The Study of Relationship among Project Management and Implementation Performance of ERP

Wen-Hsien Tsai
Professor, Business of Administration
National Central University
Jhongli, Taiwan, ROC, Jhongli 320, Taiwan
whtsai@mgt.ncu.edu.tw

Yi-Wen Fan
Associate Professor, Department of Information Management
National Central University
No. 300, Jhongda Rd., Jhongli City, Tao-Yuan County 32001, Taiwan
iwfan@mgt.ncu.edu.tw

Jau-Yang Liu
Phd. student, Business of Administration
National Central University
320 Jhongli, Taiwan, ROC, Jhongli tw, Taiwan
liu78705@yahoo.com
Abstract

This paper explores the relationships between the achievement of project management and the degree of implementation performance of Enterprise Resource Planning (ERP). In this paper, DeLone & McLean’s (1992) information systems (IS) success framework will be used to develop the implementing ERP systems performance measures for assessing project management and enterprises’ performance improvement in the post-implementation stage.

1. Introduction

To improve business performance, organizations need an efficient planning and control system that synchronizes planning of all processes across the organization. Tsai & Chien (2005) pointed out that the key to improve business performance is a solid information system (IS) infrastructure seamlessly aligned with core business processes developed for the delivery of high quality products and services to customers in the shortest possible time. These demands have prompted more and more firms to shift their information technology (IT) strategies from developing in-house information systems to purchasing application software, such as Enterprise Resource Planning (ERP) systems, to generate synergies and enhance operating efficiency (Hong & Kim, 2002).

However, how they can be implemented and embedded into organizations, organizations are usually subjected various obstacles in the process of implementation (Brown & Vessey, 2003; Mabert et al., 2003; Motwani et al., 2002; Ross et al., 2003; Scott & Vessey, 2002; Sherer, 2004; Sumner, 2002; Willcocks & Sykes, 2000). In fact, ERP projects tend to be large and complex, and require expertises that are not typically found internally within the organization implementing the ERP system. As such, these high-risk projects require multiple strategies to minimize risks (Applegate, McFarlan, & McKenney, 1999). Particularly in the beginning of implementation, organizations might have to make decision which system provider should be made at once. Selecting a vendor may be a lifelong commitment (Davenport, 2000)? Brown and Vessey (2003) also noted that implementing the best practices embedded in the vendor package greatly increases the chance of project success. Next, organization might not have experience to implement such systems and require professional consultation from external consultancy company during the process of implementation. Piturro indicated (1999) that an external consultant with knowledge about specific modules is critical, but how their knowledge could be transferred to internal employees. Janson and Subramanian (1996) further concluded that as close fit between the software vendor and the user organization is positively associated with
successful package implementation.

Furthermore, in order to adapt the organization to the package throughout the implementation process, organization might also need an executive steering committee. A steering committee, responsible for system selection, monitoring, and managing external consultants, must be involved throughout the project (Bingi, Sharma, & Godla, 1999). This critical moderate (intermediary) role or mechanism, steering committee is not only responsible for executions but also responsible for the deliveries and transformations ERP project into effective system performance with precision to ensure success in implement of system. Most important, ERP systems integrate information and standardize processes. If organizations find this consistent with their overall business strategies, then they will perceive greater value from ERP. In summary, throughout the overall implementing process, organization should be involved in three party-players which include system provider, consultancy company and internal steering committee. For this reason, organizations can not kick off system implementation without their participations.

Therefore, in this study authors accordingly not only attempt to explore the relationships among service quality (SERVQUAL), project management and implementation performance of Enterprise Resource Planning (ERP) in the post-implementation but also attempt to investigate how project management of steering committee can deliver and transfer service quality of system provider and Consultancy Company into system performance during the implementation of ERP systems. Besides, authors will also empirically investigate the multi-dimension relationships among these four subjects.

