

4-1-2006

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Carol J. Johnson
University of Denver

Lidiya Sokhnich
University of Denver

Charles Ng
University of Denver

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Recommended Citation

Johnson, Carol J., Sokhnich, Lidiya & Ng, Charles. (2006). Working toward a seamless supply chain: an exploratory analysis of the impact of supply chain on company performance. *Journal of Transportation Management*, 17(1), 61-68. doi: 10.22237/jotm/1143850020

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Working toward a seamless supply chain: an exploratory analysis of the impact of supply chain on company performance

Cover Page Footnote

The authors would like to thank the University of Denver for two scholarship grants, which helped to finance part of this research.

WORKING TOWARD A SEAMLESS SUPPLY CHAIN: AN EXPLORATORY ANALYSIS OF THE IMPACT OF SUPPLY CHAIN ON COMPANY PERFORMANCE

Carol J. Johnson
University of Denver

Lidiya Sokhnych
University of Denver

Charles Ng
University of Denver

ABSTRACT

This paper explores the role that several supply chain dimensions play in achieving overall firm performance. Measures suggested in prior studies were factor analyzed for convergent and discriminant validity and then used in a regression model. This study uses data from the Council of Supply Chain Management Professionals (CSCMP) member firms, with top level supply chain managers as informants. The results suggest that of the three dimensions tested, two are significant contributors to firm profitability, including customer service and business process usage. Relationship confidence was not found to significantly impact overall firm performance.

INTRODUCTION

Supply chain management has become an important topic to both practitioners and researchers alike. Practitioner definitions of supply chain management are numerous and emphasize different aspects of firm relationships. For example, the definition may emphasize meeting the “real needs of the end

customer” (Wisner, Leong and Tan, 2004) or it may emphasize logistics-type processes as suggested by the Supply Chain Council definition:

Managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order

management, distribution across all channels, and delivery to the customer (Wisner, Leong and Tan, 2004).

Yet another definition (Council of Supply Chain Management Professionals, 2006) emphasizes the strategic nature of supply chain across firms but does not mention the end customer:

Supply Chain Management is the systemic, strategic coordination of traditional business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.

None of these definitions mentions firm performance yet supply chain management has firm performance as an implicit goal.

In the academic literature, supply chain management emphasizes both cost reduction and increased customer value (Brewer and Speh, 2000) leading to sustainable competitive advantage (Mentzer et al., 2001). More recently, a survey of supply chain professionals was undertaken in an attempt to better define supply chain management (Gibson, Mentzer, and Cook, 2005). Yet even this most recent work suggests that "only time will tell if it [CSCMP definition] becomes the consensus definition of SCM."

Perhaps because of lack of a consensus definition and a lack of consistent management understanding, there remains a question of the connection between a high-performing supply chain and individual company performance. The lack of adequate understanding is likely due to the multifaceted and complex nature of supply chain relationships and the lack of firm-spanning metrics with which to measure these relationships. Cooper, Lambert, and Pagh (1997) suggest a conceptual supply chain framework consisting of business processes, management components, and supply chain structure and further suggest how to operationalize the

framework using case studies (Lambert, Cooper, and Pagh, 1998). While managing the supply chain from point of origin to point of consumption is indeed a difficult task, the introduction of technology that improves information flow may help with firm integration across the supply chain (Walton and Miller, 1995). Further, many executives believe that profitability could increase if key business processes are linked and managed across multiple companies (Lambert, Cooper, and Pagh, 1998).

The present research explores the importance of business processes, including customer service, business process documentation and measurement and management components such as accurate information exchange to firm performance using data collected from an online survey of high-level supply chain managers. The remainder of this work is organized as follows. First, the supply chain literature is briefly reviewed before describing the methodology. Next, the results are presented followed by a discussion of the managerial implications and recommendations for future research.

LITERATURE REVIEW

Business process documentation and measurement is found to vary with the importance of the process to the focal companies (Lambert, Cooper, and Pagh, 1998). A process may be defined as "a structured and measured set of activities designed to produce a specific output for a particular customer or market" (Davenport, 1993). While not all supply chain processes can be managed and documented in their entirety, for the more important processes this documentation will certainly decrease transaction costs and add to firm profitability.

