Received 1 October 2015
Revised 28 January 2016
18 May 2016
Accepted 18 May 2016

Operational or strategic benefits

Empirical investigation of internet adoption in supply chain management

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Abstract

Purpose – The purpose of this study is twofold: identifying important determinants for effective adoption of internet technologies in an organizational supply chain context and examining and classifying benefits yielded from internet adoption in supply chain.

Design/methodology/approach – A structured Web-based questionnaire was designed and administered to respondents to collect the primary data. With two reminders, this study managed to obtain 236 respondents from different industries in Malaysia. Structural equation modelling was applied to test the seven hypotheses.

Findings – Four of five factors were significant for successful implementation of internet technologies in organizations. In addition, results suggested that internet technologies contribute more to operational activities rather than strategic initiatives, which would be one of the main contributions of this study.

Research limitations/implications – This study is limited by its being based on organizational perception rather than absolute value for measuring the benefits of internet adoption. Moreover, this study applied the cross-sectional technique which may limit generalizability of the findings.

Practical implications – This study provides in-depth knowledge about internet adoption and benefits for the organization by combining both theoretical and empirical knowledge. It helps managers to understand the importance and process of internet adoption.

Originality/value – Organizations who are interested in adopting the internet in their supply chain may feel that these results will guide them in making their final decision.

Keywords Internet, Diffusion, Supply chain management, Business strategy, Abilities, Business value

Paper type Research paper

1. Introduction

Rapidly evolving internet technologies have forced organizations to rethink the ways they conduct business. This is necessary to keep abreast with increasingly tech-savvy societies and technologically integrated communities. In many ways, the internet and internet-based technologies are at the centre of modern business. The advent of the internet has transformed the industrial economy to a knowledge economy and gradually into a network economy (David *et al.*, 2004). The accuracy, speed and cost-efficiency of the internet make it indispensable for the growth and sustainability of all modern business operations. Advances in this area offer a platform for competitive advantage. This is particularly true in the context of a globalized world and economy. One may assert without fear of contradiction that in the context of modern business, embracing internet technologies either makes or breaks a successful business.

Adoption of internet technology in organizational context has been getting immense concern in developing countries, such as Malaysia. Many prior studies have investigated

Management Research Review
Vol. 40 No. 1, 2017
pp. 28-52

2040-8269
DOI 10.1108/MRR-10-2015-0225

effect of internet adoption on organizational performance such as market share, customer relationship management (CRM), return on investment (ROI) to name a few (Balakrishnan and Geunes, 2004; Sandars, 2007; Ramayah *et al.*, 2008). Moreover, they also added that internet technology is able to transform entire business activities, ranging from data collection to deliver final product to end users. In other words, internet technology provides a cutting-edge supply chain system for the twenty-first century. According to David *et al.* (2004), internet has become an integral part of a sustainable supply chain for an organization. Similarly, Vakharia (2002) stated that in the present business environment, it is near impossible to develop a sustainable supply chain without the use of the internet. This is evidenced by the widespread global adoption of internet technologies in supporting supply chain activities including joint forecasting, estimating market demand and inventory controlling among others (Aguila-Obra *et al.*, 2006). Among the more successful examples in the context of Malaysia is the experience of Maybank Bhd. which won the best "Retail Payments Implementation" award in 2011 for successfully implementing Web-based applications that streamline the remittance process and efficiently manage service fraud and money laundering risk.

The adoption of internet technologies results a great number of benefits (Bakker *et al.*, 2008). In their study, they examined benefits of internet adoption from different aspects including cost, communication with business partners, generating valuable knowledge in a collaborative environment and providing better customers relationship solution. They concluded that by adopting internet technology, an organization can enhance their supply chain functions. In similar fashion, Bughin and Chui (2010) identified the top five organizational benefits, namely:,

(1) increased speed to access knowledge;

(2) reduced communication cost;

(3) reduced travel cost;

(4) increased speed to access internal expert and, finally; and

(5) increased employee satisfaction.

The Malaysian government having recognized the importance of internet technology integration in business operations, according to the 2012 Business Monitor International report, the IT-friendly Malaysian budget is expected to increase Malaysian IT investment by 7 per cent in 2013 compared to 2012 with an approximate total investment of US$2.9bn (BMI Malaysian Information Technology Report, 2013). In this budget, Malaysian organizations focus their investment on three main technologies, namely, Enterprise Resource Planning (ERP), CRM and Software as a Service. All three technologies saw double digit growth in 2012. More interestingly, Malaysian government itself accounted for around 15 per cent of IT investment in 2012. All this is testimony that there is a clear drive for enhanced information technology as part of the Malaysian government's ambition to achieve developed country status by 2020 (Laurence *et al.*, 2014).

Interestingly, despite the increased investment in IT, many Malaysian organizations lack IT integration in their organizational activities. More specifically, many Malaysian organizations use the internet solely for communication. In the context of IT integration among Malaysian businesses, Kim and Lee (2005) observed that only 30 per cent of Malaysian organizations have an IT presence. Examining the implications of this on global competitiveness, Tan (2006) concluded that Malaysian organizations are losing their competitiveness in global market due to the slow adoption of IT. In an attempt to understand the causes for this, Alam and Ahsan (2007) observed that the reluctance of Malaysian

organizations to invest in IT may be due to them considering it expensive, lack of exposure and a general ignorance of the benefits of IT. Combined, these factors render Malaysia somewhat behind many developing countries in Asia in their adoption of e-commerce (Mohamed *et al.*, 2008).

In view of this predicament, in addition to the general paucity of research containing empirical evidence on the benefits of IT adoption in the context of supply chain management (SCM) (Bakker *et al.*, 2008; Sandars, 2007), the aims of this study are twofold. First, to identify the important determinants for IT adoption in the organizational domain from supply chain context. Second, to identify the benefits resulting from this adoption. Fundamentally, this study develops a conceptual model from two popular researches conducted by Sandars (2007) and Subramani (2003) for the reason that they classified benefits into main streams.

As opposed to focusing on the benefits of IT adoption from business partners and suppliers as did Sandars (2007) and Subramani (2003), this paper examines the organization itself rather than their partners or suppliers. The importance of this manifests in the nature of IT investment, namely, that it is a long-term commitment, and as such, the benefits of IT adoption must first be realized by the organization. Second, the majority of research approach this area of study in the context of financial returns such as ROI (Frohlich and Westbrook, 2002; White *et al.*, 2008; Mahmood *et al.*, 2008;) and cost reduction (Nitithamyong and Skibniewski, 2011; Ranganathan *et al.*, 2004; Subramani, 2003) to name but two.

This paper focuses on the value of internet technologies in enhancing organizational performance, which is a requisite for competitive advantage, and the ability to compete on the global market. Although there are a variety of information technologies that are set to enhance business and organizational operations, the study focuses on internet technologies. It focuses on the supply chain, as this paper argues that it requires digitalization to fit with other digitalized organizational functions in a single organization (Rajendran and Vivekkanandan, 2008).

2. Literature review

2.1 Supply chain management and technologies

Supply chain and logistics management are terms that are often used interchangeably (Mentzer *et al.*, 2001; So and Sun, 2010; Ceren and Peter, 2011). Theoretically, both concepts pertain to the same area of management. However, this study differentiates between these two concepts based on their fundamental differences. Mentzer *et al.* (2001) mentioned that although SCM is derived from logistic management, its scope is much broader. Logistic management emphasizes profitability and operational accuracy through cost efficiency (Christopher, 1998), but SCM goes further by combining strategies that include all organizational functions under one umbrella to gain a competitive advantage (Bowersox *et al.*, 2010). The fundamental aims of SCM are twofold:

(1) improve end users' value (Bowersox *et al.*, 2010); and

(2) ensure cost efficiency throughout the entire supply chain (Christopher, 1998).

Achieving these objectives is a difficult task for management, as it requires a pipeline work environment where every member, including the end user, needs to be connected. It requires dynamic strategic planning and extensive operational efficiency. Meeting these requirements is only made possible through the internet. According to Hock (2001), internet technologies facilitate supply chain activities by connecting each member in one network. Additionally, internet technologies transform the supply chain from a traditional to a network-based supply chain. As time goes by and new technologies emerge in the market place, consumers start demanding more and more sophisticated services such as real-time

order-tacking facilities, electronic invoice, 24/7 support system and self-service facilities (Li, 2010; Setia *et al.*, 2011). To be responsive to this new type of business trend, collaborating solely with partners is not adequate. Companies need to extend their network through to the end users. Consequently, companies need to adopt technology that can provide all types of functional and strategic support for supply chain functions. In response to this, many companies developed different types of technologies that can be broadly classified into four categories, namely, data acquisition technologies, communication technologies, warehouse technologies and, finally, transportation technologies. It should be noted, however, that internet technologies are necessary to facilitate networking between these categories. It offers advanced options to optimize these technologies and streamline operations through options such as CRM and business intelligence.

