

# Impact of Supply Chain Management on the Relationship between Enterprise Resource Planning System and Organizational Performance

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## Abstract

Two of the essential IT investment options that managers resort are supply chain management and enterprise resource planning. These options are known in the relevant literature as factors contributing to the enhancement of organizational performance. The objective of this study is to investigate the enterprise resource planning adoption and its influence on organizational performance through supply chain management. This article suggests a new model which applies enterprise resource planning with supply chain management to optimal organizational performance. Structural equation model was utilized to test the model fitting level and the four proposed hypotheses. The required data for this research was collected from 174 companies in Malaysia through prepared surveys. The results support, through empirical evidences, the existence of positive effects of enterprise resource planning on the supply chain which ultimately results in improved overall performance of the studied organizations.

**Keywords:** supply chain management, enterprise resource planning, organizational performance, structural equation modeling

## 1. Introduction

The dynamics of business atmosphere has placed important challenges on business organizations. As compared to the traditional business surroundings, firms nowadays have entered a new edge of business environment that is more competitive and complicated (Chen & Lin, 2009; Ellram, 1993). The advent of information technology (IT) has changed the roles and strategies of an organization, in which more emphasis are given to the strategic inter-linkages among firms in a chain of supplies and deliveries. As a result, the success of a firm does not only depend on its individual performance, rather it depends on a complex chain of firms engaging in various roles. Fine (1998) believes that along with continuous changes in business environment globally, design of supply chain is gaining an essential importance as a core competence. At the same time, another business-driven phenomenon, known as enterprise resource planning (ERP), is simultaneously conquering the business arena. The adoption of ERP system is driven by either the pressure being exerted by the competitors, demand from customers and partners for supply chain system upgrading, or the need for reformations or permutations in the current legacy systems. Although ERP and supply chain management (SCM) initially serve different aspects of an organization, the need to incorporate IT into the management of a supply chain calls for the integration of ERP into SCM. This integration is deemed as a 'natural and necessary process in strategic and managerial consideration' (Koh, Saad, & Arunachalam, 2006) for an organization to remain at competitive edge.

Previous research highlighted the importance of an efficient management of supply chain (Chang, 2008; Fine, 1998; Sirivianos, Kim, & Yang, 2009). There is an increasing need for the managers and executives to enhance the supply chain management efficiency and performance along with encouragement of gaining competitive advantages especially when the business environments and relationships with other business partners are becoming more complicated (Chang, 2008). The complex business environment necessitates an organization to have a responsive and agile SCM and effective ERP (Koh et al., 2006).

Despite the good number of academic studies addressing the relationship between organizational performance

and supply chain competences or between ERP performance and organizational performance (OP), a number of studies exclusively addressing and perceiving the potential performance of the ERP system as an integral component in SCM has never reached a satisfying level. Empirical evidences have focused more on individual impact of SCM and ERP on organizational performance. SCM most often found to be contributing positively on performance of an organization while mixed results were recorded for ERP, suggesting that the potential impact of ERP on organizational performance is mediated by SCM. Koh et al. (2006) for instance, argued that ERP is the backbone of SCM and integration of both will enable organizations to reap the maximum return on relationships in a supply chain. Therefore, this study aims mainly at examining the relationships between ERP, SCM, and OP. We test whether there are significant direct and indirect contributions of ERP on OP. We are specifically interested in looking at the indirect impact of ERP on OP mediated by SCM. A positive relationship of ERP on organizational performance mediated by SCM implies the importance of SCM in reconciling the benefits of firms' investment in IT.

## 2. The Literature

This section focuses on the development of a proposed path model and hypotheses based on the literature. For this purpose, ERP is expected to have a positive and direct impact on the SCM. It is also assumed that the positive influence of ERP on OP is mediated by SCM. Moreover, it is believed that ERP may also influence OP directly. The hypothesized path model, including the constructs and their relationships, is displayed in Figure 1. The proposed hypotheses consider SCM as a mediating variable which influences the relationship between ERP (initial variable) and OP (outcome). The relationships between ERP, SCM, and OP are discussed in the following sections.

