1 Introduction / Evelyn Thomchick
3 A Tribute to Peter M. Lynagh / Richard F. Poist

Articles
5 The Challenge of Globalization for the Logistics Industry: Evidence from Indonesia / Jose Tongzon
33 Business Case Analysis and the Confounds of Innovation Driven by Performance-Based Postproduction Support Strategies / Wesley S. Randall, Stephan P. Brady, and David R. Nowicki
59 The Effect of Risk Aversion on Manufacturer Advertising in a Two-Stage Supply Chain / Donghan Liang, Gang Li, Linyan Sun, Xinyu Sun, and Jie Gao

Industry Notes
80 Travel Planning: Searching for and Booking Airline Seats on the Internet / Rex S. Toh, Frederick DeKay, and Peter Raven
98 Logistics Innovation in China / Lianguang Cui, Shong-lee Ivan Su, and Susanne Hertz
118 Expect the Unexpected: Supply Chain Disruption and Opportunity for US Companies—A Business Case / Sameer Kumar and Gail Harrison

Book Review
137 Kevin Cullinane, ed., International Handbook of Maritime Business / Richard Young

140 Index 2011 Volume 50 Numbers 1–4
The Transportation Journal™ (TJ) is devoted to the publication of articles that present new knowledge relating to all sectors of the supply chain/logistics/transportation field. These sectors include supply chain/logistics management strategies and techniques; carrier (transport firm) and contract logistics firm (3PL and 4PL) management strategies and techniques; transport economics; regulation, promotion, and other dimensions of public policy toward transport and logistics; and education. Manuscripts published in TJ undergo a double blind refereed process. TJ is included in major citation indices and abstract databases and has been listed in the Social Sciences Citation Index since 1970. TJ is also included in SCOPUS.

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Submission Information
All articles, notes, and comments must be submitted to Evelyn Thomchick at ethomchick@psu.edu. Articles are received with the understanding that they have not been either published or submitted for review elsewhere. For more information, please e-mail or call Evelyn Thomchick at 1-814-863-3567. Books and periodicals for review are welcome. They must be submitted to Richard R. Young at rry100@psu.edu.
Adherence to the following guidelines will facilitate the publication of articles after they undergo the review process.

1. Manuscripts must be submitted electronically in Microsoft Word format (Times New Roman font, size 12, flush left, double spaced). Printed copy submissions or submissions in other digital formats will not be accepted. Pages must be numbered. Length of text (not including tables, figures, endnotes, and references) should be within the range of 3000–6000 words. The manuscript must be accompanied by an abstract of 100–200 words, which clearly states the principal conclusions of the article.

2. Documents should not contain automated formatting. The following represent some examples of formatting that should be avoided:
   A. No function of “Track Changes” should be in use.
   B. The “Style” field should read “Normal” throughout the text.
   C. The article title should be set flush left (do not tab or format an indent).
   D. The “tab” key should be used for paragraph indentation, not the paragraph indent function or the space bar.
   E. Headings should not have bold type but should be set off with line spaces (subheads may be placed in italic to distinguish them from a full heading).
   F. Do not use automated lists. All numbers or bullets must be keyed.
   G. The N-dash should be used for inclusive numbers, not a hyphen.
   H. Epigraphs and extractions from other published works should be set off with line spacing. Do not format an indent.

3. Tables, figures, charts, and photos must be submitted as a separate file from the article text with an indication in the text for placement, i.e., “Table 1”, “Figure 2”, “Photo 3”. They must be submitted in the original format at the size the author would like them to appear.
   A. Tables should be submitted in Word.
   B. Charts and graphs should be submitted in Excel.
   C. Digital images should be submitted in either .tiff, .eps, or .jpeg files at 300 dpi in order for the images to be print-worthy.
   D. All Digital files should be grey scale.

4. Endnotes are used to elaborate on information presented in the article text. If endnotes are used, they must be numbered consecutively throughout the article and be indicated by superscript numerals following the punctuation. The endnote numbers at the end of the article should not be superscript text and should be a number followed by a period. All endnote entries must be double-spaced at the end of the article and must appear before references. If it is necessary to cite a source or sources pertaining to a particular endnote, citation formation must be identical to that used for references (see #5 below).

5. Manuscripts must consistently conform to The Chicago Manual of Style, 15th Edition (CMS). Examples of reference citations for journal articles and books are shown below. For more examples, please check CMS.
   A. Books and journals in the text: Reference citations in the article must be enclosed in parentheses as follows: (Author 2000, 3); (Poist and Alen 1999; Murphy 2000, 48–51).
   B. Books and journals in the reference list: References citing source materials must be listed at the end of the article and must include, in order, the following information: Journal: Author last name, first name. Year of publication. “Title of article.” Title of journal Volume(issue):page numbers.
   Books: Author last name, first name. Year of publication. Title of Book, city: name of publisher.
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6. Book reviews should be approximately 750 words in length. The review must be headed by the following information: title of publication; name of author or editor; publisher; publisher’s address; date of publication; number of pages; ISBN number (if available in both hardcover and paperback, indicate numbers for both); and selling price(s). The text of the review must be double-spaced. The reviewer's name, full professional title, employer affiliation, and address must be indicated at the end of the review.
Introduction

The Winter 2011 issue of the Transportation Journal contains articles on a variety of topics. The first article, “The Challenge of Globalization for the Logistics Industry: Evidence from Indonesia,” by Tongzon, focuses on liberalization of the logistics services industry as part of trade liberalization overall. Tongzon uses Indonesia as a case study country to discuss facilitators and barriers that might be of use to other emerging nations at similar stages of trade liberalization. In their article, “Business Case Analysis and the Confounds of Innovation Driven by Performance-Based Post-Production Support Strategies,” Randall, Brady, and Nowicki discuss performance-based-logistics (PBL) post-production strategies. They analyze return-on-investment governance structures in comparison with return-on-sales business models and provide a theoretical framework for rationalizing PBL and traditional strategies within the same business case analysis. The third article is the final article that was selected from paper submissions to the 2009 International Forum on Shipping, Ports, and Airports. In this article, Liang, Li, Sun, Sun, and Gao use quantitative analysis to investigate the impacts of risk aversion on the manufacturer’s advertising decision and the retailer’s ordering decision.

We also are publishing three industry notes in this issue. In the first note, Toh, DeKay, and Raven, using survey methodology, examine how travelers search for and then buy airline seats, determine which distribution channel dominates, calculate what percentages of online searches convert to actual bookings on the same website, and report why people switch. The second note was selected as a refereed manuscript from the International Conference on Greater China Supply Chain and Logistics (GCSCL) 2010. GCSCL is dedicated to encouraging international academic exchanges, and cooperation on the development of supply chain and logistics management in the Greater China region. Cui, Su, and Hertz present the results of three case study analyses to assist in exploring logistics innovation at third-party logistics (3PL) companies in Taiwan, Hong Kong, and Mainland China. In the third note, Kumar and Harrison discuss supply chain disruption in the context of a firm’s financial performance, in particular, the firm’s Economic Value Added (EVA). Our Winter issue concludes with a book review of the International Handbook of Maritime Business edited by Kevin Cullinane and reviewed by Richard Young.
I would like to announce some changes in our editorial review board composition. Dr. Theodore Stank, Bruce Chair of Excellence in Business and Supply Chain Management at the University of Tennessee, is stepping down due to increased administrative and other responsibilities. I extend my sincere appreciation to Ted for his service to the Transportation Journal and his always timely and constructive manuscript reviews. Our book review editor, Dr. Peter Lynagh, Professor of Marketing in the Merrick School of Business at the University of Baltimore, passed away in October after a brief illness. A tribute to Pete follows this introduction. Dr. Richard Young, Professor of Supply Chain Management at the Penn State Capital College has agreed to serve as book review editor. I am pleased to announce that Dr. Yemisi A. Bolumole has agreed to serve on the editorial board. Dr. Bolumole is an assistant professor of supply chain management at the Michigan State University.

We’ll continue to be making changes in the Transportation Journal during 2012. We will be implementing Editorial Manager, our automated manuscript submission system. The new system should expedite the manuscript review process and will allow authors to track their manuscript submissions. The manuscript submission website is www.editorialmanager.com/TransJour. In addition to refereed articles, we also welcome book reviews or book review proposals. Our book review editor, Richard Young, is also seeking book reviewers for books he has in queue.

We will also be introducing an annual best paper award for papers published in the Transportation Journal. More details will follow in subsequent issues.

Respectfully,
Evelyn Thomchick
Editor
A Tribute to Peter M. Lynagh
1935–2011

Richard F. Poist
Walker Professor of Logistics and Supply Chain Management
Iowa State University

Peter M. Lynagh passed away on October 9, 2011, from complications of Idiopathic Pulmonary Fibrosis. To me, Peter was not only a long-time colleague but also a scholar, professor, mentor and friend. He was one of the first people to greet and welcome me when I joined the University of Maryland faculty in the Fall of 1970. He eased my transition from doctoral student to young faculty member by serving as a caring mentor and loyal friend. This friendship extended to our immediate families as Peter was also a devoted godfather to my youngest daughter.

Throughout the years we carried out a number of successful research projects together. Peter was especially proud of his involvement in some of the earliest academic research relating to the role of women and minorities in transportation and logistics.

“Dr. L.” as he was affectionately known by his students and colleagues was a member of the marketing faculty at the University of Baltimore since 1982 and was one of the Merrick School of Business’ most dedicated and decorated teachers. He was the recipient of the Frank Baker Teaching Professorship from 2006–9 and was awarded the Dean James Chair for Distinguished Teaching in 2010.

Peter was a proud and active member of AST&L; he was a member of the AST&L Board of Examiners from 1990–98 and chaired the Board in 1997–98. Likewise he was a book review editor for the Transportation Journal since the Fall 2006 issue. He also was an active member of the American Marketing Association and the Association of Transportation Practitioners.

Peter had a passion for living and this was reflected in his love of a variety of sports. He enjoyed playing golf and softball and was an avid fan of Baltimore Orioles baseball and Washington Redskins football. He also shared with this writer an interest in horse racing and was known to make several visits a year to Pimlico Racetrack in Baltimore for some wagering. We used to joke that this activity was just a natural extension of our interest in logistics as it represented yet another “mode” or form of transportation!

The academic and business communities as well as society at large are far better as a result of the involvement and accomplishments of “Dr. L.”
His life was a testament to his love of teaching, the power of humility, compassion for others, and the true meaning of loyalty and integrity.

The Lynagh Memorial Fund has been established to honor Peter's contributions and accomplishments. Checks made payable to the UB Foundation-Lynagh Memorial, can be mailed to the Office of Annual Giving, University of Baltimore, 1130 N. Charles Street, Baltimore, MD 21201.
The Challenge of Globalization for the Logistics Industry: Evidence from Indonesia

Jose Tongzon

Abstract
Trade liberalization is increasingly accompanied by efforts to liberalize logistics services as nations have realized the importance of logistics services in achieving economic progress and integration. However, liberalization also brings with it costs and challenges. In this light, this article tries to assess the progress in implementing the liberalization commitments and their implications on the logistics sector using Indonesia as a case study. The implementation of Indonesia’s liberalization commitments has been slow and cautious. Substantial barriers to trade in logistics services still exist, constraining the path toward economic progress and integration. Its logistics sector is also unlikely to benefit from trade liberalization, except in the maritime, air transport, and cargo-handling services. Indonesia’s experience could be applicable to emerging nations that are in the process of liberalizing their respective logistics services industries, as this study contributes to the understanding of the liberalization process.

