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MEASURING PERFORMANCE OF AGRI-FOOD SUPPLY CHAINS

**A thesis presented in partial fulfilment of the
requirements for the degree of**

Doctor of Philosophy

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ABSTRACT

During the past two decades Supply Chain Management (SCM) has become a popular topic of business discussions. SCM presents a business philosophy of improving the long-term performance of individual companies and the supply chain (SC) as a whole and, as a result, attains or sustains a company's competitive position. The practical implementation of SCM has a number of constraints. The basic problems facing SCM are difficulties in adopting a SCM philosophy, the lack of general theory, difficulties of system thinking, and the unique characteristics of agribusiness SCs.

Contemporary SCM theory is mainly descriptive and modern SCM research is predominately deductive. Research on SC performance measurement systems (PMSs) has not provided co-ordinated measurement of the bi-directional system flows (material, financial and informational). Available systems do not provide quantifiable measures for the network optimisation decision-making process.

In this study an alternative approach to SCM problem resolution was developed. The three SC flows were integrated through the evaluation of their normalised performance measurements (NPMs). The NPM system was developed based on the primary concept that the performance of each SC flow within a SC may be uniformly measured using comparable sets of characteristics. This primary concept was then used as a basis to evaluate higher levels of system performance such as two-party contractual performance and then the performance of the total SC. Special attention was paid to the strategic level of SC analysis and optimisation. The suggested methodology was used to demonstrate how performance improvement of the SC as a whole is interrelated to the performance improvement of individual companies.

Case evaluation of the proposed methodology allowed identification of the supply chain wave effect. This effect quantifies how the performance of one chain member affects the performance levels of other system participants. The application of game theory to the methodology indicated that a stable optimum SC strategy might be reached when business performances are balanced along the chain. The case study suggested that chain participants tend to move toward a stable optimum strategy over time.

This research may be used as a prescriptive tool for a range of agri-food chain studies. Extended case evaluation is required to test the robustness of the suggested methods.

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Table of Contents

CONTENTS	PAGE
Title Page	i
Abstract	ii
Acknowledgements	iv
Table of Contents	v
List of Tables	xi
List of Figures	xiii
Glossary of Abbreviations and Terms	xv

Chapter One

Introduction

1.1. Background	1
1.2. Problem Statement	3
1.2.1. Problem 1 - Difficulties in Adopting a SCM Philosophy	4
1.2.2. Problem 2 - The Lack of General Theory of SCM	5
1.2.3. Problem 3 - Difficulties of System Thinking	8
1.2.4. Problem 4 - Unique Characteristics of Agribusiness Supply Chains	9
1.2.5. Classification of SCM Problems	10
1.3. Research Objectives	12
1.4. Justification	13
1.4.1. Difficulties in Adopting a SCM Philosophy	13
1.4.2. The Lack of General Theory of SCM	14
1.4.3. Difficulties of System Thinking	14
1.4.4. Unique Characteristics of Agribusiness Supply Chains	15
1.5. Thesis Outline	17

Chapter Two

Literature Review

2.1. Background	19
2.2. Supply Chain Management Concept	21

CONTENTS	PAGE
2.2.1. Introduction	21
2.2.2. Contemporary Research on SCM	24
2.2.3. Overview of SCM Definitions	28
2.2.3.1. Common Characteristics of Literature on SCM Definitions	30
2.2.3.2. Summary of SCM Definitions from the Literature Review	32
2.2.4. SCM Definition Used in this Research	32
2.2.6. Conclusions	34
2.3. Agri-Food SCM	34
2.3.1. Background	34
2.3.2. Factors Affecting Agri-Food Chain Performance	35
2.3.2.1. Product Characteristics	35
2.3.2.2. Globalisation	35
2.3.2.3. Consumer Attitudes	36
2.3.2.4. Government and Industrial Policies	38
2.3.2.5. Industrialisation	39
2.3.2.6. Biological and Perishable Nature of Raw Materials	39
2.3.2.7. Structural Changes in Agri-Food Chains	40
2.3.2.8. Increase in Contractual Production	41
2.3.3. Conclusions	42
2.4. Strategic Planning	43
2.4.1. Background	43
2.4.2. Definitions	44
2.4.3. Strategic Schools of Thought	45
2.4.4. Levels of Strategic Planning	49
2.4.5. Strategic Planning and the Supply Chain Concept	50
2.4.6. Supply Chain Strategies	52
2.4.7. Conclusions	52
2.5. Performance Measurement Systems in SCM	53
2.5.1. Background	53
2.5.2. PMS Models	55
2.5.2.1. Balance Scorecard Model	55
2.5.2.2. Activity Based Costing	57
2.5.2.3. Economic Value Analysis	57
2.5.2.4. Supply Chain Operation Reference Model	58
2.5.3. PMS Research	60
2.5.4. Conclusions	64
2.6. Connecting of the Literature Review Findings to the Research Problems	65

