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Supply Chain Intelligence in Business Organisations: A Malaysian Perspective

Nor Siah Jaharuddin[1*], Zainal Abidin Mohamed[2], and Murali Sambasivan[3]

[1]Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
[2]Universiti Sains Islam Malaysia, 71800 Nilai, Negeri Sembilan, Malaysia
[3]Taylor's University, 47500 Subang Jaya, Selangor, Malaysia

ABSTRACT

The business environment has become more competitive due to advancements in technology and globalisation. Emphasising intelligence as a means for dealing with such circumstances, this study examined the role of supply chain intelligence (SCI), which embraces the process of competitive intelligence (CI) in the operations of a supply chain management (SCM). The integration is needed to ensure that this actionable information from CI has a 360-degree view of business activities amongst supply chains. What exactly is supply chain intelligence? How does supply chain intelligence influence business competitiveness in Malaysia? How does supply chain intelligence help businesses to achieve competitive advantages? This paper examined the contribution of supply chain intelligence on business competitiveness by: a) identifying and validating the dimension of supply chain intelligence components, and b) examining the levels of supply chain intelligence usage by businesses. A focus group was employed as a preliminary study to validate the supply chain intelligence components, and subsequently, for the development of the questionnaire for the survey in the study. The results contribute to the literature by emphasising the use of systematic intelligence in supply chain integration to improve business competitiveness.

Keywords: Competitive Intelligence, Supply Chain Management, Supply Chain Intelligence, Competitive Advantage

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E-mail addresses:
norsiahj@econ.upm.edu.my (Nor Siah Jaharuddin)
laniaz@usim.edu.my (Zainal Abidin Mohamed)
sambasivan@hotmail.com (Murali Sambasivan)
* Corresponding author

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INTRODUCTION

The application of Competitive Intelligence (CI) grew in the 1990s and has prompted many countries to use it on a global scale to improve their competitive edge. A large body of evidence

has shown that intelligence assists top management's overall decisions towards business competitiveness (Calof, 1999; Wright *et al.*, 1999, 2002; Badr, 2003; Stefanikova & Masarova, 2014). Due to the continuous demand from customers for variety, lower cost, better quality and more responsiveness for goods and services, the perspective of competition among the firms has also changed and shifted to the supply chain level (Christopher, 1992; Bechtel & Jayaram, 1997; Tan, 2001; Mentzer *et al*., 2001; Agarwal *et al*., 2006; Stefanovic & Stefanovic, 2009). In this study, the scope of intelligence functions has been extended by integrating it to supply chain management (SCM), and this perspective is called supply chain intelligence (SCI). While the term "SCI" has been applied in some studies of IT technical aspects dealing with data warehousing systems to store and exchange information across value chains and supply chains (Stefanovic *et al*., 2007; Stefanovic & Stefanovic, 2009), studies addressing human potential such as skills, experience and instinct in analysing and transforming raw data into actionable intelligence in formulating strategic decisions are still lacking (Gilad & Herring, 2001; Wilkins, 2007; Stefanikova & Masarova, 2014).

In addressing the critical area of intelligence, very few studies have discussed how to operationalise the construct of the SCI components and align them with a firm's practice. Most past studies centred on the acquisition and employment of intelligence by the organisations, but not many provided details about the intelligence components that firms collected (Cartwright *et al*., 1995; Rouach & Santi, 2001; Wright *et al*., 2002; Wright & Calof, 2006). Intelligence information is often treated as exclusive property to the firms, which remains private and confidential due to its link to strategy, and it is thus considered as a taboo subject. Hence, the intelligence components of the supplier, customer and competitors are covered only at the surface level (as a separate entity), without looking at their relationship as supply chain networks. Knowing what kinds of specific SCI components are collected by firms and categorising them into specific dimensions could offer an interesting pattern because different industries might gather different information. Thus, this study focused on the SCI components employed by the manufacturing industry, since it has more extensive global supply chain networks than other industries.