Keywords
Globalization, Trade liberalization, Logistics services, Indonesia

Introduction
There has been a general tendency toward liberalization of international trade in logistics services as nations are pushing for trade liberalization in goods under the auspices of the World Trade Organization (WTO), and in regional and bilateral trade contexts. Trade liberalization in logistics services is seen as an integral part of a strategy to improve exports and achieve
economic development. Indonesia in particular has pursued a multitrack approach to its export interests.

However, the fear of increasing foreign competition has further raised the question of what the appropriate nature, extent, and pace of trade liberalization for Indonesia’s logistics should be, given that its logistics sector is not yet as efficient and as competitive as its counterparts in the developed world. In this light, the objective of this article is to assess Indonesia’s progress in implementing its liberalization commitments for logistics and identify those sectors where Indonesia is likely to gain and lose from those liberalization efforts. This issue will no doubt have relevance not only for Indonesia but also for other developing countries as they implement their liberalization commitments in logistics services. Previous studies dealing with the implications of trade liberalization for logistics sector are scarce (e.g., Fung et al. 2005) and so far no study has been undertaken to address this important but difficult issue for Indonesia.

The definition and scope for logistics adopted in this article are based on the checklist recommended by the WTO, which is also employed by the ASEAN countries in their current effort toward the integration of their logistics services. This list is drawn from the United Nations (UN) Provisional Central Product Classification (CPC) system and is used to facilitate the effort of securing liberalization through negotiations. It consists of three major categories: (1) core freight logistics services, (2) related freight logistics services, and (3) noncore freight logistics services. For a more detailed description of these categories and their respective CPC codes, see appendix A.

The rest of the article is organized as follows. The next section briefly reviews the relevant literature. Then, an overview of Indonesia’s logistics sector and its economic importance is provided. An analysis of Indonesia’s liberalization commitments and implementation follows. Subsequently, the methodology and findings on the likely winners and losers from trade liberalization are discussed, followed by a conclusion with some policy implications.

**Review of Relevant Literature**

Although there are several theoretical and empirical studies dealing with the economic implications of liberalization of logistics services in specific countries (e.g., Gillen, Harris, and Oum 2002; Balestreri, Rutherford, and Tarr 2009), no study has yet been undertaken on the economic implications of logistics services liberalization in Indonesia. There are,
however, a few studies examining the importance of logistics services to a nation’s economy and to Indonesia in particular. The first set of studies establishes the link between logistics and trade performance, and the second set highlights the importance of logistics to Indonesia’s international competitiveness.

**Logistics and Trade Performance Nexus**

The literature offers substantial evidence linking improvements in transport and logistics directly to improvements in export performance. The effects are especially strong when importers have access to multiple suppliers of highly substitutable commodities. Comparing sales by manufacturers of similar products, Hummels (1999) estimated that exporters with 1 percent lower shipping costs will enjoy a 5–8 percent higher market share. Limão and Venables (2001) estimated that differences in infrastructure quality account for 40 percent of the variation in transport costs for coastal countries and up to 60 percent for landlocked countries. Fink, Mattoo, and Neagu (2000), based on US trade with its trading partners, concluded that liberalizing the provision of port services and regulating the exercise of market power in liner shipping could reduce liner shipping costs by a third on average.

A World Bank study by Wilson, Mann, and Otsuki (2003) has shown that the Asia Pacific Economic Cooperation (APEC) countries differ substantially in the quality of their logistics and trade facilitation across a broad range of measures, including ports infrastructure, customs clearance, regulatory administration, and e-business use. They found that these differences are significantly related to differences in trade performance and concluded that substantial growth in trade within their block could be accomplished by bringing lagging countries up to median performance levels in terms of logistics.

Further, improving access to international markets raises incomes. Frankel and Romer (1999) showed that countries that are closer to world markets enjoy higher levels of trade, and that a 1 percent rise in the trade to GDP ratio increases income per person by at least 0.5 percent. Redding and Venables (2002) calculated that more than 70 percent of the variation in per capita income across countries can be explained by the geography of markets and the extent of supplier access. Better access to ports alone raises incomes by 20 percent. As to income differences within countries, internal and effectively landlocked regions have systematically lower levels of income than coastal regions, other things being equal. Comparing China’s
regions, Wei and Yi (2001) demonstrated that trade levels, trade growth, and income growth rates all drop as one gets further from coastal areas. The evidence on inland regions makes an especially strong case for the importance of access to international markets.

Indonesia’s Logistics and Its Importance to International Competitiveness

Past studies that estimated the actual share of logistics costs in the overall cost of exporting in Indonesia have shown varied results, depending on sources used, ranging from 14.08 percent (as estimated by Basri 2005) to 25.0 percent (as cited by the Chairman of Indonesian Logistics Association). Since it is generally difficult to put an absolute value on the cost of logistics as a share of export costs, we can roughly say that logistics costs in Indonesia account for 14–25 percent of the total cost of exportation. Compared with the logistics costs in the United States and Japan that account for around 10 percent and 11 percent, respectively, this indicates a lot of room for improvements in logistics services in Indonesia (Basri 2005; Keretho 2005; Patunru, Nurrizdki, and Rivayani 2007). Low port efficiency measured in terms of ship turnaround time and crane productivity and relatively high port costs in Indonesia have been cited by a number of studies (e.g., see Arvis et al. 2007; Ray 2008; Kruk 2008a, 2008b).

Indonesia’s Logistics Sector and Its Economic Importance

Like that in most developing countries, the service sector is becoming increasingly important to the Indonesian economy. Its service sector has grown significantly over the past thirty-six years such that by 2006 it accounted for almost 50 percent and 44 percent of Indonesia’s total output and employment respectively (Harjono and McGuire 2006). Indonesia’s logistics services sector plays a significant role in its rising economic importance. Further, since logistics is a derived demand, its competitiveness is linked with that of the industries that it serves.

There are no trade data on logistics as a whole, but trade data on transport services are readily available from the United Nations Conference on Trade and Development (UNCTAD)’s database. These data are not decomposed into countries bilaterally, but are only aggregates in terms of exports and imports. However, these data on trade in transport services (an important component of international trade in logistics services) should provide some indication of Indonesia’s logistics trade performance compared to other founding member countries for which data are available.

As shown in table 1, the trade performance of Indonesia’s transport sector over the period of 1990–2009 (the latest year for which data are available) has not been contributing to Indonesia’s current account balance.
The discrepancy between its export and import of transportation services has been quite substantial over the years. It is clear that Indonesia's export of transport services has not been performing as well as that in Singapore, Malaysia, and Thailand.

**Indonesia’s Liberalization Commitments and Barriers to Implementation and Progress**

In an effort to open up more markets for its exports of goods and services and further liberalize the international trading environment, Indonesia has pursued a number of approaches that may be categorized into three major forms: (1) multilateral under the auspices of the World Trade Organization (WTO), (2) regional within the framework of the ASEAN Economic Community (AEC), and (3) bilateral in the context of Indonesia’s individual relationships with its individual trading partners.
Indonesia’s Liberalization Commitments

As an active member of the WTO, Indonesia is committed to the “most-favored nation” principle and has participated in a number of negotiations under the General Agreement on Trade in Services (GATS) where countries have to make bilateral offers and requests in the context of the member countries’ limitations on market access (MA) and national treatment (NT).

As a founding member of ASEAN, Indonesia has committed itself to the ASEAN vision of an economically integrated Southeast Asian region. In particular, it has officially supported the objectives under the ASEAN Roadmap for the Integration of Logistics Services. In bilateral contexts Indonesia has also upheld certain commitments under the Japan-Indonesia Economic Partnership Agreement (JIEPA), which came into force in 2007.

Table 2 summarizes Indonesia’s international trade in logistics services commitments under the WTO, ASEAN, and JIEPA.

Table 2/Indonesia International Trade in Logistics Services Commitments

<table>
<thead>
<tr>
<th>General</th>
<th>WTO</th>
<th>ASEAN</th>
<th>JIEPA</th>
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<tbody>
<tr>
<td>General</td>
<td>Indonesia is committed to the liberalization of logistics services across the board to reap the benefits of international trade.</td>
<td>Indonesia is committed to the implementation of the ASEAN Roadmap for the integration of logistics services by 2013.</td>
<td>Indonesia is committed to the implementation of the terms under the JIEPA agreement.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Key Specific Commitments</th>
<th>WTO</th>
<th>ASEAN</th>
<th>JIEPA</th>
</tr>
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<tr>
<td>Undertake substantial and meaningful market access (MA) and national treatment (NT) commitments as well as other commitments as may be needed to ensure the effectiveness of liberalization commitments. In respect of core services essential to logistics operations, MA and NT commitments with right of establishment should be provided so as to enable commercially meaningful liberalization; where limitations and restrictions are to be scheduled, they may be time-limited to be phased out. Ensure that access is provided on reasonable and non-discriminatory basis. Ensure that procedures and formalities are not unnecessarily burdensome.</td>
<td>Undertake substantial liberalization of logistics services in the following sectors: maritime cargo-handling services (CPC 741), storage/warehousing (CPC 742), transport agency (CPC 748), other auxiliary services (CPC 749), courier (CPC 7512), packaging services (CPC 876), maritime transport services (CPC 7212), air transport (CPC 732), rail transport (CPC 7112) and road transport services (CPC 7213).</td>
<td>Undertake substantial market access and national treatment commitments as specified in the Agreement. Ensure that Indonesia’s commitments are consistent with the economic objectives and priorities of JIEPA. Ensure that Indonesia’s commitments are accompanied by capacity building and other programs aimed at strengthening Indonesia’s international competitiveness.</td>
<td></td>
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</table>

Indonesia’s logistics policy is supposed to complement its overall trade objective of promoting Indonesia’s export performance by increasing its export of logistics services and by managing the flow of logistics services such that they contribute to the productivity and international competitiveness of the Indonesian economy. Achieving this objective in logistics services trade will necessarily move Indonesia closer to its strategic vision: to realize international trade as a core driver for increasing national competitiveness and the welfare of the Indonesian people.

**Barriers to Implementation and Progress**

Despite Indonesia’s declaration of trade liberalization commitments, implementation in the area of logistics services has been slow and cautious. Several barriers to free trade in logistics services still exist in Indonesia. In fact, Indonesia was rated by the ASEAN-based logistics providers as having the most significant barriers to free trade among the ASEAN countries (De Souza et al. 2007). These barriers range from market access and regulatory barriers, protectionism, institutional barriers, to administrative and infrastructure barriers that directly and indirectly prohibit trade in logistics services. For a good discussion of the various types of barriers, see Fung et al. (2005). Market access barriers in the forms of restricted foreign equity participation, regulatory and institutional barriers, and administrative barriers particularly in relation to the customs procedures and inspections are the most significant factors found across the various logistics sectors in Indonesia (De Souza et al. 2007).

**Market Access and Regulatory Barriers**

Indonesia’s logistics sector is still highly shielded from foreign competition by certain restrictions its government imposes on the entry of foreign logistics services into its domestic market. These restrictions are mainly in the forms of foreign equity participation limits, joint venture and representative office requirements for several categories in the core, and related and noncore logistics services. Although the related freight services have the largest number and most substantive commitments, the restrictions on market access in this sector are quite substantial.

