

**RESEARCHING END-USERS' INTENTION TO USE
AND USAGE OF ERP SYSTEM: A REPLICATION
AND EXTENSION OF UTAUT MODEL**

KEONG MEI LING

**UNIVERSITI SAINS MALAYSIA
2008**

**RESEARCHING END-USERS' INTENTION TO USE AND USAGE OF
ERP SYSTEM: A REPLICATION AND EXTENSION OF UTAUT
MODEL**

by

Keong Mei Ling

**Research report in partial fulfillment of the requirements of the degree of
Master in Business Administration**

MAY 2008

ACKNOWLEDGEMENT

I would like to express my sincere gratitude and appreciation to my research supervisor, Associate Professor T. Ramayah for his valuable advice and support in this study.

I would like to dedicate my deepest thanks to my beloved parents, husband and kids who have given full support and encouragement that enable me to complete this project.

Lastly, I would like to extend my appreciation to all that have participated and contributed their time and effort in this survey and provide meaningful feedback to the current study.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENT	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	vii
LIST OF FIGURES	ix
ABSTRAK	x
ABSTRACT	xii
CHAPTER 1 INTRODUCTION	1
1.1 Introduction	1
1.2 Problem Statement	3
1.3 Research Objectives	4
1.4 Research Question	5
1.5 Significance of the Study	5
1.6 Scope of Study	6
1.7 Definition of key variables	6
1.7.1 Enterprise Resource Planning (ERP)	6
1.7.2 Intention to Use and Usage	7
1.7.3 Performance expectancy	7
1.7.4 Effort expectancy	7
1.7.5 Social Influence	7
1.7.6 Facilitating Conditions	7
1.7.7 Shared Belief	8
1.7.8 Training	8
1.7.9 Communication	8
1.8 Organization of the remaining chapters	8
CHAPTER 2 LITERATURE REVIEW	9
2.1 Introduction	9
2.2 Enterprise Resource Planning System	9
2.3 Unified Theory of Acceptance and Use of Technology (UTAUT)	11
2.3.1 Theory of Reasoned Action (TRA)	13
2.3.2 Technology Acceptance Model (TAM), and TAM2	14
2.3.3 Theory of Planned Behavior (TPB)	15
2.3.4 Combined TAM-TPB (C-TAM-TPB)	16
2.3.5 Model of Personal Computer Utilization (MPCU)	17

2.3.6	<i>Innovation Diffusion Theory (IDT)</i>	19
2.3.7	<i>Social Cognitive Theory (SCT)</i>	21
2.3.8	<i>Motivational Model (MM)</i>	23
2.4	Performance Expectancy	23
2.5	Effort Expectancy	24
2.6	Social Influence	25
2.7	Facilitating Conditions	25
2.7.1	<i>Shared Belief</i>	26
2.7.2	<i>Training</i>	27
2.7.3	<i>Communication</i>	28
2.8	Moderators	28
2.8.1	<i>Gender</i>	28
2.8.2	<i>Age</i>	29
2.8.3	<i>Experience</i>	31
2.8.4	<i>Voluntariness of use</i>	32
2.9	Behavioral Intention, Use Behavior and Intention to Use	32
2.10	Theoretical Framework	33
2.11	Research Hypotheses	34
2.11.1	<i>Performance Expectancy</i>	34
2.11.2	<i>Effort Expectancy</i>	35
2.11.3	<i>Social Influence</i>	36
2.11.4	<i>Facilitating Conditions</i>	36
2.11.5	<i>Behavioral Intention</i>	37
2.12	Summary	38
CHAPTER 3	METHODOLOGY	39
3.1	Introduction	39
3.2	Population and Sample	39
3.3	Variable and Measurement	39
3.4	Data collection	41
3.5	Statistical Data Analysis	42
3.5.1	<i>Goodness and Correctness of Data Entry</i>	42
3.5.2	<i>Factor Analysis</i>	42
3.5.3	<i>Validity and Reliability</i>	43
3.5.4	<i>Descriptive Analysis</i>	44
3.5.5	<i>Regression Analysis</i>	44

CHAPTER 4 ANALYSIS AND RESULTS	47
4.1 Introduction	47
4.2 Profile of respondents	47
4.3 Factor analysis and Reliability analysis	49
4.3.1 <i>Factor Analysis</i>	49
4.3.2 <i>Reliability Testing</i>	52
4.3.3 <i>Mean and standard deviations of the variables</i>	53
4.4 Correlation Matrix and Multiple Regression Analysis	54
4.4.1 <i>Intercorrelations</i>	54
4.5 Result Summary.	61
CHAPTER 5 DISCUSSIONS AND CONCLUSION	63
5.1 Introduction	63
5.2 Recapitulation of study findings	63
5.3 Discussion	64
5.3.1 <i>Performance expectancy</i>	65
5.3.2 <i>Effort expectancy</i>	66
5.3.3 <i>Social Influences</i>	67
5.3.4 <i>Facilitating condition</i>	68
5.3.4.1 <i>Shared Beliefs</i>	68
5.3.4.2 <i>Training-Communication</i>	69
5.3.5 <i>Behavior intention and usage</i>	71
5.3.6 <i>Moderator effect</i>	71
5.3.6.1 <i>Age</i>	71
5.3.6.2 <i>Gender</i>	72
5.3.6.3 <i>Experience</i>	73
5.4 Implication of the study	75
5.5 Limitation	80
5.6 Suggestion for future research	81
5.7 Conclusion	81

REFERENCES	83
-------------------	-----------

APPENDICES

Appendix A Questionnaire	89
--------------------------	----

Appendix B Factor Analysis	94
----------------------------	----

Appendix C Reliability Analysis	98
---------------------------------	----

Appendix D Correlation	102
------------------------	-----

Appendix E Multiple Regression Analysis	103
---	-----

LIST OF TABLES

Table 4.1	Frequency Count and Percentage of Respondents profile	47
Table 4.2	Rotated Factors and Factor Loadings for the Items to measure constructs performance expectancy, effort expectancy and Social Influences.	50
Table 4.3	Rotated Factors and Factor Loadings for the items to measure constructs behavioral intention and facilitating conditions	52
Table 4.4	Reliability of the instruments	53
Table 4.5	Descriptive of the main variables	54
Table 4.6	Intercorrelations of the study variables	55
Table 4.7	Summary of Regression analysis between dependent variable, behavioral intention and independent variable, and gender as moderator	56
Table 4.8	Summary of Regression analysis between dependent variable, behavioral intention and independent variable, and age as moderator	57
Table 4.9	Summary of Regression analysis between dependent variable, behavioral intention and independent variable, and experience as moderator	58
Table 4.10	Moderating effect of ERP usage experience between effort expectancy and behavioral intention	59
Table 4.11	Summary of Regression analysis between usage as dependent variable and behavior intention, shared beliefs and training-communication as independent variables	60

Table 4.12	Summary of Regression analysis between usage as dependent variable and shared beliefs and training-communication as independent variables, and age as moderator	61
Table 4.13	Summary of Regression analysis between usage as dependent variable and shared beliefs and training-communication as independent variables, and experience as moderator	61
Table 4.14	Summary of hypothesis testing	62
Table 5.1	Result of testing adjusted UTAUT model in Malaysia context	64

