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Collaborative Commerce in Supply Chain Management: A study of Adoption Status in Malaysian Electrical and Electronic Industry

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Abstract: The principle objective of this study is to examine the adoption status of Collaborative Commerce (C-Commerce) in the Malaysian Electrical and Electronic (E and E) organizations. Original research using a self-administered questionnaire that was distributed to 400 Malaysian E and E organizations. Data were analyzed by employing descriptive statistics. In general, the adoption level of C-Commerce tools in the Malaysian E and E industry is still considered low with an average mean of 3.011. Based on the tools adopted, most organizations are utilizing C-Commerce for their supply chain execution. Among tools with lower adoption, they are mainly supply chain planning tools such as capacity planning tool and business strategy tool. This research enables organizations to have a better understanding of the current status of C-Commerce adoption level for SCM in the Malaysian E and E industry. This research have addressed previous lack of study in the adoption status of C-Commerce in the Malaysian E and E industry.

Key words: Collaborative commerce, Malaysia, electronic commerce, technology adoption, supply chain management, electrical and electronic industry

INTRODUCTION

Collaborative supply chain management has been studied widely in recent years due to its ability to improve the performance of supply chain such as reduced inventories, increase inventory turns, reduce cost and improvement in customer services (Chong and Ooi, 2008). Collaboration is defined as working together. Collaboration is described by Soosay *et al.* (2008) as an inter-organisational relationship type in which the supply chain partners agree to invest resources, mutually achieve goals and share information. As stated by Barratt (2004), many researches when talking about collaboration cite mutuality of benefit, rewards and risk sharing together with the exchange of information as the foundation of the collaboration (Barratt, 2004). Simatupang *et al.* (2004) defined supply chain collaboration as two or more independent firms jointly working to align their supply chain processes so as to create value to end customers and stakeholders with greater success than acting alone (Simatupang *et al.*, 2004).

Examples of collaboration in the supply chain has started as early as the 1980s. Large organizations such as Wal Mart and Proctor and Gamble were able to replace the early arm's length relations with durable arm's length relations and strategic partnerships (Skjoet-Larsen *et al.*,

2003; Hoyt and Huq, 2000; Holmstrom *et al.*, 2002). In today's business, many companies have worked closely with their suppliers include Dell, IBM and Hewlett Packard.

The successful deployment of IT technologies may help organizations to achieve logistics success (Lai *et al.*, 2004). Past IT technologies that were applied to supply chain include Electronic Data Interchange (EDI) and Enterprise Resource Planning (ERP) (Van Donk, 2008). With the advancement in IT technologies, in particular internet technologies, many companies are employing IT technologies in the implementation of collaborative supply chain management. The potential of IT applications for a collaborative supply chain is summarized by Handfield and Nichols (1999) as cited in Power (2005):

“With the emergence of the personal computer, optical fiber networks, the explosion of the Internet and the World wide web, the cost and availability of information resources allow easy linkages and eliminates information related time delays in any supply chain network” (Handfield and Nichols, 1999, p.6).

IT technologies such as EDI and E-Commerce have been applied in a collaborative supply chain environment. However, with the emergence of web technologies such as Extensible Markup Language (XML) and Web

Services, increasingly organizations are moving from implementing E-Commerce towards terms such as e-collaboration or Collaborative Commerce (C-Commerce) to the collaborative supply chain management.

Gartner group in 1999 defined C-Commerce as the set of electronically-enabled collaborative interactions between an enterprise, its suppliers, trading partners, customers and employees and also leverages the Web to create and maintain an interactive business community of employees, trading partners, suppliers and customers. All of these definitions essentially address the similar attributes of e-collaboration and C-Commerce. In this research, in order to avoid the confusion of using inconsistent terms, the term C-Commerce will be used to represent e-Collaboration.

The Malaysian Electrical and Electronic (E and E) industry is the number one contributor to Malaysia's industrial development in terms of output, foreign exchange earnings, employment and support activities, (Hobday, 1996). However, the Malaysian E and E industry is increasingly facing competition from countries with lower cost and huge domestic potential such as China (Chong and Ooi, 2008). Companies thus are realizing that globalization has made the world much more competitive. As Lai *et al.* (2006) indicated, a good logistics system will be able to increase a country's competitiveness. The question is however, to what extent are Malaysian E and E using C-Commerce? There has been no research in the past to address this question. The Malaysian managers who are gathering information before making a decision about what C-Commerce tools to adopt and how to use these tools to their fullest degree, need to know what others in the industry are doing. Besides needing to know what are the organization's competition is doing, it is also important to know what its partners and potential partners are doing. Therefore, this research attempts to provide the current adoption status of C-Commerce in the Malaysian E and E industry.