Understanding and managing SCI is crucial for the future business performance as a factor influencing a firm's competitiveness and as a source for developing appropriate strategy. This is especially important in Malaysia which is progressing from an industrial economy to a K-economy country (Worldbank, 2014). Entry into this knowledge economy requires the value of human potential that is closely related with knowledge and information as the primary resource for firms and the economy in rapidly changing markets, technology and products. An effective SCI serves a critical

function, especially because about 99.2% of total business establishments in Malaysia are small and medium enterprises (SMEs), which directly benefits the country in economic growth (SME Directory, 2014). In relation to that, SCI may assist the supply chain process of businesses, as it was one of the main agenda items in the 10th Malaysian Plan (2011 – 2015) to improve and to become strategically competitive in any industry. SCI is a strategic tool for firms, especially SMEs, to remain informed about their competitive environment in order to stay ahead of competition and face myriad global challenges. SCI may provide a solid basis as a tool of competitiveness for businesses to increase performance and achieve a higher economic status for Malaysia.

Therefore, the general objectives of this study are to identify and validate the supply chain intelligence components and examine the organisational characteristics (e.g., size, ownership and manufacturing sectors) that influence SCI usage in companies. In more specific, by focusing on manufacturing firms in Malaysia, this study brings a new perspective about SCI that will enable companies to have a 360-degree view of their businesses for new opportunities to increase revenue, to cut costs and enhance customer satisfaction (Haydock, 2003; Viswanathan & Sadlovska, 2010).

LITERATURE REVIEW

Supply Chain Intelligence

Even though competitive intelligence (CI) takes a comprehensive view of the internal and external environment (Academy of Competitive Intelligence, 2014), it has a limited role to play in operational aspects of SCM. CI is centred on evaluating information of individual stakeholders and internal operations without emphasising links and interaction (the harmony of the relationship) between supply chain parties (i.e., open communication, knowledge sharing, participation, trust, mutual goals, commitment, integration, etc.). SCI is therefore considered to be a "sub-set" of CI. SCI perspectives are highly valuable in analysis, not only as isolated effects for stakeholders, but also in the harmony of the relationship between supply chain partners or networks. SCI covers both CI and SCM concepts. The volumes of data SCI analysts must utilise means they must have good CI and SCM systems. SCI is a unique systematic process that involves people's capability to transform raw data into actionable intelligence, focusing on the integration of the supply chain between supply chain partners, while creating value and proving a sustainable competitive advantage for the firm (Porter, 1980; Kahaner, 1997; Wilkins, 2007; Stefanovic *et al*., 2007, 2009).

According to Wilding and Humphries (2006) and Sambasivan *et al*. (2013), collaboration by working together in the supply chain is essential to achieve effective operations that are in harmony with the strategies and objectives of the parties involved, thus resulting in mutual benefit. Based on various definitions of CI (Calof & Wright, 2008; SCIP, 2014)

and SCM (Chopra & Meindl, 2001; Viswanathan & Sadlovska, 2010) from the previous literature, the term SCI in this study is best described as a set of systematic intelligence process about opportunities or developments that have the potential to affect individual firms and their supply chain network as a whole towards improving long-term performance.

SCI is a source of competitive advantage because it utilises both CI and SCM views. According to the resource-based perspective (RBV), the existence of the SCI function itself can be justified for its rent-generating capabilities, due to its unique disciplinary expertise and skills developed over time by SCI personnel about the environment, supply chain network and competitors, expertise and skills which are difficult for other firms to imitate or replicate (Barney, 1986, 1991; Prahalad & Hamel, 1990; Hughes, 2005). Since SCI processes involve data gathering, data analysis and data dissemination, the probability of effectively replicating these routines is highly unlikely in a short time due to extreme tacitness of these processes, especially in understanding a supply chain's multiple link activities and processes (Porter, 1995; Du Toit, 2003; Hughes, 2005). In other words, the concept of SCI is strongly related as a source of competitive advantage and tacit knowledge for the firm and provides a useful paradigm for analysing the link between SCI as a firm resource and performance.

Components of Supply Chain Intelligence

Intelligence components reflect the organisation's own strategic position and the competitive advantage it maintains in a particular marketplace. Even though academic literature in this area is increasing in quantity, none of the studies has focused primarily on intelligence components. Most of the studies discussed the subject either generally or not at all. Hence, little consistency found in past studies in term of component measurement that needs to be gathered, evaluated and included as critical intelligent constructs of the organisation's competitiveness (Wright & Calof, 2006). Many businesses were found to undertake intelligence, but it was generally quite rudimentary in nature, of limited scope and on an adhoc basis. Many past studies deployed the ideas of business gurus such as Porter's five forces (1985, 1995) to provide a useful model in which competitors can be viewed in terms of strength, competitive position and competitive strategies. A study by Fleisher (2004) suggested that organisational members could assess key trends, emerging discontinuities, the evolution of industry structure and the capabilities and behaviours of current and potential competitors to assist in or develop a competitive advantage. Calof and Wright (2008) stated that the Competitive Intelligence Foundation, commissioned in 2006, found that the respondent firms focused on various components such as company profiles, competitive benchmarking, early warning alerts, market or industry trends, customer

or supplier profiles, technology assessment, economic/political analysis and executive profiles. In sum, intelligence can help business executives make better decisions than their competitors by gathering the required components of intelligence for strategic planning.

