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Full Length Research Paper

Information sharing, information quality and usage of information technology (IT) tools in Malaysian organizations

Roaimah Omar[1], Ramayah T.[2]*, May-Chuin Lo[3], Tan Yen Sang[4] and Rusinah Siron[5]

[1]Faculty of Business Management, Universiti Teknologi MARA (UiTM) Kampus Bandaraya Melaka (KBM), Melaka, Malaysia.
[2]Technology Management Lab, School of Management, Universiti Sains Malaysia, Penang, Malaysia.
[3]Faculty of Economics and Business, Universiti Malaysia Sarawak 94300 Kota Samarahan.
[4]School of Management, Universiti Sains Malaysia, Penang, Malaysia.
[5]Department of Accounting and Finance, Universiti Tenaga Nasional, UNITEN Sultan Haji Ahmad Shah Campus: 26700 Bandar Muadzam Shah, Pahang, Malaysia.

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This study examines the level of information sharing, information quality and usage of information technology (IT) tools among manufacturing companies located in the Northern region of Malaysia. A total of 250 questionnaires directed to the operations and procurement/purchasing managers were distributed through electronic mail. The results indicate that manufacturing firms recognized the impeortance of information sharing, information quality and IT tools usage in the context of supply chain management. The usage of IT tools is between moderate to high. Overall, the results provide insights into the types of information shared between manufacturers and suppliers, the aspects of information quality emphasized as well as the IT tools utilized by the manufacturing firms.

Key words: Information sharing, information quality, information technology, Malaysian organizations.

INTRODUCTION

Uncertainties in the global business environment have transformed the landscape of business competition from being predominantly firm-based to supply chain competition. Consequently, many firms have realized the imperativeness and benefits of collaborating with supply chain partner as opposed to adversarial or arms length relationship as a way to improve supply chain management. Closer relationship would result in information sharing among the supply chain partners and "seamless" functioning of supply chain (Mason-Jones and Towill, 1997) Effective supply chain management enables firms to coordinate and integrate the various flow (physical, financial and information) in the supply chain (Lee, 2000). Information flow facilitates the coordination and synchronization of supply chain processes which relates to the planning, sourcing, manufacturing and delivery or return of goods along the chain (Lee, 2000). Information sharing among supply chain influences the supply chain members' behavior and decision making as well as the performance in supply chain. Availability of information at the right time and place is essential to ensure the seamless flow of supply chain activities and processes (Childerhouse et al., 2003). Quality of information would assist firms to improve information exchange among supply chain partners (Moberg et al., 2002). Conversely poor information quality can distort the information flow in supply chain. Synchronization of demand and supply in supply chain can be affected without timely and reliable information and the support of IT system. The application of information technology (IT) facilitates information sharing by enabling firms to access or exchange information quickly and helping firms to make effective

*Corresponding author. E-mail: ramayah@gmail.com.

decisions.

Research problem

Despite the importance of information flow in supply chain management, it appears that the level of information sharing, information quality and IT tools usage still has not reached the ideal state. Furthermore the investment in IT infrastructure can be very costly and this can be a major hindrance to some firms. In addition, strategic information which is crucial in decision making is considered a proprietary property and cannot be shared with supply chain members. Information may be withheld due to the confidentiality of the information. This affects the supply chain visibility and performance. Hence the research problem is 'what is the level of information sharing, information quality and the application of IT tools among the manufacturing organizations in the Northern region of Malaysia?'

Research objectives

This study is conducted in order to achieve the following objectives:

1. To examine the level of information sharing of the manufacturing firms with their supply chain partners.
2. To determine the level of information quality of the information shared with their supply chain partners.
3. To assess the extent of IT tools usage in the information sharing with their supply chain partners.

LITERATURE REVIEW

Information sharing

Supply chain is an interlinked set of relationships which connects customer to supplier. It involves a series of intermediate stages such as manufacturing, warehousing and distribution (Agarwal and Shankar, 2002). Supply chain management (SCM) involves the management of product, information and financial flow from the source of supplies to the manufacture and assembly of the product right to the delivering of the final product to the consumer. It also includes the management of after sales service and the product returns (Lee, 2000). The objectives of SCM are to increase productivity, reduce inventory and cycle time but its ultimate goal is to increase customer satisfaction, market share, and profits for the entire supply chain in the long run (Wisner and Tan, 2005). Information flow is an integral aspect of supply chain management (Lambert et al., 1998). The importance of information flow in supply chain is demonstrated by Singh (1996) who proposed that information must be managed at three different stages, before, during and after sales have been made.

Information sharing is essential as it provides the mechanism for coordination and integration of the processes or activities along the supply chain (Lee, 2000; Ramayah and Omar, 2010). To ensure that customer requirements in the supply chain can be fulfilled, it is fundamental to manage the information flow associated with the movement of products (goods or services) to the final customer (Singh, 1996). Effective flow of product and services is dependent on information sharing among supply chain members (Lee et al., 1997a). Firms would be able to respond effectively to changing market demand requirement through information sharing (Daugherty et al., 1995; Mason-Jones and Towill, 1997). Information sharing is not only essential in manufacturing industry but also in agricultural sectors such as the wine industry. It was found that improvement in information sharing in the wine industry is critical to promote trust among its supply chain members and to ensure the effectiveness of its marketing strategies (Forbes et al., 2010).

Information sharing among supply chain partners also enables firms to achieve common goals (e.g. Bowersox, et al., 2003; Bowersox et al., 2000; Gustin et al., 1995) besides enabling the coordination of the supply chain processes (Lee, 2000; Barratt, 2004; Lambert 2004). The level of information sharing across the supply chain can be influenced by the supply network configuration and goal congruence of the supply chain partners (Samaddar et al., 2006). Information sharing is particularly important within the internal supply chain. If firms cannot share information internally, it would be difficult to share information externally with their partners (Rupple, 2004). Information can have dual functions; it benefits the supply chain entities and it can contribute to the improvement in organizational performance and competitive advantage (Li et al., 2006). To optimize supply chain performance, information about forecast, sales, promotional activities must be shared not only among the internal functions but also across the supply chain (Bowersox et al., 2000). The quality and quantity of information are important attributes which need to be stressed in information sharing. Monczka et al. (1998) defines information sharing as the level of information that is being communicated to the supply chain members or partners which is critical and proprietary in nature.