The research question of this study is thus to investigate the current status of C-Commerce adoption among Malaysian E and E organizations. The study will then provide information concerning the data used in the study, including descriptive information on the sample drawn out of Malaysian E and E companies as population. Finally, the results in terms of the current adoption status of C-Commerce are discussed followed by limitations of the study, conclusions and implications and recommendations for future research.

Theoretical base review: E-Commerce covers the buying and selling of products and services online. However, unlike E-Commerce, C-Commerce covers exchanges of

information and ideas between trading partners and within the organizations and enable them to collaboratively design, develop, build and manage products through their life cycle. It also allows companies to automate information flows within a multi-channel distribution network.

In order to decide the types of C-Commerce tools that can be used in this research, it is important to determine what types of collaborations can exist in the supply chain. Some common ways of collaboration include Information Exchanges (Lee *et al.*, 2004) and collaborative planning (Kulp *et al.*, 2004). Information exchanges postulates that information sharing on inventory level will reduce upstream demand distortion. Kulp *et al.* (2004) mentioned collaborative planning between manufacturers and retailers such as coordinating the design, development and introduction of new products and services can affect manufacturer performance in various ways. Firstly, as retailers are closer to product end users, their knowledge on consumer preferences, existing products problems and desired features or services complement the manufacturers' knowledge. This will in return result in products and service that are greater value to customers and will be consequently be associated with higher wholesale prices. Secondly, by actively involving retailers in the design and development phase, there is a higher commitment by the retailers for the success of the new products and services (Kulp *et al.*, 2004).

Matopoulos *et al.* (2007) stated that some supply chain activities where collaboration can take place include:

- Procurement
- Inventory management
- Product design and new product development
- Manufacturing (planning)
- Order processing
- Transportation/distribution
- Sales
- Demand management
- Customer service

One of the most well known forms of collaboration in the supply chain is known as collaborative resource planning, forecasting and replenishment (CPFR). CPFR as cited in Danese (2007) is concern with the collaboration where two or more supply chain partners jointly plan a number of promotional activities and work out synchronised forecasts, on the basis of which the production and replenishment processes are determined. A well developed CPFR according to Skjoett-Larsen *et al.* (2003) is where the collaboration has been expanded to

coordinate processes within forecasting, replenishment and planning. The planning processes can be additionally decomposed to involve collaboration on production planning, product development, transport planning and marketing activities.

During frequent meetings, all the relevant business processes are also coordinated on based on joint objectives. The joint objectives focused on developing a certain group of products, even though the respective supply chain members may have different but complementary goals (Skjoett-Larsen *et al.*, 2003).

According to Skjoett-Larsen *et al.* (2003), a well developed and advanced CPFR is capable of dealing with information concerning:

- Business plan
- Promotion plan
- New product introduction information
- Inventory data
- POS data and forecast
- Production and capacity plan
- Lead-time information

Therefore, it is possible to conclude from Skjoett-Larsen *et al.* (2003) that collaboration in the supply chain can include the sharing of information related to the information listed earlier.

Classifying C-Commerce tools: McLaren *et al.* (2002) clarified c-commerce systems into three major groups:

- Message-based systems that transmit information to partner applications using technologies such as XML messages.
- Electronic procurement hubs, portals, or marketplaces that facilitate purchasing of goods or services from electronic catalogues, tenders, or auctions.
- Shared collaborative systems that include collaborative planning, forecasting and replenishment (CPFR) capabilities in addition to electronic procurement functionality.

