Employee-related Critical Success Factors for Utilization of Digitally-Enabled Supply Chain Management

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Abstract

IT embeddedness has created considerable opportunities for organizations to effectively manage and streamline their supply chain. User involvement acts as an important role in the current e-service era for supply chain management. In this article, we aim to explain the impact of leadership style and knowledge-centred processes on utilization of Digitally-Enabled SCM applications and generated value for employees. We will then discuss potential contributions and implications, and also indicate future research directions. This study is conducted from the employees' perspective, and it will deepen a foundation for Digitally-Enabled SCM practices and learning, knowledge sharing in knowledge-centred processes as well as leadership style.

Introduction

The Role of Digitally-Enabled Supply Chain Management in Organizations

Digitally-Enabled SCM (Supply Chain Management) applications have been purchased and also imitated by an increasing number of organizations. Dong et al. [11] pointed out that "the use of IT has received significant attention in the supply chain context". Their study on IT in supply chains is consistent with Rai et al.'s [29] study and there is a consensus on the definition of Digitally-Enabled SCM, i.e. "'digitally enabled' means an integration of inter-firm processes through IT on the Internet platform, with the integration spanning the entire scope of the supply chain that extends across both upstream and downstream operations" [28]. Practitioner forums like the Supply Chain Management Council have been formed and special issues of journals such as Decision Sciences (2002 33:4) and Journal of Operations Management (2005 23:3, 2007 23:4) have been recently published. Digitally-Enabled SCM technologies have the potential to enhance efficient knowledge sharing, collaboration and coordination between trading partners [21] for organizations, and are therefore important for organizational performance [29] [36] [38]. In addition to IT's impact on organizations, its value is clearly emphasized and calls for research on employees' job performance perspective. Venkatesh [37] indicated that it is important to relate the adoption and use of supply chain technologies to job performance.

Employees Involvement in IT Services by Using (Digitally-Enabled) Supply Chain Management Applications

Performance of employees in customer party organizations in IT service process is important. Bardhan et al. [3] explained that one key aspect of many IT services is the "high degree of involvement by people in delivery and usage". This is the case in service processes in the context of SCM. The emphasis on the involvement of employees is critical to the motivation and a key reason why we study human behaviors in organizations. The necessity of employee

involvement is stressed in service design since customers play a role "in the construction of services in the presence of advanced IT" [3]. In addition, research also indicates that IT-enabled service processes help service providers keep employees from customer organizations participating throughout their relationship. This can be "in joint project contexts, for procurement and supply chain management with partner organizations, or for after-sales customer service (meet customers' needs and create benefits)" [3]. However, how employees in organizations engage in those activities is still an open issue and to date has only been proposed as a matter for future research [3]. Thus, factors that affect value creation and the usage of Digitally-Enabled SCM have not been fully addressed from the employees' perspective. Given the above mentioned advantages of SCM technologies, we expect to identify the employee-related factors that influence the use of those technologies and value created by Digitally-Enabled SCM technologies in corresponding service processes, and furthermore, to develop insights and implications for business operations according to these factors.

Previous research has indicated that even though technology benefits may significantly contribute to a firm's overall performance, those same technologies may not necessarily be deployed in the most effective or efficient way by employees, and so the maximum value may not be realized by the firm when they are deployed. In this paper, we take a two-pronged approach. First, we aim to develop a theoretical understanding, supported by empirical evidence, of the antecedents of employee use of Digitally-Enabled SCM technologies. Second, we aim to assess the value of digitally-enabled SCM in organizations. Through these two activities, we expect to be in a position to inform organizations how they may realize further business gains through the deployment of IT based SCM applications.

Background

Firms are investing in SCM technologies to develop their organizational capabilities given the importance of digitized capabilities for organizations [29]. However, in the current e-service era, organizations are seeking to leverage technologies (e.g., Digitally-Enabled SCM applications) that may enable them to enhance payoffs such as increasing employee productivity and increasing business value from IT. In this respect, researchers (e.g., [25] [31]) have emphasized both how IT (e.g. technologies applied in Digitally Enabled SCM) creates business value which is critical for organizations, and how IT, when embedded in business processes, has

considerable potential to improve performance of customer service (e.g. IT service) processes.

