

Exploring work system practices for time-based manufacturers: their impact on competitive capabilities

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Abstract

Manufacturing firms operating in a post-industrial environment have customers who demand specialized products and short lead times. To meet these needs, organizations are adopting time-based manufacturing practices to cut time and improve performance. The central tenet of this study is that time-based manufacturers employ traditional work system practices including standardization, formalization, and routinization plus integration to improve competitiveness. This study measures the levels of time-based manufacturing practices, work system practices, and competitive capabilities of 265 firms. The results indicate that firms with high levels of time-based manufacturing practices tend to have high levels of standardization and formalization as well as integration. Firms with high levels of standardization and integration tended to have enhanced competitive capabilities. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

An important distinction between industrial and post-industrial firms is the nature of their manufacturing systems (Doll and Vonderembse, 1991; Huber, 1984). Firms operating in an industrial environment have predictable time dimensions where they preplan product and process innovations. In this environment, firms develop and implement innova-

tions using the least costly methods and the most convenient times. Work systems are generally described as highly standardized, formalized, and routinized (Gerwin and Kolodny, 1992; Huber, 1984). These characteristics provide managers with the tools to control action and to ensure quality from the top down. Industrial era firms seek to attain high levels of these work system practices through the specialized, functional subdivision of work (Mintzberg, 1979). This is possible when organizations face a relatively slow rate of technological change and have limited product offerings (Braverman, 1974; Skinner, 1985; Thompson, 1967; Weick, 1990).

In a post-industrial environment, time is compressed, variable, and volatile (Blackburn, 1991; Stalk and Hout, 1990); change is frequent and fast

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paced (Toeffler, 1970); and adapting to change is a key success factor. Firms must evaluate and act upon the high rate of technological innovation and expanded product offering that characterizes this environment (Huber, 1984; McCutcheon et al., 1994; Nord and Tucker, 1987). A radical innovation like time-based manufacturing helps firms respond to the quickening tempo of customer demand by creating fast and responsive production systems (Koufteros and Vonderembse, 1998; Koufteros et al., 1998). To cope with innovations, organizations should develop management systems and practices that support and reinforce change and enable firms to quickly produce and deliver customized products (Doll and Vonderembse, 1991).

According to Grover et al. (1995), change management research illustrates the strong association between successfully implementing radical innovation and the ‘‘refreezing’’ stage, which institutionalizes change and restores equilibrium to the organization. It allows for the development of prescribed work procedures and methods (i.e., standards) and written documentation (i.e., formal knowledge). The successful implementation and subsequent repetitive application (i.e., routine use) of new innovations within firms depends upon the outcome of these efforts. Thus, the diffusion of new technologies may be enhanced in post-industrial firms when clear standards and written documentation are developed.

A central tenet of this study is that post-industrial firms employing time-based manufacturing practices (Koufteros et al., 1998) achieve high levels of work system standardization, formalization, and routinization as well as integration (Doll and Vonderembse, 1991). These practices are achieved through the implementation of cross-functional decision processes designed to support rapid technological change. Cross-functional decision processes create greater work system integration, collapse traditional organizational boundaries, and promote the interdependencies of work (Gerwin and Kolodny, 1992). Thus, while management often prescribes and imposes formal work standards upon industrial era workers, such standards often emerge from the cross-functional decision processes engaged in by post-industrial workers.

The number of standards may be greater in post-industrial organizations than in industrial organiza-

tions because post-industrial organizations face greater product and process variety. Therefore, it may be more important for post-industrial firms to formalize their procedures and methods. Over time, as these standards are carefully documented, disseminated, and understood, a routine develops that enables post-industrial organizations to improve their competitive capabilities (Koufteros et al., 1997).

This paper develops a framework that relates time-based manufacturing practices, work system practices, and competitive capabilities. It examines three research questions: (1) do post-industrial organizations that possess high levels of time-based manufacturing practices have high levels of standardization, formalization, routinization, and integration; (2) when standardization is achieved, does it lead to formalization, which, in turn, leads to routinization; and (3) do these work system practices lead to enhanced competitive capabilities? To test these questions, valid and reliable measures of standardization, formalization, routinization, and integration are constructed based on theory and literature and using generally accepted psychometric principles. Linear Structural Equation Modeling (LISREL) is used to test the relationships.

2. Framework to relate time-based manufacturing practices, work system practices, and competitive capabilities

This section describes the research framework illustrated in Fig. 1. It discusses time-based manufacturing practices and competitive capabilities that are described in Koufteros et al. (1998) and Koufteros et al. (1997), respectively. It provides definitions and theory development for standardization, formalization, routinization, and integration as a foundation for instrument development. Theory and literature support the hypothesized relationships shown in Fig. 1.

2.1. Research framework

Time-based competitors focus on customers. They enhance responsiveness by squeezing time from ev-

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