Cassivi (2004) discuss about the types of C-commerce tools there are available for collaborative supply chain. The study was conducted using the telecommunication industry. Using 7 main companies to form a case study and through a survey of 130 firms which are the supply chain partners of the 7 companies, Cassivi managed to classify the types of C-Commerce tools which are used for collaboration in the supply chain. The tools classified are direct procurement tool, replenish tool, projected shortage tools, delivery and tracking tool, business strategy tool, capacity planning tool and forecasting tool. Although the study is conducted in the

Table 1: Definitions of C-Commerce tools (Source: Cassivi, 2004)

C-commerce tools	Definitions
Direct procurement tools	Direct procurement tools that will forwards purchase orders (POs) to pre-qualified suppliers.
Replenishment tools	The tool will drive an ordering system from the shop. When materials are needed on the production line, an order will be placed through the replenishment system.
Projected shortages tool	This tool will scans the buyer's production plan to project expected material shortages. The tool will also provide real-time information to manufacturing and supply management units.
Delivery and tracking tool	This tool will generate a payment and a delivery request automatically when a product goes from suppliers to its customers. It can also collect shipping information from third party logistics providers.
Design tool	Enables the use of interactive engineering drawing and storage of CAD designs by all the key stakeholders.
Supply chain planning forecasting tool	Exchanges the forecast information provided by both the buyer and supplier.
Capacity planning tool	Determines the amount of capacity required to produce.
Business strategy tool	Collects and shares the actions that need to be taken to support the objectives and mission of the supply chain.
RosettaNet standards	Standard that is based on XML and defines message guidelines, business processes interface and implementation frameworks for interactions between companies in the supply chain.
E-Hub, E-Marketplace, E-Exchanges	Internet platform where firms register as sellers or buyers to communicate and conduct business over the internet

telecommunications industry, the tools identified can be generalized and applied to other industries as well (Cassivi, 2004). The C-Commerce tools will be adapted based on Cassivi's definition of supply chain e-collaboration tools as shown in the Table 1.

The tools used by Cassivi represent C-commerce tools used in both supply chain execution as well as supply chain planning. As Cassivi's study provided a comprehensive lists of C-Commerce tools in the supply chain, C-Commerce technologies in this study will be adapted and categorized based on the tools and technologies used. The C-Commerce tools listed by Cassivi are also consistent with the types of collaborations that can exist in the supply chain based on CPFR model (Skjoett-Larsen *et al.*, 2003). Two C-Commerce tools that are added to Cassivi's lists of C-Commerce tools are RosettaNet standards and E-Hub.

MATERIALS AND METHODS

Background: A survey instrument was developed to collect the data. Means, frequency, standard deviation and percentage were used to investigate the current status of C-Commerce adoption in the Malaysian E and E industry.

Sampling and data collection: The target populations of this study are E and E companies in Malaysia. A stratified sample was drawn from the database of Federation of Malaysian Manufacturer (FMM) 2007 listed members of E and E manufacturing companies in Malaysia. The Federation of Malaysian Manufacturers (FMM) is established in 1968 and represents over 2,000 manufacturing and industrial service companies of varying sizes in Malaysia. As the FMM directory consists of manufacturing companies of various sizes based on their revenue and employee size as well as having companies which are local, joint venture and MNCs, it is viewed as a valid representation of the entire Malaysian E and E organizations in Malaysia.

The survey was administered to 400 managers and executives from the purchasing or IT departments of the FMM listed organizations. The mail survey was the main form of data collection. There were 120 responses received, indicating an estimated response rate of 30%. However, only 109 of the questionnaires were usable.

Measurement of adoption level: The adoption level was measured using 5 items modified from the use of assimilation level from Fichman and Kemerer's work with software process innovations (Fichman and Kemerer, 1997) The adoption level here is measured using the items from whether the organization has actually 1 = deployed, 2 = committed, 3 = shown an interest, 4 = aware and 5 = unaware of the C-Commerce tools given.

Besides using Cassivi's literature to develop the C-Commerce tools used in this study, this research also added new tools based on the recommendations of senior executives from two major E and E companies in Malaysia. The 10 C-Commerce tools used in this study are direct procurement tools, replenishment tools, projected shortages tools, delivery and tracking tools, design tools, Supply chain Planning and Forecasting tool, Capacity planning tool, Rosetta Net standards, E-Hub and Business Strategy tool as shown in Table 1. All the adoption level questions on the C-Commerce tools added together bring the total points to 50. The mean is calculated giving a maximum mean score of 5 which signify a high adoption level of C-Commerce tools while a minimum mean score of 1 signify a low adoption level of C-Commerce tools.