In other words, the purpose of this study is to identify the variables for two service qualities, project management and the success measures of post-implementation ERP systems. By doing this, authors believe that this paper will benefit to understand whether traditional project management techniques are, in fact, unsuitable for ERP projects and whether some of the problems encountered by implementing firms could be solved by using ERP specific approaches. Of course, the paper will report more details in the beginning of literature review. The research design is then briefly introduced and followed by a discussion of the findings. Finally, conclusions and suggestions for future research directions are presented.

2. Literature Review

2.1 Selection of Dependent Variables

ERP systems success is a fairly complicated and fragmented area of research that encompasses all phases of system implementation and evaluation. Variable analysis of ERP systems success antecedents is similar to variance study but slightly narrower in focus. The dependent variables tend to cluster around a relatively small set of
variables. First, initiation, adoption, and adaptation (Cooper & Zmud, 1990) deal with the process leading up to the implementation of an ERP system, whereas intention to use, use, user satisfaction (DeLone & McLean, 2003), and acceptance (Cooper & Zmud, 1990) concern perceptions and behaviors related to the implemented ERP system. Finally, individual and organizational impacts (DeLone & McLean, 1992) focus on technology performance. As the selection of dependent variables will affect the composition of the taxonomy of antecedents to ERP systems success, an important question emerges: Why include such an eclectic collection of dependent variables? This research builds on the premise that IS researchers have used the same independent variables to examine many or all of the above nine dependent variables (Cooper & Zmud, 1990; Seddon, 1997).

In an attempt to examine the extent of available researches, a table with findings in the intersection between specific concepts (aggregated into their respective categories) and dependent variables was presented. The dependent variables were put into groups according to:

Implementation process (initiation, adoption, and adaptation)

2.2 Service Quality of System Provider and Consultancy Company

The IS function now includes a significant service component. However, commonly used measures of IS effectiveness focus on the products rather than the services, of the IS function. Similarly, software providers like other service firms are realizing the significance of customer-centered philosophies and are turning to quality management approaches to help managing their business. Service quality is a concept that has aroused considerable interest and debate in the research literature because of the difficulties in both defining it and measuring it with no overall consensus emerging on either (Wisniewski, 2001). While there have been efforts to study service quality, there has been no general agreement on the measurement of the concept. The majority of the work to date has attempted to use the SERVQUAL (Parasuraman et al., 1985; 1988) methodology in an effort to measure service quality (e.g. Brooks et al. 1999; Chaston, 1994; Edvardsson et al., 1997; Lings & Brooks, 1998; Reyunoso & Moore, 1995; Young & Varble, 1997; Sahney et al., 2004). Pitt et al. (1995) pointed out that SERVQUAL, an instrument developed by the marketing area, is offered as possible measure of IS service quality. There is the danger that IS researchers may mismeasure IS effectiveness if they do not include in their assessment package a measure of IS service quality. The SERVQUAL instrument has been the predominant method used to measure the degree of satisfaction associated to consumers’ perception of service quality special to IS function. It has five generic dimensions or factors and is stated as follows (Van Iwaarden et al., 2003):

(1) **Tangibles.** Physical facilities, equipment and appearance of personnel.
Reliability. Ability to perform the promised service dependably and accurately.

Responsiveness. Willingness to help customers and provide prompt service.

Assurance. Knowledge and courtesy of employees and their ability to inspire trust and confidence.

Empathy. Caring and individualized attention that the firm provides to its customers.

2.3 Project Management of Steering Committee

A considerable volume of research has been carried out on project management of Enterprise Resource Planning systems. There are also lots of evidences that the success rate of ERP implementation is not high or conclusively successful in view of the sums invested by firms in these applications. The main possibility might be lack of vigorously executive mechanism whose capability of ensuring available resources are used in the most effective and efficient way to deliver and transfer desired developing system performance into organization. During the implementation of ERP systems, it also appears that problems that occur are not attended to satisfactorily with substantial side effects on the outcome of the project overall.