Information sharing also relates to activities of distributing useful information among people, systems or organizational unit in an open environment. Information sharing should address the following issues; 'what to share', 'whom to share', 'how to share', and 'when to share' of which if properly addressed would minimize sharing cost, information deficiency or overload and improve supply chain responsiveness (Sun and Yen, 2005). The ability of firms to gain competitive advantage and to ensure product availability in supply chain is being

determined by how information is used in the supply chain (Mason-Jones and Towill, 1997; Ramayah and Omar, 2010)

Information has little value if it is not shared among the supply chain partners. Trust among the supply chain partners seems to have influence on the information flow in supply chain. However, due to lack of trust, certain information may be withheld from supply chain partners. Relationship among supply chain members, which is based on trust and commitment, would facilitate information sharing among supply chain partners (Moberg et al., 2002). In support of this, Kwon and Suh (2004) noted that information sharing reduces the level of behavioral uncertainty, which lead to improvement in the level of trust.

High level of information sharing and information quality is influenced by successful partner relationship (Monczka et al., 1998; Mason-Jones and Towill, 1997). However, the confidentiality of the information or privacy may influence the level of information sharing in the supply chain (Li et al., 2006). Consequently supply chain partners need to decide on the types of information that need to be shared. Supply chain partners should be aware of the information which is deemed relevant that must be shared with the supply chain partners for the successful functioning of the supply chain.

Types of information shared in supply chain

There is a wide range of information that could be shared within the firm and across the supply chain. Depending on the need of the organization, information related to market, product, design, process, production, pricing, planning, inventory, logistic, demand forecasting, order, promotion strategies, customer demand, production schedule, distribution operation, technological knowhow, manufacturing methods and sales forecast can be shared with the supply chain partners (e.g. Yu et al., 2001; Zhang et al., 2006; Ramayah and Omar, 2010). In addition, sales forecast should be shared with the upstream supply chain. Sharing of information among supply chain partners can lead to synchronization of supply and demand in the supply chain. Effective planning and decision making in the supply chain can be attained (Singh, 1996). Furthermore, demand or order variability including unnecessary storage of inventory in between downstream and upstream supply chain can be minimized (Lee et al., 1997a; 1997b). Besides sharing business strategies and operations management among supply chain partners would lead to improvement in supply chain visibility and supply chain performance (Eisman, 2008).

In view of different level of decision making in supply chain, information sharing can be strategic, tactical and operational. Facility allocation decision is classified as a strategic supply chain decision. Production/distribution planning, capacity allocation, inventory allocation, outsourcing and safety stock decision as tactical supply chain decision. On the other hand, order replenishment and shipment decision are categorized as operational supply chain decision making (Huang et al., 2003). Besides, Huang et al. (2003) also suggested that there are six categories of production information that may be shared with supply chain partners or affects the supply chain performance. The information is identified as product information, process information, inventory information, resource information, order information and planning information. Their study is focused on the importance of sharing production information in order to reduce variability of orders and inventory level.

On the other hand, Moberg et al. (2002) contend that both strategic and operational information should be shared between firms and their supply chain members. Strategic information exchange encompasses long term issues related to firm business strategies such as marketing, and logistics strategies. It can also include joint planning and goal setting between manufacturers and its strategic suppliers to enable the companies to coordinate activities in supply chain. Strategic information must be communicated promptly and accurately since it represents changes that not only affect the company but also the strategies of its supply chain partners (Moberg et al., 2002). Further, organizations that share demand information can achieve cost saving and reduced inventory level of the manufacturer (Daugherty et al., 1995; Lee et al., 2000). This would lead to improvement in supply chain efficiency since the uncertainties in demand are reduced (Lee et al., 2000). Reduction in inventory cost is related to the ability of the manufacturing firms to respond effectively to the information that it received or obtained which can contribute to reduce inventory cost. Incentives in terms of assuring supplies to retailers can be provided to retailers in order to motivate them to provide the required demand information to the manufacturer (Lee et al., 2000). Other studies have indicated that exchange of forecast information has a positive impact on supply chain performance (Forslund and Jonsson, 2007; McCarthy and Golicic, 2002; Thonemann, 2002; Gustin et al., 1995). Table 1 indicates the types of information sharing that have been emphasized in previous studies.

Information sharing among supply chain partners can also have an impact on supply chain integration (Lee, 2000; Barut et al., 2002). Information sharing may have a different reaction or effect on the different levels of supply chain. Organization in the upstream supply chain depends on the information provided by the downstream members of the supply chain or vice versa. However this depends on the extent and the intensity of information sharing among the partners. Information sharing among supply chain can be measured in terms of information intensity and the extent of information shared in both directions involving upstream and downstream of the

Table 1. Types of information sharing in supply chain.

Authors	Types of information
Daugherty et al. (1995)	Demand Information
Singh (1996)	Sales forecast
Mason-Jones and Towill (1997)	Market sales
Lee et al. (2000)	Demand Information
Yu et al. (2001)	Customer demand information
Thonemann, (2002).	Advance demand information
Barut et al. (2002)	Demand, capacity, inventory and scheduling
Moberg et al. (2002)	Operational information (sales activities, order and inventory level) Strategic information (marketing, logistics and other business strategies)
Huang et al. (2003)	Production information (product, process, resource, inventory, order and planning)
Disney and Towill (2003)	Inventory and demand information
Raghunathan (2003)	Demand information
Zhang et al. (2006)	Shipment quantity information (aka advanced shipping notice)
Eisman (2008)	Business strategies and operations information
Ramayah and Omar (2010)	Operational and strategic information

supply chain. Information intensity relates to types of information used that is demand, inventory, capacity and production schedule that the firms are willing to share with both supplier and customers (Barut et al., 2002). Information sharing would only be of value to supply chain partners if it is reliable in making better decision and improve performance. Availability of the different types of information at the right time and how the information is communicated or accessed could enable managers to react to the situation and make decisions quickly enabling them to be responsive to market demand. Besides information sharing, information quality is also important in supply chain management (Li and Lin, 2006). The next section will look at the importance of information quality.

Information quality

The importance of information quality in SCM has been discussed in many studies (e.g. Rabren, 2010; Ramayah and Omar, 2010; Li et al 2006; Miller 2005; Raghunathan, 1999; Monczka et al., 1998; Gustin et al., 1995;). Exchanging quality information between customers and suppliers and enhancing supply chain performance (Mason-Jones, 1997, Monzcka et al., 1998; Holmberg, 2000; Forslund and Jonsson, 2007) is a vital component for organizational success (Miller 2005; Li et al., 2006). In order to improve performance, managers need quality information to make operational, tactical or strategic decision. Effective information sharing depends on what, how, and with whom the information is shared as each piece of information serves a different purpose in the supply chain (Holmberg, 2000). Access to the right information would enable firms to reduce uncertainty and improve planning which in turn improves their profitability. Firms that have the access to the right information would be more proactive in responding to changes in market conditions thereby becoming more focused in meeting customer needs (Daugherty et al., 1995). Information capabilities in terms of accuracy, reliability, and accessibility are pertinent in integrating logistics activities in the supply chain (Gustin et al., 1995). Information accuracy must also be emphasized since it has an impact on the quality of decision making. Information must have its value to the receiver to facilitate managers in making effective decision making (Raghunathan, 1999; Rabren, 2010).

