

Chapter 71

An Empirical Test of the Information Processing Theory

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ABSTRACT

According to the propositions in the information processing theory, this study tests the relationship between task uncertainty and three organizational design strategies, i.e., creation of lateral relationships, investment in information systems, and creation of self-contained tasks. Data from 125 North American manufacturing firms are used and business environment uncertainty is employed to measure task uncertainty. Sourcing practice and delivery practice measure the creation of lateral relationships, while Information quality measures the investment in information systems. Also, just-in-time production and human resource management measure the creation of self-contained tasks. Regression analysis shows that business environment uncertainty has significant positive influence on sourcing practice, delivery practice, information quality, just-in-time production, and human resource management. While the information processing theory was proposed more than thirty years ago, this study empirically extends the relevance of information processing theory to today's supply chain environment.

INTRODUCTION

Galbraith (1973) proposes the information processing theory (IPT), which argues that the need for information processing increases as the task uncertainty increases. Among the four design strategies the IPT suggests, creation of slack resources and creation of self-contained tasks are

used to reduce the need for information processing. Investment in information systems and creation of lateral relations are used to increase the capacity of information processing. Creation of slack resources is not a preferred strategy, because it is usually costly. Therefore, this paper will focus on the relationship between the other three design strategies and task uncertainty.

Creation of lateral relationships can increase information processing capacity. Galbraith (1974)

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mentions several ways to build up lateral relationships, which include direct contact, liaison roles, task forces, and teams. The purpose of the lateral relationship is to move the decision to the level where the information exists. Information does not need to move up to the higher level of the organizational hierarchy for decision-making. Therefore, a good lateral relationship can increase the information processing capacity. As firms have become more globalized in the past two decades, creation of lateral relationships has become more important in today's global supply chain management. Thus, this paper will study the sourcing and delivery practices that enhance the lateral relationships between supply chain partners. Sourcing practice links suppliers with manufacturers and is critical for the lateral relationships between manufacturers and suppliers. Delivery practice connects manufacturers with customers and includes processing inquiries, entering orders, consolidating orders, routing shipments, selecting carriers, transporting products, and so on.

Investment in information systems is used to integrate enterprise-wide information and formalize information. It makes all people share the same information, which can improve standardization and result in less misunderstanding and fewer conflicts. It allows for the processing of information acquired during task performance in a timely fashion. Therefore, having an integrated information system can increase information processing capacity. However, companies are usually not willing to reveal investment dollar amount in research surveys. Thus, this paper will use information quality as a surrogate for the investment in information systems because higher investment in information systems is usually associated with higher information quality. In this study, information quality measures nine aspects: accuracy, availability, timeliness, internal connectivity, external connectivity, completeness, relevance, accessibility, and information update frequency.

Creation of self-contained tasks is a way to organize operations. It is popular in lean manufacturing environments, which usually use just-in-time (JIT) production. One of the JIT production practices is cellular manufacturing, which promotes the creation of self-contained tasks. The advantage of this mechanism is that less information needs to be exchanged across functions, which helps reduce the need for information processing. Another source of information reduction is through a reduced division of labor. Lean manufacturing advocates flexible resources and promotes employee cross-training programs. Therefore, this paper will measure the creation of self-contained tasks with two aspects of lean manufacturing, i.e., JIT production and human resource management. JIT production includes cellular manufacturing, pull system, cycle time reduction, agile manufacturing strategy, and bottleneck removal (Powell, 1995; MacDuffie et al., 1996; Flynn et al., 1999). In lean manufacturing environments, the human resource management practices emphasize employee cross-training and teamwork (Ahmad et al., 2003; Shah & Ward, 2003).

Besides the design strategies, task uncertainty is another key element in Galbraith's IPT. Task uncertainty is directly related to the uncertainty in business environments. Business environment uncertainty refers to the changes in products, technologies, and demand for products in the market (Miller & Friesen, 1983; Dess & Davis, 1984). In today's supply chain environment, the rate of innovation in products and processes has increased significantly. Fine (1998) discusses product clock speed and process clock speed. The faster the clock speeds are, the more uncertainty the business environments and tasks have. In this study, the rate of innovation in products and processes will be used to measure the business environment uncertainty (as a surrogate for task uncertainty).

As the IPT was proposed more than thirty years ago, it is important to reassess whether the relationship between task uncertainty and design strategies suggested by the IPT is still true in to-

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