CONTENTS	PAGE
Chapter Three	
Methodology - Primary Concepts	
3.1. Structure of Methodology	66
3.1.1. Introduction	66
3.1.2. The Structure of Methodology	67
3.1.3. Transaction Performance Measurement	68
3.1.3.1. Material Transaction	69
3.1.3.2. Financial Transaction	69
3.1.3.3. Information Transaction	70
3.1.4. Branch Level Performance Measurement	70
3.1.5. Network Level Performance Measurement	71
3.1.6. Methodology Application to Strategic Planning and Control	72
3.1.7. Conclusions	74
3.2. Material Flow Performance Measurement	75
3.2.1. Definitions and Notations	75
3.2.2. The Total Normalised Value of Quality	81
3.2.3. The Total Normalised Value of Delivery	83
3.2.3.1. The Normalised Acceptance Value of Volume	83
3.2.3.2. The Normalised Acceptance Value of Delivery Time	84
3.2.4. The Total Normalised Material Flow Performance Value	88
3.2.5. Conclusions	89
3.3. Financial Flow Performance Measurement	90
3.3.1. Normalised Financial Flow Performance Measurement	90
3.3.2. Selection of Discounting Factor r	92
3.4. Information Flow Performance Measurement	93
3.4.1. Introduction	93
3.4.2. Normalised Information Delivery Time Acceptance Value	94
3.4.3. Quality of Information	97
3.4.3.1. Quality Characteristics of SC Message	97
3.4.3.2. Essential Quality Characteristics	98
3.4.3.3. Convenient Quality Characteristics	99
3.4.3.4. Attractive Quality Characteristics	99
3.4.4. Conclusions	101

CONTENTS	PAGE
Chapter Four	
Methodology Extensions	
4.1. Introduction	102
4.2. Branch Level Performance Measurement	103
4.2.1. Supplier – Customer Contractual Transactions	103
4.2.2. Branch Level Normalised Performance Measurement	106
4.3. Network Level Normalised Performance Measurement	111
4.3.1. Measurement of the Total Supply Chain Performance	111
Chapter Five	
Application to Strategic Planning and Control	
5.1. Introduction	125
5.2. Relationship between Performance Measures and the Strategic Planning Process	126
5.2.1. Mission Statement	126
5.2.2. Objectives	128
5.2.3. Targets	129
5.2.4. Performance Measures	129
5.2.5. Behavioural Response and Organisational Change	130
5.2.6. Directions	130
5.3. Strategic Development Process	131
5.4. Suggested Methodology as a Part of the C&D Process	133
5.4.1. Measures of Achievement	133
5.4.2. Measures of Achievement as a Part of a Strategic Development Process	135
5.5. Conclusions	140
Chapter Six	
Case Analysis and Evaluation	
6.1. Material Flow Performance Measurement Case Analysis and Evaluation	141
6.1.1. Russian Wheat Grain Supply	142
6.1.2. New Zealand Fresh Milk	145
6.1.3. New Zealand Beef	149

CONTENTS	PAGE
6.1.4. Conclusions	155
6.2. Case Analysis of Financial Flow Performance Measurement	156
6.3. Information Quality Measurement Case Evaluation	165
6.3.1. Case Description	165
6.3.2. Results Analysis	170
6.4. Case Evaluation: Measurement of Supplier – Customer Contractual Performance	173
6.4.1. Case Study Description	173
6.4.2. Evaluation of Actual Values in the Case Studies	173
6.4.2.1. 2001 Year Transactions	173
6.4.2.2. 2002-2004 Year Transactions	174
6.5. Case Evaluation: Measurement of Network Performance	177
6.5.1. Contractual Performance between the Agent and the Company	177
6.5.2. Network Contractual Performance	179
6.5.3. Case Study Results Analysis. Supply Chain Wave Effect	180
6.5.4. Conclusions	182

Chapter Seven

Results and Conclusions

7.1. Introduction	184
7.2. Achievement of the First Research Objective	184
7.3. Achievement of the Second Research Objective	186
7.3.1. Balanced Normalised Performance	186
7.3.2. Supply Chain Wave Effect	192
7.4. SCM Problems Resolution	193
7.4.1. Problem 1 - Difficulties in Adopting a SCM Philosophy	193
7.4.2. Problem 2. The Lack of General Theory of SCM	195
7.4.3. Problem 3. Difficulties of System Thinking	197
7.4.4. Problem 4. Unique Characteristics of Agribusiness Supply Chains	197
7.5. Limitations of Study	198
7. 6. Suggestions for Further Research	200
7.7. Conclusions	201