Monczka et al. (1998) stressed that information quality should encompassed the elements of accuracy, timelyness, adequacy and credibility of information exchanged. Similar attributes were used in the studies of Li and Lin (2006), Li et al. (2006), Forslund and Jonsson (2007) to measure information quality. Moberg et al. (2002) measured information quality in terms of timeliness, accuracy, completeness, adequacy and credibility. However, Miller (2005) measured information quality based on accuracy, believability, objectivity, precision and reliability of the information, relevancy, timeliness, completeness and information appropriateness, comprehensibility, interpretability, consistency, conciseness, format and appearance of the information, accessibility , security and availability. These attributes are suitable for service product and to supplement physical products. Inadequate information exchange and poor quality of information seems to have an impact on the effectiveness and efficiency of the supply chain performance.

Timely information sharing provides early signal for

corrective action to be taken besides preventing disruption in the upstream supply chain (Li et al., 2006). Timeliness and accuracy in measuring information quality is essential since information delay can influence the upstream sales forecast. Unreliable and inaccurate customer orders can cause the demand to be amplified across the upstream supply chain (Lee et al., 1997a, 1997b). Production scheduling and inventory planning could be affected along the supply chain unless the information received by upstream members tally with the actual orders from the downstream members in the supply chain. Distortion of information along the supply chain can also affect the efficiency in the daily operations (Holmberg, 2000). Information tends to lose its usefulness due to delay and inaccuracy in communicating the information. Besides, the timeliness of information shared, forecast accuracy or invoicing accuracy is equally important. This would ensure that appropriate activities or processes can be done accordingly (Mason-Jones and Towill, 1997). Sales forecast or any changes in the forecast must be shared immediately with the upstream supply chain (Singh, 1996; Forslund and Jonsson (2007). Lack of timely forecast can have an impact on capacity planning processes. With reliable forecast information, firms would be able to plan for production activities more effectively. However, having access to customer forecast is not sufficient unless the quality of the forecast information can be used in the planning process. Besides information reliability, timely forecast information is required to enable the supplier to fulfill customer expectations as lack of timely forecast can have an impact on capacity planning processes. Nevertheless, having access to customer forecast is not sufficient unless the quality of the forecast information can be used in the planning process (Forslund and Jonsson, 2007). It is also essential to determine with whom, how much, what and how information should be shared among the different entities in the supply chain (Huang et al., 2003). Timely information sharing of supply information by the downstream supply chain can prevent disruption in the upstream supply chain, besides providing early signal for corrective action to be taken (Li et al., 2006).

Reliability and accurate customer orders are essential as distorted information can cause disorders or demand information to be amplified as it moves upstream or also known as bullwhip effect (Lee at al., 1997a; 1997b). Production scheduling and inventory planning will be affected along the supply chain if information received by upstream members of the supply chain did not tally with the actual orders from the downstream members of the supply chain. Distortion of information might occur as it moves from downstream to the upstream supply chain and can lead to inefficiency in daily operations (Holmberg, 2000). Increased in costs are attributed to correcting errors that have been incurred due to poor data quality. Information flow should be synchronized with the movement of goods. Information associated with the movement goods should be accurate, visible and timely. Inaccurate or mismanaged information would result in customer dissatisfaction (Singh, 1996). Furthermore, customer dissatisfaction, increased cost and low employee morale, ineffective decision making and inability to implement strategy are related to poor data quality (Redman, 1998).

Sales information should be transmitted to the upstream supply chain members in a timely manner in order for appropriate activities or processes to be done accordingly. The reason for this is that information tends to lose its usefulness due to delay in communicating the information and inaccurate information. Firms that provide quality information tend to have higher market share (Miller, 2005). In addition, information capabilities in terms of accuracy, reliable and accessibility seem to play significant role in integrating logistics activities in the supply chain (Gustin, 1995). Table 2 highlights the elements of information quality emphasized in the literature. It was found that supplier uncertainty and inter-organizational relationships are important factors in determining information quality and in discriminating between organizations with high and low level of information quality (Moberf et al., 2002). Firms should build good relationship with their supply chain partners as well as choosing the right suppliers to ensure quality of information. Supplier uncertainty, trust in supply chain partners and shared vision amongst supply chain partners are fundamental in influencing information quality (Li and Lin, 2006).

Customer dissatisfaction, increased cost and low employee morale, ineffective decision making and inability to implement effective strategy are related to poor data quality. In addition, increase in costs is attributed to correcting errors that have been incurred due to poor data quality (Redman, 1998). Inaccurate and mismanaged information may affect the movement of physical goods along the supply chain. This might lead to customer dissatisfaction since it affects the firm's ability to response effectively in meeting customer demand (Singh, 1996). Poor information quality affects the performance characteristics of efficient and responsive supply chains (Rossin, 2007). Besides it can lower the quality of customer service and increase the total cost for responsive supply chain. It also results in mismatched inventory level between upstream and downstream inventory requirement.

On the other hand, firms that provide information quality tend to have higher market share (Miller, 2005). In addition, firm competitive advantage and organizational performance can be improved due to higher information quality (e.g. Li et al., 2006). The transparency and efficiency of information flow in the food sector are fundamental, particularly in the food sector, since the main purpose is assuring health and consumer safety. Information quality in food supply chain relates to accessibility and communicating of fundamental

Table 2. Information Quality

Authors	Types of Information quality
Gustin et al. (1995)	Accuracy, reliability, and accessibility
Singh (1996)	Timely, accuracy and visibility
Lee et al. (1997a); Lee et al. (1997b)	Reliability and accuracy of customer orders
Mason-Jones and Towill (1997)	Timely and accuracy (Undistorted sales information)
Monczka et al. (1998)	Accuracy, timely, adequacy and credibility
Raghunathan (1999)	Accuracy
Moberg et al. (2002)	Timely, accuracy, adequacy, completeness, and credibility
Miller (2005)	Accuracy, believability, objectivity, precision and reliability, relevancy, timeliness, completeness, appropriateness, comprehensibility, interpretability, consistency, conciseness, format and appearance of the information, accessibility , security and availability
Li and Lin (2006)	Accuracy, timeliness, adequacy and credibility
Folinas et al. (2006)	Information transparency and accuracy
Forslund and Jonsson, 2007	Accuracy, timely, adequacy and credibility (Reliable forecast information)
Rabren (2010)	Speed and quality of data
Ramayah and Omar (2010)	Timeliness, accuracy, completeness, adequacy and credibility

information pertaining the product quality, source of supplies and consumer safety (Folinas et al., 2006). The ability to trace and track information in the food sector at all stages of production, storage, and distribution, shipment data, current location, product recall, and withdrawal of hazardous products is pertinent. IT tools such as EDI can overcome delay in information transmission as it facilitates and speeds up the information flow in the supply chain (Mason-Jones and Towill, 1997). The next section examines the IT tools used in communicating and transmitting information in supply chain.