2.2 Internet and supply chain management

Over the past few decades, SCM has grown into an important and strategic mechanism for an organization to achieve sustainable competitive advantage. There have been significant changes in supply chain activities since the 1960s (David *et al.*, 2004), most of which are attributed to technological advancement. For instance, Nigel Bagley, CEO of Uniliever, recognized that in the proposed 2016 supply chain, "the supply chain can only be effective with sufficient information transparency. This is particularly important for collaborative approaches to improve on-shelf availability (OSA)". Similarly, in the same report, Kim Cartiedge, CEO of Danone, mentioned that:

> […] information about the actual status of items in the supply chain, at any moment, is essential to correctly co-ordinate all the combined logistics streams in the overall 2016 future supply chain architecture.

These testimonies emphasize the importance of sharing real-time information for an effective supply chain. To this end, most organizations adopt internet technology in their supply chain (Bigne *et al.*, 2008). However, Ranganathen *et al.* (2004) argued that the implementation of internet technologies is challenging and requires efficient integration of a number of organizational, functional and technological factors.

The internet offers new capabilities for organizations, which in turn, transforms their organizational activities. Operational benefits such as reduced manpower, enhanced work accuracy, effective communication among business partners and reduced operational costs are visible; however, the strategic benefits offered by the adoption of internet technologies are often subtle. Among the important capabilities internet technologies offer the supply chain are:

- it offers a new medium for the distribution of services;
- it helps customers to customize their order by simply clicking on a mouse anytime and anywhere;
- it provides an interactive platform for organizations where business partners can share real-time information, analyse and forecast demand and work together under one umbrella;
- it enhances the organizational transactional system by facilitating consumer convenience; and
- it provides a standardized business platform.

Despite these obvious benefits, internet technologies present a number of potential challenges for organizations including, increasing buyer bargaining power, facilitating

globalization and breaking the old paradigms of inter-organizational boundaries (Chang *et al.*, 2010). Nevertheless, the benefits far outweigh the challenges, and as such, many organizations including Dell, Nestlé, Uniliever and WalMart, acknowledged that the internet provided visible benefits to their supply chain by reducing inventory cost, enhancing Just-In-Time facilities, finding new opportunities and markets and achieving greater responsiveness to the dynamic market. Through it, companies gain a sustainable competitive advantage (Carlo *et al.*, 2010).

2.3 Determinants of technology diffusion

There are many important determinants for technological diffusion in both the individual and organizational domain. Thirty years ago, Rogers (1995) developed the theory for "Diffusion of Innovation", based on agricultural innovation. However, in the context of diffusion, the central interest of researchers is in the diffusion of information systems and software. This remains a vital area of research area for both individuals and organizations (Jeyaraj *et al.*, 2006).

Jeyaraj Rottman and Lacity (2006) summarized 100 unique independent variables used to predict organizational IT diffusion. They identified 14 unique are well-used independent variables and 86 experimental variables. In addition, they classified 14 best predictors for IT diffusion in the organizational context. Based on Jeyaraj *et al.* (2006), the paper has selected five independent factors for internet adoption, classified into three main categories, namely, technological, organizational and environmental characteristics.

2.3.1 Technological characteristics. Rogers (1995) mentioned that technological characteristics are important determinants for the increasing rate of technological adoption among non-users. In his popular theory, Rogers identified five main attributes that can influence the technological adoption rate. Based on this theory, Davis (1989) proposed the Technology Acceptance Model (TAM) with the aim of identifying individuals' intention to adopt technology, which becomes another milestone for research on diffusion. Although TAM was primarily intended for individuals, however, it is becoming increasingly popular in the organizational context. In contrast with these two popular theories, Jeyaraj Rottman and Lacity (2006) identified three important innovation characteristics, namely, relative advantages, complexity and observability. These three characteristics were also observed by Rogers and Davis but under different terms. For instance, Rogers used "perceived usefulness", whereas Davis used "perceived ease of use". Given that there seems to be a degree of consensus concerning these three factors, the current paper has adopted them as independent factors for internet diffusion in the organizational context.

2.3.1.1 Relative advantage. Relative advantage pertains to the additional benefits resulting from new innovation compared with existing technology. Numerous prior studies identified relative advantage as among the most significant and positive determinants that influences the rate of IT adoption including electronic data interchange (EDI), enterprise resources planning (ERP), radio frequency identification and Web technologies. For instance, Ifinedo (2011), in his study, examined the effect of perceived usefulness on e-business adoption and concluded that it has significant positive effect on final decision of adoption. There are many recent studies utterly emphasized on this significant determinant for e-business adoption and mentioned that it is merely impossible to implement any new technology in organization unless it offers superior benefits compare to current state-of-the-arts (To and Ngai, 2006; Mosbeh and Soliman, 2008; Chong *et al.*, 2009; Theodosiou and Katsikea, 2012; Wu *et al.*, 2013; Victoria *et al.*, 2012; Tarofder *et al.*, 2013; Teoh *et al.*, 2013).

2.3.1.2 Complexity. Another important criterion for the technological adoption rate is complexity, which is a reverse influence on the rate of technological adoption. Complicated technologies cause consumers to be reluctant to use it. Many previous researchers identified this negative relationship (Doolin and Troshani, 2007; Mosbeh and Soliman, 2008; Riccardo *et al.*, 2013; Chong *et al.*, 2014). This highlights the importance of selecting the correct technology for business activities, as complicated technologies are often more expensive and are more likely to lead to confusion thereby undermining performance. Additionally, almost every prior study greatly highlighted this factor as one of the most negative influential factors for adoption of not only internet but also other new technologies such as EDI, ERP, etc.

2.3.1.3 Observability. Another influential factor identified by Rogers but not listed in TAM model is observability. One possible reason could be the domain of implementation. Theoretically, TAM was developed based on an individual domain. In addition, the TAM model also developed based on the Theory of Reasoned Action. However, this factor is one of the important factors in the organizational domain, as managers often emphasize the outcome of investments. There is a significant positive relationship of this factor with the rate of diffusion, which has been identified in many prior studies in different technological context (Troshani and Lymer, 2010; Hart *et al.*, 2011). Moreover, the greater the observed benefits of technological adoption, the greater the rate of adoption.

Based on the above discussion, this study proposes the following three hypotheses related with innovation characteristics.

H1a. Relative advantage has a significant positive effect on the rate of internet adoption in supply chain activities.

H1b. Complexity has a significant negative effect on the rate of internet adoption in supply chain activities.

H1c. Observability has a significant positive effect on the rate of internet adoption in supply chain activities.

2.3.2 Organizational characteristics. Organizational characteristics has many dimensions, which differ from research to research, including organizational climate, training and development, organizational culture, management skill and top management support. However, the dimension that appears to be accepted by the majority of researchers is "Top Management Support" (Jeyaraj Rottman and Lacity, 2006). Accordingly, Top Management Support is included in this paper as a determinant for the rate of internet adoption in the SCM process.

2.3.3 Top management support. This dimension of an organization pertains to knowledge among senior management regarding the potential of information technologies and the will to act proactively in the diffusion of IT in the efficient management of business activities to achieve a competitive advantage (Jackson *et al.*, 1995; Seyal *et al.*, 2007; Mosbeh and Soliman, 2008; Psomas *et al.*, 2010). Managerial support is central to the rate of diffusion of internet technologies among all stakeholders including employees, suppliers, distributors and end users. This factor has consistent significant positive influence in almost every prior research especially in developing countries. For instance, Ifinedo (2011) conducted a research in Canadian Small and Medium Enterprise's (SME) and concluded that top management support is one of the utmost important determinants for e-business adoption. Similarly, Lin (2013) also postulated that support from top management plays an important role for effective implementation of e-business in relation with knowledge creation. This is so given that in developing countries, organizational decisions are exclusively made by top management (Mosbeh and Soliman, 2008). As such, employees do not deliberately participate in technological changes. Furthermore, the adoption of technology often requires significant investment. Consequently, successful internet adoption largely depends on

the support of top management (Ada, 2008). Top management support adoption strategies by motivating and assisting efforts toward technology development by allocating the necessary resources for this purpose (Yean *et al.*, 2006). In line with the role of top management for the adoption and diffusion of IT technologies, the following hypothesis is made:

H2. Top Management Support has a significant positive effect on the rate of internet adoption in supply chain activities.

