

## COMPETITIVE ADVANTAGES THROUGH IT-ENABLED SUPPLY CHAIN MANAGEMENT (SCM) CONTEXT

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**Abstract:** The primary aim of this study is to investigate the effect of IT-enabled supply chain on the operational and strategic benefits, which eventually ensures firms competitive advantages. A conceptual model was developed based on the theory of competitive advantage suggested by Porter and also extensive empirical study. The questionnaire was developed based on several steps and items were adopted from several prior studies. Stratified random sampling was employed to collect data from 203 respondents. Based on structural equation modelling, IT-enabled SCM is able to offer a wide range of operational benefits, instead of strategic. Results were antagonized several prior studies and confirmed that competitive advantages greatly depend on operational benefits rather than strategic. This study is one of the very few empirical investigations that investigate the benefits of IT from two different perspectives and their effects of competitive advantages. Findings of this study will help managers to understand the importance of IT-enabled SCM in their organizations.

**Key words:** IT, supply chain, competitive advantages, strategic, operational

DOI: 10.17512/pjms.2019.19.1.35

*Article history:*

*Received* March 06, 2019; *Revised* May 11, 2019; *Accepted* June 03, 2019

### Introduction

In this dynamic business environment, organizations have been starving for the appropriate strategies that ensure rare competitive advantages over competitors. In this regard, many renowned schoolers explicitly emphasise the importance of IT integrated supply chain management. McGinnis et al. (2010), in this regard, state that IT-enabled SC becomes an indispensable component in the organizational strategic plan. In their study, Chen (2018) articulated that it is next to impossible for any organization around the world to remain competitive without having an IT-enabled SC system and infrastructure. In a similar fashion, Mellat-Parast and Spillan (2014) concluded that to gain rare competitive advantages, organizations must adopt IT-enabled supply chain management (SCM). Hence, it is requisite to define SCM to understand its importance and SCM can be defined as the process of delivering unmatched service to the customers by managing the upstream and

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downstream relationship with suppliers and customers. Faust (2013) articulated that an effective SCM requires tight internal integration, strong external collaboration and cordial cooperation among the partners across the SC. In their study, (Chiu and Yang, 2018; Adusei, 2018) stated that IT is the primary key enablers that provides an effective platform for all these.

The adoption of IT in SCM context has gained great attention since 2000. An immense number of schoolers identified a long list of the advantages of this adoption ranging from reducing the cost to ensuring higher customer satisfaction by engaging them in the product development process. Similarly, Tarofder et al. (2017) articulated that IT is capable of transforming the entire supply chain process, which eventually ensures greater customers' satisfaction. Due to the extensive triumph around the world, the Malaysian government has proposed an IT-friendly budget to boost the rate of IT adoption in Malaysia. According to Export.Gov (2018), the Malaysian govt. has set the target of 17% GDP contributions resulted from IT investment. Due to the immense potential of IT-enabled SCM, many organizations have adopted this approach and started applying the principles. Despite investing a great amount of effort in implementation, many organizations are still unable to yield the fullest benefits from this system (Ale, 2018; Du, 2007). Hence, many scholars utterly agreed that there is a significant lacuna in understanding the effectiveness of IT as an enabler for SCM system, subsequently, they advocated to investigate this issue from different industries perspective (Hua et al., 2011).

Due to these inconsistency outcomes and the paucity of empirical research, the aim of this study is to understand the effectiveness of IT-enabled SCM approach in gaining competitive advantages in the market. This study is unique from all the prior studies in several ways, including the measurement of the benefits, and application of the theories. First of all, this study classified benefits resulting from two different aspects, including operational and strategic, which is rare in prior studies. Secondly, unlike this study, most of the prior studies emphasized and measures benefits either from their partners or suppliers perspective. This study solely focused on only organizational benefits, not from their stakeholders' viewpoint. Based on the findings, this study provides empirical evidence of the effectiveness of IT-enabled SCM pursuing competitive advantages.

