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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
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“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 fails 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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Table of Contents

ABSTRACT	III
ACKNOWLEDGMENT	IV
TABLE OF CONTENTS	V
LISTS OF TABLES	IX
LIST OF FIGURES	XI
GLOSSARY OF TERMS	XIII
CHAPTER ONE: INTRODUCTION	1
1.0 Research Background	1
1.2 Study Objectives	5
1.3 Importance of the Study	6
1.4 Organisation of the Study	7
CHAPTER TWO: THE PROBLEMS WITH TRADITIONAL PERFORMANCE MEASURES	9
2.0 Introduction	9
2.1 The Manufacturing Industry Performance Measurement Evolution	9
2.2 The Role of Management Accounting in the Manufacturing Organisations	11
2.3 Limitations of Traditional Cost Accounting Based Measures	13
2.4 The Problems with the Traditional Performance Measurement in the Manufacturing Environment	15
2.5 Current Reality Tree Method to Illustrating Problems with Traditional Performance Measurement	17
2.6 Chapter Two Summary	23
CHAPTER THREE: PERFORMANCE MEASUREMENT SYSTEM DESIGN	24
3.0 Introduction	24
3.2 Performance Measurement System	24
3.2 Key Benefits of Measuring Performance	27
3.3 Focusing Improvement Efforts using Performance Measures as the Guide	28

3.4 Types of Measures	30
3.5 Kaplan and Norton's Balanced Scorecard	32
3.5.1 Internal Business Perspective	33
3.5.2 Innovation and Learning Perspective	34
3.5.3 Financial Perspective	35
3.5.4 Customer Perspective	35
3.5.5 Advantages of the Balanced Scorecard	36
3.5.6 Limitations of the Balanced Scorecard	37
3.5.7 Summary of the Balanced Scorecard	38
3.6 Lockamy and Cox's Generalised Organisational Performance Measurement System Model	39
3.7 Maskell's Performance Measurement for World Class Manufacturing	40
3.8 Srikanth's In-Sync Performance Measurement Technique	41
3.8.1 Activity-Outcome Measure	42
3.8.2 Activity-Focusing Measure	43
3.8.4 In-Sync Summary	44
3.9 Theory of Constraints	45
3.9.1 TOC's Ongoing Improvement Recipe: The Five Focusing Steps	46
3.9.2 Types of Constraint	48
3.9.3 Theory of Constraints Performance Measurement	48
3.9.4 Throughput	49
3.9.5 Inventory	50
3.9.6 Operating Expense	52
3.9.7 TOC Performance Measures Advantages	52
3.9.8 Additional Operational Measures in the Theory of Constraints Framework: Brief Descriptions and A Critique	54
3.9.9 Drum-Buffer-Rope Scheduling	56
3.9.10 TOC Synchronisation Principles	58
3.9.11 Possible Shopfloor Measures	60
3.10 Performance Measurement System Design Summary	63
CHAPTER FOUR: CRITERIA OF APPROPRIATE SHOPFLOOR MEASURES	65
4.0 Introduction	65
4.1 Criteria for Developing Appropriate Shopfloor Measures	65
4.2 Shopfloor Measures Development Sequence: A Proposal for Consideration	71
4.3 A Cause and Effect Method to Analysing Performance Measures	72
4.3.1 Reminder	80
4.4 Chapter Four Summary	81
CHAPTER FIVE: SURVEY RESEARCH METHODOLOGY	82
5.0 Introduction	82
5.1 Survey Research Justification	82
5.2 Survey Research Objectives	83
5.3 Survey Research Benefits	83