LIST OF FIGURES

		Page
Figure 1.1	Worldwide Enterprise Applications License, Maintenance and Subscription Revenue by Vendor, 2004-2006 (\$M)	2
Figure 2.1	ERP – Master Process Flow Diagram	10
Figure 2.2	Unified Theory of Acceptance and Use of Technology Model	13
Figure 2.3	Theory of Reasoned Action (TRA) Model	13
Figure 2.4	Technology Acceptance Model (TAM)	15
Figure 2.5	Theory of Planned Behavior (TPB) Model	16
Figure 2.6	C-TAM-TPB Model	17
Figure 2.7	MPCU model	17
Figure 2.8	Factors Influencing Utilization of PC (adapted from MPCU)	18
Figure 2.9	The Diffusion Process	20
Figure 2.10	Basic SCT Model	21
Figure 2.11	Model for Utilization derived from SCT	22
Figure 2.12	Research Model	33
Figure 3.1	Measurement Scales and Source	40

ABSTRAK

Sistem Enterprise Resource Planning (ERP) telah menjadi semakin penting bagi organisasi yang bertujuan membina kecekapan, memajukan operasi, membantu pengurusan membuat keputusan dan bersaing di dunia perniagaan antarabangsa. Sebenarnya, sistem ERP telah menjadi keperluan untuk perniagaan multi-nasional yang memdirikan banyak subsidiari dan kilang di banyak negara. Sekarang, penggunaan sistem ERP sudah mula di Malaysia terutamanya perniagaan dari Malaysia yang ingin menaikkan keupayaan persaingan mereka di arena antarabangsa. Walaubagaimanapun, pelaksanaan sistem ERP dari masa lepas telah menunjukkan kadar kegagalan yang tinggi dan satu daripada factor kegagalan ialah tentangan pengguna untuk mengguna sistem ERP. Dengan itu, kajian ini telah dibuat untuk mencari factor-faktor penting yang menyebabkan pengguna di Malaysia mengguna sistem ERP. Kajian ini telah dibuat berdasarkan model 'Kesatuan teori dalam penerimaan dan penggunaan teknologi' atau 'UTAUT' (Venkatesh et al., 2003) dengan sedikit penyesuaian. Borang soal selidik telah digunakan. Sejumlah 350 borang soal selidik telah diedarkan kepada pekerja-pekerja di Pulau Pinang and sejumlah 158 borang soal selidik dipulangkan dengan jawapan yang boleh digunakan untuk analisis dan ini memberikan kadar maklum balik sebanyak 45.1%. Keputusan kajian ini menunjukkan pembolehubah "kemudahan penggunaan" dan pembolehubah "pengaruh sosial" memainkan peranan yang penting dalam menentukan "niat" untuk menggunakan sistem ERP dan "pengalaman" adalah faktor pembolehubah penyederhana yang penting dalam perhubungan di antara "kemudahan penggunaan" dan "niat" untuk menggunakan system ERP. Namun demikian, lain-lain faktor seperti pembolehubah "berfaedah", "kepercayaan berkongsi", "latihan" dan "komunikasi" mempunyai kesan yang tidak penting terhadap keinginan dan penggunaan sistem ERP. Lain-lain faktor penyederhanaan seperti jantina dan usia juga didapati tidak mempunyai kesan penting. Keputusan dari kajian ini memberi makna kepada pengurusan untuk

memberikan perhatian kepada “kemudahan penggunaan” dan “pengaruh social” semasa merancang dan menjalankan strategi untuk mengalakkan penggunaan sistem ERP. Tambahan pula, keputusan kajian ini juga boleh digunakan sebagai informasi penting oleh pembekal perisian ERP untuk rekaan dan memasarkan perisian ERP mereka di pasaran Malaysia.

ABSTRACT

Enterprise Resource Planning (ERP) system has become increasingly important for organization to build strong capabilities, improve operation performance, improve business decision making and to compete in the global business context. In fact, ERP system has become necessity especially for multinational companies that have establishments in various countries. Now, adoption of ERP system has started in Malaysia local companies that intend to increase their competitiveness in global market. However, ERP implementation has historically shown to have high failure rate and one of the important factors causing failures is users' resistance to use ERP system. Thus, this study attempt to find out the important factors that affect end users' intention to use and actual use of ERP system in Malaysia context. The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) theory with little adjustment was used as the basis of this study. Questionnaires was used and a total of 350 surveys were distributed to working adults in Malaysia and a total of 158 useful responses were received, yielded 45.1% response rate. This study concluded that effort expectancy and social influence both play an important role in affecting behavioral intention to use ERP system and experience play an important moderating role in relationship between effort expectancy and intention to use ERP system. However, other factors such as performance expectancy, shared beliefs, training and communication have insignificant impact towards intention to use and ERP usage. Other moderating factors such as gender and age also found to be insignificant in the above relationship. The result of current study implied that management should place considerable attention to effort expectancy and social influence when plan and execute strategies to encourage ERP usage before, during and after ERP implementation. In addition, the current result also serves as important information for ERP software providers to design and promote their ERP software package for Malaysia's market.

CHAPTER 1

INTRODUCTION

1.1 Introduction

In today's competitive business environment, companies strive to meet the increase competition and growing customer expectations. To achieve higher profit and greater revenue, more and more companies aim for globalization and lower total cost in the entire business chain. In this context, Enterprise Resource Planning (ERP) becomes an important tool for the company to build strong capabilities, improve performance, undertake better decision making and achieve competitive advantage (Al-Mashari & Al-Mudimigh, 2003). Nonetheless, many argue that ERP is not about IT (Information Technology) or software but it's about how business is carried out. The adoption of ERP expects to enable business process reengineering, establish common data and practices, establish Single Entry-Single Source, establish End-to-End process connectivity, provides backbone to leverage best commercial business practices and most importantly it enhances the speed and accuracy in making important business decision. The process of implementation of ERP system forces organizations to develop more understanding and knowledge on their core capabilities and make necessary changes to business processes thus allowing organization to grab the opportunity to attain and maintain positions as market leaders (Bendoly & Schoenherr, 2005). In short, ERP allows businesses to respond quickly to new revenue opportunities and competitive threats.

ERP systems are highly complex and the implementation of these systems is a challenging project and involves a high level of investment that requires high demand on corporate time and resources (Sarkis and Gunasekaran, 2003). As quoted by Beatty & Williams (2006), the cost of a typical ERP implementation in a Fortune 500 company was estimated as between

\$40 million and \$240 million. As reported in the latest IDC report dated August 2007, worldwide enterprise application market hit \$81.8 billion revenue in year 2006 which was 9.1% growth rate. Furthermore, the enterprise applications market is expected to experience further growth and it will top \$112.8 billion at a compound annual growth rate (CAGR) of 6.6% over the next five years (2007 till 2011). As highlighted in the IDC report, the high growth rate was partly due to high ERP adoption rate in Asia/Pacific, Eastern Europe, Latin America, and the Middle East when these fast-growing regions start replicating their Western counterparts by reengineering their business processes and optimizing their ability to manage people, assets, and global risks in their bids to become world-class organizations. IDC's latest report shown that the top five major ERP vendors gaining the most market shares in year 2006 are SAP, Oracle, Microsoft, Sage Group and Infor (see Figure 1.1 below).

