MIGRATING SUPPLY CHAIN MANAGEMENT PROCESS ONLINE: A STUDY IN MALAYSIAN COMPANIES.

Alain Chong Yee Loong[1], Dr. A. S. Rama Sastry[2]

[1]INTI College Malaysia
Jalan BBN 12/1, Bandar Baru Nilai, 71800 Malaysia
achong@intimal.edu.my
[2] Multimedia University, Cyberjaya
Jalan Multimedia 63100 Cyberjaya Selangor Malaysia
sastry@mmu.edu.my

ABSTRACT

There has been an increasing trend for companies to migrate their Supply Chain Management (SCM) online. In Malaysia however, many companies have not or are reluctant to invest in IT to improve their SCM. In order for companies to successfully migrate their SCM online, companies need to solve both technical and business issues that are involved during and after the migration. One example for solving the technical issues is that of the Rosettanet Standards. Rosettanet promised to solve the integration issues of online SCM in particular by allowing companies to communicate in the same e-business standards. However, there are few taker for this and there is a need to study the problems of migrating SCM online.. A framework is needed for Malaysian companies to successfully migrate their SCM online and using the Rosettanet standards. This paper presents an on-going study supported by Infineon Technologies Malacca.

KEYWORDS

Adoption, E-Commerce, Supply Chain Management, Rosettanet

1. INTRODUCTION

In our current competitive business environment, it is increasingly difficult for a company to survive in isolation of its suppliers and other business partners in the network of value chain which encompasses the entire production activities of a product lifecycle (Lau and Lee, 2000). The driving forces of global sourcing, emphasis on time-and-quality-based competition, and their respective contributions to greater environmental uncertainty have also increased the interest in the topic of Supply Chain Management (SCM), which is concerned with the strategic approach of dealing with logistic planning and operation on an integrated basis (Lau and Lee, 2000).

There have been different attempts to define the term SCM. However, according to Turban (Sabath, 1998), SCM can be defined as "the integration of business processes from the end user through original suppliers that provide products, services, and information that add values for customers" (Sabath, 1998). The role of SCM involves planning, organizing and coordinating supply chain's activities. Today however, the concept of SCM indicates a holistic approach to managing the entire supply chain. An effective SCM will be able to lower production and distribution costs through seamless cooperation between business partners in their supply chain. A good supply chains can also affect customers' satisfactions. As a result, SCM is seen as a source of competitive advantage and a lever for profit margin.

With the availability of Internet technologies and broadband facilities, many companies are starting to migrate their businesses onto the Internet. The Internet enables the development of e-commerce

and that in turn enabled companies to tie together with their business partners in the supply chain. Many companies are moving the process of supply chain such as sourcing, negotiating with suppliers, and coordinating with research and development onto the Internet. There are definite advantages that companies can gain from migrating their businesses onto the Internet. However, there is a need for careful planning before migrating the businesses online. Srinivasan et al. suggested that by migrating SC onto the Internet, "both the key players and organizational activities would be adjusted, accompanied by both challenges and opportunities." (Yen and Ng, 2003). There is also a need to deal with the technological and human issues of migrating a company's supply chain process online.

This paper will provides a literature review of supply chain management with Internet technologies. It will discusses the concepts of Business to Business E-commerce as well as Rosettanet Standards. The rationale for the study as well as the research questions and objectives will be discussed.

2.   REVIEW OF LITERATURE

The concept of SCM is not new and its history can be traced back to the post world war II period. During the 60s and 70s, companies saw themselves as closely linked functions whose joint purpose was to server their customers (Chou, Tan and Yen, 2002). During this period, Materials Requirement Planning (MRP) was developed. In the late 70s and 80s, Electronic Data Interchange (EDI) was developed to improve supply chain communications.

The rises of Internet technologies occur during the 90s. During that period, the pervasive adoption of Internet and Web technology have promised a ubiquitous and less costly way to tie companies and their business partners together in the supply chain (Chou, Tan and Yen, 2002). Garner group even came up with the term "Collaborative Commerce" (c-Commerce) to emerging business model starting from the year 2000.(Chou, Tan and Yen, 2002). With the introduction of E-Commerce, it is also easier for companies to find suppliers from other countries. This type of supply chain is often referred to as Global Supply Chains.