Data analysis

Profile of organizations: This research collected responses from 109 E and E firms in Malaysia. Twenty seven of these companies have annual turnover of less than RM 10 million, 45 between RM 10 million and RM 25 million and 36 more than RM 35 million. According to Small and Medium Industries Development Corporation

Table 2: Annual turnovers of organizations

Annual turnovers	Frequency	(%)
Less than 10 million (RM)	27	24.8
Between 10 to 25 million (RM)	46	42.2
More than 25 million (RM)	36	33.0

Table 3: No. of years organizations have been operating

Years of operation	Frequency	(%)
More than 10 years	84	77.1
Less than 10 years	25	22.9

Table 4: Types of organization

Types of organizations	Frequency	(%)
Local	53	48.6
Multinational	38	34.9
Joint venture	18	16.5

(SMIDEC) of Malaysia in 2007, small organizations are organizations that have less than Rm 10 million annual turnover or have 50 or less employees, middle size organizations have between RM 10 million to 25 annual turnover or have employees of between 51 and 150, while large organization are organization which have annual turnover of more than Rm 25 million or more than 150 employees.

As shown in Table 2, most of these organizations are medium size to large organization based on their annual turnovers as 75.2% of the organizations have more than RM 10 million annual turnovers.

Table 3 shows that 84 organizations who took part in the survey have more than 10 years of operation while 25 have less than 10 years. As shown in Table 4, 53 of the responding organizations are local E and E company, while 38 of them are multinational E and E organization in Malaysia, while 18 of them are joint venture between local Malaysian E and E company and overseas organization.

Current status of C-Commerce adoption among Malaysian E and E companies:

The research question is to find out the current status of C-Commerce implementation among Malaysia E and E companies. Therefore, it is important to see the adoption level for each of the C-Commerce tool. Table 5 show the adoption level for each of the ten C-Commerce tools used in this study as well as the adoption level based on organization size.

Direct procurement tool: As shown in Table 5, most E and E organizations have deployed (n = 30) the direct procurement tool which is a tool used for supply chain execution (Cassivi, 2004). The results show that Malaysian E and E organizations are do know about this tool and many of them have deployed and are interested (n = 23) in implementing the tool. 18 companies which have taken part in the survey have also stated that they have committed to implement the technology in the near future.

Table 5: Summary of C-Commerce tools status

C-Commerce tools	Unaware	Aware	Interest	Commitment	Deployment
Direct procurement tool	8	30	23	18	30
Replenishment tools	7	39	16	21	26
Projected shortages tool	6	32	23	23	25
Supply chain planning forecasting tool	6	28	26	24	25
Delivery and tracking tool	4	36	20	29	20
E-Hub, E-Marketplace, E-Exchanges	7	25	34	27	16
Capacity planning tool	7	37	31	20	14
RosettaNet standards	22	28	33	13	13
Design tool	17	35	34	16	7
Business strategy tool	25	41	28	12	3

Projected shortages tool: Based on Table 5, most organizations are aware of the projected shortage tool (n = 32). However, in terms of actual deployment, there were only 25 organizations which have actually deployed the tool. Only 6 organizations from the survey stated that they are unaware of such tool.

Replenishment tool: Most of the E and E organizations in Malaysia are aware (n = 39) of the replenishment tool as shown in Table 5. From the survey, replenishment tool is the second most deployed tool among Malaysian E and E behind the direct procurement tool. Although the awareness of the tool is high, it also means that these organizations are not interested in deploying the tool. The organizations that are interested (n = 16) in the replenishment tool and committed (n = 21) to deploy the tool in the near future are relatively lower when compared to organizations who are aware of the tool but not going to deploy it in the near future. From the survey, most organizations have heard of replenishment tools with only 7 organizations claiming not to know about the tool.

Delivery and tracking tool: Table 5 shows that the awareness of the delivery and tracking tool is the highest with 36 organizations being aware of the technology, but are not interested or committed in deploying the technology. However, many organizations have committed to deploy the tool (n = 29) in the near future with 20 organizations having already deployed delivery and tracking tool. Relatively low number of organizations are unaware with the existence of delivery and tracking tool (n = 4).

Supply Chain planning and forecasting tool: The awareness, interest, commitment and deployment of supply chain planning and forecasting tool among Malaysian E and E are quite close as shown in Table 5, although, there are a number of organizations who are aware (n = 28) of the technology, it also means that these organizations have no interest nor committed to deploy the tool. Supply chain planning and forecasting tool is also one of the highest deployed tool with 25 organizations having already deployed the tool.