CONTENTS	PAGE
References	203
Appendices	
<i>Appendix 1.</i> Example of the Contract between the Company and the Agent (Russian version)	216
<i>Appendix 2.</i> Example of the Contract between the Company and the Agent (English version)	219
<i>Appendix 3.</i> Example of the Contract between the Company and the Consignee (Russian version)	223
<i>Appendix 4.</i> Example of the Contract between the Company and the Consignee (English version)	225
<i>Appendix 5.</i> Example of Material Flow Records Provided by the Company for Case Evaluation	229
<i>Appendix 6.</i> Example of Financial Flow Records Provided by the Company for Case Evaluation	230

List of Tables

Table 1.1. Classified SCM Literature According to the Methodology Oriented Criterion	7
Table 2.1. Principal Component Bodies of Supply Chain Literature	25
Table 2.2. Categories of SCM Research	26
Table 2.3. Supply Chain Schools of Thought (According to Bechtel and Jayaram)	27
Table 2.4. Modern Supply Chain Schools of Thought	27
Table 2.5. Comparison of the Selected SCM Definition With the Common Characteristics from the Literature Review	33
Table 2.6. Dimensions of the Ten Schools of Strategy Formation (According to Mintzberg and Lampel)	46
Table 3.1. Quality Characteristics in Hypothetical Wheat Supply Contract	81
Table 3.2. The Normalised Performance of a Financial Flow Calculation with Several Payments	91
Table 3.3. Three Dimensions [Categories] of Information Quality Characteristics	97
Table 3.4. Description of Information Quality Category	98
Table 4.1. Customer and Supplier Normalised Performance Values	108
Table 4.2. Groups of Sets of Activities in Supply Network	119
Table 4.3. Total Normalised Suppliers' and Customers' Performances (Group 1)	121
Table 4.4. The Top Five Total Normalised Suppliers' Performance Measures (Simulated Example)	122
Table 4.5. The Top Five Total Normalised Customers' Performance Measures (Simulated Example)	123
Table 4.6. Activities in the Top Five Total Normalised Customer's Performance Measures (Simulated example)	123
Table 5.1. Effect of Capability Increase on Measures of Achievement	138
Table 6.1. Levels of the Suggested Methodology vs. Case Analysis	141

Table 6.2. Raw Milk Quality Test Standards for 2003/2004 Seasons	146
Table 6.3. Converting Monthly Demerits to Milk Payments	147
Table 6.4. New Zealand Beef Prices (02/08/03 – 24/01/03)	150
Table 6.5. Relative P2 Beef Prices Scores Derived from Historical Prices	151
Table 6.6. Normalised Beef Carcass Weight Acceptance Values (NAV ₁)	152
Table 6.7. Financial Data for 2003 Transactions (Payee - Consignee)	156
Table 6.8. Financial Data for 2001-2004 Transactions	157
Table 6.9. Allocation of Consignee Payments for 2003 Transactions	159
Table 6.10. Normalised Performance of the Consignee in 2003 Transactions	159
Table 6.11. Financial Performances for 2001-2004 Transactions	161
Table 6.12. Normalised Financial Performances for 2001-2004 Transactions	160
Table 6.13. Case Evaluation of Information Quality Characteristics	167
Table 6.14. Summarised Questionnaire Results	168
Table 6.15. Average Values for Information Quality Groups	169
Table 6.16. Case Study: Total Normalised Supplier's and Customer's Performance Measures	180
Table 7.1. Contractual Balanced Payoff Matrix	188
Table 7.2. Contractual Balanced Payoff Matrix with Increased Supplier Normalised Performance	189
Table 7.3. Payoff Matrix (Agent and Company)	191
Table 7.4. Payoff Matrix (Company and Consignee)	191
Table 7.5. Existing Supply Chain Management Schools vs. Normalised Performance Measurement System.	196

