



Lean production and the Internet

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Abstract

In this paper, the implications for lean production systems of the Internet are explored. Does the World Wide Web facilitate the implementation of Just-In-Time (JIT) production systems, or alternatively, can it serve as a substitute for JIT? The possible effects on supply chains, production scheduling, inventory control, procurement, quality improvement, and the workforce are some of the issues addressed. Some case examples of use of the Internet for these purposes are presented. Constraints on the use of the Web to foster leanness are discussed and recommendations for integrating the Internet into production systems offered.

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1. Introduction

In the 1990s, many manufacturing firms around the world adopted *lean production* as a strategy to increase their global competitiveness. Some firms have made much progress in implementing lean production in their factories while others have found it to be very difficult and are still struggling with implementation, or in some cases, given up the attempt. Some of the companies that have been successful in converting their manufacturing facilities to lean production have begun to spread lean principles to other business activities (e.g. product design, payments processing, order taking) or into their supply chains. They are attempting to move

beyond lean manufacturing to become *lean enterprises*. Since the advent of the concept of lean production, which itself is derived from the *Just-In-Time* (JIT) system developed by Toyota beginning back in the 1960s, there have been many advances in information technology (IT), particularly the widespread deployment of the World Wide Web and the Internet. Almost every firm and business function has been impacted by the Internet in the last few years and whole new industries have arisen because of the technology. Of course, lean production systems are not immune from the effects of the Internet. But what are these effects likely to be? Will they allow lean production concepts to be more fully applied, or, on the other hand, might they serve as an alternative way to increase operational efficiency? In fact, some have seen an inherent conflict between lean principles and IT such as the Internet

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(Piszcalski, 2000). It is argued that lean production emphasizes reducing variety and flexibility to achieve greater efficiency whereas one of the benefits of IT is its ability to provide more flexibility and product variety. Also, many proponents of lean production believe simple visual systems (such as *kanban*) are sufficient to control a pull system and that computer systems tend to shift production control from a line to a staff function that is undesirable in lean thinking. Furthermore, computer systems can be expensive and difficult to implement and may distract attention from continuous process improvement. In this paper, we will discuss the ways in which the Internet is already having an impact on firms using lean production methods and its potential for deepening and broadening these effects. We will argue that the Internet is a facilitator to the implementation of lean production and lean enterprises and, in fact, a synergy exists between the two. In other words, if appropriately applied, the Internet can help make production systems leaner, and even more significantly, make the entire supply chain leaner.

In Section 1, the principles of lean production will be examined and how theoretically the Internet might affect the implementation of these principles. In Section 2, some examples of how firms have actually used the Internet to make their lean production operations more effective are discussed. Section 3 examines some constraints and barriers to integration of the Internet into lean enterprises. In Section 4, we reflect on the theoretical grounding of value creation in the combined system of lean production, enterprises, and the Internet. Sections 5 and 6 draw conclusions and present some guidelines for using the Internet to make the firm and its supply chain leaner, or *e-lean*, as it has been called (Piszcalski, 2000).

2. How lean production systems might use the Internet

To identify ways in which the Internet might be useful to firms using lean production approaches, it is helpful to first define what a lean production

system is and its key characteristics. The term *lean production* was used by the authors of the International Motor Vehicle Project carried out by MIT in the 1980s to describe the approach originally developed in the Japanese auto manufacturing industry which is contrasted with the mass production approach common in the United States and Europe at the time. This approach is often called JIT but the authors (Womack, Jones, and Roos) of **The Machine That Changed the World**, which popularized the term lean production, believe that leanness goes beyond JIT and more accurately describes the production systems used in the Japanese auto industry at the time (and now in much of the world). Their definition: “Lean production is ‘lean’ because it uses less of everything compared to mass production—half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also, it requires keeping far less than half the needed inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products” (Womack et al., 1990). In examining this definition, one can see that there is a strong emphasis on reducing the use of all resources, not only in the factory but also in activities extending beyond the shop floor such as product development and supplier relations. They subsequently expanded the concept of lean production to consider the *lean enterprise* and efforts to apply *lean thinking* throughout all enterprise activities (Womack and Jones, 1996). Although many use the terms JIT and lean production interchangeably, Womack, Jones, and Roos clearly believed that leanness is more descriptive of how pervasive the organizational change must be to fully benefit from a JIT approach. The key parameters are the same in the two concepts, but lean systems apply them more comprehensively throughout the firm to activities beyond the factory floor (some have called lean production *big JIT*) and in relationships with suppliers, customers and other important partners. While e-business, understood as trade over the Internet, is growing at an impressive overall rate, there now appears to be a slowing in the Business-to-Consumer (B2C) growth rate and acceleration in

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