Worldwide Enterprise Applications License, Maintenance, and Subscription Revenue by Vendor, 2004–2006 (\$M)

	2004	2005	2006	2006 Share (%)
SAP	6,077.1	6,943.5	7,736.1	9.45
Oracle	4,612.7	4,146.4	4,803.1	5.87
Microsoft	1,686.7	1,800.8	1,978.1	2.42
Sage Group	1,625.0	1,710.0	1,860.2	2.27
Infor	1,352.2	1,466.3	1,556.7	1.90

Figure 1.1: Source IDC, June 2007

However, due to the complexity of ERP set up and cross functional nature, implementing ERP is not always successful (Scott and Vessey, 2002). Furthermore, failure rate of ERP implementations is very high. In 1996, FoxMeyer Drug, a \$5 billion wholesale drug distribution company, argued that major problems faced that lead to their bankruptcy were due to a failed ERP system (Scott and Vessey, 2002). Furthermore, in an information

technology survey by the Standish Group in 2003 (as quoted by Brown and Nasuti, 2005), overall IT project success rates have only recently improved to 34 percent, which is still extremely low. Today, not only multinational companies invest in ERP, increasing number of SMEs (Small and Medium Enterprise) also look into ERP application. According to New Strait Times reported on 9th July 2007, SAP has 350 customers in the Malaysia, with more than half are from the SME segment. In fact, SME market already accounts for 80 per cent of Oracle's 25,000-strong customer base in Asia (January 2007, Computerworld).

1.2 Problem Statement

In ERP projects, employees have to shift their thinking and learn new ways of completing the job. Hence, getting employees to use ERP so as to improve the ways they carry out their jobs is by far the harder challenge. If they are resistant to change, then the ERP project is more likely to fail. According to an in-depth interviews performed by Deloitte & Touche with 164 individuals at 62 Fortune-500 companies (The Review, Maximizing the Value of ERP Enabled Processes, Deloitte & Touche, 18 Jan. 1999), 62% of the respondents cited people issues as the prime problem when taking ERP to live. (as quoted by Krasner, 2000). According to Aladwani (2001), many ERP systems faced implementation difficulties because of end users' resistance. Yi and Davis (2001) also noted that organizations will not realize desired returns from their investments in information technologies unless users are able to use them. In a report filed by Cooke and Peterson (1998), 186 companies that implemented large system found that resistance is the second most important contributor to time and budget overruns and is the fourth most important barrier to implementation (as quoted by Klaus, Wingreen & Blanton, 2007). According to the Standish Group report, the average purchase price for a single ERP application is USD1.3 million, with the cost to implement averaging at USD6.4 million (Standish Group, 2002). According to Saran, C.

(2006) reported in Computer Weekly on March 2006, Butler Group's senior research analyst, Teresa Jones commented that "ERP is complex and getting end-users in the business to use it is still a big challenge." In the same report, Butler Group revealed the results of ERP survey in 60 large organizations and reported that organizations only running 50% of the functionality implemented in their ERP system. Thus, in view of the high cost of investment and low utilization of system rate, it is thus critical for organization to understand the important variables to enhance the intention to use and actual usage of ERP system among the end users.

1.3 Research Objectives

The objective of this study is to identify the important factors that affect the end-user intention to use and usage of ERP systems in Malaysia using the Unified Theory of Acceptance and Use of Technology (UTAUT). This model integrated elements across eight models and was first proposed by Venkatesh, Morris, Davis and Davis in 2003. This paper evaluates the factors that make up UTAUT and eventually proposes an adjusted UTAUT model. Thus, this study examine three direct determinants of intention to use (performance expectancy, effort expectancy and social influence) and four direct determinants of usage behavior (intention and facilitating conditions represented by shared belief, training and communication) and lastly the moderating influences of age, gender and experience. In summary, the objectives are:

1. To test the applicability of extended UTAUT model in Malaysia, in particular usage of ERP system.
2. Identify major factors that impact intention to use and ERP usage in Malaysia.
3. Identify the moderating effect of age, gender and experience on intention to use and ERP usage in Malaysia.

1.4 Research Question

Base on the above research objectives, this study attempt to answer the following research questions:

1. Does performance expectancy affect end-users' intention to use ERP system?
2. Does effort expectancy affect end-users' intention to use of ERP system?
3. Does social influence affect end-users' intention to use of ERP system?
4. Does intention to use ERP system affect end-users' usage of ERP system?
5. Do facilitating conditions affect end-users' usage of ERP system?
6. Do gender and age moderate the relationship between the performance expectancy, effort expectancy and social influence with end-users' intention to use ERP system?
7. Do experience moderate the relationship between the effort expectancy and social influence with end-users' intention to use ERP system?
8. Do age and experience moderate the relationship between the facilitating conditions and usage of ERP system?

1.5 Significance of the Study

Although many studies have done in analyzing ERP implementation at an organization or industry level, there is a dearth in research in ERP system adoption at the individual or user level. While the remaining studies found that examine acceptance of ERP system, not many include in their studies the moderating effects of gender, age and experience. Due to this, this study adapted UTAUT model to investigate the main factors contributed to intention to use and actual usage of ERP system in Malaysia including the moderating roles play by gender, age and experience. With the increasing adoption of ERP among SME industries in Malaysia, the outcome of the study would help to provide a clearer picture to management

team what are the main areas that they should focus when they attempt to increase the usage or intention to use the ERP system newly implemented in the company. Besides, the result of the study should view as knowledge for existing companies in Malaysia who intend to implement ERP system to increase process efficiency and competitive advantage among the local and international market Finally, the result of this study shall reveal the explanation power of UTAUT model in examining the intention to use and usage of ERP system among end users in Malaysia.

1.6 Scope of Study

The scope of the study is to examine selected independent variables in UTAUT model in explaining intention to use and usage of ERP system. The major independent variables tested are performance expectancy, effort expectancy and social influence affect intention to use ERP system. This study also examines the impact of intention to use and facilitating conditions on actual usage of ERP system. Next, as propose by UTAUT model, this study examines the impact of moderating variables (age, gender and experience) on intention to use and actual usage of ERP system. The samples selected for this study are employees of various industries in Malaysia which have adopted ERP system. The duration of data collection is estimated between one to two months with target useful samples of 100 sets or more.

1.7 Definition of key variables

1.7.1 Enterprise Resource Planning (ERP)

ERP is a packaged software system that enable an organization automate and integrate the majority of its business process, share common data and practices across the enterprise and

produce and access information in a real-time environment which enable information enter to system only once (Marnewick & Labuschagne, 2005).

1.7.2 Intention to Use and Usage

In information system context, behavioral intention is the intention of end-user to make use of the new technology (Amako-Gyampah & Salam, 2004). Usage is the actual use of ERP system.

1.7.3 Performance expectancy

Performance expectancy is the degree to which an individual believes that using the system will help him or her to attain gains in job performance (Venkatesh et al., 2003).