Specifically, there is a 49 percent maximum foreign equity participation limit for cargo-handling service suppliers, transport agency service suppliers (except for customs clearance, which is reserved for locals only), maritime transport service suppliers (excluding cabotage), internal waterways services, air transport service suppliers, air transport supporting service suppliers, road transport service suppliers, and courier service suppliers. Moreover, no foreign equity participation is permitted for rail
transport service suppliers, establishment and operation of land terminals for road freight transport services, technical testing and analysis service suppliers, and commission agents’ service suppliers and various distribution service suppliers. There are also joint venture requirements between foreign and domestic service suppliers for shipping services while there are representative office requirements for scheduled foreign air transport service suppliers.

There are no specific regulations for the core logistics services with respect to the various modes of supply. In particular, freight forwarding as an industry should be given legal recognition in Indonesia’s legal framework. Currently, it is not clearly defined and is, therefore, not exempted from VAT, further constraining the development and international competitiveness of Indonesia’s domestic freight forwarding industry. 6

The liberalization process in logistics services has been very slow, especially in the maritime transport and distribution subsectors. The progress has been inhibited mainly due to political sensitivities and the tendency to discriminate in favor of domestic enterprises. 7 For example, the purposes of limiting the foreign equity ownership in port and ship operating companies based in Indonesia to less than 50 percent are twofold. It is intended to both maintain the control by domestic operators and discourage some foreign mega-operators from participating in the management of Indonesia’s port and shipping sector. 8

Protectionism

The role of protectionism is best illustrated by Indonesia’s current cabotage policy. Although there has been some discussion in academic journals on cabotage in Indonesia (e.g., see Dick 2008; Ray 2008), there seems to have been no sufficient public discussion and consultation on this issue (Ray 2008). Cabotage, which prohibits foreign registered ships from operating in domestic shipping or carrying cargo between domestic ports, has led to the high cost and inefficiency of domestic shipping services. The lack of foreign competition and the undersupply of domestic shipping capacity have given rise to excessively high freight rates and inefficient delivery of freight within the country. 9 Although shipping lines could have made multiple port calls to fill up their slots to make the calls economically viable, this is not allowed under the cabotage rule. Consequently, many foreign-registered shipping lines have not provided shipping services to small and distant island ports.

Although the cabotage policy can be justified from the political and strategic perspective, the prohibition of the world-class shipping
operators from participating in domestic shipping has limited competition in the domestic shipping service market to the detriment of the shippers, Indonesian operators, and other users. They are, in effect, denied state-of-the-art technology and management know-how of world-class shipping operators such as Maersk and other non-ASEAN carriers that have established reputations as efficient and reliable shipping operators. The more stringent cabotage policy under the shipping law of 2008 is further evidence to the government’s attempt to protect local shipping interests. For more detailed discussion of this issue, see Ray (2008) and Dick (2008).

Institutional Barriers

There is no lead government agency to oversee logistics and to coordinate the formulation and dissemination of policies and regulations for logistics services (Tongzon 2009). The absence of a lead agency has not only led to duplication and inconsistencies in the formulation and dissemination of policies and regulations for logistics services to the private sector, but has also not given logistics the special attention that it deserves. The need for coordination among the various relevant government agencies cannot be overemphasized. The relevant agencies involved in the various aspects of the logistics chain need to have their functions coordinated to avoid any duplication and inconsistencies in the formulation of policies and regulations.

Administrative Barriers

Indonesia has to further simplify the administrative procedures in the exporting and importing processes by reducing the number of government agencies involved and the length of time spent in the processes. Currently, there are a number of government agencies with which the importers and exporters have to deal in the export and import processes. In the import processes under the red channel (where goods are to be checked and examined by customs), customs clearance at the port of Tanjung Priok takes an average of four and a half days from the time import declaration of containerized goods is received to the time the goods are inspected (Mitsubishi UFG Research and Consulting 2008). This does not fare well when compared to only two days in Malaysia, two and a half days in Thailand, and one or two days in Singapore.

There is a lack of an integrated regulatory framework that covers all aspects of logistics services. Currently, various regulations and business
licenses covering the various aspects of logistics services are under the jurisdiction of different government agencies. Such fragmentation makes it difficult for prospective logistics investors to apply for licenses to conduct logistics services in Indonesia.  

Infrastructure Barriers

Indonesia is in the process of establishing a National Single Window (NSW). NSW aims to facilitate and expedite customs processing by using electronic submission of customs declarations, and by linking electronically the various stakeholders across the supply chain. Indonesia has recently implemented a pilot project for its NSW at the port of Tanjung Priok and other major ports and airports. However, based on the feedback obtained from the interviewees, there is much to be done to ensure that it is sufficiently robust and flexible to cope with all import and export transactions, peak loads, security, and e-payments.

Progress in Implementation

The progress in liberalization implementation can be gauged from two proxy indicators: (1) Indonesia’s share of world merchandise exports, and (2) its share of global trade (in the absence of data on foreign direct investment flows into Indonesia’s logistics sector). As shown in Table 3, Indonesia’s shares of world merchandise exports and global trade made some progress as reflected in its rising shares starting from 2003, especially for 2008–2009. While the growth of its shares is quite significant compared to other ASEAN countries, these shares are marginal at less than 1 percent of the world merchandise exports (0.85–0.93%) and global trade (0.82–0.86%), respectively. In fact, its shares are lower than those of Singapore, Malaysia, and Thailand. Considering its relatively large GDP and population size, this means that its trade performance needs to be further enhanced to become a significant contributor to Indonesia’s economic growth. Further, in 2008 Indonesia’s trade in transportation services only accounted for 3.27 percent of its GDP, about similar to that of the Philippines, but much lower compared to that of Singapore (32.29%), Thailand (11.06%), and Malaysia (8.17%). In the context of logistics facilitating and inducing trade, this implies that there is indeed a lot of scope to improve the contribution of its logistics sector to its merchandise exports and global trade.
Table 3a/ASEAN Shares of World Merchandise Exports (%), 2000–2009

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<td>0.05466</td>
<td>0.063709</td>
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<td>Cambodia</td>
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<td>0.027893</td>
<td>0.029013</td>
<td>0.027898</td>
<td>0.027046</td>
<td>0.03992</td>
</tr>
<tr>
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<td>0.804877</td>
<td>0.832224</td>
<td>0.814949</td>
<td>0.850158</td>
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</tr>
<tr>
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<td>0.003327</td>
<td>0.002728</td>
<td>0.005137</td>
<td>0.005137</td>
<td>0.009904</td>
</tr>
<tr>
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<td>1.298109</td>
<td>1.258524</td>
<td>1.206775</td>
<td>1.256133</td>
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<tr>
<td>Malaysia</td>
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<td>0.029021</td>
<td>0.042376</td>
<td>0.041081</td>
<td>0.050777</td>
</tr>
<tr>
<td>Myanmar</td>
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<td>0.477603</td>
<td>0.39143</td>
<td>0.360446</td>
<td>0.304182</td>
<td>0.306926</td>
</tr>
<tr>
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<tr>
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<td>0.453891</td>
<td>0.453891</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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</tr>
</tbody>
</table>

Sources: ASEAN Secretariat (www.aseansec.org); UN Services Trade Database (www.unitednations.com).

Table 3b/ASEAN Shares of Global Trade (%), 2000–2009

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunei</td>
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<td>0.030012</td>
<td>0.037532</td>
<td>0.034805</td>
<td>0.039551</td>
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<td>1.048887</td>
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<td>0.0232</td>
<td>0.031135</td>
<td>0.032247</td>
<td>0.040845</td>
</tr>
<tr>
<td>Philippines</td>
<td>0.558775</td>
<td>0.48493</td>
<td>0.408717</td>
<td>0.37832</td>
<td>0.32715</td>
<td>0.336113</td>
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<tr>
<td>Singapore</td>
<td>2.102322</td>
<td>1.947637</td>
<td>2.101978</td>
<td>2.007799</td>
<td>2.036988</td>
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<tr>
<td>Thailand</td>
<td>1.050885</td>
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<td>Vietnam</td>
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<td>0.392609</td>
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<td>0.504645</td>
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<tr>
<td>World</td>
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<td>100</td>
<td>100</td>
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</tr>
</tbody>
</table>

Sources: ASEAN Secretariat (www.aseansec.org); UN Services Trade Database (www.unitednations.com).

Implications of Liberalization for Indonesia’s Logistics Sector
Whether Indonesia is going to accelerate the process of liberalizing its logistics sector largely hinges on how Indonesia perceives the likely impacts. In particular, the question of which sectors and subsectors will benefit or lose from liberalization will affect the nature, extent, and pace of trade liberalization in logistics services.
Areas of Competitive Advantage and Disadvantage

Due to the lack of export and import data on the various components of logistics services, it is not possible to address this issue based on the standard economic approach. The standard approach to quantify Indonesia’s competitive advantage makes use of world market shares and revealed comparative indices, for which statistical data on logistics services by sector are unavailable. 13

Methodology Used

In the absence of statistical trade data on logistics services by sector for Indonesia, the article adopts the data triangulation technique to obtain a more complete picture of the current logistics situation in Indonesia. It involves the use of the Heckscher-Ohlin (H-O) model, results of previous studies, and questionnaire-based interviews. This technique allows for cross verification of the H/O model with information gathered from previous studies, and from interviews with policymakers, logistics service providers, their respective logistics industry associations, and selected research institutes.

It is assumed based on the H-O model that a country has a competitive advantage in a certain type of logistics service if it is relatively endowed with those resources that are used more intensively in the production of that type of service. For example, endowed with relatively abundant and cheap but low-skilled labor, Indonesia should have competitiveness in the production of labor-intensive logistics services. For a more detailed discussion of this model, see Leamer (1995). The H-O model has been criticized for its simplistic assumption of a two-factor world with competitive markets. However, in the absence of actual data on exports and imports of logistics services by sector, this approach can be employed for the purpose of this article since a country’s relative resource endowment ceteris paribus can determine its competitive advantage. To offset its inherent limitations and to allow for other factors that can affect a nation’s competitive advantage, this approach is supplemented by the results of previous studies on logistics services pertinent to Indonesia’s comparative advantage. In addition, questionnaire-based interviews with the policymakers, representatives of the Indonesian logistics industry, and relevant research institutes provide further supplements.

The policymakers are the government agencies and ministries directly involved in the administration and formulation of logistics policies (e.g., Indonesia’s departments of Trade, Transport, and Finance). These
national agencies and ministries provided a good source of information in relation to Indonesia’s implementation of liberalization commitments as well as the factors affecting their implementation. The logistics industry associations in ASEAN (such as Indonesia’s Freight Forwarders Association and ASEAN Freight Forwarders Association) and selected research institutes mainly provided information about the structure, profile, overall performance and capacity, and international competitiveness of Indonesia’s logistics industry. Moreover, the logistics industry associations supplied useful feedback on behalf of their members with respect to the level of liberalization commitments and the likely implications for Indonesia’s logistics industry. The interviews with a sample of logistics companies produced further inputs on the level of implementation of the liberalization commitments in Indonesia and the challenges facing them. Since they were promised at the interviews that their inputs would be treated in the strictest confidentiality, their names are not specifically cited in this article.

To lend the interview results to content analysis, the interviewees were asked to rate each logistics subsector from 1 (very low) to 5 (very high) in terms of international competitiveness, employment generation, contribution to economic growth, strategic importance, and world growth. They were also asked to justify their answers. Appendix B contains a copy of the questionnaire used for the interview. These results were then analyzed objectively and systematically to derive the findings in this paper. For a detailed discussion of content analysis as a technique for data analysis, see Holsti (1969). Twenty-five individuals were interviewed. To ensure that the interviewees’ responses are accurate and reliable, only those persons who are responsible for the formulation of logistics strategy or have sufficient knowledge of the Indonesian logistics industry were included in the sample. Other studies (e.g., Tongzon and Wu 2005; Chang, Tongzon, and Lee 2008) have also conducted statistical analysis based on twenty-five and twenty-eight observations, respectively.

