The impact of supply chain process integration on business performance

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The Impact of Supply Chain Process Integration on Business Performance

A thesis submitted in fulfilment of the requirements for the award of the degree

Doctor of Philosophy

from

University of Wollongong

by

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Graduate School of Business

2006
Abstract

Over the past century and accelerated since the end of the post WWII manufacturing boom, a number of forces acting upon manufacturing organisations have led to significant changes to underlying manufacturing philosophies used, to the technologies employed and to the manufacturing methods and practices applied. Such forces (Hammer and Champy, 1993, pp. 17) are related to organisational survival factors such as market share and price premiums, cost reductions, quicker response to new market demands, quicker response to competitor practices, operating equipment effectiveness, cycle time reductions and reductions to inefficiencies and material requirements.

As a result, manufacturing organisations now have an increased focus on specific competitive advantages, geographic spread and location, management of costs, relations with customers and suppliers and by no means least, the treatment and development of people (Porter, 1990, pp. 40–41). As well, in some industries more than others, there has been a progressive change in focus away for separate, arms-length entities along a common supply chain to a more integrated and collaborative view. (Christopher, 1998, pp. 5).

Supply Chain Management (SCM) as such, is by now recognised by many organisations as a means by which they can gain competitive advantage and improve their business results (Spekman et al., 1998, pp. 630). Effective SCM therefore can become a strategic factor in a firm’s success (Cohen and Roussel, 2005, pp. 9). This is particularly the case as more companies link their advantages together and start to operate as supply networks of interdependent supply chain partners as opposed to separate, stand-alone entities (Spekman et al., 1998, pp. 632). Associated with such an approach is the integration of intra and inter-businesses processes in order to achieve such business-to-business linkage. As illustrated by companies such as Amazon, Dell, Hewlett-Packard, Wal-Mart, Shell Chemical and Georgia-Pacific Corp, an effective supply chain network can competitively outperform the standalone model (Lummus and Alber, 1997, pp. 10, Cohen and Roussel, 2005, pp. 10). This
superior performance manifests itself as performance advantages on a number of key supply chain performance measures (Shin et al., 2000, pp. 330).

Consistent with the theme of supply chain management, this research deals specifically with the order fulfilment processes operating within a supply chain and in particular the integration of those processes both horizontally and vertically within the chain. The key belief is that higher levels of such integration will assist organisations to improve their supply chain and overall business performance.

The major objective of this work therefore was to answer the question:

“How much and in what ways does the integration of supply chain logistics processes in manufacturing organisations impact upon business performance?”

The methodology used to address the above research question consisted firstly of conducting an exhaustive literature review. From that review, the main research hypotheses and three theoretical frameworks were proposed. The hypotheses and theoretical frameworks captured the ideas and findings of numerous researchers and writers with respect to variables and relationship structures that may help answer the research question. The main research hypotheses developed and tested therefore were as follows:

H1: That the integration of supply chain logistics processes does significantly and positively impact supply chain and business performance.

H2: That the application of supply chain management principles does significantly and positively impact supply chain and business performance.

H3: That the application of human ‘social’ principles/approaches does significantly and positively impact supply chain and business performance.

Following the literature review, a survey instrument was designed and tested, contact
details of target participants were obtained and finally the sequence of questionnaire related letters (including the questionnaire) was mailed out.

Responses were assessed for suitability (completeness and reasonableness), entered into Excel and later imported into SPSS ver. 13.0 for analysis. 210 usable responses were obtained from 230 returned questionnaires sent to 1050 supply chain professionals in 990 companies worldwide.

The results of the data analysis (principally via the use of structural equation modelling) showed conditional support for each of the research hypotheses and good support for the first of the proposed theoretical frameworks. Because of this, a simulation model of the first theoretical framework was developed such that the research results can: (a) be seen visually and in a dynamic way, (b) be used by others to test their mental models of supply chain ‘DNA’ against and to improve the robustness of their supply chain improvement plans and initiatives and (c) be used by educators to demonstrate dynamically the relationships between supply chain lever and outcome variables.

The second and third theoretical frameworks proposed were not supported.

Factor analysis was undertaken in order to reduce highly related variables to fewer underlying constructs. The factor analysis confirmed that such data-reduction was possible for the study’s chosen variables such that the 10 dependent variables could be reduced to 5 variates and the study’s 32 independent variables could be reduced to 8 variates.

