

Chapter 28

Information and Communications Technology (ICT) and the Supply Chain

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ABSTRACT

Information and communications technology (ICT) is an integral part of supply chain management (SCM) (Anderson, Britt, & Favre, 2007; Subramani, 2004). ICT supports SCM by enhancing supply chain efficiency, effectiveness and competitive advantage at strategic, tactical and operational management levels. Derived from extant literature on the application of ICT in SCM and ICT infrastructure sources, this chapter explores the significance of ICT in the business of SCM and describes the various ICT infrastructures deployed in aid of supply chain collaboration, integration and connectivity. While most related studies focus on organisational perspectives of ICT and SCM like benefits (Auramo, Kauremaa, & Tanskanen, 2005b), buyer-supplier relationships (Bakos & Brynjolfsson, 1993) and so on; the chapter presents a technological viewpoint of ICT and SCM. The chapter explores the function of ICT in SCM and proposes a classification framework of ICT in SCM.

INTRODUCTION

Globalisation, increased competition, and access to new [emerging] markets are contributory factors to the integration of business activities and practices as well as the need for effective and efficient supply chains and supply chain management (SCM) (Stevens, 1989). These sought after gains are a consequence of strategies and techniques that shorten product cycles while managing uncertainties and complexities (Davis, 1993). The application of information and communication technology (ICT) in business has evolved from specialist-manned mainframe systems restricted to computer rooms to smartphone and tablet users operating everywhere; automation of business processes to organisational transformation and value creation; intra-organisational systems to inter-organisational systems, and so forth. These de-

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velopments, proponents of the information age or digital economy, are gradually changing businesses, work activities, people and products and services.

In addition, the adoption of ICT is presumed to enhance effectiveness, efficiency, and competitive advantage, thus playing a significant role in business. Derived from extant literature on the application of ICT in SCM and ICT infrastructure sources, this chapter explores the significance of ICT in the business of SCM and describes the various ICT infrastructures deployed in aid of supply chain collaboration, integration, and connectivity. The chapter proposes a classification framework of ICT infrastructure in SCM, and is especially useful for supply chain managers and executives who lack incisive knowledge of the capabilities of ICT.

The current literature of ICT in SCM is somewhat fragmented and diverse. Some studies provide a broad understanding of ICT in SCM (Auramo, Inkiläinen, & Kauremaa, 2005a; Gunasekaran & Ngai, 2004), benefits (Auramo, Kauremaa, & Tanskanen, 2005b), importance (Moharana, Murty, Senapati, & Khuntia, 2011), planning requirements (Holland, Lockett, & Blackman, 1992). Other address ICT roles in buyer-supplier relationships (Bakos & Brynjolfsson, 1993; Chae, Yen, & Sheu, 2005; Subramani, 2004); specific supply chain functions (Helo & Szekely, 2005); perceived benefits or impacts using specific ICT (Dedrick, Xu, & Zhu, 2008; Subramani, 2004). Studies also address information sharing and flow strategies (Vanpoucke, Boyer, & Vereecke, 2009), sharing practices (Singh, 1996; Zhou & Benton, 2007); sharing impacts in specific SC activities like inventory management and collaborative planning (Cachon & Fisher, 2000; Sherman, 1998).

Nair et al. (2009) present a narrative catalogue of ICT tools; McDonnell et al.'s (2004) review of the role of ICT focuses on functional and enterprise applications; Helo and Szekely (2005) focus on logistics information systems. The limited empirical value and frequency of innovations and change makes studies addressing ICT infrastructure scarce; when available, such empirical studies evaluate organisational aspects of a particular technology in a particular setting or supply chain activity. The scarcity of comprehensive studies on ICT infrastructure or technological capabilities motivated this chapter which takes an all-inclusive view of ICT capabilities in SCM alongside a catalogue of related ICT infrastructure. The chapter is presented in four parts commencing with a brief background introduction to supply chain and SCM. The role of ICT in supply chain collaboration, integration and connectivity are discussed next. This is followed by a catalog of ICT infrastructure deployed towards collaboration, integration and connectivity applications alongside Internet applications in SCM. The section closes with a classification framework of ICT in SCM. The conclusion is preceded by a preview of emergent ICT developments.

SUPPLY CHAIN MANAGEMENT

Supply Chain

As a business environment, the supply chain is “the connected series of activities which is concerned with planning, coordinating, and controlling material, parts, and finished goods from suppliers to customers” (Stevens, 1989) that comprises of material, information, and financial flows (Sweeney, 2006). This unidirectional flow of supply chain activities is refuted by the service-dominant logic (SDL) where producers and consumers co-create value (Vargo, Maglio, & Akaka, 2008). Thus, the alternative definition, “a network of multiple businesses and relationships” (Lambert, Cooper, & Pagh, 1998), may be more appropriate. While Lambert’s definition categorises businesses as supply chain participants, Mentzer’s

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