### 2.1 Enterprise Resource Planning and Supply Chain Management

Managers in various industrial fields, especially in the manufacturing sector, are trying to have a better control over the supply chain. To achieve this objective, managers attempt to employ effective methods and techniques such as lean production, just in time (JIT), total quality management (TQM), and ERP. Firms with information advantage as well as effective SCM are more likely to have a better control over their suppliers. With this in mind, various firms in most countries have been interested in huge investments in IT in permuting the structure of domestic and global market businesses. A good number of companies and organizations have aimed at or already fulfilled the implementation of ERP systems. This system is especially designed to match with various business processes such as order entry and production planning, across the entire organization or company and enhance them optimally (Mabert, Soni, & Venkataramanan, 2001). Huge investments in IT systems have enabled companies to share considerable volumes of data and information along the supply chain, making real-time collaboration possible among the partners of the supply chain, as well as enhancing inventory management and distribution. As some researchers believe, ERP enables data and information processing and transmission which is essential for synchronous decision-making and SCM competencies (Hsu, Tan, Kannan, & Keong Leong, 2009; Sanders, 2007). Moreover, myriad number of ERP equipped companies have extended the scope of the system to incorporate their customers and suppliers into the system to provide more e-business or e-commerce services and to enhance the functionalities of the supply chain (Olhager & Selldin, 2003).

Theoretically, van Donk (2008) believed that the capabilities of ERP systems in the supply chains is at best inadequately explored. Enormous amount of capital is invested in the purchase of the ERP system, its implementation and upgrading although the objectives of implementing the system rarely achieved a satisfactory level. The studies by Akkermans, Bogerd, Yücesan, and Van Wassenhove (2003) revealed that the influence of the ERP systems in enhancing and improving the performance of a supply chain is not significant because ERP systems were usually supposed to be able to integrate the functions of the system of a company. This feature makes the designed ERP not completely applicable to multiple partners. In this regard, Kelle and Akbulut (2005) also believed that the ERP systems are capable to simultaneously facilitate and obstruct integration of a supply chain.

There are many academic studies that confirm the existence of a significant relationship between ERP and SCM performance (Akkermans et al., 2003; Shatat & Udin, 2012; Su & Yang, 2010a, 2010b). Furthermore, these researches have attempted to determine the way different ERP modules can be integrated into SCM for planning, execution and control of items, materials, operations, and resources (Ho, 2007; Koh et al., 2006). In line with the previous studies, this research focuses on the relationship between ERP and SCM performance in the Malaysian context. The first hypothesis that can be derived from the above discussion is the following:

H<sub>1</sub>: The effect of enterprise resource planning system on supply chain management performance is positive.

## 2.2 Enterprise Resource Planning and Organizational Performance

The main purpose of investments in ERP system is to enhance of the organizational efficiency and effectiveness (i.e., non-financial performance) as well as the financial performance of the firm (Kallunki, Laitinen, & Silvola, 2010). Financial performance is closely related to firm's profitability, measurable by financial assessments like investment ratio return rate. Areas like customer service, product reliability, knowledge management and other performances affecting the firm's ultimate profitability are in turn fall into non-financial performance category. Therefore, measurements of non-financial performance covers the gaps of the financial accounting to provide a unified image of the performance of an organization (Ittner & Larcker, 2003). Past decade has witnessed myriad number of firms adopting frameworks of performance measurement which cover not only financial performance but also non-financial performance. Kaplan and Norton's Balanced Scorecard (BSC) is an example.

It is expected that ERP systems would contribute to a more efficient system of information and increase the non-financial efficiency of a firm and ultimately affect the financial performance of the firm (Nicolaou, 2004). Some studies support the role of ERP system in directly improving the financial performance of an organization due to the lower costs of IT infrastructure (Shang & Seddon, 2002). In this regard, a field study conducted by Velcu (2007) confirms the many direct effects of ERP system on financial as well as non-financial performance. Velcu believed that the implementations of ERP can result in more accurate prices, which in turn, contribute to better profit margin maintenance. It also reduces the number of the mistakes expected in invoiced prices leading to improvements in revenue. Initiation of ERP implementations in business sectors can contribute to formation of scale economies, which prevent extra headcount costs and selling as well as general and administrative expenses, partly due to alterations occurred in the structure of the firm following the implementation of the ERP system.