The research conclusions are described including identification of conditional support for the three above hypotheses, confirmation of the best-fit theoretical model and affirmation that integration of supply chain logistics processes does positively influence both supply chain and business outcomes.
Implications arising from and limitations of the study are discussed, as are recommendations for further research.
Table of Contents

Publications and Conference Presentations 9
List of Tables 10
List of Figures 14
Abbreviations 20
Thesis Certification 22
Acknowledgments 23

Chapter 1 Introduction
  1.1 Background to the Research 24
  1.2 Research Problem and Hypotheses 34
  1.3 Justification for the Research 35
  1.4 Methodology 38
  1.5 Outline of the Report 41
  1.6 Definitions 43
  1.7 Delimitations of Scope and Key Assumptions 44
  1.8 Conclusion 46

Chapter 2 Literature Review
  2.1 Introduction 48
  2.2 Parent Disciplines and Classification Models 53
  2.3 Immediate Discipline 118
  2.4 Analytical Models 139
  2.5 Research Questions 141
  2.6 Hypotheses 142
  2.7 Conclusion 142

Chapter 3 Methodology
  3.1 Introduction 145
  3.2 Justification for the Methodology 146
  3.3 Methodology Used 147
Chapter 4    Analysis of Data
4.1 Introduction  161
4.2 Data Analysis Subjects  161
4.3 Conclusion  218

Chapter 5    Simulations
5.1 Introduction and Intent  222
5.2 Scope and Intent  224
5.3 Simulation Infrastructure and Architecture  224
5.4 Relevance to the ‘Real World’  227
5.5 Developed Model  228
5.6 Results of Model Runs  231
5.7 Conclusion  235

Chapter 6    Conclusions and Implications
6.1 Introduction  236
6.2 Conclusions about each Hypothesis  236
6.3 Conclusions about the Theoretical Frameworks  238
6.4 Conclusions about the Research Problem  238
6.5 Conclusions about the Simulation Model developed  240
6.6 Implications for Theory  240
6.7 Implications for Private Sector Managers  241
6.8 Implications for Public Sector Managers  242
6.9 Limitations  242
6.10 Recommendations for Further Research  243

References  246

Appendix 1    Descriptive Statistics Results for Dependent and  256
Independent Survey Question Variables by Manufacturing Segment

Appendix 2  Results of each Structural Equation Model Specification Search  277

Appendix 3  Survey Questionnaire  293

Index  303
Publications and Conference Presentations Made as Part of This Research Work