IT business value has always been a critical issue for IS research. In response to recent calls for researchers to pay more attention to the involvement of people in IT service processes, we investigate the behavior of employees in organizations involving Digitally-Enabled SCM processes and study success factors that pertain to business value and the utilization of relevant SCM applications. These factors include learning and knowledge, which are critical components of knowledge-centered processes. The importance of these factors for IT use is explained by related studies (e.g., [30]) and theories (e.g., [2]). Our study also explains how knowledge-centered practices are affected by leadership style. Our data collection will be conducted in China. Organizations in China are normally characterized by strong power distance [cf. 17] with "leaders wielding considerable influence over the actions of their subordinates" [18]. Thus the values and attitudes of leaders in organizations exert an impact on the intention and subsequent behavior of employees to engage in knowledge sharing [18] [24]. Given that limited research has taken "a leadership-style perspective to knowledge sharing in China" [18], we expect that leadership style will exert an impact on knowledge sharing practices in organizations.

The Research Model and Hypothesis Development

The research model can be seen in Figure 1 below. In the following sub-sections, we introduce the constructs in the study. The model considers the impact of leadership styles and knowledge-centred process on usage of Digitally-Enabled SCM practices and generated value for employees in organizations.

Leadership and Knowledge Sharing

Leadership has been found to influence knowledge sharing [6] [35], and such influence can also be shown through mediating factors – such as trust [18]. However, when subordinates in an organization have developed intuition for learning something, they need to capture intuitions into accessible knowledge. Nonaka [28] has discussed such processes and recently other researchers (e.g., [4]) have also stressed the importance of studying the type of leadership that promotes "intuition into available knowledge" practices.

A number of leadership styles have been identified, including initiating structure and consideration, transformational and transactional. Judge et al. [19] emphasized the contribution of consideration and initiating structure in leadership research and then

indicated the appropriateness of future studies after reporting these two constructs' validity. We thus focus on the classification of consideration and initiating structure in our study.

"Consideration refers to the extent to which a person has job relationships characterized by mutual trust and respect for subordinates' ideas and feelings" [32]. When a manager is inclined to show high consideration, his or her subordinates can feel relatively harmonious, with a casual atmosphere. For example, when a manager pays more attention to consideration, he or she will show more concern for his or her subordinates. To be specific, he or she is more willing to enhance cohesion within the group and also attaches importance to relationships among group members. Such managers normally realize the abovementioned wishes by showing appreciation for their subordinates and paying attention to how they feel about certain issues in the organization. Previous management literature also suggests that employees and subordinates "may be more likely to share knowledge when they are praised by managers" [6]. Managers' positive behavior forms a warm and caring atmosphere in the workspace. Employees working in such an environment will also pay attention to and care for colleagues around them. Thus, knowledge is shared and accumulated over time across the organization both vertically and horizontally.

We then hypothesize that:

Hypothesis 1: Consideration positively influences knowledge sharing in organizations.

Initiating structure "refers to the extent to which the leader is likely to define the structure of his or her role and those of subordinates in the search for goal attainment. It includes behavior that attempts to organize work, work relationships and goals" [32, p. 322]. Huang et al. [18] suggest that initiating structure is as important as consideration in stimulating knowledge sharing. For example, when a manager is inclined to show high initiating structure, he or she tends to consider accomplishment of a task to be critical. These managers hope that their groups will be very efficient at accomplishing tasks and so form an atmosphere with both explicit and latent pressure for their subordinates. To achieve the assigned task, subordinates tend to communicate and coordinate their work through knowledge sharing since communication is critical to task accomplishment.

We thus hypothesize that:

Hypothesis 2: Initiating structure positively influences knowledge sharing in organizations.

