

Chapter 33

A Virtual Supply Chain System for Improved Information Sharing and Decision Making

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ABSTRACT

Integrated supply chain information systems (ISCIS) face various barriers including lack of alignment between IT and business model, security and privacy concerns, behavioral and cultural issues, and heterogeneous software applications. This paper develops an architecture for ISCIS and validate it by interviewing experts. The proposed architecture is an intermediary to integrate in-house information systems as well as cloud-based systems across distributed heterogeneous supply chain networks. The developed ISCIS architecture works in three layers of data, processes, and knowledge and facilitates the alignment of information systems and decision making with business.

INTRODUCTION

To succeed today, businesses need fluid integration of mobile and cloud, partners and suppliers, developers and big data, and security and governance. (Wittmann, 2014, p. 4).

Integrated interorganizational information systems (IS) facilitate supply chain integration (SCI) and improve supply chain decision making (Saeed, Malhotra, & Grover, 2011) which in turn leads to enhanced supply chain performance (Devaraj, Krajewski, & Wei, 2007). However, achieving integrated supply

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chain information systems (ISCIS) is an extremely challenging task because of the inherent complexity of interorganizational relationships and the volatility of business environment (Choi & Krause, 2006).

The ISCIS challenge is partially due to the heterogeneity of IS that are used across a supply chain. Since no individual business solution can possibly afford to meet all the organization's needs, organizations usually implement several local solutions to augment their core business systems. Many of these local solutions and in-house systems are customized to address specific business purposes. The integration of all these systems is complicated and challenging due to their mismatch. Recently, cloud-computing services became popular and added to the existing mishmash of organizational systems. To maximize the overall effectiveness of intra-organizational systems, organizations rely on integration tools to marry the distributed local and cloud-based systems with the core business systems. Organization-wide integration is crucial for business performance (Vallet-Bellmunt & Rivera-Torres, 2013) but is a complicated multi-dimensional task which demands sophisticated integration tools (Williamson, Harrison, & Jordan, 2004). Given the complexity of organization-wide integration, it is obvious that much more sophisticated concepts, frameworks, and tools are required to accomplish such systematic integration across supply chain (SC) members (Fawcett, Osterhaus, Magnan, Brau, & McCarter, 2007; Narasimhan & Nair, 2005). A SC is composed of several organizations with individual and often conflicting goals, and different structures and operations. Integration across SCs must therefore address such concerns as strategic alignment and privacy requirements in a totally different level.

Despite the crucial role of IS in SCI, there is no comprehensive framework available on the ISCIS (Gunasekaran & Ngai, 2004; Palma-Mendoza, Neailey, & Roy, 2014). The authors performed an exhaustive search using different keywords and journals to find previous studies aimed at developing designs and frameworks for ISCIS, but the results showed a gap in this field. The current paper addresses this void by proposing an architecture to combine IT tools and methodologies that are required to achieve SCI. This work is constructed on a successful consulting work that authors did in a holding of 63 companies involved in production, packaging, and distribution of food and beverage products. Given that these semi-autonomous subsidiary companies are poorly inter-connected and have different size, geographical location, and cultures, the holding company triggered an initiative to harmonize SC partners through better-integrated IS. The holding company had previously undertaken several solutions including SAP/R3 in the subsidiary companies to improve collaboration and visibility throughout the chain, but such initiatives failed due to resistance and extent of work. This paper is an outlook on the project "development of a virtual supply chain system" for integration of business processes and IS. The current paper discusses the first layer of the proposed architecture design and does not address further details such as applications, processes, and data flows.

In the next section, the problem and its challenging facets are discussed and the relevant literature is reviewed. In the third section, the available SCI tools are explored and an architecture is developed. The fifth section reviews the measures taken for the validation of the developed architecture. Finally, conclusions are presented in section 6.

SCI AND EXISTING CHALLENGES: LITERATURE REVIEW

The goal of SCM is to enhance overall performance by integrating internal functions of companies and aligning them with that of suppliers, distributors, customers, and other SC players (Kim, 2009). A successful integration should result in a seamless SC with fully-integrated physical, financial, and

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