... 116

6.2 Contribution ..... 117
6.2.1. Contribution to theory ..... 118
6.2.2. Contribution to practice ..... 120

6.3 Limitations ..... 122

6.4 Future Work ..... 124

6.5 Conclusion ..... 125

**APPENDICES ..... 127**

Appendix A ..... 127

Appendix B ..... 128

Appendix C ..... 129

Appendix D ..... 132

**REFERENCES ..... 138**

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

# List of Tables

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

Table 2-1: General technology adoption studies ..... 19
Table 2-2: Influential studies on corporate-wide system adoption ..... 22
Table 2-3: Definitions of ERP ..... 25
Table 2-4: Studies on ERP systems ..... 27
Table 2-5: Traditional ERP system versus cloud ERP system ..... 34
Table 2-6: Prior studies on adoption stages ..... 38
Table 2-7: Summary of studies that align with thesis conceptualisation ..... 40
Table 2-8: Key literature focusing on behavioural intention ..... 49
Table 3-1: Primary constructs and definitions ..... 63
Table 3-2: Stages and definitions ..... 64
Table 4-1: Primary constructs and items ..... 79
Table 5-1: Cronbach's alpha value for intention construct ..... 89
Table 5-2: Demographic information ..... 90
Table 5-3: Formative measures of the full dataset ..... 94
Table 5-4: Reflective measures of the full dataset ..... 95
Table 5-5: Test for discriminant validity for full dataset (cross loading +AVE) ..... 95
Table 5-6: Measure representation for both models ..... 96
Table 5-7: Formative measures of the evaluation stage ..... 98
Table 5-8: Formative measures of the trial stage ..... 99
Table 5-9: Reflective measures of the evaluation stage ..... 100
Table 5-10: Reflective measures of the trial stage ..... 100
Table 5-11: Corresponding t-values and p-values ..... 103
Table 5-12: Results of polynomial equation for the evaluation stage ..... 108
Table 5-13: Results of polynomial equation for the trial stage ..... 108
Table 5-14: Results of the regression analysis – testing slopes and curves between the three variables for the evaluation stage ..... 110
Table 5-15: Results of the regression analysis – testing slopes and curves between the three variables for the trial stage ..... 110

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

# List of Tables

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

Table 2-1: General technology adoption studies ..... 19
Table 2-2: Influential studies on corporate-wide system adoption ..... 22
Table 2-3: Definitions of ERP ..... 25
Table 2-4: Studies on ERP systems ..... 27
Table 2-5: Traditional ERP system versus cloud ERP system ..... 34
Table 2-6: Prior studies on adoption stages ..... 38
Table 2-7: Summary of studies that align with thesis conceptualisation ..... 40
Table 2-8: Key literature focusing on behavioural intention ..... 49
Table 3-1: Primary constructs and definitions ..... 63
Table 3-2: Stages and definitions ..... 64
Table 4-1: Primary constructs and items ..... 79
Table 5-1: Cronbach's alpha value for intention construct ..... 89
Table 5-2: Demographic information ..... 90
Table 5-3: Formative measures of the full dataset ..... 94
Table 5-4: Reflective measures of the full dataset ..... 95
Table 5-5: Test for discriminant validity for full dataset (cross loading +AVE) ..... 95
Table 5-6: Measure representation for both models ..... 96
Table 5-7: Formative measures of the evaluation stage ..... 98
Table 5-8: Formative measures of the trial stage ..... 99
Table 5-9: Reflective measures of the evaluation stage ..... 100
Table 5-10: Reflective measures of the trial stage ..... 100
Table 5-11: Corresponding t-values and p-values ..... 103
Table 5-12: Results of polynomial equation for the evaluation stage ..... 108
Table 5-13: Results of polynomial equation for the trial stage ..... 108
Table 5-14: Results of the regression analysis – testing slopes and curves between the three variables for the evaluation stage ..... 110
Table 5-15: Results of the regression analysis – testing slopes and curves between the three variables for the trial stage ..... 110

