

Improving the performance of a Malaysian pharmaceutical warehouse supply chain by integrating value stream mapping and discrete event simulation

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ABSTRACT

Purpose

Lean implementation is vastly incorporated in core manufacturing processes; however, its applicability in the supply chain and service industry is still in its infancy. To acquire performance excellence and thrive in the global competitive market, many firms are adopting newer methodologies. But, there is a stringent need for production simulation systems to analyze supply chains both inbound and outbound. The era of face validation is slowly disappearing. Lean tools and procedures that provide future state assumptions need advanced tools and techniques to measure, quantify, analyze and validate them. The purpose of this study is to enable dynamic quantification and visualization of the future state of a warehouse supply chain value stream map using discrete event simulation (DES) technique.

Design/methodology/approach

This study aimed to apply an integrated approach of the value stream mapping (VSM) and DES in a Malaysian pharmaceutical production warehouse. The main focus is diverted towards reducing the warehouse supply chain lead time by initially constructing a supply chain value stream map (both present state and future state) and integrating its data in a DES modelling and simulation software to dynamically visualize the changes in future state value stream map.

Findings

The DES simulation was able to mimic the future state lead time reductions successfully, which assists in better decision-making. Improvements were seen related to total lead time, process time, value and non-value-added percentage. Warehouse performance metrics such as receiving, put away and storage rates were substantially improved along with pallet processing time, worker and forklift throughput usage percentage. Detailed findings are clearly stated at the end of this paper.

Research limitations/implications

This study is limited to the warehouse environment and further additional process models and functional upgrades in the DES software systems are very much needed to directly visualize and quantify all the possible Lean assumptions such as radio frequency image identification/Andon (Jidoka), 5S, Kanban, Just-In-Time and Heijunka. However, DES has a leading edge in extracting

dynamic characteristics out of a static VSM timeline and capture details on discrete events precisely by picturizing facility modification and lead time related to it.

Practical implications

This paper includes all the fundamental pharmaceutical warehouse supply chain processes and the simulations of the future state VSM in a real-life context by successfully reducing supply chain lead time and allowing managers in inculcating near-optimal decision-making, controlling and coordinating warehouse supply chain activities as a whole.

Social implications

This integrated approach of DES and VSM can involve managers and top management to support the adoption of anticipated changes. This study also has the potential to engage practitioners, researchers and decision-makers in the warehouse industry.

Originality/value

This study involves a powerful DES software package that can mimic the real situation as a virtual simulation and all the data and model building are based on a real warehouse scenario in the pharmaceutical industry.

KEYWORDS: Logistics, Modelling, Productivity, Supply chain management, Simulation, Lean warehousing, Lean supply chain, Discrete event simulation, Value stream mapping, Supply chain lead time, Lead time reduction, Anylogic

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