Proceedings of the 2011 International Conference on Industrial Engineering and Operations Management
Kuala Lumpur, Malaysia, January 22 – 24, 2011

Collaborative Commerce Technologies Adoption for Supply Chain Collaboration and Service Innovation: A Conceptual Model

Alain Y.L Chong
Department of Industrial and Systems Engineering,
The Hong Kong Polytechnic University, Hung Hom, Hong Kong

Felix T.S Chan
Department of Industrial and Systems Engineering,
The Hong Kong Polytechnic University, Hung Hom, Hong Kong

Keng Boon Ooi
Faculty of Business & Finance,
University Tunku Abdul Rahman,
Jalan University, Bandar Barat, 31900, Kampar, Perak, Malaysia

Abstract

The principle objective of this research is to develop a conceptual model to study the relationships between collaborative commerce tools adoption, collaborative supply chain implementations, service innovations and the competitive advantages gained by manufacturing companies in Hong Kong/China and Malaysia. One challenge for governments in these countries is to ensure that their manufacturing industry remains competitive globally. This paper presents the first stage of our study which aims to develop a conceptual model which will then be empirically tested to formulate strategies that companies and government in Hong Kong/China and Malaysia can use to improve their competitiveness. This study aims to bridge the gap in the existing studies in innovation and supply chain management by firstly focusing on collaboration in supply chain management, and secondly in the service innovation in manufacturing companies.

Keywords
Service Innovation, Collaborative Supply Chain Management, Competitive Advantages

1. Introduction
One challenge for governments in these countries is to ensure that their manufacturing industry remains competitive globally. Manufacturing companies in Malaysia and China have mainly relied on having lower cost to attract investors while in Hong Kong, their more efficient manufacturing sector attracts investors. For the manufacturing industry to survive, they cannot simply just rely on lower cost. Instead, one way to attract investors is to have an efficient supply chain among the manufacturing companies and to have manufacturing sectors that are innovative. An efficient supply chain management can be achieved through the implementation of collaborative commerce or e-collaboration tools and a collaborative supply chain management. Together with supply chain management, the concept of innovation is also important to manufacturing companies. However, although past studies have focused on product innovations, there is an increasing emphasis on the service innovation of companies. Service innovation is gaining attentions by researchers especially in the field of Service Science, Management and Engineering (SSME). SSME is a term coined by IBM to describe Service Science, an interdisciplinary approach to the study, design, and implementation of services systems. As manufacturing companies such as IBM and RIM placed more emphasis on services, it is important to know if there is a relationship between the two key concepts in the manufacturing industry – supply chain collaboration and service innovation. There is currently no study that is known to us which have attempted to study on the relationships between supply chain collaborations and the service

innovation by companies. There are little studies which look at whether competitive advantages can be gained by manufacturing companies through service innovations.

There are several practical implications for this research. Firstly, the findings will create an understanding of whether collaborative commerce technologies implementation will improve the collaboration in the supply chain of companies. Furthermore, the relationships between collaborative supply chain management and service innovation will be examined, and whether service innovation will bring competitive advantages to manufacturing companies. In terms of theoretical contributions, this study bridges the gap in the existing studies in innovation and supply chain management by firstly focusing on collaboration in supply chain management, and secondly in the service innovation in manufacturing companies. This study will also examine manufacturing companies from both Hong Kong/China and Malaysia's perspective.

2. Background Study

Businesses today are getting more competitive. In order for many companies to stay competitive, businesses strived to improve themselves by creating better products and services for their customers. For many companies, one way to improve their products and services is through a good management of the supply chain [7]. A well planned and managed supply chain will bring benefits such as reduced inventories, increase inventory turns [25] [2], reduce cost, and increase customer service to the companies [19]. One current popular research area of supply chain is in the area of collaborative supply chain management. A collaborative supply chain enables the supply chain members to work together to improve the supply chain performance. Companies such as Hewlett-Packards, IBM, Dell and Procter & Gamble have collaborated with their supply chain partners and managed to gain many benefits from this collaboration [21]. Improvements in companies performances through the implementation of a collaborative supply chain management has been studied in the past [24], [18]; [12]. Moreover, with the advancement in Internet technologies, it is much easier for supply chain partners to collaborate. In the early 70s, companies have mainly been using technologies such as Electronic Data Interchange (EDI) to communicate with their supply chain partners. However, the limitations of EDI due to different standards, cost and only sending data through batches instead of real time means the adoption of EDI was not practical and slow. The 90s saw companies move towards B2B implementation. B2B facilitated supply chain partners in terms of their procurements through the use of web [10]. However, one of the main technology enabler of collaborative supply chain is through collaborative commerce tools [10].

