ERP Systems Success: An Integration of IS Success Model and Balanced Scorecard

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This paper presents a respecification to the DeLone and McLean IS success model and empirically examines it in the enterprise resource planning (ERP) context. Five IS success constructs and a balanced scorecard were used to predict ERP systems success. The theoretical model was tested using a survey of 257 companies that had already implemented ERP systems in Taiwan. Structural equation modelling (LISREL) was used to validate the research model. Results of the study are consistent with the IS success factors for explaining ERP systems success. System quality and information quality were found to have a significant effect on system use and user satisfaction. System use and user satisfaction were associated with individual impact. Individual impact had a significant effect on four balanced scorecard perspectives.

ACM Classification: H.1.1 (Systems and Information Theory – Information theory), K.6.2 (Installation Management – Performance and usage measurement), K.4.3 (Organizational Impacts)

1. INTRODUCTION

Information technology (IT) has been viewed by enterprises worldwide as a vital tool in improving efficiency and competitiveness. In the last decade, many companies have turned to information systems, usually known as enterprise resource planning (ERP) systems, to respond to competitive pressures and market opportunities (Bingi, Sharma and Godla, 1999). The implementation of ERP systems has grown rapidly world-wide in recent years (Mabert, Soni and Venkataramanan, 2000; van Everdingen, van Hillegersberg and Waarts, 2000; Olhager and Selldin, 2003). ERP systems are integrated information systems that support value-added processes of enterprises. Based on modular software structure and a centralized database, information flows in manufacturing, finance, sales, distribution as well as human resources processes that can be integrated in real time. The ERP

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systems have become one of the largest IT investments for many companies during the 1990s (Chung and Snyder, 1999).

It is expensive and time consuming for companies to implement ERP systems (Davenport, 1998). The companies can take many years to implement a full ERP system, and the cost can be up to $10 million for a moderate size company and over $100 million for a large international enterprise (Mabert *et al*, 2000). Enterprises have invested heavily in ERP systems, with the expectation of improvements in business processes, increased customer responsiveness, and strategic business improvements (Li, 1999; Umble, Haft and Umble, 2003). Despite the growth in ERP system implementation, previous research shows a growing dissatisfaction with ERP systems; that they have failed to deliver the anticipated benefits (Holland, Light, and Gibson, 1998; Bingi *et al*, 1999).

The concept of information system (IS) success is widely accepted for the evaluation of information systems. After a comprehensive review of various measures used in the literature to assess IS success, DeLone and McLean (1992) proposed a model that incorporates several individual categories of success into an overall IS success model. The model provides two important contributions to our understanding of IS success: It classifies IS success measures into six dimensions and it suggests a model of temporal and causal factors among these dimensions (Seddon, 1997). The IS success model has received much attention among IS researchers. Several recent studies have replicated or extended the IS success model to the study of different applications (Rai, Lang and Welker, 2002; McGill and Hobbs, 2003; DeLone and McLean, 2004). Therefore, an ERP system can be considered as a kind of information system, thus providing the application of IS success model to ERP systems.

Many approaches and techniques have been suggested over the decades to evaluate the investments in information technology and information systems. Traditional evaluations focus on financial measures, such as return on investment, net present value, internal rate of return, and payback period (Martinsons, Davison, and Tse, 1999). Kaplan and Norton (1992) developed a balanced scorecard as a means to evaluate organizational performance by including financial and non-financial measures. The balanced scorecard may help organizations to evaluate information technology investments and the performance of an information system (Martinsons, 1992). In recent years, several studies have indicated that the balanced scorecard approach can be used to evaluate ERP performance (Markus and Tanis, 2000; Rosemann, 2001; van Grembergen, Saull and De Haes, 2003; Chand, Hachey, Hunton, Owhoso, and Vasudevan, 2005). As a result, we suggest that it may be appropriate to use a balanced scorecard to measure and evaluate the performance of ERP systems.

The aim of this research is to address 'how ERP systems success can be usefully measured' with a combination of IS success model and a balanced scorecard to capture both financial and non-financial aspects of ERP systems measurement.

2. LITERATURE REVIEW

2.1. IS Success Model

The DeLone and McLean's model of IS success is based on an extensive literature review. They identified over one hundred measures and classified them into six interrelated categories of success: System quality, information quality, system use, user satisfaction, individual impact and organizational impact. The model posits that system quality and information quality are the two major determinants of IS use and user satisfaction, which in turn are direct antecedents of individual impact and then individual impact has a positive effect on organizational impact.