List of Figures

Figure 1. 1. Classification of Categories of SCM Problems	11
Figure 1.2. Relationship of the Suggested Methodology to Classified SCM Problems	16
Figure 2.1. The Changing View of Food Quality	37
Figure 2.2. Various Stages in the Evolution of the Supply Chain	40
Figure 2.3. Levels of Organisational Strategy	50
Figure 2.4. Strategies and Relationships in Supply Chains	51
Figure 2.5. The Four Processes to Manage Strategy in the Balance Scorecard	55
Figure 2.6. Circular Cause-and-Effect Relationships	56
Figure 2.7. The SCOR –Based Supply Chain Infrastructure	59
Figure 3.1. The Structure of Methodology	67
Figure 3.2. Graphical Presentation of Branch Level Interchanges	70
Figure 3. 3. Network Supply System Presentation	72
Figure 3. 4. Methodology Applications to Strategic Planning and Control	73
Figure 3.5. Assignment of Normalised Acceptance Value to High Characteristic	79
Figure 3.6. Assignment of Normalised Acceptance Value to Low Characteristic	80
Figure 3.7. Evaluation of the Actual Delivery Time for Financial and Material Flow Activities	95
Figure 3.8. Evaluation of the Actual Delivery Time for Information Flow	95
Figure 3.9. Example of SC Message Delivery Times	96
Figure 4.1. Example of Customer-Supplier Activities Under Contractual Agreement	105
Figure 4.2. Graphical Presentation of Supplier-Customer Contractual Performance	109
Figure 4.3. A Traditional Food Industry Supply Chain	112
Figure 4.4. Example of a Food Industry Supply Network	113
Figure 4.5. Example of Suppliers' Normalised Performance Measures in a Food Industry Supply Network	116
Figure 4. 6. Example of Customers' Normalised Performance Measures in a Food Industry Supply Chain	118
Figure 5.1. Performance Measurement Induced Strategy	126
Figure 5.2. Vertical (Chain) and Horizontal (Industrial) Levels of Competition	128

Figure 5.3. SCM Performance Measurement Induced Strategy	131
Figure 5.4. A Strategic Development Process	132
Figure 5.5. Measures of Achievement as a Part of the Strategic Development Process	136
Figure 5.6. The Relationships between Measures of Achievement in the Strategic Development Process	139
Figure 6. 1. NAV for Acceptable High Wheat Quality Characteristic	144
Figure 6. 2. NAV for Acceptable Low Wheat Quality Characteristic	144
Figure 6.3. Actual Normalised Performance for 2001 Transactions	173
Figure 6.4. Actual Normalised Performance Values of Material and Financial Flows for 2002-2004 Transactions	175
Figure 6.5. Normalised Performance Measures for Agent and Company Transactions	178
Figure 6.6. Network Normalised Performance Measures for 2001-2004 Transactions	179
Figure 6.7. Supply Chain Wave Effect	181
Figure 7.1. Normalised Performance Balance for Contractual Parties	187
Figure 7.2. Transference of Normalised Performance Improvement in the Balanced Supply Chain	194

Glossary of Abbreviations and Terms

Abbreviations

ABC	-	Activity Based Costing
AV	-	Actual Value
C	-	Quality Characteristic
C&D	-	Strategic Control and Development
ECR	-	Efficient Consumer Response
EV	-	Expected Value
EVA	-	Economic Value Analysis
F	-	Financial Flow Activities
FTP	-	Normalised Performance of Financial Flow
GMO	-	Genetically Modified Organisms
I	-	Information Flow Activities
IT	-	Information Technology
M	-	Material Flow Activities
MFP	-	The Total Normalised Material Flow Performance Value
NAV	-	Normalised Acceptance Value
NDT	-	Normalised Delivery Time Acceptance Value
NDV	-	Normalised Volume Acceptance Value
NOPAT	-	Net Operating Profit After Taxes
NPC	-	The Measure of Normalised Performance of the Customer in the Chain
NPM	-	Normalised Performance Measure
NPMS	-	Normalised Performance Measurement System
NPS	-	The Measure of Normalised Performance of the Supplier in the Chain
O	-	Over-achievement
$\bar{O}$	-	Acceptable Premium Overachievement
P	-	Performance
p_1	-	The Total Normalised Value of Quality
p_2	-	The Total Normalised Value of Delivery

PMS	-	Performance Measurement System
PR	-	Productivity
SC	-	Supply Chain
SCM	-	Supply Chain Management
SCP	-	Supply Chain Participant
SCOR	-	Supply Chain Operation Reference Model
TANP	-	Total Actual Normalised Performance
TC	-	Total Customer's Contractual Normalised Performance
TDQM	-	Total Data Quality Management
TS	-	Total Supplier's Contractual Normalised Performance
U	-	Under-achievement
$\bar{U}$	-	Acceptable Discount Underachievement

Terms (introduced in this thesis)

Term	Defined on Page
Acceptable Characteristic	73
Actuality	130
Balanced Performance Value	171
Branch Level	67
Branch Level Normalised Performance Measurement	103
Capability	130
Characteristic	72
Characteristic's Actual Value	72
Characteristic's Expected Value	72
Controllable Characteristic	73
Discount Acceptance	74
Expected Acceptance	74
“High” Characteristic	72
Latency	131
“Low” Characteristic	72
Network Level	68
Network Level Normalised Performance Measurement	108
Non-Acceptance	74

Over-Achievement	73
Performance	130
Premium Acceptance	74
Potentiality	130
Productivity	131
Quality of Information	94
Supply Chain Management Mission Statement	124
Supply Chain Wave Effect	177
The Normalised Performance of Financial Flow (FTP)	87
Total Normalised Material Flow Performance Measure (MFP)	85
Under-Achievement	73