2.3.4 Environmental characteristics. The environmental factor is uncontrollable and erratic in nature. Fundamentally, in adoption or diffusion research, environmental characteristics consist of environmental uncertainty, competitive pressure and industry pressure. Organizations consider adoption of technology a static movement when there is deadly competition among rivals within the industry. However, organizations often decide to gain competitive advantage by adopting new technologies that lead to a greater market presence. When properly performed, the introduction of new technologies can prove a strategy that renders competitors unable to compete in the market. Competitive pressure is likely one of the most influential determinants for adopting new technologies. Jeyaraj *et al.* (2006) concluded that competitive pressure is one most important impetus for adopting innovation. This is perhaps best illustrated by the emergence of smart phones.

2.3.5 Competitive pressure. Competitive pressure is among the most dynamic pressures anticipated by every organization throughout their business life. Companies often prepare a course of action in the event of unpredictable pressures. Such pressure has a significant positive effect on the organizational decision-making process, which subsequently influences the rate of technological adoption (To and Ngai, 2006; Zhu and Kraemer, 2005). This forces a continuous pursuit of optimization through the latest technologies. Similarly, Ifinedo (2011) identified external pressure as the second most influential factor for e-business adoption and stated that extensive popularity of technology among partners likely to increase the rate of adoption of such technology within the industry. Moreover, in one recent meta-analysis related with IT adoption conducted by Hemlata *et al.* (2014) stated that without having pressure from any of the industry partner, organizations are reluctant to invest in technology. Additionally, many recent studies identified similar results in their investigation (Victoria *et al.*, 2012; Chad *et al.*, 2011). In line with this premise, the following hypothesis is proposed:

H3. There is a significant positive effect of competitive pressure on the rate of internet adoption.

2.3.6 Adoption and its benefits. In this competitive era, decisions related to technological adoption is among the most important and strategic decisions. As such, it must be done carefully and by the most appropriate persons. Selecting the technologies that best suit a specific business can lead to sustainable competitive advantage for firms. However, organizations do not operate in isolation. Therefore, there is a need to adopt technologies that can cut across organizations on a single platform. According to Liu *et al.* (2005), dominating a market requires firms to emphasize on external relationships. Having a collaborative platform facilitates easy exchange of information between partners in real time. This allows for better management of day-to-day activities.

To this end, the internet is perhaps the only platform through which such information sharing and networking is possible. It offers a platform for new business collaborations, a channel for media distribution and access to a global market. Many firms use the internet for digitalizing their day-to-day activities, enabling CRM, providing digital catalogues and facilitating electronic transactions with the primary aim of streamlining business activities through integrating and coordinating their supply chain process.

Interestingly, in regards to internet adoption, greater emphasis is places on operational benefits over strategic benefits. For instance, Deveraj *et al.* (2007) examined the benefits of e-business technologies on organizational supply chain performance and concluded that there is no significant direct effect of e-business technologies on strategic benefits. More interestingly, Power *et al.* (2010) identified no significant effect of the electronic market on a firm's operational performance unless every business partner is involved in the same electronic market. In contrast, Sandars (2007) mentioned that e-business technologies are able to provide both operational and strategic benefits for firms. However, this research focused only on the point of view of suppliers. Similarly, Ranganathan *et al.* (2004) stated that Web technologies are able to enhance a firm's operational activities. Table I presents a summary of the benefits identified by prior researchers

Authors' name	Context of research	Technological context	Benefits identified from adoption
Frohlich and Westbrook (2002)	Supply chain	e-business	General (ROI, Profitability)
Subramani (2003)	Supplier relation in supply chain	General IT	Strategic (learning about customers, and market; creation of new product, development of new business opportunities); Operational (cost effectiveness; improvement to current process, profitability)
Ranganathan *et al.* (2004)	Supply chain management	Web-technologies	General (customer service, investment control, operational cost, reduce cycle time, better relationship with suppliers, competitive advantage)
David *et al.* (2004)	Supply chain management	Internet technology	Developing e-commerce applications; Standardized XML platform for sharing information; Integration of computer application; and Managing partner relationships
Sandars (2007)	Suppliers perspective	E-business	Operational (cost, important of current process, profitability); Strategic (learning about customers and market, creation of new products, product enhancement, new business opportunities)
Lin (2008)	Logistic service	General technology	Supply chain performance (Financial and non-financial)
White *et al.* (2008)	Supply chain	RFID	General outcome (Anticipated benefits, Anticipated ROI, operational deployment)
Mohamed and Shen (2008)	Business value	E-commerce	Return on investment (ROI), Return on equity (ROE), Return on sales (ROS)
Iyer (2011)	Demand chain	IT	Operational performance
Wiengarten *et al.* (2011)	Supply chain	E-business	Operational performance
Nitithamyong and Skibniewski (2011)	Project management	Web-based technology	Strategic improvement, risk improvement, time improvement, communication, cost improvement and quality improvement
Tarofder *et al.* (2013)	Supply chain management	Web-based technology	General
Victoria *et al.* (2012)	Retailers	E-Business	Firm's strategy, management and marketing

Source: Developed for this study

Table I.
Summary of benefits

from different technological contexts. Based on the above discussion, two hypotheses for the benefits of internet adoption from the point of view of the supply chain are proposed:

H4a. Internet adoption provides greater operational benefits for organizational SCM.

H4b. Internet adoption provides greater strategic benefits for organizational SCM.

3. Research design and conceptual model

This study developed a conceptual model consisting of eight variables adapted from the findings of many prior studies discussed above. These variables validated through theoretical and empirical research to ensure a balanced study. Three from the five innovation characteristics identified by Rogers were selected, as some researchers considered trialability and communicability insignificant variable.

The developed conceptual model consists of seven hypotheses, as shown in Figure 1. The hypotheses were tested through a Web-based questionnaire. This study consists of a three-staged research design. The first stage is an exploratory research to clarify the research problem and formulation appropriate hypotheses. The second stage sought to identify the characteristics of respondents and to determine the need for internet technologies in SCM. This is approached through descriptive research. However, descriptive research does not examine the relationships among variables, which was important for testing the hypotheses. Consequently, we used causal research for testing the conceptual model developed for this study. By using causal research, this study can assess both the hypotheses and association between variables. Furthermore, the issue of inferring causality was approached by applying cross-sectional data. To examine causality, this study applied two important assessments: association among variables and elimination of alternative plausible explanations (Neuman, 2000). To test the hypotheses, this study used primary data in the form of a structured questionnaire.

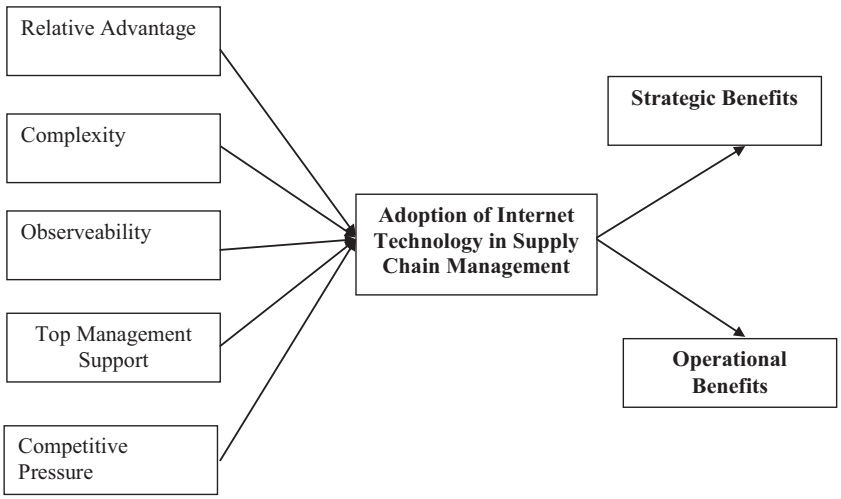


Figure 1.
Conceptual model for this study

Source: Developed for this study

3.1 Questionnaire design and data collection methods

A structured questionnaire was designed and administered to respondents to collect the primary data. A questionnaire plays a vital role for achieving research objectives and testing proposed hypotheses. Six steps were taken to finalize the final questionnaire. These steps were:

(1) identify appropriate data type and define the operational definition for each selected variable;

(2) select the appropriate data collection method;

(3) administer a pre-test for validity;

(4) administer a pilot test;

(5) check for reliability; and

(6) finalize the questionnaire.

Table II presents the constructs, operational definitions and measurement scale for the selected variables.

Questionnaire development began by identifying the appropriate data type for each variable that will produce the correct answers. It therefore began with conceptual and operational definitions that assist in the selection of the correct theoretical constructs. All the constructs were adapted from different researches, which ensured face, content and construct validity for this study.