Areas of Competitive Advantage

Indonesia’s competitive advantage based on the H-O model should be found in those logistics services that use more low- or semi-skilled labor, in which Indonesia is relatively abundant. However, given their limited access to capital and state-of-the-art technology constrained by less-developed infrastructure and institutional quality, Indonesia’s logistics services are relatively inefficient and deal mostly with low-valued and basic
logistics operations. It is, therefore, difficult for Indonesia to export these types of services under modes 1–3 of supply. Further, certain regulations have limited the market access for logistics services in this country. Thus, in the short run Indonesia’s capacity and competitive advantage should only lie in exporting its low- and semi-skilled labor under mode 4 in certain sectors that require these types of labor. Indonesia has already been an exporter of seamen for foreign commercial ships. There are currently 300,000 Indonesian nationals working in Malaysia as domestic helpers (Jakarta Post 2008a). It is foreseeable that Indonesia can become a major exporter of low- and semi-skilled workers for the ports, airports, and other logistics service subsectors in other labor-scarce countries in the region and beyond.

The above inferences derived from the H-O theory are further supported by the questionnaire-based expert opinion interview results, as shown at the first column of table 4. Based on their ratings (where a rating of 4 to 5 denotes Indonesia’s strong competitive advantage), Indonesia is perceived to be highly competitive under mode 4, but only in some subsectors. The service subsectors where Indonesia is perceived to have a strong competitive advantage under mode 4 include cargo handling, storage and warehousing, transport agency, other auxiliary services, maritime transport, internal waterways transport, road transport, air transport, retailing, other supporting services, and packaging services. Except for the cargo-handling, maritime, and air transport services, where Indonesia also has a competitive advantage under modes 1–3 of supply, Indonesia’s competitive advantage is perceived to be confined only to mode 4. The expert opinion survey has also revealed that Indonesia’s basic (i.e., core freight logistics) and freight-related logistics sectors can make significant contribution to the Indonesian economy in terms of employment generation and value added.

Indonesia potentially holds a competitive advantage in exporting the above services under other modes of supply (modes 1–3), provided that Indonesia can implement the required institutional reforms, develop its transport infrastructure (e.g., expansion and upgrading its road and rail networks, seaports and airports), and address other constraints facing its logistics industry. For example, in packaging services Indonesia can develop a competitive advantage under modes 1–3 due to its well-established packaging industry, which boasts annual revenues of Rp 20 trillion (US$2.18 billion). Provided that there is a stable source of polypropylene (PP), which is used in plastic-based packaging material, this industry is likely to have a bright prospect (Jakarta Post 2008b).
### Table 4/Indonesia’s Rating of Logistics Services Using Certain Criteria

<table>
<thead>
<tr>
<th>Sectors</th>
<th>Indonesia’s International Competitiveness</th>
<th>Employment Generation in Indonesia</th>
<th>Value Added/Contribution to Indonesia’s Economic Growth</th>
<th>Strategic Importance for Indonesia</th>
<th>World Growth Prospect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Modes 1–3</td>
<td>Mode 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. Core Freight Logistics</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cargo handling</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Storage and warehousing</td>
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<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Transport agency</td>
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<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Other auxiliary servicesa</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>IIa. Freight Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maritime transport</td>
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<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Internal waterways</td>
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<td>4</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Air transport</td>
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<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Rail transport</td>
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<td>2</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Road transport</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>5</td>
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<tr>
<td>IIb. Other Related Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical testing and analysis</td>
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<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Couriers</td>
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<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Commission agents</td>
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<td>2</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Wholesale trade</td>
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<td>2</td>
<td>4</td>
<td>5</td>
<td>5</td>
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<tr>
<td>Retailing</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Other supporting servicesb</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>III. Noncore Freight Logistics</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Packaging</td>
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<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Leasing/rental of vessels</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Leasing/rental of aircraft</td>
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<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Computer &amp; related</td>
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<td>3</td>
<td>3</td>
<td>4</td>
</tr>
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<td>Management consulting</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: Based on the interview results.

Notes: The ranking ranges from 5 = very high; 4 = high; 3 = moderate; 2 = low; 1 = very low. The ratings are averages and rounded up to eliminate any decimal points.

a Other auxiliary services include bill auditing, freight brokerage, freight inspection, weighing and sampling services, freight receiving and acceptance services, and transportation documentation preparation services.

b Other supporting services refer to supporting services not covered which include supporting services for railway and road transport, and towing services. Bus station services and supporting services for air transport do not fall into this category.
Areas of Competitive Disadvantage

As discussed in the preceding section, except in the maritime, air transport, and cargo handling services, Indonesia’s logistics is not internationally competitive under modes 1–3 and is, therefore, likely to lose revenues from the trade liberalization of logistics services with serious short-term adjustment costs for Indonesia.

Another way to assess Indonesia’s competitive disadvantage in the export of logistics services under modes 1–3 is to look at Indonesia’s logistics performance index and other indicators compared with the other ASEAN countries. The assessment is based on the most recent worldwide survey of the world’s multinational freight forwarders and main express carriers undertaken by Arvis et al. (2010) from the World Bank. Their findings show that, in the global context, Indonesia ranks forty-third in terms of overall logistics performance. As can be seen from table 5, compared to other ASEAN countries Indonesia’s overall logistics performance, although higher than those of other former centrally planned economies in Southeast Asia, is far below those of Singapore, Malaysia, Thailand, and the Philippines. In terms of domestic logistics costs, it is the third-weakest performer, leading only Singapore and Laos (Arvis et al. 2007).

This ASEAN cross-country comparison suggests that Indonesia’s logistics sector has a competitive disadvantage in the export of logistics services (modes 1–3) compared to Singapore, Malaysia, Thailand, and the Philippines on the assumption that the logistics performance index reflects a country’s ability to export logistics services. Reinforcing

<table>
<thead>
<tr>
<th>Country</th>
<th>LPI</th>
<th>Customs</th>
<th>Infrastructure</th>
<th>International Shipments</th>
<th>Logistics Competence</th>
<th>Tracking and Tracing</th>
<th>Timeliness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>4.09</td>
<td>4.02</td>
<td>4.22</td>
<td>3.86</td>
<td>4.12</td>
<td>4.15</td>
<td>4.23</td>
</tr>
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<td>Malaysia</td>
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<td>3.11</td>
<td>3.50</td>
<td>3.50</td>
<td>3.34</td>
<td>3.32</td>
<td>3.86</td>
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<td>3.27</td>
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<td>3.41</td>
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<td>2.67</td>
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<td>3.40</td>
<td>2.95</td>
<td>3.29</td>
<td>3.83</td>
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<td>2.68</td>
<td>2.56</td>
<td>3.04</td>
<td>2.89</td>
<td>3.10</td>
<td>3.44</td>
</tr>
<tr>
<td>Indonesia</td>
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<td>2.43</td>
<td>2.54</td>
<td>2.82</td>
<td>2.47</td>
<td>2.77</td>
<td>3.46</td>
</tr>
<tr>
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<td>2.70</td>
<td>2.14</td>
<td>2.45</td>
<td>3.23</td>
</tr>
<tr>
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<td>2.37</td>
<td>2.28</td>
<td>2.12</td>
<td>2.19</td>
<td>2.29</td>
<td>2.50</td>
<td>2.84</td>
</tr>
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<td>Myanmar</td>
<td>2.33</td>
<td>1.94</td>
<td>1.92</td>
<td>2.37</td>
<td>2.01</td>
<td>2.36</td>
<td>3.29</td>
</tr>
</tbody>
</table>

Source: Arvis et al. 2010.  
a All ASEAN member countries are represented with the exception of Brunei, which has the smallest economy in ASEAN.
the findings based on the questionnaire-based interviews presented in table 4, Indonesia’s logistics sector was found to be one of the most inefficient and highest cost sectors that adversely affect Indonesia’s international competitiveness (Arvis et al. 2007, 2010). The relatively poor logistics performance was attributed to its relatively poor infrastructure quality and competency of its logistics providers, and the relatively high domestic logistics costs. The major factors that contribute to high domestic logistics costs in Indonesia and constrain the flow of cargoes throughout the logistics chain have been found to lie in the lack of adequate road and air transport networks, and excessively high domestic shipping costs (which constitute a major part of domestic logistics costs in the export of goods).

Based on a comprehensive survey of domestic trucking costs along nine routes in Indonesia, the Asia Foundation (2008) has further confirmed Indonesia’s unreliable and highly expensive road transportation. A combination of poor road infrastructure and payment of a host of charges (official as well as unofficial) have inflated the total cost of transportation and eroded the profits of transport services providers and users. Since approximately 70 percent of Indonesia’s freight is transported by road, this has had a significant implication for Indonesia’s national cost competitiveness (Asia Foundation 2008; Arvis et al. 2010).

The logistics cost disadvantage of Indonesia is more specifically illustrated by comparing the cost of shipping containers from the port of Tanjung Priok to the port of Los Angeles, relative to shipment from other main regional ports. As table 6 shows, the cost of shipping twenty-foot containers from the port of Tanjung Priok to the port of Los Angeles is much higher than shipping from the rest of the main regional ports, except for the ports of Manila and Phnom Penh (higher by a range of US$80–160 per twenty-foot container).

<table>
<thead>
<tr>
<th>No</th>
<th>From</th>
<th>To</th>
<th>Currency</th>
<th>20-foot</th>
<th>40-foot</th>
<th>ROUTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Port Klang, Malaysia</td>
<td>LA</td>
<td>USD</td>
<td>1,260</td>
<td>1,600</td>
<td>via HKG</td>
</tr>
<tr>
<td>2</td>
<td>Port of Singapore</td>
<td>LA</td>
<td>USD</td>
<td>1,270</td>
<td>1,612</td>
<td>Direct</td>
</tr>
<tr>
<td>3</td>
<td>Port of Ho Chi Minh, Vietnam</td>
<td>LA</td>
<td>USD</td>
<td>1,340</td>
<td>1,700</td>
<td>via HKG</td>
</tr>
<tr>
<td>4</td>
<td>Port of Bangkok, Thailand</td>
<td>LA</td>
<td>USD</td>
<td>1,340</td>
<td>1,700</td>
<td>via HKG</td>
</tr>
<tr>
<td>5</td>
<td>Port of Tanjung Priok, Malaysia</td>
<td>LA</td>
<td>USD</td>
<td>1,420</td>
<td>1,800</td>
<td>via HKG</td>
</tr>
<tr>
<td>6</td>
<td>Port of Manila, Philippines</td>
<td>LA</td>
<td>USD</td>
<td>1,450</td>
<td>1,717</td>
<td>via Kaohsiung</td>
</tr>
<tr>
<td>7</td>
<td>Port of Phnom Penh, Cambodia</td>
<td>LA</td>
<td>USD</td>
<td>1,740</td>
<td>2,200</td>
<td>via HKG</td>
</tr>
</tbody>
</table>

Source: DHL.