According to Chou, Tan and Yen (Serve and Yen, 2002), SCM goals can be classified into three categories:

1. Reduce inventory costs by matching production to demand. The aim of this is similar with the concept of just-in-time (JIT) inventory management.
2. Reduce overall production costs through streamlining the products flow within the production process and improving information flow between partners
3. Improve customer satisfactions through speedy delivery and flexibility through the seamless cooperation with the distributors and vendors.

2.1   The advantages of Supply Chain Management

The main goals of SCM are to reduce uncertainty and risks along the supply chain, therefore affecting inventory levels, cycle time, processes and customers level in a positive way. The benefit of supply chain was recognized by businesses for a long time and an example include Henry Ford who purchased rubber plantations to ensure a supply of tires for the cars he manufactured (Chou, Tan and Yen, 2002).

The flow of goods and services, information and other such products is designed not only to effectively transform raw items to finished products and services, but to do it in an efficient manner (Chou, Tan and Yen, 2002).

2.2   Problems related to SCM

A disadvantage of SCM is that it is very difficult to maintain. Lines of communications must be open to all the vendors that operate throughout the supply chain (Sabath, 1998). It is difficult to ensure that individual operators in the chain do what is best for the supply chain as a whole. If a supplier takes advantage of the

chain and thinks about himself/herself rather than concerning himself/herself with the chain as a whole, the supply chain can be destroyed.

Along with the above problems of SCM, Robert Sabath of Mercer Management Consulting also pointed out 3 other problems with traditional SCM (Sabath, 1998).

Firstly, traditional approaches to supply chain management rely on at least three discrete inventory buffers to smooth the flow of goods through production and provide a reliable response to volatile consumer demand. A major shortcoming of these approaches is that at each step back in the supply chain, volatility of demand increases and forecast accuracy decreases. Manufacturers and retailers find themselves "drowning in inventory" on many items at the same time that they are chronically stocked out of others (Sabath, 1998) . This is also known as the bullwhip effect (Sabath, 1998).

Secondly, traditional approaches react very slowly to new demand trends. If an item suddenly becomes all the rage and starts to sell out in stores, replenishment orders go to retailers' distribution centers, but no further, until minimum inventory levels are reached and an order is placed with the manufacturer. Manufacturers, in turn, fill orders from their distribution centre inventory until they hit their reorder point, and only then does the production planning group begin to plan new production. If the new sales trend continues, the system will not catch up. Traditional systems, with their "step-wise" reordering process up the supply chain, do not communicate underlying consumer demand trends and therefore tend to under supply the fastest selling items.

The last problem with traditional approaches is that they treat all items very much the same. Similar levels of inventory (measured in weeks of demand) are held for volatile and non-volatile items. Common material handling approaches are used across high- and low-volume items. As a result, opportunities are missed for reducing the cost of distribution. A conceptual model of the study will also be presented in the study.

2.3   Internet and Supply Chain Management

The Internet has changed the way companies do businesses. Internet based information systems offer a great opportunity to improve supply chain management (Zeng and Pathak, 2003). SCM has been enabled by convergence, which refers to the integration of computer and communicating technologies (Zeng and Pathak, 2003). Convergence is strengthened by the Internet due to the fact that it enables ubiquitous and low cost connectivity. The speedy network transmission also helps businesses to realize seamless and real-time communications and transactions.

Most business view the Internet as an extra distribution channel to most firms. However, the Internet and web technologies can support the entire supply chain's operations.

Examples of how Internet technologies contribute to SCM include:

1. Developing e-Commerce applications. The Internet offers a variety of supports for online communications and transactions. An example of e-Commerce applications will be online procurement.
2. Order taking can be conducted on EDI, EDI/Internet, or extranet and it can be fully automated. An example can be found in Business to Business (B2B) where orders are generated automatically to suppliers when inventory levels fall below certain levels.
3. Collaborative commerce among members of the supply chain can be done in different areas from product design to demand forecasting. This will result in shorter cycle times, minimal delays and work interruptions, lower inventories and less administrative cost.
4. Applications integration. This is an important IT strategy since it can create or modify the interactions among related applications and to encompass canned software, legacy applications and Web services (Turban, 2002).

2.4   B2B Supply Chain Management

B2B e-commerce is an e-commerce model where both the buyers and sellers are organizations. B2B process holds many positive attributes. Firstly, it can reduce purchasing costs. For example, a company searching for products online will take less time and electronically processing an order streamlines the ordering procedure.

Secondly, B2B increases the efficiency of the market. Through the Internet, the companies can quickly and easily get quotes from different suppliers.