In regards to data collection, there are several techniques for collecting primary data including face-to-face collection, telephone calls, interviews, observation, mail survey, Web-based survey and e-mail survey. Each technique has its own unique strengths and weaknesses. There is no single superior technique suitable for all contexts. The appropriateness of the data collection method depends on the research objectives, time, cost, geographic location, sample size and respondents. Time, cost and the characteristics of respondents were considered to select the most appropriate data collection methods for this study. Upon careful consideration, the internet survey technique was selected for primary data collection due to the following reasons:

- it becomes an effective media for communicating with top management, as top management is the target respondents for this study;
- internet has a greater response accuracy by reducing response error, interview bias, inputting errors and the sampling distribution problem; and
- finally, it is well suited for collecting data from a geographically dispersed sample population as Malaysia has 14 Free Trade Zones, which are situated in different states.

The questionnaire was designed in observance of the principles identified by Sekaran and Bounge (2013), which includes questions sequence, wording and length of content. It begins by introducing the research project and its objectives, which fosters confidence among respondents. Instructions were provided wherever necessary. The questionnaire avoided posing recall questions with the exception of how long their organization has used the internet. This was unavoidable because it indicated the length of the respondents' experience with the using the internet. In addition, the questionnaire sought to be as convenient as possible to illicit a comfortable and accurate response from the respondents. Similarly, simple English was used in this questionnaire to maintain standardized meaning among respondents. A well-structured questionnaire can provide benefits for both respondents and researcher.

Table II. Constructs, operational definitions and measurement scale

Variable	Operational definition	Measures	Scale
Relative advantage (RA)	Relative advantage considered as additional benefit resulted from new technology compare with conventional technology in organizational supply chain activities	Internet provide better communication system with our partners compare with traditional system (RA 1) Internet provides efficient order management system than traditional system (RA 2) Internet allow us to reduce production cycle time than traditional system by sharing real time information (RA 3) Internet technology helps us to offer more customize facilities for business partners than traditional technology (RA 4)	7-point Likert scale
Complexity (COM)	It is considered as the level of difficulty to use internet technology compare with current technology in supply chain activities	Internet technology is too difficult to understand for supply chain activities (COM 1) To install internet technology in supply chain management, organization needs to invest significant amount of money for training (COM 2) To use internet for supply chain, every employee need to learn complicated technical knowledge (COM 3) Procedures for using internet in supply chain is more difficult than conventional technology (COM 4)	7-point Likert scale
Observability (OBV)	Observability considered as realizing instant benefits comparing with conventional technology that can demonstrate to others	Obtaining significant communication benefits by other companies resulted from internet adoption insist me to use internet technology in supply chain (OBV 1) Enhancing coordinating activities by using internet among business partners encourage me to use internet in our supply chain activities (OBV 2) Looking at business partners' remarkable results gaining from internet entice us to implement internet in our supply chain (OBV 3) Identifying better performance by different industry resulted from internet, encourage us to implement internet in our organization (OBV 4)	7-point Likert scale
Top management support (TMS)	It refers as the support or encouragement comes from management to use internet for supply chain activities by providing training and resources	Management allocates enough resources for diffusion of the internet for the SCM functions (TMS 1) Management activity encourages employees to use the internet technologies in supply chain tasks (TMS 2) Management enthusiastically supports the diffusion of internet for the supply chain management (SCM) functions (TMS 3) Management provides sufficient training for using internet for supply chain activities (TMS 4)	7-point Likert scale

(*continued*)

Table II.

Variable	Operational definition	Measures	Scale
Competitive pressure (CP)	It considered as to the degree to which organizations need to be responsive to the competitors' actions to adopt of diffuse Web technology in their supply chain	Emergence of Web technology as a standard mode of communication in the industry (CP 1) Customers' insistence on using Web technology to do business with them (CP 2) Most of the competitors are using Web technology for their supply chain functions (CP 3) Suppliers' insistence on using Web technology to do business with them (CP 4)	7-point Likert scale
Adoption of internet in supply chain management (AIT)	It considered as the extent to which internet technology is used in key supply chain activities	Internet technology use for Inventory control (AIT 1) Internet technology use for purchasing order processing (AIT 2) Internet technology use for online transaction with business partners (AIT 3) Internet technology use for sharing real time information with business partners (AIT 4) Internet technology use for delivery tracking system (AIT 5)	7-point Likert scale
Operational benefits (OB)	It considered as doing things efficiently to deliver additional value to the end users	By using internet in supply chain, our company can significantly reduce inventory cost (OB 1) By using internet in supply chain, our company can manage day-to-day work efficiently (OB 2) By using internet in supply chain our company can foster collaboration with the business partners (OB 3) By using internet in supply chain, our company can significantly reduce delivery time to the end users (OB 4) By using internet in supply chain, our company can significantly reduce purchasing time (OB 5)	7-point Likert scale
Strategic benefits (SB)	It defined as doing things effectively to deliver superior value to the all business partners including end users	By using internet in supply chain, our company can reduce product development time (SB 1) By using internet in supply chain, our company can get more business opportunities (SB 2) By using internet in supply chain, our company become more responsive to the customer's specific needs (SB 3) By using internet in supply chain, our company can understand all business partners need better than before (SB 4) By using internet in supply chain, our company can share more information in a real-time environment (SB 5) By using internet in supply chain, our company can reduce uncertainty resulted from external environment (SB 6)	7-point Likert scale

Source: Developed for this study

This study followed the technical guidelines for Web questionnaires suggested by Dillman and Bowker (2001). It included a vertical flow, proper resolution, partial screen displays and wrap-around text. It was designed in plain format with minimum graphics and visual navigation control (Dillman and Bowker, 2001). It used lower levels of HTML in order that it will be compatible with older browsers. The questionnaire included a section for comments. After clicking the "submit" button, a "thank you" notice appeared signalling the completion of the process.

A pilot test was conducted after the pre-test among 23 organizations in Selangor. All the respondents were requested to complete the questionnaire and comments on the questionnaire's items. All the respondents were from different background including top management from manufacturer, the service industry and industry researchers. The two main reasons of selecting these respondents were:

(1) top management is best suited to answer questions pertaining to the internet investment of their organization; and

(2) researchers help to ensure the accuracy and validity of the questionnaire.

Results indicated that most of the questions were understood by the respondents with a reliability score greater than 0.80 for each item. Some minor amendments were made for each section as recommended by respondents.

3.1.1 Validity and reliability. Validity and reliability are two important components for ensuring an effective and consistent questionnaire. Several types of validity tests were conducted including face, measurement and convergent tests.

3.2 Sampling strategy

The respondents for this study predominantly consisted of senior management and organizations that use the internet in their supply chain activities. Information about the respondents was gathered from different popular directories in different times (Malhotra, 1999) because an appropriate selection of population provides for more accurate results (Sekaran and Bounge, 2013; Zikmund, 2000; Salant and Dillman, 1994). Three types of sampling methods in internet survey were considered, namely, unrestricted sample, where everyone who comes into contact with the survey is eligible to complete; screened samples, where only those who fit certain criteria can continue with the survey; and finally, required sample, which uses e-mail or other methods to approach those specific individuals who are interested (Forrest, 1999). This study applied screened and recruited sampling. A total of 2,687 organizations were selected from the databases of Federation of Malaysian Manufacturers, Malaysian Investment Development Authority, SAP Malaysia and Export and Import and Member of Port Klang Shipping Agencies Association. These are the most popular and reliable databases available in Malaysia for industrial research. Among the entire population, 1,000 organizations were randomly selected on the condition that the organization uses the internet in their supply chain activities.

Before executing final data collection, a fax was sent to the entire sample population requesting them to join in this survey. Fax was used instead of e-mail because the database suppliers desired to protect client anonymity and to reduce potential alienation and complaints from subscribers. The Web address of the internet survey was included, and respondents were given the option of submitting the survey online or through e-mail. This step was followed by two faxes, which proved effective in increasing the response rate.

As for sample size, the minimum requirements for structural analysis were considered. Moreover, Roscoe (1975) proposed that a sample size larger than 30 and less than 500 is appropriate for most research. In addition, Hair *et al.* (2006) recommended that in

multivariate research, the sample size should be ten times more than the number of variables. With two reminders, this study obtained 236 respondents with a 23.6 per cent response rate. The total response rate was satisfactory, as a rate of 12 per cent is acceptable in most internet-based research. Based on all these sampling decision criteria, 236 respondents were considered a satisfactory number for this research.

In regards to non-response bias, this study conducted a Chi-square test between the first-round respondents and second-round respondents. Table III shows the result of the Chi-square test. The results confirmed that there were no statistically significant differences in industry type, annual revenue and years of using the internet in their SCM functions.