Note: These charges are as of April 30, 2009.
This shipping cost disadvantage is due to the lack of direct shipping services between the port of Tanjung Priok and other final destination ports. As such, Indonesian cargoes have to be transshipped at the port of Hong Kong or port of Singapore, resulting in a higher shipping cost than direct shipments. The lack of direct shipping services at the port of Tanjung Priok is further driven by a number of factors, including its insufficient cargo base, which does not allow for the realization of economies of scale from the shipping lines’ perspective. From the Indonesian shippers’ perspective, the high frequency of shipping services at hub ports is another factor that makes the ports of Singapore and Hong Kong more attractive than direct shipments from the port of Tanjung Priok. Other contributing factors include Indonesia’s low port efficiency and reliability, inadequate infrastructure, and bureaucratic delays that result in a longer ship-turnaround time and, thus, higher operating costs.

However, the enhancement of Indonesia’s capacity and international competitiveness for the logistics sector in the long run can be achieved if appropriate and effective policies and measures are in place to bring in appropriate foreign logistics providers or investors. Ensuring an effective transfer of technology from these foreign logistics providers or investors is also vital, especially for those logistics services that can significantly contribute to Indonesia’s logistics services exports. In this respect, the liberalization of the logistics services sector—especially in the rail and road transport subsectors, and the auxiliary services for these two modes of transport—should go a long way in bringing down the cost of transport and improve the efficiency of delivery across the logistics chain. Table 7 lists the categories of logistics services that can be reformed to enhance Indonesia’s international competitiveness under mode 3 and their rationale.

**Table 7/Areas of Competitive Disadvantage and the Rationale for Reforms**

<table>
<thead>
<tr>
<th>Service Sector</th>
<th>Target Service Sector and Mode of Supply</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Core Freight Logistics</td>
<td>Cargo-handling services (CPC 741)—mode 3&lt;br&gt;Storage and warehousing services (CPC 742)—mode 3&lt;br&gt;Transport agency services (CPC 748)—mode 3&lt;br&gt;Other auxiliary services (CPC 749)—mode 3</td>
<td>Opening Indonesia’s cargo-handling services to foreign and private competition will improve competition in the port sector and thus enhance Indonesia’s competitiveness in the trade of goods. Reform in this sector will lead to more modern and adequate storage and warehousing facilities in Indonesia which has been constrained by lack of adequate and modern storage and warehousing. More foreign transport agencies and auxiliary services will improve the adequacy and efficiency of transport and reduce the cost of exporting as foreign transport agencies will bring with them the latest technology and best practices.</td>
</tr>
</tbody>
</table>
Service Sector | Target Service Sector and Mode of Supply | Rationale
--- | --- | ---
II. Related Freight Logistics | Railway transport services (CPC 7112)–mode 3 | Reform in rail, road and air transport services can provide greater capacity and efficiency for the delivery of Indonesia’s traded goods to its export markets. These in turn will further facilitate the movement of goods with access to the latest technology and best practice management.
Road transport services (CPC 7123)–mode 3 | | |
Air transport services (CPC 732)–mode 3 | | |
Technical testing and analysis services (CPC 8676)–mode 3 | | |
III. Noncore Freight Logistics | Data processing services (CPC 843)–mode 3 | This will stimulate more automation in the delivery of logistics services and facilitate the adoption of electronic data interchange among the various parties in the logistics chain. Moving Indonesia to a higher valued logistics exports through technology transfer.
Database services (CPC 844)–mode 3 | | |
Management consulting and allied services (CPC 865)–mode 3 | | |

Source: Author
Notes: CPC means Central Product Classification employed by the WTO in classifying the different types of logistics services.

Conclusion
Indonesia, like other developing countries, is facing a serious dilemma. Although it has embraced the principle of liberalization in this era of globalization, short-run political considerations and institutional and regulatory constraints have slowed the implementation of liberalization committed for its logistics sector. Further, it is likely that Indonesia will continue to adopt a cautious approach toward liberalization, unless necessary and appropriate reforms are effectively implemented to enhance the capacity and international competitiveness of its logistics sector. The findings of this article reveal that except in the maritime, air transport, and cargo-handling services, Indonesia does not have a competitive advantage in the export of logistics services under modes 1–3. Therefore, services under modes 1–3 are likely to lose from the liberalization of logistics services in the short run. It is only in the area of mode 4 (supply of labor services) where Indonesia is likely to gain, although only in some sectors.

However, logistics plays a crucial role in the economic development process of developing countries. Apart from facilitating international trade, it contributes to the enhancement of a nation’s export competitiveness. The importance of logistics to Indonesia is further accentuated by the fact that logistics costs in Indonesia are considered to be quite high by international standards. Introducing more foreign competition into its logistics
sector and improving access to the most efficient logistics services is crucial to Indonesia’s export success, as evidenced in many empirical studies (e.g., Estache, González, and Trujillo 2002). On the other hand, logistics services export is an important component of Indonesia’s international trade objective. Enhancing its export of logistics services through liberalization should, therefore, have beneficial effects on Indonesia’s overall export performance.

In this context, Indonesia has to engage in international trade in logistics services. In pursuing international trade, Indonesia has to focus its exports on those logistics services where it has major and potential competitive advantage in terms of resource endowments and market access. Concurrently, Indonesia should further liberalize those logistics services where Indonesia has a competitive disadvantage, but which can enhance Indonesia’s international competitiveness. In prioritizing these services, however, the political sensitivities and strategic interests have to be taken into account. At the same time, more domestic and regional initiatives should be pursued to enhance its logistics sector’s capacity and international competitiveness (e.g., human resource and infrastructure development, and trade facilitation measures, particularly in the area of customs administration, institution building and government regulations).

The partial approach adopted in this article may not be consistent with the logic of logistics as door-to-door services. However, it is sufficient to achieve the objectives of this article and is appropriate to address the current concerns in Indonesia regarding the implications of trade liberalization in the various sectors of logistics services. Given the lack of data on logistics trade performance by sector, the paper relies partly on a “deductive” process by employing the H-O model in determining areas of Indonesia’s competitive advantage and disadvantage. Although the H-O model is not without limitations, it is supplemented by the use of questionnaire-based interviews with industry and government experts on Indonesia’s logistics. Further, although the article has recommended a path of continued liberalization, it has not discussed in detail the issue of how Indonesia should embark on such a path of liberalization and how to deal with the “losers” of logistics reforms. This undertaking will be left to the politicians to decide based on the country’s economic and political situations. Clearly, there are many issues worth investigating in the area of logistics liberalization in Indonesia that could be good subject matter for future study. This article has addressed one of the most important and pressing, but less discussed policy issues facing Indonesia’s logistics sector. Indonesia’s experience in
this regard could provide other countries with some valuable insights into the challenges and opportunities in the process of liberalizing logistics and how to deal with them.

Appendix A
Scope for Logistics Services

<table>
<thead>
<tr>
<th>Categories</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Core Freight Logistics Services</td>
<td></td>
</tr>
<tr>
<td>Cargo-handling services</td>
<td>CPC 741</td>
</tr>
<tr>
<td>Container-handling services</td>
<td>CPC 7411</td>
</tr>
<tr>
<td>Other cargo handling</td>
<td>CPC 7419</td>
</tr>
<tr>
<td>Storage and warehousing services</td>
<td>CPC 742</td>
</tr>
<tr>
<td>Transport agency services</td>
<td>CPC 748</td>
</tr>
<tr>
<td>Other auxiliary services</td>
<td>CPC 749</td>
</tr>
<tr>
<td>II. Related Freight Logistics Services</td>
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<tr>
<td>(1) Freight transport services</td>
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<tr>
<td>Maritime Transport Services</td>
<td>CPC 7212</td>
</tr>
<tr>
<td>Internal Waterways Transport Services</td>
<td>CPC 7222</td>
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<tr>
<td>Air Transport Services</td>
<td></td>
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<tr>
<td>Air freight transport</td>
<td>CPC 732</td>
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<tr>
<td>Rental of aircraft with crew</td>
<td>CPC 734</td>
</tr>
<tr>
<td>Rail Transport Services</td>
<td></td>
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<tr>
<td>Freight transport</td>
<td>CPC 7112</td>
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<tr>
<td>Road Transport Services</td>
<td></td>
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<tr>
<td>Freight transport</td>
<td>CPC 7123</td>
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<tr>
<td>Rental of commercial vehicles with operator</td>
<td>CPC 7124</td>
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<tr>
<td>without operator</td>
<td>CPC 83102</td>
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<tr>
<td>(2) Other related logistics services</td>
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<tr>
<td>Technical Testing and Analysis Services</td>
<td>CPC 8676</td>
</tr>
<tr>
<td>Courier Services</td>
<td>CPC 7512</td>
</tr>
<tr>
<td>Commission Agents’ Services</td>
<td>CPC 621</td>
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<tr>
<td>Wholesale Trade Services</td>
<td>CPC 622</td>
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<tr>
<td>Retailing Services</td>
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<tr>
<td>Food retailing services</td>
<td>CPC 631</td>
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<tr>
<td>Non-food retailing services</td>
<td>CPC 632</td>
</tr>
<tr>
<td>Sale of motor vehicles</td>
<td>CPC 6111</td>
</tr>
<tr>
<td>Sale of parts and accessories of motor vehicles</td>
<td>CPC 6113</td>
</tr>
<tr>
<td>Sales of motorcycles and snowmobiles and related parts and accessories</td>
<td>CPC 6121</td>
</tr>
<tr>
<td>(Other supporting services not covered (CPC 743, 7113, 744 excluding 7441, and 746).)</td>
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<tr>
<td>III. Noncore Freight Logistics Services</td>
<td></td>
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<tr>
<td>Packaging services</td>
<td>CPC 876</td>
</tr>
<tr>
<td>Leasing or rental services concerning vessels without crew</td>
<td>CPC 83103</td>
</tr>
<tr>
<td>Leasing or rental services concerning aircraft without operator</td>
<td>CPC 83104</td>
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<tr>
<td>Computing and related services</td>
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<tr>
<td>Data-processing services</td>
<td>CPC 843</td>
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<tr>
<td>Database services</td>
<td>CPC 844</td>
</tr>
<tr>
<td>Management consulting and related services</td>
<td>CPC 865</td>
</tr>
</tbody>
</table>

Notes: CPC 743: Supporting services for railway transport; CPC 7113: Pushing or towing services; CPC 744: Supporting services for road transport; CPC 7442: Highway, bridge and tunnel operation services; CPC 7443: Parking services; CPC 7449: Other supporting services for road transport; CPC 7441: Bus station services; CPC 746: Supporting services for air transport.
Appendix B
Interview Questionnaire

Name: 
Company: 
Phone: 
Email: 

1. Rating of Indonesia’s logistics services based on certain criteria

**Direction:** The following are the various sectors of logistics services based on UN/WTO classifications. Please rate each sector of logistics services in Indonesia from 5 (highest) to 1 (lowest) based on the criteria specified:

<table>
<thead>
<tr>
<th>Sectors</th>
<th>Indonesia’s International Competitiveness</th>
<th>Employment Generation in Indonesia</th>
<th>Value Added/Contribution to Indonesia’s Economic Growth</th>
<th>Strategic Importance for Indonesia</th>
<th>World Growth Prospect</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Core Freight Logistics</td>
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<tr>
<td>Cargo handling</td>
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<td>Storage and warehousing</td>
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<td>Transport agency</td>
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<td>Other auxiliary services</td>
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<td>Iia. Freight Transport</td>
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<tr>
<td>Maritime transport</td>
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<td>Internal waterways</td>
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<td>Air transport</td>
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<td>Rail transport</td>
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<td>Road transport</td>
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<td>Iib. Other related services</td>
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<tr>
<td>Technical testing and analysis</td>
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<tr>
<td>Couriers</td>
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<tr>
<td>Commission agents</td>
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<tr>
<td>Wholesale trade</td>
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<tr>
<td>Sectors</td>
<td>Indonesia's International Competitiveness</td>
<td>Employment Generation in Indonesia</td>
<td>Value Added/Contribution to Indonesia’s Economic Growth</td>
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<td>World Growth Prospect</td>
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<tr>
<td>Retailing</td>
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<td>Other supporting services</td>
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<tr>
<td>III. Noncore Freight Logistics</td>
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<td>Packaging</td>
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<td>Leasing/rental of vessels</td>
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<td>Leasing/rental of aircraft</td>
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<td>Computer and related</td>
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<tr>
<td>Management consulting</td>
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</tbody>
</table>

Notes: The ranking ranges from 5 = very high; 4 = high; 3 = moderate; 2 = low; 1 = very low.