Information exchange has been found to impact logistics performance (Gustin, Daugherty and Stank, 1995). Ellinger, Daugherty and Keller (2000) found that information integration was linked with logistics service and thus firm performance. Firms using high levels of integration in warehousing operations were

found to have higher levels of performance in that area (Rogers, Daugherty, and Ellinger, 1996).

While there have been a number of books and papers outlining the definition and scope of supply chain management (Mentzer, et. al, 2001; Simchi-Levi, Kaminsky, Simchi-Levi, 2003; Wisner, Leong, and Tan, 2004, for example), research studies to examine supply chain partnerships (Lambert, Knemeyer and Gardner, 2004), and sources of competitive advantage attributable to supply chain management (Mentzer, 2004), to date there has been little investigation of the impact of supply chain processes and management on firm performance.

RESEARCH QUESTION AND METHODOLOGY

Model Development

This exploratory research begins with an examination of the relationship between firm performance and business process documentation, accurate information exchange and customer service. The dimensions are defined as follows:

Firm performance: The overall performance of the firm, compared to major competitors

Business process documentation: The extent of documentation of business processes within and across firms. This includes documentation of process changes as well as information technology support of supply chain processes.

Accurate information exchange: Perception that key customers, suppliers, and service providers exchange accurate information across the supply chain.

Customer service: includes product availability (the proportion of units, order lines, or orders completely filled) and delivery quality (depends on the incidence (or lack thereof) of in-transit damage, shipment of incorrect items, and incorrect shipment quantity), as well as the ability to reduce lead time without overtime charges.

Research Question

The research question investigated is: Which of the above supply chain dimensions (business process documentation, relationship confidence, and customer service) explain more of the variance in firm performance? The research was conducted using multiple regression analysis to explore the following model:

$$\text{Firm Financial Performance} = \beta_0 + \sum \beta_i X_i + \varepsilon_i$$

Where:

β_0 = Y intercept

β_i = relative importance of each independent variable

X_i = each independent variable representing a supply chain dimension

ε_i = perceptual or idiosyncratic error introduced into the model

Or more specifically:

$$\text{Overall Firm Performance} = \beta_0 + \beta_1 \text{Customer Service} + \beta_2 \text{Business Process Usage} + \beta_3 \text{Relationship Confidence} + \varepsilon_i$$

The model suggests that each of the supply chain dimensions is positively related to overall firm performance. Each measure was constructed

from the average answer to a specific set of questions. Only those questions that exhibit convergent and discriminant validity and reliability remain in each set. The factor scores and reliability estimates for the remaining measures are shown in Table 1. The data were also analyzed for non-response bias. There were no statistically different responses between early and late informants indicating a low likelihood of non-response bias (Armstrong and Overton, 1977).

Data

The data used in this research comes from a web-based survey that was sent to senior supply chain professional members of the Council of Supply Chain Management Professionals. The informants span a variety of industries. The respondent firms are well dispersed in terms of sales and number of employees. Table 2 gives demographic information about the firms included in the research.

TABLE 1
PARTIAL ROTATED COMPONENT MATRIX AND RELIABILITY SCORES

	Customer Service	Business Process Usage	Relationship Confidence
Accommodate Delivery Times	.825		
Provide Customer Quantity	.810		
Response to Need without Additional Charges	.799		
Ability to Reduce Lead Time to Close to Zero	.712		
Quoted Order Lead Times	.670		
On-time Performance vs Customer Commit Date	.654		
Top Management Supports SC Processes		.778	
SC Vision Communicated through Organization		.765	
Business Process Changes are Measured		.756	
Documented Business Processes		.720	
IT Supports SC Processes		.691	
Jobs in SC can be Described		.659	
Key Service Providers Give Accurate Information			.791
Key Suppliers Give Accurate Information			.786
Key Customers Give Accurate Information			.721
Key Service Providers Get Accurate Information			.721
Key Suppliers Get Accurate Information			.698
Key Suppliers Are Concerned that Our Business Succeeds			.668
Key Customers Get Accurate Information			.597
Cronbach's Alpha	.882	.884	.892

TABLE 2
A DESCRIPTION OF THE RESPONDENT FIRMS

Business Description		Number of Employees	
Business Type	Percentage	Category	Percentage
Raw Materials/Components	14.0	Fewer than 500	26.0
Final Product Manufacturer	34.3	500-999	12.0
Wholesaler/Retailer	5.3	1,000-9,999	44.0
Other Services	29.3	10,000 or greater	18.0
Other	17.1		