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

# List of Figures

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

Figure 1-1: Conceptual stages of cloud ERP adoption ..... 11
Figure 1-2: Key steps in the research project ..... 13
Figure 2-1: Theory of reasoned action from the work of Fishbein and Ajzen (1975) ..... 41
Figure 2-2: Technology acceptance model from the work of Davis (1989) ..... 42
Figure 2-3: UTAUT model adapted from the work of Venkatesh et al. (2003) ..... 43
Figure 3-1: Focus of most technology adoption studies ..... 58
Figure 3-2: Conceptual model of cloud ERP adoption ..... 62
Figure 4-1: Survey design steps ..... 74
Figure 4-2: Question in relation to adoption stages ..... 81
Figure 4-3: Rating scale of agreement ..... 83
Figure 5-1: Data analysis design ..... 88
Figure 5-2: Industry representation ..... 90
Figure 5-3: Reliability and validity test of reflective and formative measures ..... 91
Figure 5-4: Structural model testing for full dataset ..... 102
Figure 5-5: Structural model testing for the (a) evaluation stage and (b) trial stage of the technology adoption process ..... 103
Figure 5-6: Response surfaces between attitude, subjective norms and intention in the evaluation and trial stages ..... 109

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

# List of Abbreviations

The following abbreviations are used in the thesis:

| Acronym | Full title |
|---|---|
| AVE | Average variance extracted |
| CRM | Customer relationship management |
| ERP | Enterprise resource planning |
| ES | Enterprise system |
| NIST | National Institute of Standards and Technology |
| PLS | Partial least square |
| TPB | Theory of planned behaviour |
| SAP | Systems applications and products |
| SEM | Structural equation modelling |
| SME | Small and medium-sized enterprises |
| SPSS | Statistical Package for the Social Sciences |
| TAM | Technology acceptance model |
| TRA | Theory of reasoned action |
| VIF | Variance of inflation factor |

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

# List of Publications

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

## Journal Papers

- Sawang, S., Sun, Y., and Salim, S. A. 2014. "It's not only what I think but what they think! The moderating effect of social norms," Computers & Education (76), pp. 182–189.
- Salim, S. A., Sedera, D., Sawang, S., Alarifi, A., and Atapattu, M. "Moving from Evaluation to Trial: How do SMEs Start Adopting Cloud ERP," Australasian Journal of Information Systems (accepted).

## Conference Proceedings

- Salim, S. A., Sedera, D., Sawang, S., and Alarifi, A. 2014. "Technology Adoption as a Multi-Stage Process: Differing Levels of Significant," Proceedings of the 25th Australasian Conference on Information Systems, Auckland, New Zealand: Association of Information Systems.
- Salim, S. A. 2013. "Cloud ERP Adoption-A Process View Approach," Proceedings of the 17th Pacific Asia Conference on Information Systems, Jeju Island, South Korea: Association of Information Systems.

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

# Chapter 1: Introduction

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

The purpose of this chapter is to provide a broad overview of the research conducted in this study. This chapter begins by introducing the background and motivation for the research. Next, the chapter outlines the context of this study and provides the theoretical underpinning of this research. It is then followed by an overview of the research purpose, specific aims and objectives of this study. The subsequent section outlines the significance, research scope and conceptual definitions used in this study. The remaining section of this chapter outlines the structure of this thesis, which includes a description of the five forthcoming chapters.

## 1.1 BACKGROUND

Issues of globalisation and competitiveness have had an enormous impact on the decisions made by organisations to adopt technological solutions for managing their everyday business requirements. These solutions take the shape of computerised business processes (Wieder et al. 2006) and organised accounting systems (DiGiorgio et al. 2002) in addition to other endeavours that could help to improve a firm's performance and capabilities.

From an academic perspective, a large number of theorists have analysed the process of technology adoption from the viewpoint of different theoretical lenses (Hirschheim 2007). This is seen in the recognition of technology adoption as one of the mature topics in the information systems (IS) research domain (Venkatesh 2006). It can also be anticipated that the topic of technology adoption will remain popular and relevant, as new findings continue to emerge from this area of research and as new technologies emerge. For example, the most widely tested model in technology adoption, namely, the technology acceptance model (TAM), is still being studied. A number of scholars (e.g., Brown et al. 2010; Brown et al. 2014) have extended the discussion of the TAM using the statistical technique of polynomial regression, as well as response surface methodology. These techniques (Shanock et al. 2010) not only provide more interesting findings but also extend the common way of researching, especially in the context of technology adoption.