Meanwhile, intelligence on supply chain components was examined as a separate entity without looking at the harmony of the relationship and its unique integration between supply chain partners. According to a study by Quayle (2003) on the supply chain practices among SMEs in the UK, there are 18 different components including supplier development, e-commerce, new technology, time-to-market, staff development, leadership, strategy, team working and waste reduction. All these components are deemed essential to improve the competitive position of a company. Subsequently, the study conducted by Tan *et al*. (2002) is more comprehensive because they have considered more supply chain components such as collaboration, trust, ethical practices, continuous improvement efforts and infrastructure drivers. Similarly, Hua (2002), in a survey among 143 SMEs in Malaysia, found that only 28% of them practice SCM for competitive position in their organisations.

Based on the previous studies of CI and SCM, Table 1 provides lists of SCI components. All of these components are summarised and divided into several categories. Finally, based on the characteristics of the intelligence components, eight dimensions were identified in this study.

TABLE 1
SCI

SCI DIMENSIONS	SCI COMPONENTS	CI LITERATURE	SCM LITERATURE
Uncontrollable environment (external Issue)	Global economy, market and industry structure, political, social, government policy, and substitute product.	Prescott & Gibbons (1993); Porter (1995); Johnson & Scholes (2002); APQC (2003); Fleisher (2004); Priporas *et al*. (2005); Pelsmacker *et al*. (2005); Badr *et al*. (2006); Brouard, (2006); Wright & Calof (2006); Miree *et al*. (2007); Pirttimaki (2007); Calof & Wright (2008)	
Competitive activities	Capacity expansion, mergers and acquisitions, potential strategic partnersand benchmarking.	Fleisher (2004); Pelsmacker *et al*. (2005); Badr et al. (2006); Brouard (2006); Miree *et al*. (2007); Wilkins (2007); Calof & Wright (2008)	Lamming (1993); Monczka *et al*. (1998); Chandra and Kumar (2000); Mentzer *et al*. (2001); Gunasekaran *et al*. (2001); Childerhouse&Towill (2002); Tan *et al*. (2002); Sambasivan & Jacobs (2008)