Annual Revenue	Percentage	Number of Firms Responding-159
\$25 million or less USD	8.7	
>\$25 million-\$100 million USD	13.3	
>\$100 million-\$1 billion USD	36.0	
>\$1 billion-\$5 billion USD	26.7	
>\$5 billion-\$10 billion USD	7.3	
>\$10 billion USD	8.0	

The survey grew out of an earlier qualitative study completed by the lead author, which involved in-depth interviews of 31 senior supply chain executives of Global 1000 companies. Three industry managers reviewed the survey for likely understanding by the informants and determined that it was easily understood. An invitation letter was emailed to prospective informants directing them to the URL where the survey was located.

All members of the Council of Supply Chain Management Professionals that indicated a position of Director or Vice President of Supply Chain were invited to participate. From 1826 emailed invitations to participate, 224 addresses were undeliverable, 175 addresses returned a message indicating the informant was away and not reading email during the time the survey was administered, and 159 complete responses were received for a response rate of 11%. This response rate was considered reasonable and similar to other research studies in the field (e.g., Wisner, 2003).

The results of the regression analysis are shown in Table 3.

DISCUSSION OF RESULTS AND MANAGERIAL IMPLICATIONS

While the overall model was found to be significant, only two of the dimensions of supply chain management were found to be significant contributors to overall firm performance. The results for each dimension are discussed below.

Customer Service

An increase in customer service was found to be positively related to overall firm performance. This dimension was the most important contributor in explaining the variance in overall firm performance. The customer service measures used in this research focus on delivering the product on time and complete as well as company flexibility in filling orders with near zero lead-time. This suggests that the company is filling every order, thus increasing firm performance by maximizing sales.

Business Process Usage

An increase in business process documentation and definition was found to be positively related

TABLE 3
THE EFFECTS OF CERTAIN SUPPLY CHAIN DIMENSIONS ON FIRM PERFORMANCE

Dependent Variable: Overall firm performance
Form: OLS Regression
No. of Observations: 159
Model's R-square: .299
Model's F Statistic: 20.796
Significance of F: .000

Variable	Expected Sign	Coefficient (Std. Error)	T-statistic (Significance)*
Constant		1.132 (.385)	2.940 (.004)
Customer Service	0	.564 (.109)	5.191 (.000)*
Business Process	0	.276 (.084)	3.302 (.001)*
Relationship	0	-.154 (.134)	-1.151 (.252)

to overall firm performance. This dimension was the second contributor in explaining the variance in overall firm performance. Documenting and using supply chain processes along with top management support of these processes may add to firm performance. When processes are valued and measured, performance on those measures likely follows. This research suggests that use and monitoring of the correct processes does indeed add value to firm performance.

Exchange of Accurate Information

The exchange of information between key service providers, suppliers and customers and the focal firm did not have an impact on overall firm performance. This was a surprising result since, with additional accurate information, the supply chain, including the focal firm, should be able to reduce inventory, thus reducing cost. One explanation may be that the current level of information exchange between these key players in the network was already quite high. Any additional information exchange may have little impact on performance and indeed may be unnecessary.

CONCLUSION

This article explores the role that several supply chain dimensions play in contributing to overall firm performance. Measures suggested in prior studies were factor analyzed for convergent and discriminant validity and then used in a regression model. This study uses data from CSCMP member firms, with top level supply chain managers as informants. The results suggest that of the three dimensions tested, two are significant contributors to firm profitability, including customer service and business process usage. Relationship confidence was not found to significantly impact overall firm performance.

Future research areas include further modifying the model to gain additional insight into additional supply chain drivers of overall firm performance.

ACKNOWLEDGEMENT

The authors would like to thank the University of Denver for two scholarship grants, which helped to finance part of this research.