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

In recent years, a number of specific technologies have become available for adoption by firms, namely: cloud computing, big data, social media and mobile technology. These types of technologies have specific properties that were not offered by previous types of technologies such as on-demand usage and flexibility. Thus, the adoption factors that may have been important when selecting previous technologies might not be applicable in the adoption of these current technologies. Further, in terms of the importance of the adoption factors (i.e., from "very important" to "not very important"), an organisation's assessment might be different when it is in the position of being ready to adopt new technology compared to its views when it is not in a position to adopt the technology.

From an academic perspective, there are a few topics that are frequently discussed in the technology adoption domain. These include: the factors that influence adoption (Sawang et al. 2014; Sawang and Unsworth 2011); the stages involved in the technology adoption process (Dorner et al. 2013; Salim 2013; Salim et al. 2014); the characteristics of the technology to be adopted (Campbell et al. 2013); and the critical success or failure factors among the adoption factors (Ngai et al. 2008). The theories that are largely used in the technology adoption domain when supporting these discussions include: Rogers's diffusion of innovation theory; TAM; the unified theory of acceptance and use of technology (UTAUT); theory of reasoned action (TRA); institutional theory; the technology–organisation–environment (TOE) framework; and self-efficacy (e.g., Ajzen 1985; Ajzen 1991; Davis 1985; Davis 1989; Rogers 1995; Tornatzky et al. 1990; Venkatesh et al. 2003) (for reviews see Venkatesh et al. 2007).

Further, IS researchers have supplied a number of differing definitions of technology adoption. This has resulted in a lack of clarity regarding the boundary of the definition. According to the majority of IS and management scholars, technology adoption is associated with the decision about whether or not to adopt technology based on certain criteria. A number of strategies can be used to gain a better understanding of the concept of technology adoption. One way is to explore the adoption factors in a multi-faceted scenario. It can be observed that when the condition changes, the level of significance of the adoption factors also changes.

The present study aims to better understand technology adoption in a dynamic manner by following the definition proposed by Frambach and Schillewaert (2002)

who define technology adoption as "the sequence of stages through which an innovation (i.e., new technology) passes before the new product, service or idea will be accepted by a potential adopter". Applying this definition enables us to broaden the discussion while at the same time giving us the opportunity to rationalise each of our findings in a more structured manner as we specify the observed determinants relating to a particular condition. This is particularly helpful for the investigation of complex technology adoption as the occurrence of a simple mistake at the beginning of the process can affect the success of the overall implementation.

## 1.2 RESEARCH BACKGROUND AND MOTIVATION

Research on technology adoption (either at the individual or firm level) is one of the most mature domains in IS research (Venkatesh et al. 2007). However, the majority of research has focused predominantly on exploring determinants as a single course of action (i.e., a snapshot – a "yes or no" decision about whether to adopt or not to adopt) (Aguirre-Urreta and Marakas 2012) without considering other actions (e.g., information search, evaluation and trial). Such a narrow discussion prevents a holistic understanding of the technology adoption process especially for corporate-wide system adoption where the process of adoption decision is far more complex (Damanpour and Schneider 2006).

The criticality for understanding the adoption of corporate-wide systems is driven by several factors including: (i) the risk of making the wrong decision during the adoption process (Winters et al. 2008); (ii) the inability to observe the change in critical adoption factors during the adoption process (Law and Ngai 2007; Salim 2013); (iii) the inability to achieve adequate vendor involvement during the adoption process (Willcocks and Sykes 2000); (iv) the possibility of the firm switching to an alternative technology from another vendor as a result of not receiving adequate information during the early stage of the adoption process (Dubey and Wagle 2007); and (v) from the vendor's side, the inability to understand the reasons why some firms choose to drop out from the adoption process (Muscatello et al. 2003).

