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ERP Success in the SMEs: The Perspectives of Service Quality and Social Cognitive Theory

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Abstract

Since the service-oriented ERP systems have become essential to SMEs, the service quality of IS characteristics and the user's internal expectations are considered the key factors of ERP success. With the purpose of understanding how service quality influences user's satisfaction through psychological constructs, based on the Social Cognitive Theory and the framework of D&M IS Success Model, this study starts from the point of service quality to create a conceptual research model. The model and relevant hypotheses are tested in a survey of 205 Taiwan SMEs with the ERP system. The results show that the most significant linkages between service quality and psychological factors are tangibles and personal outcome expectations, responsiveness and assurance and performance outcome expectations, and tangibles and performance outcome expectations. Nevertheless, only the construct of responsiveness and assurance has a significant positive correlation with computer self-efficacy. It is suggested that the model provides fruitful implications for both academia and practical world.

Keywords: ERP system, social cognitive theory, IS success model, structural equation modeling, small and medium-sized enterprises

1. Introduction

Adopting the Enterprise Resource Planning (ERP) system is a trend in the e-business world since it is such a powerful tool for supporting enterprise operation activities, decreasing the running cost, and increasing the sharing of information resources (Davenport, 1998; Olson, 2004; e.g. Sumner, 2005; Olsen and Sætre, 2007). However, despite ERP having been well developed in large-scale corporations, small and medium-sized enterprises (SMEs) have encountered various problems because of high implementation cost, insufficient capital, and inadequate human resources (Huin, 2004; Street and Meister, 2004). The restriction of manpower and capital makes SMEs evaluate their IT/IS investment more carefully in order to maximize benefits from very limited resources. It is with no exception when making an investment in an ERP system (Rajagopal, 2002; Huin, 2004). Thus, implementing ERP modules gradually and outsourcing the ERP project are considered the favorite strategies for SMEs. Although outsourcing the IS implementation project is helpful for them to strengthen the competitiveness of e-business, low user satisfaction can still cause ERP implementation failure (e.g. Sumner, 2005; Wu and Wang, 2006).

In the e-business world, maintaining a high level of service quality has been regarded as the key measurement of the successful use of systems (Parasuraman, Zeithaml, and Berry,

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1985, 1988; Pitt and Watson, 1997). A reasonable portion of investment in ERP implementation for meeting the purpose of high service quality is also essential for creating customer satisfaction (Jiang, Klein, and Carr, 2002; DeLone and McLean, 2003). As a result, in addition to service quality, the user's beliefs and internal expectations are often considered as being critical determinants during the IS implementation since these aspects represent a complex psychological construct which could be adapted to predict the behaviors for IS implementation (Benbasat and Zmud, 2003; DeSanctis, 2003; Marakas, Johnson, and Clay, 2007).

A great deal of research has identified that the critical factors of IS success are service quality and user's psychological constructs (Compeau and Higgins, 1995b; Pitt and Watson, 1997; Marakas, Yi, and Johnson, 1998; Jiang et al., 2002; DeLone and McLean, 2003; Petter, DeLone, and McLean, 2008). Although these two the constructs have been discussed for implementing and utilizing information systems successfully, it is questionable whether these findings hold true in the environment of ERP implementation, particularly, in SMEs. Therefore, the purpose of this study is to understand how psychological constructs play a role in causation that the service quality creates the user satisfaction with the ERP system.

For helping SMEs to enhance their users' satisfaction and understanding the determinants of ERP success, this study focuses on the notion of service quality to examine what salient factors affect psychological constructs and user satisfaction. Based on the theory of SCT (Bandura, 1986) and DeLone and McLean IS success model (DeLone and McLean, 2003), we constructed a conceptual research model of ERP success. The feature of SCT aims to emphasize that the belief of psychological constructs will be affected by external information which further influences the human behavioral model, while the D&M IS success model is to examine the influence of system characteristics on system use, user satisfaction, and net benefit through information quality, system quality, and service quality. For attaining the research goal, this study addresses three research questions: (a) How service quality influences the user's psychological constructs; (b) how the two psychological constructs affect the user's satisfaction; and (c) what the suitable model is for ERP system's success in SMEs. Validating corresponding hypotheses helps answer these questions.

2. Literature Review

2.1 Enterprise Resource Planning (ERP)

ERP is commonly recognized as the system which integrates all the information resources in the organization in order to increase the organization's production performance. A highly effective ERP system can lower inventory levels, reduce the production cycle time, decrease running costs, and provide a strong back up for enterprise resource integration and business process standardization (Davenport, 1998; Olson, 2004; Gargeya and Brady, 2005; Wu and Wang, 2006; Liang et al., 2007). Despite the features of complicated function and high implementation cost, adopting ERP is a trend in the e-business world since it is such a powerful tool and has a long development history.