Information technology

The role of information technology (IT) in the supply chain has been a topic of interest for many researchers (e.g. Wang et al., 2010., Rabren, 2010., Fawcett et al., 2009; Chen et al., 2007; Lin and Tseng, 2006; Zhang et al., 2006; Sander and Premus, 2005; Bhatt and Troutt, 2005; Disney and Towill, 2003; Raghunathan, 2003; Bhatt, 2001; Yu et al., 2001). IT could provide real time information sharing among supply chain partner. IT allows quick communication between buyers and suppliers and enables the sharing of large quantity and quality of information on tactical and strategic operations. Supply chains that utilized RFID has outperformed firms in terms of improving service level, increased inventory turnover rate and reduction in total inventory cost (Wang et al., 2010).

Extensive information system support is required to capture and communicate information within the firm and across the supply chain (Fawcett and Cooper, 2001). Willingness to share information would be more efficient with the support of IT capability. Seemingly high level of IT investment is related to the level of information sharing (Fawcett et al., 2009). Data integration and communication network flexibility can shorten product time cycle, increase design alternatives and produce higher quality products. Information regarding new products can be disseminated quickly across the supply chain (Bhatt and Troutt, 2005). Besides, using IT a supplier can also share advance shipping notice with its customers (Zhang et al., 2006). The use of IT also results in improvement in supply chain performance such as on time delivery, responsiveness, costs, and product development cycle time (Sander and Premus, 2005).

Many supply chain alliances are dependent on EDI and extranets to facilitate interactions and coordination of transaction. EDI has proven to be beneficial to businesses as it improves quality of information, operational efficiency, and customer service, reduces transaction cost and enhances firms ability to compete (Iacovou et al., 1995). It has also been found that Electronic Data Interchange (EDI) is an important tool for logistic organizations to be successful international freight forwarders. EDI enables the transfer of data in an agreed electronic format, such as invoices, bills and, purchased orders, from one company's computer to another company's computer. About 57% of their survey respondents cited the benefits of EDI implementation as "quick access to information" and 34% cited "better customer service". Large forwarders tend to use EDI compared with smaller forwarders. Small forwarding companies also indicate that they do not have the intention of using EDI in the future (Murphy and Daley, 1996). In the inventory

management area, EDI was proposed as one of the solutions to minimize bullwhip effect. EDI can enhance suppliers' delivery performance which will improve the performance of supply chain (Lee et al., 1997a).

Using EDI to support Vendor-Managed Inventory (VMI) strategy does not only eliminate bullwhip effect but also enhances the overall performance of supply chain (Yu et al., 2001). VMI is an inventory planning and fulfillment technique in which a supplier is responsible for monitoring and restocking customer inventory at the appropriate time to maintain predefined levels. The vendor is given access to current customer inventory, forecast and sales order information and initiates replenishment as required. VMI links suppliers directly to a manufacturing base and then EDI is applied to generate material "pull" signals. IT also shortens delivery lead time. Implementation of IT has enabled organization such as Campbell Soup Company to reduce its order processing time from one week to two or three days (Cochon and Fisher, 2000). By using VMI, suppliers would be able to have access to buying company's demand, which allows supplier to improve its ordering for supplies and production scheduling besides reducing inventory level in the supply chain (Wisner et al., 2005).

SRM is the management of the flow of information between suppliers and purchasing organizations and the integration of supplier information in the procurement process by the buyer. The application of SRM has positive impact on cost reduction besides improving procurement and providing real time visibility across supply chain (Wisner et al., 2005). It helps to improve communication and collaboration with supply chain partners. Besides SRM provides support solutions for assisting in planning, execution, and optimization of the supply chain. SCM software may include strategic planning, demand management, supply management, fulfillment planning/execution, warehouse management, transportation management and so on.

Frohlich (2002) looked at IT from the internet dimension. Internet technology has significantly enabled VMI, Electronic Fund Transfer (EFT), and collaborative planning, forecasting and replenishment (CPFR) (McCormack and Kasper, 2002). EFT permits the electronic transfer of money or funds across the supply chain without any paper money changing hands. Hence, this facilitates fast payment of goods and supplies between buyer and seller. Besides, smoothing the coordination of cash flow in the supply chain, IT is required in managing the movement of physical goods along the supply chain.

IT tools such as Distribution Requirement Planning (DRP) provides a linkage between warehouse operations and transportation requirement. DRP reconciles demand forecast against inventory and transportation capacity. In addition, usage of Data Warehouse (DW) provides a combination of many different databases across an entire enterprise which aids management in decision making process. The system enables the integration of data and effective management of information from various sources in a single place. Organizations that apply DW would be able to have accessibility to a wide variety of data. For example, information with regards to sales or trend reports in a particular location or region can be obtained. Data stored can be used for reporting and information analysis. Hence, DW provides fast and cost effective management information requirements.

Internet or extranet also enables integration of supply chain with lower cost, offers rich content and supports linking of supply chain partners located from long distance. Internet provides direct connectivity to anyone over a local area network (LAN) or Internet service provider (ISP) using a common set of communications protocols. On the other hand, extranet is a collaborated network that uses internet technology to deliver information from within an organization to a defined group of users outside of that organization, typically customers, suppliers or business partners via valid usernames and passwords (O'Brien and Marakas, 2006).

It has enabled inter-enterprise communication across organizations in the supply chain besides contributing to significant impact on company's performance (e.g Sander etl., 2005). The ability of the supply chain partners to retrieve, manage and track the flow of the relevant information across the chain from data warehouse has also been greatly enhanced by the rapid growth of IT (Kulp et al., 2004). Large volume of information can be transferred smoothly and inexpensively in real time, enabling supply chain members to optimize effective strategies which are critical to the success of supply chain. To react quickly to supply chain uncertainty and enhance customer satisfaction, it is essential for organizations to develop capable information systems. This will enable firms to gather and exchange information with supply chain partners (Bowersox et al., 2000). Evolution of IT has lowered the transaction cost and eased the information movement which facilitates better decision making and improved the time base performance (Lewis and Talalayevsky, 2004).