Articles


Conference Proceedings


# List of Tables

<table>
<thead>
<tr>
<th>Table No.</th>
<th>Table Title</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1.1</td>
<td>Historical Development of Manufacturing Paradigms</td>
<td>28</td>
</tr>
<tr>
<td>Table 1.2</td>
<td>Reasons Organisations Undertake Change</td>
<td>30</td>
</tr>
<tr>
<td>Table 1.3</td>
<td>Effect That Flow-Line, Lean and Agile has on the Supply Chain</td>
<td>32</td>
</tr>
<tr>
<td>Table 1.4</td>
<td>Summary Details of Research Design</td>
<td>39</td>
</tr>
<tr>
<td>Table 2.1</td>
<td>Performance Measurements Suggested by Otto and Zotzab (2003) for Six Different Supply Chain Perspectives</td>
<td>60</td>
</tr>
<tr>
<td>Table 2.2</td>
<td>Points of Customer Buying Differentiation</td>
<td>71</td>
</tr>
<tr>
<td>Table 2.3</td>
<td>Supply Chain Classification Based on Product Type and Life Cycle</td>
<td>82</td>
</tr>
<tr>
<td>Table 2.4</td>
<td>Strained and Capable Supply Chain Characteristics</td>
<td>88</td>
</tr>
<tr>
<td>Table 2.5</td>
<td>An Integrating Framework for TQM, JIT and TPM</td>
<td>93</td>
</tr>
<tr>
<td>Table 2.6</td>
<td>Examples of Key Supply Chain Capability Measures and Targets</td>
<td>94</td>
</tr>
<tr>
<td>Table 2.7</td>
<td>Change Attitudes</td>
<td>95</td>
</tr>
<tr>
<td>Table 2.8</td>
<td>Departmental Orientations Toward Inventory</td>
<td>109</td>
</tr>
<tr>
<td>Table 3.1</td>
<td>Description of the Study’s Main Characteristics</td>
<td>147</td>
</tr>
<tr>
<td>Table 4.1</td>
<td>Q1 - Response Depth of Respondesees</td>
<td>165</td>
</tr>
<tr>
<td>Table 4.2</td>
<td>Q2 - Respondesees Position in Organisation</td>
<td>166</td>
</tr>
<tr>
<td>Table 4.3</td>
<td>Q3 - Manufacturing Segment of Respondesees’ Organisation</td>
<td>167</td>
</tr>
<tr>
<td>Table 4.4</td>
<td>Q4 - Location of Manufacturing Facilities</td>
<td>168</td>
</tr>
<tr>
<td>Table 4.5</td>
<td>Q5 - Location Type</td>
<td>168</td>
</tr>
<tr>
<td>Table 4.6</td>
<td>Q6 - Annual US$M Sales</td>
<td>169</td>
</tr>
<tr>
<td>Table 4.7</td>
<td>Q7–Q10 - Delivery Performance, Perfect Order Fulfilment and Lead-Time Results</td>
<td>170</td>
</tr>
<tr>
<td>Table 4.8</td>
<td>Q11~Q14 and Q16 - Flexibility, Days of Inventory, Cash-to-Cash Cycle and Return-on-Capital-Margin Results</td>
<td>171</td>
</tr>
<tr>
<td>Table 4.9</td>
<td>Q15 – Product Cost Quartiles</td>
<td>172</td>
</tr>
<tr>
<td>Table 4.10</td>
<td>Q17 – Supply Chain Operating Principle Used</td>
<td>173</td>
</tr>
<tr>
<td>Table 4.11</td>
<td>Q18 – Supply Chain Focus More Strategic Than Operational</td>
<td>173</td>
</tr>
<tr>
<td>Table 4.12</td>
<td>Q19 – Supply Chain Goals More Customer Than Internally Aligned</td>
<td>173</td>
</tr>
</tbody>
</table>
Table 4.13  Q20 – Organisational Approach More Total Chain Than Silo 174
Table 4.14  Q21 – Customer Relationships More Cooperative Than Adversarial 174
Table 4.15  Q22 - Supplier Relationships More Cooperative Than Adversarial 175
Table 4.16  Q23 – Supply Chain Strategy is Well Defined and Clear 175
Table 4.17  Q24 – Supply Chain Product Flow Happens by Design 176
Table 4.18  Q25 - Organisation is More Customer/Supplier Facing Than Internal Facing 176
Table 4.19  Q26 – Optimisation of Points-of-Production is Practiced 177
Table 4.20  Q27 – Planning and Scheduling Conducted Extensively 177
Table 4.21  Q28 – Level of Integration of Planning & Scheduling Processes is High 178
Table 4.22  Q29 – Process Integration Includes Feed-forward & Feedback 178
Table 4.23  Q30 – Processes Linkages are Automated 179
Table 4.24  Q31 – Planning and Scheduling Integrated with Other SC Processes 179
Table 4.25  Q32 – Planning & Scheduling Processes Integrated with Customers 180
Table 4.26  Q33 – Planning & Scheduling Processes Integrated with Suppliers 180
Table 4.27  Q34 – Sharing of Schedules with Customers Achieved Electronically 181
Table 4.28  Q35 – Sharing of Schedules with Suppliers Achieved Electronically 181
Table 4.29  Q36 – Effective Demand Forecasting is Conducted 182
Table 4.30  Q37 – e-Logistics is an Active and Key Supply Chain Strategy 182
Table 4.31  Q38 – Convergence of Internet and Decision Support Systems has Begun 183
Table 4.32  Q39 – Transaction Processes with Customers and Suppliers are e-Enabled 183
Table 4.33  Q40 – People Role Networks are Well Understood 184
Table 4.34  Q41 – Shared Vision is High 185
Table 4.35  Q42 – Common Mental Models are Clear and Aligned 185
Table 4.36  Q43 – Personal Mastery is High 186
| Table 4.37 | Q44 – Have the Right People ‘On The Bus’ | 186 |
| Table 4.38 | Q45 – Level of Training is Adequate | 187 |
| Table 4.39 | Q46 – Team Learning is High | 187 |
| Table 4.40 | Q47 – Senior Sponsorship is High | 188 |
| Table 4.41 | Q48 – Political Astuteness is High | 188 |
| Table 4.42 | Five Variables Found to Have Differences in their Means at $p \leq 0.001$ Level | 192 |
| Table 4.43 | Summary Results of ANOVA Analysis on Business Descriptor Factors Showing Only The Significant Differences and Significant Individual Factor Element Differences Between Groups Found – Part A | 193 |
| Table 4.44 | Summary Results of ANOVA Analysis on Business Descriptor Factors Showing Only The Significant Differences and Significant Individual Factor Element Differences Between Groups Found – Part B | 194 |
| Table 4.45 | Summary Results of ANOVA Analysis on Business Descriptor Factors Showing Only The Significant Differences and Significant Individual Factor Element Differences Between Groups Found – Part C | 195 |
| Table 4.46 | Summary Table of Above ANOVA Analysis (Tables 4.43 to 4.45) on Business Descriptor Factors Showing Frequency of Significant Differences and Frequency of Factor Element Differences at $p \leq 0.05$ and $p \leq 0.001$ | 196 |
| Table 4.47 | KMO and Bartlett’s Test Results for Dependent Variable Factor Analysis | 200 |
| Table 4.48 | Rotated Component Matrix for Factor Analysis on Dependent Variables | 200 |
| Table 4.49 | KMO and Bartlett’s Test Results for Independent Variable Factor Analysis | 201 |
| Table 4.50 | Rotated Component Matrix for Factor Analysis on Independent Variables | 202 |
| Table 4.51 | Part II Manifest Independent Variables Regression Result Against Each Manifest Dependent Variable Sorted by Independent Variable | 213 |
| Table 4.52 | Part II Manifest Independent Variables Regression Result Against Each Manifest Dependent Variable Sorted by Dependent Variable | 214 |
| Table 4.53 | Part III Manifest Independent Variables Regression Result Against Each Manifest Dependent Variable Sorted by Independent Variable | 215 |
| Table 4.54 | Part III Manifest Independent Variables Regression Result | 216 |
Table 4.55 Part IV Manifest Independent Variables Regression Result Against Each Manifest Dependent Variable Sorted by Dependent Variable 216

