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Knowledge sharing—A key role in the downstream supply chain

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ABSTRACT

We explore the role of knowledge sharing within a downstream two-echelon supply chain. Drawing on chaos theory and the literature on knowledge management, we contrasted the information and knowledge sharing contexts. More specifically, we have provided a real-world case study of knowledge management practice at a U.S. Fortune 40 firm. We reviewed the major issues in this firm's downstream supply chain operations and have described its knowledge management initiative. Finally, we discuss the implications of knowledge management on managerial practice.

1. Introduction

Since Dell Computer introduced the concept of built-to-order computer manufacturing in 1985, the general approach to production has shifted from mass production to mass customization. After more than two decades of development, the process has been extended to industries such as the automobile, shoes, clothing, and furniture. Furthermore, manufacturers have attempted to combine the built-to-order approach with others, such as just-in-time, lean manufacturing, and time-to-market, to respond more effectively to specific and changing customer needs.

For any manufacturing strategy to work well, it is necessary to stabilize demand and reduce supply chain uncertainty [13]. One way to decrease such uncertainty is to integrate the IT system with the supply chain network resulting in lower production cost, shorter lead times, and faster product delivery.

Chaos theory suggests that uncertainty in the supply chain can be managed by imposing rules or principles guided by existing knowledge and experience. Supply chain management (SCM) helps organizations manage the flow of information, money, and products beyond the physical boundaries of the organization. Members of forecast-driven supply chains generally focus on estimating demand at the next link in the chain and consequently often face problems created by poor forecasting and the so-called *bullwhip effect*, which results from a lack of transparency of the actual demand. An effective solution to such problems is to promote the efficient flow of information in the supply chain.

IT may be used to streamline the supply chain information flow [18]. Clearly, the goal is to avoid information manipulation and prevent inaccurate forecasts. While the bulk of the supply chain literature has focused on information management in the upstream, we addressed the importance of information to downstream operations. More specifically, we explored the role of information sharing in the business processes of downstream supply chain operations.

Information sharing is suitable for efficient day-to-day operations but when the decision making processes become more complex and chaotic, knowledge management is better because it makes it easier to address the uncertainty and changes in the environment. Previous experience reflects tacit rather than explicit knowledge. However, decision makers often need to rely on both explicit and tacit knowledge.

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2. Theoretical foundations

2.1. Chaos theory

Supply chains may face chaotic situations due to uncertainty or complexity. For example, forecasting customer demand is difficult. While the needs of a customer is difficult to predict, a comprehensive demand planning model requires the aggregation of future demand to be made by all consumers – a significantly more complex undertaking [20].

Chaos theory deals with complex, nonlinear dynamic systems – all parts being complex, not random. In other words, it seeks to explain apparent disorder in a very orderly way.Often, managers in different parts of a supply chain face different and conflicting objectives which hinder cooperation. Prater [17] asserted that chaos may result from decision processes or control systems such as ERP, warehousing, or inventory management, caused by variability, complexity, uncertainty, and spikes. IS researchers have tried to render chaotic situations manageable. Recent advances view supply chains as complex adaptive systems (CAS) that are best managed by understanding how and why they occur.

2.2. Tacit and explicit knowledge

Knowledge creation, organization, and use are facilitated by the flow of information. It is important to distinguish between data, information, and knowledge. The primary distinction lies in its degree of organization and usefulness. *Data* are raw stimuli with little organization or ready utility. *Knowledge* is a high value form of information that may be useful in making decisions and prompting actions. Tacit knowledge is difficult to codify, transmit, or convey: it contains data that are processed, organized, and useful, but the logic of its organization is frequently complex, implicit, and ambiguous [4]. It is rooted in actions within a specific context. It is important for solving problems that are intractable, complex, or variable.

As phenomena become better understood, the knowledge necessary for decision-making becomes more explicit. As solutions to a problem become more routine, they can be codified more easily. This simplifies the extraction and processing of information. Explicit knowledge is discrete and digital, and may be easily transmitted via formal and systematic means. Examples include records from the past, such as from archives or databases. In contrast, *tacit knowledge* represents a higher level of abstraction than *explicit knowledge*.

The degree to which knowledge is tacit influences the choice of communication channels most appropriate for its dissemination. For example, when knowledge is only tacit, it may not be transferable through face-to-face interaction.

Alavi and Tiwana [1] stated that knowledge management (KM) involves both technological and social-cultural factors and should focus on the flow of information and remain a management issue, with technology performing the role of supporting it.

3. Knowledge sharing

3.1. Information sharing

Within a supply chain, all the information needed for its efficient operation should be available at the right place and time. Leading firms facilitate information flows to encourage the sharing of point of sale (POS) information with others. The contribution of information sharing to performance improvement has been empirically validated.

According to Kaipia [12], supply chain characteristics can be balanced by a coordination mechanism that uses information to support both material flow and resources allocation. Thus flexible material flow needs frequent updates based on accurate information. If the material flow is inflexible, there is no need to update information frequently. However, the likelihood of excess inventory or capacity rises.

In supply chain operations, delays, amplifications, or oscillations in the information flow may adversely impact inventory and production efficiency. However, Steckel et al. [21] found that information sharing is not enough to improve performance unless customer demand is stable. As Kulp et al. [14] stated, information sharing is necessary to remain competitive but not sufficient to earn superior profits. As a result, some firms share knowledge both internally and externally to their customers, suppliers, and partners.

3.2. Knowledge sharing

Knowledge sharing focuses on the supply side of KM. In contrast, knowledge creation concentrates more on the demand side. Johnson and Whang [11] proposed the term *e-collaboration* for systems that facilitate Internet-based coordination of decisions across all members of the supply chain. Coordinating information flow requires a system to identify, analyze, and transform useful information into reusable knowledge which can be used to make decisions with extensive impact along the supply chain.

Uncertainty contributes to variability in a supply chain: unpredictable customer demand is its primary source. An e-collaboration approach may significantly speed up knowledge sharing. Park et al. [16] identified the behavioral process of knowledge transfer from vendor and client matched-pairs from 87 IT outsourcing projects: they found that the client's IT human capability was a crucial factor in effective knowledge transfer during IT outsourcing. IT personnel who considered the vendors' competencies in IT practice and tackled related technological challenges contributed effectively to knowledge transfer.

Wadhwa and Saxena [25] noted that the competitive potential of a flexible supply chain (FSC) was driven by KM. They also provided directions for applying KM to FSCs that were more complex, involved multiple autonomous players, and/or included different technical cultures, managerial backgrounds, and degree of SCM exposure. In KM practice, technical culture influences the knowledge mindset. Different managerial backgrounds may affect the decision making and prior SCM exposure may affect the attitude toward knowledge sharing.

Compared to information sharing, knowledge sharing contributes more to efficient and effective decision making. The biggest challenge is in establishing a trusting relationship between the sharing parties [5]. Partnership quality, as pointed out by Vijayasarathy [24], significantly influences performance.

Table 1 presents a comparison of information and knowledge sharing.

3.3. Decision knowledge sharing in the downstream supply chain

Decision knowledge sharing involves proactive knowledge management. As the level of cooperation and coordination in the downstream supply chain increases, the need for both transactional and decision-making data increases because the single-faceted transaction information alone is not helpful to a customer facing a product-related problem. This requires that customers have access to a knowledge database that helps them understand the problem and navigate the appropriate steps to a solution.

Dell Computers nicely illustrates this. The firm adapted a flexible infrastructure to support its mass customization agenda, thereby coordinating its suppliers and customers beyond Dell's geographical boundaries. In addition, Dell allowed its customers to