The IS success model has been assessed and validated in a wide range of IS use contexts. These applications include departmental accounting systems (Seddon and Kiew, 1996), student

information systems (Rai *et al*, 2002), and user-developed applications (McGill and Hobbs, 2003). Some studies have also applied the IS success model to measure e-commerce success (Liu and Arnett, 2000; Molla and Licker, 2001; DeLone and McLean, 2004).

2.2. Balanced Scorecard

The concept of a balanced scorecard was developed by Kaplan and Norton (1992, 1993, and 1996) to include both financial and non-financial measures for the estimation of the state of the organization. They proposed that financial measures can be supplemented with additional measures that reflect customer satisfaction, internal business processes, and the ability to learn and grow, while traditional financial measures provide a narrow and incomplete evaluation of business performance. The balanced scorecard includes four sets of measures: Financial, customer, internal business and innovation and learning (Kaplan and Norton, 1992).

The financial perspective is a traditional measure of success. Financial measures compute the handily measured monetary effects of activities. They indicate whether the implementation of an ERP system contributes to the improvement of the company's financial position. Customer perspective refers to the degree of customer satisfaction. Internal business perspective refers to effectiveness of the production processes. The firm should identify activities and key processes for the realization of the aims formulated in the financial and customer perspectives. Innovation and learning perspective embraces the aims and measures determining the development of the organization and growth of employees.

3. RESEARCH MODEL AND HYPOTHESES

Based on a review of the literature, the authors have developed a theoretical model to measure ERP systems success. The model for this research is a respecification of the IS success model as shown in Figure 1. The balanced scorecard, the integrated part of the model, is the construct of interest because it is used to estimate the enterprise's effectiveness on ERP systems. The effectiveness of ERP systems is expected to enhance system use and user satisfaction. DeLone and McLean (2003) proposed minor refinements to the IS success model which included an additional service quality. They argued that to measure a single IS success; system quality and information quality may be the

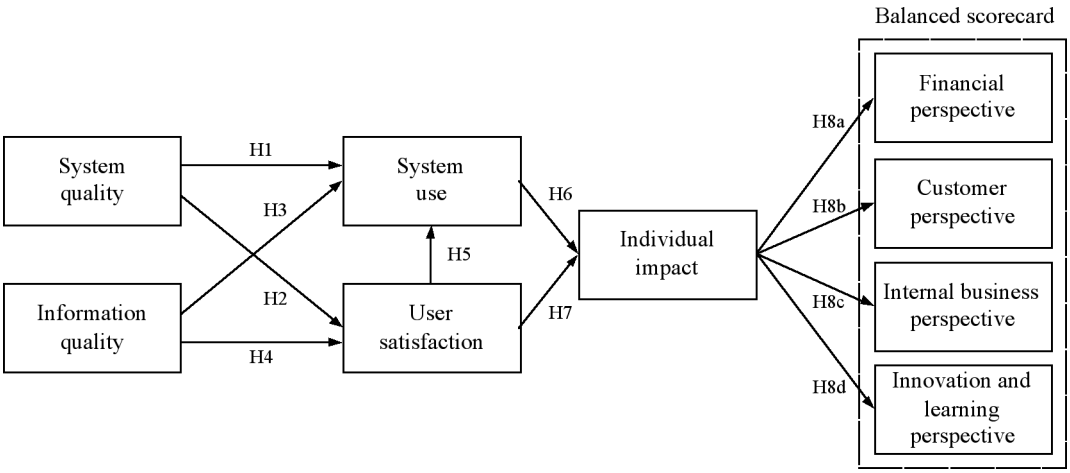

Figure 1: Research model for ERP systems success

most important quality dimensions while service quality may become the most important factor for measuring the overall success of the IS department. Thus, service quality was not considered in this study, because the focus is to measure the success of ERP systems rather than the IS department. The basic assumption is that system quality and information quality have a positive effect on the users' attitude toward the use of ERP systems and their satisfaction with the systems. Four balanced scorecard constructs including financial perspective, customer perspective, internal business perspective, and innovation and learning perspective were used to measure the performance of ERP systems.