Studies investigating the inclusive view of corporate-wide system adoption are still scant. A number of studies, however, have recognised the importance of approaching technology adoption as a process (e.g., Aguirre-Urreta and Marakas 2012; Campbell et al. 2013; Choudhury and Karahanna 2008) by demonstrating how

the factors that influence technology adoption vary during the adoption process (i.e., in the progression from one stage to another). This is consistent with the existing propositions and hypotheses in the literature that the nature and importance of the antecedents of adoption are expected to vary across different adoption conditions (Rogers 1995). However, those studies have discussed technology adoption in relation to specific aspects, namely, simple technology adoption (e.g., electronic commerce or electronic channel adoption) or have captured the technology adoption factors within a single broad stage (e.g., pre-adoption, adoption) which neglects some important facts such as the changes in the importance levels of each factor from one condition to another condition. As a result of overlooking aspects that are most likely to be important from the perspective of the practitioner, businesses tend to abandon the adoption of new technologies if they feel they have not received adequate information from vendors during the early stages of the adoption process (Cisco 2012). This signifies the criticality of actions at the commencement of the adoption process and their importance in relation to the successful adoption of technology.

In order to better understand the process of technology adoption, we capitalise on the definition proposed by Rogers (1995, p.5) of technology adoption as "a process in which the technology is communicated through certain channels over time among the members of social systems". This view highlights the process and time elements that are essential in the adoption of new technology. However, studies investigating the inclusive view (i.e., explaining how and in what ways such a process should be conceptualised) of technology adoption are still scant.

Motivated by the paucity of research explaining technology adoption as a process view, the present study investigates how complex technology adoption (which in this study context refers to corporate-wide systems) is adopted through a multi-stage approach (i.e., process view). This approach is beneficial to researchers and prospective adopters (i.e., firms) as it: (i) enhances the understanding of how technology adoption is implemented by emphasising that each factor in each of the adoption stages has a different level of importance; and (ii) presents the justification as to why certain factors are either more important or less important in certain adoption stages.

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

This research was conducted by applying two theoretical lenses wherein the critical adoption factors were identified through the theory of planned behaviour (TPB) (Ajzen 1991) and the progression of each factor was observed through Ettlie's (1980) multi-stage adoption model. Two stages, namely, evaluation and trial, in Ettlie's model were selected for detailed investigation in this study. The selection of the evaluation and trial stages was based on the following reasons: (i) the evaluation and trial stages are the most critical stages in the process of adoption (Howard and Sheth 1969); (ii) a number of empirical studies have concluded that a large number of firms experience a "drop-off" from the adoption process as a result of receiving limited information on the system to be adopted (e.g., Arthur 1989; Au and Kauffman 2003); (iii) the evaluation and trial procedures have apparent differences (i.e., before and after experiencing the use of the technology) which enable us to observe the fluctuation in the significance of the adoption factors in two different conditions; and (iv) completing the evaluation and trial stages will lead organisations to the final adoption stage (i.e., prior to use) where they are expected to decide whether to go ahead or drop out from the process.

Our study contributes to current research in a fivefold manner. First, it provides a better understanding of the technology adoption process in organisations by emphasising that each factor in each adoption stage has a different level of importance. Second, we selected cloud ERP (as discussed in detail in Chapter 2, Section 2.6.6) and small and medium-sized enterprises (SMEs) as the context of our study in order to demonstrate the adoption process in an organisation. The outcome of this discussion will provide guidelines to both prospective adopters and vendors to better suit the adoption process. Third, we extend the use of TPB (individual adoption theory) for organisational technology adoption wherein the individuals who made the important decisions in the organisation's technology adoption process were selected for our data collection. Fourth, we demonstrate the application of a new theoretical lens of technology adoption whereby the adoption determinants are observed in two main stages (i.e., evaluation and trial), rather than a snapshot decision. Fifth, we present a detailed justification as to why certain factors are either more important or less important in the adoption stages that we selected for the observation.

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

## 1.3 RESEARCH CONTEXT

In explaining how the technology adoption process takes place in organisations, SMEs in Southeast Asia were selected as the respondents in this study. The process of collecting data occurred during a regional event where the respondents were mostly the owners of SMEs who were considering the adoption of cloud ERP. Selecting the right respondents was important, especially for the purpose of understanding the accurate reasons for adopting cloud ERP. As the data was gathered from respondents who were already engaged in technology adoption, care was taken to avoid positive bias towards the adoption process. Further justification on the rationale for selecting respondents who were already engaged in the adoption stages, particularly respondents who were in the evaluation and trial stages, is presented in Chapter 2 (Section 2.8.6).

