Role of Information Technology in Supply Chain Systems: Technology Coherence and Technology Determinism Perspectives

Vikram Bhakoo

University of Melbourne

Prakash Singh

University of Melbourne

Information technology is extensively used in the management and governance of supply chain systems. However, its role, value and impact is not fully understood and appreciated. Two competing theories have addressed this issue. Technology determinism suggests that the higher the level and usage of technology, the better the outcomes will be. On the other hand, technology coherence theory suggests that too much (or too little) technology results in sub-optimal outcomes, and that there is a 'right' level of technology which results in optimal outcomes. The two theories therefore provide different views on how much information technology is appropriate for the effective management of supply chain systems.

In this study, we revisited this issue through a study of the Australian retail industry. We conducted three case studies involving the supply chain systems of three key players in the Australian retail sector. Firm A is fully and vertically integrated, owning most factors of production from the warehousing of goods to retailing activities; Firm B is totally disintegrated, with its main role being a wholesaler and distributor; and, Firm C is partially integrated, with its main role being a retailer, and third party logistics (3PL) firms play a major role in the warehousing and distribution functions for this firm. The three firms therefore have developed different management and governance of their supply chain systems. However, all three are very successful companies, with all performing strongly and having dominant market share positions.

Our study revealed some interesting aspects as far as the level, type, complexity and sophistication of information technologies that are used all three supply chain systems. For Firm A, the technologies are mostly internally developed and highly consistent in terms of its usage throughout its supply chain system. In Firm B's case, there are many IT systems that are used, some that are very basic, while others are highly sophisticated. Firm B, not having control over all parts of its supply chain system, has had to deal with a complex array of systems. This has made it very difficult to operate in an efficient manner. For Firm C, the IT for managing many aspects of its supply chain system is provided by 3PLs who are specialists in the roles that they perform. Firm C uses contractual arrangements to obtain the benefits that IT can provide.

From a theoretical perspective, the case studies showed that both theories are at play within the three companies. All companies showed their supply chain systems are extremely reliant on IT systems, that this dependence is growing, the IT systems are becoming more and more sophisticated, complexity is increasing exponentially and that the supply chain systems face

considerable challenges to maintain and leverage the appropriate benefits from their IT systems. This suggests that technological determinism has ascendancy. However, there is evidence that technology coherence theory is also at play. This is because the three firms are always searching for ways to reduce their IT footprints, are developing IT architectures that attempt to reduce the proliferation of disparate IT systems, there is a strong philosophical desire to have high degree of integration through standard IT systems, and that in two out of three cases, there was evidence that a pre-determined 'right' level of IT was set and sought to be implemented throughout the extended supply chain systems. These suggest that firms in the supply chain systems were acting in ways that are in line with the predictions of technology coherence theory.

These findings suggest that the role of IT in supply chain systems is complex and multi-faced. Theoretically, instead of the two theoretical viewpoints being at odds with each other, our study suggests that the behaviour of players in most supply chain systems is such that the two theoretical viewpoints are in sync with each other, explaining different aspects of their use of IT systems. This study therefore informs and clarifies the debate about the use of IT systems for supply chain management purposes.