In this research, IT encompassed the diverse arrays of IT tools usage such as EDI and VMI between manufacturing organizations and its suppliers. Usage of information technology (IT) tools is defined as IT used to facilitate SCM practices. Information can be exchanged in the form of data files and direct access to databases, through shared employees, third party logistics where employees are stationed at shipper location to allow for better coordination between both locations (Bowersox et al., 2000). IT is essential to ensure that organization is able to obtain the necessary information required in order to improve supply chain performance (Lin and Tseng, 2006). Quality of information can be leveraged to design processes or products that can fulfill customer expectations. Firms should reduce reliance on forecast and share real time information to guide daily operational operations (Bowersox et al., 2000). Information integration via the electronic transactions and communications among the

organizations must be emphasized within and across the supply chains (Chen and Paulraj, 2004). Adoption of e-business enables firms to share information and improve decision making more effectively (Hsieh et al., 2006). It was revealed that organizations that implement CPFR with suppliers and customer have significant effect on supply chain performance due to increase collaboration across supply chain partners (Chen et al., 2007). Quality of information exchanged can be further enhanced if both supplier and customer fully trust each other and there is no conflict between both parties. Customers may be more willing to share the demand or planning information with their suppliers instead of suppliers making assumptions about customer demand requirements if there is trust and collaboration of supply chain partners (Bowersox et al., 2000).

Though information sharing is important in SCM, high investment in IT tools seems to be the obstacle for effective information sharing. Firms may need to incur substantial cost of adopting inter-organizational information system (IOS) in order to share information. In addition to acquisition cost, lack of trust or unwillingness to share information due to privacy of the information and insufficient or lack of information could also affect the effectiveness of information sharing (Huang et al., 2003). IT tools such as point of sale (POS) systems and EDI has enabled manufacturers to share information such as demand and inventory information with their supply chain partners. This enables firms to reduce lead time, improve logistics management and improve forecasting (Raghunathan, 2003).

IT facilitates SCM by improving integration and coordination of physical flow as wells as the various information flow in the supply chain. This includes information such as demand, capacity, inventory, and scheduling in the supply chain. IT facilitates information sharing. However, it may have little value unless firms capitalize on it to share information among supply chain partners. To enhance supply chain performance, the issue of the intensity and the extent or the depth of the information sharing ought to be emphasized (Barut et al., 2002).

EDI can facilitate the timeliness of information transmission as it speeds up the information flow in the supply chain (Mason-Jones and Towill, 1997). EDI has been noted as an important tool in information sharing (Bhatt, 2001; Lee et al., 2000). Besides, the information generated from the IT of which decision making is based upon has an influence over the information quality (Raghunathan, 1999). Alternatively, IT could improve information quality which leads to improvement in decision quality and performance (Ragunathan, 1999). Without effective IT tools, such as EDI and Internet, communication in supply chain would be delayed and accurate information would not be possible. Timely and accurate information sharing would enable firms to improve forecasting accuracy and facilitate improved decision making (Zhang et al., 2006).

Vendor–managed inventory (VMI) is a tool that permits the supplier or upstream supply chain members to have access to information pertaining to the inventory level of the manufacturer or downstream supply chain members. VMI has been found to perform better in terms of reducing bullwhip effect in supply chain compared to traditional supply chain. In a traditional supply chain, each entity such as manufacturer, supplier and retailer acts independently with regard to ordering and inventory control. In a VMI supply chain, demand and inventory information is shared between suppliers and customers. In this sense bullwhip effect tend to be higher in a traditional supply chain. VMI speeds up the decision making process and reduces delays in information flow which would result in improved supply chain performance. VMI is also capable of responding to volatile changes in demand due to price variations or as well as order variation as a result of price discounts (Disney and Towill, 2003). In addition, the use of bar code and RFID enables firms to track the product physical flow or movement at different stages in the supply chain. Besides, Internet technology, e-mail and cellular phones would allow easy access and communication of required information across the supply chain and to parties in authority (Folinas et al., 2006). IT system that is non-user friendly may affect the ability to share or access the required information. In order to reduce bullwhip effect and improve supply chain performance, manufacturer should have access to customer demand information. Customer demand information can be directly accessed via EDI.

EDI can be used to support VMI strategy to enable firm or manufacturer make inventory control decision (Yu et al., 2001). IT permits improved coordination of supply chain by optimizing information associated with the flow of physical good in the supply chain. IT enables timely information (e.g. demand information) to be communicated and accessed quickly across the supply chain. Decision making pertaining to supplier selection, price and quantity in the supply chain can be enhanced. On top of that, time based performance can also be improved. Most importantly IT permits data to be accessed simultaneously and directly from multiple locations in supply chain (Lewis and Talalayevsky, 2004). In this study, the usage of IT tool is defined as the IT used to facilitate inter-organization activities as this study focuses on the buyer/supplier relationship.

METHODOLOGY

Data for this study were collected through a survey questionnaire. A total of 250 questionnaires were distributed through electronic mail and post and directed to persons in charge of purchasing and procurement. The population of this study comprised manufacturing companies located in the northern region of Malaysia. The target respondents were purchasing directors, managers, executive, and buyers from manufacturing companies that have direct contact with suppliers. List of samples were generated from the Federation of Malaysian Manufacturers (FMM) Directory, 2005 via a random sampling method. Prior to the actual data collection, a pilot test was conducted in four organizations to get an understanding among

purchasers in order to improve the overall quality of the survey questionnaire. Based on their feedbacks, several minor changes in terms of wording of the items were made to the questionnaires to tailor them to the targeted context. This study measures the level of information sharing, information quality and usage of IT tools among manufacturing organizations in the Northern region of Malaysia. The items for information sharing, information quality and IT tools were measured based on review of literature. A total of 16 items were used to measure information sharing, 5 items for information quality and 9 items for IT tools. Respondents were requested to assess the level of information sharing and information quality based on a 5 point Likert scale; 1= strongly disagree, 2 = disagree, 3 = neutral, 4= agree, 5 = strongly agree. On the other hand, respondents were asked to evaluate the level of IT tools usage based on; 1=not at all, 2 =little, 3 =moderate, 4=High, 5 = very high.

RESULTS

A total of 64 questionnaires were returned, which reflected about 26% response rate. However, only 58 questionnaires, giving an effective response rate of 23.2%, could be used. This response rate is the norm in similar survey research conducted in Malaysia. Majority of the respondents came from Original Equipment Manufacturer (OEM), with 74% of their primary business involved in electronic and electrical industry. 43.1% of the organizations have been operating for more than 20 years. Another 34.48% operated between 10 to 15 years. 76% of the organizations were fully owned by foreigners and half of them came from Europe or America with 57% of them having employees of above 1,000. In terms of their supplier's profile, electronics component was the major component purchased by respondents' organizations with working relationship with their supplier's on average around 9 years. About 53% of their suppliers' organization is owned by foreigners with the owners' coming from Asian country, Europe, and America.