On the contrary, more recent studies have provided reliable evidence of considerable benefits of IT investments and important productivity gains from them. As an example, through an elaborative case study on an ERP implementation, McAfee (2002) has reported the effects that ERP system exerts on OP of a single company. This longitudinal study provides primary evidence of a causal connection between improvements in a firm's operational performance and the adoption of IT. Furthermore, this research presents evidence of the timescale associated with the said benefits. Hunton, McEwen, and Wier (2002) examined the relationship between OP and ERP using an experimental approach. Sixty three verified scholars and analysts at a company of financial services were presented with a hypothetical case. A review of the initial achievements of these analysts complies with their forecasts after they learn that the hypothetical firm is determined to invest in IT systems such as ERP. As the outcomes confirm a positive revision in earnings, they can, therefore, support the hypothesis which claims that the effect of ERP implementation on performance is also positive. An integrated theoretical model proposed by Shaio-Yan, Ching-Wen, Seng-Lee, and Ming-Chun (2007) showed that ERP implementation has a positive effect on the company's process capital of its Intellectual Capital (IC). Hence, the customer capital is also affected by the process capital, ultimately translating it into business performance. Elragal and Al-Serafi (2011) and Poston and Grabski (2000) also support the positive contribution of ERP on OP. Elragal and Al-Serafi (2011) found that the positive contribution of ERP mainly comes from increase efficiency in information diffusion which enable organizations to response faster and improve the management of inventory. Poston and Grabski (2000) argue that ERP contributes to cost reduction and thus revenue enhancement.

The results of many studies by various researchers have confirmed the existence of a positive relationship between ERP and OP (Ehie & Madsen, 2005; Gupta & Kohli, 2006; Hendricks, Singhal, & Stratman, 2007; Hitt, Wu, & Zhou, 2002; Kalling, 2003; Mabert et al., 2001; Mabert, Soni, & Venkataramanan, 2003; McAfee, 2002). From the discussion raised above, it can be concluded that the adoption of ERP system in a firm is expected to be followed by direct effects on the performance of the company. Hence, our second hypothesis for this study is as follow:

H<sub>2</sub>: The effect of enterprise resource planning system on organizational performance will be positive.

## 2.3 Supply Chain Management and Organizational Performance

Mentzer (2001) defines SCM as a strategic and systemic coordination among traditional business functions and the tactics within a specific firm on one side, and the tactics of the businesses within the supply chain from the other side, to boost the long-term performance of the individual firm and the supply chain as a whole. During the past twenty years, SCM has emphasized on sullyng firm's and customer's interdependence. SCM encourages supplier companies to collaborate with other firms on the chain to enhance the organizational performance of the entire supply chain. The study of this subject has gained an extensive attention from

academicians and experimental practitioners over the past decade (Narasimhan & Kim, 2002; Shin, Collier, & Wilson, 2000). With the increasing trend towards globalization in modern business areas, the main challenge for the firms is finding an effective way to gain and retain their position in the competitive market despite the domestic and international pressures and threats that they face continuously (Huo, Selen, Yeung, & Zhao, 2008; Kannan & Tan, 2005). The main advantage of SCM system is increase in upstream and downstream linkages. Besides, companies have taken measures to start integrating the relationships of their external customer-firm-supplier to the internal contextual factors in order to enhance the level of customers' satisfaction as well as firm's competitiveness and performance.

The employment of SCM provides suppliers and customers with closer coordination and configuration opportunities of business process to increase the availability of the products in an effective and efficient atmosphere (Forker, Mendez, & Hershauer, 1997). One of the most important effects of a successful SCM implementation is the improvement of the relationship between upstream suppliers and downstream customers, ultimately resulting in customers' satisfaction and optimal organizational performance of the company. Many previous studies have also confirmed the role of SCM as a key promoter of OP (Kannan & Tan, 2005), either directly or indirectly through different supply chain practices and strategies. Furthermore, review of earlier literature supports SCM as a successful strategic vision based on the efficient leadership theories, generating and communicating the collaborative strategic vision of SCM. The created vision is then fed into generation of strategic planning, which needs the internal business processes be designed to back and support enhanced customer satisfaction, consequently reflected in OP (Tan, 2001a, 2001b).

A good number of academic researchers confirm the existence of a positive relationship between OP and SCM (Byrd & Davidson, 2003; Du, 2007; Gunasekaran, Patel, & McGaughey, 2004). Therefore, an investigation on the effect of SCM on organizational performance as well as a show this impact becomes effective can make a significant and interesting issue for study. Thus, the third hypothesis of this research that can be drawn from the above discussion is the following:

H<sub>3</sub>: Organizational performance will be positively affected by supply chain management performance.

As the literature review reveals that SCM is positively affected by ERP (Akkermans et al., 2003) and OP is positively influenced by ERP (Gupta & Kohli, 2006), we argue that there is a potential indirect linkage between ERP and OP mediated by SCM. Hence, the fourth hypothesis of this study can be proposed as follows:

H<sub>4</sub>: The relationship between ERP and OP will be mediated by SCM.