SMEs were selected as the subject of investigation in this study because studies of this type of firm can generally produce evidence over a shorter period of time compared to studies of large organisations. Further, there is a trend for businesses including SMEs to use enterprise applications over the cloud-based platform, such as customer relationship management (CRM) systems (e.g., Salesforce.com), human resource management systems (e.g., the SAP SuccessFactors software product) and enterprise resource planning (ERP) systems (e.g., the SAP Business ByDesign software product). The availability of these cloud-based systems has impacted on SMEs as the subscription costs for such systems are low (Forrest and Barthold 2009) and they maintain the same functionality as on-premise systems (Koslowski and Strüker 2011). Further, considering the typical setting of SMEs that do not have an IT department, it is worthwhile to examine how the consultation services offered by cloud service providers could influence the adoption of cloud ERP. Cloud-based ERP systems (i.e., cloud ERP) were selected as the context of the study since this type of technology could provide the broad explanation of the adoption process. This is because the process of adopting cloud ERP (i.e., the decision-making prior to use) is not bound with any technology infrastructure which makes it convenient for the SME to adopt the system. In this research, the definition of cloud ERP is derived through an amalgam of the National Institute of Standards and Technology (NIST) (2011) conceptualisation of cloud computing and Markus et al.'s (2003) definition of ERP. Herein, cloud ERP is defined as commercial software packages that enable the

integration of business processes and transaction-oriented data throughout the organisation using a model that enables ubiquitous, convenient, on-demand network access within minimal management effort or service provider reaction.

Kampus Sultan Abdul Jalil Shah ptbupsi

## 1.4 PURPOSE OF THE STUDY, RESEARCH PROBLEM AND KEY RESEARCH QUESTIONS

The main purposes of this study are to: (i) identify the determinants that are important for SME decision-makers when deciding whether or not to adopt new and complex technology (in the context of this study, this technology is cloud ERP); (ii) enhance the understanding of complex technology adoption (i.e., the decision-making prior to use) through a detailed investigation of the steps involved, with a specific focus on the evaluation and trial stages; and (iii) show and explain the change in the determinants' importance at each adoption stage.

In doing so, this study contributes to the body of knowledge in several ways. First, it provides a better understanding of how decision-makers (i.e., in this context the SME owner) form and carry out the intention to adopt new technology. In providing this understanding, we identify the adoption determinants derived from the variables in TPB.

Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

For the purpose of illustrating how the levels of importance of these determinants change, we have selected cloud ERP as the context of this study. However, these determinants might also be applied for the adoption of other technology as the adoption process will remain the same for most of the phenomenon. Second, this study provides the justification as to why the level of importance of the adoption determinants – in particular, cloud ERP adoption determinants – will be either more important or less important in different adoption conditions (i.e., stages). Further discussion on how this observation will be done can be referred to in Chapter 6 (Section 6.1 ). Third, this study demonstrates the use of a new theoretical lens as we extend the examination of TPB into multi-stages and corporate-wide system adoption.

Despite a huge growth in the number of firms adopting cloud-based applications, a clear understanding of the organisational technology adoption process is essential as success stories for cloud providers are not always prevalent. It has been reported that there are a number of cloud providers who face challenges in

retaining customers for reasonable lengths of time (Chowhan and Saxena 2011). Hence, investigating the determinants of cloud ERP adoption (particularly for the period before the firm commits to the final decision) is a topic that has exceptional practical importance for cloud service providers in order to understand the demands of the firm. Studying the key determinants which enable the firm to adopt cloud ERP is not only interesting from the practitioner perspective, but also provides an ideal setting for studying organisational-level adoption decision stages from a theoretical point of view. This is still lacking, especially in the IS domain.

It is also noted that cloud-based applications offer features that make them different from on-premise corporate-wide systems. For example, according to Walther et al. (2013), cloud-based applications offer subscription-based services wherein there are no financial penalties if seamless service cancellation occurs. The payment model offered through cloud-based applications is in contrast with the classical licence-based model of on-premise ERP, where clients are usually contractually bound over a pre-determined period of time. Further, as cloud-based applications provide an opportunity for the client to use the product for a limited time period, the investigation needs to be undertaken in much greater depth than identifying only the snapshot view of the critical determinants.

