Concept and Practices of Cyber Supply Chain in Manufacturing Context

Anisha Banu Dawood Gani
Universiti Sains Malaysia, Malaysia

Yudi Fernando
Universiti Malaysia Pahang, Malaysia

INTRODUCTION

In an effort to improve business agility and responsiveness to changing market requirements, many manufacturing companies are decentralizing non-value adding activities by outsourcing. The anticipated benefits of outsourcing are to improve profitability and operating efficiency (Gonzalez, Gasco & Llopis, 2005), reduce capital investment (Lynch 2004), improve business focus (Baldwin, Irani & Love, 2001, Weerakkody, Currie and Ekanayake, 2003), enhance flexibility (Jennings 2002; Lynch 2004), and to gain a competitive advantage (Clott, 2004). This widely adopted business model only solves manufacturer's perennial priorities around cost, growth, risk sharing, and supply chain efficiency. However, achieving the appropriate level of supplier visibility is key, along with investment into greater technology enablement to have an agile and transparent supply chain.

KPMG International's Global Manufacturing Outlook (GMO) Report (2015) shows that while manufacturers are concerned about supplier performance and capacity, the visibility into supplier organizations remains surprisingly low. According to the report, only 14% of respondents (out of 386) claim to have complete supplier visibility into Tier 1 (manufacturers' direct suppliers), Tier 2 (Tier 1 supplier's supplier) and beyond. One of the primary condition for a supply chain to be effective is by integrating the members of the network to ensure an undisrupted information flow. Add transparency to the equation and it in its entirety becomes a requirement that is achievable by digitally integrating the supply chain, or in the course of this chapter, otherwise termed as the cyber supply chain (CSC).

The advancements in technology has been pivotal in transforming the physical supply chain into an integrated CSC. CSC provides tremendous advances in efficiency and effectiveness.(Linton, Boyson, & Aje, 2014). The benefits of digital integration and collaborations are realized through low cost but rapid transmission of information's which facilitates joint planning and reaction to events, in real-time, by all stakeholders. When integrated for manufacturing, data and information technologies bring intelligence and insight that enables fact backed-up decisions.

This chapter is intended to address this deficiency by comprehensively examining the concept and practices of CSC in a manufacturing context. It is also aimed to provide awareness into the nature of CSC risks and recommend best practices in implementing CSC. Due to the limited literatures pertaining to CSC specifically, this chapter has applied general supply chain management literatures to CSC context while duly differentiating the uniqueness, where applicable.

BACKGROUND

Manufacturing is one of the leading industries of the global economy and is projected to undergo a major transformation driven by power of digita-

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lization. Manufacturing industry's share of GDP has remained stable over the last 40 years. According to United Nations Industrial Development Organization (UNIDO), the total contribution of the entire manufacturing sector to GDP, measured as manufacturing value added (MVA), reached an all-time high of $9,228 billion in 2014. The MVA of developing and emerging industrial economies (DE IEs) for the same year increased 2.4 times from 2000, while their GDP doubled (UNIDO, 2015). Inarguably, manufacturing remains a key driving force of overall economic growth globally.

UNIDO Director General, Mr. Li Yong recognized that the technological change shall become one of the main drivers of long-term growth for the industry:

"In the coming decades, radical innovations such as the mobile internet, the Internet of Things and cloud computing are likely to revolutionize production processes and enhance living standards, particularly in developing countries", he envisioned.

These rising trends are promising evidence that the digitalization of manufacturing industry will dramatically transform the way companies operate in many areas – from Research & Development (R&D) efficiency and faster product launches to supply chain improvements, better operations services and more efficient processes. Oliver Wyman, one of the leading management consultancies in the world, predicts that the global annual margin impact of digital industry across discrete manufacturing in 2030 could be an estimated US$1.4 trillion (Oliver Wyman, 2016).

As these trends play out in a growing number of manufacturing sectors, the incumbents should concentrate on product innovations and core competencies. Non-core competency activities should be outsourced to suppliers who have the specialization and technological advantage to offer scalability. Therefore, the need for integration among supply chain partners becomes eminent for a seamless and dynamic collaboration. Consequently, CSC network too can be seen growing in tandem to the manufacturing sectors growth. Thus, it is not far-fetched to conclude that, organization that has a strong and secure CSC are likely to develop a competitive advantage among industry players.

Many researchers have published isolated literatures on the benefits of integrated supply chain (Richey, Roath, Whipple & Fawcett, 2010; Ajmera & Cook 2009; Gimenez & Ventura, 2005; Sabath & Whipple, 2004) its security risks (Boyson, 2014; Elzarka, 2013; Ma, Chen, Meng, & Yi, 2014; Micheli, Mogre, & Perego, 2014; Tummala & Schoenherr, 2011) and integration challenges (Awad & Nassar, 2010; Carter, Monczka, Robert, & Ragatz, Gary, 2009; Pagell, 2004). However, there is no evidence on the concept of CSC and its practices being covered holistically nor has it been attributed specifically to a manufacturing industry. Thus, this paper will answer research question "what is cyber supply chain?" and "how does cybercrime affect supply chain?"

LITERATURE REVIEW

There is a lack of clear definitions and understanding of supply chain management (SCM) in general (New, 1997; Lummus, Krumwlede & Vokurka, 2001; Mentzer et al., 2001; Kauffman, 2002). This problem remains despite a considerable growth in the number of published articles dealing with the topic since the mid-1980s (Stock and Boyer, 2009) due to the unavailability of a good SCM definition (Kathawala & Abdou, 2003). Furthermore, there is no widely accepted definition of related topics such as supply chain integration (SCI) and supply chain collaboration.(Näslund & Hulthen, 2012). However, Mentzer et al. (2001) proposed a broad definition that covers issues related to SCM which can be used to explain any specific discipline such as SCI and CSC. The definition suggested that SCM can be defined as the systemic, strategic