Considering the above points, it can be understood that in this study a system perspective is employed in which ERP is considered as an important input, SCM as a key process, and OP as a critical output. As per the reviewed literatures, the research framework constructed by the present study is displayed in Figure 1.

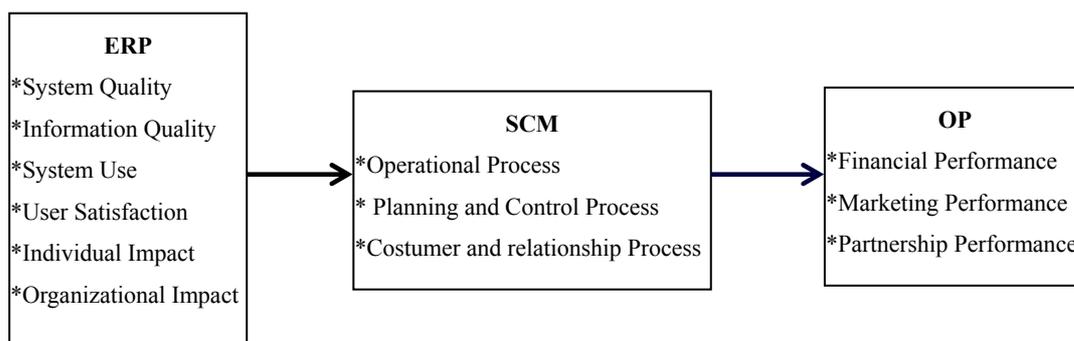


Figure 1. Research framework

### 3. Research Methodology

For testing the proposed theoretical model, AMOS's 16 maximum likelihood program is employed. One the significant features of the used structural equation model approach is not only flexibility of its role interplaying between theory and data, but also its capability to bridge the gap between theoretical and empirical knowledge for an optimal perception the world around (Fornell & Larcker, 1981). This kind of analysis enables formation of a modeling which is based on both manifest and latent variables, which is considered as an

important property that suits to the hypothesized model well, in which most of the constructs represent unobservable abstractions rather than empirical and concrete phenomena. Moreover, in structural equation modeling, measurement errors, multiple-group comparisons, and variables with multiple indicators are considered.

In recent years, SEM has attracted the attention of many researchers as a commonly adopted method used in various disciplines like supply chain (Bharadwaj & Matsuno, 2006; Seggie, Kim, & Cavusgil, 2006), organizational performance (García-Morales, Jiménez-Barrionuevo, & Gutiérrez-Gutiérrez, 2011; Jiménez-Jiménez & Sanz-Valle, 2010), knowledge management (Cepeda & Vera, 2007; C. Liao, Chuang, & To, 2011; Zheng, Yang, & McLean, 2010), organizational innovation (Camisón & Villar-López, 2012; Weerawardena, O'Cass, & Julian, 2006), organizational learning (Santos-Vijande, López-Sánchez, & Trespalcacios, 2011) topics.

### *3.1 Data*

The data collection period spanned between July 2010 and December 2010 for a period of six months. The prepared questionnaires were distributed among 450 randomly selected firms, which have had implemented the ERP system for at least two years in Malaysia. Senior manager, such as ERP manager, director manager, or CEO, were chosen as the key informants. Only 174 companies returned the completed questionnaires which provided this study with a response rate of 39% of which 43% of them belong to the service sector and 57% to the manufacturing sector.

### *3.2 Measures*

We do a comprehensive review of the previous studies to build research variable for testing our research hypotheses. We borrow some theories to measure the research constructs. In this paper we use 7-point Likert scale (1 totally disagree to 5 totally agree) and content and structure of questionnaire items are listed in appendix.

The objective of this study is to carry out a detailed investigation on the effect of ERP performances on OP mediated by SCM competencies. Therefore, this research model covers three areas: ERP system, SCM competencies, and OP. We use ERP model, as independent latent variable, proposed by DeLone and McLean (1992) to gauge the performance of the ERP system. DeLone and McLean classified ERP measure into six different dimensions, namely, 1. System Quality (ERP1); is to determine the degree of the information processing system itself, Information Quality (ERP2); is to determine the degree of ERP output, System Use (ERP3); is to determine the degree of recipient use of information system, User Satisfaction (ERP4); is to determine the degree of recipient response to the use of the output of an information system, Individual Impact (ERP5); is to determine the degree of the impact of data and information on the behavior of the recipient, and Organizational Impact (ERP6); is to determine the degree of the impact of data and information on firm's output.