In the DeLone and McLean IS model (1992), system quality and information quality are depicted as affecting both system use and user satisfaction. System quality is concerned with the performance characteristics of the ERP systems, including reliability, flexibility, ease of use, and response time (DeLone and McLean, 1992; Rai *et al*, 2002). Information quality is concerned with timeliness, relevance, and usefulness of information generated by an information system (DeLone and McLean, 1992; McKinney, Yoon and Zahedi, 2002). System usage is the degree of user recipient consumption of the output of an information system (DeLone and McLean, 1992). User satisfaction is the recipient response to the use of the outcomes of an information system (DeLone and McLean, 1992). There is quite strong support in the literature both theoretical and empirical; the results indicated that system quality and information quality positively affected both system use and user satisfaction (DeLone and McLean, 1992; Seddon and Kiew, 1996; Rai *et al*, 2002; DeLone and McLean, 2003). Therefore, we hypothesize that the paths predicted by IS success model also apply to this study.

H1: System quality is positively related to ERP system use.

H2: System quality is positively related to user satisfaction with ERP system.

H3: Information quality is positively related to ERP system use.

H4: Information quality is positively related to user satisfaction with ERP system.

Although DeLone and McLean IS model (1992) depicted a bidirectional effect between system use and user satisfaction, in this study, only user satisfaction that affects system use was considered because a higher level of user satisfaction makes the user rely on the system frequently (Rai *et al*, 2002). In an application of the IS success model to computer systems acceptance, Igbaria and Tan (1997) found that users with higher satisfaction used the system very frequently. Gelderman (1998) investigated the validity of usage and user satisfaction for the success of information systems. The results indicated that user satisfaction had a significant relationship with system usage. Torkzadeh and Doll (1999) found that end-user computing satisfaction has significant correlation with usage pattern. Rai *et al* (2002) partially tested DeLone and McLean's IS success model. They found that there was strong support for the positive relationship between user satisfaction and system use. Accordingly, this study theorizes that if the users are satisfied with ERP system, there is a greater user dependence on the system.

H5: User satisfaction is positively related to ERP system use.

Individual impact is concerned with the effect of information on the behaviour of the user (DeLone and McLean, 1992). Individual impact was measured in terms of job performance, individual productivity, capability of problem identification, and decision-making effectiveness. Guimaraes and Igbaria (1997) reported a positive effect of system usage and user satisfaction on the impact of end-user jobs for client/server systems success. Igbaria and Tan (1997) found that user satisfaction and system usage are important factors affecting individual impact. The study of Torkzadeh and Doll (1999) indicated that user satisfaction has significant correlation with the four dimensions of impact scale: task productivity, task innovation, customer satisfaction, and management control. The four impact dimensions have significantly higher correlations with a

perceived usage pattern than user satisfaction, suggesting that they are more closely associated with usage than user satisfaction. Previous studies tested the direct associations from system use and user satisfaction to individual impact, and found the two associations to be significant. Therefore, the following hypotheses are proposed.

H6: ERP system use is positively related to individual impact.

H7: User satisfaction is positively related to individual impact.

In order to include a balanced scorecard in the IS success model, we had to decide which category in the taxonomy it represents. Although DeLone and McLean (1992) did not include a balanced scorecard in their taxonomy, we make the assumption that a balanced scorecard is associated with the taxonomic category, organizational impact. The organizational impact is the effect of ERP systems on organizational performance. Martinsons *et al* (1999) have proposed a balanced scorecard based approach to measure organizational performance. Chand *et al* (2005) developed a framework to assess strategic impacts of ERP systems based on a balanced scorecard. In a three-year longitudinal study surveyed by Jurison (1996) to evaluate the relationship between user productivity and organizational effectiveness of an integrated office information system, the results indicated that individual benefits (individual impact) occur first, then improvements in organizational effectiveness (organizational impact). Teo and Wang (1998) examined the relationships between IT investment and performance impact measures of the retail industry. The result indicated that improvement in the work environment has a significant positive relationship with organizational impact. They argued that improvements in the work environment can motivate employees to work harder and smarter, thereby resulting in increased effectiveness and productivity. Previous studies tested the association between individual impact and organizational impact and the association was found to be significant. Therefore, the following hypotheses are proposed.

H8a: Individual impact is positively related to financial effectiveness.

H8b: Individual impact is positively related to customer effectiveness.

H8c: Individual impact is positively related to internal business effectiveness.

H8d: Individual impact is positively related to innovation and learning effectiveness.