SCM activities	Agility, cost efficiency, information sharing, logistics, communication, commitment, response time and product development.	Wilkins (2007)	Monczka *et al*. (1998); Chandra and Kumar (2000); Mentzer *et al*. (2001); Gunasekaran *et al*. (2001); Tan *et al*. (2002); Childerhouse & Towill (2002); Wilkins (2007); Sambasivan & Jacobs (2008); Stefanovic & Stefanovic (2009)
Customer/ supplier activities	Bargaining power, relationship, delivery flexibility and capability, quantity delivered, product prices, procurement system, technical expertise and on-time delivery.	Porter (1995); Johnson & Scholes (2002); APQC (2003); Fleisher (2004); Pelsmacker *et al*. (2005); Brouard (2006); Wright & Calof (2006); Pirttimaki (2007); Miree *et al*. (2007); Calof & Wright (2008)	Lamming *et al*. (1996); Monczka *et al*. (1998); Tan *et al*. (1998); Narasimhan & Das (2001); Gunasekaran *et al*. (2001); Tan *et al*. (2002); Chopra & Meindl (2004); Sambasivan & Jacob (2008)
Research and Technology initiatives	Product innovation, RMD planning & investments, technology capability and expertise.	Teo & Choo (2001); Chen *et al*. (2002); Fleisher (2004); Thomas &Tryfonas (2005); Priporas *et al*. (2005); Badr *et al*. (2006); Brouard (2006); Wright & Calof (2006); Pirttimaki (2007); Calof & Wright (2008); Dishman & Calof (2008)	Stuart & McCutcheon (2000); Kuei & Madu (2001); Kuei *et al*. (2002); Min & Zhou (2002); Vickery et al. (2003); Kemppainen & Vepsalainen (2003); Stefanovic *et al*. (2007); Stefanovic & Stefanovic (2009)
Marketing planning	Product developments & enhancements, pricing strategy, market focus, cost structure, branding and positioning, product quality, customer service and complaints and substitute product.	Prescott & Gibbons (1993); Porter (1995); Johnson & Scholes (2002); APQC (2003); Fleisher (2004); Badr *et al*. (2006); Miree *et al*. (2007); Wilkins (2007)	Slater & Narver (2000); Stuart & McCutcheon (2000); Frohlich & Westbrook (2001); Kuei & Madu (2001); Min & Zhou (2002); Vickery *et al*. (2003); Kemppainen and Vepsalainen (2003); Green *et al*. (2006)
Strategic planning	Organisation and supply chain goal, competitive strategy and scope of activity.	Calof & Miller (1998); Du Toit (2003); Fleisher (2004); Hodges (2005); Badr *et al*. (2006); Miree et al. (2007); Wilkins (2007)	Chandra and Kumar (2000); Mentzer *et al*. (2001); Gunasekaran *et al*. (2001); Tan *et al*. (2002); Childerhouse & Towill (2002); Sambasivan & Jacobs (2008); Wilkins (2007)
Organisational resources	Culture, reward, structure, policy, top management, financial, employees, training, reputation, trust, communication, knowledge sharing lifelong learning, and lead time.	Prescott & Gibbons (1993); APQC (2003); Thomas &Tryfonas (2005); Priporas *et al*. (2005); Marson (2006); Miree *et al*. (2007); Calof & Wright (2008)	Monczka *et al*. (1998); Chandra and Kumar (2000); Mentzer *et al*. (2001); Slater and Narver (2000); Gunasekaran *et al*. (2001); Tan *et al*. (2002); Childerhouse & Towill (2002); Sambasivan & Jacobs (2008)

While many past studies have focused on varieties of SCM components, they are almost similar in nature, that is, to improve and satisfy their supply chain integrations between trading partners. Mentzer *et al*. (2001) proposed that the most basic SCM flow involves three parties: supplier, internal process and customer. Thus, the SCI components derived from past CI and SCM studies need to be examined across four supply chain elements: (1) selecting and maintaining suppliers, (2) making internal processes effective, (3) retaining and expanding customer base, and (4) obtaining information on competitor activities. A set of SCI components for each supply chain elements (supplier, internal process, customer and competitor) needs to be conclusively established as a guideline by the organisation in order to remain competitive, as shown in Table 2.

TABLE 2
The Supply Chain Intelligence (SCI) Components

SCI COMPONENTS	Supplier	Internal Process	Customer	Competitor
1. Uncontrollable environment				
2. Competitive activities				
3. SCM activities				
4. Supplier/buyer activities				
5. Technology initiatives				
6. Marketing activities				
7. Strategic planning				
8. Resources and capabilities				

RESEARCH METHODOLOGY

Developing the SCI components requires several critical stages. First, components are gathered, collated and consolidated from CI and SCM empirical research, and the final products are called SCI components (see Table 1). This is followed by focus group discussion with ten experts from different industrial backgrounds such as food process, electric and electronics, rubber and liquid. A draft of the compilation of the SCI components from past empirical literature and related sources were given to participants before the meeting. The discussion focused on arrangement of the components into their respective dimensions. Most components were retained, and a few suggestions such as adding new product enhancement and rebranding in sales and marketing were made to strengthen the matrix. This draft was then used for questionnaire development. From a pilot test conducted on 25 companies, minor changes were made before the actual distribution process.

Questionnaires were distributed during the survey to the target population, which included the managers or executives who are familiar with supply chain areas of the company, as the respondents of this study. The Federation of Malaysian Manufacturers (FMM) book is used as the sample framework because it is recognised in Malaysia (Haslinda *et al*., 2011; Sambasivan *et al*., 2013) and represents about 2135 leading manufacturing and industrial service companies of varying sizes. By eliminating the industrial service sector and several small companies (fewer than 50 employees), the actual population of study consisting of 1430 manufacturing companies was used as the samples. Afterwards, the questionnaire was sent to 1430 companies, from which 174 feedback responses were received and used for the analysis.