The definitions of SCM competencies, as mediator latent variable, were based on the 21st Century Logistics framework as extended by Bowersox, Closs, and Stank (1999). The three constructs proposed for SCM competencies are operational (SCM1); is define to manage operative order between company and supply chain partner, planning & control (SCM2); denotes to information systems to support the wide variety of operational configuration needed to serve diverse market segments, and the ability to improve the evaluation systems that helpful to simplify process and strategies, and costumer & relationship processes (SCM3); denotes to the capability and capacity to progress and maintain a shared conceptual structure with suppliers and customers concerning inter-enterprise dependency and principles of collaboration.

The scale for firm performance, as dependent latent variable, was adapted from Emden, Yaprak, and Cavusgil (2005). Three components considered for OP, they are financial performance (OP1) four indicators include profitability, cost control, cash-flow, and Return on investment. These indicators present the success of the company in the business plan. Market performance (OP2) is the success of a business' plans and products in current and future businesses. This construct is measured by three dimensions contains product development, market development, and market share. Partnership performance (OP3) relates to the accomplishment of organizational goals concerning the companies' partners, in terms of the sustainability, stability, and strength of their linkages.

## **4. Results**

### *4.1 Measurement Model*

The correlation coefficients for each research variable that can be used as analysis of the significance degree of

the relationship between the analyzed aspects (Table 1). The correlation among measurements are all positive significant.

Table 1. Correlations of research dimension

Variables	ERP1	ERP2	ERP3	ERP4	ERP5	ERP6	SCM1	SCM2	SCM3	OP1	OP2	OP3
ERP1	1.00											
ERP2	.760	1.00										
ERP3	.739	.816	1.00									
ERP4	.653	.722	.702	1.00								
ERP5	.591	.654	.635	.562	1.00							
ERP6	.585	.647	.629	.556	.503	1.00						
SCM1	.485	.536	.521	.461	.417	.413	1.00					
SCM2	.488	.540	.525	.464	.420	.416	.719	1.00				
SCM3	.673	.450	.437	.386	.350	.346	.599	.603	1.00			
OP1	.400	.443	.430	.380	.344	.341	.440	.443	.369	1.00		
OP2	.423	.468	.455	.402	.364	.361	.465	.468	.390	.894	1.00	
OP3	.388	.429	.417	.369	.334	.330	.426	.429	.358	.819	.866	1.00

#### 4.1.1 Convergent Validity

For assessment of convergent validity of the measure in a research, three procedures were suggested by Fornell and Larcker (1981), namely: each measure's item reliability, each construct's composite reliability, and the average variance extracted (AVE). The assessment of item reliability of a measure was conducted through its factor loading onto the basic construct. A factor loading of 0.7 was recommended by Hair, Black, Babin, Anderson, and Tatham (2006) which indicated the item level validity. However, in the present research, the composite reliability replaces the Cronbach's alpha since reliability is tended to be understated in the latter. In order to have adequate composite reliability, the researchers recommend a value of 0.70 or higher (Nunnally & Bernstein, 1994). The role of the third indicator of convergent validity mentioned above, i.e., average variance extracted, is to measure the total amount of variance related to the construct in connection with the variance amount that can be attributed to measurement error (Fornell & Larcker, 1981). It is believed that when the average variance extracted is equal or higher than 0.50, the convergent validity is adequate (Segars, 1997). As it is shown in Table 2, all factor loadings satisfy the guidelines recommended by various experts. This indicates the adequacy of the convergent validity recommended for the measurement model proposed constructs.

Table 2. Results for the measurement model

Latent Variable	Item	Factor Loading (>0.70)*	Average variance extract(>0.50)*	Composite reliability (>0.70)*
Enterprise resource planning			0.66	0.81
	ERP1	0.83		
	ERP2	0.92		
	ERP3	0.89		
	ERP4	0.79		
	ERP6	0.71		
Supply chain management			0.64	0.88
	SCM1	0.84		
	SCM2	0.85		
Organizational performance			0.93	0.78
	OP1	0.92		
	OP2	0.97		
	OP3	0.89		

#### 4.1.2 Discriminant Validity

Discriminant validity occurs when the shared variance between two constructs in the model happens to be less than the variance shared between a construct and its indicators (Fornell, Tellis, & Zinkhan, 1982). The assessment was carried out by comparing the square root of the AVE for a construct with inter-construct correlations between the specific construct and all other constructs. It can be taken as evidence of existence of stronger correlation between a construct and its indicators than with the other constructs in the model if the values of the AVE square roots at the off-diagonal elements in the corresponding rows and columns are higher than the correlations that exist between one construct and other constructs in the model. As it is obvious in Table 3, the square roots of the AVEs have replaced the diagonal elements in the correlation matrix. The degree of discriminant validity is apparently adequate and satisfactory for all the constructs.