1.7.4 Effort expectancy

Effort expectancy is the degree to which a person believes that using a system would be free of effort (Venkatesh et al., 2003).

1.7.5 Social Influence

Social influence is the degree to which an individual perceives that those people important to him or her believe that he or she should use the new system (Venkatesh et al., 2003).

1.7.6 Facilitating Conditions

Facilitating conditions is the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system (Venkatesh et al.2003).

1.7.7 Shared Belief

Shared beliefs are those beliefs that organizational stakeholders share with their peers and managers about the benefits of ERP systems.

1.7.8 Training

Training refers to the acquisition of knowledge, skills, and competencies to understand and use ERP system via a teaching process.

1.7.9 Communication

Communication is the formal promotion of project teams and the advertisement of project progress to the rest of the organization (Holland et al., 1999)

1.8 Organization of the remaining chapters

The remainder of the thesis is organized as follows: Chapter 2 presents the literature review on ERP system, UTAUT model and the relevant variables. In the same chapter, theoretical framework and the hypothesis are developed. Chapter 3 discusses the research methodology used in this thesis. Chapter 4 lay out the analysis of data collected and the result and finally a detail discussion on the finding, limitation and conclusion is included in Chapter 5.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature and research in support of this study. The main areas that are discussed are ERP system, the theoretical models reviewed and consolidated into UTAUT model, UTAUT's main constructs and its moderating variables.

2.2 Enterprise Resource Planning System

According to a conceptual model for ERP written by Marnewick and Labuschagne (2005), ERP is packaged software that enables an organization to automate and integrate the majority of its business processes, share common data and practices across the enterprise and produce and access information in a real-time environment. ERP system consists of several generic modules i.e. finance, human resources, supply chain management, supplier relationship management, customer relationship management and business intelligence (Marnewick & Labuschagne, 2005). This database collects data from, and feeds data into, modular applications supporting virtually all of a company's business activities – across functions, across business units and across the world (Wu & Wang, 2006). ERP has been promoted as a desirable and critical link for enhancing integration between all functional areas within the manufacturing enterprise, and between the enterprise and its upstream and downstream trading partners. (Muscatello, Small & Chen, 2003). During the process, ERP implementation environment was affected by numerous software and technology systems available to managers, the complexity of the requirements from those systems and the need to adapt any existing or future software to the core ERP technology (Amaoko-Gyamph, 2007). Figure 2.1 shows that all the software components of various functions are integrated

and information flows from one software component to another (Marnewick & Labuschgne, 2005):

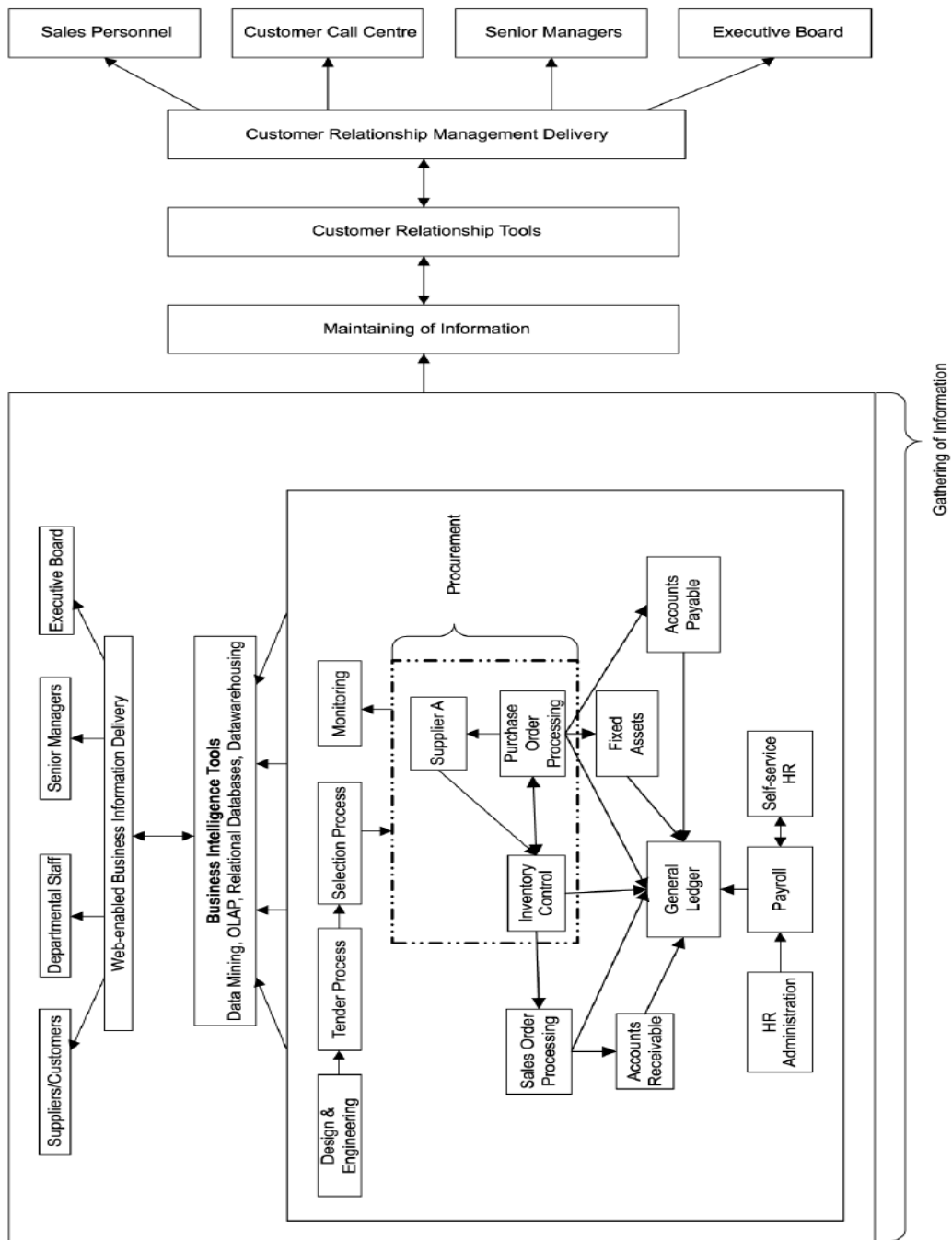


Figure 2.1: ERP – Master Process Flow Diagram (adopted from Marnewick and Labuschagne, 2006)

With ERP system, as shown in the process flow above, information entered in one place will automatically updated to all modules at once. Thus, ERP system reduces redundancies by

eliminate multiple points of entries by different parties, ensures higher accuracies and enables real time updates of information for better decision making.

2.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

Many theories were developed to investigate the technology acceptance in the IS (Information System) literature. The research model which will be developed and tested in this study primarily adapted from the Unified Theory of Acceptance and Use of Technology (UTAUT) model developed by Venkatesh et al. (2003).