Gartner Group defined collaborative commerce as a set of electronically-enabled collaborative interactions between an enterprise, its suppliers, trading partners, customers and employees. Collaborative commerce leverages the Web to create and maintain an interactive business community of employees, trading partners, suppliers and customers. This real-time Internet connectivity enables data, intellectual capital, human resources and processes that were once considered internal to be shared and used by the collaborative community at large [13]. It involves the dynamic, Web-enabled exchange of information and ideas between trading partners and within enterprises to maximize product design and development, supply chain operations and manufacturing processes. The implementation of collaborative commerce will help facilitate what is known as a collaborative supply chain. In a collaborative supply chain environment, the supply chain members work together, share important information, and collaborate on activities efficiently and effectively [13]. A collaborative supply chain is defined by [15] as the cooperation by firms which are independent but related to share resources and capabilities to meet their customers' needs.

The study of collaborative commerce tools is not something entirely new. Studies from [7], [9] have focused on the factors affecting the adoption of collaborative commerce tools. However, although these studies have focused on what influence the adoption of collaborative commerce, these studies did not address the issue of whether the adoption of collaborative commerce will improve the level of collaborations in the supply chain. Furthermore, given that there are various types of collaborative tools; will an increase in a particular tool significantly improve the level of collaboration in the supply chain? This is one issue that has not been addressed by many past studies.

Although supply chain management is an important topic for companies, in particularly the manufacturing companies, there is an increase in the trends for manufacturing companies to focus not only to improve their production performance through supply chain management, but also to improve their level of innovation, especially in service innovation. The study of innovation in companies, in particular, manufacturing firms, is not something new. Innovation in companies, especially in the manufacturing companies, has been studied by past researchers such as [11], [17] and [20]. Innovation is defined as the process of taking new ideas effectively and profitably

through to satisfy customers [1]. Innovation has received many attentions as it has a crucial role in securing sustainable competitive advantage for companies [23].

Traditional manufacturing companies have now paid more focus on service operations and service innovation rather than just technology innovation. The implementation of service innovation will also help improve a company's competitive advantage [6]. The areas have attracted many interests from academics and the term Service Science, Management and Engineering (SSME) have been coined by IBM. SSME aims to study the multidisciplinary area of service, business and engineering. The area of SSME has gained popularity and many universities have even offered courses which included SSME as either a subject or an area of study. Universities such as UC Berkeley, North Carolina State University, Carnegie Mellon, and University of Sydney have developed interests and offered courses and research projects in this field. However, the study of innovation in the past has primarily being focused in the manufacturing companies although innovation itself can take place in products, services, production processes and management systems [14]. One of the examples of study of innovation related to primarily the manufacturing companies lie with the study of TQM and its relationships with innovation. Such studies have been conducted by past researchers such as [14], [17], [26], [20], [5], [4]. However, it should be noted that although TQM and innovation are important for manufacturing companies, hence the number of past studies in this area, supply chain management is also an important area for the manufacturing companies. As supply chain partners collaborate together in the supply chain and share information such as the products information, customer requirements, designs and so forth, the question as to whether the collaboration in supply chain will have an impact on innovation in companies. [27] stated that if companies collaborate in their supply chain, it is able to speeds up innovation. Innovation, in particular service innovation, is also an important area which not only for the service industry, but also for the manufacturing industries as well. Service innovation is an emerging discipline that was first coined by IBM. Service innovation aims to use science and engineering to support knowledge workers within the complex service environments through technological architectures which is knowledge centered, and at the same time ensuring the workers are managed towards maintaining and developing knowledge driven value add [3], [16].

