



Absorptive capacity: Enhancing the assimilation of time-based manufacturing practices

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Abstract

Increasingly, manufacturers are making radical changes in management practices and investing heavily in advanced technologies as they attempt to achieve sustainable competitive advantage. Organizations seeking to implement these changes should have an internal environment that emphasizes knowledge assimilation and sharing and creates continuous learning capability, i.e., absorptive capacity. This study reviews the construct of absorptive capacity, develops a valid and reliable instrument to measure it, and examines its impact on the organization's ability to assimilate innovative manufacturing technology and management practice. To illustrate the links, this study tests the relationships among absorptive capacity, time-based manufacturing practices, and value to customer. Structural equation modeling, applied to a relatively large sample ($n = 303$), indicates strong, positive, and direct relationships between absorptive capacity and time-based manufacturing practices, and between time-based manufacturing practices and value to customer. The managerial implications of these empirical findings are also discussed.

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1. Introduction

The business environment has three revolutionary change forces: intense global competition, rapid technological advancements, and innovative managerial practices (Champlin and Olson, 1994). The Global Manufacturing Futures Survey indicates that

U.S. manufacturers face unprecedented competition in world markets, which requires them to move beyond cost containment and quality assurance to address global opportunities for innovative new products and rapid response (Miller et al., 1992; Harrison, 2002). The increasing speed and power of computers and information systems coupled with developments in advanced manufacturing technology are changing the ways productivity is increased and customers are satisfied (Shaw et al., 1997; Oliner and Sichel, 2000). New managerial approaches, such as time-based manufacturing and new product development

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practices, enable firms to anticipate and respond effectively to rapid environmental change (Koufteros et al., 1998; Cooper and Kleinschmidt, 1994; Golhar and Stamm, 1991). In this context, managers are being challenged to emphasize organizational learning capability, i.e. absorptive capacity (Cohen and Levinthal, 1990), which helps firms assimilate new technologies and practices.

A study by Mansfield (1993) involving 175 Japanese, Western European, and U.S. firms shows that U.S. firms have been slow to assimilate flexible manufacturing technologies as evidenced by a lower return on investment. According to Huber (1996), in highly unpredictable environments, the lack of organizational learning capacity may explain why organizations are less effective at assimilating technology and practice that lead to competitive advantage. Lane and Lubatkin (1998) indicate that the ability to develop sustainable competitive advantage depends on a firm's ability to convert knowledge into capabilities to meet environmental demands. Rindova and Fombrun (1999) also view the creation of competitive advantage as a learning process where slow assimilation can seriously undermine a firm's ability to achieve sustainable advantage.

Absorptive capacity results from the cumulative effect of continuous learning (Cohen and Levinthal, 1990). Prior related-knowledge and effective organizational routines and communication processes are major constituents of absorptive capacity (Zahra and George, 2002). Fiol (1996) thought of organizations as sponges that have different capacity to absorb new knowledge and practices; these firms generate innovative outcomes when squeezed effectively. However, "squeezing harder does not always work" if the sponge has limited accumulation of prior knowledge and processes, or even "left dry out to the point where it can no longer absorb anything".

Boynton et al. (1994) claim that absorptive capacity appears to offer specific and promising avenues for research about successful innovations in information technology. This study attempts to show that manufacturing firms with higher absorptive capacity are more likely to succeed in implementing new manufacturing practices because they have related experiences and effective communications infrastructure.

Despite the growing popularity of using the absorptive capacity construct under different settings,

empirical research on absorptive capacity was hindered by the lack of clear definition and operationalization of the construct (Joglekar et al., 1997). The most commonly used measure for absorptive capacity is R&D intensity (Tasi, 2001; Stock et al., 2001), which is not comprehensive enough to cover the rich content domain of the construct. Zahra and George (2002) suggest that absorptive capacity is a dynamic capability with different components embedded in specific organizational processes.

This paper attempts to conceptualize absorptive capacity in a manufacturing setting and to develop valid and reliable measures for the sub-dimensions that comprise absorptive capacity. It provides theory and literature that links absorptive capacity to the ability to assimilate innovative manufacturing technology and management practice, specifically time-based manufacturing. To investigate this relationship, the study tests a structural equation model that relates absorptive capacity to a firm's level of time-based manufacturing practices, and then considers the impact of these practices on value to customer.

2. Theory development

Levinson and Asahi (1995) argue that the introduction of innovative technology and practice involves substantial change, "when it comes to change, the absorptive capacity of an organization is perhaps the most critical factor in determining whether a planned change can be implemented successfully". Markus and Robey (1988) identify three conceptions of causal agency on organizational change. The *technological imperative* views technology as an exogenous driving force, which determines or strongly constrains the behavior of individuals and organizations, i.e., technology dictates. The *organizational imperative* assumes choices over technological options and control over the consequences, i.e., stability and authority in the implementation process. The *emergent perspective* holds that decisions about the use and consequences of information technology emerge unpredictably from complex social interactions. This perspective implies that the acquisition and application of technology is the result of interactions among complex stochastic, continuous, and abstract events.

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