Table 3. Discriminant validity for the measurement model

	ERP	SCM	OP
ERP	(0.66)		
SCM	0.48	(0.64)	
OP	0.28	0.32	(0.93)

Diagonal in parentheses Square root of average variance extracted from observed variables (items); Off-diagonal Correlations between constructs.

#### 4.2 Structural Model

Structural equation modeling of the AMOS assesses the strength and reliability of the outcomes, as well as the models stability. Figure 2 presents the relationships between research latent variables and Table4 illustrates the parameter estimates and goodness of fit indicators for the structural model. The results support that this structure suites the data well, namely,  $\lambda^2(50, n = 174) = 186.810$ ,  $p < 0.01$ , CFI = 0.926, TLI= 0.902, IFI= 0.926, NFI= 0.902, RMSEA = 0.046. Furthermore, the conclusions as illustrated in Table4 provide adequate support for the first proposed hypothesis in this paper; hence, ERP is significantly and positively related to SCM,  $\beta_1 = 0.69$ , C.R. = 9.179,  $p < 0.01$ . Furthermore, results in Table4 provided support for hypothesis 2 and 3. ERP is significantly and positively related to OP,  $\beta_2 = 0.26$ , C.R. = 2.284,  $p < 0.05$ . SCM is significantly and positively related to OP,  $\beta_3 = 0.39$ , C.R. = 3.320,  $p < 0.01$ . Therefore, these three relations;  $\beta_1$ (impact of independent on mediator) of ,  $\beta_2$  (impact of independent on dependent), and  $\beta_3$ (impact of mediator on dependent); are significant and based on Baron and Kenny (1986)&Preacher and Hayes (2004) it can be concluded that the relationship between ERP and OP is partialmediated by SCM, a finding which support the proposed hypothesis, H<sub>4</sub>.

As a conclusion, it can be said that after path analysis, OP will be affected by ERP through SCM. Therefore, SCM is an essential mediator that bridges the gap and strengthens the relationship between ERP and OP via linking the weaknesses. The model proposed in this paper is totally new in comparison to the former studies done on such models. Therefore, it can be concluded that considering the vital role of ERP as an essential input, implementation of SCM by organizations will definitely enhance their OP.

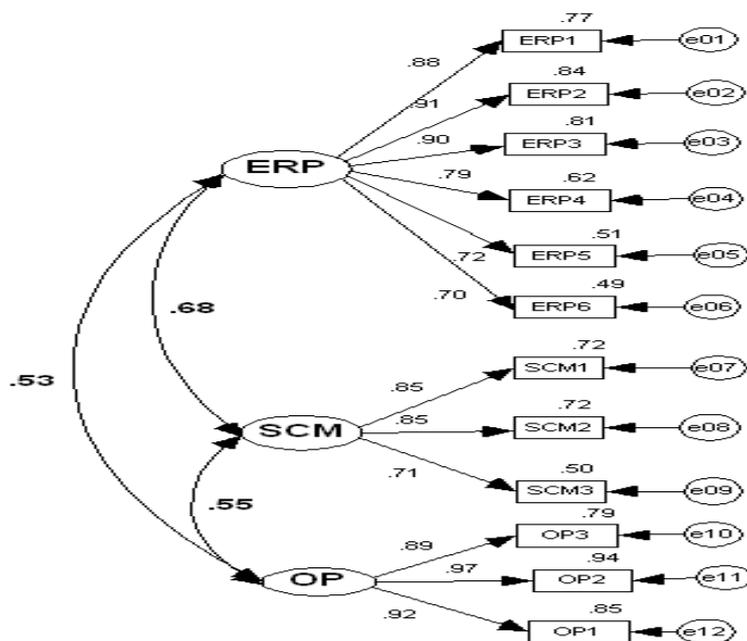


Figure 2. Correlation between the latent

Table 4. Parameter estimated and goodness of fit indices

Hypotheses	Path	Standardized coefficient	C. R.	p-value	Result
H1	ERP → SCM	0.69	9.179	<0.01	Supported
H2	ERP → OP	0.26	2.284	<0.05	Supported
H3	SCM → OP	0.39	3.320	<0.01	Supported
	$\lambda^2(50) = 186.81$	CFI=.926	TLI=.902		
	RMSEA=.046	IFI=.926	NFI=.902		