Although TQM and supply chain management practices can improve manufacturing processes, there is a limit to what can be achieved by continuously improving manufacturing, delivery, customer and general service support systems [16]. Most western companies such as IBM have now tried to develop services based on their products in order to differentiate value that will act as bulwark against products which have lower price. [16] stated that although manufacturing processes can be improved, the law of diminishing returns would eventually occurred. Examples of service innovation in manufacturing companies include RIM which makes money through monthly subscription fees rather than from selling Blackberries, Roll Royce which rents airplane engines to airlines instead of selling the engines. Even though China has grown rapidly in recent years through its low-cost manufacturing strategy, they are already looking to move away from reliance on such a low-margin, capital-intensive business. India for example, is also continuously moving upward on the value chain.

As companies aim to improve its service innovation, like past studies on product innovation, it is important to see if the management of supply chain, in particular the collaboration in the supply chain will allow manufacturing firms to improve their service innovation. For example, in a collaborative supply chain, there will be communication and sharing of information between individuals or groups across the supply chain. As information are communicated and share, it will lead to the discovery of ideas, which is the basis for innovative service [27]. [27] also stated that the collaboration supported by IT applications which allow teams to visually collaborate in a seamless exchange of ideas and discoveries will lead to breakthrough innovations.

Although the relationships between collaborative commerce tools and supply chain collaborations have been proposed, as well as the supply chain collaboration and the service innovation of companies, so far there has been limited or not studies empirically to investigate these relationships. Countries such as China and India aim to move towards service innovation and supply chain management, such research will enable these countries' manufacturing companies to stay competitive. This study also aims to investigate whether there are any competitive advantages obtained when companies have achieved innovation in their service through supply chain collaboration.

3. Justification of proposing a comparative study

In this proposed research, a comparative study between Malaysia and Hong Kong/China is proposed for a few reasons. Firstly, both countries are located in Asia and when considering supply chain collaborations, it will be

interesting to see how the culture of these countries will hinder the sharing of information in the collaborative supply chain. Such recommendations have been made by [8]. Secondly, although there are studies of service innovation in China [11], there is no studies which have attempted to study service innovation and supply chain collaboration in Hong Kong/China and Malaysia. Thirdly, we also believe that this research adds to the growing body of literature in the area of supply chain collaboration and service innovation. A comparative study between Hong Kong/China and Malaysia is timely because these countries compete with each other directly for foreign direct investment in the manufacturing sector. Both Hong Kong/China and Malaysia are considered as important countries in Asia. They also have an internationally competitive business environment as well as having a diversified industrial base. These countries also contrast each other in terms of population. Hong Kong has a population of 7 million people over 1104 per square kilometer; Malaysia on the other hand has a total population of around 20 million people distributed between the comparatively urbanized peninsula and the less developed states of Sabah and Sarawak [22]. China on the other hand, is the world's most populous nation with 1.3 billion people.

Lastly, we look at Malaysia, China and Hong Kong, it provides a good overview of how an economy can progress from the manufacturing industry to a service industry. Hong Kong's economy has relied mainly in the manufacturing sector in the 70s. From the 80s to the 90s it is finance. However, service industry is now the major economy contributor in the Hong Kong economy. Both China and Malaysia's government however, have made them into a highly competitive manufacturing and export base countries. However, one challenge with the Malaysia's economy is that its manufacturing sector is losing its competitiveness when compared to countries such as China and Vietnam. Therefore the Malaysian government is increasingly asking the manufacturing companies to move up their value chain and focuses on services and improving their supply chains management. The Chinese economy however, is still heavily dependent on the manufacturing sector, but has shown by city such as Hong Kong and even country like India, in the long term, the long term strategic plans for the Chinese economy will be moving towards services. Such a comparative study will allow us to propose a model which fits for economies that are in various stages of development.

4. Research Model

Based on the literature, the current research model is presented in Figure 1.