### Literature Review

Information Technology (IT) has dramatically transformed the world from the industrial economy to a network economy (Chen, 2018). According to Short, (2002) SCM concept has enhanced by convergence, which primarily refers to the integration process of computer and communication technology. Technology enabled SC offers benefits not only for organizations but also for every single member in the chain including end users. This study mainly focuses on organizational benefits because of the research context. Technology allows organizations transforming SC from a traditional approach to digitalize integration.

It helps organizations to develop online procurement, share information in a real-time platform, provide an effective environment for strong collaboration with partners, and facilitate global interconnectivity (Rokanta, 2018). With all these features, IT-enabled SCM system is an allure strategic decision in every industry, which eventually ensures sustainable competitive advantages.

Two important theories underpinned this study, namely the notion of extended enterprise and competitive advantage. The notion of the extended enterprise is relatively a new theory in the IT management discipline despite many types of research is in progress (Moghavvemi et al., 2012). Theoretically, the extended enterprise is the mirror view of supply chain collaboration with internal and external members. This theory fundamentally emphasis on the importance of tight coordination and collaboration between the firm and their partners in the Supply chain platform. The key manifest of this theory is to create supreme value for every member by working collaboratively with them. Chan (2004) first proposed this model, which become a very popular concept in the strategic domain. She illustrated the integration process between organizations and technology and explained the model from three main angles, including external, internal and conceptual enterprise. She concluded that this theory provides an appropriate guideline for the organization on how to convert IT strategies into the business strategies to gain competitive advantages. In their study, Ülengin and Uray (2005) suggested that the primary concern for the external extended enterprise is to optimize work efficiency through real-time data sharing with partners. They found that learning through sharing valuable information with the supply chain members enhance the supply chain performance and gain sustainable competitive advantages.

Technology-oriented strategies become an important foundation for sustainable competitive advantages. Developing a relationship with external partners becomes the norm for every organization. In this regard, Liu (2005) stated that IT facilitate a smooth platform for external collaboration, which eventually helps the organization to acquire unique capabilities that lead to competitive advantages. Firms are able to harvest many advantages by adopting IT in their supply chain, which is not available in a traditional setting (Potiwanna and Avakiat, 2017; Almeqdadi, 2018). Thus, IT plays an important role to perform this rigorous integration (Vitorino Filho and Moori, 2018, Bhatnagar and Teo, 2009). Pertaining to the benefits of IT adoption in SCM, prior studies can be reckoned into two domains. Firstly, several prior studies have acknowledged that it is not possible to manage supply chain effectively without proper integration, hence IT plays a very crucial role in improvising traditional supply chain process (Izzah et al., 2015). Based on prior research, this study classified all these benefits into two main categories, namely operational and strategical. Very few researches have classified and tested benefits in this manner. Figure 1, presents the conceptual model for this study. According to Mukhopadhyay and Kekre (2002), operational benefits mainly emphasis on the business process that can improvise by IT. More specifically, operational benefits

primarily derive from automation of business process, including inventory management, e-procurement, the name of few (Hazen and Byrd, 2012; Haseeb et al., 2019). On the other hand, strategic benefits mainly resulting from collaboration, including knowledge creation, better understanding market and consumers, identifying opportunities are the name of few (Ramayah et al., 2008).