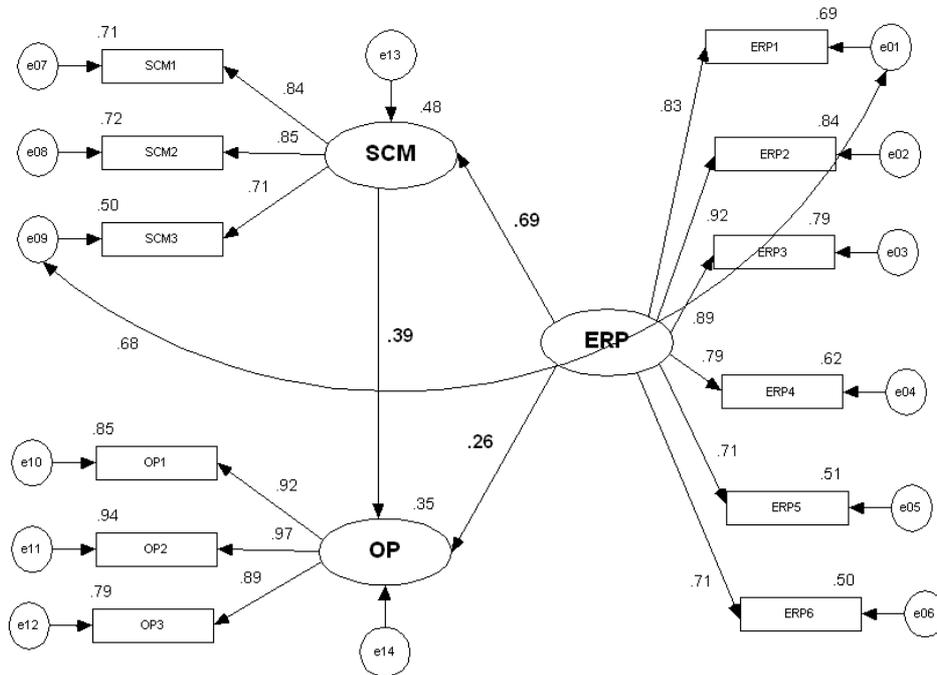


Figure 3. Theoretical framework

## 5. Discussion

The suggested model articulates the significant effects of different essential variables that were ignored or received marginal attention in the past studies. Major findings of this research and their implications are dealt with in the following discussion in this section.

The first finding of this study confirms the existence of a significant and positive relationship between ERP and OP. This outcome is in line with many previous studies (Ehie & Madsen, 2005; Gupta & Kohli, 2006; Hendricks et al., 2007; Hitt et al., 2002; Kalling, 2003; Mabert et al., 2001, 2003; McAfee, 2002; Nicolaou & Bhattacharya, 2006). The second outcome in connection with of the structural equation model support that the effect of ERP on SCM is positive. Therefore, with more implementation of ERP systems in a firm, the SCM capability of that company will increase significantly. This finding is also consistent with the findings of Su and Yang (2010b). Nevertheless, in comparison to their findings, we found that the SCM is both directly and indirectly affected by ERP.

The third finding provides sufficient empirical evidence to support existence of a relationship between OP and SCM. The evidence implies that OP was affected by SCM. Therefore, it can be concluded that the employment of SCM could lead to the said solution. This outcome is consistent with the findings of Li, Ragu-Nathan, Ragu-Nathan, and Subba Rao (2006) and Ou, Liu, Hung, and Yen (2010). Their studies showed that there is a positive and direct relationship between SCM and OP. Therefore, this paper encourages inclusion of SCM in the overall implemented systems to enhance the OP in the firms.

The fourth finding concerns the main theoretical contribution of this study. We found evidence supporting the essential role of the SCM as mediator between ERP and OP. The provided empirical evidence confirms the existence of significant relationship between ERP and OP with the indirect effect bigger than the direct effect. Therefore, our analysis establishes that the relationship between ERP and OP is triggered by SCM in the sense that SCM serves as a black box or a process in which the input is ERP and the output is the better performance achieved by an organization. A contributing point of our study stands from the fact that many researchers and experts mix the ERP and OP (Hunton, Lippincott, & Reck, 2003; Kallunki et al., 2010; Shang & Seddon, 2002), ignoring the significant role of SCM in the enhancement of OP.