Table 4.56 Part IV Manifest Independent Variables Regression Result Against Each Manifest Dependent Variable Sorted by Dependent Variable 217

Table 4.57 Summary Results of SEM Factor Score Based Model Run Shown at Figure 4.34 217

Tables in Appendix 1

Table A1.1 Frequency Statistics for Manufacturing Segments 256
Table A1.2 Mean and SD Statistics for Manufacturing Segment Results on Q7~10 257
Table A1.3 Mean and SD Statistics for Manufacturing Segment Results on Q11~13 258
Table A1.4 Mean and SD Statistics for Manufacturing Segment Results on Q14~16 259
Table A1.5 Mean and SD Statistics for Manufacturing Segment Results on Q17~20 260
Table A1.6 Mean and SD Statistics for Manufacturing Segment Results on Q21~24 261
Table A1.7 Mean and SD Statistics for Manufacturing Segment Results on Q25~26 262
Table A1.8 Mean and SD Statistics for Manufacturing Segment Results on Q27~30 263
Table A1.9 Mean and SD Statistics for Manufacturing Segment Results on Q31~35 264
Table A1.10 Mean and SD Statistics for Manufacturing Segment Results on Q36~39 265
Table A1.11 Mean and SD Statistics for Manufacturing Segment Results on Q40~43 266
Table A1.12 Mean and SD Statistics for Manufacturing Segment Results on Q44~48 267
## List of Figures