Leadership and Learning in Organizations

When leaders show concern and care for their subordinates, employees tend to interact with others more flexibly and frequently. Huang et al. [18] investigated the impact of consideration leadership style in organizations and found that it positively influences interaction frequency among employees. Employees tend to accumulate knowledge through learning from more knowledgeable individuals. To facilitate knowledge acquisition, interaction and communication are important and CMC (computer-mediated communication) tools are widely adopted. As interaction frequency increases, so both the use of CMC tools and the intensity and frequency of learning increases. In the context of SCM practices, cooperation and communication become even more important since the ultimate goal is to maximize the value of overall SCM processes [16]. In this case, employees who participate in SCM processes are responsible for corresponding tasks for which they need to acquire and learn relevant SCM practice knowledge. They also intend to try their best to ensure value creation in tasks assigned to them. To capture shared knowledge that is potentially valuable for future knowledge users (e.g. how to manipulate a new technology to achieve an SCM process), interaction among both more and less knowledgeable and experienced individuals is critical. Moreover, those employees tend to interact and communicate comparatively frequently in order to work more effectively in a flexible working environment. Accordingly, we hypothesize that:

Hypothesis 3: Consideration positively influences learning in organizations.

When a leader is inclined to initiating structure, implementing a task becomes the most important thing for his or her subordinates. Those subordinates experience pressure in order to accomplish their assigned tasks in a relatively serious working environment. Meanwhile, the motivation for knowledge acquiring and learning is strengthened. Gong et al. [14] have recently pointed out that learning orientation drives one to develop an individual competency. When the environment is characterized by relatively stronger competition and pressure is formed under an initiating structure leadership style, employees are more willing to learn and further develop their own competence and adapt to changes in the organization. Therefore, we expect that employees tend to conduct more frequent learning and studying when they are working under an initiating structure leadership style.

Hypothesis 4: Initiating structure positively influences learning in organizations.

Knowledge Sharing, Learning and IT Use

As employees learn, so they acquire the ability to acquire knowledge and thus improve their job performance, an important determinant of performance. Previous studies also suggest that "a learning orientation is conductive to the acquisition of knowledge and skills" [14]. Employees can intensify the effectiveness of their learning via CMC tools such as instant messengers and remote service since these tools facilitate both communication with knowledgeable individuals and also problem solving, which is a key aspect of business process. Neo [27] has suggested that IT implementation practices in an organization are likely to be more successful if an organization has more experiences with respect to the use of similar systems and has accumulated experience from this use. Firstly, knowledge exchange among knowledgeable professionals and novices suggests the importance of IT use practices in an organization where knowledge can be exchanged and shared through communication practices that rely on CMC tools. Furthermore, employees also acquire knowledge and skills through "enactive mastery experience" [14], i.e., direct experience of attaining a task or skill, explained by social cognitive theory [2]. This skill can be further promoted by means of shared knowledge and experiences accumulated through actual operations. As interaction becomes smoother, the intensity of knowledge sharing practices becomes stronger. Thus, we expect that learning is likely to promote knowledge sharing practices in organizations.

Hypothesis 5: Learning positively influences knowledge sharing in organizations.

Knowledge sharing in Digitally-Enabled SCM contributes considerably to solving problems in supply chain processes since employees who use Digitally-Enabled SCM need to learn "how customers use their products and how the service group handles failures" [36]. Having acquired the knowledge on how to use Digitally-Enabled SCM more effectively, employees are more likely to use the tool efficiently. Furthermore, previous studies also indicate that the level of IT knowledge held across the organization is "a key predictor of technology assimilation" [1] [8] [30]). Having emphasized the importance of IT knowledge across an organization, Ranganathan et al. [30] further point out that greater usage of Digitally-Enabled SCM systems may result in improved performance metrics, such as "lead time, customer service, cost reduction, inventory management, cycle-time reduction, supplier-relationship management, and overall competitive advantage". Thus we need to investigate how knowledge benefits improve utilization of Digitally-Enabled SCM applications. We then integrate knowledge sharing for using Digitally-Enabled SCM in our framework, and suggest that:

Hypothesis 6: Knowledge sharing positively influences utilization of Digitally-Enabled SCM applications.