UTAUT model was empirically validated in four organizations of different industries and found to outperform the eight individual models as able to explain 69% of technology acceptance behavior, a considerable improvement compared to previous individual models. (Venkatesh et al. 2003). Subsequently UTAUT model was cross-validated in two new organizations and found the similar result i.e. explain 70% of the variance in user intentions to use Information System and subsequent usage behavior (Venkatesh et al., 2003). This is a major improvement compared with using individual models which explained between 17% and 53% of the variance in user intentions to use information technology (Venkatesh et al., 2003). In another test of five models individually (TAM, TAM2, PCI – Perceived Characteristics of Innovating, TPB and MPCU) by Riemenschneider, Hardgrave and Davis (2002) on IS usage intention, adjusted R^2 was from 50% to 58%. Four significant variables found are usefulness, subjective norm, voluntariness and compatibility but none of the five original models tested contained all four significant intention determinants (Riemenschneider et al. 2002). In this juncture, UTAUT model not only addressed all the above important variables (i.e. usefulness similar with performance expectancy, subjective norm similar with social influence; compatibility similar with facilitating condition and voluntariness), it added another four moderating variables which

provide a clearer picture to assist management in strategize ERP acceptance among end-users. As quoted by Lee et al. (2003), integration efforts are required to obtain a better understanding of IT adoption (Hu et al., 1999). In view of this, UTAUT model was adapted in this study in search of the important variables on usage behavior of ERP system. A brief explanation on the eight models that was consolidated into UTAUT model is included in the following sections.

As noted by King & He (2006), in their meta-analysis of 88 TAM studies, the most comprehensive narrative review of the TAM literature is by Venkatesh et al. (2003). In his paper, Venkatesh et al. (2003) proposed UTAUT model which was developed through a review and consolidation of 32 constructs of eight models that earlier research had employed to explain Information System usage behavior, namely theory of reasoned action (TRA), technology acceptance model (TAM), motivational model (MM), theory of planned behavior (TPB), combined theory of planned behavior/technology acceptance model (C-TAM-TPB), model of PC utilization (MPCU), innovation diffusion theory (IDT) and social cognitive theory (SCT). In formulating the main constructs of UTAUT model, Venkatesh et al. (2003) theorized that four independent variables play significant role as direct determinants of user acceptance and usage behavior i.e. performance expectancy, effort expectancy, social influence and facilitating conditions. Venkatesh et al. (2003) completed UTAUT model by added in 4 moderating factors which are age, gender, experience and voluntariness. The final UTAUT model is shown as Figure 2.2 below:

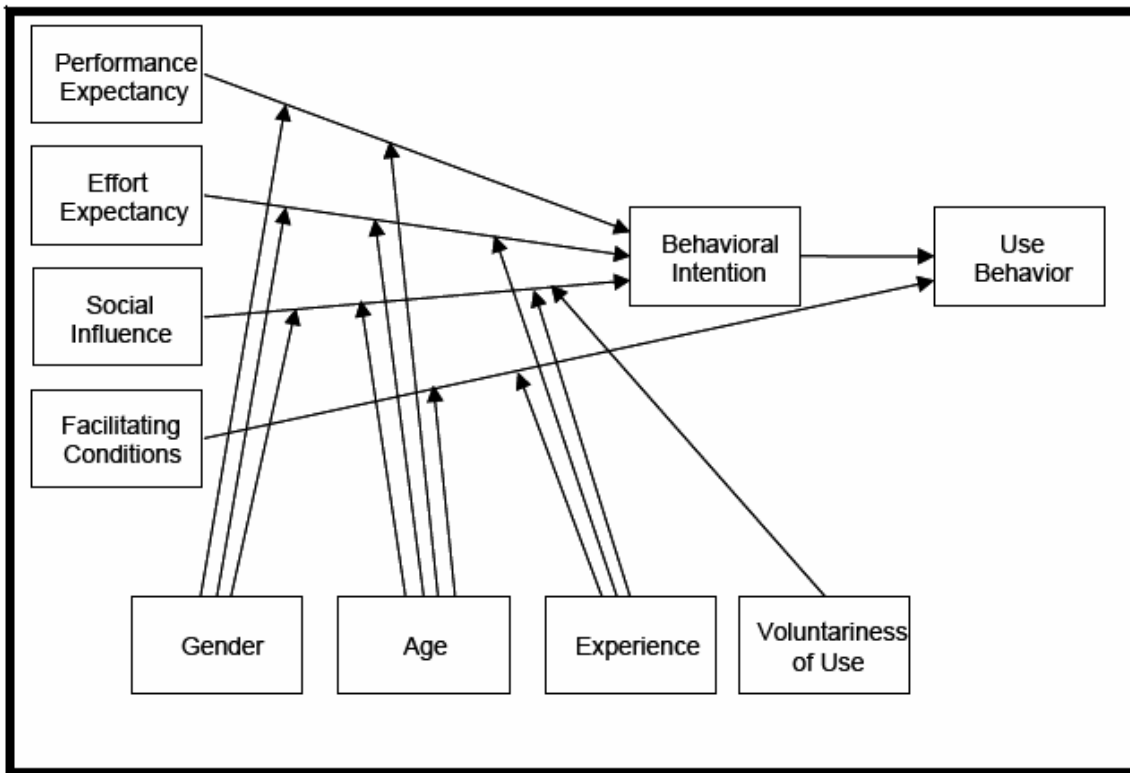


Figure 2.2: Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003)

2.3.1 Theory of Reasoned Action (TRA)

Derived from the social psychology setting, theory of reasoned action (TRA) is one of the most fundamental and influential theories of human behavior (Venkatesh et al., 2003) TRA was first proposed by Fishbein & Azjen (1975) and it is made up of three major constructs, namely behavioral intention, attitude, and subjective norm. (see Figure 2.3)

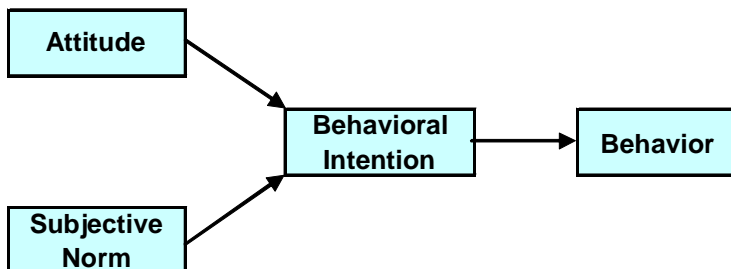


Figure 2.3: Theory of Reasoned Action (TRA) (Fishbein & Azjen, 1975)

TRA suggests that a person's behavioral intention depends on the person's attitude about the behavior and subjective norms ($BI = A + SN$). If a person intends to perform a behavior then it is likely that the person will do it. Attitude toward the behavior is defined as the individual's positive or negative feelings about performing the behavior (Fishbein and Ajzen 1975, p.216). The next main construct in TRA, subjective norm, is defined as "the person's perception that most people who are important to him or her think he should or should not perform the behavior in question" (Fishbein and Azjen 1975, p.302). Put into simple terms, TRA posits that a person's voluntary behavior is predicted by his/her attitude toward that behavior and how he or she thinks other people would view them if he/she performed the behavior. However, Ajzen commented that TRA is ill equipped to predict situations in which individuals have low levels of volitional control. (Ajzen, 1985).