<table>
<thead>
<tr>
<th>Figure No.</th>
<th>Figure Title</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1.1</td>
<td>Supply Chain Management Impact on Business Returns</td>
<td>36</td>
</tr>
<tr>
<td>Figure 1.2</td>
<td>Supply Chain Council’s High Level SCOR Model</td>
<td>44</td>
</tr>
<tr>
<td>Figure 2.1</td>
<td>Supply Chain Issues Impacting Business Performance</td>
<td>50</td>
</tr>
<tr>
<td>Figure 2.2</td>
<td>The Flow of Strategy</td>
<td>51</td>
</tr>
<tr>
<td>Figure 2.3</td>
<td>Supply Chain Business Success Drivers</td>
<td>53</td>
</tr>
<tr>
<td>Figure 2.4</td>
<td>Shifting Supply Chain Power Balance</td>
<td>64</td>
</tr>
<tr>
<td>Figure 2.5</td>
<td>The Strategic Alignment Model</td>
<td>67</td>
</tr>
<tr>
<td>Figure 2.6</td>
<td>Sweeney’s Generic Customer Service/ Process Design Strategies</td>
<td>68</td>
</tr>
<tr>
<td>Figure 2.7</td>
<td>Meeting Customer Needs Through Strategy</td>
<td>71</td>
</tr>
<tr>
<td>Figure 2.8</td>
<td>Business Success Via Customer Focus Via Organisational Capability</td>
<td>77</td>
</tr>
<tr>
<td>Figure 2.9</td>
<td>Strategies of Cooperation in a Supply Network</td>
<td>80</td>
</tr>
<tr>
<td>Figure 2.10</td>
<td>Example of a Generic Netchain</td>
<td>81</td>
</tr>
<tr>
<td>Figure 2.11</td>
<td>Towards the e-Supply Chain</td>
<td>86</td>
</tr>
<tr>
<td>Figure 2.12</td>
<td>Five Phase Global Supply Chain Management Development Process</td>
<td>86</td>
</tr>
<tr>
<td>Figure 2.13</td>
<td>PDCA Improvement Cycle for Supply Chain</td>
<td>92</td>
</tr>
<tr>
<td>Figure 2.14</td>
<td>TOC based Synchronised, Integrated Flow Control</td>
<td>97</td>
</tr>
<tr>
<td>Figure 2.15</td>
<td>Stages of Supply Chain Maturity</td>
<td>104</td>
</tr>
<tr>
<td>Figure 2.16</td>
<td>Supply Chain Planning and Scheduling Matrix</td>
<td>105</td>
</tr>
<tr>
<td>Figure 2.17</td>
<td>Typical Order Generation to Fulfilment Transactions</td>
<td>107</td>
</tr>
<tr>
<td>Figure 2.18</td>
<td>The Bullwhip Effect in Supply Chain Management</td>
<td>111</td>
</tr>
<tr>
<td>Figure 2.19</td>
<td>Hierarchical Traditional Supply Chain</td>
<td>115</td>
</tr>
<tr>
<td>Figure 2.20</td>
<td>An Agent-Based Adaptive Supply Chain Network</td>
<td>116</td>
</tr>
<tr>
<td>Figure 2.21</td>
<td>Steps to an Adaptive Supply Chain</td>
<td>117</td>
</tr>
<tr>
<td>Figure 2.22</td>
<td>The Concept Of Supply Chain Management Applying to the Core Business Process of Order Fulfilment With Associated ‘Flows’ of Information, Materials and Financials Up and Down the Supply Chain</td>
<td>121</td>
</tr>
<tr>
<td>Figure 2.23</td>
<td>Typical Supply Chain Order-Fulfilment Processes</td>
<td>123</td>
</tr>
<tr>
<td>Figure 2.24</td>
<td>A Simple Supply Chain Illustrating the Constraint Resource</td>
<td>124</td>
</tr>
</tbody>
</table>
Figure 2.25 Arcs of Integration 126
Figure 2.26 Configurations of Supply Chain Channel Governance 128
Figure 2.27 Change Learning and Resistance 132
Figure 2.28 Customer-Supplier Interaction Model 135
Figure 2.29 Theoretical Framework 1 – Groups of Independent Variables Influencing Separately the Dependent Variables 140
Figure 2.30 Theoretical Framework 2 – One Group of Independent and Groups of Intervening Variables 140
Figure 2.31 Theoretical Framework 3 – One Independent and Two Intervening Variables 141
Figure 2.32 House of SCM 143
Figure 4.1 Q1 - Response Depth of Respondes 165
Figure 4.2 Q2 – Histogram of Respondes Position in Organisation 166
Figure 4.3 Q3 – Histogram of Manufacturing Segment of Respondes’ Organisation 167
Figure 4.4 Q4 – Histogram of Location of Manufacturing Facilities 168
Figure 4.5 Q5 – Histogram of Location Type 169
Figure 4.6 Q6 – Histogram of Annual US$M Sales 169
Figure 4.7 Q7~10 – Histograms of Delivery Performance, Perfect Order Fulfilment, Manufacturing and Offered Lead-Time Results 170
Figure 4.8 Q11~Q14 and Q16 – Histograms of Flexibility, Days of Inventory, Cash-to-Cash Cycle and Return-on-Capital-Margin Results 172
Figure 4.9 Q15 – Histogram of Product Cost Quartiles 172
Figure 4.10 Q17~Q18 – Histograms of Supply Chain Operating Principle and Supply Chain Focus Used 173
Figure 4.11 Q19~Q20 – Histograms of Supply Chain Goals and Supply Chain Organisational Approach 174
Figure 4.12 Q21~Q22 – Histograms of Supply Chain Customer Relationships and Supply Chain Supplier Relationships 175
Figure 4.13 Q23~Q24 – Histograms of Supply Chain Strategy and Supply Chain Product Flow 176
Figure 4.14 Q25~Q26 – Histograms of Organisational Facing and Optimisation of Points of Production Practice 177
Figure 4.15 Q27~Q28 – Histograms of Planning & Scheduling Extent and Level of Planning & Scheduling Integration 178
Figure 4.16 Q29~Q30 – Histograms of Extent of Feed-Forward and 179
Feedback Linkages and Linkage Automation