Adam and Twomey (2001) pointed out that ERP projects are often treated as normal IS projects, whereas they often involve specific aspects that make them different from traditional information systems development projects because an ERP is constituted by many subsystems, which collaborate aiming at the complete cooperation and interaction of the enterprise departments and at the leveling of the proper company operation (Shtub, 1999; Markus & Tanis, 2000; Davenport, 2000; Laudon, 2000; Soh et al., 2000; Kenerley & Neely, 2001; Laughlin, 1999; Rosemann, 1999). The complete implementation of an ERP system is a very difficult and important task and includes the optimal adaptation and installation of all the subsystems in the respective departments of the enterprise.

Just owing to the involvements of people, systems, organization, and consultant in this process of transition, therefore, organizations need moderate (intermediary) mechanisms to coordinate them to achieve its set goal of implementation. Here, project management of steering committee accordingly plays a critical role during the process of implementation. Project management is an aid to steering committee because it helps them to standardize routine tasks and reduce the number of tasks that could potentially be forgotten. Cleland and Ireland (2000) further stated that a vital procedure of project management is risk management. Risk management contributes in avoiding problems during a project, which can lead to deviation from project goals, timetables and cost estimation. So and application for managing risk is very crucial for the success of a project special in the implementation of an ERP system (Zafiropoulos, Metaxiotis & Askounis, 2005). In addition, the application of project
management principles allows steering committee to establish and use more appropriate measures of success, to quantify value commensurate with cost and to optimize the use of organizational resources.

In the following sections, author proposes a description of the activities identified the achievement level of project management in project management of steering committee categorized under the eight knowledge areas of project management which included (1) fulfilling business implementation goal (2) full of top management support (3) meeting schedule goal (4) meeting budget objective (5) triggering effective communication (6) solving problem (7) fulfilling integration of system (8) fulfilling user’s needs. These eight areas, although presented as distinct features are usually totally integrated, as are their component processes.

(1) **The consistent extent to which the goal of PM is meeting overall development strategy of business.** It has long been common knowledge that the first phase of an IT project should start with a conceptualization of goals and ways to accomplish these (Clenland & King, 1983; Slevin & Pinto, 1987). Clear goals and objectives seem to form a clear-cut CSF, but can actually be rather problematic. Therefore, lack of agreement on a set of project goals/objectives lead to time/cost overruns (Ewusi-Mensah, 1997).

(2) **The degree of top management support on PM.** If top management is not actively backing an all-pervasive project, there is little hope for it. This is especially so in the early stages of such a project (Slevin & Pinto, 1986; Bingi et al., 1999). It is probably true for most implementations of innovations into organizations (Jarvenpaa & Ives, 1991). On the other hand, it would be unwise to suggest that top management is omnipotent in this kind of process. Therefore, lack of senior management commitment (Keil et al., 1998) and lack of agreement on a set of project goals/objectives (Ewusi-Mensah, 1997) lead to time/cost overruns.

(3) **The effective degree of Budget Control.** The total costs of implementing an ERP system include the cost of licensing, training, implementation, maintenance, customization and hardware requirements (MacVittie, 2001), but Bingi et al. (1999) warned that ERP projects are characterized by a lot of hidden costs. Therefore, if project management is unable to control budget and lack of an effective methodology and poor estimation can lead to cost and time overruns (Keil et al., 1998).

(4) **The effective degree of Time schedule monitoring.** McKie (1999) stated, “Nobody is capable of implementing all of modules (financial, distribution and manufacturing software across a range of statutory, operational, linguistic and cultural parameters) in a short time frame”. Evidently, the length of implementation is greatly affected by the scope of the project. Minahan(1998)
claims that a typical ERP implementation takes between two and three years while a larger one. Stefanou (2000) states that unrealistic time frames add unnecessary pressure will lead to project failures.

(5) **The effective degree of communication.** Schwalbe (2000) stated that communication is the oil that keeps everything working properly in IT project management. Slevin and Pinto (1986) reached similar conclusions for project management in general. As noted above, this need for communication across functional boundaries is all the more important in an ERP context since the primary objective of ERP systems is to integrate business functions (Davenport, 1998). Palaniswamy et al. (2000) stated that the higher the levels of communication and interaction in the implementation team, the higher the performance of the team. The members of the team must be able to communicate between themselves, with the clients, the suppliers and all other stakeholders.