2.3.2 Technology Acceptance Model (TAM), and TAM2

Technology Acceptance Model (TAM) is one of the most influential models used in explaining the acceptance of information technology (IT) (Lee et al., 2003). According to TAM (Davis, 1989), perceived usefulness (PU) and perceived ease of use (PEU) of IT are two major determinants of IT usage. PU defined as the extent to which a person believes that using the system will enhance his or her job performance and PEU defined as the extent to which a person believes that using the system will be free of effort. TAM posits that computer usage is determined by a behavioral intention to use a system, where the intention to use the system is jointly determined by a person's attitude toward using the system and its perceived usefulness (see Figure 2.4). In Davis (1989), as learning progressed over time, the concern on perceive ease of use is less salient.

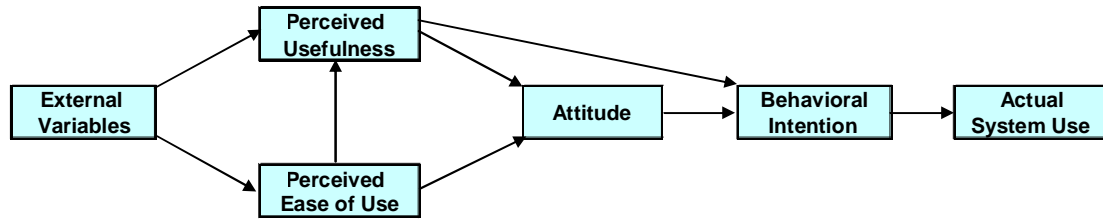


Figure 2.4: Technology Acceptance Model (TAM) (Davis, 1993)

However a major assumption underlying TAM is voluntary usage. In ERP implementation, mandatory usage throughout the organization is required. This is necessary since the system integrates data to produce organizational reports useful for managers; these reports would not be very useful if only some departments used the system while others entered data elsewhere (Klaus et al. 2007). TAM2 has thus included subjective norm as an additional predictor of intention in the case of mandatory settings (Venkatesh and Davis, 2000). However, in a comparison of five theoretical models on theory of acceptance, Riemenschneider et al (2002) found that apart from usefulness (significant across five models), subjective norm, voluntariness and compatibility were found significant determinant of end user acceptance.

2.3.3 Theory of Planned Behavior (TPB)

Ajzen (1985) extended TRA by adding the construct of perceived behavioral control to form TPB to cover volitional behaviors for predicting behavioral intention and actual behavior (see Figure 2.5).

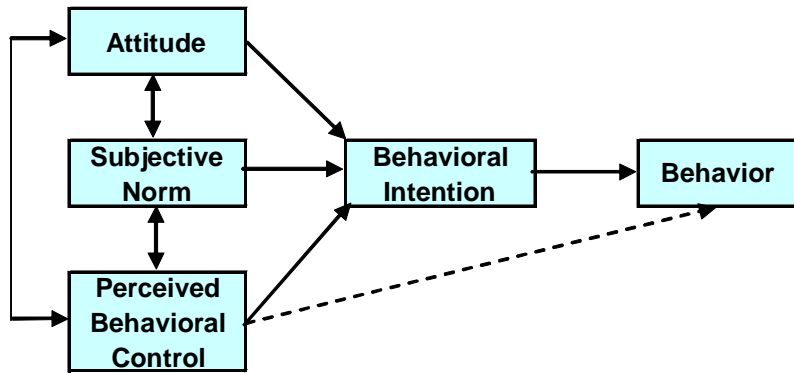


Figure 2.5: Theory of Planned Behavior (TPB) (Ajzen, 1991)

While attitude and subjective norm are adapted from TRA, perceived behavioral control measure the perceived ease or difficulty in performing the behavior (Ajzen, 1991). In explaining behavioral intention and target behavior, Madden, Ellen and Ajzen (1992) made a comparison between TRA and TPB and found that TPB significantly explained more variations than TRA. As noted by Venkatesh et al.(2003), TPB has been successfully applied to the understanding of individual acceptance and usage of many different technologies.

2.3.4 Combined TAM-TPB (C-TAM-TPB)

Taylor and Todd (1995) combined the predictors of TPB with perceived usefulness from TAM to provide a hybrid model i.e. C-TAM-TPB. In C-TAM-TPB, the main variables are attitude toward behavior, subjective norm, perceived behavioral control and perceived usefulness. C-TAM-TPB attempted to find out whether the determinants of IT usage are the same for experienced and inexperienced users of a system. In fact, C-TAM-TPB model has been found to be able to predict the behavior of both experienced and inexperienced users of IT (Taylor and Todd, 1995). See C-TAM-TPB model as proposed by Taylor and Todd in Figure 2.6 below:

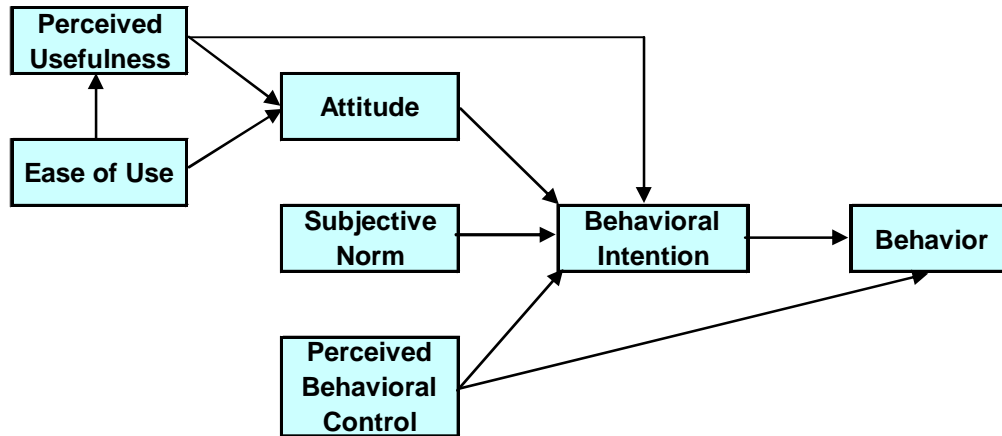


Figure 2.6: C-TAM-TPB (Taylor and Todd, 1995)

2.3.5 Model of Personal Computer Utilization (MPCU)

Extended from theory of human behavior, Triandis (1980) proposed that social factors, affect and perceived consequences influence behavioral intentions, which in turn influence behavior. In Triandis' model, habits are both direct and indirect determinants of behavior while facilitating conditions directly affect behavior. Triandis' model (as quoted from Thompson, Higgins & Howell, 1991) is shown in Figure 2.7 below:

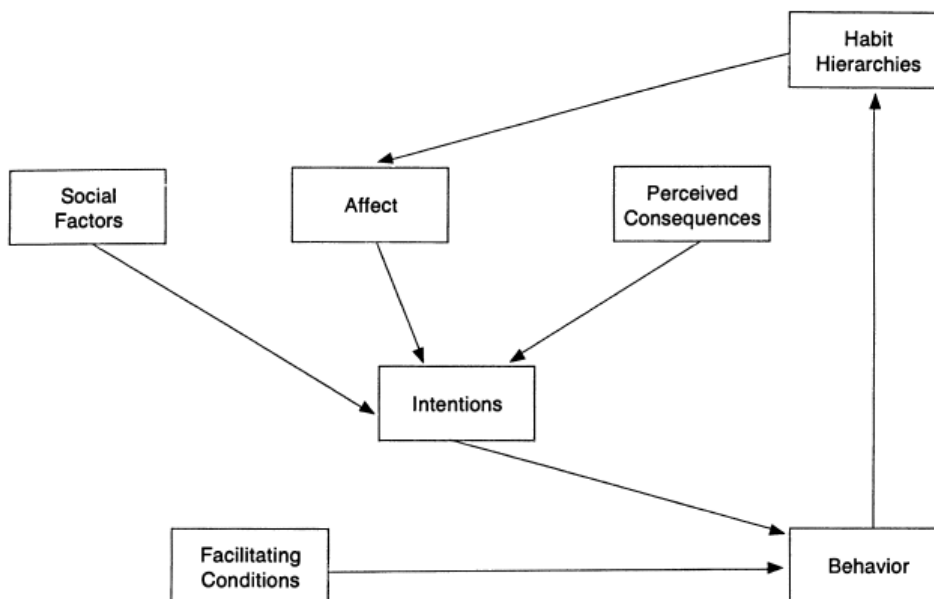


Figure 2.7: MPCU model (a subset of the model proposed by Triandis, 1980)

Thompson et al. (1991) adapted and refined from Triandis' model as shown above and introduced MPCU to predict PC utilization. Thompson et al. (1991) excluded the habit construct as there was no clear distinction between habits of PC use and PC usage. Perceived Consequences construct was further elaborated and replaced by three independent variables, namely complexity of PC use, job fit with PC use and long-term consequences of PC use (refer Figure 2.8).

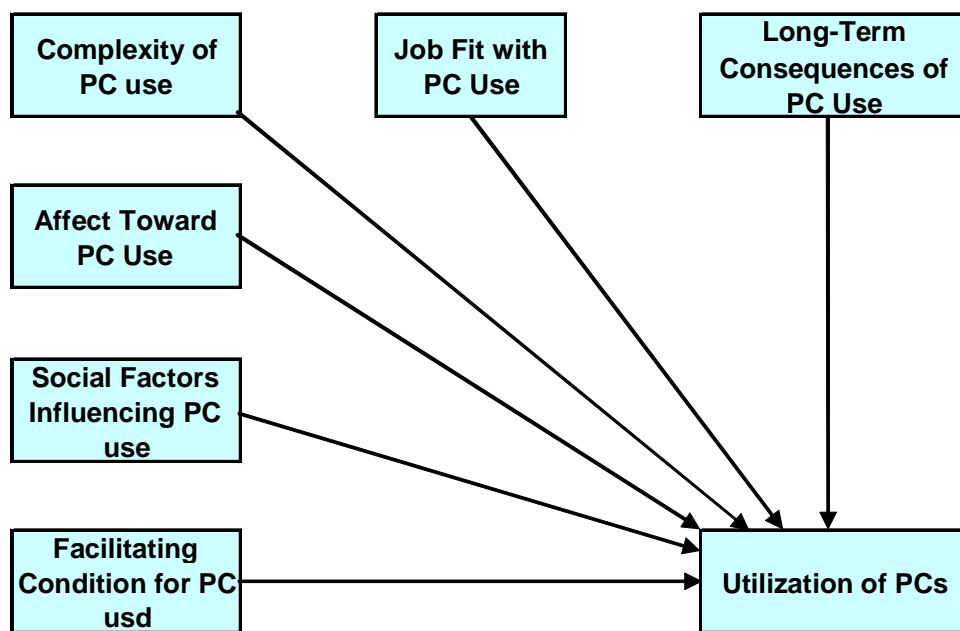


Figure 2.8: Factors Influencing the Utilization of Personal Computers (adapted from the model proposed by Triandis, 1980)

The definitions of the main constructs as proposed by MPCU (Thompson et al., 1991) are:

- *Job Fit* is the extent to which an individual believes that using (a technology) can enhance the performance of his or her job (Thompson et al., 1991, p.129).
- *Complexity* is the degree to which an innovation is perceived as relatively difficult to understand and use. (Thompson et al., 1991, p.128).

- *Long-term consequences* are the outcomes that have a pay-off in the future (Thompson et al., 1991, p.129).
- *Affect towards use* is the feelings of joy, elation, or pleasure, or depression, disgust, displeasure, or hate associated by an individual with a particular act. (Thompson et al., 1991, p.127).
- *Social Factors* is the individual's internalization of the reference group's subjective culture and specific interpersonal agreements that the individual has made with others, in specific social situation (Thompson et al., 1991, p.126).
- *Facilitating Conditions* are objective factors in the environment that observers agree make an act easy to do. In IS context, provision of support for users of PCs may be one type of facilitating condition that can influence system utilization (Thompson et al., 1991, p.129).

2.3.6 Innovation Diffusion Theory (IDT)

IDT posits that individuals possess different degrees of willingness to adopt innovations and they are generally segregated into five categories: innovators, early adopters, early majority, late majority, laggards (Rogers, 1995). Each adopter's willingness and ability to adopt an innovation would depend on their mental process which divided into following stages: awareness, interest, evaluation, trial, and adoption. The cumulative adopters give rise to S-shaped curve as seen in Figure 2.9 below:

Figure 1-1. Diffusion Is the Process by Which (1) an *Innovation* (2) Is *Communicated* Through Certain *Channels* (3) Over *Time* (4) Among the Members of a *Social System*

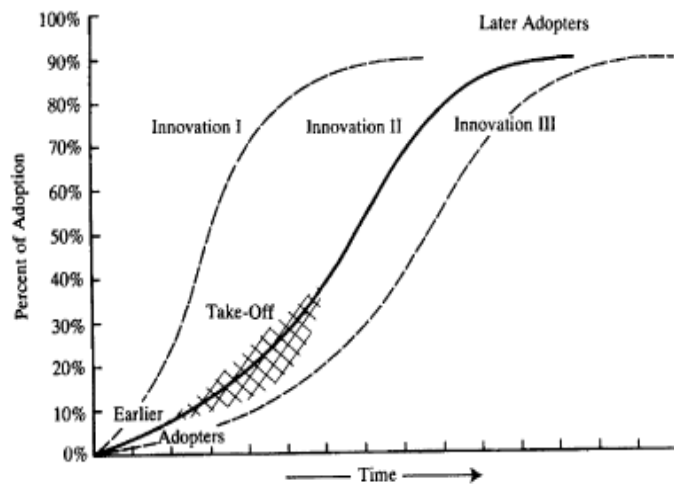


Figure 2.9: The Diffusion process. (Source: Rogers, 1995, p.11)

An innovation will experience an increased rate of diffusion if potential adopters perceive that the innovation: 1) Can be tried on a limited basis before adoption (trialability); 2) Offers observable results (observability); 3) Has an advantage relative to other innovations (relative advantage); 4) is not overly complex (complexity); and 5) Is compatible with existing practices and values (compatibility)(Surry, 1997)

Within information system, Moore and Benbasat (1991) adapted the characteristics of innovations presented by Rogers and refined a set of constructs used to study individual technology acceptance:

- Relative advantage – the degree to which an innovation is perceived as being better than its precursor.
- Ease of use – the degree to which an innovation is perceived as being difficult to use.
- Image – the degree to which use of an innovation is perceived to enhance one’s image or status in one’s social system.