1. In which sectors does Indonesia have a competitive advantage vis-à-vis other countries? Competitive disadvantage? Why?
2. In which sectors does Indonesia have potential competitive advantage? Why?
3. How important is logistics to Indonesia’s economy?
4. What are to date Indonesia’s liberalization commitments under WTO, ASEAN and bilaterally?

Notes
The author is quite grateful to the three anonymous referees and to the editor of this journal who made valuable comments and suggestions on the earlier draft of this article. The author thanks those who in one way or another provided relevant information about Indonesia’s logistics industry. Without their kind support and cooperation this study would not have been completed. Any omissions and remaining errors are the responsibility of the author.

1. The estimate of 25 percent came from the chairman of the Indonesian Logistics Association during the interview.
2. It was cited by one shipping lines manager that port costs account for a third of its total shipping cost between Medan, Indonesia, and South China. The terminal handling charge for containers at the port of Tanjung Priok, Indonesia,
is more expensive than that at the port of Singapore, while Tanjung Priok’s port productivity is very low by international standards. For example, it costs exporters approximately US$800 per container to ship domestically in Indonesia between Medan and Jakarta, which is almost the same cost of shipping containers internationally from Jakarta to Japan. Although shipping is only part of the overall door-to-door logistics cost, this is an important indicator of logistics cost in Indonesia, which relies heavily on maritime transport for its international freight movements. Ocean shipping rates are not regulated but are subject to market forces.

3. Transportation services constituted the largest component of logistics services among US manufacturing firms (Davis and Drumm 2002).


6. This point was raised by Jakob Sorensen, Maersk Indonesia and European Business Chamber of Commerce at the second Indonesia Transport and Logistics Expo and Conference 2008, Jakarta, Indonesia, August 21–23.

7. The main legal instruments for regulating Indonesia’s logistics service sector are the Presidential Decree No. 111/2007, Presidential Decree No. 112/2007, and Government Regulation 82/1999. Ministerial Decrees from the Ministry of Trade that affect the regulation of the logistics service sector are also issued from time to time. The main regulators of the logistics service sector are the Ministry of Trade, the Ministry of Transport, and the Ministry of Information and Communication.

8. Investors from ASEAN member countries are, however, allowed to have up to 51 percent of shares in shipping and port operating companies by 2010. The regulation also requires a reciprocate offer from the investor’s country of origin (Asia Pulse 2009).

9. This is the view expressed during the interviews with shippers and freight forwarders in Indonesia.

10. According to the chairman of the Indonesian Logistics Association, sometimes different and separate regulations across all ministries for the various aspects of logistics services are conflicting and producing complex procedures for business enterprises. Currently, business licenses (e.g., a license to open a freight forwarding business) are separate from technical licenses (e.g., a license to run a fleet of trucks for haulage), and it is unclear as to which one applies to which type of company. Coordination, rather than more regulations, is particularly important in the policy formulation and implementation of logistics services due to the interconnectivity and interdependence of the various activities in the logistics chain.

11. One example cited at one of the interviews conducted relates to the lack of coordination among the relevant ministries to clarify the regulations on courier services. Since the passing of the Negative List (i.e., list of logistics sectors subject to restrictions) issued in 2007, small- and medium-scale courier services has been reserved for the domestic firms and fully close to foreign investors. However, for large-scale courier services, foreign equity participation is possible, but subject to a 49 percent
limit. Even so, a number of applications from foreign firms to engage in large-scale courier service operations in Indonesia have been rejected by the Indonesian Board of Investments on the basis that the whole courier services sector is reserved for domestic firms. Clarity of regulations and more coordination among the relevant ministries could make Indonesia more attractive for foreign investments in the logistics services sector, and thus enhancing Indonesia’s long-term international competitiveness. It should be noted, however, that there have been recent policy coordination efforts to develop the national logistics strategy as part of Indonesia’s logistics blueprint for national logistics reform, including the establishment of a national logistics council. The World Bank has been spearheading this development of Indonesia’s national logistics strategy with active cooperation from the government and private sectors.

12. For example, there is one license for land transport business and another license for storage and warehousing operation, each to be obtained from different government agencies.

13. Very limited data availability on export and import performance of the logistics sector in Indonesia is one of the major constraints that prevent the use of a more objective and standard approach to identify the areas in logistics where Indonesia has a competitive advantage and disadvantage.

14. Mode 1 of supply refers to the export of logistics services across borders; for example, an Indonesian freight forwarder is transporting cargoes on behalf of an Indonesian exporter to a Malaysian importer in Malaysia. Mode 2 refers to consumption abroad; for example, a Singaporean registered shipping company may use an Indonesian stevedoring company to handle its cargoes at Indonesian ports. Mode 3 relates to commercial presence; for example, when an Indonesian logistics provider establishes a branch in other countries.

15. Mode 4 of supply refers to the temporary movement of natural persons across borders; for example, an Indonesian crane operator may be temporarily contracted to operate a crane in a Japanese port.

16. Although a broader economic impact assessment of the trade liberalization in logistics is an important issue from a public policy perspective, this is not within the scope of this article. The implications in terms of employment generation and other macroeconomic implications could be another interesting area for future research.

17. Indonesia has a large number of small and inefficient ports inhibiting cargo aggregation, leading to higher transportation and cargo handling costs. Indonesia has over 140 operational ports. Of these, 43 ports are feeder ports that act as transshipment points to the major Indonesian gateways such as Jakarta and Surabaya. Attracting frequent and competitive direct liner services has been difficult as cargo is dispersed over a large number of smaller ports and carried by its fleet of smaller and older vessels. Thus, frequent transshipment by smaller feeder vessels will continue to be the most efficient solution, unless a cost-effective consolidation occurs.
References


Abstract
The postproduction support cost of complex systems such as rail, power, and defense often exceed the cost of research, design and production. As such systems age and degrade the traditional maintenance, repair, and overhaul (MRO) approach does little to reduce their cost or improve performance. The failure of traditional MRO has given rise to a number of multi-year, performance-based, postproduction support strategies. These strategies drive investment to reduce cost, infuse innovation, and increase system performance. The dynamism and innovation associated with these strategies makes it difficult to conduct a business case analysis (BCA) that compares the return on sales model of traditional MRO, to the return on investment model of performance based strategies. To address this gap in practice and theory we provide a framework for rationalizing performance-based and traditional strategies within the same BCA. We develop questions to guide the creation of BCAs that include performance-based options. Finally, we offer analytical guidance to support direct economic comparison between these two fundamentally different postproduction support strategies.

Keywords
Performance-based logistics; performance-based contracting; after market sales; business case analysis; performance-based outcomes.

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Introduction
Maintaining complex systems such as aircraft fleets, rail systems, and production facilities can often exceed the cost of research, development, and production (Randall, Pohlen, and Hanna 2010). As systems age, they require more funds to deal with repairs, upgrades, or replacements (MaClean et al. 2005). Concurrently, operators of such systems are pressured to maintain performance on increasingly tight budgets. In meeting these challenges, the traditional, transactional postproduction support approaches are simply not keeping up.

Faced with these realities, a number of entrepreneurial operators and support providers have adopted a new group of postproduction support strategies. These strategies, commonly known as performance-based logistics (PBL), convert the year-after-year cost outlays of transactional maintenance, repair, and overhaul (MRO) into large pools of cost avoidance. These pools form a governance structure that encourages investment, innovation, and cost reduction (Carter 2009; Randall, Pohlen, and Hanna 2010). This governance structure recognizes that each system, and subsystem, has inherent cost avoidance potential. Improvements in technology, material, and processes will allow the providers to harvest this cost avoidance, given the correct contract governance structure.

Given a multiyear contract (or multiyear agreement) and the system cost avoidance potential, PBL encourages suppliers to make investments in technology, material, and process improvements that increase system reliability, maintain or improve system performance, and decrease life cycle cost (Berkson 2005; Kim, Cohen, and Netessine 2007; Sols, Nowicki, and Verma 2007; Fowler 2009). PBL uses objective performance (e.g., system up time), instead of purchased goods, to form the basis of the relationship between operators and support providers. Performance outcomes define the level of performance over some period of time. By doing so PBL moves beyond a transactional approach to embrace a multiperiod relationship.

The success of performance-type strategies does not merely represent an isolated case or niche. The US Department of Defense (DoD) and the United Kingdom Ministry of Defense have both saved billions of dollars using PBL (Fowler 2008; Cundy 2009; Fesquet 2009). In the commercial sector, Luftsna Technik possesses more than 1,600 aircraft from multiple airline operators under a PBL-type contract (Flint 2007; Sols, Nowicki, and Verma 2007). In addition, Boeing uses a performance-based approach, Boeing GoldCare, as the preferred approach for the new 787 (Boeing Company 2011). Siemens also has a broad range of integrated, outcome-based approaches for its rail sector (Siemens 2011). Similarly, the World Bank
uses performance-based strategies for health services in developing countries (The World Bank 2008). And according to the Transportation Research Board, thirty-five countries are using performance-based approaches for highway management (Transportation Research Board 2009). Yearly the examples of PBL application increase.

As supply chain partners consider the adoption of a PBL strategy, a prevalent first step is the performance of a business case analysis (BCA) to determine if, when, and why it might be appropriate for a program to utilize a performance-based approach. Yet traditional BCA processes do not readily handle the dynamism of comparing the investment-innovation-return-on-investment aspects of PBL to the transactional approach of traditional postproduction support. This situation has created frustration and confusion. Practitioners struggle to define the key elements of a PBL BCA and understand why some elements (e.g., “known-unknown” factors such as anticipated introduction of improved technology) are not being considered (Sols, Nowicki, and Verma 2007; Government Accountability Office 2008).

The Government Accountability Office (2008) articulated this concern as part of a scathing assessment of the DoD’s implementation of PBL contracts. Following this thread, the GAO (2008) and others (Sols, Nowicki, and Verma 2007) suggest there is a lack of a consistent understanding of how to approach the BCA process when one of the alternatives is PBL. Current methodologies and philosophies find that the underlying econometric and governance models at the core of PBL are incommensurable with transactional strategies of traditional sustainment. Attempting to understand how BCAs deal with PBL and traditional approaches combined leads to our research questions:

1. What are the key characteristics of a PBL that should be included in the BCA process and its supporting analytical models?
2. How is time-based innovation addressed within a traditional postproduction BCA?
3. How is system life-cycle affordability accounted for in the supporting cost models of BCAs that include a PBL alternative?

Answering these research questions will provide a frame of reference for academics and practitioners exploring PBL.