The study focused on two sectors of the manufacturing industry. The first sector is electrical and electronics because this sector represents the supply chain market in which Malaysia is one of its important hubs in Asia. The second sector consists of other relevant support sectors in manufacturing. All the research questions and objectives were answered by performing appropriate descriptive and inferential statistical analyses such as independent sample t-test and ANOVA.

FINDINGS AND DISCUSSION

A considerable effort has been given to define the unique context of SCI (see Table 1) based on empirical data. This process has led to the development of about 78 first-order measurement scales of SCI, which were then viewed and validated by industrial experts in focus group discussions and finally, pilot testing. While many of these scales are obviously and appropriately rooted in the previous literature, the development process is necessary to ensure the appropriateness of these scales in the manufacturing context. As such, the researcher was able to develop a new set of SCI across supply chain elements that has been tested to be valid and reliable.

In this study, exploratory data analyses (EDA) using principal component analysis (PCA) were performed to derive valid and reliable SCI components. A PCA test was used to derive a relatively small number of variables that could account for the variability found in a relatively large number of measures (De Winter & Dodou, 2014). The findings in Table 3 show a total of five factors (dimensions), which explain about 68% of the total variance. Thus, the original eight dimensions of the SCI components shown in Table 1 have been compressed further to five, after using the PCA.

TABLE 3
The SCI Components after Using the PCA

SCI Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
	Sales & Mktg	*R&D*	Org. Resources	Supply Chain	External
Customer service	.833				
Price strategy	.814				
Customer complaints	.793				
Product quality	.793				
Market focus	.786				
After sale service	.761				
Flexibility customer	.740				
Market strategy	.687				
Product enhancement	.664				
Supply chain goals	.648				
Product price	.646				
New prod develop	.633				
Cost structure	.614				
Quality service	.566				
Tech expertise		.789			
Compatible tech		.741			
R&D develop		.682			
Financial stability		.681			
Delivery capacity		.660			
IT Capacity		.649			
Commit. to cont. imp		.613			
Communication ability		.607			
Comp. strategy		.590			
Orgn goals		.587			
Tech. capacity		.567			
Reward			.779		
Structure			.736		
Staff policies			.735		
Culture			.700		
Training			.698		
Lifelong learning			.671		
Knowledge share			.644		
Communication			.630		
Scope of activity			.617		
Top mgmt.			.609		
Transp. costs			.606		
Internal operations			.598		
Delivery accuracy				.723	
Delivery flexibility				.699	
Supplier forecast				.659	
Shifting needs &prio.				.647	
On time delivery				.609	
Relation supp./buy.				.605	
Barg. power supp/buy				.598	
Cost structure				.576	
Cap. Expansion				.564	
Cust/suppinteg.					.719
Substitute products					.619
Market structure					.595
Agility					.590
Benchmarking					.589
Economic cond.					.571
Outsourcing					.569

All the calculations of Cronbach's alpha coefficients resulted in alpha coefficients for supply chain components that showed acceptable reliability above 0.7 (Nunnally, 1978; Slater & Narver, 1995; Hair *et al*., 2010) (see Table 4).

TABLE 4
Reliability Analysis

Variables Pilot Study (N=25)	**Cronbach's Alpha**		
	Actual Study (N=174)		
SCI Components			
Uncontrollable Environment	0.874	Original eight dimensions	
Competitive Activities	0.855		
SCM Activities	0.944		
Supplier/Buyer Activities	0.957		
Technology Initiatives	0.955		
Marketing Activities	0.979		
Strategic Planning	0.908		
Resources and Capabilities	0.966		
External Environment		0.855	Five dimensions after PCA
Supply Chain Integration		0.910	
Research & Development		0.907	
Sales & Marketing		0.946	
Organizational Resources		0.922	

Table 5 indicates the company's background that consists of company size, company ownership and the industries participating in the study. There are three groups of company sizes: small (<100 workers), medium (100 – 499 workers) and large firms (> 500 workers). The findings show that a very small percentage (16.1%) of small companies participated in the survey; most of them refused to participate due to shortage of manpower and the rare use of SCI in their organisation. On the contrary, large companies (53.4%) and medium-size companies (30.5%) showed more willingness to cooperate in the survey. There is also an equal percentage of company ownership among the companies: 50% are foreign-owned, and another 50% are locally-owned companies. There are about eleven manufacturing sectors; however, for analysis purposes, these sectors are divided into five categories. The majority of the companies (46%) are from electrical and electronics since this industry contributes the largest export amounts, and Malaysia is one of the important hubs of global supply chain manufacturing (MIDA, 2014). As for the rest, solid material industry accounts for 24.7%, followed by liquid material industry (13.2%), consumer product industry (9.8%) and other industries (6.3%).