The development of ERP systems started from the main frame computer of 1970. Since then, businesses have used the computer to process complicated data because of its rapidity and accuracy. The most commonly used system in early stages is Material Requirements Planning (MRP) which was designed for inventory control and material requirement management. Therefore, MRP is considered as the core module of the first ERP generation (e.g. Sumner, 2005). In 1980, enterprises turned those sub-modules that were used for production, finance, selling, engineering technology, and procurement into an integrated information system. This was the Manufacturing Resource Planning (MRP II) system. The main purpose of this system was for planning all the resources used for production. It is

generally categorized into three sub-systems: Production control, logistics management, and financial management. In terms of practical application, MRP II system was mainly used for integrating accounting and finance systems to generate the planning, budgeting, inventory forecasting, and procurement reports (Jacobs and Bendoly, 2003; Olson, 2004; e.g. Sumner, 2005; Wu and Wang, 2006).

For ERP providers, the trend has been in dividing the large system into several small modules to meet the actual needs of businesses, such as the modules for financial management, human resources, operation and logistics management, selling and marketing, so that businesses are able to conduct the service of system implementation and application in each level at an affordable price (Huin, 2004; e.g. Sumner, 2005). This strategy gives SMEs opportunities to adopt this powerful tool because they can be freed from the financial constraints once the modularization is actualized. SMEs can also choose to adopt combination system modules during the implementation phase, and purchase those modules from different vendors according to their operation requirements (Davenport, 1998; Olsen and Sætre, 2007). As a result, the ERP systems with outsourcing and customization on a small scale module have been widely adopted by SMEs (Olson, 2004). Although SMEs are continually making investments in relevant ERP facilities, the failure rate is still very high (Gargeya and Brady, 2005; Presley, 2006). The reason for this is the complicated features of ERP systems, and most importantly, their inability to realize users' expectations and meet their actual requirements (Au, Ngai, and Cheng, 2002; Huin, 2004; Wu and Wang, 2006).

2.2 Evaluation of Service Quality – SERVQUAL

In recent years, service quality has received increasing attention from practitioners and academic researchers within the modern business environment of e-commerce; in particular, it has been a critical determinant in information development and application (Pitt, Watson, and Kavan, 1995; Jiang, Klein, and Crampton, 2000; DeLone and McLean 2003; Petter et al. 2008). Since 1980, the concept of service quality has been studied by a number of researchers in the fields of marketing who examined the importance of quality in products and services, and considered that the measures of service quality are not easy to separate because of their elusive and indistinct characteristics.

Parasuraman et al. (1985) concluded that service quality has several characteristics: services are intangible, heterogeneous, and inseparable during the procedure of production and consumption. Parasuraman et al. (1985) suggested that service quality and customer requirements are not easy to evaluate or express, and most of all, it is a very difficult task for researchers to measure such a construct. Thus, the measurement of service quality should be analyzed thoroughly according to its characteristics so that the essence and spirit can be captured. In order to evaluate the service quality effectively, Parasuraman, Zeithaml, and Berry (1988) developed SERVQUAL, a multi-dimension (tangibles, reliability, responsiveness, assurance, and empathy) instrument with 22 items, to assess the customer perception of service quality in service and retailing organizations.

By observing the use of information systems, Pitt et al. (1995) found that service quality has a large influence on the promotion of IS efficiency, hence they suggested that the future researchers and system developers should prudently consider this important construct in the implementation and measurement of information systems. For the sake of more effectively measuring the service quality in the IS field, Pitt et al. (1995) made a minor adaptation to SERVQUAL to make it more appropriate for evaluating the service quality provided by IS. A number of later studies, in particular, found that service quality has played a critical role in ensuring IS implementation success (DeLone and McLean, 2003; Petter et al., 2008; Cenfentelli, Benbasat, and Al-Natour, 2008). Furthermore, a group of researchers conducted an in-depth study to analyze the SERVQUAL measurement and found that if those conditions

such as culture differences, organizational type, and sampling data were considered then three, five, and seven factors were extracted respectively from three different sample sites. (Pitt et al., 1995; Jiang et al., 2000; Van Dyke, Kappelman, and Prybutok, 1997; Van Dyke, Prykuto, and Kappelman, 1999). Jiang et al. (2002) also argued that the follow-up research should continually verify and modify this measurement by focusing on different user groups, more various industry types, and large sampling size of data, in order to reach a higher stability.

Since being developed, SERVQUAL has been widely employed and heatedly discussed in IS research (Parasuraman et al., 1985, 1988, 1991; Pitt et al., 1995; Pitt and Watson, 1997; Seddon and Kiew, 1996; Seddon, 1997; Jiang et al., 2000; Jiang et al., 2002; DeLone and McLean, 2003). However, during the implementation of an ERP system, deep insight into the effect of service quality on user satisfaction is an essential task. Although service quality has played a significant role in the continuing development of the ERP system, compared with the other fields, the investigation of SERVQUAL applied in this field has less been explored.