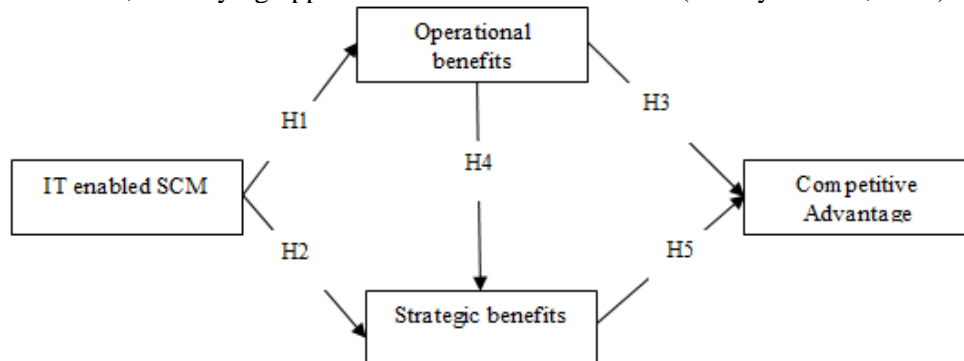


Figure 1. Conceptual Model for this Study

Mukhopadhyay and Kekre (2002) suggested that competitive advantage can only be acquired by having an effective business operation and the right set of long term strategies. Numerous previous studies reported that IT integration in SCM activities significantly elevates the supply chain's performance (Gualandris and Kalchschmidt, 2015; Artha and Mulyana 2018). They reported that IT automated the SC activities, which considerably minimize working time and enhance greater quality. They also added that IT-enabled supply chain helps organizations to respond faster with unique offerings to their stakeholders, which eventually ensure competitive advantages for the organizations. Hence, this study proposed the following hypothesis:

*H1: Adoption of IT enhance operational activities of the supply chain functions.*

*H2: Adoption of IT enhance strategic activities of the supply chain functions.*

*H3: There is a significant positive relationship between operational benefits and gaining competitive advantages.*

*H4: There is a significant positive relationship between operational benefits and gaining competitive advantages through acquiring strategic benefits.*

*H5: There is a significant positive relationship between strategic benefits and gaining competitive advantages.*

### Research Design and Instrument Development

The hypothetic deductive research method was used to conduct this quantitative research. Based on the nature of the study, the explanatory research design was applied. With minimal interference, this study conducted a field study in several Malaysian organization. Primary data was collected to test the hypothesis. Several steps were taken into consider before finalizing the questionnaire. At the first stage

of the questionnaire development, this study develops both conceptualization and operationalization definitions for each variable, which were aligned with the theory. In the second stage of questionnaire development, this study finalizes the items and scales for the constructs. 16 constructs were adapted from prior studies. This adoption ensured construct, face and content validity for the study. 5 point Likert scale was employed for all these constructs. All the questions were close-ended because it is easy to code in software and response friendly. Time, cost and nature of the respondents were taken into consideration to select data collection method. Despite having few limitations, this study used Web-based data collection method due to the three main reasons including, (a) minimizing response error; (b) zero data entry error; and lastly (c) cost-effective when respondents are geographically dispersed.

### **Sampling Strategy**

The population for this study were the organizations using the SC concept in their business activities. Primarily, this study collected information about the population from the database provided by the Federation of Malaysian Manufacturers (FMM), and Malaysian Investment Development Authority (MIDA). Stratified random sampling was applied to select organizations, which have been using IT for their SCM. According to Kline (2005), a sample size of 200 is adequate to perform structural equation modelling (SEM). With five reminders and 4 months of effort from October 2018 to January 2019, this study managed to get 203 respondents from different organization selected from the sample frame. Independent sample 't' test was employed to test the response bias between early and late respondents. Results confirmed no significant difference between these two groups, subsequently; this study includes all these 203 responses for the SEM.

### **Validation of Measurement Model**

Confirmatory Factor Analysis (CFA) was used to validate the measurement model. This analysis ensured internal consistency, convergent and discriminant validity. There are several criteria were used to evaluate the model, including GFI, AGFI, RMR, and RMSEA. 16 items on 4 factors show a good model fit for each factor (Table 1). Results showed that loading scores for all the constructs were more than 0.70, which indicates the appropriateness of those items on their specific variables (Hair et al., 2010; Bachev, 2018). Additionally, Cronbach alpha value showed a strong evidence of excellent reliability of the data as all the alpha value was more than 0.90. Hence, CFA ensured excellent fit of the model with good factor loading scores, which gave an excellent foundation for the structural equation modelling applied for hypothesis testing for this study (Table 1).