E-Hub, E-Marketplace and E-Exchange: Table 5 shows that E-Hub, E-Marketplace and E-Exchanges tools have relatively low deployment among Malaysian E and E organizations when compared to the previous tools described. As shown in Table 5, only 16 organizations have deployed E-Hub, E-Marketplace and E-Exchanges in their supply chain. However, many organizations have expressed interest (n = 34) and are committed (n = 27) to deploy the tool in the near future. Only 7 organizations are not aware of the existence of such tool showing that organizations are aware of such tool, but are unwilling to deploy the tool.

Capacity planning tool: Table 5 shows that similar to E-Hub, E-Marketplace and E-Exchanges, the deployment of capacity planning tool is relatively low given that only 14 organizations from the survey have actually deployed the tool. There are however, a number of organizations which have expressed an interest (n = 31) and committed (n = 20) to the deployment of capacity planning tool. As such, in the long term, the deployment of capacity planning tool can be improved. Similar to the previous tools described, the unawareness of capacity planning tool is relatively low given that only 7 organizations are unaware of the tool.

RosettaNet standards: Based on Table 5, the degree of using RosettaNet standards is quite low. It is the 3rd lowest deployed C-Commerce tool with 13 organizations having deployed it. Organizations that are committed to deploy RosettaNet standards is also relatively new as only 13 organizations have expressed that they have committed to the deployment of RosettaNet standards in the future. Despite the fact that Malaysian government have been promoting RosettaNet standards through various government promotions and incentives, many Malaysian E and E are still unaware of the tool (n = 22).

Design tool: As shown in Table 5, the deployment for the design tool is the second lowest among the 10 C-Commerce tools described. Only 7 organizations have actually deployed design tool. Seventeen organizations are unaware of such C-Commerce tool, which is the 3rd

highest of unawareness among the C-Commerce tool. However, 34 organizations have expressed an interest in deploying design tool in the future while 16 organizations have actually committed towards the deployment of design tool in the near future.

Business strategy tool: The deployment of the business strategy tool is the lowest (n = 3) among the Malaysian E and E organizations as shown in Table 5. There are also 25 organizations which are unaware of the business strategy tool. Forty one organizations are aware of the tool but are not interested or committed to deploy the tool in the near future. Overall, business strategy tool has the lowest deployment and highest unawareness among E and E organizations in Malaysia.

Overall, based on the Table 5, direct procurement tool has the highest number of deployment among Malaysian E and E organizations. The organization with the lowest deployment include business strategy tool. The tool that most organizations are unaware of includes business strategy tool and RosettaNet standards, while delivery and tracking tool have the lowest unawareness among Malaysian E and E organizations.

Based on the findings, Table 6 shows that the average mean of all current C-Commerce adoption level to be at 3.01102. This show that most organizations are still not adopting the C-Commerce tools listed, but they are mostly interested (mean = 3.011) in the adoption of C-Commerce tools. The tools that have the highest adoption mean is supply chain planning and forecasting, followed

by direct procurement tools, projected shortages tool, delivery and tracking tools, replenishment tools, e-hub/e-marketplace, capacity planning tools, RosettaNet standards, design tool and business strategy tool.

Overall, the deployment of C-Commerce tools among Malaysian E and E organizations are relatively low. Based on Table 7, many organizations are deploying C-Commerce tool in their supply chain. However, the extent to which they were used was still limited. The C-Commerce tools with the highest deployment in terms of percentage are 27.5%, which is quite low.

The tools that were deployed the most among Malaysian E and E companies are direct procurement tool (27.5%). C-commerce tools that were lowly adopted include business strategy tool (2.7%) and design tool (6.4%).

The results also show that many organizations are not aware about RosettaNet standards (20.2%) and Business Strategy tool (22.9%). The result shows that despite Malaysian government efforts in promoting the implementation of Rosettanet standards, many organizations are still unaware of the tool.