Figure 4.17 Q31–Q32 – Histograms of Planning & Scheduling Process Integration with Other Supply Chain Processes and with Customers

Figure 4.18 Q33–Q34 – Histograms of Planning & Scheduling Process Integration with Suppliers and Electronic Sharing of Schedules with Customers

Figure 4.19 Q35–Q36 – Histograms of Electronic Sharing of Schedules with Suppliers and Effective Demand Forecasting

Figure 4.20 Q37–Q38 – Histograms of e-Logistics Strategy and Convergence of Internet and Decision Support Systems

Figure 4.21 Q39 – Histogram of e-Enabling of Customer and Supplier Transactional Activities

Figure 4.22 Q40–Q41 – Histograms of Role Network Understanding and Shared Vision

Figure 4.23 Q42–Q43 – Histograms of Common Mental Models and Personal Mastery

Figure 4.24 Q44–Q45 – Histograms of Having the Right People ‘On the Bus’ and Training Adequacy

Figure 4.25 Q46–Q47 – Histograms of Team Learning and Senior Sponsorship

Figure 4.26 Q48 – Histogram of Political Astuteness

Figure 4.27 Error Chart of Response Depth and square-root Days of Inventory Found by ANOVA Analysis to Have Significantly Different Means (Business Unit Vs Whole Company) at p ≤ 0.001

Figure 4.28 Error Chart of Manufacturing Segment and Cash-to-Cash Cycle Time Found by ANOVA Analysis to Have Significantly Different Means (Food Vs Machinery) at p ≤ 0.001

Figure 4.29 Error Chart of Location Type and Level of Planning and Scheduling Found by ANOVA Analysis to Have Significantly Different Means (Single Site Vs Multi-National Site) at p ≤ 0.001

Figure 4.30 Error Chart of Location Type and Integration Includes Feed-Forward and Feedback Found by ANOVA Analysis to Have Significantly Different Means (Single Site Vs Multi-National Site) at p ≤ 0.001

Figure 4.31 Error Chart of Manufacturing Segment and Political Astuteness Found by ANOVA Analysis to Have Significantly Different Means (Food Vs Petroleum) at p ≤
Figure 4.32 Example of 10 Pathway SEM Specification Search on Manifest Part II Independent Variables and reflect-square-root Delivery Performance to Confirm Theoretical Framework 1

Figure 4.33 Example of 13 Pathway SEM Specification Search on Manifest Part III Independent Variables and reflect-square-root Delivery Performance to Confirm Theoretical Framework 1

Figure 4.34 Example of 9 Pathway SEM Specification Search on Manifest Part IV Independent Variables and % Return on Capital Margin to Confirm Theoretical Framework 1

Figure 4.35 Result of Factor Score SEM Run for 5 Dependent Variate Factors and 8 Independent Variate Factors (i.e. 40 pathways) to Confirm Theoretical Framework 1

Figure 4.36a 17 Pathway SEM Factor Score Based Model Structure Used to Confirm Theoretical Framework 2

Figure 4.36b Result of Running Model Shown Above at Figure 4.36a

Figure 4.37 Model Run Results for Modified SEM Factor Scores Based Model Used to Confirm Theoretical Framework 2

Figure 4.38 SEM Factor Scores Based Model Used to Confirm Theoretical Framework 3

Figure 5.1 Immediate Space and Time Focus Limits Validity of Mental Models of Wider Systems