(6) **The effective degree of Problems solving.** Project managers may have to address issues over which they have no control, such as changing scope/objectives and conflicts between user departments (Keil, Cule, Lyytinen, & Schmidt, 1998).

(7) **The effective degree of integration of system.** Technical complexity, links to existing legacy systems) and failure of technology to meet specifications are project hazards(Bark et al., 1993)

(8) **The effective degree of Acceptance by end-user.** Lack of user commitment, ineffective user communications, and conflicts among user departments are sources of risk (Keil et al., 1998). Lack of adequate technical expertise and lack of an adequate technology infrastructure to support project requirements contribute to escalating time and cost overruns and are associated with project abandonment (Ewusi-Mensah, 1997).

Steering committees should recognize and implement strategies to minimize the risk of project failure, as outlined in the above description. If they recognize the nature and magnitude of the risks they face in implementing ERP systems, they can minimize these risks by employing project management and control strategies to address the challenges they face. By doing this, organizations will be able to distinguish the extent of which steering committee implement into their organizations with precision.

### 2.4 Information System Success Model

Information system success is widely recognized by practitioners and academics as a difficult concept to define. A great many past studies have endeavored to describe as well as to justify the evaluation of IS success (Ives et al. 1983; Davis, 1989; DeLone & McLean, 1992; Goodhue, 1995; Seddeon, 1997, DeLone & McLean 2003). According to DeLone and McLean (1992), measurement of IS success is critical for
understanding the value and efficacy of IS management actions and IS investments. One of the most important and popular works on IS success model is the DeLone and McLean model (D&W IS success model). DeLone and McLean proposed in 1992 a taxonomy and an interactive model as the frameworks for conceptualizing IS success. Driven by the need of a process to understand IS and its impacts, they developed a multi-dimension integrated view of IS success model.

The description and examples of measures for these six dimensions are as following:

1. **System quality** denotes system performance like data accuracy, database contents, data currency, system accuracy, and response time, etc.
2. **Information quality** refers to the quality of the IS product, such as believability of output, timeliness of output, usefulness of output, understandability of output, and relevance of output.
3. **Use** refers to the frequency an information system is used, examining items like the rate of using ERP to assist in making decision, charge for ERP system use, volunteers of use, and amount of connect time.
4. **User satisfaction** records the satisfaction level as reported by system users, including information, software, interface, overall satisfaction, ad ERP project satisfaction etc.
5. **Individual impact** refers to measuring the impacts brought about by the information system on individual users, such as job performance, individual productivity, decision quality, information awareness and inventory etc.
6. **Organizational impact** requires the evaluation of the changes caused by the information system to the organization, such as decrease in operating cost, savings in labor costs, and growth in profits. Authors also use the Balanced Scorecard (BSC) approach as the financial measures to evaluate the ERP performance of organization impact dimension. The four categories of BSC are financial, customer, internal business process, and learning and Growth (Kaplan & Norton, 1992; Roseman & Wiese, 1990; Lipe & Salterio, 2000)

### 3 Proposed Frameworks and Hypothesis Development

#### 3.1 Proposed Framework

The proposed integrated relationship of model for three parties in implementation of ERP is shown in Figure 1. It is a multi-dimensional model, and the dimensions are interrelated. Whether SERVQUAL of two dimensions will directly influence system performance on post implementation or these SERVQUAL will be delivered or transformed through project management of steering committee will be explored. Here, authors not only attempt to explore the relationships among the degree of satisfaction of service quality, the achievement level of project management
and the degree of performance improvement of Enterprise Resource Planning (ERP) in the post-implementation but also attempt to investigate how project management of steering committee can deliver and transfer service quality of system provider and Consultancy Company into system performance during the implementation of ERP systems.