Learning and the Acquisition of IT Capabilities in Organizations

Bhatt and Grover [5] emphasize the importance of IT capabilities and provide guidance for how such capabilities direct firms to achieve competitive advantage. They also indicate that "the development of IT capabilities requires learning and experience". Concerning the importance of learning and accumulated experiences, the intensity of learning is instrumental [5] in facilitating this capability development. For example, Neo [27] found that IT implementation practices in firms are likely to be more successful if firms have implemented similar systems and acquired experiences from such practices. Likewise, Cash et al. [7] point out that "an IT infrastructure evolves through learning and assimilation of a firm's information requirements". More investigations have also shown that "the development of IT skills, embedded into specific business practices, requires knowledge assimilation over time" [5]. Meanwhile, Sambamurthy and Zmud [33] suggest that "technical and business skills evolve through learning by doing". Considering the above-mentioned evidence on the development of IT skills and experience, creating cordial relationships among non-technical individuals and IT professionals is also necessary if business needs are to be met, though it may need some time. Communication and interaction during the learning of IT applications may further facilitate more effective learning. Therefore, based on the abovementioned arguments on learning in organizations [5], we need to pay more attention to issues like whether and how employees with strong learning capabilities in organizations contribute to IT implementation and applications, and in turn improve IT capabilities.

Learning in Organizations and Utilization of Digitally-Enabled SCM

In order to adopt and manipulate technologies effectively, users need to possess both skills and the relevant expertise and knowledge such as routines and activities concerning the technologies. These skills need to be developed across the whole enterprise in order that the organization can glean the most benefit from its acquisition of the technology. Scott [34] emphasizes the importance of dynamic capabilities with respect to the use of IT applications, while Dodgson [10] indicates that "learning is a dynamic concept and its use in theory emphasizes the continually changing nature of

organizations". Furthermore, the intensity of learning facilitates the development of IT capabilities. We therefore infer that organizational learning is critical to the effective utilization of Digitally-Enabled SCM applications and hypothesize:

Hypothesis 7: Organizational learning positively influences the utilization of Digitally-Enabled SCM applications.

Technology Utilization and Individuals' Job Performance

As more and more employees acquire the skills needed to use Digitally-Enabled SCM, the diffusion and assimilation of Digitally-Enabled SCM applications across an organization facilitates employees involved in supply chain processes to work more efficiently, with particular improvements in information sharing and upstream

procurement, internal production, and downstream sales and customer services [11] [23]. Perceived ease of use [9] is an employee's perception that using a particular technology would be relatively free of cognitive burden (with skills and training, employees become more familiar with how to use and manipulate Digitally-Enabled SCM). Perceived usefulness is defined as the extent to which an employee in the organization believes that using Digitally-Enabled SCM would enhance his or her performance at work. We suggest that if employees perceive that they could use Digitally-Enabled SCM better and if more and more employees acquire these skills, then their perception that their corresponding task and job performance would be improved. We named this perceived usefulness as perceived value for employees in our study.

Hypothesis 8: Utilization of Digitally-Enabled SCM positively influences perceived usefulness for employees.

Figure 1 The Research Model
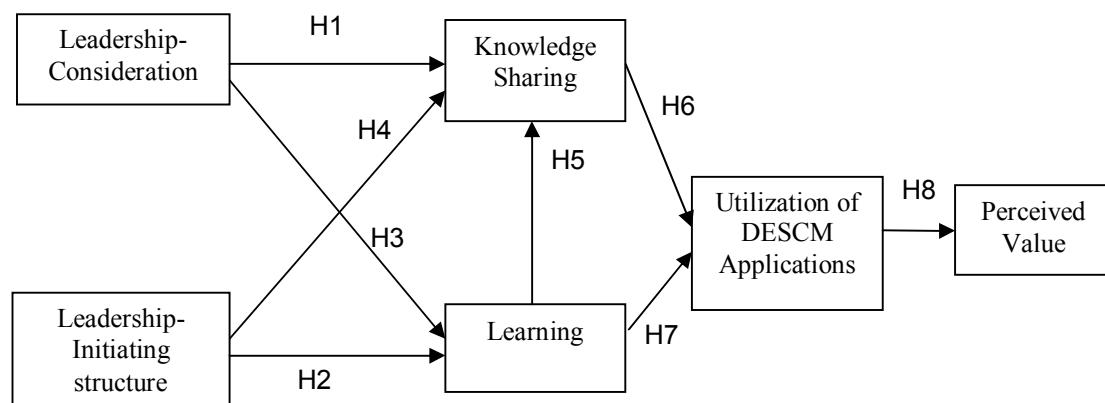
Research Methodology

