IN-PLANT LOGISTICS EFFICIENCY VALUATION USING DISCRETE EVENT SIMULATION

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Abstract
The purpose of this paper is to present an applicable approach for the valuation of in-plant logistics efficiency. Therefore, we developed a time-based efficiency concept that considers all relevant time losses when executing production logistics processes. The occurring delays are captured in real-time using modern auto-ID-technologies. For the valuation and improvement of in-plant logistics efficiency, we propose to use simulation modelling to investigate the cause-effect relations in the production system in advance. Thus, a discrete event simulation model has been constructed to model the workflow of a production system with discrete manufacturing processes and its in-plant logistics processes. The aim of the provided simulation study is to prove the functionality and to verify the applicability of the current approach in business practice.

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Key Words: In-Plant Logistics Efficiency, Efficiency Valuation, Discrete Event Simulation

1. INTRODUCTION

Industrial companies must eliminate waste in manufacturing to become more efficient and to achieve a reduction in costs. As a result, many industrial companies implement efficiency improvement programs and establish well-known lean practices, such as 5S, value stream analysis, continuous improvement, to realise efficient processes in manufacturing. In addition, for a more efficient handling of logistical tasks, many companies rely on common concepts and methods, such as just-in-time (JIT) and/or just-in-sequence (JIS) delivery. Scientific research provides suitable approaches and efficiency metrics to evaluate the efficiency of individual and/or a group of manufacturing facilities adequately [1-4]. Furthermore, the existing literature provides appropriate indicators and performance measurement systems for efficiency assessment of JIT- and/or JIS-deliveries [5-8]. However, a comprehensive efficient order processing requires an additional assessment of the entire internal production logistics processes in terms of efficiency. Therefore, it is necessary to provide a practical approach to capture the efficiency of in-plant logistics. In this context, simulation modelling can be a powerful tool to capture the efficiency of in-plant logistics tasks on a regular basis in business practice. By simulating current in-plant logistics tasks, possible inefficiencies can be easily identified along the entire internal value chain. Appropriate measures to eliminate these inefficiencies can be simulated and compared to the current in-plant logistics efficiency. As a result, successfully simulated efficiency-improving measures can be transferred to reality and implemented in practice. Efficiency-improving action can be repeated until an adequate level of efficiency is achieved. Thus, simulation allows a dynamic investigation of the system’s behaviour and it therefore facilitates the implementation of a continuous improvement process. Consequently, it is a useful tool for managers to derive appropriate measures for continuously improving a manufacturing system’s efficiency.

Related work has been done by different authors. Chance et al. [9] have shown that simulation can be a powerful tool to support production improvement. Moreover, Galbraith and Standridge [10] successfully employed simulation to demonstrate how to transfer a push