**Table 1. Confirmatory Factor Analysis**

Factor Indicators	Df	P	GFI	AGFI	RMR	RMSEA	Factor Loading	Composite Alpha
<b>IT Adoption</b>	<b>2</b>	<b>0.701</b>	<b>.996</b>	<b>.978</b>	<b>.011</b>	<b>.036</b>		<b>0.946</b>
ITAD 1							.898	
ITAD 2							.896	
ITAD 3							.941	
ITAD 4							.854	
<b>Operational Benefits</b>	<b>2</b>	<b>0.933</b>	<b>.999</b>	<b>.996</b>	<b>.006</b>	<b>.024</b>		<b>0.935</b>
OB 1							0.933	
OB 2							0.920	
OB 3							0.906	
OB 4							0.952	
<b>Strategic Benefits</b>	<b>2</b>	<b>0.280</b>	<b>.985</b>	<b>.926</b>	<b>.022</b>	<b>.059</b>		<b>0.944</b>
SB 1							0.96	
SB 2							0.98	
SB 3							0.87	
SB 4							0.94	
<b>Competitive Advantage</b>	<b>2</b>	<b>0.789</b>	<b>.997</b>	<b>.985</b>	<b>.009</b>	<b>.046</b>		<b>0.922</b>
CA 1							0.994	
CA 2							0.958	
VA 3							0.975	
CA 4							0.876	

### Hypothesis Testing

Table 2 presents the results of structural equation modelling and indicated a good model fit with multiple goodness-of-fit indices. Values of all indices include RMR (.058); RMSEA (.010), GFI (.931); AGFI (.901) and NFI (.987), were better than cut-off point suggested by Hair et al. (2006). Hence, this study can confidently conclude that the model construction of this study was appropriate. In relation to a hypothesis, results indicated that both strategic and operational, benefits can significantly acquire from IT enable SCM. But, IT-enabled SCM is relatively more effective for enhancing operational performance than strategic landscape. Results clearly showed that 72% variance of operational benefits depends on IT-enabled SCM, whereas only 19% for strategic benefits, and no significant effect. Results also indicated that competitive advantage also significantly depends on strategic benefits rather than operational benefits. More specifically, 45% variance of competitive advantage depends on operational benefits, and 21% on strategic benefits (Table 2). However, a result also revealed that 81% variance of strategic benefits depends on operational benefits. Lastly, results clearly showed that there is no significant effect of IT-enabled SCM on strategic benefits.

## Discussions

In relation to benefits, results reveal that IT-enabled SCM can greatly improve firms' day-to-day activities, rather than strategic contributions. Results confirmed that IT in SCM can offer a wide range of services including tight internal integration, subsequently, this system elevates organizational efficiency. Despite acknowledgement from a giant organization, our result confirmed that IT-enabled SCM does not have a significant effect on strategic benefits. This likely be nature of the firm. Moreover, this result antagonized the findings of Sandars (2007) and Subramani (2003), where they stated that strategic benefits are the most important for achieving competitive advantage. However, our study revealed a new avenue for the researchers to evaluate the contributions of IT-enabled SCM. There are no questions about the importance of IT-enabled SCM, but results confirmed that IT contributes more to enhance organizational operational activities. Finally, based on the regression weight and significant value stated in table 2, four out of five hypotheses were accepted at a 99% confidence interval. Most of the Malaysian organizations are followers in the industry. Besides, our results also confirmed that operational benefits significantly affect both strategic and competitive advantages. It is clear that IT-enabled SCM significantly reduce inventory cost, foster collaboration, eventually, firms can offer the lowest price with great value to their customers. It is also identifiable from the results that IT-enabled SCM may not improve firms' strategic capabilities as much as it improves operational activities. As per theory, competitive advantages can gain through either by reducing cost or by differentiating firms' offering. This study confirmed that by yielding operational benefits from IT-enabled SCM, an organization can gain competitive advantages over its competitors as many other previous studies confirmed (Amir et al., 2018; Chen, 2018)

