



# Information technology for competitive advantage within logistics and supply chains: A review



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## ABSTRACT

This paper offers a systematic review of the literature on the use of information technology (IT) in logistics and supply chain management to achieve competitive advantage. While IT has revolutionized traditional logistics and supply chains to achieve numerous benefits such as increased efficiency and responsiveness, it is not still clear to what extent IT has contributed to competitive advantage within logistics and supply chains. This paper contributes to this debate by: (i) reporting the literature on the role of IT in achieving competitive advantage within logistics and supply chains based on the linkages between 'adaptation', 'alignment', and 'agility', (triple A's) (Lee, 2004), and (ii) discussing managerial implications and identifying future research directions.

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## 1. Introduction

Contemporary logistics and supply chains have to deal with multiple challenges from urban and rural demands, such as how to make use of competitors as collaborators, increasing cross channel visibility and incentives, tradeoffs between analytics and if/then modeling, complexity optimization, ability to allocate indirect spend, varying metric targets and incentives aligned to desired results (e.g. Fawcett et al., 2011; Gunasekaran and Ngai, 2011). Practitioners need to deal with challenges such as how to manage complexity much closer to the customer and how logistics activities can support these, especially how logistics managers can function as the commanding officers of the information control tower (Cegielski et al., 2012; Hazen and Byrd, 2012). To meet those challenges, it is necessary to devise strategies and value differentiators with the support of information technology (IT) (e.g. Ketchen and Hult, 2007; Ngai et al., 2011).

Literature suggests that IT has revolutionized traditional logistics and supply chains to achieve numerous benefits such as increased efficiency and responsiveness (Gunasekaran and Ngai, 2004, 2011; Subramani, 2004; Prajogo and Olhager, 2012; Subramanian et al., 2014; Gunasekaran et al., 2015a, 2015b). However, while on one hand supply chain challenges and practitioners' expectations in terms of achieving competitive advantage through the use of IT solutions are enormous, on the other hand it is not clear to what extent IT has contributed to competitive advantage within supply chains (Grover and Kohli, 2012; Wang et al., 2012; Fosso-Wamba et al., 2015).

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To address this gap, this study reviews systematically the literature from 2004 to 2014 on the use of IT in logistics and supply chains to achieve competitive advantage. We conceptualize the use of IT within logistics and supply chains to achieve competitive advantage based on the characteristics of adaptation, alignment and agility (Lee, 2004). Our paper is informed by the following questions: Does IT enable supply chains: (i) to accommodate market changes – that is, to become adaptable (Lee, 2004)? (ii) To incentivize supply chain partners to improve the supply chain – that is, to be aligned (Lee, 2004)? (iii) To rapidly respond to short-term changes in demand or supply – that is, to be agile (Lee, 2004)?

Our contribution lies in (i) arguing for and reporting the literature on the role of IT in achieving competitive advantage within logistics and supply chains based on ‘adaptation’, ‘alignment’, and ‘agility’, (triple A’s) (Lee, 2004) and (ii) discussing managerial implications and identifying future research directions.

The rest of the paper is organized as follows. Our classification scheme used to review previous studies is discussed in Section 2. The methodology adapted to select the sample and collect relevant studies are explained in Section 3. Adaptation, alignment and agility related studies are described in Section 4. The theoretical and managerial implications of our study are presented in Section 5 and the summary of the review, limitations, and future research directions are outlined in Section 6.

## 2. Classification scheme

To gain competitive advantage supply chains need to develop ‘agility’, ‘alignment’ and ‘adaptation’ (triple-A’s) (Lee, 2004). Supply chain ‘agility’ refers to quick response of supply chain to short term changes because of uncertainties both in the upstream and downstream supply chains. It is, hence, related to the ability of the supply chain to deal with unexpected changes in market demand and to have the appropriate capabilities to transform these changes into opportunities (Swafford et al., 2008), enabling the supply chain to gain competitive advantage in a turbulent and volatile environment (Swafford et al., 2006, 2008; Ngai et al., 2011; Blome et al., 2013; Yusuf et al., 2014; Brusset, 2016). Supply chain ‘alignment’ can be defined as the process integration of several members in the supply chain to achieve better performance. Gattorna (1998) has highlighted the importance of alignment between firms’ supply chain strategies and those of their external and internal partners. Such view has been highlighted in later studies (e.g. Johnson and Scholes, 1999; Christopher et al., 2004; Pagell, 2004; Baier et al., 2008; Wong et al., 2012) where it was also noted the benefits in terms of enhancing customer value and gaining competitive advantage. At the same time, however, scholars have underlined the ongoing challenges in achieving alignment and the need to further investigate how alignment can be achieved and its performance implications. Finally, supply chain ‘adaptation’ enables the supply chain to evolve (adapt) according to market changes in terms of strategies, products and technologies (Lee, 2004). Swafford et al. (2006) define adaptation as “the ability to change from one state to another state in a timely and cost effective manner” (p. 174). Later studies such as Schoenherr and Swink (2015) have underlined the importance of supply chain adaptation as a dynamic capability (Teece et al., 1997) that can assist product designers in innovative thinking (Pavlou and El Sawy, 2011) through “providing a context for the development and refinement of a firm’s product innovation capability” (p. 909) and reducing product risk. Adaptation, being a dynamic capability, enables first mover advantages in the market place (Eisenhardt and Martin, 2000) and hence achievement of competitive advantage.

However, Eckstein et al. (2015) have suggested that theory on the effects of supply chain adaptation and agility remain fragmented and apart from few exceptions (Lee, 2004; Ketchen and Hult, 2007) the majority of scholars use the terms agility and adaptation interchangeably (Gligor et al., 2013; Schoenherr and Swink, 2015), resulting in a lack of solid research on adaptation (Eckstein et al., 2015).

In this paper we aim to contribute to the debate on the role of IT within supply chain management and the achievement of adaptable, aligned, and agile supply chains (Lee, 2004). To this extent, we use the triple-A (Lee, 2004) framing, which has been used in order to propose a supply chain performance model that incorporates the triple-A classification as antecedents to supply chain performance and supply chain performance as antecedent to organizational performance (Whitten et al., 2012). Furthermore, the triple-A framing has been used by Eckstein et al. (2015) to empirically investigate how supply chain agility and adaptability affects cost performance and operational performance, whereas in a recent study Dubey and Gunasekaran (2016) have used this framing to characterize sustainable humanitarian supply chain design. Therefore, the aforementioned use of the triple-As framework by scholars to investigate the achievement of competitive advantage within supply chains coincides with our aim to study the achievement of competitive advantage in supply chains through the use of IT. So far literature has highlighted the role of IT in e.g. achieving supply chain integration and performance (Prajogo and Olhager, 2012; Liu et al., 2016) and supply chain and firm performance (Qrunfleh and Tarafdar, 2014) drawing on the wider argument that information measuring and monitoring is key to successfully managing the supply chain (Gunasekaran and Ngai, 2004). IT allowed collaboration and sharing of data and information in order to identify shifts in the market and take appropriate actions such as moving facilities, changing suppliers, and outsourcing (Ketchen and Hult, 2007). Ngai et al. (2011) have illustrated the role of IT in achieving agile supply chains, in terms of utilizing IT to enable sensing and response capabilities, sharing information and knowledge among functions and supply chain members’ allowing them to collaborate, respond to rapidly unforeseen events and market changes, and creating a virtual supply chain.

Since the key publication of Garr (2003) suggesting that IT alone cannot create strategic value due to wide availability and affordability of data storage, data processing and data transport, researchers investigate the role of IT with caution, and have suggested that IT per se is unlikely to generate value, but only when complemented by organizational and human resources

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