Nonetheless, it is important to note that the findings on the relationship between ERP, SCM and OP could be influenced by the level of ERP implementation and SCM integration. Kim (2009) found that Korean and Japanese firms' supply chain integration and practice follow different paths to affect performance. He argued that on the earlier stage, attention should be given to supply chain integration, while firms at later stage should

focus on consistency between SCM strategy and competitive strategy. His findings highlight the importance of knowing the current level of implementation of SCM and ERP in firms.

### 5.1 Potential Limitations and Future Works

The use of cross-sectional data obtained through questionnaire post several limitations to our study. Firstly, data obtained through survey is often subject to self-reporting bias and sampling generalizability. Therefore, the readers need to be wary of any precarious generalizations which may not be applicable to different cultural and national contexts. It is hoped that future studies will be able to utilize longitudinal data which will provide more dynamics to the data and analysis. Finally, the last restriction is attributed to the sample size used in this study which suggests that the conclusion be made cautiously considering that the numbers may not be representative. In addition, future studies on the same topic should include the moderator variables such as types of industry, culture, and nationality in the model. Besides, the interrelations among SCM and OP can be studied with more elaboration.

### 5.2 Conclusion

The present study illustrates the significant role of the SCM and the relationship between ERP and OP. Relying on 174 valid subjects, this study employs path analysis with structural equation modeling to examine the framework of the research and the proposed hypotheses. The findings support that the ERP system can be considered as an important input to firms with its impact performance is mediated by SCM. The direct effect of ERP on OP is significant. However, we found a stronger impact of ERP on OP that is mediated by SCM. Therefore, it is necessary for an organization to thoroughly implement SCM through which ERP implementation can lead to OP. Several past studies suggested several factors influencing the successful implementation of an ERP system in Malaysia (Noudoostbeni, Yasin, & Jenatabadi, 2009; Osman, Yusuff, Tang, & Jafari, 2006) which includes proper planning, clear goals and objectives, top management commitment, and cooperation among various departments in the organization. The importance of ERP on OP can be made clearer to different levels of management and departments by emphasizing on its contribution on SCM that will consequently contribute to the overall performance of an organization.

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## Apendix

Variable	Items
Dependent Variable; Organizational Performance (Emden et al., 2005; S. Liao & Wu, 2009)	
Financial Performance	
	1 Cost Control
	2 Profatibility
	3 Cash Flow from Operation
	4 Return on Investment
Partnership Performance	
	1 Constancy on your associations
	2 Capability to sustain linkages regardless of changes in senior people
	3 Strength of your linkage with key alliance partners
Marketing Performance	
	1 Market Share
	2 Sales Growth
	3 Market Development
Independet Variable; ERP Success (DeLone & McLean, 1992; Tsai, Fan, Leu, & Chou, 2007)	
User Satisfaction	
	1 ERP project satisfaction
	2 Information satisfaction
	3 Interface satisfaction
	4 Software satsifaction
	5 Overaal satisfaction
Information Quality	
	1 Relevance of output
	2 Timeliness of output
	3 Believability of output
	4 Understandability of output
	5 Usefulness of output
Organizational Impact	
	1 Learning and growth
	2 Internal business process
	3 Customer

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System Quality	1	Response time
	2	Database contents
	3	System accuracy
	4	Data accuracy
	5	Data currency
Individual Impact	1	Accurate interpretation
	2	Decision quality
	3	Job performance
	4	Information awareness
	5	Individual productivity
System Use	1	Amount of connect time
	2	Mount of ERP using Rate to help in decision making
	3	ERP system use charging
	4	Voluntariness of use
	5	Frequaency of report requests
Mediator Variable; SCM (Su & Yang, 2010a)		
Costumer & relationship processes	1	Sharing of Information
	2	Segmental focus
	3	Relevancy
	4	Role specificity
	5	Flexibility
	6	Resposiveness
Operational	1	Operational fusion
	2	standardization
	3	Suplier management
	4	Structural adaption
	5	Coss functional unification
	6	Compliance
Planning & control	1	Total cost management and ctivity based
	2	Internal comunication
	3	Planing and forecasting
	4	Information management
	5	Conectivity

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