Thirdly, B2B hosts also give producers a better insight into the demand levels in any given market. "Spot price levels can quickly be determined in everything from paint pigments to plastic cups." (Turban, 2002).

Lastly, B2B technologies will allow companies to better utilize their inventory and raw materials.

2.5 Rosettanet

Successful partnering requires automating B2B commerce both intra and interenterprise (Yen and Ng, 2003). Companies conducting e-business among multiple, dynamic partners must be capable of equally dynamic B2B communications. Successful e-business requires adaptable B2B communications that are accurate and reliable for all partners, both upstream and downstream. This includes company applications that can communicate information with another company's or even companies' applications and information. B2B communications at this level mandate the use of open industry standards that transcend enterprises, vendors, infrastructures and platforms. This is one of the challenges faced by companies as they try to migrate their SCM online.

RosettaNet is set up with the aim to solve the standardization of B2B communications. RosettaNet was founded in 1998 and it is a nonprofit consortium of more than 500 of the world's leading information technology, electronic components, logistics, semiconductor manufacturing, solution provider, and telecommunications companies working to create, implement, and promote open e-business process standards. Rosettanet Malaysia was set up in 2002 to promote and facilitate the adoption and implementation of RosettaNet e-business standards amongst multinational corporations and small and medium size companies in Malaysia. By using RosettaNet standards, companies can communicate electronically with other companies already using the same e-business standards. For companies adopting RosettaNet standards, they can also connect to the global supply chain as Rosettanet is an open standard (www.Rosettanet.org).

So far, the adoption of RosettaNet in Malaysia has been slowed. According to a recent research conducted by International Data Corporation (IDC), not many Malaysian companies have invested heavily in their IT plans to improve SCM. According to IDC, "lots of organizations in the region do not fully understand the significance of SCM within the business community and leveraging on the partnerships to grow their market. Educating the users on the relevance of SCM has to be one of the key priorities in their marketing strategies for SCM software publishers." (IDC, 2000)

In IDC's end-user research to identify organizations' IT spending trends, it was discovered that only 6.2 per cent of the respondents in Malaysia rated SCM as one of their top three IT investment priorities for the year 2000, compared to about 9.3 per cent in the whole of Asia Pacific. Among the countries take took part in the survey, China topped the list with about 41 per cent followed by New Zealand at 37.3 per cent. Industries which are currently more responsive towards adopting SCM applications are from the distribution and manufacturing sectors with 33.1 per cent and 18.8 per cent respectively. The problems with companies migrating towards RosettaNet standards or Online SCM can be summarized as below:

I.   Cultural issues. A seamless collaboration among trading partners in the SC are based on trust and commitment, cooperative norms, interdependence, compatibility, managers' perceptions of environmental uncertainty, and extendedness of a relationship (Chou, Tan and Yen, 2002) (Murtaza, Gupta and Carroll, 2004) (Yen and Ng, 2003). In order to achieve collaboration, the trading partners must reach a common vision about the SCM strategy. The companies might also need to reveal their business secrets to their partners.

II.   Technical issues. The problems with technical issues include security issues on the Internet. Another problem that faces a big technical concern is application integration (Chou, Tan and Yen, 2002) (Murtaza, Gupta and Carroll, 2004) (Yen and Ng, 2003). For example, a good SCM needs the linking of both the suppliers' and buyers' back end systems. The integration can take place by allowing companies' internal applications such as ERP or manufacturing systems, to exchange data directly with their partners. Technical issues concerning data formats, standardized process, scalabilities of systems become issues that need to be solved.

In the case with Rosettanet, companies must translate their current systems and procedures in accord with the Rosettanet standards. This involves technical expertise and financial investments.

Although the government has been promoting Rosettanet actively and giving out incentives such as funding for the implementation of Rosettanet, the adoption of Rosettanet has been slow in Malaysia. The data up to March 2005 shows that there are only 83 members of Rosettanet, and out of the 83, only 46 have implemented Rosettanet. The rest have signed up or in the process of implementing.

3. RATIONALE FOR THE STUDY

In order for Malaysian companies to gain competitiveness in the current global business environment, it is important for Malaysian companies realize the importance of IT's contributions to SCM. Based on the review of literature review it can be seen that migrating the SCM function online has benefits and also some problems that needs to be overcome. Thus, there is a need to study the problems and potential of migrating SCM online before companies are willing to invest on it. Also with many options available for online SCM, like the Rosettanet or various proprietary software like SAP and others, companies also need to know the potential impacts or pros and cons of using the various technologies and standards for migrating their SCM functions online. The main aim of the study is to investigate the problems and prospects of IT enabled SCM among Malaysian organizations.