In other words, the purpose of proposed model is to identify the variables for two service qualities, project management and the success measures of post-implementation ERP systems. By doing this, authors expected that this proposed framework will benefit to understand whether traditional project management techniques are, in fact, unsuitable for ERP projects and whether some of the problems encountered by implementing firms could be solved by using ERP specific approaches.

Figure 1: An Integrated Approach among SERVQUAL, PM and System Performance

3.2 Hypothesis Development

The dependent variables in this study are the degree of achievement level in project management and the degree of the improvement in system performance which include system quality, information quality, system use, user satisfaction, individual impact, organizational impact after having implemented ERP systems. These six dimensions come from the Information System success model proposed by DeLone and McLean (1992). Meanwhile, the achievement level in project management not only plays a intervening (moderating) variable but also consists of eight areas of knowledge which has been described in Section 2.1. Besides, the independent variables in this study are the SERVQUAL of system provider and Consultancy Company in integrated approach of relationship which has been described in Section 3. The audit
involvement levels are divided into three levels, i.e., High, Medium, and Low level. Therefore, the following hypotheses are examined in this paper:

H1: The degree of satisfaction of SERVQUAL of system provider is associated with the SERVQUAL of Consultancy Company.

H2: There is a positive relationship between the degree of satisfaction of SERVQUAL of system provider and the degree of improvement in the performance of system.

H3: There is a positive relationship between the degree of satisfaction of SERVQUAL of Consultancy Company and the degree of ERP performance improvement.

H4: There is a positive relationship between the degree of satisfaction of SERVQUAL of system provider and the achievement level of project management.

H5: There is a positive relationship between the degree of satisfaction of SERVQUAL of Consultancy Company and the achievement level of project management.

H6: There is a positive relationship between achievement level of project management and the degree of ERP performance improvement.

3.3 Summary of Research Variable
The literature review in previous section offers the opportunity not only to identify factors of potential interest for each dimension but also to formulate the above general research proposition. For the purposes of questionnaire reliability and validity, we also transform these concepts to corresponding similar concrete items that are mentioned above and carry out another complete measure variable for the framework. In conclusion, the list of SERVQUAL measures can be categorized as 5 measure items for Service quality of software Provider and 5 measure items for Service quality of Consultancy Company. Similarly, the list of Project Management of Steering Committee measures can be categorized as 8 measure items. Besides, the list of ERP systems performance measures can be categorized as 5 System Quality items, 5 Information Quality items, 5 System Use, 5 User Satisfaction, 5 Individual Impact and 5 Organizational Impact according to the six dimensions of DeLone and McLean’s model. Please consult the following Table 1 for a complete listing of statement items. Each of the statements is used as an indicator variable that measures the latent constructs of interest in this study.

4. Methodology
4.1 Sample and Variable Measurement
To explore the relationship among SERVQUAL, project management and system performance of ERP implementation, this study investigates the ERP implementation experiences of the Top 5000 Largest Corporations in Taiwan. In this survey, 4300 questionnaires were sent to manufacturers and service companies, banking, publicly-owned profit institutes and foreign-funded enterprises on the 2005 list of Top 5000 Largest Corporations in Taiwan. All of the corporations registered at the
Ministry of Economic Affairs with annual revenue over NT$ 300 Million for manufacturers and NT$ 200 million for service industry. Of the 4300 questionnaires mailed, 620 (14.41% of 4300) usable responses were returned. Of 620 useable responses, 207 companies that had implemented all the planned modules or the partial planned modules will be analyzed. Therefore, 207 companies will be examined in the paper. Likert Scale was used to measure relevant variables. Sample data were obtained with a certain level of reliability and validity.