4. Respondents' attributes

Table IV represents the characteristics of the respondents participating in this study. Most of the respondents in this study were involved in the tourism and hotel industry (14 per cent), followed by the software industry (13.58 per cent) and hardware industry (12.79 per cent). This result is not surprising because these industries are probably the most tech savvy industries, which optimise their use of internet technologies. Only 3 per cent of respondents in this study were from the publishing industry. Almost 50 per cent of the respondents' revenue was between 1 and 5 million ringgit. One best explanation for this scenario could be the 2009 report of the SME performance and statistic, which mentioned that 99.2 per cent of operating organizations in Malaysia are considered as SMEs. In total, 5 per cent of respondents had annual revenues greater than 50 million. As for workforce, 55 per cent of the respondents have less than 500 employees, whereas 2 per cent per cent employed more than 5,000 employees.

In regards to internet application in supply chain activities, respondents exhibited great familiarity, as almost 72 per cent of respondents have been using internet technologies in their supply chain activities for more than five years. Some of the most frequent supply chain activities in which internet technologies were used were inventory management (56 per cent), customer service (53 per cent), electronic transaction (51 per cent) and electronic ordering system (48 per cent). One important issue that can be identified from this is the Malaysian organizations are yet to realize the value of sharing information with their partners, as only 5 per cent of respondents agreed that they using internet for sharing information with their partners. This is a significant area of concern from the point of value creation.

5. Validation of measurement model

In a move to validate the measurement model, this study applied the confirmatory factor analysis (CFA), which assists in improving internal consistency, and convergent and discriminant validity for reflective constructs. Several fit indices were applied to evaluate the measurement model in this study. These indices were goodness-of-fit index (GFI), adjusted of goodness-of-fit index (AGFI), normed fit index (NFI), root mean square of error of estimation (RMSEA) and root mean square residual (RMR). Cut points for the fit indices were established from several empirical studies in a similar context. Specific cut-off points were GFI, AGFI, NFI and CFI greater than 0.90; RMSEA less than 0.06 and RMR less than 0.05. Table V presents the results of the measurement model as analysed by analysis of a moment structure (AMOS) 6.

	Industry	Revenue	Use internet
Pearson Chi-square	17.621	2.846	10.634
Asymp. Sig. (2-sided)	0.347	0.484	0.100

Table III.
Non-response error

	Frequency	(%)
Industry		
Tourism/Hotel	33	13.98
Software	32	13.55
Hardware	30	12.71
Retail	29	12.28
Apparel	28	11.86
Electronic	28	11.86
Telecommunication	26	11.01
Education	15	6.35
Transportation and courier	9	3.81
Publication	6	2.54
Annual revenue (in Ringgit)		
Less than 1 million	36	15.25
1-5 million	117	49.57
6-10 million	14	5.93
11-15 million	12	5.08
16-20 million	4	1.69
21-25 million	0	0
26-30 million	0	0
31-35 million	20	8.47
36-40 million	0	0
41-45 million	0	0
46-50 million	16	6.77
More than 50 million	14	5.93
Number of employees		
Less than 500	131	55.50
501-1,000	53	22.45
1,001-1,500	32	13.55
1,501-2,000	8	3.38
2,001-2,500	2	0.84
2,501-3,000	3	1.27
3,001-3,500	1	0.42
3,501-4,000	1	0.42
4,001-4,500	0	0
4,501-5,000	0	0
More than 5000	5	2.11
Duration of using internet for supply chain		
Less than 5 years	66	27.96
More than 5 years	170	72.03
Supply chain activities using internet		
Inventory management	133	56.35
Customer service	125	52.96
Electronic transaction	121	51.27
Electronic ordering system	114	48.30
Information sharing with partners	12	5.08
Online demand scheduling	30	12.71
Delivery tracking system	40	16.94

Source: Developed from SPSS

Table IV.
Respondents' characteristics

Factor indicators	x^2	Df	P	GFI	AGFI	CFI	RMSEA	Factor loading	Composite alpha
Relative advantage	*36.13*	*23*	*0.051*	*0.994*	*0.969*	*0.99*	*0.062*		*0.913*
RA 1								0.85	
RA 2								0.96	
RA 3								0.78	
RA 4								0.88	
Observability	*3.062*	*2*	*0.087*	*0.994*	*0.968*	*0.99*	*0.810*		*0.853*
OBV 1								1.08	
OBV 2								0.95	
OBV 3								0.93	
OBV 4								0.75	
Complexity	*3.085*	*2*	*0.214*	*0.994*	*0.969*	*0.99*	*0.047*		*0.926*
Com 1								0.96	
Com 2								0.98	
Com 3								0.87	
Com 4								0.94	
Top management support	*3.179*	*2*	*0.204*	*0.994*	*0.969*	*0.96*	*0.049*		*0.910*
TMS1								0.97	
TMS2								0.78	
TMS3								0.85	
TMS4								1.08	
Competitive pressure	*4.238*	*2*	*0.120*	*0.992*	*0.958*	*0.99*	*0.067*		*0.909*
CP 1								0.97	
CP 2								0.96	
CP 3								0.94	
CP 4								0.92	
Internet adoption	*1.41*	*4*	*0.84*	*0.99*	*0.98*	*0.96*	*0.00*		*0.926*
AIT 1								1.09	
AIT 2								0.72	
AIT 3								0.96	
AIT 4								0.95	
AIT 5								0.89	
Operational benefits	*5.549*	*2*	*0.049*	*0.989*	*0.943*	*0.96*	*0.084*		*0.904*
OB 1								0.98	
OB 2								0.86	
OB 3								0.95	
OB 4								0.99	
OB 5								1.02	
Strategic benefits	*2.355*	*2*	*0.308*	*0.995*	*0.967*	*0.91*	*0.027*		*0.879*
SB 1								0.98	
SB 2								0.92	
SB 3								0.84	
SB 4								0.99	
SB 5								1.04	
SB 6								0.89	

Source: Developed from AMOS results

Table V.
Results of measurement model

CFA helps to examine convergent validity by assessing the confirmatory factor loading of each item with its targeted factor. In this study, CFA recommended little modification on some constructs as these construct loadings were below 0.50 and had an insignificant *t*-value. As such, one item from "observability", and "strategic benefits" was removed as suggested by prior research. Apart from inadequate loading values, one possible explanation for the insignificance of these two constructs could be the relevance of these constructs in the context of a supply chain. However, 34 items on eight factors produced a good model fit value for each factor (Table V). Furthermore, all construct loading scores were above 0.70 as suggested by Hair *et al.* (2006).

Similarly, discriminant validity was evaluated based on the correlation score among variables. Several approaches were used in this study for assessing discriminant validity. A confidence interval test, which involved calculating confidence interval of plus or minus 2 standard errors around the correlation between the variables, was applied to determine whether this interval includes 1. If this situation is absent, then there is discriminate validity. Table V shows that none of the intervals in this study had 1. Additionally, this study followed a cut-point of correlation value as suggested by Kline (2005), who mentioned that if the correlation values exceed 0.85, then there is no discriminant validity. The results showed that none of the correlation values between variables exceeded 0.85, thus ensuring discriminant validity of this study.

6. Hypothesis testing

Structural equation modelling (SEM) was used to test the proposed theoretical model presented in Figure 1 All analysis regarding SEM were examined applying AMOS. Maximum likelihood method of parameter estimation techniques were used for all the analyses, and regression weights were calculated to measure the effect of each variable on the proposed relationship. This research used multi goodness-of-fit indices for assessing the model as a single index is not adequate for drawing conclusions. All the goodness-of-fit indices for the model and the results of the hypotheses testing are presented in Figure 2 and Table VI, respectively. In addition, Figure 3 illustrates the SEM results of the proposed model.

The results from the hypotheses testing revealed that "relative advantage" had a strong effect on increasing the internet diffusion rate in SCM ($\beta = 0.36, p < 0.001$). These results assert that the internet provides many benefits to supply chain activities, resulting in increased internet diffusion. Similar findings can also be found in many prior studies. Chwelus *et al.* (2010) mentioned that organizations will deliberately adopt internet technologies if it provides additional benefits. The first hypothesis is therefore accepted, and it is concluded that "relative advantages" has a significant positive effect on diffusion of internet in SCM.