The survey methodology is used to verify the research model in our study. This section explains the measurement development and data collection.

Measurement

The survey instrument was originally developed in English and is presented in the Appendix. 7-point Likert scales ranging from "strongly agree" to "strongly disagree" are used in order to measure all the items in addition to "frequency of using Digitally-Enabled SCM applications". The frequency of usage is measured using seven-point scales anchored from "Extremely Rarely" to "Extremely Frequently". Listed questions in Section A measuring leadership style (including initiating structure and consideration) are derived from the LBDQ [15]. In section B, measurements of knowledge sharing practices in organizations are

adapted from [12] [22] [35] and measurements of learning practices in organizations are adapted from Gary et al. [13]. Items in Section C are adapted from Kankanhalli et al. [20] and further developed to better suit our research context. We adapted the scales from Davis [9] and Moore and Benbasat [26] to measure added value created through using Digitally-Enabled SCM applications in Section D. Demographic Questions are also developed but not listed in this paper.

Since the research is being conducted in China, it is appropriate to use a Chinese version of the instrument. The original English version was thus translated into Chinese by translation professionals from the translation department of a major university in Hong Kong. Two of them are responsible for translation from English to Chinese, and two other translators are in charge of translation from Chinese to English. We then

compared the two versions of translations and backtranslations so as to ensure that the accuracy and equivalent meaning of the Chinese version is the same as the original English version. A translation check has been conducted by a research scholar, the authors and translators. The Chinese version is available on request from the authors.

Data collection Procedures

The study population comes from organizational employees in China who are involved in supply chain management practices and adopt related technologies to achieve their work assignments. We expect that they will all be university graduates and so will have relevant knowledge background on leadership, knowledge management and value creation by IT. Thus, they will be able to answer the questions and report their perceptions relating to Digitally-Enabled SCM use. They are thus qualified to participate in the survey.

Discussion and Future Work

The purpose of our study is to investigate the success factors relating to usage and value of Digitally-Enabled SCM applications for organizations. Our study is based on organizational theories. The empirical investigations will be conducted in the context of real-world organizations. Our proposed research has both theoretical and practical contributions. Theoretically, it contributes to an understanding of the antecedents of knowledge-centered processes related to the application of Digitally-Enabled SCM practices. It also helps us to study how critical factors influence these antecedents.

Empirically, our study aims to provide insights for leaders in organizations to leverage their leadership style and also for employees in organizations to acquire useful knowledge. Eventually, we expect the above-mentioned factors to facilitate employees' performance underlying the theoretical foundations and empirical evidence.

Our future work is composed of four parts. Firstly, we need to finish collecting data from organizations and analyze our dataset. Secondly, based on the findings from the statistical analysis, we intend to offer effective strategies for employees to eventually demonstrate better performance underlying the use of Digitally-Enabled SCM influenced by the following aspects as we suggested: knowledge acquisition, knowledge sharing, co-work style, and CMC tools. This may be achieved by developing a workshop (it can also be provided by IT service providers) to train employees to acquire the relevant skills. Employees can learn informally through face to face or CMC tools (e.g. IM, SNS), including extempore demonstrations, as well as knowledge dissemination and sharing via communication with others. To do this effectively, the importance of CMC tools needs to be highlighted. Thirdly, future schemes will be suggested for IT service or product providers to provide enhanced quality of service. Finally, we hope that this study will inspire researchers to consider how business value can extend organizational capabilities brought by "new IT", since this is a critical aspect of transforming the supply chain. We also hope to encourage more IS researchers to study issues related to Digitally-Enabled SCM and its business value for organizational capabilities.