TABLE 5
Background of Companies

Profile	Frequency (n=174)	Percentage (%)
Size of Organization		
Small (Below 100)	28	16.1
Medium (100-499)	53	30.5
Large (Above 500)	93	53.4
Company Ownership		
Foreign	87	50
Local	87	50
Manufacturing Industry		
1.Electrical & Electronics sector	81	46.0
2.Other Sectors	93	54.0
Solid Material Sector:	43	24.7
Wood Material	16	9.2
Basic Metal	14	8.0
Machine & Equipment	13	7.5
Liquid Material Sector:	23	13.2
Petrochemical & Polymer	15	8.6
Plastic Products	8	4.6
Consumer Product Sector:	17	9.8
Pharmaceuticals	7	4.0
Food Processing	8	4.6
Medical Devices	2	1.1
Others Sector	10	6.3

SCI Usage between Manufacturing Sectors

Table 6 shows almost equal numbers of electric and electronics (N= 81) and other sectors (N=93). The independent-sample t-test (refer to Table 7) shows that there is a significant difference in the scores for electric and electronics (M = 3.52, SD = 0.49) and others (M = 3.36, SD = 0.57) [manufacturing sectors; t (172) = 1.97, p = 0.05]. This finding suggests that the E&E sector has a higher SCI usage than the other sectors. One possible explanation might be attributed to the fact that most E&E industry in Malaysia is foreign-owned and therefore represents global market players. Thus, a higher usage of SCI by E&E is expected, since they are more exposed to global competition and technology advancement, especially regarding the importance of practicing SCI.

TABLE 6
Statistics tests between Manufacturing Sectors and SCI

	Industry	N	Mean	Std. Deviation	Std. Error Mean
SCI	Electric & electronic	81	3.5241	.49093	.05455
	Others	93	3.3649	.56570	.05866

TABLE 7
Results of the Independent Samples Test of the SCI Usage between Manufacturing Sectors

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SCI	Equal variances assumed	.963	.328	1.968	172	.050*	.15919	.08089	-.00048	.31885
	Equal variances not assumed			1.987	171.999	.048*	.15919	.08010	.00108	.31730

*Significance level - 0.05

SCI Usage between Size of Organisations

Tests were also conducted to compare the use of SCI in small, medium and large organisational sizes. A one-way between subjects ANOVA test in Table 8 shows a significant difference of SCI usage on organisational size at $p < .05$ level for the three categories [$F (2, 171) = 3.93$, $p = 0.021$]. Hence, post-hoc comparisons using the Tukey HSD test (Table 9) were carried out to determine the relationship of each size with all other sizes. The findings in Table 10 indicate that the mean score for the large companies ($M = 3.53$, $SD = 0.59$) is significantly different than the small companies ($M = 3.23$, $SD = 0.45$); meanwhile, the medium-sized companies ($M = 3.39$, $SD = 0.45$) do not significantly differ from either the large and small companies. Taken altogether, the result reveals that large companies are more inclined towards high SCI usage. This finding implies that SCI is the domain of larger firms even though there is a good representation in the small companies towards medium SCI usage. It might be possible to conclude that small companies are less likely to have the extra resources to invest heavily in SCI, even if they have an interest in it compared to larger organisations. This result is in line with the findings of Calof and Dishman (2002), Saayman *et al*. (2008) and Wright *et al*. (2012), who found the association between organisation size and SCI usage.