Figure 5.2 Simple Systems Dynamics Reinforcing Loop Model

Figure 5.3 ithink Representation of Model Shown in Figure 5.2 With Resultant Exponential Growth Rate of Enthusiasm

Figure 5.4 ithink Simulation Model of Research Relationship Findings

Figure 5.5 Simulation Model Control Panel

Figure 5.6 Result of Increasing Independent Variables Having a Positive Impact on Return-on Capital-Margin

Figure 5.7 Result of Increasing and Then Decreasing the Independent Variables Positively Impacting Product Costs

Figure 5.8 Result of Increasing and Then Decreasing the Independent Variables Positively Impacting Perfect Order Fulfilment

Figure 5.9 Result of Increasing and Then Returning to Zero the Independent Variables Positively Impacting Cash-to-Cash Cycle Times

Figure 6.1 Determinates of Business Success
Figures in Appendix 2

Figure A2.1 Result of SEM Specification Search on Manifest Part II Independent Variables and reflect-square-root Delivery Performance 268

Figure A2.2 Result of SEM Specification Search on Manifest Part II Independent Variables and reflect-square-root Perfect Order Fulfilment 269

Figure A2.3 Result of SEM Specification Search on Manifest Part II Independent Variables and log Manufacturing Lead-Time 270

Figure A2.4 Result of SEM Specification Search on Manifest Part II Independent Variables and log Offered Lead-Time 271

Figure A2.5 Result of SEM Specification Search on Manifest Part II Independent Variables and log Time to Respond to a 20% Demand Increase 272

Figure A2.6 Result of SEM Specification Search on Manifest Part II Independent Variables and log Time to Respond to a 20% Demand Decrease 273

Figure A2.7 Result of SEM Specification Search on Manifest Part II Independent Variables and square-root Days of Inventory 274

Figure A2.8 Result of SEM Specification Search on Manifest Part II Independent Variables and Cash-to-Cash Cycle Time 275

Figure A2.9 Result of SEM Specification Search on Manifest Part II Independent Variables and Product Costs/Unit Quartile 276

Figure A2.10 Result of SEM Specification Search on Manifest Part II Independent Variables and % Return on Capital Margin 277

Figure A2.11 Result of SEM Specification Search on Manifest Part III Independent Variables and reflect-square-root Delivery Performance 278

Figure A2.12 Result of SEM Specification Search on Manifest Part III Independent Variables and reflect-square-root Perfect Order Fulfilment 279

Figure A2.13 Result of SEM Specification Search on Manifest Part III Independent Variables and log Manufacturing Lead-Time 280

Figure A2.14 Result of SEM Specification Search on Manifest Part III Independent Variables and log Offered Lead-Time 281

Figure A2.15 Result of SEM Specification Search on Manifest Part III Independent Variables and log Time to Respond to a 20% Demand Increase 282

Figure A2.16 Result of SEM Specification Search on Manifest Part III Independent Variables and log Time to Respond to a 20%
Demand Decrease

Figure A2.17  Result of SEM Specification Search on Manifest Part III
Independent Variables and square-root Days of Inventory

Figure A2.18  Result of SEM Specification Search on Manifest Part III
Independent Variables and Cash-to-Cash Cycle Time

Figure A2.19  Result of SEM Specification Search on Manifest Part III
Independent Variables and Product Costs/Unit Quartile

Figure A2.20  Result of SEM Specification Search on Manifest Part III
Independent Variables and % Return on Capital Margin

Figure A2.21  Result of SEM Specification Search on Manifest Part IV
Independent Variables and reflect-square-root Delivery Performance

Figure A2.22  Result of SEM Specification Search on Manifest Part IV
Independent Variables and reflect-square-root Perfect Order Fulfilment

Figure A2.23  Result of SEM Specification Search on Manifest Part IV
Independent Variables and log Manufacturing Lead-Time

Figure A2.24  Result of SEM Specification Search on Manifest Part IV
Independent Variables and log Offered Lead-Time

Figure A2.25  Result of SEM Specification Search on Manifest Part IV
Independent Vars and log Time to Response to a 20% Demand Increase

Figure A2.26  Result of SEM Specification Search on Manifest Part IV
Independent Vars and log Time to Response to a 20% Demand Increase

Figure A2.27  Result of SEM Specification Search on Manifest Part IV
Independent Variables and square-root Days of Inventory