4. RESEARCH METHODOLOGY

4.1 Subjects and Procedure

The unit of analysis in this study is the individual companies which have already implemented an ERP system. The data for the study were made available from a mail survey of the top 3000 companies in Taiwan listed by the China Credit Information Service, Ltd. A total of 3000 surveys were distributed, 548 responses were returned with response rate of 18.3%. A total of 271 companies had implemented ERP systems. The other 277 firms were still in the implementation stage, under evaluation or not planning to implement an ERP system. The exclusion of 14 responses from incomplete questionnaires resulted in a total of 257 usable questionnaires (a net response rate of 8.6%). Detailed descriptive statistics relating to the respondents' characteristics are shown in Table 1.

The definition of industry sectors given by Scott and Meyer (1991) has been considered. The sample used is from 257 companies, corresponding to agriculture and food (6), manufacturing (158), construction (7), transportation (26), distribution (19), and services (41). As Table 1 indicates, thirty-two percent of companies have fewer than 150 employees and sixty-eight percent of enterprises have more than 150 employees. The results show that the current ERP implemented focus is on the large enterprise sector in Taiwan. The majority of survey respondents have annual revenues of NT$ 1,001 to 5,000 million. Although there are numerous packaged ERP systems provided by international and local ERP vendors, about sixty-eight percent of companies have

Characteristics	Statistics[a] (N=257)
Industry	
Agriculture and food	6 (2.3)
Manufacturing	158 (61.5)
Construction	7 (2.7)
Transportation	26 (10.1)
Distribution	19 (7.4)
Services	41 (16.0)
Number of Employees	
<150	82 (31.9)
150 – 500	101 (39.3)
501 – 1000	29 (11.3)
1001 – 5000	40 (15.6)
>5000	5 (1.9)
Annual revenue (NT$ million)	
<500	44 (17.1)
500 – 1000	56 (21.8)
1001 to 5000	102 (39.7)
> 5000	55 (21.4)
Implemented ERP system	
International ERP products	81 (31.5)
Local ERP products	176 (68.5)
Implementation duration	
< 6 months	64 (24.9)
6 to 12 months	111 (43.2)
1 to 2 years	63 (24.5)
> 2 years	19 (7.4)

[a] Values shown in the parentheses are in percentage.

Table 1: Descriptive statistics of respondents' characteristics

selected local ERP products for implementation. The result illustrates that the local ERP vendors dominate Taiwan's ERP market share. The results of the responding firms indicate a fairly time consuming implementation, with most companies (75%) spending over six months.

4.2 Measurement Development

In order to develop and validate the instrument, two steps were taken:

– Development of the measures from the literature.
– Initial pretest with expert professionals.

The questionnaire used for data collection contained scales to measure the various constructs of the research model and demographical data of respondents. Table 2 lists the instrument for the research constructs. The principle constructs were developed based on existing measures where possible or on similar scales. Measures for five IS success constructs were adapted from existing studies on the IS success model (DeLone and McLean, 1992; Rai *et al*, 2002). Measures for four balanced scorecard constructs: Financial perspective, customer perspective, internal business perspective, and innovation and learning perspective were based on the existing research of Kaplan and Norton (1992), Maltz, Shenhar, and Reilly (2003), Chand *et al* (2005), and Michalska (2005).

Construct	Measure	Mean	S.D.	Loading
System quality (SQ)				
Composite reliability = 0.90				
SQ1	System reliability	5.88	1.03	0.82
SQ2	Speed of system responses	5.97	0.93	0.76
SQ3	Ease of use	5.81	1.05	0.87
SQ4	Flexibility of system	5.77	1.13	0.82
Information quality (IQ)				
Composite reliability = 0.92				
IQ1	Information accuracy	5.74	1.04	0.83
IQ2	Timeliness of information provision	5.86	0.98	0.85
IQ3	Usefulness of data provision	5.83	0.92	0.88
IQ4	Information understandability	5.59	1.03	0.90
IQ5	Importance of information related to decision making	5.41	0.96	0.75
System use (SU)				
Composite reliability = 0.81				
SU1	Ration of the use of the ERP system for decision support purposes	5.30	0.97	0.69
SU2	Frequency of the use of report/information	5.73	0.98	0.71
SU3	Degree of voluntary use of the ERP system	5.76	0.93	0.73
SU4	Connection time	5.68	1.09	0.75
User satisfaction (US)				
Composite reliability = 0.94				
US1	Information satisfaction	5.41	1.04	0.82
US2	Software satisfaction	5.15	1.17	0.91
US3	System interface satisfaction	5.14	1.12	0.74
US4	Overall satisfaction	5.28	1.07	0.89
US5	The ERP project satisfaction	5.22	1.01	0.88
Individual impact (II)				
Composite reliability = 0.94				
II1	Job performance	5.43	1.01	0.86
II2	Individual productivity	5.33	1.01	0.81
II3	Decision effectiveness	5.30	0.93	0.81
II4	Capability of problem identification	5.22	0.92	0.79
II5	Accurate readiness of problems	5.23	0.97	0.81
Financial perspective (FP)				
Composite reliability = 0.95				
FP1	Inventory levels	5.39	1.02	0.89
FP2	Purchasing costs	5.33	1.01	0.96
FP3	Inventory turnover	5.23	0.99	0.97
Customer perspective (CP)				
Composite reliability = 0.89				
CP1	Ratio of on time delivery of goods	5.06	0.98	0.88
CP2	Response time to customer complaints	4.96	0.97	0.87
CP3	Ratio of on time delivery of bills	5.34	1.03	0.81

