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The Definition of Appropriate Shopfloor Performance Measures Using the Theory of Constraints Philosophy and Study of Shopfloor Performance Measures Application in New Zealand Manufacturers

A thesis presented in partial fulfillment of the requirements for the degree of Master of Technology in Manufacturing and Industrial Technology at the Institute of Technology and Engineering, Massey University.

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1999
“When you measure what you are speaking about and express it in numbers, you know something about it. Otherwise, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in thought advanced to the stage of science.” - Lord Kelvin, 1824-1907.
Abstract

Shopfloor performance measures have significant impact on the overall performance of a manufacturing organisation. Measures are used in many ways to support the decision making function across an organisation.

Many research suggest that many shopfloor measures used by manufacturers were derived when producers dominated market (Srikanth et al, 1995; Goldratt, 1988, 1990; Stein, 1994; Kaplan et al, 1992). Cost control was the major factor in ensuring profitable operations (Srikanth et al, 1995).

Today cost-based measures are no longer appropriate as other critical dimensions are needed to maintain manufacturing competitiveness (Goldratt, 1990). The market condition dictates such things as faster lead times, increased variety of quality products and cost effective purchasing. Increasing competition has also forced producers to be more proactive in seizing every sales opportunity available. Cost-based measures fail because they focus too much on local improvements and short term performance that do not necessarily translate into overall improvement (Goldratt, 1992).

Today manufacturing competitiveness come in three key dimensions: product, price and responsiveness (Goldratt, 1986). Shorter lead times and due date performance assist to achieve manufacturing responsiveness. In turn, these key factors rely on good shopfloor performance assisted by shopfloor measures.

Theory of Constraints synchronisation principles were looked at and analysed to explore how they could be used to derive working shopfloor measures. Synchronisation of activities is important to bring about the desired performance through synergy. The step by step approaches of the Five Focusing Steps and the synchronisation mechanism offered by the DBR scheduling could be used as the benchmark whereby shopfloor measures are derived. The TOC performance measurement, Throughput, Inventory and Operating Expense measures, should be the objectives of shopfloor measures achievements.
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Glossary of Terms

The followings are the definitions of some popular terms used in this document (in alphabetical order):

1. CCR: Umble et al (1990) describes Capacity Constraint Resource (CCR) as any resource which if not properly scheduled and managed, is likely to cause the actual flow of product through the plant to deviate from the planned product flow.

2. Dependent Events: A chain of events or activities that cannot overlap each other to give the full results or products.

3. Global Optima: Achievement of organisation wide or overall improvement that should also cover localised improvement (Goldratt, 1992).

4. JIT: Just-In-Time (JIT) is defined in Schermerhorn (1993) as a scheduling system that attempts to reduce costs and improve workflow by scheduling materials to arrive at work centres as they are needed.

5. Local Optima: Achievement of localised improvement that may not have any effect on overall improvement (Goldratt, 1992).

6. Shopfloor Performance Measures: A metric used to quantify the efficiency and/or effectiveness of an action at the shopfloor level (see Chapter 3 for detailed descriptions of this term and its associated topics).

7. Sub-system: A smaller component of a larger system that operates to its benefit (Schermerhorn, 1993). This could be interpreted as those individual but interrelated departments working together in an organisation.

8. System: A collection of interrelated parts that function together to achieve a common purpose (Schermerhorn, 1993).

9. System’s Constraint: Anything that prevents the system advancing towards its goal.

10. The Goal: The ‘Goal’ or simply the ‘goal’ will be utilised throughout this document and Goldratt (1992) defines the goal of for-profit enterprise as “to make (more) money now and in the future”.

11. TOC: Dettmer (1994) describes Dr. EM Goldratt’s Theory of Constraints (TOC) as a system improvement philosophy. TOC is a paradigm, which includes not only its concepts and guiding principles, but also its tools and applications. Examples of TOC applications are the Thinking Process and the Drum Buffer Rope scheduling mechanism.
12. TQM: Total Quality Management (TQM) is defined in Schermerhorn (1993) as a style of managing an organisation wide commitment to continuous improvement and focusing on meeting customer needs.

13. WCM: *World Class Manufacturing* (WCM) is a term first widely publicised in studies developed by RJ Schonberger (1986). Although the meaning of world class is in the eye of beholder, there is general agreement that a WCM is a firm that has attained a high level of manufacturing capability, used that capability to gain competitive advantage and constantly strives to improve those capabilities (Leong et al, 1995).

Additional and more complete descriptions of other terms used will be explained in the body of this document.