TABLE 8
Results of ANOVA of the SCI Usage between Organisational Size

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.189	2	1.094	3.929	0.021*
Within Groups	47.631	171	0.279		
Total	49.819	173			

*Significance level - 0.05

Table 9
Results of the Tukey Post Hoc Test between Organisational Sizes

					95% Confidence Interval	
(I) size	(J) size	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
small	medium	-.16234	.12330	.388	-.4539	.1292
	large	-.30472	.11377	.022*	-.5737	-.0357
medium	small	.16234	.12330	.388	-.1292	.4539
	large	-.14237	.09083	.263	-.3571	.0724
large	small	.30472	.11377	.022*	.0357	.5737
	medium	.14237	.09083	.263	-.0724	.3571

*Significance level - 0.05

TABLE 10
Results of the Descriptive Statistics between Organisational Sizes

					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Min.	Max.
small	28	3.2267	.45183	.08539	3.0515	3.4019	2.41	4.41
medium	53	3.3890	.44971	.06177	3.2651	3.5130	2.34	4.60
large	93	3.5314	.58609	.06077	3.4107	3.6521	1.68	4.84
Total	174	3.4390	.53663	.04068	3.3587	3.5193	1.68	4.84

SCI Usage between Types of Company Ownership

Ownership was examined to compare the use of SCI between foreign-owned (N=87) and locally-owned (N=87) companies (see Tables 11 and 12). An independent-samples t-test was conducted, and the results in Table 11 show that there is a significant difference in the scores for foreign-owned (M = 3.53, SD = 0.49) and locally-owned (M = 3.35, SD = 0.57) companies, with t (172) = -2.15, p = 0.033. The results indicate that foreign-owned organisations are more inclined towards high SCI usage. Many foreign–owned companies are exposed to global competitiveness, and thus, they need to be more alert for sustainability by having more systematic

processes of SCI at headquarters in their home country. In contrast, locally-owned organisations are more inclined towards medium SCI usage, and this is largely due to financial constraint. This finding is further described by Worldbank (2007, 2014), which reported that MNCs have better advantages over local firms in terms of technology and financial availability.

TABLE 11
Statistics Tests of the SCI Usage between Types of Company Ownership

	Ownership	N	Mean	Std. Deviation	Std. Error Mean
SCI	Local	87	3.3524	.56715	.06080
	Foreign	87	3.5256	.49240	.05279

TABLE 12
Results of the Independent Samples T-test of the SCI Usage between Types of Company Ownership

	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Difference Lower	Upper
SCI	Equal variances assumed	0.312	0.577	-2.151	172	.033*	-0.17322	0.08052	-0.33216	-0.01427
	Equal variances not assumed			-2.151	168.675	.033*	-0.17322	0.08052	-0.33218	-0.01425

*Significance level - 0.05

Level of Usage of the SCI Components

In ranking the importance among five SCI dimensions, Table 13 shows the descriptive findings.

TABLE 13
Mean and Standard Deviation Statistics

Variables	**Mean**	**Std. Deviation**
Supply Chain Intelligence Components		
Sales & Marketing	3.583	0.643
Supply Chain Integration	3.540	0.658
Research & Development	3.382	0.693
External Environment	3.369	0.543
Organizational Resources	3.321	0.620
Supply Chain Elements		
SCI Internal Process	3.506	0.578
SCI Customer	3.500	0.568
SCI Supplier	3.430	0.598
SCI Competitor	3.184	0.685

In ranking the importance among five SCI components, the results in Table 13 show that sales and marketing intelligence has the highest mean score (M=3.583, SD=0.643), supply chain integration intelligence is second (M=3.540, SD=0.658), research and development intelligence is third (M=3.382, SD=0.693), external environment intelligence is fourth (M=3.369, SD=0.543), and the lowest mean score is organisational resources intelligence (M=3.321, SD=0.620). Sales and marketing intelligence such as pricing strategy, quality service, cost structure, marketing strategy, customer service and market structure is perceived as important information to retain and generate customers. This finding is consistent with the empirical studies that show that business and supply chain networks have emphasised customer satisfaction as their main strategy to maximise profits, in which SCI of sales and marketing is the main resource to fulfil a customer's needs (Horvath, 2001; Vickery *et al*., 2003; Singh & Power, 2009). In general, the high mean score of sales and marketing is expected because intelligence is originally rooted in the sales or marketing department (Pelsmacker *et al*., 2005; Qiu, 2008). Meanwhile, SCI of supply chain integration such as relationships with supply chain partners, delivery flexibility, on-time delivery, cost structure, supplier forecast, bargaining power and shifting needs and priorities, has the second highest mean score. This intelligence is given considerable attention because most manufacturing companies in Malaysia are part of the global supply chain companies which leads to more emphasis on improving their supply chain effectiveness (Sambasivan & Jacobs, 2008). In other words, supply chain networks create cross-organisational linkages to integrate human, financial or technical resources in order to have better business model (Bowersox *et al*., 2003). Research and development intelligence such as patent development, technology capability, compatible technologies with supply chain partners, technology expertise and IT capacity are also found to be important for organisational growth and supply chain activities. A few past studies have found that a large number of companies gave more attention to innovation as one of their core capabilities for competitiveness (Tanev & Bailetti, 2008; Nemutanzhela & Iyamu, 2011). External environment intelligence (i.e., global economic condition, changing market structure, substitute product, capacity expansion of competitors and benchmarking) has also influenced organisations in strategizing against their competitors (Wilkins, 2007). Finally, organisational resources intelligence such as culture, reward system, structure, staffing, top management, internal operations, learning and knowledge sharing and training is also important to assess a firm's and its main competitors' internal strengths in terms of operations (Simkin & Cheng, 1997; Calof & Wright, 2008; Tanev & Bailetti, 2008).