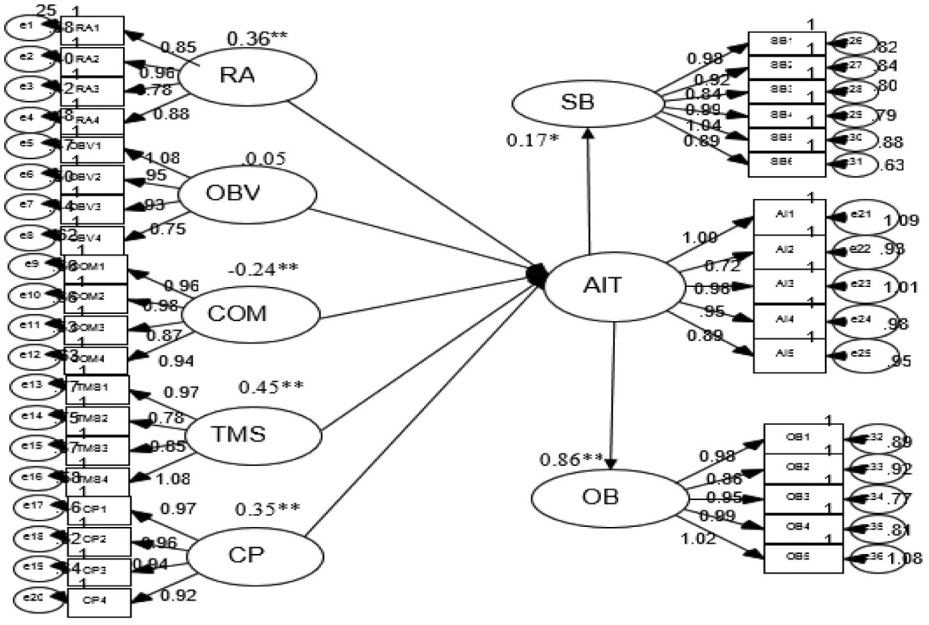
Standardised regression weight				S.E.	P value	C.R.
Perceived Usefulness	→	Internet Adoption	0.36	0.099	0.001	8.999
Complexity	→	Internet Adoption	–0.87	0.082	0.001	7.592
Observeability	→	Internet Adoption	0.05	0.561	0.085	1.262
Top Management Support	→	Internet Adoption	0.45	0.052	0.001	7.926
Competitive Pressure	→	Internet Adoption	0.35	0.061	0.001	7.458
Internet Adoption	→	Operational Benefits	0.86	0.043	0.001	7.849
Internet Adoption	→	Strategic Benefits	0.17	0.051	0.01	8.530
Chi-Square (x2)				3.37		
P				0.50		
Normed chi-square (CMIN/DF)				0.84 (< 5.0)		
Root mean square residual (RMR)				0.010 (< 0.1)		
Root mean square of error of estimation (RMSEA)				0.049 (< 0.10)		
Goodness-of-fit index (GFI)				0.994 (> 0.9)		
Adjusted of goodness-of-fit index (AGFI)				0.976(> 0.8)		
Normed fit index (NFI)				0.996 (> 0.9)		

Figure 2.
Final model fit summary

Hypothesis	Results	Contribution
H1a. Relative Advantage has a significant positive effect on the rate of internet adoption in supply chain activities	Accepted	Minor
H1b. Complexity has a significant negative effect on the rate of internet adoption in supply chain activities	Accepted	Minor
H1c. Observability has a significant positive effect on the rate of internet adoption in supply chain activities	Rejected	New knowledge emerged to the theory of diffusion of innovation
H2. Top management support has a significant positive effect on the rate of internet adoption in supply chain activities	Accepted	Minor
H3. There is a significant positive effect of competitive pressure on the rate of internet adoption	Accepted	Minor
H4a. Internet adoption provides greater operational benefits for organizational supply chain management	Accepted	New contribution to the real knowledge which helps to guide for further direction of internet technology
H4b. Internet adoption provides greater strategic benefits for organizational supply chain management	Accepted	New contribution to the real knowledge which helps to guide for further direction of internet technology

Source: Developed for this study

Table VI.
Summary of hypothesis testing



Notes: ** Significant at 99 percent; *significant at 95 percent

Figure 3.
SEM results for the proposed model

As displayed in Table .., we found a significant negative effect of complexity on internet diffusion in SCM. Generally, it is true that complexity is a great impediment for effective implementation or internet diffusion. However, in some scenarios, especially where there is no other option, organizations overcome the complexity by providing training or coaching. In the Malaysian context, most of the Malaysian organizations are categorized as SME and, as such, think twice about investing in IT due to financial considerations. Hence, complexity plays an important negative role on internet diffusion, especially in SCM.

Somewhat unexpectedly, the results reported that "observability" is not a significant determinant for internet diffusion in SCM ($\beta = 0.05$; $p = 0.085$). Therefore, the hypothesis related to observability is rejected. This is probably due to:

- industry standards;
- environmental changes;
- availability of technologies at a low cost; and
- extensive use of e-business technologies throughout the world.

Although internet diffusion increases when organizations realize the positive differences of adopting internet technology, however, to respond to current market needs and trends or retain an organization's position, organizations may have little time to evaluate internet technologies. As a result, the importance of observability for diffusion of the internet in SCM is overlooked.

Concerning "Top Management Support", many researchers argue that it is the foremost variable influencing the rate of technological diffusion in an organization. This paper concluded the same finding as "top management support" was the most important factor among all five factors identified in this study ($\beta = 0.45$; $p < 0.001$). Therefore, it is clear that without having proper support from the management, it would not be possible to diffuse internet technologies in SCM.

With regard to competitive pressure, results indicated that it has a significant positive effect on the diffusion rate of internet technologies in SCM ($\beta = 0.35$; $p < 0.001$). This is not surprising because in this acute competitive business environment, every organization reacts to the activities of their competitors. To retain their own market position, organizations must continuously redefine their business processes. If an organization sees their competitors pursuing new technologies, they too will seek to acquire new technologies. Hence, the hypothesis related to competitive pressure is accepted.

As for benefits, the results revealed that both strategic and operational benefits can gain from effective internet diffusion in SCM. Between these two, the results showed that an organization gains more in operation benefits ($\beta = 0.86$; $p < 0.001$) relatively to strategic benefits ($\beta = 0.17$, $p < 0.001$). These results are in contrast to the conclusions of Sandars (2007) and Subramani (2003), who found that e-business technologies contribute more on strategic benefits ($\beta = 0.46$) rather than operational benefits (0.46). These results suggest that this area requires further exploration. Table VII presents the summary of hypotheses testing for this study.

7. Discussions and managerial implications

The results of the study concluded that "Top Management Support" is the most important determinant for effective diffusion of internet technologies in SCM. This is so because the use of internet technologies in an organization is essentially decided by senior management. Following this, training appears to be an important factor for the diffusion of new technologies, especially in an organizational domain.

Both theoretically and practically, the relative advantages of innovation positively influence the rate of adoption. This is because if innovation provides greater benefits

compared with existing technologies, then organizations are more likely to embrace it. However, it is also important to remember that benefits must be greater than cost of implementation, as due to the short life cycle of technologies, organizations must think twice when investing in IT.

Not surprisingly, competitive pressure is more important than complexity in the organizational domain. In the individual domain, complexity is likely be one of the foremost negative influencing factor for adoption of technology, as individuals may not have the resources to learn complicated technologies. However, the scenario is different in the organizational domain, as reflected in this study. Doubtless, every organization seeks to secure or improve their market position. Therefore, if the competitors improve their technological initiatives, others will fell pressure to do so, as they need to keep up to date. For instance, in Malaysia, a small number of internet users engage in internet banking. Despite the small number of users, every bank in Malaysia provides internet-banking services, as every competitor is providing such a service. This clearly indicates that competitive pressure is an important determinant for diffusion of technology. However, technology developers should not ignore the fact that complexity can also negatively influence diffusion rates. Practically, giant organizations, who have sufficient resources to train their employees, may overcome this problem. However, for SME's, complexity can be the main hindrance for adoption. Hence, to increase diffusion rates, technology developers should develop technologies that can be easily integrated into existing business operations.

The internet provides different benefits ranging from product development to effective delivery system. In this study, we classified these benefits in two broad categories, namely, strategic and operational benefits. The research sought to determine the benefits internet technologies offer SCM. Despite the general paucity of empirical research on this important issue, the little research in this area concluded that the internet offers a good number of benefits for organizations. The results of this paper reveal some interesting facts regarding the benefits arising from internet diffusion. We identified that internet is able to improve operational benefits significantly compared to strategic benefits. With the help of internet technologies, organizations can better manage their day-to-day activities. For instance, with the help of internet technologies, retailers can manage their inventory system in an efficient manner. However, internet technologies cannot reduce the uncertainty arising from the external environment. In fact, our results revealed that internet technology is able to produce more operational benefits, although it has significant contribution to both benefits. This is a debatable issue, as many large international organizations acknowledged that they improve their strategic initiatives by using internet technologies.