5.4 Information Used in the Development of the Survey Questionnaire	85
Title or Focus	85
5.5 Survey Research Design	86
5.5.1 Data Source	86
5.5.2 Targeted Respondents	86
5.5.3 Targeted Companies	87
5.5.4 Methods to Ensuring Adequate Response Rate	88
5.6 Survey Research Process	88
5.7 Survey Research Instruments Design Considerations	90
5.7.1 Plant Type	91
5.7.2 Manufacturing Classification	96
5.8 Problems Encountered	96
5.9 Survey Questionnaire: Improvement Opportunities	97
5.10 Chapter Summary	98
CHAPTER SIX: SURVEY RESULTS ANALYSIS	99
6.0 Introduction	99
6.1 Survey Response	99
6.2 Survey Problems	100
6.2.1 Low Response	100
6.2.2 Incorrect Details	100
6.2 Section A: General Enquiries	102
6.2.1 Objective	102
6.2.2 Analysis	102
6.3 Section B: Company Profile	102
6.3.1 Objective	102
6.3.2 Analysis	102
6.4 Section C: Production and Operation	104
6.4.1 Objective	104
6.4.2 Analysis	104
6.5 Section D: Shopfloor Performance Measures	118
6.5.1 Objective	118
6.5.2 Analysis	119
6.6 Section E: Finance	134
6.6.1 Objectives	134
6.6.2 Analysis	135
6.10 Summary	138
CHAPTER SEVEN: CONCLUSION	140
7.0 Introduction	140
7.1 An Outline of the Problems Associated with Traditional Performance Measures	140

7.2 Description of Key Attributes in a Performance Measurement System Design with Particular Emphasis in the Theory of Constraints Philosophies	141
7.3 The Criteria for Developing Appropriate Shopfloor Performance Measures	142
7.4 The Survey of Shopfloor Performance Measures Application in New Zealand Manufacturing Companies	143
7.5 Publication from this research	143
7.6 Summary	144
CHAPTER EIGHT: RECOMMENDATIONS	145
8.0 Introduction	145
8.1 The Application of TOC-based Performance Measurement System	145
8.2 Additional Examination of the Proposed Method to Derive Shopfloor Measures	146
8.3 Explore Other Improvement Ideas from the Survey Research	146
REFERENCES AND BIBLIOGRAPHY	147
TABLE OF APPENDICES	151

Lists of Tables

1. Table 1.1: Manufacturing Competitive Edge.
2. Table 1.2: Definitions of T, I and OE Operational Measures.
3. Table 1.3: T, I and OE Formulas to Calculate NP and ROI.
4. Table 2.1: Summary of Problems with Traditional Accounting Based Measures – adapted from Maskell (1991).
5. Table 2.2: General Limitations of Traditional Performance Measures – adapted from Ghalayini et al (1996).
6. Table 3.1: Performance Measurement Effectiveness and Efficiency Terms Descriptions.
7. Table 3.2: Additional Performance Measurement Terms Descriptions.
8. Table 3.3: Seven Key Benefits of Performance Measurement.
9. Table 3.4: The Groups within In-Sync Performance Measurement – adapted from Srikanth et al (1995).
10. Table 3.5: Examples of types of measures appropriate for various organisational levels – adapted from Srikanth et al (1995).
11. Table 3.6: TOC Applications Descriptions.
12. Table 3.7: Five Types of Constraint.
13. Table 3.8: Mathematical Formulas Relating to T, I and OE.
14. Table 3.9: Drum-Buffer-Rope Terms Definitions.
15. Table 3.10: Examples of Shopfloor Measures Following the Drum-Buffer-Rope Scheduling Principles – suggestion by Wright (1999).
16. Table 5.1: Selected References Discussing Performance Measurement Research.
17. Table 5.2: Hypotheses Definitions.
18. Table 5.3: NZSIC Manufacturing Classification.
19. Table 6.1: Overall Classification of Survey Response.
20. Table 6.2: Overall Response Classification of Management Hierarchy.
21. Table 6.3: Respondents' Company Personnel Classification.
22. Table 6.4: Survey Results NZSIC Classification.
23. Table 6.5: New Zealand Statistics Classification of Manufacturing Companies.
24. Table 6.6: Classification of Plant Types in the Survey Data.
25. Table 6.7: Comparison between Manufacturing Division and Plant Types in the Survey.

