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The impact of lean practices on inventory turnover

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ABSTRACT

Lean manufacturing (LM) is currently enjoying its second heyday. Companies in several industries are implementing lean practices to keep pace with the competition and achieve better results. In this article, we will concentrate on how companies can improve their inventory turnover performance through the use of lean practices. According to our main proposition, firms that widely apply lean practices have higher inventory turnover than those that do not rely on LM. However, there may be significant differences in inventory turnover even among lean manufacturers depending on their contingencies. Therefore, we also investigate how various contingency factors (production systems, order types, product types) influence the inventory turnover of lean manufacturers. We use cluster and correlation analysis to separate manufacturers based on the extent of their leanness and to examine the effect of contingencies. We acquired the data from the International Manufacturing Strategy Survey (IMSS) in ISIC sectors 28–35.

1. Introduction

Every company has to invest in manufacturing management programs, methods and technologies in order to remain competitive. One very popular investment choice nowadays is lean production (LP), which consists of several manufacturing practices, including process focus, pull production, quality development, total productive maintenance, continuous improvement, worker empowerment, supplier development, and so on. The main objective of LP is to satisfy customer needs on the highest possible level through the elimination of waste. Some sources of waste are overproduction, faulty products, sub-optimized processes, unnecessary waiting, movement or transportation, and excess inventory.

However, if this is true, and several kinds of waste can be reduced, why does every company not implement LP, and why do some fail during the implementation process? In the early literature, researchers blamed various conditions: for example, excessive demand fluctuation, a high level of product variation, or low demand that therefore cannot justify a line production system or cellular manufacturing. A few years later, however, we read about successful lean manufacturing program implementation at companies and industries that were far from satisfying these conditions (e.g., health care, Fillingham, 2007). As a result, the question arises of whether LP can be successful under any circumstances and what results can be achieved if the circumstances are not ideal.

In this paper, we investigate how various contingency factors influence inventory turnover performance, a very important indicator of the success of LP in companies applying lean practices (see e.g., Huson and Nanda, 1995). For this purpose, we formulate the following research questions:

- How do lean practices affect firm inventory levels?
- How do certain contingency factors (production systems, order types and product types) influence corporate inventories within an LP environment?

The structure of the paper is as follows. First, we review the LP literature, including works on inventory performance and contingency issues, to form a basis for our propositions. Then we introduce our methodology and the survey. After our data analysis, the results are discussed and some conclusions are drawn.

2. Literature review

2.1. Lean production in general

LP originated from the Toyota production system (TPS) and gained ground as a best-practice manufacturing strategy and repository of increasing competitiveness in recent decades (Voss, 1995). The best evidence of this phenomenon is the increase in

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the number of lean transformations all over the world in the preceding 10–15 years (Bruun and Mefford, 2003).

It is extremely difficult, however, to determine what LP stands for. Unfortunately, definitions are rather vague and confused, with several elements and sub-elements put forth in various papers. Even in standard OM textbooks, one can find only definitions such as "[lean production is] an integrated set of activities designed to achieve high-volume production using minimal inventories of raw materials, work-in-process, and finished goods" (Lewis, 2000; Chase et al., 2006). The first publication using the term (Womack et al, 1990) explained lean production simply as a journey leading to the use of fewer resources.

The confusion around lean production arises from several sources: (a) the Toyota production system itself, which has undergone tremendous improvement during its lean journey over the last 40 years (Spear, 2004; Voss, 2007); (b) the fact that several companies consider themselves lean, even if they are at very different stages of development; (c) the fact that researchers use various definitions for the term, such that there is no common understanding (Hines et al, 2004); and (d) the introduction of another book by Womack and Jones (1996) entitled "Lean thinking", which describes the principles of LP and opens new areas for leanness, thus leading to further lack of clarity. From that book on, it became evident that LP exists at both strategic and operational levels (Hines et al, 2004). At the strategic level, the concept helps one to understand customer value and identify the value stream. At the operational level, it is a bundle of practices and tools that lead to the elimination of waste and force continuous improvement. It is the latter that is relevant to the goals of this paper.