2.3 Social Cognitive Theory (SCT)

Social Cognitive Theory (SCT) was developed from Social Learning Theory (Bandura 1986). SCT states that the behavior/intention model of the human being is formed by the interactions among behavior, cognition, and environment. Bandura stressed that an individual's behavior activity can be affected by the external information resource and the change of environment, and then consequently alter the individual's cognition or ability to do some specific task. Under the interaction influence, the impact intensity of these three factors is different to each other, but there appears to exist some degree of relationship (Bandura, 1982; 1986; 1997; Marakas et al., 1998). SCT has been broadly studied in the fields of social science, education, and information application. This theory has been the core conception of many constructs such as modeling, skill training, behavioral rehearsal, self-monitoring, and contracting. In the recent years, SCT has built a strong theory foundation to describe the interaction between personal behavior and the reaction of physiologic emotion in the application of computer sciences. Particularly, this theory has been broadly discussed in empirical research exploring personal cognitive behavior (Compeau and Higgins, 1995a; 1995b; Compeau, Higgins and Huff, 1999; Igbaria, Guimaraes, and Davis, 1995; Piccoli, Ahmad, and Ives, 2001; Hsu and Chiu, 2005).

Bandura indicted that an individual's cognition is the main influence behind behavior, and that there are two core constructs: Self-efficacy and outcome expectations. Self-efficacy is the belief of conducting a specific behavior, and working hard for achieving the goal (Compeau and Higgins, 1995a; 1995b). Outcome expectations induce a person to perform a certain task that can bring more benefit, and avoid doing a task which brings no advantages. Bandura also noted that people picture the outcome and infer their working competencies so as to reflect a specific performance approach and take action to reach that outcome. In short, because of possessing the self-efficacy belief, people are willing to take action on a specific matter; and also because of possessing the outcome expectations, people perceive that it is worth the effort for such action (Bandura, 1997). The present research provides an insight into how ERP service quality can affect the satisfaction level through the user's personal cognition. Based on the social cognitive theory, this research cites self-efficacy and outcome expectation, two core constructs affecting cognitive behavior, as the framework of the research model. Hopefully, the research results can effectively describe how the interaction outcome between service quality, psychological factors, and user satisfaction can influence the success of ERP system implementation.

2.4 Information System Success Model

The launch of the Internet and the development of information technology have popularized the e-business model around the world. At the same time, the operational problems in business organization have turned out to be more diversified and complicated, which means that making more investment in IT/IS infrastructure is necessary for enterprises to support e-commerce activities. Thus, how to appropriately assess and ensure a successful e-commerce system becomes a challenge for business. The information system success model has been considered as one of the essential frameworks for evaluating the success of information system (Rai, Lang, and Welker, 2002). DeLone and McLean (1992, 2003) have made efforts in developing a more rigid model for evaluating the success of information system. They announced an initial IS success model in 1992, and then revised it in 2003 by including a construct of service quality to perfect the framework.

The feature of the updated D&M IS success model (DeLone and McLean, 2003) is to discover the effect of system characteristics on intention to use, use, and user satisfaction through the focus of information quality, system quality, and service quality, and through this to understand how this effect can eventually impact on the net benefit of individual and organization. The updated IS success model has provided a strong model foundation as reference for follow-up research (Rai et al., 2002; Sabherwal, Jeyaraj, and Chowa, 2006; Petter, DeLone, and McLean, 2008).

2.5 User Satisfaction and System Performance

When an information system has been implemented, enterprises can evaluate the outcome through a number of factors. For example, Raymond (1987) collected four important indicators for measuring the success of information system implementation from the prior documentation pertaining to information management: user satisfaction, level of systems usage, user decisional performance, and organizational performance. Galletta and Leaderer (1989) classified evaluation indicators into two categories: economic outcome and personal outcome. Economic outcome means the increased advantage resulting from the promoted economic effects caused by the information system, this includes cost saving and income generation. Personal outcome can be categorized into user satisfaction and system usage. Galletta and Lederer (1989) considered that the reason for user satisfaction being widely adopted is its potential influence on the goals of the information department, the quality of user's work, and the degree of system utilized. Seddon and Kiew (1996) defined user satisfaction as the pleasure level of the user after using information system, and those items such as the degree of satisfaction of the meeting of information processing needs, efficacy, effectiveness, and the overall perception of information system are all included as criteria to assess this level.

However, based on the prior research, user satisfaction is the most commonly accepted construct for measuring IS success (Doll and Torkzadeh, 1988; Doll, Xia, and Trokzadeh, 1994; DeLone and McLean, 2003). Wu and Wang (2006) pointed that user satisfaction may be considered as a good and appropriate surrogate measure in an involuntary situation. Researchers also believed that user satisfaction, being commonly used in assessing the success of information system, resulted from the outputs of the other measurements being hard to evaluate directly and objectively. Therefore, it is more appropriate to measure satisfaction through the user's actual perception.