Although most studies in the past have studied adoption of e-commerce in Malaysia based on factors such as costs, lack of infrastructure, lack of technical staffs etc, there are few studies on: 1) The adoption of E-commerce technologies to SCM. E-commerce is a vital part of SCM and there is a need to study the impact of implementing E-commerce technologies to SCM. 2) Adoption of new E-commerce technologies such as XML (Extensible Markup Language), Rosettanet, E-Exchange etc. Most of the existing studies tend to focus on old technologies such as EDI. 3) The cultural issues and government initiatives on the impact of adopting E-Commerce in SCM. This study focused on the adoption of E-commerce in supply chain among Malaysian Electrical and Electronics companies.

4. RESEARCH QUESTIONS

Based on the literature review, the research questions for this study are:

- What is the current state of E-Commerce implementation among Malaysian electronics and electrical (E&E) companies in Malaysia?

- What are the discriminating factors that will move firms towards implementing E-commerce technologies in SCM?

- What are the issues in adopting E-commerce technologies for E&E companies in SC. The issues involved for Malaysian companies might be different for companies in different countries.

- What are the impact on Malaysian companies that have migrated their supply chain online using the Rosettanet standards.

- What are the results or perceived results on Malaysian companies that have migrated their supply chain online.

- What recommendations can be provided for Malaysian E&E companies that want to implement e-commerce in their SCM.

- What recommendations can be provided for Malaysian E&E companies that want to use Rosettanet standards in their SCM.

5. THE OBJECTIVES OF THE STUDY

- To study the issues of migrating SC online for Malaysian E&E companies. The issues involved for the Malaysian E&E companies in adopting E-commerce in their SC might be different from companies in different countries.

- To investigate the impact on Malaysian E&E companies that have adopted E-commerce technologies to their SC.

- To identify the critical factors that affect the adoption of E-commerce technologies in SCM among Malaysian E&E Companies.

- To build an theoretical model for adopting E-commerce technologies in SC.

- Finally, a framework proposing how Malaysian companies should migrate their SC online will be developed. The framework will include strategies for companies who want to use the Rosettanet standards for their online SCM.

6. OVERVIEW OF THE METHODOLOGY

For this study a two step research design will be adopted, involving
   (a) A Pilot study
   (b) A Main study

Pilot Study
   The pilot study will involve developing a few cases to help in identifying variables for the study and also for refining the variables collected from literature for the study. In addition, a questionnaire for the study will be developed and tested for content validity. A pilot study was conducted for Infineon Technologies Melacca.

Main Study
   The main study will be a survey based one. A sample of business organizations and their suppliers in Malaysia will be identified to conduct the study. The refined questionnaire will be used to collect data on the identified issues. Data will be collected from the respondent through personal interviews. The collected data will be analyzed using multivariate data analysis technique. SPSS will be used to analyze the data. At the end of the research, a framework of ensuring how companies can successfully migrate their Supply Chain Management online will be developed.

7. CONCEPTUAL MODEL

The conceptual model developed for this study is based on a combination existing models as well as new variables defined from the pilot study. The existing models used in the study are Rogers' Diffusion of Innovation Model (Rogers, 1995), Technology Acceptance Model (TAM) (Davis, 1989), Hofstede's National Culture Dimensions (Hofstede, 1997), and IOS Standards Diffusion Conceptual Model (Nelson and Shaw, 2005).
   Rogers Diffusion of Innovation model constructed 5 innovations characteristics from previous research, consisting of relative advantage, compatibility, complexity, trialabilty, and observability. Relative advantage is defined as the degree to which an innovation is perceived being better than the idea it

supersedes. Compatibility is the degree to which an innovation is seen as consistent with the past values, experience, and needs of potential adopters. Complexity is the degree egree to which the innovation is perceived as relatively difficult to use and understand. Trialability is the degree which an innovation may be experimented with on a limited basis. Observability is the degree to which the results of the innovation is visible to others.