The unique features of cloud-based applications do not disrupt the original adoption stages and determinants that are discussed in this study. The focus of this study is on observing the change in the importance level of the determinants in different conditions (i.e., stages). Motivated by the necessity to understand this phenomenon, we extend our understanding of the adoption process of corporate-wide systems through a multi-stage approach and observe the adoption determinants in the evaluation and trial stages. The study utilises TPB (Ajzen 1991) with the aim to identify the critical adoption determinants and Ettlie's (1980) multi-stage adoption model with the aim to observe changes in the level of importance of the adoption determinants. Having outlined this purpose, the research questions are as follows:

**Research Question 1:** What are the critical determinants that influence SME decision-makers to adopt cloud ERP?

This research question seeks to identify the critical determinants for the SME decision-maker when making the decision whether or not to adopt cloud ERP. The determinants that lead to the adoption intention are influenced by several factors

including objective data (e.g., financial condition, resource capabilities or infrastructure availability). However, this research takes the perceptual view of the decision-maker and behavioural-related determinants are the focus of the discussion. These behavioural-related determinants are identified through individual adoption theories. Moreover, these research questions will be answered using a linear approach which will be discussed further in Chapter 6 (Section 6.1 ).

**Research Question 2:** How do the levels of importance for each of the adoption determinants change as the adoption process progresses?

This research question focuses on an examination of the level of importance of the adoption determinants in different adoption stages. This question aims to provide an understanding of the extent to which the condition of the adoption stage affects the level of importance of each determinant. This research question also leads to the following sub-questions:

- How does the combination of TPB determinants influence the decision-maker's adoption decision?
- How does the condition of the stage impact the level of importance of the adoption determinants?

The first sub-question is designed particularly to explore whether the combination of TPB determinants (e.g., attitude and subjective norms) acts as a competitor or complement in the formation of the adoption intention. In order to observe how the combination of these determinants acts, a non-linear approach using the polynomial regression (Edwards and Parry 1993) and response surface analysis (Box and Draper 1987) are utilised. Further discussion on the non-linear approach will be discussed further in Chapter 5 (Section 5.2.8) and Chapter 6 (Section 6.1.2).

The second sub-question specifically aims to explore how the condition of the adoption process (e.g., evaluation stage) impacts upon the level of importance of attitude, subjective norms and perceived behavioural control. The examination of these determinants in different technology adoption stages could be performed in any number of contexts; however, this research focuses on SME decision-makers who are undergoing the evaluation and trial stages in the specific context of cloud ERP adoption.

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

## 1.5 RESEARCH SCOPE, DEFINITIONS AND SIGNIFICANCE

Technology adoption is undoubtedly a very broad topic and considerable effort is needed to set the scope of research in this area. This is especially so when a researcher seeks to approach the topic from different perspectives for the purpose of a comprehensive discussion. However, by scoping down the topic, the discussion can be accomplished in a more thorough and systematic manner. Within the technology adoption domain, the scope of the present study was sufficiently narrowed to identify the critical adoption determinants that influence SME decision-makers when they are in the process of making the decision whether or not to adopt a cloud ERP system. The process of adopting a corporate-wide system is quite complicated. Therefore, it was important to select the appropriate corporate-wide system in order to ensure that the objectives of the research could be met. Cloud ERP is a corporate-wide system that is becoming prominent, and the adoption of this type of system is not bound with the procedure of procuring and installing IT infrastructure. This flexibility allows the adopters to use the system on a trial basis before making the decision whether or not to adopt the system. From a research point of view, it allows us to explain the adoption stages in breadth. In parallel with the flexibility that cloud ERP systems offer, the decision-makers need to equip themselves with certain approaches that would guide them to make a sound decision. From a thorough archival analysis of the technology adoption literature (see Salim 2013), we found that one way of assisting the decision-maker to make a sound decision is by providing the understanding that technology adoption determinants have different levels of importance in different scenarios. Further, the literature shows that the element of time affects the level of importance of each adoption determinant. Thus, selecting cloud ERP as the context of our study enabled us to observe the adoption of complex technology in stages.