Based on Table 8, most small organization have low deployment of the C-Commerce tool. As shown in Table 8, less than 4% of the small organizations have deployed each of the C-Commerce tool listed. Many organizations are also unaware of some of the C-Commerce tool listed, in particular RosettaNet standards, Design tool and Business strategy tools which have more than 40% of the small organizations being unaware of

Table 6: Mean of adoption level of each C-Commerce tool

C-Commerce tools	N	Minimum	Maximum	Mean	Standard error	Standard deviation
Supply chain planning and forecasting	109	1.00	5.00	3.3119	0.1185	1.23751
Direct procurement tools	109	1.00	5.00	3.2936	0.1272	1.32848
Projected shortages tools	109	1.00	5.00	3.2661	0.1206	1.25935
Delivery and tracking tools	109	1.00	5.00	3.2294	0.1148	1.19902
Replenishment tools	109	1.00	5.00	3.1835	0.1265	1.32053
E-Hub, E-Marketplace	109	1.00	5.00	3.1835	0.1092	1.13989
Capacity planning tool	109	1.00	5.00	2.9725	0.1094	1.14227
RosettaNet standards tool	109	1.00	5.00	2.6972	0.1205	1.25834
Design tool	109	1.00	5.00	2.6422	0.1063	1.10991
Business strategy tool	109	1.00	5.00	2.3303	0.0993	1.03687
Average mean				3.0110	0.1152	

Table 7: Percentage of the utilization of C-Commerce tools among Malaysian E and E organizations

C-Commerce tools	Unaware (%)	Aware (%)	Interest (%)	Commitment (%)	Deployment (%)
Direct procurement tool	7.3	27.5	21.1	16.5	27.5
Replenishment tools	6.4	35.8	14.7	19.3	23.9
Projected shortages tool	5.5	29.4	21.1	21.1	22.9
Supply chain planning forecasting tool	5.5	25.7	23.9	22.0	22.9
Delivery and tracking tool	3.7	33.0	18.3	26.6	18.3
E-Hub, E-Marketplace, E-Exchanges	6.4	22.9	31.2	24.8	14.7
Capacity planning tool	6.4	33.9	28.4	18.3	12.8
RosettaNet standards	20.2	25.7	30.3	11.9	11.9
Design tool	15.6	32.1	31.2	14.7	6.4
Business strategy tool	22.9	37.6	25.7	11.0	2.8

Table 8: Percentage of the utilization of C-Commerce tools for organizations with annual turnover of less than RM 10 million (small organizations)

C-Commerce tools	Unaware (%)	Aware (%)	Interest (%)	Commitment (%)	Deployment (%)
Direct procurement tool	7.4	70.4	22.2	0.0	0.0
Replenishment tools	3.7	81.5	14.8	0.0	0.0
Projected shortages tool	18.5	55.6	25.9	0.0	0.0
Supply chain planning forecasting tool	14.8	55.6	14.8	11.1	3.7
Delivery and tracking tool	11.1	66.7	11.1	11.1	0.0
E-Hub, E-Marketplace, E-Exchanges	7.4	48.1	37.0	3.7	3.7
Capacity planning tool	18.5	63.0	14.8	3.7	0.0
RosettaNet standards	40.7	37.0	11.1	11.1	0.0
Design tool	40.7	44.4	11.1	0.0	3.7
Business strategy tool	44.4	37.0	11.1	7.4	0.0

Table 9: Percentage of the utilization of C-Commerce tools for organizations with annual turnover of between RM 10 million to RM25 million (medium organizations)

C-Commerce tools	Unaware (%)	Aware (%)	Interest (%)	Commitment (%)	Deployment (%)
Direct procurement tool	10.9	15.2	26.1	21.7	26.1
Replenishment tools	10.9	21.7	19.6	21.7	26.1
Projected shortages tool	2.2	28.3	23.9	21.7	23.9
Supply chain planning forecasting tool	4.3	21.7	26.1	21.7	26.1
Delivery and tracking tool	2.2	26.1	26.1	26.1	19.6
E-Hub, E-Marketplace, E-Exchanges	8.7	17.4	32.6	21.7	19.6
Capacity planning tool	4.3	26.1	37.0	19.6	13.0
RosettaNet standards	17.4	26.1	43.5	6.5	6.5
Design tool	13.0	30.4	39.1	10.9	6.5
Business strategy tool	19.6	41.3	32.6	4.3	2.2

Table 10: Percentage of the utilization of C-Commerce tools for organizations with annual turnover of more than RM 25 million (large organizations)