26. Table 6.8: Approximate % Production Volume of Make to Stock and Make to Order (not all data collected are shown).
27. Table 6.9: Approximate % of \$ (Monetary) Value of Make to Stock and Make to Order Production (not all data collected are shown).
28. Table 6.10: Overall Classification of Make to Stock and Make to Order based on Production Volume and Monetary Value.
29. Table 6.11: Overall Respondents Production Scheduling Method Classification.
30. Table 6.12: Top 10 Measures Based on Level of Importance Average Score – Overall Respondents.
31. Table 6.13: Top 10 Measures' Level of Importance for Each Plant Type.
32. Table 6.14: Usefulness Rating using Average Score – Overall Respondents.
33. Table 6.15: Top 10 Measures' Usefulness Rating for Each Plant Type.
34. Table 6.16: Pearson Correlation Values.
35. Table 6.17: Pearson Correlation Hypotheses Definitions.
36. Table 6.18: The Spread of Results Data for the Pearson Correlation between Measures' Level of Importance and Usefulness Rating.
37. Table 6.19: Pearson Correlation between Measures' Level of Importance and Usefulness Rating.
38. Table 6.20: Top 10 Company Concerns Ranked Using Rate of Occurrence Scores – Overall Plants.
39. Table 6.21: Top 10 Company Concerns Ranked Using Rate of Occurrence Scores – All Plants.
40. Table 6.22: Top 10 Company Concerns Ranked by Financial Impact Scores – Overall Response.
41. Table 6.23: Top 10 Company Concerns Ranked by Financial Impact – All Plants.
42. Table 6.24: Top 10 Pearson Correlation Values between Concerns' Rate of Occurrence and Financial Impact.
43. Table 6.25: The Spread of Pearson Correlation Values Between Concerns' Rate of Occurrence and Financial Impact.
44. Table 6.26: Perceived Success Rate of Current Performance Measurement System.
45. Table 6.27: ROI Classifications in the Survey Results.
46. Table 6.28: The Spread of Relative Proportion of Materials Cost from Sales Revenue.
47. Table 6.29: The Spread of Direct Labour relative proportion from Sales Revenue.

List of Figures

1. Figure 1.1: Hierarchy of Measures.
2. Figure 2.1: Example of a CRT.
3. Figure 2.2: Current Reality Tree – Part 1.
4. Figure 2.3: Current Reality Tree – Part 2.
5. Figure 2.4: Current Reality Tree – Part 3.
6. Figure 2.5: Current Reality Tree – Part 4.
7. Figure 2.6: Current Reality Tree – Part 5.
8. Figure 2.7: Current Reality Tree – Part 6.
9. Figure 3.1: A framework for performance measurement system design – adapted from Neely et al (1995).
10. Figure 3.2: Approximate Proportion of Non Financial and Financial Measures in a Manufacturing Organisation Management Hierarchy.
11. Figure 3.3: The Four Elements of the Balanced Scorecard – adapted from Clarke (1997).
12. Figure 3.4: Generalised Organisational Performance Measurement System Model – adapted from Lockamy and Cox (1994).
13. Figure 3.5: The Relationship between T, I and OE and the flow of money into and out of a system – adapted from Srikanth and Robertson (1995).
14. Figure 4.1: Initial connection of proposed action and expected consequences – adapted from Boyd et al (1997).
15. Figure 4.2: Negative Branch for Using “Efficiency” as a Performance Measure – adapted from Boyd et al (1997).
16. Figure 4.3: Negative Branch for Decreased Cost – adapted from Boyd et al (1997).
17. Figure 4.4: Positive and Negative Effects of Overtime – adapted from Boyd et al (1997).
18. Figure 4.5 Negative Branch for Adopting “Overtime” as a Performance Measure – adapted from Boyd et al (1997).
19. Figure 5.1: The Shopfloor Performance Measures Survey of New Zealand Manufacturing Companies Flow-chart.
20. Figure 5.2: Type A Plant Configuration.

21. Figure 5.3: Type V Plant Configuration.
22. Figure 5.4: Type T Plant Configuration.
23. Figure 5.5: Type I Plant Configuration.
24. Figure 5.6: Selected Combination Plant Configurations.
25. Figure 6.1: Pie-graph Showing “Original” Classification of Survey Response.
26. Figure 6.2: Classifications of Manufacturing Divisions in the Survey Data.
27. Figure 6.3: Comparison of Manufacturing Division – Survey Response, Total New Zealand Statistics and New Zealand Medium to Large.
28. Figure 6.4: Classification of Plant Type in the Survey Data.
29. Figure 6.5: Classification of Production Type from Survey data.
30. Figure 6.6: Classification of Production Batch Splitting Policy.
31. Figure 6.7: Distribution of Production Batch Splitting Allowance for Each Plant Types.
32. Figure 6.8: Distribution of Minimising Setups Policy in the Survey.

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.