Available online at www.sciencedirect.com
SCIENCE DIRECT®
ELSEVIER
J. Eng. Technol. Manage. 20 (2003) 161–191
Journal of ENGINEERING AND TECHNOLOGY MANAGEMENT JET-M
www.elsevier.com/locate/jengtecman

The role of infrastructure practices in the effectiveness of JIT practices: implications for plant competitiveness

Sohel Ahmad [a,*], Roger G. Schroeder [b], Kingshuk K. Sinha [b]

[a] *Department of Management, St. Cloud State University, 720 Fourth Avenue South, St. Cloud, MN 56301-4498, USA*
[b] *Department of Operations and Management Science, Carlson School of Management, University of Minnesota, 3-140 Carlson Management Building, 321-19th Avenue South, Minneapolis, MN 55455, USA*

Abstract

Previous research on JIT provides very little insight as to why the same JIT practices are able to foster competitiveness in one plant but fail to do the same in another plant. The premise of this research is that such failures are due to a lack of managerial concern regarding infrastructure practices needed for JIT. The current JIT literature on infrastructure design is largely prescriptive, but the prescriptions are not founded on systematic empirical investigation. In this paper, we examine the role of infrastructure practices in the effectiveness of JIT practices from three perspectives—universal, contingency, and configurational—with data from a study sample of 110 plants. The plants in the study sample belong to three industries—electronics, machinery, and transportation—and are located in three countries—US, Italy, and Japan. Our results support the contingency and the configurational perspectives. Specifically, the analyses based on the contingency perspective indicate that with the exception of manufacturing strategy, all other infrastructure practices—quality management, product technology, work integration system, and human resource management (HRM) policies—individually moderate the relationship between JIT practices and plant competitiveness. The analyses based on the configurational perspective indicate that synergy between JIT practices and infrastructure practices needs to be exploited to attain superior plant competitiveness.

Keywords: Just-in-time; Quality management; Plant competitiveness; Manufacturing strategy; Integrated competitive strategy

* Corresponding author. Tel.: +1-320-255-2994; fax: +1-320-255-3986.
E-mail addresses: ahmad@stcloudstate.edu (S. Ahmad), rschroeder@csom.umn.edu (R.G. Schroeder), ksinha@csom.umn.edu (K.K. Sinha).

0923-4748/$ – see front matter © 2003 Elsevier B.V. All rights reserved.
doi:10.1016/S0923-4748(03)00017-1

1. Introduction

The primary motivation for adopting JIT practices has been to reduce and ultimately eliminate waste, enhance the quality of the product, and improve delivery efficiency. While many JIT implementations have been successful, many have failed to improve plant performance (Inman and Brandon, 1992; Safayeni and Purdy, 1991; Crawford et al., 1988). Previous research on JIT provides very little insight as to why the same managerial practice is a success in one plant and a failure in another. The premise of this research is that failures are due to a lack of managerial concern regarding infrastructure practices needed for JIT. We propose that effectiveness of JIT practices to enhance plant competitiveness will be minimized without developing and instituting these infrastructure practices. Additionally, we posit that infrastructure practices must fit the core requirements of JIT practices for them to be effective.

The current literature on infrastructure design for JIT is largely prescriptive. The prescriptions are not backed by systematic empirical investigations. In this paper, we examine the relationship between JIT practices and infrastructure practices through theory-driven empirical research. First, we identify the infrastructure practices. Next, we assess the individual and combined effects of the infrastructure practices on the effectiveness of JIT.

In reviewing the literature, we found that infrastructure for JIT is composed of initiatives, practices, procedures, and competencies that create an environment conducive for JIT practices to be effective. After identifying the infrastructure practices, we examine the relationship between these infrastructure practices, JIT practices, and plant competitiveness. Following Delery and Doty (1996), we examine this relationship from three perspectives: universal, contingency, and configurational. A *universal* perspective posits a direct relationship between JIT practices and plant competitiveness. A *contingency* perspective posits that the relationship between JIT practices and plant competitiveness is contingent on the infrastructure practices in a plant. A *configurational* perspective posits that synergy between the infrastructure practices and JIT practices determine plant competitiveness. The configurational perspective is founded on the holistic principle of inquiry aimed at identifying maximally effective patterns of JIT practices and infrastructure practices.

The unit of analysis for this study is a plant. The study sample contains 110 plants from three industries—electronics, machinery, and transportation—located in three countries—US, Japan, and Italy. The remainder of the paper is organized as follows. In the ensuing section, we provide the theoretical background of this study and present the relevant hypotheses. Next, we describe the research setting and discuss research methods. In the penultimate section, we present the results. The last section contains our concluding remarks, implications, and directions for future research.

2. Theoretical background and hypotheses

2.1. JIT practices

Ohno (1982), the originator of JIT, defines JIT as having the right part at precisely the right time, and in the right quantity, to go into assembly. JIT strives to eliminate waste