This study investigates the level of information sharing between manufacturing firms and their suppliers. As previously stated, the information sharing is measured based on 16 items as shown in Table 3. Most of the items revealed a mean score of above 3.00, and only few items indicated a mean score of below 2.00. Information about events or changes that may affect business indicated the highest mean score (3.93) while 'working closely on new product development' ranked second with the mean score of 3.88. This point out that manufacturers generally perceive the imperativeness of sharing information about new product development and any information that could have an impact on business. The results also show that sharing information in advance with regard to changing needs, information that affect planning, supply chain relationship, order status, advance shipping notice and production schedule, information on target market and inventory level are important as reflected by the mean score of above 3.00.

Manufacturing firms seems to stress on information relating to shipping notice, order status, production and inventory levels as indicated by higher mean score (above 3.00). These information is operational in nature hence needs to be exchanged on daily or weekly basis. For example information on inventory level is important as it would enable supplier to determine the material required for the production needs. On the other hand, sharing order status instead of demand information could lead to distortion in information which in turn contributes to bullwhip effect in the supply chain (Lee et al., 1997a, 1997b). Conversely, the level of information sharing pertaining pricing strategies and promotion strategies revealed a means score of below 3.00. These information are perceived as proprietary information hence, the information sharing is lower. As noted by Li and Lin (2006), trust and shared vision indicated a significant impact on information sharing and information quality. Lower level of information sharing could be attributed to the issue of confidentiality, lack of trust and shared vision among the supply chain partners (Kwon et al., 2004; Li et al., 2006). Besides lack of knowledge, failure to see the strategic value of sharing information could also be the reason for lower mean score.

Firms seem to place emphasis on the information quality as indicated by high mean score for all the items as shown in Table 4. Among the dimension of information quality, information accuracy shows a highest mean score (3.67). Credibility, adequacy and timeliness were rated equally important with a mean score of 3.56. On the other hand, information completeness was rated at 3.51. The mean scores among the responding firms are quite consistent evidenced by the low variation of standard deviation. Firms generally believed that information quality pertaining to timeliness, accuracy, completeness, credibility and adequacy is important and should not be compromised. This point out that timeliness information is of little value if the information is inaccurate, inadequate and unreliable. As noted by Lee et al. (1997a; 1997b), accurate and reliable customer orders would reduce the bullwhip effect.

Table 5 indicates the level of IT tools usage among the manufacturing firms. As indicated in Table 5, Internet shows the highest (3.83) mean score while the means score for DRP is the lowest (2.71). As such, Internet appears to be the common method utilized by firms to communicate or exchange information with their supply chain partners. Internet enables supply chain to connect with one another at lowest cost. Email, instant messaging and the World Wide Web (WWW) are common Internet applications which provides ease of communication to the users (O'Brien and Marakas, 2006). The average usage of VMI, EDI and EPT are rated as moderate to high. However, there is large variation in terms of VMI, EDI and EPT usage as indicated by high standard deviation. This shows the degree of usage for these IT tools among the manufacturers range from very high to not at all. Nevertheless high mean score for VMI, EDI and EPT indicates that these tools are perceived to be important in optimizing information sharing and information quality in

Table 3. Information sharing.

S/N	Items	Mean	Std deviation	Rank
1.	We and our suppliers share business units' proprietary information with each other	3.31	0.730	10
2.	We informed our suppliers in advance of changing needs	3.90	0.583	2
3.	We and our suppliers share information which might be useful for each other to establish business planning.	3.88	0.677	3
4.	We exchange core business processes and knowledge with our supplier	3.67	0.906	8
5.	We and our supplier are expected to keep each other informed about events or changes that may affect our business.	3.93	0.769	1
6.	Any information that might help to maintain excellent supply chain relationship will be provided to each other	3.86	0.661	5
7.	We and our supplier will share information even without specified agreement.	3.22	0.796	11
8.	Our supplier provides advanced shipping notice to us.	3.76	0.601	7
9.	We and our supplier keep each other informed about order status.	3.83	0.625	6
10	Our supplier share production schedule with us.	3.40	0.771	9
11	We and our supplier know each other inventory level quite well	3.09	0.756	14
12.	We exchange pricing strategies with our suppliers	2.95	0.711	16
13.	Our supplier knows our new target markets very well	3.28	0.812	12
14.	Distribution strategies will be shared among each other	3.24	0.885	13
15.	We and our supplier work closely on new product development	3.88	0.703	3
16.	We never afraid to let our supplier know our promotional strategies	2.98	0.827	15

Items are measured based on a 5 point Likert Scale; 1= strongly disagree, 2 = disagree, 3 = neutral, 4= agree, 5 = strongly agree.

Table 4. Information quality.

S/N	Items	Mean	Standard deviation	Rank
1.	Timeliness	3.56	0.680	2
2.	Accuracy	3.67	0.621	1
3.	Completeness	3.51	0.683	3
4.	Adequacy	3.56	0.680	2
5.	Credibility	3.56	0.598	2

Items are measured based on a 5 point Likert Scale; 1= strongly disagree, 2 = disagree, 3 = neutral, 4= agree, 5 = strongly agree.

Table 5. IT Tools usage.

No.	Items	Mean	Standard deviation	Rank
1.	EDI (Electronic Data Interchange)	3.45	1.187	3
2.	Internet	3.83	0.920	1
3.	Extranet	3.12	0.957	7
4.	EPT (Electronic Fund Transfer)	3.24	1.048	5
5.	DRP (Distribution Requirement Planning)	2.71	0.838	9
6.	SRM (Supplier Relationship Management)	3.36	0.968	4
7.	VMI (Vendor Managed Inventory)	3.48	1.128	2
8.	DW (Data Warehouse)	3.03	0.858	8
9.	SCM Software (Supply Chain Management Software)	3.24	0.979	5

Items are measured based on a 5 point Likert Scale; 1=not at all, 2 =little, 3 =moderate, 4=High, 5 = very high.

supply chain.

DISCUSSION AND CONCLUSION

Information flow is integral in supply chain management. Hence, this study has attempted to evaluate the level of information sharing, information quality and IT tools usage in the manufacturing companies in Malaysia. The first research question was to assess the extent of information being shared by the firms and their partners. All items of information sharing were higher than 3.0 except for 2 items which were below 3.00. These items relate to information about promotional strategies and new target market. The reason for this could possibly be attributed to the confidentiality or the privacy of the information and lack of trust between firms and their suppliers. In all, the level of information sharing is moderate to high as most items (14 out 16 items) have mean score of above 3.00. This shows that most manufacturing firms recognize the importance of information sharing among supply chain partners.