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Internal business perspective (IBP)				
Composite reliability = 0.89				
IBP1	Internal data transmission time	5.79	0.95	0.86
IBP2	Frequency of interaction across departments	5.52	0.92	0.87
IBP3	Response time to environmental volatility	5.42	0.97	0.92
Innovation and learning perspective (ILP)				
Composite reliability = 0.84				
ILP1	Understanding of business processes	5.35	0.92	0.83
ILP2	Job achievement of employees	5.14	0.99	0.89
ILP3	Product development to the market	4.80	0.91	0.66

All ratio of improvement were measured by using seven-point Likert-type scales ranging from 1 (substantial deteriorate) to 7 (substantial improvement).

Table 2: Summary of measurement scales

A pretest of the questionnaire was performed using six experts in the IS area and five consultants from ERP vendors to assess its logical consistencies, ease of understanding, sequence of items and ERP relevance. The comments collected from these experts led to several minor modifications of the wording and item sequence.

4.3 Data Analysis

Data analysis utilized a two-step approach (Anderson and Gerbing, 1988). The first step involves the analysis of the measurement model, while the second step tests the structural relationships among constructs. The test of the measurement model includes the estimation of internal consistency and the convergent and discriminant validity. Table 2 shows that most reliability measures were well above the recommended level of 0.7, thus indicating adequate internal consistency (Nunnally, 1978). Convergent validity is demonstrated when items load highly (loading>0.7) on their associated factors and constructs have an average variance extracted (AVE) of at least 0.5 (Fornell and Larcker, 1981). Table 2 shows that most of the measures have significant loadings that load much higher than the suggested threshold. The two exceptions were the first item of system use scale and the third item of innovation and learning perspective scale, where loading was slightly below 0.7. Table 3 shows that all AVE were well above the recommended value level of 0.5. Discriminant validity can be tested by comparing the AVE of construct pairs to the squared correlation between construct pairs. For satisfactory discriminant validity, the AVE from the construct should be greater than the variance shared between the construct and other constructs in the model (Chin, 1998). Table 3 lists the correlation matrix, with correlations among constructs and the square root of AVE on the diagonal.

After the assessment of reliability and validity, the overall fit of the research model was tested using LISREL 8.50. Using sample covariance matrices, the overall fit and the explanatory power of the research model were examined, together with the relative strengths of the individual causal path. Seven common model-fit measures were used to assess the model's overall goodness-of-fit: normed chi-square (chi-square divided by degrees of freedom: χ^2/df), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normed fit index (NFI), non-normed fit index (NNFI), comparative fit index (CFI), root mean square error of approximation (RMSEA), and root mean square residual (RMSR). Table 4 summarizes the overall fit indices of the research model. All model fit indices surpass the recommendations suggested by earlier studies (Hayduk, 1987; Jöreskog and Sörbom, 1993; Chin and Todd, 1995; Etezadi-Amoli and Farhoomand, 1996). It seems certain; therefore, the research model provided a good fit to the data.

