Using the balanced scorecard in assessing the performance of e-SCM diffusion: A multi-stage perspective

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A B S T R A C T

Electronic supply chain management (e-SCM), a specific form of inter-organizational systems, has generally regarded as one of the major strategies to create competitive advantage. The diffusion of e-SCM among trading partners is critical for its final successful use and accordingly, performance impact. However, the diffusion process is complex and dynamic in nature and involves an evolutionary property across time. Innovation diffusion theory (IDT) is defined for effectively exploring diffusion process with multiple stages. Moreover, prior studies have found inconclusive results of IT-enabled performance due to inadequate measures. The balanced scorecard (BSC) with the extension to SCM, incorporating four performance perspectives, is appropriate for overcoming this problem. Grounding on the IDT and BSC, this study proposes a novel framework for exploring the relationships between a stage-based structure and the BSC. Data are collected from a questionnaire survey. The results indicate that there are significant differences between external diffusion and the two earlier stages, adoption and internal diffusion, on the four BSC perspectives. Furthermore, all of the four perspectives are well realized at external diffusion stage. Implications for managers and scholars are discussed.

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1. Introduction

Business organizations face a more complex and competitive environment than ever before in the Internet era. Many organizations are gradually considering the importance that they must compete, as part of a supply chain against other supply chains, to quickly reflect the customers’ changing demands. Supply chain management (SCM) is an important discipline that enables business partners to integrate their products/services effectively and to build a long-term relationship eventually [24]. SCM can be extensively defined as effective coordinations on material, product, delivery, payment, and information flows between enterprises and trading partners [68,74]. Therefore, SCM discipline is complex and dynamic while involving various work flows across inter-organizational boundaries. The support of information technology (IT), in particular, the Internet and communication technologies, is therefore imperative for making SCM practice feasible [41,81,82]. Electronic SCM (e-SCM) is defined as the physical implementation of SCM process with a support of IT while also attempting to make a distinction from the concept of SCM.

However, e-SCM, although still considered to be in its earlier stage and with a high reported failure rate, is nonetheless believed to be the key to the final success of SCM process [55]. The issue of e-SCM diffusion between partners is complex and dynamic in nature and involves an evolutionary property across time. Previous research has discussed a single decision of adoption in the innovation based on relevant theories, such as technology acceptance model (TAM) [7,11], theory of planned behavior (TPB) [76,80], and their many extensions [75,79]. In contrast, innovation diffusion theory (IDT) is a theory to understand the diffusion of innovations across time [65]. According to the IDT, researchers have presented many models concerning information system (IS) innovation. These models were often addressed as a stage-based process, such as initiation, adoption, and implementation stages [21,22,61]. Specifically, some studies have empirically examined the diffusion of inter-organizational systems (IOS), such as electronic data interchange (EDI), supply chain technology, and e-business, using a stage-based analysis [63,64,85]. An example defines a three-stage structure, adoption, internal integration, external integration, in a diffusion of EDI among small organizations [29]. Therefore, a stage-based analysis may further capture the changes of various diffusion stages in e-SCM implementation over time. Next, as e-SCM increasingly becomes popular, it is necessary to systematically examine its performance impact on the organization [56,57]. The stage-based analysis can provide different degrees of performance impacts on different diffusion stages in a dynamic manner [63,64]. However, little research on deploying IOS has discussed the performance impact in a diffusion perspective among partners. Most studies have focused on the perspective of adoption behaviors, such as intention to use or actual use, across different diffusion stages [21,73]. The enabling role of e-SCM diffusion in organizational
2. Literature review and hypotheses development

Based on the above discussion, Fig. 1 provides a pictorial depiction of this research framework. The following paragraphs discuss the theoretical foundation of this framework and development of hypotheses.

2.1. SCM and e-SCM

In the contemporary business, SCM is one of the major strategies to enhance organizational efficiency and effectiveness, and ultimately achieve competitive advantages [24,78]. Moreover, the development of business-to-business (B2B) commerce has spotlighted the role of SCM in the modern digital economy [30]. The definition of SCM is developed and used by The Global Supply Chain Forum (GSCF) as “…the integration of key business processes from end users through original suppliers that provide products, services, and information that thus add values for customers and other stakeholders” [40]. The mechanism, in essence, widely covers the activities of integration in an intra-organizational basis and collaboration across inter-organizational boundary [59,71,73]. The ultimate goal of SCM is to build strategic relationships with customers, suppliers, and other business partners [50,54].

In general, there are three components flowing through the supply chain: goods, payments, and information [60]. The movement of the three components needs large amount of information exchange and generally requires frequent communication and collaboration among trading partners. Recently, a growth in information and communication technologies (ICT) such as the Internet-based technologies enhances the capabilities to integrate the supply chain [24,72]. Without the support of ICT, the objective of SCM will not be effectively accomplished [55,62]. Traditionally, inter-organizational systems (IOS) provide an electronic linkage infrastructure to facilitate the movement of the three components in the supply chain with the support of EDI [43,71]. Similarly, electronic SCM (e-SCM) is a specific form of inter-organizational systems with the support of the Internet and e-commerce technologies. More recently, the concept of virtual enterprise (VE) for integrating trading partners through the Internet-based is an important approach to carry out strategic relationship [24].

2.2. IDT and e-SCM diffusion

Effective diffusion of IS innovation is the critical force in determining final success of IS implementation [22,65]. In fact, this process is complex and dynamic in nature, which may vary with distinct sets of characteristics across time and involves different loci of organizational impact [61]. To better understand IS implementation problems and how they can be solved, a multiple-stage rather than a single-stage analysis would provide deep insight for understanding this process [21]. While the IDT is mainly defined for exploring how diffusion of innovation with multiple stages is guided and affected by changes in related variables over time, a stage-based process is originally proposed to include two stages: adoption and implementation [66,67]. The adoption stage further defines sub-stages of knowledge acquisition, persuasion and learning, and decision, leading to the actual adoption decision. The implementation stage further comprises activities of preparation of changes to task structure, task process, and technology necessary for innovation deployment.

While IS innovation has increasingly become an important resource in a firm, the IDT has been widely applied for effectively understanding its diffusion. Kwon and Zmud [39] first generally discussed a six-stage model for IS innovation diffusion, founded on Lewin’s three-stage change model [44], including initiation, adoption, adaptation, acceptance, routinization, and infusion. Afterwards, various stage-based models have been proposed for different IS innovations. A four-stage model, comprehension, adoption, implementation, and assimilation, was developed to explore a firm’s involvement in IT innovation diffusion [74]. There are a number of three-stage structures presented for the diffusion of IS innovation. A model with the stages of initiation, adoption, and implementation was proposed to understand the use of telecommunications technologies in business organizations [22]. Additional model with the stages of earliness of adoption,
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