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PERFORMANCE ANALYSIS OF DEMAND-DRIVEN MATERIAL REQUIREMENTS PLANNING FOR A BICYCLE ASSEMBLY COMPANY

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ABSTRACT

Demand-driven material requirements planning (DDMRP) is considered as an effective method to help enterprises plan and manage inventories and materials, and it addresses the challenges of the increasing variability and complexity in the current market environment. Herein, a simulation model of a bicycle assembly company was constructed to verify and evaluate the DDMRP benefits, for implementing experiments that consider variability.

1 INTRODUCTION

Since the 1970s, material requirements planning (MRP) has been widely used as a planning method and tool for controlling the inventory, production, and scheduling in most mid-range and large manufacturing companies worldwide (Ptak and Smith 2011). In the current market environment, however, the increasing customization of products requires that the systems handle higher numbers of product variants, as well as smaller lot sizes, thereby making it greatly difficult for traditional planning systems to cope with these uncertain situations and to keep the inventory (material, intermediate products, and final products) at an appropriate level. To address these challenges, demand-driven MRP (DDMRP) has been developed to aid in the planning and management of inventories and materials, as well as to promote better and quicker decisions and actions at the planning and execution levels (Ptak and Smith 2011). In this study, the effectiveness of conducting DDMRP is verified and evaluated through the simulation model of a bicycle assembly company, which provides a comparison of its performance to that of the traditional planning method.

2 FRAMEWORK OF DEMAND-DRIVEN MATERIAL REQUIREMENTS PLANNING

DDMRP is a formal multi-echelon planning and execution method that protects and promotes the flow of relevant information and materials through the establishment and management of strategically placed decoupling point stock buffers (Ptak and Smith 2018). The concept and the five components of DDMRP are shown in Figure 1.

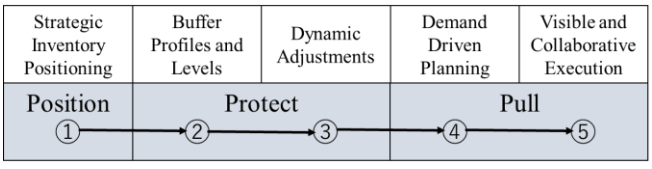

Figure1: Five components of DDMRP.

Figure 2 provides a summary of the main calculation method for a decision strategic buffer at the decoupling points, which is different from the traditional MRP.

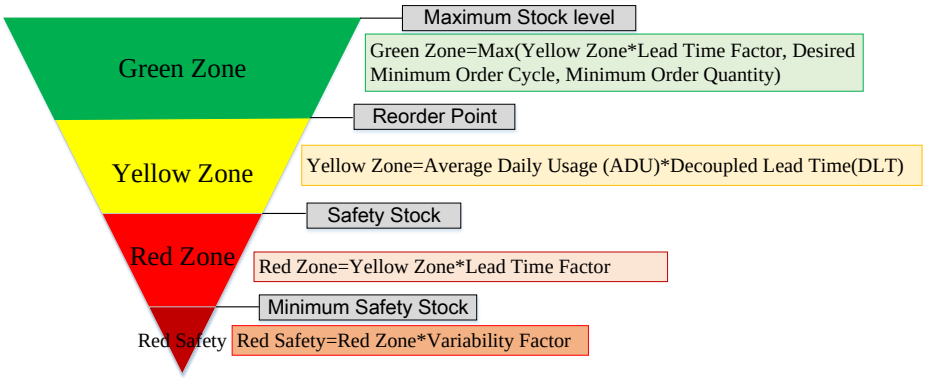

Figure 2: Buffer zone division and equation of DDMRP.

3 SIMULATION MODEL

This study utilizes the data from Global Bike Inc. (GBI, designed for SAP ERP) for visualization and analysis. GBI is a fictitious corporation that was developed for demonstration and educational purposes. Data tables stored in the ERP system, such as the bill of materials, processing routing, manufacturing orders, etc., can be imported into the simulation model using Simio. The experiments are performed under several scenarios by adjusting the variability factors to create a comparison between the DDMRP and the traditional planning method.

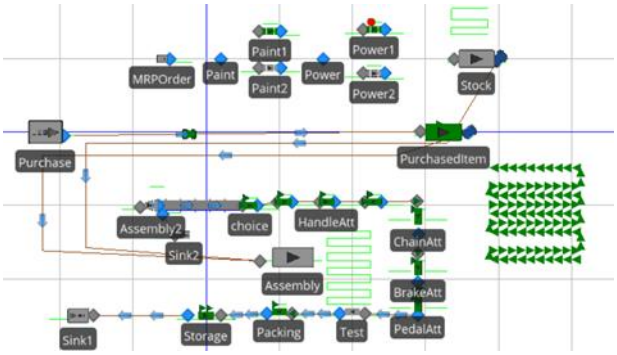

Figure3: Screenshot of the simulation model execution.

4 SUMMARY

This study clarified the definition and schema of DDMRP. Furthermore, a simulation model of a bicycle assembly company was constructed, and experiments were performed to analyze and evaluate the performance of DDMRP by comparing it with the traditional planning method.

ACKNOWLEDGMENTS

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