3. Research Methodology

3.1 Research Conceptual Model

A great deal of research has noted that service quality is vitally important in inspiring user's cognition toward user satisfaction and job accomplishment for e-business success (Bandur, 1986; Marakas et al., 1998; Marakas et al., 2007; Cenfetelli et al., 2008). This research creates an ERP success model based on the theory of SCT (Bandura, 1986) and the D&M IS success model (DeLone and McLean, 2003) for understanding how service quality influences user satisfaction through cognitive factors of a psychology construct. The model contains three cause and effect dimensions: Service quality, psychological constructs, and user satisfaction, which is displayed in Figure 1.
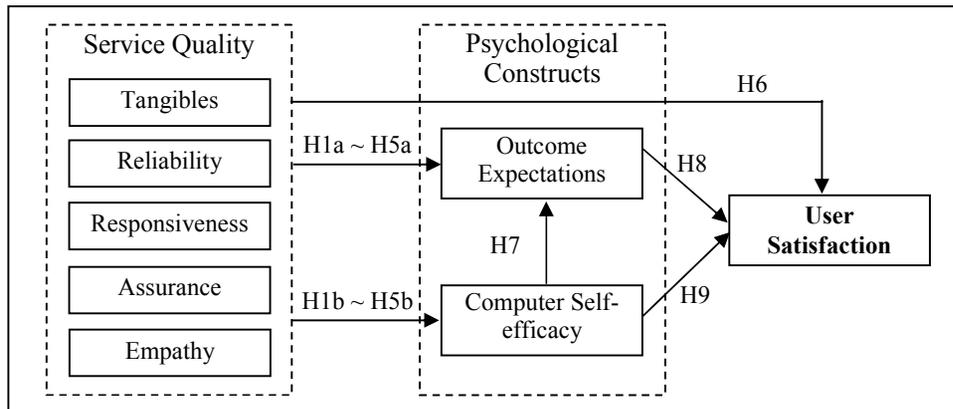

Figure 1. Conceptual Research Model

3.2 Research Hypotheses

3.2.1 Relationships between service quality and psychological constructs

Better service quality by IS providers can encourage users to perceive situational support and arouse positive emotion toward a prospective outcome. Self-efficacy theory was sourced from Social Cognitive Theory that regarded the concept of self-efficacy as the critical factor in producing the motive power of human actions and the significant leading belief driving individual behavior activities. In terms of the particular ability and the expectation toward the performance of applied information technology, computer self-efficacy and outcome expectations are the two essential factors that can closely and properly affect an individual's behavior in adopting information technology (Bandura, 1986; Compeau and Higgins, 1995a, 1995b; Compeau et al., 1999; Henry and Stone, 1995; Marakas et al., 1998; Piccoli et al., 2001; Niederhauser and Perkmen, 2010).

Based on the Technology Acceptance Model (TAM) of Davis et al. (1989), Igbaria et al. (1995) conducted research to explore the application of micro-computers, and found that user characteristics, the quality of system characteristics, and organizational support can be considered as the external factors of the TAM model that can affect the usage of microcomputer through people's beliefs: Perceived usefulness, perceived ease of use (Igbaria et al., 1995). Likewise, the IS Success Model of DeLone and McLean (2003) also shows that the quality of IS (information quality, system quality, service quality) certainly plays an important role in affecting the usage of system and user satisfaction. From the SCT perspective, the overall quality of the information system is a significant external construct influencing self-efficacy, judgments of mastery, self-determination, and hence, as

determinants (Bandura, 1982, 1986, 1997). However, in line with the SCT, several studies identify that perceived usefulness and perceived ease of use are similar to the psychological constructs of outcome expectations and self-efficacy which can be affected by external factors and influence individuals' motivation (Davis, 1989; Henry and Stone, 1995; Compeau and Higgins, 1995b; Niederhauser and Perkmen, 2010).

Regarding the study of investigating the effects of end-user's job satisfaction, Henry and Stone (1995) pointed out that outcome expectation is the belief of task accomplishment which leads to a desired outcome of personal, and computer self-efficacy is the belief of possessing the requisite skills and abilities to perform individual task. In their study, Henry and Stone demonstrated that there exists a significant positive correlation among external variables (management support, ease of use, system experience) and psychological constructs (outcome expectations, computer self-efficacy). An additional point, Piccoli et al. (2001) suggested that high technology quality, reliability, easily-accessed system software and hardware do have significant effects on the promotion of performance, self-efficacy, and satisfaction in the web-based virtual learning environments.

Within the study of specific computer self-efficacy (CSE), Marakas, Yi, and Johnson (1998) reviewed the literature regarding CSE and presented an integrated model. By grouping the various issues and summarizing the observations, they pointed out that the quality of feedback, degree of professional orientation, perceived effort, verbal persuasions, situational support, and emotional arousal are the important determinants of self-efficacy. Psychological constructs can be influenced by environmental factors and play a motivational role to prompt individuals to commit to the effort to attain their goal or plan (Niederhauser and Perkmen, 2010; Prodaniuk, Plotnikoff, Spence, and Wilson, 2004). The influence factors of encouragement by others, others' support, training method, and prior performance also have an effect on the belief of outcome expectations (Compeau and Higgins, 1995a, 1995b; Marakas et al. 1998).

Based on the relevant research findings and theory support, the relevant factors mentioned above have relative content to the factors of service quality (tangibles, reliability, responsiveness, assurance, empathy). However, a successful ERP system implementation indeed needs sound service quality to increase the user's psychological reaction and accomplish user satisfaction. Thus, this study presents hypotheses in H1 to H5 below.

H1(a): The tangibles of service quality have a significant positive effect on user outcome expectations.

H1(b): The tangibles of service quality have a significant positive effect on user computer self-efficacy.

