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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

Peter W Robertson MLom

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.

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Publications and Conference Presentations Made as Part of This Research Work

Articles

1. Robertson, Peter. W., Gibson, Peter. R., Flanagan, John. T., *Strategic Supply Chain Development by Integration of Key Global Logistical Process Linkages*, International Journal of Production Research, 40, 16, (2002), pp. 4021-4040
2. Robertson, Peter W., *Adaptive Supply Chains: From Command and Control to Control Commands*, Supply Chain Week, MHD Supply Chain Solutions, 35, 3, (2005) pp. 60-66

Conference Proceedings

1. Robertson, Peter. W., Gibson, Peter. R., Flanagan, John. T., *Supply Chain Integrated Logistical Processes: Achieving the Key Logistical Process Linkages Required to Deliver Optimal Supply Chain Performance*, POMS 12th Annual Conference, Orlando Fl., 30th Mar to 2nd Apr, (2001), 13 pages
2. Robertson, Peter. W., Whalan, Bruce. D., *Supply Chain Velocity*, South East Asian Iron and Steel Institute Conference, Kuala Lumpur, Malaysia, Nov., (2001), 18 pages
3. Robertson, Peter. W., *e-Supply Chain Velocity*, Australia New Zealand Supply Chain Council's Supply Chain World Conference, Sydney, Australia, 3rd Dec., (2003), 14 Pages
4. Robertson, Peter. W., *Adaptive Supply Chains: From Command and Control to Control Commands*, Adaptive Supply Chains Conference, Sydney, Australia, 9th & 10th Feb., (2005), 11 Pages
5. Robertson, Peter. W., *The Impact of Supply Chain Process Integration on Business Performance*, SMART Conference, Sydney, Australia, 1st & 2nd June, (2005), 27 Pages
6. Robertson, Peter. W., *The Impact of Social Issues on Supply Chain Performance in Manufacturing Organisations*, ANZAM Conference, Yeppoon, Qld., 13th & 14th June, (2005), 17 pages

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Abbreviations

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

QR	Quick 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

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