4.2 Data arrangement and Operation

In order to evaluate their importance level and compute the degree of satisfaction of SERVQUAL or the degree of performance improvement measure, this study adopted a two-stage approach to design the questionnaires and collect data. The respondents was asked to evaluate the degree of satisfaction, the performance improvement level, and importance level for each of the SERVQUAL and the 37 chosen ERP performance measures by using 7-point Likert-type scales ranging from 1 (Substantial Deterioration) to 7 (Substantial Improvement) and from 1 (Extremely unimportant) to 7 (Extremely important), respectively. The data of importance levels are used to calculate the relative weights of measures. We used these data and the following equations not only to determine each SERVQUAL of system provider and consultancy company but also to determine the performance improvement levels of the six dimensions and Composite Performance after having implemented ERP systems. Then the importance of these ERP performance measures (83 measures in total) is evaluated by companies that have implemented ERP systems by using 7-point Likert-type scales. The two-stage approach in this study described as follows:

Stage 1: Firstly, in order to obtain the relative weight of the $k^{th}$ measure of the $j^{th}$ dimension relative to the measures within the $j^{th}$ dimension, the important level of SERVQUAL and the performance improvement level were calculated as following equation:

$$W_{jk} = \frac{1}{N} \sum_{i=1}^{N} W_{ijk}, \quad i = 1 \text{ to } N$$

In equation (1), $W_{ijk}$ is the importance level score (1 to 7) of the $k^{th}$ measure of the $j^{th}$ dimension as perceived by the $i^{th}$ respondent, and $W_{jk}$ is the average importance level score of the $k^{th}$ measure of the $j^{th}$ dimension as perceived by $N$ respondents.

Stage 2: According to the average importance score rankings obtained from Stage 1, the satisfaction score and the performance improvement level of the $j^{th}$
dimension for the \( i^{th} \) respondent’s company can be calculated as equation (2a and 2b):

\[
S_{ij} = \sum_{k=1}^{l_i} S_{ijk} \times \frac{W_{jk}}{\sum_{k=1}^{l} W_{jk}}, \quad i = 1 \text{ to } N \quad \text{and} \quad j = 1 \text{ to } 10 \quad (2a)
\]

\[
P_{ij} = \sum_{k=1}^{l_j} P_{ijk} \times \frac{W_{jk}}{\sum_{k=1}^{l} W_{jk}}, \quad i = 1 \text{ to } N \quad \text{and} \quad j = 1 \text{ to } 6 \quad (2b)
\]

Here, \( \frac{W_{jk}}{\sum_{k=1}^{l} W_{jk}} \), in equation (2), is the relative weight of the \( k^{th} \) measure of the \( j^{th} \) dimension relative to the measures within the \( j^{th} \) dimension. Meanwhile, \( P_{ijk} \) is the performance improvement level score (1 to 7) of the \( k^{th} \) measure of the \( j^{th} \) dimension for the \( i^{th} \) respondent’s company, and \( P_{ij} \) is the performance improvement level of the \( j^{th} \) dimension for the \( i^{th} \) respondent’s company. Note also that \( l_j \), in equation (1), is the number of chosen measures for the \( j^{th} \) dimension.

The composite performance improvement level for the \( i^{th} \) respondent’s company:

\[
P_i = \sum_{j=1}^{6} \left( P_{ij} \times \frac{\sum_{k=1}^{l_j} W_{jk}}{\sum_{j=1}^{6} \sum_{k=1}^{l_j} W_{jk}} \right), \quad i = 1 \text{ to } N \quad (3)
\]

In equation (3), \( \frac{\sum_{k=1}^{l_j} W_{jk}}{\sum_{j=1}^{6} \sum_{k=1}^{l_j} W_{jk}} \) is the total weight of all the measures of the \( j^{th} \) dimension relative to all the chosen measures. Therefore, \( P_i \) is the composite performance improvement level for the \( i^{th} \) respondent’s company. In equation (3), \( P_{ij}, W_{jk}, \) and \( l_j \) are defined as above.