One may question as to the cause of these behavioural differences. Perhaps, one possible reason could be the organizational type. Most of the sampled Malaysian organizations are SMEs that have yet to fully implement internet technologies in their organizations. Hence, our results strongly recommended that technology developers should clearly communicate the advantages of internet technologies to senior management. This is a strategic initiative to optimise organizational performance and realise competitive advantages.

8. Limitations, further studies and conclusions

Despite its important contributions, this study is limited by its being based on perception rather than absolute value. Therefore, it is wise to measure benefits based on quantitative data such as the reductions in cost resulting from the use of internet technologies. Such an approach offers concrete benefits for internet diffusion.

Second, we applied cross-sectional studies, however, by applying longitudinal research approaches; researchers can give exact benefits for internet diffusion.

Third, many studies suggested that organizational size, revenue and workforce have a significant effect on successful implementation of internet technology. This study did not consider these moderating effects because the primary aim was to identify the important benefits derived from internet diffusion in SCM. It is worth testing these moderating effects on the model proposed by this study.

Fourth, an indeed random error is the inherent constraint for empirical data (Sandars, 2007). Due to this, scales results may differ with different data. However, this study tries to minimize this error by adopting scales from prior studies. Nevertheless, scale development, purification and validation are an ongoing process that needs to be developed longitudinally and across multiple data sets.

Finally, in this study, we collected data from different industries and generalized conclusions. Practically, the requirement of internet in SCM may differ from industry-to-industry. For instance, automobile manufacturers require relatively more tight collaboration with their business partners then educational institutions. Therefore, it is worth examining the benefits of internet diffusion in SCM for a specific industry.

Despite these limitations, our study identified many important findings for both theory and practice. The results confirmed that top management support is the most important factor that increases the diffusion rate for internet technologies in SCM. It also showed that internet technology helps to improve operational activities, but managers need to be intuitive when tackling competition and securing market position.

References

Ada, S. (2008), "Conceptualizing Competences in e-services adoption and assimilation in SMEs", *Journal of Electronic Commerce in Organizations*, Vol. 6 No. 2, pp. 78-91.

Aguila-Obra, A., Del, R. and Padilla-Melendez, A. (2006), "Organizational factors affecting Internet technology adoption", *Internet Research*, Vol. 16 No. 1, pp. 94-110.

Alam, S.S. and Ahsan, N. (2007), "ICT Adoption in Malaysian SMEs from service sector: preliminary findings", *Journal of Internet Banking and Commerce*, Vol. 12 No. 3, pp. 1-11.

Bakker, E., Zheng, J., Knight, L. and Harland, C. (2008), "Putting e-commerce adoption in a supply chain context", *International Journal of Operations & Production Management*, Vol. 28 No. 4, pp. 313-330.

Balakrishnan, A. and Geunes, J. (2004), "Collaboration and coordination in supply chain management and e-commerce", *Production and Operations Management*, Vol. 13 No. 1, pp. 1-2.

Bigne, J., Enrique, A.J. and Andreu, L. (2008), "B2B services: IT adoption in travel agency supply chain", *Journal of Service Marketing*, Vol. 22 No. 6, pp. 454-464.

Bowersox, D.J., Closs, D.J. and Cooper, B.M. (2010), *Supply Chain Logistic Management*, 3rd eds., McGraw-Hill, New York, NY.

Bughin, J. and Chui, M. (2010), "The rise of the networked enterprise: web 2.0 finds its payday McKinsey Quarterly", McKinsey Global Institutie, Seattle, 10th December.

Carlo, A., Mora, M., Azadegan, A. and Gonzalez, M.E. (2010), "Assessing the impact of web-based electronic commerce use on the organizational benefits of a firm an empirical study", *Benchmarking: An International Journal*, Vol. 17 No. 6, pp. 773-790.

Ceren, A. and Peter, M. (2011), "Improving supply chain performance through auditing: a change management perspective", *Supply Chain Management: An International Journal*, Vol. 16 No. 1, pp. 11-19.

Chad, L., Huang, Y. and Stockdale, R. (2011), "Developing a B2B web site effectiveness model for SMEs", *Internet Research*, Vol. 21 No. 3, pp. 304-325.

Chang, H.H., Wang, H.W. and Ta, W.K. (2010), "The determinants of long-term relationship on inter-organizational systems performance", *Journal of Business & Industrial Marketing*, Vol. 25 No. 2, pp. 106-118.

Chawla, S.K., Khanna, D. and Jin, C. (2010), "Are small business critical success factors same in different countries?", *SIES Journal of Management*, Vol. 7 No. 1, pp. 1-12.

Chong, A.Y., Ooi, K., Haijun, B. and Lin, B. (2014), "Can e-business adoption be influenced by knowledge management? An empirical analysis of Malaysian SMEs", *Journal of Knowledge Management*, Vol. 18 No. 1, pp. 121-136.

Chong, A.Y., Ooi, K., Lin, B. and Tang, S.Y. (2009), "Influence of interorganizational relationships on SMEs' e-business adoption", *Internet Research*, Vol. 19 No. 3, pp. 313-331.

Christopher, M. (1998), *Logistic and Supply Chain Management-Strategic For Reducing Cost and Improve Service*, Pitman Publishing, London.

David, C.C., Xin, T. and David, C.Y. (2004), "Web technology and supply chain Management", *Information Management & Computer Security*, Vol. 12 No. 4, pp. 338-349.

Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of Information technology", *MIS Quarterly*, Vol. 13 No. 3, pp. 319-339.

Deveraj, S., Krajewski, L. and Wei, J.C. (2007), "Impact of ebusiness technologies on operational performance: the role of product information integration in the supply chain", *Journal of Operations Management*, Vol. 25 No. 6, pp. 1199-1216.

Dillman, D.A. and Bowker, D.K. (2001), "The web questionnaire challenge to survey methodologists", in Reips, U.D. and Bosnjak, M. (Eds), *Dimensions of Internet Science*, Pabst Science, Lengerich, pp. 159-178.

Doolin, B. and Troshani, I. (2007), "Organizational adoption of XBRL", *Electronic Markets*, Vol. 17 No. 3, pp. 199-209.

Forrest, E. (1999), *Internal Marketing Research: Resources and Techniques*, McGraw-Hill, Sydney.

Frohlich, M.T. and Westbrook, R. (2002), "Demand chain management in manufacturing and services: web-based integration, drivers and performance", *Journal of Operations Management*, Vol. 20 No. 1, pp. 729-745.

Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (2006), *Multivariate Analysis*, 6th ed., Prentice Hall International, New Jersey.

Hart, O.A., Sunday, C.E., Joseph, E.U. and Benjamin, J.I. (2011), "Upper echelon theory (UET): a major determinant of information technology (IT) adoption by SMEs in Nigeria", *Journal of Systems and Information Technology*, Vol. 13 No. 2, pp. 144-162.

Hemlata, G., Hema, D. and Raoot, A.D. (2014), "Review on IT adoption: insights from recent technologies", *Journal of Enterprise Information Management*, Vol. 27 No. 4, pp. 488-502.

Hock, R. (2001), "Revisiting web search engines features and commands", *Questia*, Vol. 25 No. 5, pp. 18-24.

Ifinedo, P. (2011), "Internet/e-business technologies acceptance in Canada's SMEs: an exploratory investigation", *Internet Research*, Vol. 21 No. 3, pp. 255-281.

Jackson, S.E., May, K.E. and Whitney, K. (1995), "Under the dynamics of diversity in decision-making teams", in Guzzo, R.A. and Salas, E. (Eds), *Team Effectiveness and Decision Making in Organizations*, Jossey-Bass, San Francisco, pp. 204-261.

Jeyaraj, A., Rottman, J.W. and Lacity, M.C. (2006), "A review of the predictors, linkages, and biases in IT innovation adoption research", *Journal of Information Technology*, Vol. 21 No. 1, pp. 1-23.

Kim, S. and Lee, H. (2005), "Employee knowledge sharing capabilities in public and private organizations: does organizational context matter?", *Proceedings of the 38th Hawaii International Conference on System Sciences*, *Hawaii*.

Kline, R.B. (2005), *Principles and Practice of Structural Equation Modeling*, 2nd ed., The Guilford Press, New York, NY.

Laurence, F., Zamzulaila, Z. and Peter, E. (2014), "The role of budget speech: a Malaysian Government study", *International Journal of Public Sector Management*, Vol. 27 No. 7, pp. 564-580.

Li, L. (2010), "Antecedents and effect of internet implementation for trade shows", *Journal of Business & Industrial Marketing*, Vol. 25 No. 4, pp. 272-283.