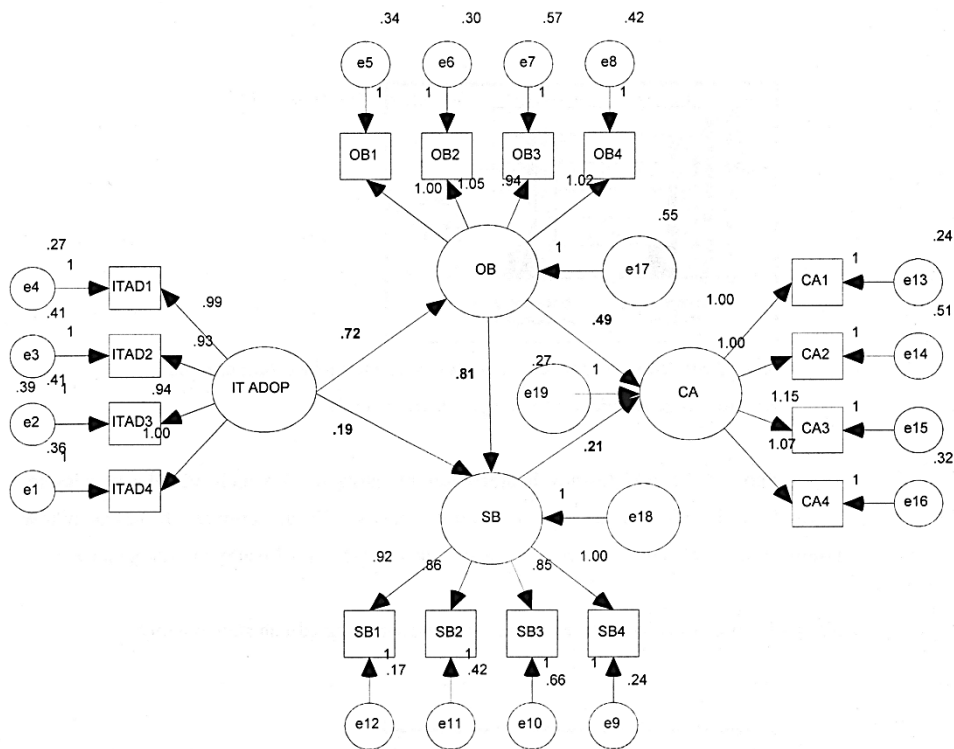
Findings of this study confirmed the significant association between operational and strategic benefits with competitive advantages. Every prior study utterly mentioned that effective SCM can enhance competitive advantage by improving organizational performance (Thierry and Eileen, 2018; Lara et al., 2019). This study ameliorates the knowledge by classifying the benefits. Results confirmed that IT enabled SCM offers greater operational benefits, though strategic benefits are also can be enhanced.

## Conclusions

In summary, results support the hypothesis related with IT enabled SCM and operational and strategic benefits, which can be considered as one of the limited empirical knowledge pertaining in this area. Additionally, this study evidence that IT enabled SCM reduces inventory cost, enables rapid assembly, foster collaboration among business partners, and improves operational activities. As recommendations, this research offers evidence for practitioner about the benefits that can obtain from the IT enabled SCM.

**Table 2. Results of Structural Equation Modelling**

Standardised regression weight				S.E.	P value	C.R.
IT ADOPTION	→	OPERATIONAL BENEFITS	0.72	0.087	0.000	8.286
IT ADOPTION	→	STRATEGIC BENEFITS	0.19	0.126	0.137	1.488
OPERATIONAL BENEFITS	→	STRATEGIC BENEFITS	0.81	0.147	0.000	5.526
OPERATIONAL BENEFITS	→	Competitive Advantage	0.45	0.131	0.000	3.757
STRATEGIC BENEFITS	→	Competitive Advantage	0.21	0.093	0.040	3.465
Root mean square residual (RMR)				.058 (< 0.1)		
Root mean square of error of estimation (RMSEA)				.010 (< 0.10)		
Goodness-of-fit index (GFI)				.931 (> 0.9)		
Adjusted of goodness-of-fit index (AGFI)				.901(> 0.8)		
Normed fit index (NFI)				.987 (> 0.9)		