H2(a): The reliability of service quality has a significant positive effect on user outcome expectations.

H2(b): The reliability of service quality has a significant positive effect on user computer self-efficacy.

H3(a): The responsiveness of service quality has a significant positive effect on user outcome expectations.

H3(b): The responsiveness of service quality has a significant positive effect on user computer self-efficacy.

H4(a): The assurance of service quality has a significant positive effect on user outcome expectations.

H4(b): The assurance of service quality has a significant positive effect on user computer self-efficacy.

H5(a): The empathy of service quality has a significant positive effect on user outcome expectations.

H5(b): The empathy of service quality has a significant positive effect on user computer self-efficacy.

3.2.2 Relationships between service quality and user satisfaction

SERVQUAL is typically considered as an important instrument of service quality for measuring user perceptions of what has been received from IS providers (Parasuraman et al., 1985, 1988, 1991; Pitt et al., 1995). A number of researchers have suggested that service quality and user satisfaction are the key constructs in understanding IS success (Piccoli et al., 2001; Au et al., 2002; Jiang et al., 2002; DeLone and McLean, 2003; Cenfentelli et al., 2008; Petter et al., 2008). In their study of SERVQUAL reliability and validity, Jiang et al. (2000) found that the SERVQUAL metrics hold a high correlation with user satisfaction which represents accurate views of user perception. A number of researchers also pointed out that user satisfaction can be influenced by service quality, such as the quality of facilities conditions, updated software and hardware equipment, staff appearance, vendor's reliability, technical competence, and empathy of the personnel staff etc. (DeLone and McLean, 2003; Rai et al., 2002; Sabherwal et al., 2006; Petter et al., 2008). Therefore, based on the relevant studies shown above, we proposed the hypothesis H6 below.

H6: The overall service quality has a significant positive effect on user satisfaction.

3.2.3 Relationships between computer self-efficacy and outcome expectations

SCT shows that the beliefs of personal expectation toward some outcomes are indeed an important factor leading to the action of behavior activities, and these beliefs will eventually result in the corresponding outcomes (Bandura, 1986, 1997; Prodaniuk et al., 2004; Niederhauser and Perkmen, 2010). A number of studies found that there exists a significant correlation between computer self-efficacy and outcome expectations (Compeau and Higgins, 1995a, 1995b; Henry and Stone, 1995; Marakas et al., 1998). Accordingly, on the basis of the literature discussed above, hypothesis H7 is presented below.

H7: Within the use of an ERP system, computer self-efficacy has a significant positive effect on user outcome expectations.

3.2.4 Relationships between psychological constructs and user satisfaction

User satisfaction can be defined as the affective attitude towards a specific IT application, the pleasurable level of end-user's overall affective, cognitive evaluation, and the consumer's fulfillment response (Doll and Torkzadeh, 1988; Au et al., 2002). Henry and Stone (1995) noted that the cognitive factors have a significant influence on end-user's satisfaction. With a focus on the computer self-efficacy, Marakas et al. (1998) conducted a literature review between 1985 and 1996, and found that in the circumstance of applied IT, computer self-efficacy has significant effect on improving the personal work efficiency and decision-making results. Bandura (1986) proposed that employees with high self-efficacy can usually display better work performance than those with low self-efficacy.

People's beliefs could have affect on the achievement of their actual performance or on their attitude towards IS usage, for example, the effort a person is willing to make in carrying out a job, the time a person is able to spend in persisting in overcoming an obstacle, and the capability a person actually has for recovering from failures, are all concrete presentations of people's beliefs. Accordingly, the thinking patterns of people's beliefs can usually impact on the degree of success in reaching a goal under the pressure of crisis. Thus, from the perspective of user psychology, the individuals tend to do the work for which more advantage is expected to be obtained. When studying the use of IT and the impact of IT on working

performance, this expectation is even more conspicuous (Bandura 1986; Compeau and Higgins 1995a; 1995b; Marakas et al., 1998). Therefore, based on the analysis of associated literature above, hypotheses H8 to H9 are proposed.

H8 : Outcome expectations of psychological constructs have a significant positive effect on user satisfaction.

H9 : Computer self-efficacy of psychological constructs has a significant positive effect on user satisfaction.

3.3 Measurement Development and Procedure

The survey methodology is used to collect data from the SMEs users that are using the ERP modules of logistics, accounting, or finance. A summary of the variable name and its operational definition, items, and source of literature is presented in Table 1 below. This study conducted a structured literature review to design a questionnaire for attaining the research objectives of testing the hypotheses and validating the research model. At the initial stage of questionnaire design, some scholars in the fields of accounting and information technology were invited to review the content of questionnaire. The main purpose of this was to revise the questionnaire according to the relevance of each question and to ensure all questions could properly determine the correct content of the associated variable it was to assess. After pretest, pilot test, and revision for the measure, the final version was arrived at for distribution. Finally, the questionnaire was distributed to those SMEs users that had implemented an ERP system for at least one year. SPSS 10.0 software was used for descriptive analysis and test of reliability and validity in the sample data collected. Regarding the module testing, Structural Equations Modeling (SEM) was employed to test the correlation between each path of the model.