This article is organized as follows. First, we develop the background on both traditional and PBL sustainment strategies. Following we describe our sample, method, analysis, and results. Third, we provide a theory-based framework in the form of questions and guidance that practitioners should
consider in future BCA decisions. Finally, we offer opportunities for future research in this area.

Literature Review

PBL and traditional postproduction support strategies each seek to efficiently fulfill demand (e.g., improve forecasting, balance inventory quantity and location against inventory pipeline and the use of express transportation). However, PBL takes this tradeoff a step further. PBL balances the cost of traditional functions, such as warehouse, inventory, and transportation, against the cost of improving reliability by redesigning out demand for spares and repairs. The PBL governance structure creates an incentive for suppliers to invest in innovations that decrease the costs associated with system failure (Randall, Pohlen, and Hanna 2010). Therefore, it is essential that when a BCA is to include PBL, there is a specific mechanism in place to quantify the economic impact of innovation.

Background: Performance-Based Logistics, Traditional Sustainment Strategies, and Business Relationship Management

A PBL strategy is instantiated through a contract or other relationship that specifies the outcomes and rewards between a supplier and a customer. In this way, a PBL strategy is consistent with principles that define sound supply chain business relationship management such as delivering solid value propositions (Lieb 2008) and high-quality logistical performance (Morash 2001). PBL supports Morash (2001, 50), who suggests that “value congruency recommends that once firms have developed minimum supply-side and demand-side capabilities to be order qualified, they should then concentrate on those capabilities and performance metrics that support their chosen value focus.”

PBL strategies differentiate themselves in that they are holistically focused on value, while attempting to capture the synergistic benefit that comes with examining the intersection of system design and its postproduction support network (Randall, Nowicki, and Hawkins 2011). This notion is confirmed in US DoD guidance governing the use of PBL:

The Program Manager shall employ effective Performance-Based Life-Cycle Product Support planning, development, implementation, and management. Performance-Based Life-Cycle Product Support represents the latest evolution of Performance-Based Logistics. PBL offers the best strategic approach for delivering required life cycle readiness reliability, and ownership costs. (Department of Defense 2008)
Under a PBL strategy, support providers agree to a level of performance over a specified period of time (e.g., power distribution system on line 99.999% of the time at a fixed cost per hour). At the same time, the customer agrees to provide stable funding and a share in cost avoidance. Ideally, PBL brings together a network of support providers who seek to fill demand efficiently while also searching for a way to cost-effectively design demand for MRO products and services out of the system. This philosophy is in line with DoD’s Defense Acquisition University (2005, 1) definition of PBL:

The purchase of support as an integrated, affordable performance package designed to optimize system readiness and meet performance goals for weapon systems through long-term support arrangements with clear lines of authority and responsibility. Simply put, performance-based strategies buy outcomes, not products or services.

PBL and its definitions were recently reviewed during a landmark evaluation that confirmed the efficacy of PBL (Carter 2009). That study outlined the ability of PBL to provide a financially efficient means for achieving post-production support requirements. This is also consistent with Berkowitz et al. (2005) and their approach to a PBL contract structure and guidelines for PBL implementations.

Central to a PBL strategy is the idea that supplier networks for aircraft, roads, and high-speed rail are incredibly complex. Sources come and go, operating conditions change, and new materials, processes, and technologies appear every day. This dynamism provides opportunities for these systems to be evaluated, transformed, and innovated continuously (Sols, Nowicki, and Verma 2007). However, this focus on evolving the system makes predicting affordability and performance, the business case analysis, difficult.

The cost of postproduction support greatly impacts expense and profit (Keating and Huff 2005; Flint 2007; Kim, Cohen, and Netessine 2007). Typically, postproduction support costs are a function of system design. Once a system enters production, the die is cast on support costs (Sauser 2006). Other than serious reliability or safety concerns, the lion’s share of effort in post-production support is on providing scheduled maintenance and inspections, and returning the system to operation when it fails (Flint 2007; Hamad, Andrew, and Mohamed 2007).

In the traditional model, the system operators end up integrating the various sustainment tasks required to maintain system performance.
This means operators accept significant risk since the lack of coordination within the supply chain, particularly at the third and fourth tiers, can lead to material shortages, diminishing sources of supply, and system downtime due to stock outages (Cooper and Ellram 1993; Fugate, Sahin, and Mentzer 2006). This structure also means that operators are saddled with the increasing costs associated with corrosion, fatigue, and obsolescence (MaClean et al. 2005). Experience shows that the traditional approach tends not to focus the upstream trading partners on outcomes that matter most to the operator—a system that meets operational requirements at the lowest possible cost (Geary and Vitasek 2008). Instead, trading partners attempt to maximize their own bottom line, which can have negative effects on system operators and end-users (Ellram and Cooper 1993; Wathne and Heide 2000).

Therefore, traditional sustainment can be viewed as a return on a sales governance structure where suppliers are paid by the transaction. Under that structure, the more the end item breaks, the more the suppliers repair, and the greater suppliers’ sales, the greater the suppliers’ revenue and profit. On the contrary, PBL runs on a return-on-investment governance structure (Randall, Pohlen, and Hanna 2010). Smart investment by the supplier means better reliability and lower logistics costs, all of which translate to greater cost avoidance. Increased cost avoidance leads to improved return on the investment. Moreover, improved reliability means the end items break less often, which translates to more system up time for the end customer. Typically, PBL uses a firm fixed price (FFP), multiyear contract structure (Sols, Nowicki, and Verma 2007). However, a PBL can rely on a noncontract mechanism (e.g., government depots providing PBL support to government operators or industry support providers).

PBL checks increasing costs by using up-front investment to achieve savings in future years (Sols, Nowicki, and Verma 2007). This practice is a significant departure from traditional postproduction support where operators lack the capital funds needed to invest in long-term affordability improvements (Geary and Vitasek 2008). A properly structured PBL transforms the year-to-year spending on repairs into incentive pools that drive investment in improvements and ultimately reduce costs (Berkson 2005; Kim, Cohen, and Netessine 2007; Sols, Nowicki, and Verma 2007).

The savings associated with PBL-type strategies have been significant. Defense agencies have saved billions of dollars by utilizing a PBL approach (Kratz 2007; Fowler 2008). For example, the British military has saved $250M on the CH-47 helicopter program, the US Air Force $477M on the C-17 airlifter program, the US Navy $688M on the F/A-18 fighter program, and the US Army $350M on the AH-64 attack helicopter program.
Commercial MRO companies also use PBL, with 70 percent of the $40 billion per year spent on MRO using PBL-type contracts (Nativi and Barrie 2006; Flint 2007; Hamad, Andrew, and Mohamed 2007). Clearly, practitioners have found success in implementing PBL. However, getting through the PBL business case has been problematic.

### Background: Business Case Analysis

Several books have been written in the past forty years that outline ways to conduct a BCA. These books delineate strategies and techniques for evaluating make-or-buy and lease-or-buy decisions, and provide general guidance for the conduct of a BCA in a governmental setting (Allen and Hawkins 1968; Schmidt 1999; Brannock 2004; Klein 2008). The Department of the Air Force published an Instruction (US Air Force 2008) and a Manual (US Air Force 2008) designed to guide the conduct of a BCA for Air Force programs. This guidance suggests that “a BCA is considerably broader in scope” (US Air Force 2008, 3) than a simple cost comparison between two alternatives, and requires a focus on an economic analysis that considers desired outcome.1

Conducting a BCA is not a straightforward process, especially when considering the intricacy of a PBL (Harada 2010). While the BCA (or as DoD refers to it, an “Economic Analysis”) is designed as a decision support process aimed at choosing “the best method of allocating sparse resources to achieve a given objective” (Maroni 1995, 9), the current process has a limited ability to meet this charter. Policy directs the analyst to collect the cost and benefit data for various alternatives using a historical perspective, and then use that information to determine the net savings or profits in support of alternative selections (Maroni 1995; Klein 2008). While recent guidance suggests considerations of longer time horizons (US Air Force 2008), no specific guidelines exist with respect to investment and innovation, neither does the guidance address the dynamism of innovation over time (Miller 2008).

There is no standard formula for business case analyses when one option is PBL. The processes appear to be ad hoc, drawing from a variety of cost, analysis, and systems engineering approaches (Smith 2001; Franck 2004; Stacey 2006; Shick 2007; Klein 2008). The guidance covers a wide swath of topics such as reliability rates, elements of risk, and tradeoffs between fixed costs and variable costs, supply chain partnerships, and outsourcing risk (Freeman and Cavinato 1990; Su et al. 2009) but there is no integrated formula or framework.

Many of the current post-production support BCA approaches focus on overall analysis of the obvious or tangible costs associated with one
alternative or the other (Leander 2002). These modeling approaches do not address wholesale outsourcing of the postproduction support infrastructure or the associated impact of long-term, contractually motivated innovation across the life of the program (Knemeyer and Paul 2005; Sols, Nowicki, and Verma 2007). While some guidance considers the impact of time and risk, this analysis typically focuses on the probability of negative outcomes rather than the probability of positive ones (Smith 2001; US Air Force 2008). When a BCA considers a PBL alternative, there is little practical and quantifiable guidance aimed at a holistic analysis. In short, there exists no framework that incorporates the key strengths of a PBL alternative.

Logistics research recognizes the need for a holistic approach for contracting out part of the supply chain (Christopher, Peck, and Towill 2006; Sols, Nowicki, and Verma 2007). Yet, despite the success of PBL, there is a surprising gap in academic and practical literature guidance and frameworks supportive of informative BCA when one alternative is a PBL strategy. The current postproduction BCA frameworks do not conceptualize or model strategies that drive investment and innovation across the life cycle. There is a gap in literature and practice when performing a BCA where one of the alternative’s key strengths involves an ability to drive cost-reducing innovations over the life of the program. Such an oversight is significant as cost-reducing innovations and their impacts on revenue, costs, and performance are central to a successful PBL program.

Method
This research uses a grounded theory (GT) approach and leverages the previous theoretical framework of Randall, Pohlen, and Hanna (2010). In that research, issues with BCA were frequently noted. Also during that time, a number of controversial (multibillion-dollar) PBL-related BCAs were ongoing (Air Force Audit Agency 2009; Cook et al. 2011). These generated considerable conversation among practitioners (Government Accountability Office 2008). Business case analysis difficulty was identified, highlighted, and coded during the Randall, Pohlen, and Hanna (2010) PBL study. That documentation provided both initial insight and sources of empirical data to support the investigation.

We then sought additional archival data, interviews, and practitioner engagement to advance this study. The methodology followed in this study was parallel to the one followed by Randall, Pohlen, and Hanna (2010). In total, the PBL and PBL BCA research generated seventy different recorded interviews. Each interview lasted between forty-five and seventy minutes. In addition, BCAs were discussed as part of a panel at three
national conferences and one international conference each with over 200 practitioners (Randall 2008, 2009, 2010; Johnston, Randall, and Nowicki 2010). One of these panels was specifically devoted to the difficulties associated with conducting a BCA where one alternative was a PBL (Johnston, Randall, and Nowicki 2010). The sample included a broad range of individuals involved in both PBL and, to a lesser extent, non-PBL programs. Specifically, we ensured representation from participants at various levels of expertise (executive, engineer, logistician manager, and technician), supply chain position (supplier and customer), and program stage (PBL, non-PBL, and converting). This approach to sampling ensured that we adopted a multidimensional approach for each construct (Charmaz 2006). In addition, the sample included contractor and government employees, and covered a variety of DoD air and land programs. During the investigation, the initial interviews we undertook focused on the following questions:

1. What does the term PBL mean?
2. What does a PBL strategy require?
3. What factors encourage or discourage success in a PBL strategy?
4. What is a business case where PBL might not be effective?
5. What are the positive and negative consequences of a PBL strategy?