Appendix

Construct	Item	
Initiating Structure	1.	He/She schedules the work to be done.
	2.	He/She gets goals for the work group.
	3.	He/She diagnoses group deficiencies.
	4.	He/She takes remedial action to correct deficiencies.
Consideration	5.	He/She is friendly and approachable.
	6.	He/She rarely does things to make it pleasant to be an employee.
	7.	He/She puts suggestions made by employees into operation.
	8.	He/She looks out for the personal welfare of employees.
	9.	He/She treats all employees as his/her equal.
Knowledge Sharing	10.	People in our team share their special knowledge and expertise with one another.
	11.	If someone in our team has some special knowledge about how to perform the team task, he or she is not likely to tell the other member about it.
	12.	There is virtually no exchange of information, knowledge, or sharing of skills among members.

	13.	More knowledgeable team members freely provide other members with hard-to-find knowledge or specialized skills.
	14.	We are given complete and comprehensive documentation (e.g., manuals, product and design specifications) of Digitally-Enabled SCM applications.
	15.	The IT service companies that sell Digitally-Enabled SCM to my company transfer know-how of the product or service to us (the customer-company).
Learning	16.	When I need specific information, I know who will have it.
	17.	I am keenly aware of where my knowledge can serve the company.
	18.	I use electronic means to communicate.
	19.	I have a large variety of communications tools (telephone, e-mail, Internet, and so on) from which to choose in our organization.
	20.	I am encouraged to communicate clearly.
	21.	I make extensive use of IS to support my work.
	22.	I retrieve archived information when making decisions.
	23.	I keep information (such as, numbers, plans and ideas) from other employees.
	24.	I resist changing to new ways of doing things.
	25.	I learn about the company's recent developments through informal means (such as new stories and gossip, remote or CMC tools etc).
	26.	I acquire information (such as skills and how to use IT tools) from professionals from IT service providers (those companies that sold ERP or other Digitally-Enabled SCM tools to the company you work for).
Utilization of Digitally-Enabled SCM applications:	27.	I often use Digitally-Enabled SCM applications to accomplish tasks involving SCM process in my work.
	28.	I regularly use Digitally-Enabled SCM applications to accomplish tasks involving SCM process in my work.
	29.	What is your frequency of usage of Digitally-Enabled SCM applications in SCM process in a month?
Perceived values for employees	30.	My job would be relatively difficult to perform without using Digitally-Enabled SCM applications.
	31.	Using Digitally-Enabled SCM applications give me greater control over my work.
	32.	Using Digitally-Enabled SCM applications improve my job performance.
	33.	The Digitally-Enabled SCM applications address my job-related needs.
	34.	Using Digitally-Enabled SCM applications save me time.
	35.	Digitally-Enabled SCM applications enable me to accomplish tasks more quickly.
	36.	Digitally-Enabled SCM applications support critical aspects of my job.
	37.	Using Digitally-Enabled SCM applications allow me to accomplish more work than would otherwise be possible.
	38.	Using Digitally-Enabled SCM applications reduce the time I spend on unproductive activities.
	39.	Using Digitally-Enabled SCM applications enhance my effectiveness on the job.
	40.	Using Digitally-Enabled SCM applications improve the quality of the work I do.
	41.	Using Digitally-Enabled SCM applications increase my productivity.
	42.	Using Digitally-Enabled SCM applications make it easier to do my job.
	43.	Overall, I find Digitally-Enabled SCM applications useful in my job.
	44.	The disadvantages of my using Digitally-Enabled SCM applications far outweigh the advantage.
	45.	Overall, I find using a Digitally-Enabled SCM application to be advantageous in my job.

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