The second research question was to assess the quality of information being shared by the firms and their partners. The results indicate that the quality of information in terms of timeliness, accuracy, completeness, adequacy and credibility are also being emphasized by the firms. Among the dimension of information quality, information accuracy shows a highest mean score (3.67). Credibility, adequacy and timeliness were rated equally important with a mean score of 3.56. On the other hand, information completeness was rated at 3.51. This could mean that firm would invest in IT tools if this could lead to improvement in information quality. Nonetheless, it does not guarantee that manufacturing firms would be more willing to share relevant information with their suppliers. Firms generally believed that information quality is important with greater emphasis on the accuracy of the information exchange between the firms and their supply chain partners.

The third research question was to assess the extent of IT tools used in information sharing by the firms and their partners. The findings show that the application of IT tools such as the Internet, VMI and EDI are among the popular tools used by the responding firms. However, Internet seems to be the most frequently used tools in exchanging information with the suppliers. IT tools would be of no use unless it is utilized to transmit or communicate relevant information across the supply chain. For example instead of relying on customer order, information on the end customer demand must be shared in the supply chain to avoid information distortion (e.g. Lee et al., 2000; Mason-Jones and Towill, 1997). Managers can determined the appropriate IT tools to determine the support of the information exchange requirement. IT tools must be capitalized effectively to support quality information sharing with the supply chain partners. Effective utilization of IT tools can enhance visibility in supply chain of which blind spot with regard to supply chain requirement could be eliminated.

The level of IT usage is considerably strong since IT capability is essential to support the information quality and the information sharing across the supply chain. These three concepts, information sharing, information quality and IT tools are interrelated and are interdependent on one other.

This research has its limitation as it only focuses on the information sharing between manufacturing firms and their suppliers. Future research should investigate the information sharing between manufacturing firms and its customers.

REFERENCES

Agarwal A, Shankar R (2002). Modeling supply chain performance variables. Asian. Acad. Manage. J., 10(2): 47-68.

Barratt M (2004). Understanding the meaning of collaboration in the supply chain. Supply. Chain. Manage*., 9*(1): 31-42.

Barut GDM, Faisst W, Kanet JJ (2002). Measuring supply chain coupling: an information system perspective. European. J. Purchasing. Supply. Manage., 8: 161-171.

Bhatt GD (2001). Business process improvement through data interchanges (EDI) systems: an empirical study. *Supply* Chain Management: Inter. J., 6: 60-73.

Bhatt GD, Troutt MD (2005). Examining the relationship between business process improvement initiatives, information systems integration and customer focus: an empirical study. Bus. Process. Manage., 11(5): 532-558.

Bowersox DJ, Closs DJ, Stank TP (2003). How to master cross – enterprise collaboration. Supply. Chain. Manage. Rev., pp. 18-27.

Bowersox DJ, Closs DJ, Stank TP, Keller SB (2000). How supply chain competency leads to business success. Supply. Chain. Manage. Rev., pp. 70-78.

Chen IJ, Paulraj A (2004). Towards a theory of supply chain management: the constructs and measurements. J. Operations. Manage., 22: 119-150.

Chen Mu-Chen, Yang T, Chia Li H (2007). Evaluating the supply chain performance of IT-based inter-enterprise collaboration. Info. Manage., 44: 524-534.

Childerhouse P, Hermiz R, Mason-Jones R, Popp A, Towill DR (2003). Information flow in automotive supply chains – present industrial practice. Industrial. Manage. Data. Syst., 103(3): 137-149.

Daugherty PJ, Elinger AE, Rogers DS (1995). Information accessibility: customer responsiveness and enhanced performance. Inter. J. Physical. Distribution. Logistics., 25(1): 4-17.

Disney SM, Towill DR (2003). The effect of vendor managed inventory (VMI) dynamics on the bullwhip effect in supply chains. Inter. J. Prod. Econ., 85: 199-215.

Eisman A (2008). Achieving a High-Performance Supply Chain: Sharing Information with Partners. Bus. Intelligence. J., 13(2): 29-37.

Fawcett SE, Wallin C, Alfred C, Magnan G (2009). Supply chain information sharing: benchmarking a proven path. Benchmarking: Int. J., 16(2): 222-246.

Fawcett SE, Cooper MB (2001). Process integration for competitive success: benchmarking barriers and bridges. Benchmarking: Inter. J., 8(5): 396-412.

Folinas D, Manikas I, Manos B (2006). Traceability data management food chains. British. Food. J., 108(8): 622-633.

Forbes S, Cohen D, Clements M (2010). The dissemination of information amongst supply chain partners: A New Zealand wine industry perspective. Supply Chain Forum: Int. J., 11(1): 56-63.

Forslund H, Jonsson P (2007). The impact of forecast information quality on supply chain performance. Inter. J. Operations. Prod. Manage., 27(1): 90-107.

Frohlich MT (2002). “E-integration in the supply chain: Barriers and performance”, Decision. Sci., 33: 537-556.