In the technology adoption research domain, technology adoption stages are widely discussed and are considered to be a broad topic. In order to set the scope for the discussion, we reviewed the definitions of technology adoption in the literature and found that Fichman and Kemerer (2012) provide the most suitable definition for our research. According to Fichman and Kemerer, technology adoption can be

described as the stages that happen prior to use, spanning from an organisation's awareness of technology through to its widespread deployment. From this definition, we made an early assumption that technology adoption involves the element of time and is a process consisting of several actions and steps. However, a review of the technology adoption literature indicates that the understanding of technology adoption as a process (Salim et al. 2014) is at a moderate stage of progress. Most of the studies primarily focus on a "yes or no" action (i.e., snapshot action) which covers only the last stage of the adoption process. Figure 1-1 provides an illustration of the technology adoption stages interpreted from the definition of Fichman and Kemerer (2012). As mentioned in the earlier discussion, the flexibility of cloud ERP that allows potential adopters to use the system on a trial basis (in the trial stage) makes this conceptualisation model (Figure 1-1) particularly relevant to cloud ERP adoption. Further, the proper distribution of the stages can be inferred from the actual adoption stages proposed by Ettlie (1980). In this study, however, we discuss the two most critical stages, namely, evaluation and trial (as discussed above in Section 1.2).

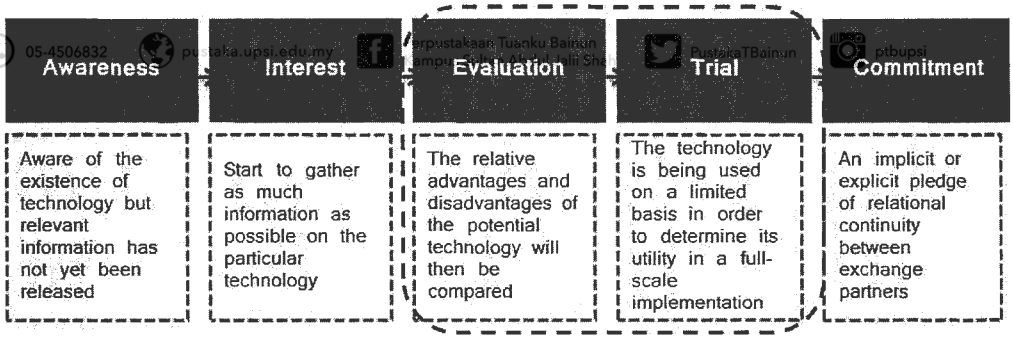


Figure 1-1: Conceptual stages of cloud ERP adoption

A number of studies (e.g., Campbell et al. 2013; Karahanna et al. 1999; Pavlou and Fygenson 2006) discuss the distribution of stages in a quite similar way to the focus of our research (see Chapter 2, Sections 2.6.9 and 2.6.10). However, their discussion is at a high level and focuses on broader adoption stages (i.e., pre-adoption, adoption and post-adoption). In our research, we aim to identify the critical determinants for cloud ERP adoption and relate these determinants to the key adoption stages. By integrating the discussion (i.e., determinants and stages), we aim to make significant contributions for research and practice. First, it provides a better understanding of how SMEs in general and decision-makers in particular go through

the process of adopting cloud ERP. This understanding is obtained by providing a clear picture of what the decision-makers actually do and thereby how to influence them in response to the specific decision-making processes they undertake. An illustration of this is achieved by emphasising that the influencing factor (i.e., determinant) changes its importance as the adoption process progresses. Second, it presents the justification as to why certain factors will be either more important (i.e., superior) or less important (i.e., inferior) during certain adoption stages. An understanding on the superiority and inferiority of the adoption determinants is especially important for the vendor who can use this understanding to maximise their marketing strategy whilst engaging with new or existing customers. Third, the study demonstrates a new way of presenting technology adoption determinants which leads to new theoretical contribution to technology adoption studies in general and cloud ERP adoption studies in particular. Offering a new theoretical lens does not provide any meaningful contribution if there is no specific benefit which could be gained from it. Hence, this study not only provides a new way of demonstrating technology but also offers practical contributions.