Construct	AVE	Construct								
		SQ	IQ	SU	US	II	FP	CP	IBP	ILP
SQ	0.667	**0.816**								
IQ	0.710	0.799	**0.843**							
SU	0.521	0.670	0.707	**0.722**						
US	0.725	0.676	0.650	0.654	**0.852**					
II	0.666	0.699	0.701	0.707	0.779	**0.816**				
FP	0.886	0.563	0.551	0.532	0.550	0.559	**0.942**			
CP	0.727	0.575	0.640	0.594	0.641	0.694	0.662	**0.853**		
IBP	0.780	0.607	0.643	0.601	0.662	0.690	0.554	0.674	**0.883**	
ILP	0.642	0.548	0.622	0.615	0.703	0.760	0.575	0.714	0.704	**0.801**

Diagonal elements (in bold) are the square of average variance extracted (AVE).
These values should be larger than off-diagonal elements for adequate discriminant validity.
SQ=system quality; IQ=information quality; SU=system use; US=user satisfaction; II=individual impact
FP=financial perspective; CF=customer perspective; IBP=internal business perspective;
ILP=innovation and learning perspective.

Table 3: Correlations of latent variables

Model fit indices	Results	Recommended value
Chi-square statistic $\chi 2$/df	1.51	< 3.0
Goodness of fit index (GFI)	0.85	> 0.8
Adjusted goodness of fit index (AGFI)	0.82	> 0.8
Normed fit index (NFI)	0.91	> 0.9
Non-normed fit index (NNFI)	0.96	> 0.9
Comparative fit index (CFI)	0.97	> 0.9
Root mean square error of approximation (RMSEA)	0.045	< 0.08

Table 4: Overall model fit indices for the research model

The significance of individual paths was examined and summarized in Figure 2. All paths exhibited a *P*-value of <0.05 with significant effect. As hypothesized, system quality had a positive effect on system use and user satisfaction, with path coefficients of 0.41 and 0.43. Hypotheses 1 and 2 were supported. Consistent with hypotheses 3 and 4, information quality also had a positive effect on system use and user satisfaction, with path coefficients of 0.24 and 0.38. User satisfaction had a positive effect on system use with a path coefficient 0.32, thus, hypothesis 5 was supported. System use and user satisfaction were associated with individual impact, with path coefficients of 0.67 and 0.31. Hypotheses 6 and 7 were supported. Finally, individual impact had a positive effect on the four perspectives of balanced scorecards, with path coefficients of 0.67, 0.82, 0.86 and 0.87. Hypotheses 8a, 8b, 8c and 8d were supported.

The explanatory power of the research model was also shown in Figure 2. R^2 values show that system quality and information quality account for 77% of variance in system use and 62% of variance in user satisfaction. System use and user satisfaction account for 69% of variance in individual impact. Given the high explanatory power of the resulting model, it is likely to predict usage behaviour on individual impact and enhance understanding of ERP systems success.

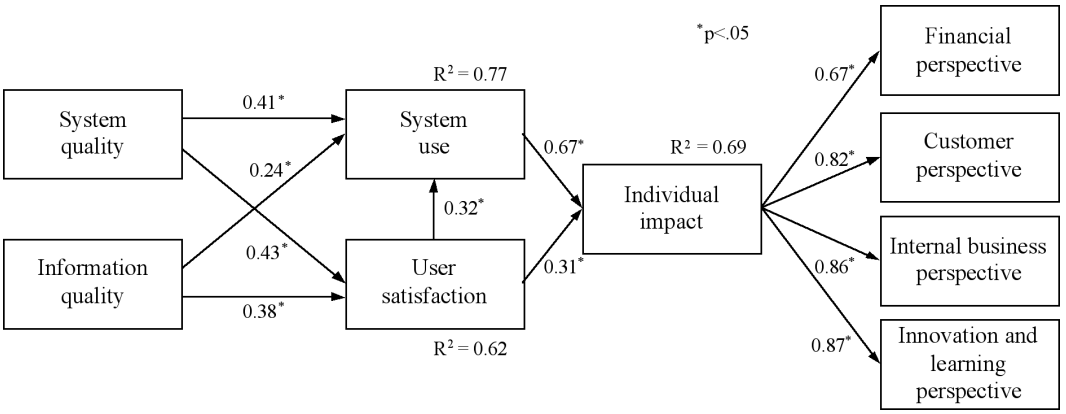

Figure 2: SEM analysis of the research model

5. DISCUSSION

In this study we examined the integrated model of the IS success model using a balanced scorecard within the context of ERP. Structural equation modelling (SEM) was used to validate the research model. This approach was chosen due to its capability to test causal relationships between constructs with multiple measurement items (Jöreskog and Sörbom, 1993). The SEM approach also has the capability of testing the measurement characteristics of constructs (Hair, Anderson, Tatham, and Black, 1998). The results supported the proposed research model. The primary contribution of this research is the integration of variables associated with the IS success model (system quality, information quality, system use, user satisfaction and individual impact) and balanced scorecard constructs (financial, customer, internal business, and innovation and learning perspectives) that jointly predicts ERP system success.