**Figure 2. Hypothesis Testing**



This study empirically support that it is worth to invest and install IT enabled SCM. Organizations can obtain immense numbers of benefits from this adoption including better collaboration, knowledge sharing, accurate demand forecasting and many mores, subsequently gain competitive advantage. Despite contributing in both, theory and practical, domain, few limitations were unavoidable. Firstly, this study measured the perceived competitive advantage instead of absolute value. It is better to test competitive advantages based on absolute values, such as market share or cost reduction. Therefore this can be another avenue for further study. Besides, the cross-sectional approach is a methodological limitation of this study. It is difficult to generalize findings based on a cross-sectional approach. Hence, it would be worth to conduct a longitudinal study to measure the real benefits of IT-enabled supply chain management. Despite the minor limitation, this study significantly contributes to the body of knowledge in SCM. Results confirmed that IT-enabled SCM offers wide ranges of operational benefits which eventually enhance both strategic benefits and competitive advantages for the organization. This study confirmed that operational benefits are extremely significant for competitive advantages. Hence, organizations must install IT that facilitates tight internal integration.

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## PRZEWAGA KONKURENCYJNA DZIĘKI ZARZĄDZANIU ŁAŃCUCHEM DOSTAW (SCM) W KONTEKŚCIE IT

**Streszczenie:** Głównym celem przeprowadzonego badania jest zbadanie wpływu IT w łańcuchu dostaw na korzyści operacyjne i strategiczne, które ostatecznie zapewniają firmom przewagę konkurencyjną. Opracowano model koncepcyjny oparty na teorii przewagi konkurencyjnej sugerowanej przez Portera, a także przeprowadzonych obszernych badaniach empirycznych. Kwestionariusz został opracowany na bazie kilku etapów, a jego elementy zostały przyjęte z wcześniejszych badań. Do zbierania danych od 203 respondentów wykorzystano losowy dobór próby badawczej. W oparciu o modelowanie równań strukturalnych, należy stwierdzić że SCM ze wsparciem IT może zaoferować szeroki zakres korzyści operacyjnych, zamiast strategicznych. Wyniki były sprzeczne z kilkoma wcześniejszymi badaniami i potwierdziły, że przewaga konkurencyjna w dużym stopniu zależy od korzyści operacyjnych, a nie strategicznych. Niniejsze badanie jest jednym z niewielu badań empirycznych, które badają korzyści z IT z dwóch różnych perspektyw i ich skutków w postaci przewagi konkurencyjnej. Wyniki tego badania pomogą menedżerom zrozumieć znaczenie SCM ze wsparciem IT w ich organizacjach.

**Słowa kluczowe:** IT, łańcuch dostaw, przewaga konkurencyjna, strategiczne, operacyjne

## 通过有效供应链管理（SCM）背景的竞争优势

**摘要:** 本研究的主要目的是研究IT支持的供应链对运营和战略利益的影响，最终确保企业的竞争优势。基于波特提出的竞争优势理论和广泛的实证研究，开发了一个概念模型。调查问卷是根据几个步骤制定的，并从以前的几项研究中采用了这些项目。采用分层随机抽样收集203名受访者的数据。基于结构方程模型，支持IT的SCM能够提供广泛的运营效益，而不是战略性的。几项先前的研究结果被对抗，并证实竞争优势在很大程度上取决于运营效益而非战略性。这项研究是极少数从两个不同角度研究IT优势及其竞争优势影响的实证研究之一。本研究的结果将有助于管理者了解IT组织中支持IT的SCM的重要性。

**关键词:** IT, 供应链, 竞争优势, 战略, 运营。