4.3 Data Analysis and Discussion

For assessing enterprises’ the degree of performance improvement in the post-implementation stage, authors conducted a normality test for the 620 usable responses. The Kolmogorov-Smirnov test result was non-significant, which indicated our collected data is normally distributed. Authors also conducted to compare the respondents of initial mailing and those respondents after follow-up mailing in terms of demographic characteristic a test for response bias. T-tests of the means did not reveal any significant differences between those two groups of respondents. The
reliability coefficients, Cronbach’s alpha of the six dimensions of ERP performance measures, are equal or larger than 0.8. It means there have good consistency for the subjects of the questionnaires. The characteristics of the respondents are shown in Table 2.

Path analysis has been adopted to test our model as well as to check the relationship among these dimensions. The hypothesized paths in the modified model described above were tested using STATISTICA 6.0 (Joreskog & Sorbom, 1993) with maximum likelihood (ML) estimation since STATISTICA is appropriate in testing well-developed theories (Barelay et. al., 1995).

4.3.1. Model Testing

The structural models are evaluated on the basis of five goodness-of-fit measures. A widely used fit measure is the statistical significance of the chi-square statistic which indicates whether the model has a good fit with the data. The drawback of the chi-square test is that significance is sensitive to sample size and the number of parameters in the model (Bentler & Bonett, 1980), and as a result, the test may provide an inappropriate indication of good fit. The fit of the models is accordingly evaluated in terms of three alternative measures that are less sensitive to sample size or model complexity. These are (a) the goodness-of-fit index (GFI) which outperformed other alternative indices in a study by Marsh el. al. (1988); (b) the adjusted goodness-of-fit index (AGFI) which regulates the GFI for degrees of freedom; (c; d) Normed Fit Index and Non-Normed Fit Index as recommended by Bentler and Bonett (1980) respectively; and (e) Steiger’s (1990) root mean square error of approximation (RMSEA) as recommended by Browne and Gudeck (1993).

The fit statistics and estimated path coefficients for the modified structural model are listed in Table 6. The fit estimates provide mixed signals concerning the goodness-of-fit of the modified structural model. Thresholds for GFI and AGFI in IS research have been argued at above 0.90 and above 0.80, respectively (Segars & Grover, 1993; Chin & Todd, 1995), while a more restrictive 0.90 threshold for AGFI is also cited (Hair et. al., 1998; Chin & Todd, 1995). Both NFI and NNFI are above the threshold of 0.90 as recommended by Bentler and Bonett (1990) for good fit and RMSEA is below the 0.05 level which Browne and Cudeck (1993) set as a maximum allowable of an acceptable model.

Results show that GFI is above the recommended 0.90 threshold for good fit, and the chi-square estimate (165.09) is significant (p<0.001) in this study, suggesting good fit. The AGFI is above the 0.80 threshold, but does not meet the more restrictive 0.90 threshold level. Overall, the fit statistics indicate that the modified model provides a good fit to the data \( \chi^2/df=2.00 \), p<0.00001; GFI=0.91; AGFI=0.87; NFI=0.92; NNFI=0.95 and RMSEA=0.04). That is, the \( \chi^2 \) value is significant, all other fit
statistics stay within the rage suggestive of a good model fit.

In the following analysis, to ensure the validity of path analysis, it is imperative to confirm the absence of multicollinearity among the exogenous variables and nonlinear relationship between exogenous and endogenous variables. This means that the modified structural model factors are treated as dependent variables and standardized betas are generally used to detect the strength and direction of relationships in the model. The related standard deviations and correlations are presented in Table 7. In our study, correlations among exogenous variable are less than 0.8, indicating that there is no problem with multicollinearity (Billings & Wroten, 1978), and examination of residual plots reveals no nonlinear relationship.

4.3.2. The Result and Management Implication

As indicated in Figure 2, the result not only presents the parameters and the p-values of the assumed paths for the structural model but also shows that most path coefficients were as hypothesized. Figure 2 also shows that the relationship in multi-dimensional model (SERVQUAL, project management and system performance) are all significant at a 0.01 statistically significant level. Such results reveal the fact that the paths from SERVQUAL of software provider and consultancy company to performance improvement of ERP Implementation were significant, as where SERVQUAL of software provider and consultancy company is also associated. It is very interesting to notice that the paths from SERVQUAL of software provider and consultancy company to achievement level of project management were also significant. Most importantly, the path from achievement level of project management to the degree of performance improvement of ERP implementation was also significant.