The TAM model was developed by Davis which is adapted from the Theory of Reasoned Action (TRA). It is designed to understand the linking of external variables to IT usage intention and actual use in a workplace. This theory is mainly used by existing researchers to study the user acceptance of IT. In TAM, the behavioral intention to use a technology is determined by two key variables: Perceived Usefulness and Perceived Ease of Use.
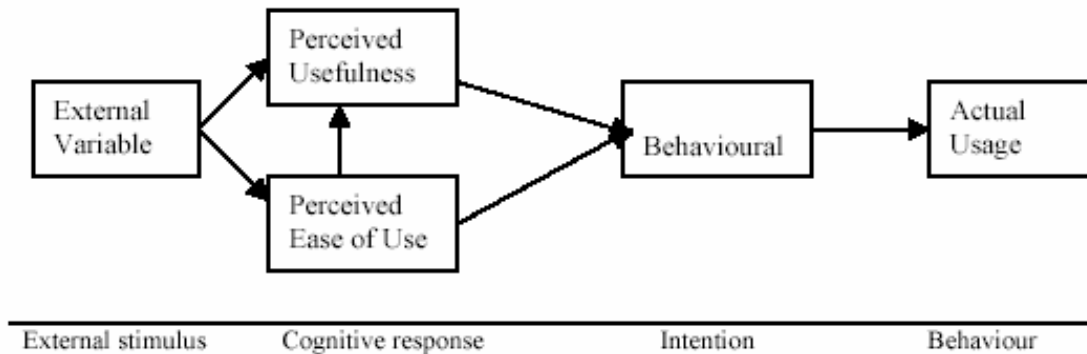

Figure 1. Technology Acceptance Model (Davis, 1989)

Much of research into e-commerce adoption concludes that the lack of technological infrastructure is the main barrier to e-commerce adoption and the key priority for developing countries is to ensure that their citizens have access to the Internet at a reasonable price. Malaysia although is a developing country, it has the necessary infrastructure for E-commerce adoption. Yet the adoption of E-Commerce in SCM is low. Another model which can be used to explain this could be Hofstede's National Culture Dimensions. This model describes five differences/value perspectives between national cultures which are : power distance, individualism versus collectivism, masculinity versus femininity, uncertainty avoidance, and long term versus short term orientation. The two variables used in Hofstede's National Culture of Dimensions in the study are power distance and uncertainty avoidance. Power Distance reflects the degree to which society accepts unequal distribution of power, Uncertainty Avoidance is the extent to which the members of a culture feel threatened by uncertain or unknown situations.

The Interorganizational System (IOS) Standards Diffusion Conceptual Model is much newer than the other models. In this model, four independent constructs are introduced in this model. They are organizational readiness, IOS technology attributes, external environment, and the standard development organization (e.g. Rosettanet). This model is suitable for the study of Rosettanet as it focuses on Interorganizational standard. However, there is not application of this model in the Malaysian context.

Based on the existing model as well as the pilot study conducted, the proposed model developed is shown in figure 1.
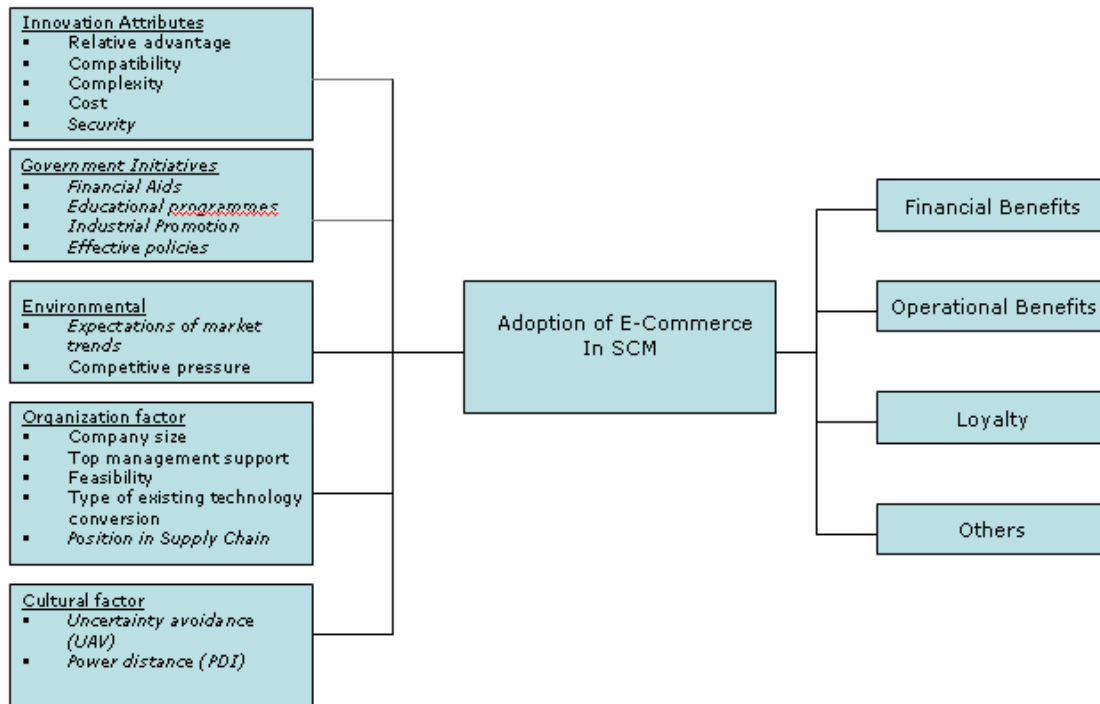
Figure 1. Conceptual model for the adoption of E-Commerce in SCM for Electrical and Electronics company in Malaysia