Table 1. Operational Definitions and Measurement Items of Variables.

Variable	Operational Definition	Items	References
Service Quality	Ability to enable the user to receive convenient and high quality service by keeping good relationships, presenting pleasant attitudes, and delivering overall support among ERP system service provider and user	22	Parasuraman et al. (1988) Pitt et al. (1995)
Tangibles	Physical facilities, equipment, and appearance of personnel	4	Parasuraman et al. (1988) Pitt et al. (1995)
Reliability	Ability to perform the promised service dependably and accurately	5	Parasuraman et al. (1988) Pitt et al. (1995)
Responsiveness	Willingness to help customers and provide prompt service	4	Parasuraman et al. (1988) Pitt et al. (1995)
Assurance	Knowledge and courtesy of employees and their ability to inspire trust and confidence	4	Parasuraman et al. (1988) Pitt et al. (1995)
Empathy	Caring, individualized attention the firm provides its customers	5	Parasuraman et al. (1988) Pitt et al. (1995)
Computer Self-efficacy	User perception of his/her ability to achieve an identified goal through using the ERP system	10	Bandura (1982, 1986) Compeau and Higgins (1995a)
Outcome Expectations	User expectation of the usage of ERP system, including the performance outcome expectations and personal outcome expectations	11	Bandura (1982,1986) Compeau and Higgins (1995b)
User Satisfaction	User's satisfaction level of the entire effectiveness and efficiency of the output of the ERP system	4	Seddon (1997) Seddon and Kiew (1996)

4. Data Analysis

4.1 Sampling and Demographic Characteristics

The SMEs that participated in the "Bridging the Digital Divide of the SMEs Project" sponsored by the Information Service Industry Association and the Small-and-Medium Enterprise Administration (SMEA) of the Ministry of Economic Affairs in Taiwan were targeted as the population. The period of data collection started on 30 August, 2007 and ended on 30 September 2007. Data were collected using a paper-based survey and targeted the SMEs users that were using the related module of an ERP system (such as logistics, accounting, or finance). A total of 550 questionnaires were sent, and 460 of which were returned. After deleting 255 invalid copies that either offered incomplete answers, or where the system had been implemented for less than one year, or did not include ERP-related modules, the remaining 205 copies were considered valid, and giving a valid response rate of 37.27 percent.

After data purification, the valid sample data collected were managed through the procedure of frequencies in SPSS, and the basic characteristics of each category were summarized. The majority of respondents (105; 73.2%) have graduated from college or university, and most of the respondents majored in business administration (82; 40.0%) and information application (66; 32.2%). General services industry was the largest proportion of corporation type (87 respondents; 42.4%). With respect to system implementation, the data collected shows that of the SMEs firms investigated, 125 had implemented a logistics management system, 138 had implemented an accounting information system, and 89 had implemented a finance management system. Each firm had implemented between one and three packages in general; more specifically, 139 had implemented one package, 62 had implemented two packages, and 31 had implemented three packages.

4.2 Tests of Reliability and Validity

In empirical research, Cronbach's Alpha is the most widely used measure for assessing reliability. In general, the Alpha value should be 0.8 or above for an acceptance criterion in fundamental studies (e.g. Nunnally, 1978; e.g. Hair et al., 2006). According to this criterion, this research uses Cronabch's Alpha to test the reliability of the questionnaire, and measure the consistency for each variable. The test result is displayed in Table 2 below, and it shows that the α values of all factors are greater than 0.8. Accordingly, it proves that as a whole, there is a very high degree of consistency and stability in the questionnaire of this research.

Table 2. Reliability Test of Cronbach's Alpha.

Factor Name	Items for Measurement	Cronbach's α
Service Quality	22	0.9603
Outcome Expectations	11	0.9294
Computer Self-efficacy	10	0.9537
User Satisfaction	4	0.8853

In this study, the content validity, convergent validity and discriminant validity are used for systemically measuring a questionnaire and testing the relevance of its content. The measurement for each variable was designed and modified by reviewing the theory-conceptions and suggestions from prior studies to ensure content validity. Followed by the initial translation, several consultations from a number of scholars at the department of accounting and IT were conducted, and subsequently the measurement was reviewed and revised. After completing the first draft, focused on the applicability and wording of items, the researcher requested a further consultation from the experts in practice, and afterward

conducted a pretest and revision for the measure. Consequently, in general the questionnaire possesses reasonable content validity for this study.

In respect of convergent validity, an Exploratory Factor Analysis (EFA) was firstly conducted to access the variability of each questionnaire item. For a valid sample of 205, the criterion of 0.5 for identifying substantial loadings on factors is used in this study (Sethi and Carraher, 1993; e.g. Hair et al., 2006). A result of three factors for SERVQUAL evaluation is obtained rather than five factors as prior studies suggested; two factors are extracted for outcome expectations measurement, and only one factor is used for the assessment of computer self-efficacy and so as to the user satisfaction. Table 3 shows the outcome of each variable after factor analysis. After factor analysis, an evaluation for deriving the fitted model was performed based on the outcome of extracted factors. Each factor was given a name which can best represent the characteristics of its variables.

