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Inter-Organizational Coordination, IT Support, and Environment

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Abstract: Manufacturing organizations must know how to deal with uncertainty, manage environmental impact, effectively coordinate with suppliers, and use information technology (IT) to support coordination. Applying cybernetics and information processing theories, this study explores the relationship between organizational environment, inter-organizational coordination, IT support, and the effectiveness of inter-organizational coordination. Using the case study method, data was collected from six manufacturing firms in China. The results show that inter-organizational system adoption is affected by organizational environment and is related to the management of inter-organizational coordination. Coordination and IT application affect the performance of inter-organizational coordination.

Key words: cybernetics; information processing theory; information technology (IT) application; inter-organizational coordination

Introduction

Globalization and consumer demands have forced many business organizations to operate in complex and dynamic environments. For many manufacturing organizations, they must maintain close relationships with the suppliers to respond to changes effectively and to acquire necessary production inputs. Inter-organizational systems (IOS) are important information technology (IT) tools that can support business transactions. Inter-organizational systems promise the benefits of rapid information exchange, low cost, and high efficiency[1]. The studies of these issues are the domain of social and system science research. Using social and system theories, we can better understand the relationships between business environments, the dominant coordination mechanisms, and IT support to identify the guiding principles relevant to an organization when it decides to choose the best coordination mechanisms and to select, design, and implement inter-organizational systems. The purpose of this paper is to find potential solutions for these issues. We formulate our theoretical models using the viable system model (VSM)[2,3] (derived from cybernetics) and information processing theory (IPT)[4,5].

1 Literature Review

There are two main thoughts that deal with the impact of environment on organization and the use of information systems: system theories and organizational theories. System theories regard an organization as an element in a group of organizations. They deal with organization's survival and evolution in an environment. Organizational environment is measured by complexity to reflect the quantity of the elements, the relationships among the elements, and the dynamics of the elements and overall system. Organizational theories focus on the relationships between environment and organizational design issues, such as organizational

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structure and organizational information processing requirement and capability. Traditionally, organizational theorists focused primarily on the issues internal to the organizations. Recently, particularly as a result of the Internet and e-commerce, attention has been paid more and more to the issues external to the organizations, such as inter-organizational coordination and inter-organizational system support, e.g., institutional theory[6].

1.1 System theory

The focus of system theories is on the complexities of environment. These address the issue of how an organization adapts to its environment. System theories originated from Holism Theory and Gestalt after World War I and Cybernetics after World War II. They emphasizes coordination, regulation, and control of systems[7,8]. Cybernetics and general system theory are the main streams in system science. General system theory focuses more on system structure and system modeling. Cybernetics deals more with system functions. It pays more attention to the coordination and control of its subsystems, or system elements, as well as the communications among subsystems. The applications of cybernetics principles in business and management are represented by two theories: Ashby's law of requisite variety (Ashby's Law) and Beer's viable system theory. According to Ashby, the higher the "variety" possessed by the system, the higher the capability of the system in handling its environment. From information perspective, the amount of information in control system determines the degree of system's controllability. Beer applied Ashby's Law into enterprise management, and proposed the VSM to study the balance relationship between a system and its environment[2]. Ashby's Law has been widely accepted[9,10]. The VSM has also been applied in organizational diagnoses, management and control, and project management[11-13].

1.2 Research in organizational theories

The focuses of organization studies are the organizational environment and its impacts on organizational structure and strategy. The main stream theories are resource-based theory, organizational economics, and organizational design theories. These studies have been verified by empirical evidence[14-19]. Among many theories, IPT is particularly useful for current study. IPT originated from the studies by Simon[20], Thompson[21], Galbraith[4,5], and Tushman and Nadle[22]. There are two main concepts: information processing needs (IPN) and information processing capability (IPC). An organization must acquire the necessary information processing capability to deal with information processing needs. In other words, if IPC fits IPN, i.e., there is a balance between information processing needs and information processing capability, the organization will perform well. According to Galbraith, when facing uncertain environment, it's difficult for organization to pre-plan its tasks. Therefore, decision makers must coordinate frequently with related parties and seek more information in order to make the right decisions. Therefore, an uncertain environment increases the needs for information processing. An organization can design its structure and implement information processing mechanisms to handle the needs. A few studies have applied the information processing theory to organizational design and information system studies. Some used the theory to study the coordination issues within the sub-units of an organization and inter-organizational coordination among a group of organizations such as enterprises within a supply chain[23-26]. According to IPT, there are two ways to deal with uncertainty: either reducing the needs for processing information through reducing "environment uncertainty" or through increasing information processing capability. There are a number of ways to reduce information processing needs. These ways include actively managing uncertain environment by reducing the uncertainty factors such as forming strategic alliances, increasing slack capacity (i.e., inventory), and designing independent tasks. The way to increase information processing capability includes investment in IT and the creation of lateral coordinating mechanisms.

1.3 Inter-organizational coordination and IT support

Assume that we can apply the two theories to inter-organizational coordination and IT support research. The application of cybernetics and the law of requisite variety in management will shed a light in our understanding about how organizations coordinate to achieve their goals. Organizational theories, such as