- Visibility – the degree to which one can see others using the system in the organization.
- Compatibility – the degree to which an innovation is perceived as being consistent with the existing values, needs and past experiences of potential adopters.
- Results demonstrability – the tangibility of the results of using the innovation, including their observability and communicability.
- Voluntariness of use – the degree to which use of the innovation is perceived as being voluntary or of free will.

2.3.7 Social Cognitive Theory (SCT)

SCT posits that individual behavior change depend on the following factors: (a) personal factors in the form of cognition, affect, and biological events, (b) behavior, and (c) environmental influences. Each factors influence one another. The conceptual model of SCT is shown in Figure 2.10:

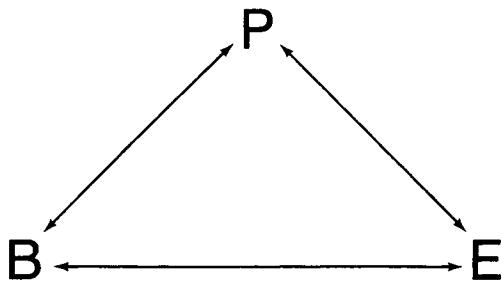


Figure 2.10: Schematization of the relations among behavior (B), cognitive and other personal factors (P), and the external environment (E) (Wood & Bandura, 1989).

Compeau and Higgins (1995) extended SCT to study computer usage. Base on SCT, Compeau and Higgins tested behavior modeling, i.e. an individual's knowledge acquisition can be directly related to observing others within the context of social interactions, experiences, and outside media influences. In fact, Compeau and Higgins' (1995) model

drawn from SCT's cognitive influence on behavior and examined two important variables, i.e. outcome expectations and self-efficacy.

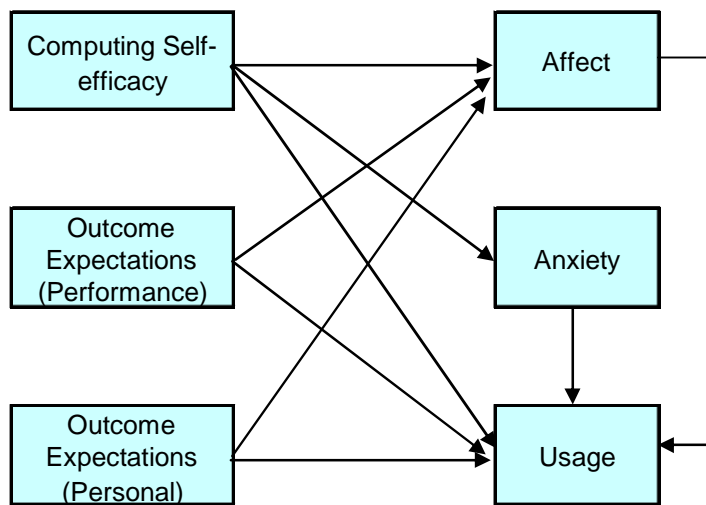


Figure 2.11: Model for utilization derived from Social Cognitive Theory (Compeau and Higgins, 1995)

With reference to Figure 2.11 (Compeau and Higgins, 1995), the five major constructs that impacted information technology adoption is further explained as follows (quoted from Venkatesh et al., 2003):

- *Outcome Expectations-Performance* is the expectations about the performance-related consequences of the behavior which deal with job-related outcomes, specifically.
- *Outcome Expectations-Personal* is the expectations about the personal consequences of the behavior which deals with the individual esteem and sense of accomplishment, specifically.
- *Self-efficacy* is the beliefs about one's ability to use a technology to accomplish a particular job or task.
- *Affect* is an individual liking for a particular behavior
- *Anxiety* is evoking anxious or emotional reactions when it comes to performing a behavior.

2.3.8 Motivational Model (MM)

MM is a general motivation theory that explain for behavior. Davis, Bagozzi & Warshaw, (1992) had applied motivational theory to explain technology acceptance and use (as quoted from Venkatesh et al. 2003). There are two main drivers on technology acceptance namely extrinsic motivation and intrinsic motivation. As quoted in Venkatesh et al. 2003, extrinsic motivation explain the reason users want to perform the activity “because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions” (Davis et al. 1992, p. 1112). On the other hand, as sighted by Venkatesh et al. 2003, intrinsic motivation is the perception that users want to perform an activity “for no apparent reinforcement other than the process of performing the activity per se” (Davis et al. 1992, p. 1112).

2.4 Performance Expectancy

In UTAUT, Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job. (Venkatesh et al. 2003). According to Venkatesh (2003), this factor was derived from the perceived usefulness (PU) factor as proposed in TAM. In Davis (1989) studies, PU was significantly correlated with self-predicted current usage ($r = 0.63$) and self-predicted future usage ($r = 0.85$). A system that is high in PU is one that the user believes will reduce his or her task ambiguities and eventually increases work-related performance (Davis ,1989; Venkatesh, 2000; Amoako-Gyamph, 2004). When end users think that using the new system will enhance their efficiencies in work and result in better job performance, this will positively influence their intention to use the new ERP system. As evidenced by a research to compare theories in year 2002, usefulness still found to be the strongest and highly significant determinant on technology usage (Riemenschneider et al. ,2002). The same result is

evidenced in the meta-analysis of 88 TAM studies involving more than 12,000 observations by King and He (2006). In Malaysia context, Ramayah and Lo (2007) found similar result, i.e. PU is still the more influential driver for predicting the intention to use ERP system. With greater PU in using the ERP system, the more likely it is that ERP system would be adopted. (Venkatesh, 2000)

2.5 Effort Expectancy

In UTAUT, effort expectancy is defined as the degree of ease associated with the use of the system. According to Venkatesh (2003), this factor was derived from the perceived ease of use factor as proposed in TAM. According to Davis (1989), an application perceived by people to be easier to use is more likely to be acceptable. In another word, with higher PEU, end users found less task ambiguities and have higher intention to use the ERP system (Ramayah and Lo, 2007). More and more emphasize is placed by ERP vendors to gain higher level of “ease of use” perception by end-users. During an interview, AMR VP of research, Bill Swanton, stated that ERP is shifting to “role-based interfaces” as companies are demanding that technology work intuitively based on the specific needs of individual workers and without requiring excessive training (Sleeper, 2004). As such, he further commented that “ERP that offer such ease of use are on the agenda these days.” Similar with earlier finding in Davis et al. (1989), effort-oriented constructs are expected to be more salient in the early stages of a new behavior, when process issues are overcome, and later become overshadowed by instrumentality concerns (Venkatesh, 2003). Consistent with previous finding (Davis, 1989; Davis et al., 1989; Amoako-Gyampah and Salam, 2004; Venkatesh and Davis, 2000; Ramayah and Lo; 2007), effort expectancy (PEU) influenced behavioral intention to use ERP system through influencing perceived usefulness.