Regarding the discriminant validity, the factors generated by factor analysis are used to test the validity. SPSS software was employed for multicollinearity test, and a simple regression/correlation analysis was proposed to obtain the Pearson's correlation coefficient for variables and subsequently to check for multicollinearity in variables, and to find the initial relationship among variables. The result of data analysis indicates that no correlation coefficient between any two anticipating variables is greater than the suggested value of 0.8 or 0.9 (e.g. Hair et al., 2006, p.114). Thus, there is no significant multicollinearity in anticipated variables, showing good discriminant validity from variables of the research model. The correlation coefficient between each variable is summarized in Table 4 below.

Table 3. Factor Analysis Outcomes.

Factor Name	Items	Factor Loadings	Factor Name	Items	Factor Loadings
Service Quality1	2	.800	Performance Outcome Expectations	11	.827
	1	.754		10	.768
	9	.732		9	.744
	4	.698		1	.734
	10	.691		3	.733
	8	.680		8	.720
	7	.675		2	.705
	5	.667		5	.686
	3	.600	Personal Outcome Expectations	6	.870
	6	.581		7	.866
	11	.561		4	.763
Service Quality2	20	.720	Computer Self-efficacy	9	.864
	19	.719		8	.864
	18	.717		7	.863
	22	.692		4	.857
	21	.676		6	.855
	17	.634		5	.850
Service Quality3	13	.784		3	.841
	14	.730		1	.837
	15	.680		10	.816
	12	.669		2	.769
	16	.583			
User Satisfaction	2	.888			
	4	.868			
	1	.848			
	3	.847			

Table 4. Correlation Analysis Matrix of Anticipated Factors.

	Service Quality1	Service Quality2	Service Quality3	Performance Outcome Expectations	Personal Outcome Expectations	Computer Self-efficacy	Satisfaction
Service Quality1	1.000						
Service Quality2	0.754**	1.000					
Service Quality3	0.717**	0.762**	1.000				
Performance Outcome Expectations	0.726**	0.678**	0.693**	1.000			
Personal Outcome Expectations	0.588**	0.498**	0.453**	0.673**	1.000		
Computer Self-efficacy	0.275**	0.323**	0.333**	0.336**	0.158*	1.000	
Satisfaction	0.698**	0.701**	0.664**	0.723**	0.508**	0.313**	1.000

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

4.3 Model Testing

This research adopts a Structural Equations Modeling (SEM) test to estimate a serial of unique, but interdependent regression equations, and employs AMOS 5.0 software to evaluate the optimal model and path coefficient. Two stages are adopted for research model testing: a measurement model test and a structural model test. Firstly, the structure of the conceptual model was amended based on the EFA result, and a Confirmatory Factor Analysis (CFA) was proposed to estimate each parameter, and a more adequate measurement model was sequentially developed to facilitate the structure model test in the second stage. With regard to the test of measurement model, after confirming that no abnormal estimate existed, a test of measurement model index was conducted as indicated by the suggestions pertaining to fit indices shown in Table 5 below.

Table 5. Fit Indices of Measurement Model and Structural Model.

Index	Recommended Value	Measurement Model	Structural Model
X^2/d.f.	< 3	1.368	1.431
NFI	>= 0.9	0.914	0.910
CFI	>= 0.9	0.975	0.970
GFI	>= 0.9	0.900	0.895
AGFI	>= 0.8	0.866	0.860
RMR	< 0.05	0.069	0.070
RMSEA	< 0.1	0.042	0.046

Note. NFI: Normed Fit Index; CFI: Comparative Fit Index; GFI: Goodness of Fit Index;
AGFI: Adjusted Goodness of Fit Index; RMR: Root Mean Square Residual;
RMSEA: Root Mean Square Error of Approximation.
Source: Segars and Grover (1993); Gefen et al. (2000); Hair et al. (2006)

Regarding the test of structural model, after the CFA analysis applied in the first stage for creating estimated values of the best fitted measurement model, a path diagram of the research model was constructed for conducting a path analysis. Table 5 shows the fit indices of measurement model and structural model. Table 6 shows the significance of individual path coefficient.

Table 6. Significance of Individual Path Coefficient

Relationship between Variables			Standardized Estimate	C. R.
Service Quality 1 (Tangibles)	→	Performance Outcome Expectations	0.086***	2.898
Service Quality 2 (Empathy)	→	Performance Outcome Expectations	0.131	0.512
Service Quality 3 (Responsiveness and Assurance)	→	Performance Outcome Expectations	0.131***	3.204
Service Quality 1 (Tangibles)	→	Personal Outcome Expectations	0.140***	3.463
Service Quality 2 (Empathy)	→	Personal Outcome Expectations	0.212	1.195
Service Quality 3 (Responsiveness and Assurance)	→	Personal Outcome Expectations	0.203	-0.068
Service Quality 1 (Tangibles)	→	Computer Self-efficacy	0.258	-0.464
Service Quality 2 (Empathy)	→	Computer Self-efficacy	0.401	0.942
Service Quality 3 (Responsiveness and Assurance)	→	Computer Self-efficacy	0.385*	1.766
Computer Self-efficacy	→	Performance Outcome Expectations	0.026	1.379
Computer Self-efficacy	→	Personal Outcome Expectations	0.041	0.312
Performance Outcomes Expectations	→	User Satisfaction	0.124***	3.919
Personal Outcome Expectations	→	User Satisfaction	0.059	-0.438
Computer Self-efficacy	→	User Satisfaction	0.026	0.321
Service Quality 1 (Tangibles)	→	User Satisfaction	0.097	0.715
Service Quality 2 (Empathy)	→	User Satisfaction	0.134***	2.786
Service Quality 3 (Responsiveness and Assurance)	→	User Satisfaction	0.139	1.003