The level of SCI usage among supply chain elements (i.e., supplier, internal process, customer and competitor) was

also examined. The result of supply chain elements indicates the mean score of internal process (M=3.506, SD=0.578), customer (M=3.500, SD=0.568), supplier (M=3.430, SD=0.598) and competitor (M=3.184, SD=0.685). This finding provides a valid evidence that the supply chain element of the internal process is perceived to be the most important and frequently-used by organisations. The results appear to be in line with those of Tanev and Bailetti (2008), who found that the use of supply chain elements was highest on internal information and customer, while competitor and industry information were the lowest. Consistently, a study by Kaplan and Norton (2004) also found that internal processes were the most critical in creating value for customers, shareholders and other stakeholders because the organisation can easily access the full details of its own operation. This is further supported through recent studies by global audit firms, KPMG (2011) and Supply Chain Foresights (2013), which revealed that internal process improvement efforts were highly demanded.

CONCLUSION AND RECOMMENDATIONS

In this study, SCI was found to be the domain of large-sized and foreign-owned organisations such as multinational corporations (MNCs). Even though larger firms have an edge in terms of greater financial advantage and are able to conduct more formal SCI analysis, small firms can still focus on SCI by using informal intelligence networks (McGonagle & Vella, 2004; Wright & Calof, 2006). In other words, for most businesses, SCI is one of the important tools to understand and predict the future market and to ensure business survival and competitiveness in a rapidly growing market. According to Stefanikova and Masarova (2014), acquiring and embracing knowledge of SCI will help firms achieve higher performance and ultimately contribute to Malaysia's economic growth.

Even though SCI is an established practice in large-scale companies in developed countries, the concepts and practices of strategic intelligence among businesses in Malaysia are still very new. Awareness programmes to recognise SCI as a strategic management tool to achieve competitive advantages need to be expanded by the government. The manufacturing companies were also found to be a bit passive in building SCI, due to limited accessible information from the government and limited financial resources. Apart from limited intelligence expertise, the costs to acquire and obtain global SCI information are staggering and become a hindrance, especially after considering the foreign exchange rate. Even though most manufacturing firms in Malaysia are multinational corporations (MNCs), the headquarters that handle the SCI functions or research and development (R&D) are located in their respective home countries (Worldbank, 2014). Since economic growth and the success of a country depend on its ability to create,

accumulate and disseminate knowledge (Worldbank, 2014), effective use of SCI is greatly needed as a source of intelligence for creating knowledge. This fact should be addressed with serious and careful consideration by Malaysia due to its direct effect on the country's plan to transition to a K-economy country by the year 2020.

This study contributes to the literature by developing a valid and reliable measure for the dimensions of SCI components. It thus offers a new tool for researchers in the area of SCM and CI, who are interested in exploring dynamic and strategic information for competitive advantages. This study discussed the importance of SCI to be adopted by firms as one of the measures to deal with an increasingly competitive business environment, especially in ensuring successful supply chain integration. This study is limited by the relatively small sample size due to the sensitive nature of the intelligence information in businesses. The SCI components of this study are specifically designed for the manufacturing industry, and thus the priority of the SCI components might be different when applied to another industry. Future research could strengthen the SCI in service sectors since SCI components are different between tangible and intangible products. It would be interesting to probe deeper into the strategic role of SCI in the respective functional units both within an organisation and between supply chain networks as a competitive advantage. This future research could result in a more objective assessment of the effectiveness of SCI.

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