Figure A2.28  Result of SEM Specification Search on Manifest Part IV
Independent Variables and Cash-to-Cash Cycle Time

Figure A2.29  Result of SEM Specification Search on Manifest Part IV
Independent Variables and Product Costs/Unit Quartiles

Figure A2.30  Result of SEM Specification Search on Manifest Part IV
Independent Variables and % Return on Capital Margin
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>Agile</td>
<td>Manufacturing Philosophy Calling for High Levels of Responsiveness to Customer Dynamics</td>
</tr>
<tr>
<td>AMOS</td>
<td>Structural Equation Modelling Software Program</td>
</tr>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance Analysis</td>
</tr>
<tr>
<td>CR</td>
<td>Continuous Replenishment Style of Even Flow of Products to Match Consumer Demand</td>
</tr>
<tr>
<td>‘DNA’</td>
<td>Used in This Study to Imply the Underlying Structure or Successful Pattern of Workings of Supply Chain Management</td>
</tr>
<tr>
<td>DP</td>
<td>Delivery Performance</td>
</tr>
<tr>
<td>DRP</td>
<td>Distribution Requirements Planning</td>
</tr>
<tr>
<td>ECR</td>
<td>Efficient Consumer Response Process Adopted Initially by US Grocery Industry and Included Introduction of Point of Sales Tracking Processes in Order to Align Product Make Program with Consumer Consumption Patterns.</td>
</tr>
<tr>
<td>EDLP</td>
<td>Every Day Lower Pricing</td>
</tr>
<tr>
<td>ithink</td>
<td>Systems Dynamics Based Simulation Software</td>
</tr>
<tr>
<td>JIT</td>
<td>Just in Time; Similar Manufacturing Philosophy to ‘Lean’</td>
</tr>
<tr>
<td>Lean</td>
<td>A Manufacturing Philosophy Focusing on Elimination of Waste and Increasing Flow Velocity Through the Supply Chain</td>
</tr>
<tr>
<td>LT or L/T</td>
<td>Lead-time</td>
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<tr>
<td>MRP</td>
<td>Materials Requirements Planning</td>
</tr>
<tr>
<td>PoP</td>
<td>Point of Production</td>
</tr>
<tr>
<td>POS</td>
<td>Point of Sale</td>
</tr>
<tr>
<td>Pull</td>
<td>Kanban Style of Operating Philosophy Whereby an Upstream Unit Does Not Operate Unless Given a ‘Pull’ Signal From a Downstream Unit</td>
</tr>
<tr>
<td>Push</td>
<td>Manufacturing Philosophy Whereby Product is ‘Pushed’ Down the Supply Chain Almost Irregardless to Consumer Consumption Rates</td>
</tr>
</tbody>
</table>
QR  Quic Response to Customer Process Adopted by US Apparel Industry

SC  Supply Chain

SCM  Supply Chain Management

SCOR  Supply Chain Operations Reference Model

SEM  Structural Equation Modelling

Six Sigma  Business Improvement Program Using Structured Problem Solving and Statistical Methodology

SPSS  Statistical Analysis Software Program

TOC  Theory of Constraints

TPM  Total Productive Maintenance

TQC  Total Quality Control

TQM  Total Quality Management

VMI  Vendor Managed Inventory
Thesis Certification

I, Peter W Robertson, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Graduate School of Business and Professional Development, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged.

The document has not been submitted for qualifications at any other academic institution.

_____________________________
Peter W Robertson

22 May 2006
Acknowledgments

The researcher wishes to thank my research thesis supervisors, Professor Peter Gibson of UOW and Honorary Senior Research Fellow John Flanagan of UOW, for their help, guidance, encouragement, friendship and above all their patience during the course of this work.

The staff members of UOW have been very helpful throughout the entire course of this study. I thank them for their tolerance, understanding and above all for the invaluable support and advice they freely gave to me.

I would like to thank my work colleagues for their diligence and support during the time I undertook this study.

I would like to especially thank those selfless supply chain professionals who took the time to complete my survey questionnaire and entertain my follow-up questioning of them.

I would like to offer a very heartfelt thank you to all the members of my family, for the support they gave me in all the stages of this work (including help with the ‘stuffing’ of over 3000 envelopes) and for making me feel so loved.

A final thank you to my wife, who has not only stood by me as a friend and companion for 32 years of married life, but also never once questioned the many, many hours that I dedicated to this work. The love and support my wife has given me is simply irreplaceable.