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Int. J. Production Economics 90 (2004) 187–198
international journal of production economics
www.elsevier.com/locate/dsw

Exploring applicability of the workload control concept

Peter Henrich*, Martin Land, Gerard Gaalman

Faculty of Management and Organisation, University of Groningen, Landleven 5 Box 800, Groningen 9700 AV, The Netherlands

Received 13 May 2002; accepted 24 April 2003

Abstract

To be successful in companies, a production planning and control (PPC) concept should fit to the production environment. Essential elements of the concept should correspond with the characteristics of the production system. For classical concepts such as MRP these elements have become common sense. For example, BOM-explosion and constant lead times make MRP known to perform best in environments with high material and low capacity complexity. For many other concepts the situation is less clear. In this paper the workload control (WLC) concept is considered for which the requirements for a successful application have never been investigated. A framework is proposed to explore the applicability of WLC in small- to medium-sized make-to-order (MTO) companies. It supports an initial consideration of WLC in the first phase of a PPC selection and implementation process.

As a first step in developing the framework, the inherent characteristics of the WLC concept and the relevant MTO production characteristics are identified. Confronting the indicators of the company characteristics with the WLC elements results in best-fit indications for the WLC concept. Contrarily to other PPC evaluation schemes the framework considers variability indicators besides averages.

Use of this framework for a medium-sized MTO company demonstrates its suitability in getting a systematic and quick impression of the applicability of WLC. Essential elements are treated and assessed.

Keywords: Workload control; Job shop; Small- and medium-sized enterprise (SME)

1. Introduction

Small- and medium-sized enterprises (SMEs) in the make-to-order (MTO) sector are of great interest, as they are a relevant part of the industrial infrastructure. These companies have to react on turbulent environments: they have to cope with changes in product mix and volume, production rate changes, a high number of rush orders, and lot of internal uncertainty. As a consequence, the production planning and control (PPC) in MTO companies is rather complex and often based on insecure data. Since a good functioning of the PPC concept is crucial for the economic success of the enterprise, the selection of a fitting PPC concept is an important decision process. While selecting and implementing a suitable shop floor control concept, different stages can be distinguished. Fig. 1 roughly sketches these stages.

1. *Preliminary study and evaluation*: In this stage a pre-selection between alternative PPC concepts takes place. All possible concepts are considered without collecting detailed information.

*Corresponding author. Tel.: +503633845.
E-mail address: p.henrich@bdk.rug.nl (P. Henrich).

0925-5273/03/$ - see front matter
doi:10.1016/S0925-5273(03)00126-9

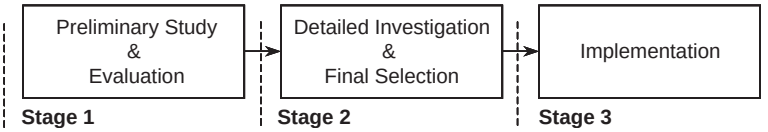

Fig. 1. Stages in selecting and implementing a PPC concept.

2. *Detailed investigation and final selection*: Before implementing a chosen concept, a detailed investigation of relevant company characteristics and planning and control tasks is necessary. Also the characteristics of possible PPC software systems are evaluated. The huge amount of data retrieving and processing in this stage provides the motivation for pre-selection in stage 1.
3. *Implementation*: The PPC tasks of the shop floor have to be adapted according to the chosen concept. The selected software package is parameterised and embedded into the company.

In practice, mostly external consultants support companies in selecting a suitable concept in the 'preliminary research and evaluation' stage. This decision-making process is frequently based on intuitive reasoning rather than on an objective evaluation of the company characteristics and the considered PPC concepts. Moreover, the selection is based on the experience of the advisor, collected in prior projects. There is a big need to make this initial selection procedure more transparent.

Several operations management textbooks (e.g. Vollmann et al., 1997; Silver et al., 1998) show diagrams relating control concepts to product and process characteristics of companies. The example in Fig. 2 is taken from Silver et al. (1998).

Remarkably little seems to be known about the applicability of PPC concepts for the area in Fig. 2 related to job shops. The suggested sequencing rules and 'factory physics' cannot be seen as complete PPC concepts. Exactly this part of the matrix reflects the environment that can be found in most SMEs in the MTO sector. Hendry and Kingsman (1989) suggest amongst others that the workload control (WLC) concept is particularly suitable in this environment. As for JIT manufacturing and MRP, WLC also imposes certain requirements on the production environment to guarantee a successful implementation. The inherent characteristics of the concept have to match up with the company characteristics. For classical concepts such as MRP these requirements have become common sense. For example, BOM-explosion and constant lead times make MRP known to perform best in environments with high material and low capacity complexity.

In this paper we identify these inherent characteristics of the WLC concept, particularly those that can be seen as distinguishing elements. The possible match between the distinguishing WLC elements and the company characteristics is analysed, and, based on the resulting insights, a framework is developed that supports the consideration of WLC in the 'preliminary study and evaluation' stage of a selection process (Fig. 1).

The structure of the paper is as follows: Section 2 discusses the distinguishing elements of the WLC concept. Section 3 analyses the relevant company characteristics to be considered in the preliminary selection. A compact set of indicators is proposed to describe these characteristics. In Section 4 the framework is set up by relating each indicator to the distinguishing elements of WLC. Section 5 discusses the use of the framework in an MTO company. Finally, in Section 6 some concluding remarks are provided.

2. The characteristics of WLC

This section gives a comprehensive analysis of the WLC concept. For a more extensive and formal description, we refer to Kingsman (2000).

The WLC concept is based on principles of input/output control. Input control relates to both accepting orders and releasing them to the shop floor. Once released the orders remain on the shop floor. Simple priority dispatching rules will direct the orders along their downstream operations. In