The result was consistent with previous IS success model research (Seddon and Kiew, 1996; Seddon, 1997; Molla and Licker, 2001; Rai *et al*, 2002; DeLone and McLean, 2004). System quality and information quality were found to have a significant effect on system use and user satisfaction. As expected, system use depended mainly on user satisfaction. Individuals are likely to increase utilization of an information system if they feel satisfaction with the system. The result also confirmed many of the findings of the earlier studies indicating that system use and user satisfaction have an effect on individual impact. Davenport (2000) observed that there are different types of benefits of ERP systems. The four performance perspectives of the balanced scorecard correspond with Davenport's observations. The balanced scorecard will allow companies to see the positive and negative impacts of ERP systems and IS activities on the factors that are important to the organization as a whole. This study made it apparent that a balanced scorecard was able to translate ERP strategy more effectively across the entire enterprise as well as manage it effectively throughout its execution.

This research attempted to establish a base for future studies on the role of the IS success model and balanced scorecard in ERP implementation. This study has certain limitations, which may present opportunities for further research. Since the respondents to the survey were limited to enterprises in Taiwan, this study may have limited application to other countries. There is obviously a survey bias in the sample, because those who felt dissatisfied with the ERP systems were unwilling to participate in the survey accordingly. Although there are numerous factors affecting the

success of ERP systems, in this study we only focused on the IS success constructs as seen in the research model.

This research has potential for practical application in the implementation of ERP systems. By confirming the IS success model, it suggests that ERP systems should provide system quality and information quality to encourage system utilization and increase user satisfaction. Although system quality and information quality are as important in ERP systems as in the traditional IS environment, a balanced scorecard concept will play a critical role in performance evaluation. Given the critical role played by the balanced scorecard in the formation of organizational performance, managers should track the four perspectives of measures, identify sources of any dissatisfaction, and justify investments in ERP systems. The research could be used to identify strengths and weaknesses in existing ERP systems and then used to improve the quality of ERP systems and organizational performance.

6. CONCLUSION AND FURTHER RESEARCH

This study provides a better understanding of the system success for ERP implementation. The findings have been achieved on the basis of an integrated IS success model using additional determinants from a balanced scorecard. System quality and information quality were shown to be important to ERP utilization and user satisfaction. In addition, system use and user satisfaction appear to influence individual performance and productivity. The results show that individual impact has strong direct effects on the four balanced scorecard dimensions.

Both the IS success model and the balanced scorecard concept have been studied for years in different fields. IS research and e-commerce have looked at the relationship between dimensions of quality and the success of variety of information systems. In the organizational strategy literature, a balanced scorecard is strongly associated with organizational performance. The current study has combined these research streams by placing four balanced scorecard perspectives into a context of system quality, information quality, system use, user satisfaction, and individual impact.

The value of cross-cultural research is significant due to the movement toward global competitions and corporate multinationalism (Straub, 1994; Straub *et al*, 1997; Hempel, 2001). However, little research has addressed the issue of how cultural factors affect the ERP systems success within different countries or multinational enterprise. Different cultural heritages and users' behaviour may influence the implementation experiences of ERP systems (Davison, 2002), which in turn create different perceptions of ERP success and performance improvement. Future research may compare the results of this study with those performed in different countries. As companies in Taiwan extend their operations into China, there is a need to exploit the utilization of ERP systems among these widespread locations and to coordinate activities and processes both within and across countries. Awareness of cultural differences will certainly improve the assessment of ERP success. Cultural factors could have significant influence in many situations (Hofstede, 1991). The previous research indicated that cross-cultural differences have a significant influence not only for organizational and job-satisfaction values, but also for technical and economic values (Kumar and Bjørn-Andersen, 1990). Accordingly, in the proposed model, the cultural factors could have an influence on system quality, information quality, user satisfaction, individual impact and organizational effectiveness. Finally, this study was conducted with a snapshot research approach, a longitudinal research design is essential to confirm the research model in the future.

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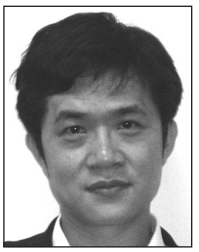

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