## 1.6 UNIT OF ANALYSIS

Pinsonneault and Kraemer (1993) classify the unit of analysis into six different levels as follows:

1. Individual level
2. Work group level
3. Department level
4. Organisational level
5. Application or system level
6. Project level.

The objective of this research is to identify and observe changes in the importance level of the key determinants that influence decision-makers when they are deciding whether or not to adopt cloud ERP. As such, the empirical data relating to the constructs in our conceptual model was gathered at the individual level. However, the decision made by this single person represents the firm wholly. Thus, the unit of analysis of the present study is the individual level of adoption. This is also in line with the level of abstraction provided by the theoretical lens employed in this research (i.e., TPB).

## 1.7 RESEARCH DESIGN

Research design refers to consistent plans that outline the key steps of a research project, such as conceptualisation, research model development, data collection, data analysis and results. Figure 1-2 illustrates the key steps of this research project.

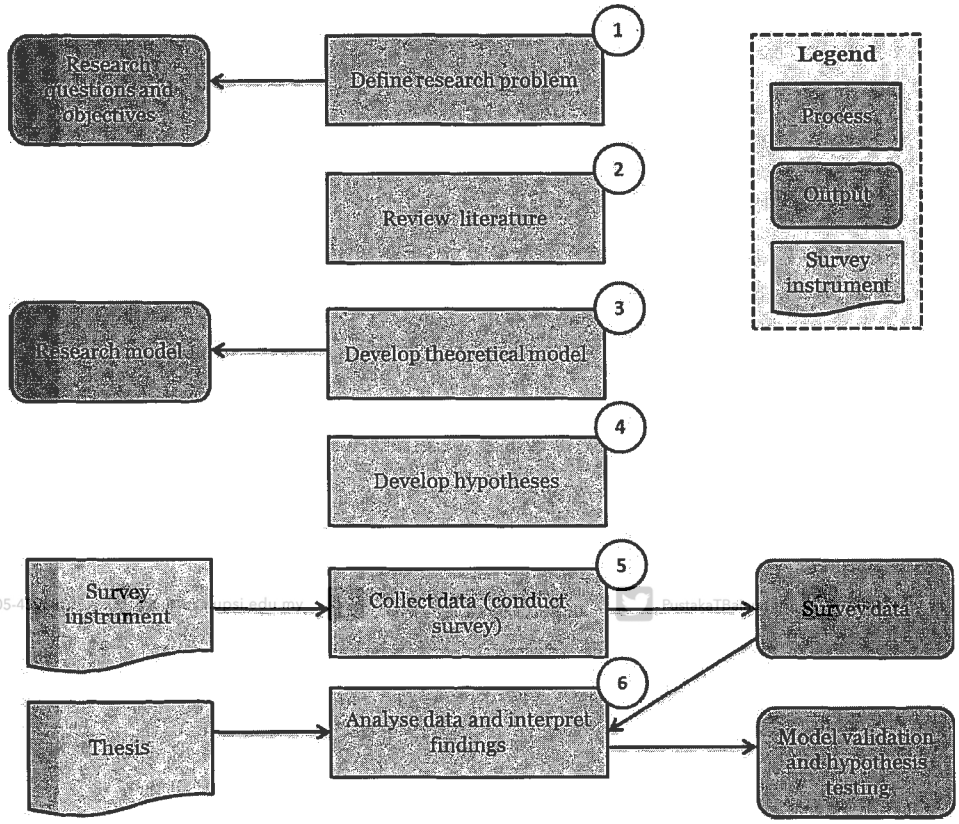


Figure 1-2: Key steps in the research project

As shown in Figure 1-2 above, the design of this research comprises six main steps: (1) research definition; (2) literature review; (3) theoretical/conceptual model development; (4) hypotheses development; (5) data collection through a survey; and (6) analysis of data and interpretation of findings. In Figure 1-2, the rectangular boxes represent the different stages of the research process. The arrows that link the boxes refer to the direction in which information flows in each step. The remaining two boxes (see the legend) represent the outputs and the documents generated during the research process.

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi