



Integration of logistics and cloud computing service providers: Cost and green benefits in the Chinese context



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ABSTRACT

Drawing on the innovation diffusion theory and data from 236 Chinese small and medium-sized logistics service providers (SMLSPs), this study developed and tested a conceptual model for empirically examining the green and cost benefits of integration between cloud service providers and SMLSPs in the Chinese context. The study posits that the perceived green and cost benefits drive the need for cloud computing (CC) adoption by Chinese SMLSPs. The results indicate that Chinese SMLSPs are attracted by CC to reduce cost in a short term and to gain sustainability through green benefits in a long term. The study extends CC capabilities and enterprise integration literature in the context of logistics services.

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1. Introduction

Logistics services are gaining prominence in China as demonstrated through its essentiality and customer expectation. The essentiality of logistics services in China can be observed from three major aspects: (i) 76% of the multinational firms are sourcing material from China (PwC, 2012); (ii) the exponential growth of trading through ecommerce, RMB 4.5 trillion at the end of 2012 (CRG, 2013); and (iii) freight transportation contributions to the national economic growth (Mesa-Arango and Ukkusuri, 2013). However, customer expectations (business to business and business to consumer) from the logistics service providers are increasing on a multifold basis. Recent study suggests that only 24% of customers are satisfied with the logistics services provided in China, whereas 74% of customers report that the logistics service providers are of average or poor quality due to complaints such as loss, theft, damage and long delays during peak times (PwC, 2012; Mir, 2012). In terms of constituent of logistics service providers complained, the majority of them are local Chinese small or medium-sized logistics service providers (SMLSPs) with the remaining being foreign logistics service providers (FLSPs) such as DHL, FedEx, TNT and UPS (FBIC, 2012; KPMG, 2011; PwC, 2012). The decline in logistics service quality is mainly associated with SMLSPs and attributable to their lack of resources, technologies and comprehensive network coverage. It is evident that logistics services are important and their growth is substantial, but their importance and growth does not satisfy the customer expectations.

To improve service quality, Chinese SMLSPs need to enhance their technologies and the related resources. Since these local service providers are of small and medium size, and scattered distribution, the only way to achieve the desired service quality is to integrate with external service providers. One of the newer ways to integrate is to utilize the innovative cloud

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computing (CC) which will enable the logistics service providers to substantially improve their services and achieve optimal planning and reliable day-to-day operations, with less investment (Gil-Saura et al., 2010; Li, 2013).

The common reasons for the reluctance to store business information on the cloud involve security and privacy of storage and computation (Lin and Chen, 2012). Early research attempts were only about CC usage and the issues related to work capability, security, privacy and trust (Gil-Saura et al., 2010; Zissis and Lekkas, 2012; Wei et al., 2014). Very few attempts have been made to study the influence of CC on supply chains and it was stated that an empirical study is essential to understand the CC adoption in logistics (Carbone and Stone, 2005; Crujissen et al., 2007; Lin and Chen, 2012). Need for integration through new innovative technologies depends on the long-term and short-term benefits and varies between developed and emerging economies. The short-term benefits are related to economic aspects such as costs, relative advantage etc., whereas long-term benefits to efficiency and green aspects such as empty mileage, on-time delivery and poor vehicle routing.

To best of our knowledge there has been no effort to discuss the need for integration of logistics service providers and CC service providers in the emerging economy context. The paper attempts to understand the need for service providers' integration and its short and long-term benefits in the emerging economy context. The major contributions of the paper are to develop the benefit analysis model based on the innovation diffusion theory (IDT) and to validate the cost and green benefits of CC integration perceived by Chinese SMLSPs.

The rest of this paper is structured as follows. Section 2 presents the review of the relevant literature on CC computing and logistics service integration. Section 3 indicates the theoretical background for the study, while Section 4 presents the research model and hypothesis development. Section 5 is the research methodology, Section 6 discussions, and finally Section 7 provides the concluding remarks and implications of the study.

2. Literature review

2.1. Cloud computing adoption challenges

CC is a virtualized IT resource that allows businesses to access software applications, other manipulative data services, and data storage and processing power over the Internet. Compared with the traditional IT solutions, CC offers clear superior advantages such as dynamically scalable IT capabilities which allow users to increase and decrease their demand and usage as and when required and, most importantly, the zero initial fixed cost investment requirement for its usage (Grossman, 2009; Barnatt, 2010; Lin and Chen, 2012). This is in addition to the ease of use characteristics of CC which comes from the fact that its adopter is completely free from the running, maintaining and updating hardware, software and other IT-related infrastructures (Grossman, 2009; Lin and Chen, 2012).

Any new technology adoption has both advantages and disadvantages. Besides CC advantages, however, its adoption and growth encountered barriers. Literature indicates that security, trust and privacy concerns due to lack of control and/or visibility over the physical infrastructure are the major barriers to CC adoption (Lin and Chen, 2012). The security aspect can be fixed through technological means that include use of firewalls, intrusion detection and prevention systems, authentication, authorization and encryption, amongst others (Barnatt, 2010; Gil-Saura et al., 2010; Bayrak, 2013). The trust aspect is more difficult to establish, as it is dependent on vendors' accumulated past experiences and demonstration of reputation, reliability, credibility, integrity and transparency over a given period (Gil-Saura et al., 2010; Zissis and Lekkas, 2012; Wei et al., 2014).

Other than digital challenges, a major reason for small and medium enterprises' (SMEs) reluctance to outsource their IT operations is that its own existing IT resources were established with heavy investment (Misra and Mondal, 2011; Bayrak, 2013). The switching cost to a new system for SMEs who already face severe financial constraints is another major impediment. Furthermore, while most SMEs may want to try out such IT systems before investing in them, most vendors lock firms into a contract during the trial period (Bayrak, 2013). There is also the problem that firms are limited to the vendor-determined applications without options. The major issue here is that, generally, if a firm is not very large, cloud service providers may be unwilling to provide the highly customized Service-oriented-Architecture (SOA) and application programming interfaces (APIs) it required to operate (Misra and Mondal, 2011; Bayrak, 2013). Furthermore, small firms may face technical difficulties such as compatibility and perceive difficulties in integrating CC with existing IT systems (Misra and Mondal, 2011; Bayrak, 2013). These difficulties arise from the fact that small enterprises suffer from severe human cost and expertise needed to facilitate the necessary operational integration with new and innovative systems such as CC (Misra and Mondal, 2011; Bayrak, 2013).

Even though CC adoption has few challenges, the above challenges have been compensated by CC vendors in terms of technological and expertise know-how in IT security and data protection when compared to the most in-house systems (Barnatt, 2010). In contrast to the US and other developed western nations that are increasingly being powered by CC services, China has lagged behind in the widespread adoption of CC due to what industry insiders' referred to as lack of trust, unclear standards and unfriendly regulatory regime to different players. In China most local Chinese cloud vendors have limited capacity and are only able to provide services to small and/or startup firms with not more than 20 employees (ChinaDaily, 2014).

CC adoption is growing substantially in the logistics and transportation service sector (PwC, 2012; Oliveira et al., 2013). This is because CC solutions provide logistics service providers (LSPs) with capabilities to effectively organize and execute basic handling, transportation, freight forwarding and customs clearance, warehousing, distribution and other value-added

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