This model includes the study of government initiatives to the adoption of E-Commerce in SCM. This is because Malaysian government has put a lot of emphasis in the implementation of E-Commerce, especially in the supply chain. The government aims to develop a "global supply chain" starting with many electrical and electronics companies. In Penang, Rosettanet Malaysia has continued to promote the benefits of Rosettanet. Currently the Malaysian government offers funding for the implementation of Rosettanet. A grant of RM5 milion has been allocatedl as a grant for local Malaysian companies to implement the RosettaNet Standard. There is a need to study on whether the government initiatives will increase the adoption of E-commerce/Rosettanet implementation in the supply chain.

8.   CONCLUSION

This paper presents an overview of an on-going study. Although in the past there have been study on the adoption of E-commerce, there is limited or no study on the adoption of E-commerce in Supply Chain management. There is also lack of study in the adoption of newer technologies based on web services, XML, E-Hub as well as Rosettanet standards. This study aims to find out the factors that causes the adoption of E-commerce in supply chain management among Malaysian electrical and electronics companies. Currently this study has just completed the pilot study. Further data obtained from the pilot study will be published in the future.

ACKNOWLEDGEMENT

REFERENCES

1. H.C.W. Lau and W.B. Lee (2000), On a responsive supply chain information system, International Journal of Physical Distribution & Logistics Management, Vol. 30 No. 7/8, pp. 598-610.

2. Robert Sabath (1998) Volatile demand calls for quick response: The integrated supply chain, International Journal of Physical Distribution & Logistics Management, Vol. 28 No. 9/10, pp. 698-703.

3. Mike Serve, Dave C. Yen (2002) B2B-enhanced supply chain process: toward building virtual enterprises, Business Process Management Journal, Vol. 8 No3, 2002,pp 245-253

4. David Chou, Xin Tan, David Yen (2004), Web technology and supply chain management, Information Management & Computer Security, Vol. 12, No. 4 , 2004, pp. 338-349

5. Amy Zeng, Bhavik Pathak (2003) Achieving information integration in supply chain management through B2B e-hubs: concepts and analyses, Industrial Management & Data Systems, 103/9, pp. 657-665

6. Remko van Hoek (2001), E-supply chains – virtually non-existing, Supply Chain Management: An International Journal, Volume 6 Number 1, pp. 21-28

7. Efraim Turban, Electronic Commerce, A Managerial Perspective 2002, Prentice Hall.

8. Supply Chain Management: The next big wave? Available online: http://www.idc.com.my/Research/supply_chain_management.htm

9. Mirza B. Murtaza, Vipul Gupta, Richard C. Carroll (2004), E-Marketplaces and the future of supply chain management: opportunities and challenges, Business Process Management Journal, Vol. 10 No. 3, 2004, pp.325-335

10. Online: http://www.rosettanet.org

11. Benjamin P.C Yen, Elsie O.S. Ng (2003), The migration of electronic commerce (EC): from planning to assessing the impact of EC on supply chain, Managfement Decision, 41/7, pg. 656-665

12. Rogers, E.M., (1995), The Diffusion of Innovations, Free Press, New York, NY

13. Davis, F.D., (1989), Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technolgy, MIS Quarterly, September 1989, pp 319-339

14. Hofstede G (1997). Culture and Organizations: Software of the Mind. Mcgraw Hill. New York.

15. Matthew L. Nelson Michael J. Shaw (2005), Interorganizational System Standards Diffusion: The Role of Industry−based Standards Development Organizations Online: http://www.business.uiuc.edu/Working_Papers/papers/05−0126.pdf