Gustin CM, Daugherty PJ, Stank TP (1995). The effects of information availability on logistics integration. J. Bus. Logistics., 16(1): 1-21.
Holmberg S (2000). A systems perspective on supply chain measurements. Int. J. Physical. Distribution. Logistics. Manage., 30(10): 847-868.
Huang GQ, Lau JSK, Mak KL (2003). The impacts of sharing production information on supply dynamics: a review of the literature. Inter. J. Pro. Res., 41(7): 1483-1517.
Iacovou CI, Banbasat I, Dexter AS (1995). Electronic Data Interchange and small organization: Adoption and impact of technology, MIS Quarterly, 19(4): 465-485.
Kulp SC, Lee HL, Ofek E (2004). Manufacturer benefits from information integration with retail customers. Manage. Sci., 50(4): 431-444.
Kwon IG, Suh T (2004). Factors affecting the level of trust and commitment in supply chain relationships. J. Supply. Chain. Manage., pp. 4-20.
Lambert DM (2004). The eight essential supply chain management processes. Supply. Chain. Manage. Rev., pp. 18-26.
Lambert DM, Cooper MC, Pagh JD (1998). Supply Chain Management" implementation issues and research opportunities. Inter. J. Logistics. Manage., 9(2): 1-20.
Lee H (2000). Creating value through supply chain integration. Supply. Chain. Manage. Rev., pp. 30-36.
Lee HL, Padmanabhan V, Whang S (1997a). The bullwhip effect in supply chains. Sloan. Manage. Rev., 38(3): 93-102.
Lee HL, Padmanabhan V, Whang S (1997b). Information distortion in a supply chain: the bullwhip effect. Manage. Sci., 43(4): 546-558.
Lee HL, So KC, Tang CS (2000). The value of information sharing in a two-level supply chain, Manage. Sci., 46: 626-643.
Lewis I, Talalayevsky A (2004). Improving the interorganizational supply chain through optimization of information flows. J. Enterprise. Info. Manage., 17(3): 229-237.
Li S, Lin B (2006). Accessing information sharing and information quality in supply chain management. Decision. Support. Syst., 42: 1641-1656.
Li S, Ragu-Nathan B, Ragu-Nathan TS, Rao SS (2006). The impact of supply chain management practices on competitive advantage and organizational performance. Omega, Int. J. Manage. Sci., 34: 107-124.
Lin C, Tseng H (2006). Identifying the pivotal role of participation strategies and information technology application for supply chain excellence. Industrial. Manage. Data. Syst., 106(5): 739-756.
Mason-Jones R, Towill DR (1997). Information enrichment: designing the supply chain for competitive advantage. Supply. Chain. Manage., *2*(4): 137-148.
McCarthy TM, Golicic SL (2002). Implementing collaborative forecasting to improve supply chain performance. Int. J. Physical. Distribution. Logistics. Manage., 32(6): 431-454.
McCormack, Kasper (2002). The extended supply chain. A statistical study. Benchmarking: Int. J., 9(2): 133-145.
Miller H (2005). Information quality and market share in electronic commerce. J. Services. Mark., 19(2): 93-102.
Moberg CR, Cutler BD, Gross A, Speh TW (2002). Identifying antecedents of information exchange within supply chains. Int. J. Physical. Distribution. Logistics., 32(9): 755-770.
Monczka RM, Petersen KJ, Handfield RB, Ragatz GL (1998). Success factors in strategic supplier alliances: The buying company perspective. Decision. Sci., 29(3): 553-577.
Murphy PR, Daley JM (1996). International freight forwarder perspectives on electronic data interchange and information management issues. J. Bus. Logistics., 17(1): 63-84.
O'Brien JA, Marakas GM (2006). Management Information Systems. McGraw-Hill International Edition, New York, NY.
Rabren J (2010). Technology, Integration and Data Drive Supply Chain Visibility. Material Handling Management, Retrieved Business Source Complete database, 65(3): 42.
Raghunathan S (1999).Impact of information quality and decision-maker quality on decision quality: a theoretical model and simulation analysis. Decision. Support. Syst., 26: 275-286.
Raghunathan, S. (2003). Impact of demand correlation on the value of and incentives for information sharing in a supply chain. European. J. Operational Res., 146: 634-649.
Ramayah T, Omar R (2010). Information Exchange and Supply Chain Performance. Int. J. Info. Technol. Decision. Mak., 9(1): 35-52.
Redman TC (1998). The impact of poor data quality on the typical enterprise. Association for Computing Machinery, Communications of the ACM, 41(2): 79-82.
Rossin D (2007). An exploratory analysis of information quality in supply chains: efficient and responsive models. J. Global. Bus., 1(2): 151-158.
Rupple C (2004). "An information systems perspective of supply chain tool compatibility: the roles of technology fit and relationships", Bus. Process. Manage. J., 10(3): 311-324.
Samaddar S, Nargundkar S, Dalcy M (2006). Inter-organizational information sharing: the role of supply network configuration and partner goal congruence. European. J. Operational. Res., 174: 744-765.
Sander NR, Premus R (2005). "Modeling the relationship between firm IT capability, collaboration, and performance", J. Bus. Logistics., 26: 1-23.
Singh J (1996). The importance of information flow within the supply chain. Logistic. Inf. Manage., 9(4): 28-30.
Sun S, Yen J (2005). "Information supply chain: A unified framework for information-sharing", ISI. LNCS 3495, pp. 422-428.
Thonemann UW (2002). Improving supply-chain performance by sharing advance demand information. European. J. Operational. Res., 142: 81-107.
Wang S, Huang C, Wang W, Chen Y (2010). Incorporating ARIMA forecasting and service-level based replenishment in RFID-enabled supply chain. Inter. J. Prod. Res., 48(9): 2655-2677.
Wisner JD, Leong GK, Tan KC (2005). Principles of Supply Chain Management. Thomson South-Western, Mason, Ohio, U.S.
Yu Z, Yan H, Cheng TCE (2001). Benefits of information sharing with supply chain partnerships. Industrial. Manage. Data. Syst., 101(3): 1-10.
Zhang C, Tan GW, Robb DJ, Zheng X (2006). Sharing shipment quantity information in the supply chain. Omega, int. J. Manage. Sci., 34: 427-438.

Appendix A1. Respondents' personnel profile.

Variable	Frequency	Percentage
Job title		
Director/Senior manager	7	12.1
Manager/Assistant manager/Section head Senior	21	36.2
executive/Executive	27	46.6
Others (Buyer)	3	5.2

Appendix A2. Respondents' working experience statistics.

Variable	Mean	Std deviation
Working experience		
Current organization	5.86	4.16
Overall	10.16	6.54

Appendix A3. Respondents' organization profile.

Variable	Frequency	Percentage
Nature of business		
OEM	27	47.56
EMS	16	27.59
Supporting industry	15	25.86
Primary business		
Electronic/Electrical	43	74.14
Plastic and Rubber product	5	8.62
Metal products	2	3.45
Computer products	5	8.62
Others	3	5.17
Years in industry		
1 - 5 years	4	6.90
5.1 - 10 years	6	10.34
10.1 - 15 years	20	34.48
15.1 - 20 years	3	5.17
> 20 years	25	43.10
Organization's ownership		
Fully Malaysian	9	15.52
Local and foreign joint venture	5	8.62
Fully foreign owned	44	75.86
Country of origin		
Malaysian	10	17.24
Asian country	19	32.76
Europe/America	29	50
Number of employee		
100 and below	11	18.97
101 - 500	10	17.24
501 – 1000	4	6.90
Above 1000	33	56.90

Appendix A4. Respondents' supplier profile.

Variable	Frequency	Percentage
Product type supplied by supplier		
Accessories	3	5.17
Electronics component/subassembly	26	44.83
Mechanical components	5	8.62
Fixture/Stencil/Equipments	7	12.10
Packaging/Manual/Flyer/Insert	5	8.62
Software/Firmware	4	6.89
Service provider	4	6.89
Others	4	6.89
Number of employee		
100 and below	15	25.86
101 - 500	15	25.86
501 – 1000	4	6.89
Above 1000	24	41.38
Supplier's organization ownership		
Fully Malaysian	18	31.03
Local and foreign joint venture	9	15.52
Fully foreign owned	31	53.45
Supplier's country of origin		
Malaysian	23	39.65
Asian country	21	36.21
Europe/America	14	24.14

Appendix A5. Respondents' years of working relationship with supplier.

Variable	Mean	Std deviation
Working experience with supplier	9.34	6.45