REFERENCES

- Armstrong, J. Scott and Overton, Terry S., (1977), "Estimating Non-response Bias in Mail Surveys." *Journal of Marketing Research*, 14(3), pp. 396-402.
- Brewer, Peter C. and Speh, Thomas W., (2000), "Using the Balanced Scorecard to Measure Supply Chain Performance." *Journal of Business Logistics*, 21(1), pp. 75-94.
- Cooper, Martha C., Lambert, Douglas M., and Pagh, Janus D., (1997), "Supply Chain Management: More than a New Name for Logistics." *The International Journal of Logistics Management*, 8(1), pp. 1-13.
- Council of Supply Chain Management Professionals, (2006), [On-line]. Available: <http://www.cscmp.org/Downloads/Resources/glossary03.pdf>. Accessed 1/16/06.
- Davenport, Thomas H., (1993), *Process Innovation-Reengineering Work Through Information Technology*, Boston, MA: Harvard Business School Press.
- Ellinger, Alexander E., Daugherty, Patricia J., and Keller, Scott B., (2000), "The Relationship Between Marketing/Logistics Interdepartmental Integration and Performance in U.S. Manufacturing Firms: An Empirical Study." *Journal of Business Logistics*, 21(1), pp. 1-22.
- Emerson, Carol J. and Grimm, Curtis M., (1998), "The Relative Importance of Logistics and Marketing Customer Service: A Strategic Perspective." *Journal of Business Logistics*, 19(1), pp. 17-32.
- Gibson, Brian J., Mentzer, John T. and Cook, Robert L., (2005), "Supply Chain Management: The Pursuit of a Consensus Definition." *Journal of Business Logistics*, 26(2), pp. 17-25.
- Gustin, Craig M., Daugherty, Patricia J., and Stank, Theodore P., (1995), "The Effects of Information Availability on Logistics Integration." *Journal of Business Logistics*, 16(1), pp. 1-21.
- Lambert, Douglas M., Cooper, Martha C., and Pagh, Janus D., (1998), "Supply Chain Management: Implementation Issues and Research Opportunities." *The International Journal of Logistics Management*, 9(2), pp. 1-19.
- Lambert, Douglas M., Knemeyer, A. Michael, and Gardner, John T., (2004), "Supply Chain Partnerships: Model Validation and Implementation." *Journal of Business Logistics*, 25(2), pp. 21-42.
- Mentzer, John T., (2004), *Fundamentals of Supply Chain Management: Twelve Drivers of Competitive Advantage*, Thousand Oaks, CA: Sage Publications.
- Mentzer, John T., DeWitt, William, Keebler, James S., Min, Soonhoong, Nix, Nancy W., Smith, Carlo D., and Zacharia, Zach G., (2001), "Defining Supply Chain Management." *Journal of Business Logistics*, 22(2), pp. 1-24.
- Rogers, Dale S., Daugherty, Patricia J., and Ellinger, Alexander E., (1996), "The Relationship Between Information Technology and Warehousing Performance." *The Logistics and Transportation Review*, 32(4), pp. 409-421.
- Simchi-Levi, David, Kaminsky, Philip, and Simchi-Levi, Edith, (2003), *Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies*, 2nd Edition, Boston, MA: McGraw-Hill Irwin.
- Walton, Lisa Williams and Miller, Linda G., (1995), "Moving toward LIS Theory Development: A Framework of Technology Adoption Within Channels." *Journal of Business Logistics*, 16(2), pp. 117-133.

Wisner, Joel D., (2003), "A Structural Equation Model of Supply Chain Management Strategies and Firm Performance." *Journal of Business Logistics*, 24(1), pp. 1-26.

Wisner, Joel D., Leong, G. Keong, and Tan, Keah-Choon, (2004), *Principles of Supply Chain Management: A Balanced Approach*, Mason, OH: Thompson-Southwestern.

AUTHOR BIOGRAPHY

Carol J. Johnson is associate professor of marketing at the University of Denver. She received her B.S., M.B.A., and Ph.D. from the University of Maryland at College Park. Her research interests include channel strategies, supply chain management, and strategic alliances. She has published in a variety of scholarly journals including *Journal of Business Logistics*, *Journal of Marketing Channels*, *Journal of Transportation Management*, and *Business and Industrial Marketing*. Prior to entering academia, she owned a chain of card and gift shops where she obtained practical experience in providing customer service and in developing vendor partnerships.

AUTHOR BIOGRAPHY

Lidiya Sokhnich is a junior undergraduate student at the University of Denver, with dual majors in finance-marketing and statistics. She received a scholarship grant from the university to pursue this research.

AUTHOR BIOGRAPHY

Charles Ng is a junior undergraduate student at the University of Denver, majoring in international business. He received a scholarship grant from the university to pursue this research.