Lin, R.J. (2013), "Using fuzzy DEMATEL to evaluate the green supply chain management practices", *Journal of Cleaner Production*, Vol. 40, pp. 32-39.

Lin, C. (2008), "Determinants of the adoption of technological innovation by logistics service providers in China", *International Journal of Technology Management and Sustainable Development*, Vol. 7 No. 1, pp. 19-38.

Liu, J., Zhang, S. and Hu, J. (2005), "A case study of an inter-enterprise workflow-supported supply chain management system", *Information & Management*, Vol. 42 No. 3, pp. 441-454.

Mahmood, M.A., Gemoets, L., Hall, L.L., López, F.J. and Mariadas, R. (2008), "Measuring e-Commerce technology enabled business value: an exploratory research", *International Journal of E-Business Research*, Vol. 4 No. 2, pp. 48-68.

Malhotra, N.K. (1999), *Marketing Research: An Applied Orientation*, 3rd ed., Prentice Hall, NJ.

Mentzer, J., Dewitt, W., Keebler, J., Min, S., Nix, N., Smith, C. and Zacharia, Z. (2001), "Defining supply chain management", *Journal of Business Logistic*, Vol. 22 No. 2, pp. 1-25.

Mohamed, K. and Shen, K.N. (2008), "Explaining the adoption of transactional B2C mobile commerce", *Journal of Enterprise Information Management*, Vol. 21 No. 2, pp. 110-124.

Mosbeh, R. and Soliman, S.K. (2008), "An exploratory of factors affecting users adoption of corporate intranet", *Management Research News*, Vol. 31 No. 5, pp. 375-385.

Neuman, W.L. (2000), *Social Research Methods: Qualitative & Quantitative Approaches*, 4th ed., Allyn & Bacon, Boston.

Nitithamyong, P. and Skibniewski, J.M. (2011), "Success factors for the implementation of web-based construction project management systems a cross-case analysis", *Construction Innovation*, Vol. 11 No. 1, pp. 14-42.

Power, D., Hanna, V., Singh, P.J. and Samson, D. (2010), "Electronic markets, data access and collaboration: relative value to performance in firm operations", *Supply Chain Management: An International Journal*, Vol. 15 No. 3, pp. 238-251.

Psomas, E.L., Fotopoulos, C.V. and Kafetzopoulos, D.P. (2010), "Critical factors for effective implementation of ISO 9001 in SME service companies", *Managing Service Quality*, Vol. 20 No. 5, pp. 440-457.

Rajendran, R. and Vivekanandan, K. (2008), "Exploring relationship between information systems strategic orientation and small business performance", *International Journal of E-Business Research*, Vol. 4 No. 2, pp.14-28.

Ramayah, T., Sang, T.Y., Omar, R. and Dahlan, N.M. (2008), "Impact of information technology (IT) tools, partner relationship and supply chain performance", *Asian Academy of Management Journal*, Vol. 13 No. 2, pp. 33-55.

Ranganathan, C., Dhaliwal, J.S. and Teo, T.S.H. (2004), "Assimilation and diffusion of web technologies in supply chain management: an examination of key drivers and performance impacts", *International Journal of Electronic Commerce*, Vol. 9 No. 1, pp. 127-161.

Riccardo, S., Romano, D. and Harindranath, G. (2013), "IT readiness in small firms", *Journal of Small Business and Enterprise Development*, Vol. 20 No. 4, pp. 807-823.

Rogers, E.M. (1995), *Diffusion of Innovations*, 4th ed., The Free Press, New York, NY.

Roscoe, J.T. (1975), *Fundamental Research Statistics for the Behavioral Science*, 2nd ed., Rinehart and Winston, New York, NY.

Salant, P. and Dillman, D.A. (1994), *How to Conduct Your Own Survey*, John Willey & Sons, New York, NY.

Sandars, N.R. (2007), "The benefits of using e-business technology: the supplier perspective", *Journal of Business Logistics*, Vol. 28 No. 2, pp. 177-207.

Sekaran, U. and Bougie, R. (2013), *Research Methods for Business A Skill Building Approach*, 6th ed., John Wiley & Sons, New York, NY.

Setia, P., Setia, M., Krishnan, R. and Sambamurthy, V. (2011), "The effects of the assimilation and use of IT applications on financial performance in healthcare organizations", *Journal of the Association for Information Systems*, Vol. 12 No. 1, pp. 1-36.

Seyal, H.A., Mohd, N.A.R. and Hj Awg, Y.H.A.M. (2007), "A quantitative analysis of factors contributing electronic data interchange adoption among Bruneian SMEs a pilot study", *Business Process Management Journal*, Vol. 13 No. 5, pp. 728-746.

So, S. and Sun, H. (2010), "Supplier integration strategy for lean manufacturing adoption in electronic-enabled supply chains", *Supply Chain Management: An International Journal*, Vol. 15 No. 6, pp. 474-487.

Subramani, R.M. (2003), "How do suppliers benefit from information technology use in supply chain relationships?", *MIS Quarterly*, Vol. 28 No. 1, pp. 45-73.

Tan, C. (2006), "Towards progress", Computerworld Malaysia, July.

Tarofder, A.K., Marthandan, G., Mohan, A.V. and Taofder, P. (2013), "Web technology in supply chain: an empirical investigation", *Business Process Management Journal*, Vol. 19 No. 3, pp. 431-458.

Teoh, W.M., Chong, S.C., Lin, B. and Chua, J.W. (2013), "Factors affecting consumers' perception of electronic payment: an empirical analysis", *Internet Research*, Vol. 23 No. 4, pp. 465-485.

Theodosiou, M. and Katsikea, E. (2012), "Antecedents and performance of electronic business adoption in the hotel industry", *European Journal of Marketing*, Vol. 46 Nos 1/2, pp. 258-283.

To, M.L. and Ngai, H.W.T. (2006), "Predicting the organisational adoption of B2C e-commerce: an empirical study", *Industrial management & Data Systems*, Vol. 106 No. 8, pp. 1133-1147.

Troshani, I. and Lymer, A. (2010), "Translation in XBRL standardization", *Information Technology & People*, Vol. 23 No. 2, pp.136-164.

Vakharia, A.J. (2002), "e-Business and supply chain management", *Decision Sciences*, Vol. 33 No. 4, pp. 495-504.

Victoria, B., Laura, L. and Yolanda, P. (2012), "Antecedents and consequences of e-business adoption for European retailers", *Internet Research*, Vol. 22 No. 5, pp. 532-550.

White, A., Mark, J. and Hugh, W. (2008), "RFID in the supply chain: lessons from European early adopters", *International Journal of Physical Distribution & Logistics Management*, Vol. 38 No. 2, pp. 88-107.

Wu, C.H., Kao, S. and Lin, H. (2013), "Acceptance of enterprise blog for service industry", *Internet Research*, Vol. 23 No. 3, pp. 260-297.

Yean, P.L., Suhaiza, Z. and Keng, L.S. (2006), "Understanding factors for benchmarking adoption new evidence from Malaysia", *Benchmarking: An International Journal*, Vol. 13 No. 5, pp. 548-565.

Zhu, K. and Kraemer, K. (2005), "Post-adoption variations in usage and value of e-business by organizations: cross-country evidence from the retail industry", *Information Systems Research*, Vol. 16 No. 1, pp. 61-84.

Zikmund, W.G. (2000), *Business Research Methods*, The Dryden Press, Harcourt College Publishers, Orlando, Philadelphia.

Further reading

Chwelos, P., Benbasat, I. and Dexter, A.S. (2001), "Empirical test on EDI adoption model", *Information Systems Research*, Vol. 12 No. 1, pp. 304-321.

Devaraj, S., Krajewski, L. and Wei, J.C. (2007), "Impact of eBusiness technologies on operational performance: the role of production information integration in the supply chain", *Journal of Operations Management*, Vol. 25, pp. 1199-1216.

Iyer, N.S.K. (2011), "Demand chain collaboration and operational performance: role of IT analytic capability and environmental uncertainty", *Journal of Business and Industrial Marketing*, Vol. 26 No. 2, pp. 81-91.

Jackson, L., Martin, A. and Sloane, A. (2007), "A model for analyzing the success of adopting new technologies focusing on electronic commerce", *Business Process Management Journal*, Vol. 13 No. 1, pp. 121-138.

Rogers, E.M. (1983), *Diffusion of Innovations*, Free Press, New York, NY.

Wiengarten, F., Fynes, B., Humphreys, P., Roberto, E.E. and McKittrick, A. (2011), "Assessing the value creation process of e-business along the supply chain", *Supply Chain An International Journal*, Vol. 16 No. 4, pp. 207-219.

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