Note: C.R. for construct's standard regression weights possesses the following level of statistical significance .
*$p <0.1$ (C.R. > 1.64), **$p < 0.05$ (C.R. > 1.96), ***$p < 0.01$ (C.R. > 2.58)

5. Conclusion

This study aims to understand how services quality influences user's satisfaction through psychological constructs, in order to assist SMEs to enhance their users' satisfaction and to understand the determinants of ERP success. Results from data analysis suggest that the significance paths of the variables provide only partial support for the research model. Yet, the findings help us to answer the three questions for understanding the particular setting when the ERP modules of logistics, finance, and accounting have been implemented in SMEs.

First, the results show that the most significant linkages are tangibles and personal outcome expectations, responsiveness and assurance and performance outcome expectations, as well as tangibles and performance outcome expectations. Although responsiveness and assurance has a significant positive correlation with computer self-efficacy, it is not as strong as the theoretical suggestion of SCT. Second, user's satisfaction has been significantly affected by performance outcome expectations, but not affected by either personal outcome expectations or computer self-efficacy. The interesting findings helped shape the proposed model into a refined model for answering the third question of what the suitable model for ERP system's success in SMEs is. The fruitful implications for both academia and practical world are presented in the following sections.

5.1 Implications for Academia

Academically, previous research revealed that the 22 items included in five factors in SERVQUAL for evaluating service quality can sometimes be regrouped into three to seven different factorial categories when culture difference, sample source regarding organization type or IS characteristics are considered (Pitt et al., 1995; Jiang et al., 2000). In addition, a number of researchers noted that SERVQUAL still needs perfecting when being used in different circumstances due to its reduced reliability, poor convergent validity, and the unstable dimensionality issues (Van Dyke et al., 1997, 1999; Jiang et al., 2000). Likewise, this study also found that the three factors were extracted in the broad ERP environment, yet the outcome is different from the suggestions of original measurement (Parasuraman et al., 1988). Thus, it is suggested that future study can focus on categorizing the research objectives into some different groups according to the function characteristics of ERP system or organization type of enterprise, in order to observe more in depth the effect of service quality on satisfaction for each level of user.

5.2 Implications for Practice

Empirically, the ERP system is a success unless it satisfies the users' needs (Au et al., 2002; Wu and Wang, 2006). Thus, it is important for SMEs to pay more attention to the salient factors of service quality and to the development of friendly system functions to meet the user's expectations. With regard to the empathy of service quality, this research found that it has a very significant positive effect on the user satisfaction, but not on the psychological factors. This means that the users of SMEs do not have high expectations of the caring service, individual attention, and understanding of the specific needs of the users from the ERP employees. With regard to the tangibles of service quality, the users of SMEs, in practice, still pay more attention to the concrete functions. For example, those quality factors such as a reliable physical facilities, up-to-date hardware and software, insistence on error-free records which can meet the work requirement are all highly expected by individual. Overall, this study believes that understanding how the characteristics of service quality affect user satisfaction through the psychological factors is important for SMEs to design and implement a successful ERP system.

5.3 Limitations and Future Research

There are three aspects to the limitations and relevant future research. First, from the aspect of conceptual research model, this research targets only service quality for an in-depth exploration. However, there are a number of other constructs that might considerably affect the success of ERP systems. For example, system quality, information quality, user's characteristics, organization situation (Igbaria et al., 1995; DeLone and McLean, 2003; Petter et al., 2008). Therefore, conducting a broad investigation into the other potential factors to meet the goal of building up a more diversified and more complete model is recommended.

Second, from the aspect of research object and industry, the research object of this study is the SMEs that have participated "Bridging the Digital Divide of the SMEs Project", and the industry type is limited in the wholesaler, retailer, goods producer, and general service provider. Hence, the model verification outcome is only suitable to apply to interpreting the perception of users who have adopted a similar type of systems. Thus, it is suggested that future research can target a wider variety of industry types or different groups of users for advanced data analysis and model verification.

Third, from the aspect of information system type, the sampling data is sourced from the SMEs that have implemented finance, accounting, and logistics modules of ERP systems. Although this research has covered a very wide range of application domains, in addition to the modules already mentioned, there are numerous of other modules such as production,

engineering technology, procurement, human resource, operation and logistics management (Olson, 2004; Liang et al., 2007). As a result, we suggest that future research examines other types of ERP modules that are applied to different areas in order to perform a deeper analysis and comparison for perfecting the model for evaluating the success of ERP systems.

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