According to Karlsson and Ahlstrom (1996), LP permeates an entire organization (Fig. 1). It consists of lean development, lean procurement, lean manufacturing (LM) and lean distribution. This shows that the proper utilization of LP affects the whole firm. However, LP is not only a set of practices connected to the value-creation process. Rather, LP constitutes the pursuit of excellence based on a mixture of performance, continuous improvement and organizational change (De Toni and Tonchia, 1994).

Empirical evidence supports the idea that LP partially explains high corporate performance. For example, the British auto components industry increased its stock turn ratio by 177.4% between 1992 and 1994 (Oliver et al., 1996). Indeed, early implementation was seen in the automotive and electronics industries (Crawford et al., 1988). Nevertheless, LP as a whole seems to be universal, even if there are industrial barriers to the transfer of certain elements. For example, in the healthcare industry, LP can be applied easily in theory, but the special circumstances that characterize that industry (e.g., the simple fact that one has to work with patients rather than lifeless material) make its proper application more difficult. This indicates that there is no single good solution to achieving higher performance, and that the context of operations is of the utmost importance, but that LP can at least be applied to a certain extent in several industries (Lowe et al., 1997; Shah and Ward, 2003).

We analyzed data from an international manufacturing survey that also contained questions from other corporate functions, but wherein manufacturing was in the focus. On this basis, we concentrated our subsequent efforts only on the LM part of lean production. This decision was also supported by the fact that manufacturing is the function whereby leanness is usually introduced to a company. Therefore, if one is looking for candidates for lean adaptation, one must look at the first area of LP implementation—that is, manufacturing.

Karlsson and Ahlstrom (1996) enumerate the following building blocks of LM: elimination of waste, continuous improvement, multifunctional teams, zero defects/JIT, vertical information systems, decentralized responsibilities/integrated functions, pull versus push (see Fig. 1).

As the goals of LM are realized through the implementation of several lean practices, we will investigate them more closely in the following section.

2.2. Lean practices

There are numerous practices that can be applied under LM. This is one reason why one finds rather different individual practices investigated in the relevant literature, though the focus on LM is the same (e.g., see Sohal and Egglestone, 1994; Oliver et al., 1996; White et al., 1999). A better approach is to create bundles of practices that show the multi-faceted nature of LM. There have been several classifications of bundles put forth by previous literature. For example, Lowe et al. (1997) differentiate between three bundles of practices: factory practices (related to the minimization of buffers), human resource management (HRM) practices (concerning the encouragement of high commitment and motivation among the workforce) and work systems (related to teamwork and the development and application of employee knowledge and skills on the shop floor). On the other

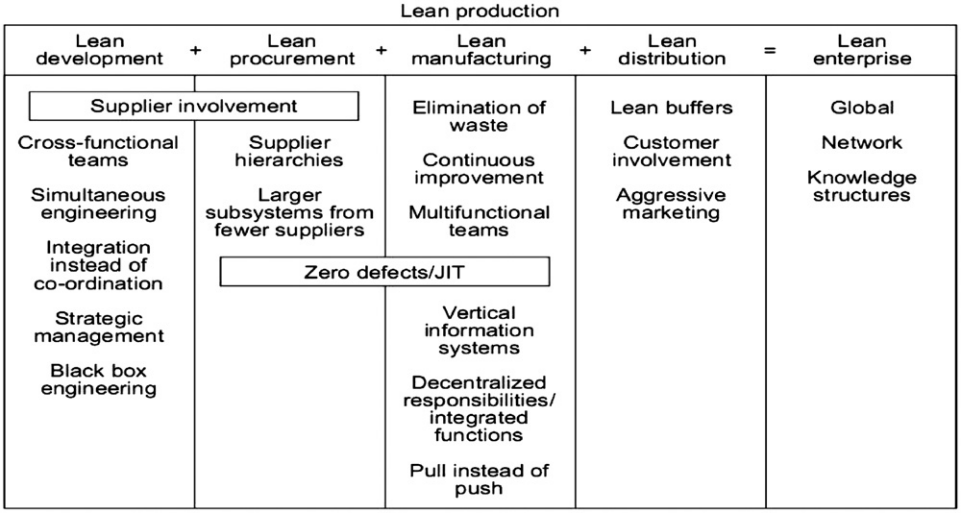

Fig. 1. Elements of lean production (Karlsson–Ahlstrom, 1996).