C-Commerce tools	Unaware (%)	Aware (%)	Interest (%)	Commitment (%)	Deployment (%)
Direct procurement tool	2.8	11.1	13.9	22.2	50.0
Replenishment tools	2.8	19.4	8.3	30.6	38.9
Projected shortages tool	0.0	11.1	13.9	36.1	38.9
Supply chain planning forecasting tool	0.0	8.3	27.8	30.6	33.3
Delivery and tracking tool	0.0	16.7	13.9	38.9	30.6
E-Hub, E-Marketplace, E-Exchanges	2.8	11.1	25.0	44.4	16.7
Capacity planning tool	0.0	22.2	27.8	27.8	22.2
RosettaNet standards	8.3	16.7	27.8	19.4	27.8
Design tool	0.0	25.0	36.1	30.6	8.3
Business strategy tool	11.1	33.3	27.8	22.2	5.6

them. Small organizations are also less committed to deploy the C-Commerce tools in the near future with tools such as direct procurement, replenishment, projected shortages and design tools have 0% commitment from the small organization.

Table 9 shows that the deployment of C-Commerce tools among medium size organization is much higher compared to the smaller organization. Although tools such as RosettaNet standards, Design tool and Business Strategy tool are have low percentage of deployment and commitment among the medium sized organization, they are still higher than the small organization. Overall, the percentage of unawareness among the medium sized organization is much lower in general when compared to small organizations. However, direct procurement (10.9%), replenishment (10.9%) and E-Hub, E-Marketplace, E-Exchanges (8.6%) do have a higher percentage of unawareness among the medium sized organization when compared to the small organization although overall, the deployment and commitment of these tools are still much higher than small organization.

Table 10 shows the percentage of the utilization of C-Commerce tools for organizations with annual turnover of more than RM 25 million. Large organizations have the highest percentage of deployment when compared to medium sized and small sized organization. The percentage of unawareness of the C-Commerce tools among the large organization is low when compared to the medium and small organizations. RosettaNet standards have the highest percentage of unawareness among the large organization although the deployment of RosettaNet standards is high when compared to the medium and small sized organization.

DISCUSSION

In general, the adoption level of C-Commerce tools in the Malaysian E and E industry is still considered low with an average mean of 3.011. Based on the tools adopted, most organizations are utilizing C-Commerce for their supply chain execution. For example, tools such as direct procurement, replenishments, shortages and

delivery and tracking are some of the tools which have the highest number of adoption when compared to other tools. Among tools with lower adoption, they are mainly supply chain planning tools such as capacity planning tool and business strategy tool.

One observation that be made from this is that most organizations are still not willing share information that are more sensitive to their supply chain partners such as the design of their products and well as business strategy tools. However, in order for a collaborative SCM to be implemented in the supply chain, it will be important that organizations start sharing this information with their supply chain partners.

In terms of the adoption status of C-Commerce based on organization size, the lowest number of adoption of C-Commerce tools come from smaller organizations compared to large organizations. Although this is understandable due to the limited resources in financial and technical resources that smaller organizations have when compared to larger organizations, it is still vital for these organizations to start adopting c-commerce tools. This is because the success of c-commerce adoption requires the co-adoption from more than one supply chain partners. Therefore, organizations with larger resources can consider helping their smaller partners to adopt C-commerce. This can be in the form of financial assistance as well as technical assistance.

CONCLUSIONS

This research also enables organizations to have a better understanding of the current status of C-Commerce adoption level for SCM in the Malaysian E and E industry. This research have addressed previous lack of study in the adoption status of C-Commerce in the Malaysian E and E industry. This research allows management of organizations to know what is the adoption level of E and E industry in Malaysia. This information about other organizations' adoption level of C-Commerce for SCM is important as SCM evolves from the integration level of firm-centric towards the integration level of industry-centric whereby the industry standard C-Commerce environment needs to be established and industry level SCM standards need to be developed.

LIMITATIONS AND FUTURE WORK

This study has several limitations. One of the limitations is that this research has been conducted in Malaysia and whether the results from this research would be consistent with other countries' E and E industry would need to be verified through further

research. As such, there is a need to compare the adoption level of C-commerce in Malaysian's E and E industry with other countries' to allow us to have a better understanding the overall C-commerce adoption level in the E and E industry.

Given that this research showed that the C-Commerce adoption level in the Malaysian E and E industry is not relatively high, there is a need to further investigate what are the factors that might influence the improvement in the adoption of C-Commerce in the Malaysian E and E industry.

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