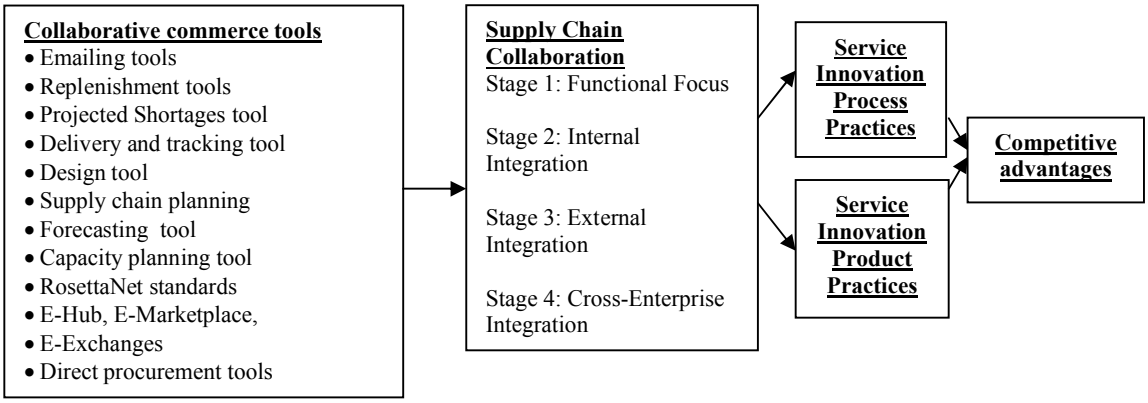

Figure 1.0 Research model

4.1 Propositions for research model

Based on the model above, the following propositions are proposed:

Proposition 1: There is a significant relationship between collaborative commerce adoption and supply chain collaboration of manufacturing companies.

Proposition 2: There is a significant relationship between the level of supply chain collaboration and the service innovation process practices of manufacturing companies.

Proposition 3: There is a significant relationship between the level of supply chain collaboration and the service innovation product practices of manufacturing companies.

Proposition 4: There is a significant relationship between Service innovation process practice and the competitive advantages for manufacturing companies in Hong Kong/China and Malaysia.

Proposition 5: There is a significant relationship between Service innovation product practice and the competitive advantages for manufacturing companies in Hong Kong/China and Malaysia.

5. Implications of research

Tables There are several practical implications of this research. For Hong Kong, its main economy contribution is from the service industry. Given the importance of the service industry to Hong Kong, in order to remain competitive, the Hong Kong's service industry needs to innovate continuously. The research findings will assist Hong Kong companies to decide and form strategies on how to improve their service innovation, and present the analysis to them if there is a relationship between the service innovation and competitive advantages achieved by companies in Hong Kong. In terms of the manufacturing companies in Hong Kong, China is one of their main trading partners. Thus the study will show how Hong Kong and China can improve their supply chain through collaborative commerce tools implementation and forming a collaborative supply chain. The results will also help decision makers from both countries to form strategies on how they can collaborate in their supply chain and whether the collaboration in supply chain which often involves knowledge and information sharing will improve service innovation. For Malaysia, the results will also help them to improve their supply chain management as well as focusing on service innovation, which is what the Malaysian government is focusing so that the nation can become a developed country by 2020. Although these countries compete with each other for foreign investments, they are also trading partners. In this connection, the results will also help companies from Hong Kong/China and Malaysia to improve their overall supply chain management as well as their innovativeness in services.

In terms of theoretical contribution, the model developed by this research contributes to the growing literature in the field of supply chain management and service innovation. Although supply chain management and its relationship with service innovation has been proposed by researchers such as [16], there is no empirical analysis which aims to establish the relationships between these two areas which are so important for the manufacturing companies. Furthermore, most studies on supply chain collaborations have mainly been conducted in western countries and this study extends their studies to developing and Asian economies. Lastly, although the concept of SSME has been proposed by IBM and is an emerging area of research for researchers from disciplines such as IT, Engineering and Management, this will be one of the few empirical studies which looks at service innovations from countries with various stages of development (e.g. Hong Kong being more developed in the service industry while Malaysian and China are still manufacturing based nations).

References

[1] Adams, M.E., Day, G.S., Dougherty, D., 1998, "Enhancing new product development performance: an organizational learning perspective", The Journal of Product Innovation Management, 15 (5), 403-22.

[2] Arora, V., Chan, F.T.S. and Tiwari, M.K., 2010, An integrated approach for logistic and vendor managed inventory in supply chain, Expert Systems With Applications, 37 (1), 39-44.

[3] Bitner, M. J. and Brown S. W., 2008 "The Service Imperative", Business Horizons, 50th Anniversary Issue.

[4] Chan, F.T.S., Au, K.C., Chan, L.Y. and Lau, T.L., 2007, "Using genetic algorithms to solve quality-related bin packing problem", Robotics and Computer Integrated Manufacturing, 23 (1), 71-81.

[5] Chan, F.T.S. and Chung, S.H., 2005, "Multicriterion genetic optimisation for due date assigned distribution network problems", Decision Support Systems, 39, 661-675.