However, the path from project management to performance improvement appeared to be more significant than the path from SERVQUAL no matter to software provider or consultancy company to performance improvement since the significance of SERVQUAL is not obvious prior to modification model. It means that SERVQUAL should be delivered and transferred through the mechanism of project management. Here, perceived SERVQUAL to the organization is not equitant to the performance improvement gained by the company completely in the future. That is, SERVQUAL could not produce performance improvement itself in nature. Project management will make the moderate (intermediary) mechanism for the SERVQUAL during the process of Implementation.

Therefore, the path from SERVQUAL no matter to software provider or consultancy company to performance improvement is indirect, not direct. On the contrary, the relationship of project management to the performance improvement is indeed direct. Here, Project management accordingly plays important roles in
influencing performance improvement of an ERP system directly. This critical moderating (intermediary) role or mechanism, steering committee is not only responsible for executions but also responsible for the deliveries and transformations ERP project into effective system performance with precision to ensure success in implement of system. A steering committee, responsible for system selection, monitoring, and managing external consultants, must be involved throughout the project (Bingi, Sharma, & Godla, 1999). Finally, the hypothesis could be proved by the above evidence.

5. Limitations and Suggestion for Future Research
Several limitations of the study should be addressed. The first limitation is that SERVQUAL, project management and system performance are measured using perceptions of functional managers. Authors follow Mabert et al. (2001) in the use of subjective measures for IT research. The satisfaction, achievement and perceptive improvement level of functional managers proxies for organizational satisfaction, achievement and perceptive improvement level. This level of analysis was chosen because managers are usually responsible for integrating ERP into their respective departmental units. Objective measures would add further support for this model and would be a fertile area of inquiry. Meanwhile, using these samples does enable us to measure the level of satisfaction, achievement and perceptive improvement of ERP implementation model, achieving thereby a significant advantage.

Future studies should examine the forms of reactions between MIS department and users. Differences in goals and their importance might also be studied as a measure of managerial effectiveness. Moreover, the measure of complexity used focused on system performance and did not consider other complexity issues specific to ERP system such as individual impact or organizational impact (Poston & Grabske, 2001). Finally, because few empirical studies have examined the impact of ERP on organizations, there are numerous avenues of future research and extensions of this study. This paper used a survey methodology to collect data. Future research could further test and refine these relationships using an experimental design that would enable researchers to establish causal relationship.

Besides, subsequent researches may not only pursue more in-depth analysis on the factors reviewed by this study but also consider examining whether any differences exist between executives, mid-level managers, and end-users in terms of their ERP success models so as to provide a more comprehensive evaluation approach. Such works will help evaluate the ERP implementation model in a more accurate and precise manner.

6. Conclusions
Enterprise resource planning systems have revolutionized organization computing by
facilitating integrated and real-time planning, production, and customer response. While some companies have achieved significant efficiencies through ERP, other have complained of failed implementations, budget overruns, and disappointing performance. This paper draws upon SERVQUAL, project management, and Information Systems Success (IS) theory to develop and empirically tests the relationships proposed by the success model. Research findings have not only indicated that the causal relationships are significant from one another among these three parties, more importantly, but also found that project management of steering committee plays an important roles in terms of influencing ERP system performance. In this system performance research, SERVQUAL is the cause, not the consequence, of progress in ERP Implementation. Such result has illustrated the need of MIS researchers to pay greater attention to the issues of SERVQUAL and Project Management. Moreover, using comprehensive models that integrate literature streams from different fields such as marketing theory and project management can provide interesting insights into ERP implementation with broad organizational impact. Following this approach, the study will contribute to the implementation literature of ERP and poses new questions about the role of SERVEQUAL and project management on implementation success with more broad avenues.

Reference