[6] Chen, J.S. & Tsou, H.T., 2007, "Information technology adoption for service innovation practices and competitive advantage: the case of financial firms", Information Research, 12 (3).

[7] Chong, A.Y.L and Ooi, K.B., 2008a, "Adoption of Interorganizational System Standards in Supply Chains: An Empirical Analysis of RosettaNet Standards", Industrial Management and Data Systems, 108 (4), 529 - 547.

[8] Chong, A.Y.L and Ooi, K.B, 2008b, "Collaborative Commerce in Supply Chain Management: A study of adoption status in Malaysian Electrical and Electronics Industry", Journal of Applied Sciences, 8 (21), 3836

– 3844.
[9] Chong, A.Y.L, Ooi, K.B and Sohal, A., 2009, "The relationship between supply chain factors and e-collaboration tools adoption: An empirical examination", International Journal of Production Economics, 122 (1), 150 – 160.
[10] Chou, D. C., Tan, X., and Yen, D. C., 2004, "Web technology and supply chain management", Information Management & Computer Security, 12 (4), 338-349.
[11] Grawe, S.J., Chen, H. and Daugherty, P.J., 2009, "The relationship between strategic orientation, service innovation, and performance", International Journal of Physical Distribution & Logistics Management, 39 (4), 282-300.
[12] Humphreys, P.K., Shiu, W.K. and Chan, F.T.S., 2001, "Collaborative buyer-supplier relationships in Hong Kong manufacturing firms", Supply Chain Management: An International Journal, 6 (3 & 4), 152-162.
[13] Kim, S. and Smari, W.W., 2005, "On a collaborative commerce framework and architecture for next generation commerce", International Symposium on Collaborative Technologies and Systems, Missouri, 282-289.
[14] Lorente, A.R.M., Dewhurst, F. and Dale, B.G., 1999, "TQM and Business Innovation", European Journal of Innovation Management, 2 (1), 12–19.
[15] Narus, J. A. and Anderson, J., 1996, "Rethinking distribution: adaptive channels", Harvard Business Review, 74 (4), 112-120.
[16] Paton, R.A. and McLaughlin, S., 2008, "Services innovation: knowledge transfer and the supply chain", European Management Journal, 27 (2), 77-83.
[17] Prajogo, D.I. and Sohal, A.S., 2003, "The relationship between TQM practices, quality performance, and innovation performance International", Journal of Quality & Reliability Management, 20 (8), 901-918.
[18] Sahay, B.S., 2003, "Supply Chain Collaboration: the key to value creation", Work Study, 52(2), 76 – 83.
[19] Serve, M., Yen, D., Wang, J.-C. & Lin, B., 2002, "B2B-enhanced supply chain process: toward building virtual enterprise", Business Process Management Journal, 8 (3), 245-253.
[20] Singh, P.F. and Smith, A.J.R., 2004, "Relationship between TQM and innovation: an empirical study", Journal of Manufacturing Technology Management, 15 (5), 394–401.
[21] Simantupang, T.M. and Sridharan, R., 2005, "The collaboration index: a measure for supply chain collaboration", International Journal of Physical Distribution & Logistics Management, 35 (1), 44-62.
[22] Sohail, S., Bhatnagar, R. and Sohal, A., 2006, "A comparative study on the use of third party logistics services by Singaporean and Malaysian firms", International Journal of Physical Distribution & Logistics Management, 36 (9), 690 – 701.
[23] Tushman, Michael, and D. Nadler. 1986, "Organizing for Innovation", California Management Review, 28 (3), 74-92
[24] Vereecke, A. and Muylle, S. 2006, "Performance improvement through supply chain collaboration in Europe", International Journal of Operations & Production Management, 26(11), 1176-1198.
[25] Wadhwa, S., Bibhushan and Chan, F.T.S., 2009, "Inventory performance of some supply chain inventory policies under impulse demands", International Journal of Production Research, 47 (12), 3307-3332.
[26] Wiklund, H., Wiklund, B.K.P.S. and Edvardsson, B., 2003, "Innovation and TQM in Swedish higher education institutions – possibilities and pitfalls", The TQM Magazine, 15 (2), 99 – 107
[27] Williams, J.P., 2006, "Collaboboration in the supply chain speeds innovation", IndustryWeek.Com.