As BCA became recognized as an area of interest, we focused follow-up interviews, practitioner engagement sessions, and reengagement within the original transcripts on the following BCA-specific questions:

1. What is different about a BCA when a PBL alternative is involved?
2. How are innovations in a BCA accounted for?
3. How is a multiple year original equipment manufacturer (OEM) and supplier investment accounted for in a BCA?

The investigation employed multiple iterations of the process shown in figure 1. Step 1 involved identifying the research question, the initial sample, and the interview protocol.

*Constant Comparison*

During steps 1 and 2, we reviewed policy statements, meeting memos, and government accountability office reports dealing with the BCA process. At step 2 we began initial coding and the process of constant comparison. Constant comparison emphasizes the “discovery of what concepts and
hypotheses are relevant for the area that one wishes to research” (Glaser and Strauss 1967, 2). Constant comparison involves finding themes in interviews and the archival data and then testing to see if those themes remain consistent in follow-on interviews as shown in steps 3, 4, and 5 (Glaser and Strauss 1967; Charmaz 2006).

**Theoretical Sampling**

Positing and testing relationships using a new sample is known as theoretical sampling (step 6) (Glaser and Strauss 1967; Glaser 1978). In GT, memos are used to document the process of theoretical sampling and constant comparison. Memos track how a particular concept, category, or relationship emerges. This process of positing relationships, testing them, capturing their evolution in memos, and then sorting the various pieces into an initial theoretical structure is shown in step 7.

**Validation through Constant Comparison and Saturation**

The key to a GT is validation (Glaser and Strauss 1967; Charmaz 2006; Cho and Trent 2006). The mechanism of theory validation in GT is theoretical sampling and saturation. Saturation, step 8, means that the researcher gathers data until no new insights are obtained (Strauss and Corbin 1998; Cho and Trent 2006; Bowen 2008). In this research, saturation, and thus validity, occurred when additional interviews demonstrated consistency in the findings. The final GT step is theory emergence, which occurred during step 9. This research documents the emerged theory structure in a framework and group of questions from which practitioners can approach a PBL and non-PBL BCA.
Assessing Grounded Theory—Fit

Flint, Woodruff, and Gardial (2002) suggested researchers ensure any proposed GT framework fits the practitioners’ interpretation of the phenomena. Because GT uses direct insight and interpretation of the practitioners, it should be recognizable to those practitioners. To gain fit, two of the researchers volunteered to act as part of an industry panel focused on BCAs (Johnston, Randall, and Nowicki 2010). Over 200 industry participants attended this panel. During this session the framework and key questions were presented and discussed. The researchers also wove these findings into two other PBL industry panels. These practitioner groups concurred with the findings and interpretation.

Assessing Grounded Theory—Workability

Another key to GT research involves workability. Glaser (1978) terms workability “getting the facts” straight. Workable theory should be recognizable by the practitioners; they should identify their own experiences in the research findings. The practitioners indicated that the emerged framework, the questions, and the return-on-sales versus return-on-investment conceptualization provided sound insight into the source of difficulty and tension associated with a PBL BCA, thus further validating our findings and conclusions.

Analysis and Results

The investigation relied on active and direct engagement with practitioners (Reason and Bradbury 2001, 2006; Stringer 2007) while following the process-oriented engine of GT’s constant comparison (Glaser and Strauss 1967). This resulted in an analysis that formed a dialogue with our participants. This dialogue allowed us to understand the key sources of tension associated with a PBL-traditional BCA.

The Basis: Knowledge and Decision

The core element in PBL resides in knowledge and innovation. Randall, Pohlen, and Hanna (2010, 53) found knowledge and decision to be at the center of the PBL theory: “Performance-based outcomes will lead managers to co-create and exchange knowledge across a supply chain to achieve continuous value creation for the end user and the entire network.” The interviews suggest that PBL is inherently knowledge-centric, continuous, and evolutionary. The knowledge centrality of PBL, coupled with a continuous and dynamic nature, is what first sets PBL apart from the non-PBL strategies.
The Value of Underlying Governance Structures

We found the key difference between a PBL approach and a traditional approach resides in the underlying governance structure and ensuing economic models. This pursuit of dynamic application of knowledge appears to be what confounds the PBL and non-PBL BCA process. Non-PBL BCA processes look at historical costs and extrapolate those costs into the future. A relatively simple algorithm is used that discounts a series of transactional and return-to-specification exchanges into a single, net present value number. In some cases, a more advanced computation may exist where echelons within the supply chain are consolidated or economies of scale are calculated. Either way, the numerical analysis of the traditional BCA process does not consider the difficult challenge of predicting technology infusion against corporate investment.

PBL focuses on a return-on-investment governance structure where decisions are made to convert knowledge into cost avoidance. The focus in that model is on knowledge application and the decisions that lead to innovation. This knowledge-decision-investment-innovation process is what sets PBL apart from the return-on-sales, return-to-specification approach of traditional sustainment. We found the core elements key to properly predicting PBL’s impact on future life-cycle affordability deal with (1) supplier network knowledge, (2) a business cycle aligned by achievement of performance metrics and incentives, (3) an alignment focused on performance, not parts, and (4) cost incentives to invest in long-term system improvements. Figure 2 outlines these constructs and their relationships. Each element is described below.

Supplier Network Knowledge and Dynamic Nature

Knowledge and knowledge management came up hundreds of times during the interviews. The more advanced the PBL strategy, the more intricately imbued was the discussion of knowledge management and knowledge-management systems in the quest for superior financial performance. Knowledge management was what linked together decisions, the supply chain network, and a performance output. According to a senior manager of a system designed to use PBL postproduction support,

We have to have knowledge of everything that impacts the system performance outcome, so that when we look at it, it is not just a number . . . we say “here is the metric” . . . what are the restrictors to achieving that metric? What are
the things that we can control? What are the things that we cannot control? What are the worst-case resources? Are there certain resources that we need, that are going to, because of non-availability or lack of ready availability that could impact that performance outcome? What is the availability of that resource? Is it lead-time? If I am not going to get there, what is the next option? What are the restrictions the customer must figure a way around?

This interview segment suggests that PBL requires the following:

1. Knowledge of the system
2. Knowledge of how the system is performing
3. Understanding of how the customer perceives that performance (outcome)
4. Knowledge of increased value potential in the network
5. Ability to leverage network value potential
6. Awareness of the role of knowledge management and an ability to respond with that knowledge
7. Pursuing decisions that affect the system
The ability to leverage knowledge from the network partners in a timely and efficient manner creates value. This value creation requires knowledge not only of the customer’s perception of performance requirements, but also knowledge management that is fundamentally relational with the supply chain network. According to a senior supplier manager, “So it is not like we are dictating down to the vendors, it is like they’re helping us. Because they have all this wealth of knowledge.”

Knowledge of the system and an ability to convert that knowledge to an outcome generates value. The suppliers co-create with the operator a value proposition by harnessing knowledge today in a more efficient and effective manner than yesterday.

Business Cycle Aligned by Achievement of Performance Metrics and Incentives

PBL involves long-term contracts, knowledge management, supplier investment, and supplier incentives that drive that investment. These elements focus on long-term performance. The performance-oriented incentives create a sustainment “business cycle.” According to one industry PBL strategist,

[In PBL] your business decision cycle, your performance incentives, and your performance outcomes have to be aligned. If you can align those three things, your chances of success are multiplied immensely. Your decision cycles, and what you reinforce, and what you are trying to achieve, are all aligned with an output type of metric as opposed to sub-metrics of a transactional nature (spare levels or repair times). When you tie that all together, you can optimize toward the end result that you really want.

The engine of the business cycle involves aligning performance incentives with performance outcomes. We found that the incentive focuses the integrator and the supplier base toward long-term, continuous value creation. Value is created by lowering repair costs, improving the repair process, or improving the reliability of the part in a continuous fashion. As a senior manager working on a PBL program for a major OEM put it:

*Interviewer: So maybe the (system) three years from now will be better?*

*Participant: Right, but the incentive for them to do that, because*
they have always had that capability, is how do you get them to want to infuse that technology, or capability? In the past, they have been paid on breakage. If it breaks, I will pay you for it. The new paradigm is now: you are going to get paid a dollar per usage. So, as long as that thing keeps working, you are getting paid.

Alignment Focused on Performance (Metrics)

The practitioners insisted that PBL metrics improve the probability of achieving performance and affordability goals by aligning effort across the supply chain. PBL creates a process wherein decision cycles are reinforced by incentives that are tied to network level goals. One supplier manager working for a major OEM vocalized it this way: “We are selling a service ultimately (as defined by a metric). Not parts. You know we are in it to make a profit, but also bring a reduced cost for sustainment to the government.”

Incentivizing Long-Term System Improvements (Repair, Process, and Reliability)

To gain return on investment, system-level improvements must reduce costs. PBL provides a governance structure that spurs investment and innovation, both of which create cost-avoidance pools. A manager responsible for heavy maintenance (major overhaul) stated:

If you are trying to reduce, or control costs, and the predominant cost is in repair, you can reduce costs in one of two or three ways. Either [you] find a lower cost repair source in terms of labor rates, you find a way to improve the reliability of that part, or you improve the repair process.

We found that effective long-term PBL arrangements involve translating knowledge into innovation. Short-run innovation aims at improving existing processes (e.g., warehousing, inventory, transportation, and repair), while long-term cost reduction is pursued through reliability improvement. PBL’s focus on knowledge sharing and application creates an evolving inter-firm knowledge management process that leads to new value creation. PBL governance structures reward awareness and dissemination of knowledge that reduce postproduction support costs. Value is created when the decision maker acts on knowledge in a way that leads to long-term cost avoidance and generates a positive return on investment. In this
structure, the central production operation is decision making. Decisions are what convert knowledge into innovation, innovation into cost avoidance, and cost avoidance into return on investment.

PBL is about applying knowledge and innovation, while improving performance and affordability. PBL supplants a cost for repair with a capability to provide a price for value. That price-value dynamic capability is the core competency of the PBL supplier network. This is not a new capability. This industry has “always had the capability,” but application was rarely rewarded.

PBL is a contract, a relationship, a group of performance metrics, and a governance structure that activates the supplier network’s ability to turn knowledge into value. Furthermore, PBL encourages the supply chain to invest, drive out cost, and share in that cost avoidance. Innovations are created through the application of new materials, processes, and technologies.

These areas suggest four key variables that a PBL BCA should address, including the following:

1. Incentive sharing structure
2. Contract length
3. Probability that the supplier network will invest in material, process, and technology
4. The efficiency with which the investments convert knowledge into cost avoidance

Findings
The foundation for PBL success is a multiple year, firm fixed-price contract (or agreements) written with performance- and outcome-focused incentives. Successful PBL providers are able to build on this foundation through the application of what we see as informed experience. The PBL providers, particularly those involved in development and production, possess an inherent skill set that enables them to meet the requirements of the performance contract, while reducing cost by high return on investment application of knowledge, skills, and ability.

Several concepts coalesced as a result of the interviews, archival research, literature review, and active research engagement. As discussed in the literature, a PBL can take a number of contract types, including firm fixed-price, fixed-price award fee, fixed-price incentive fee, and cost-plus-incentive fee (Sols, Nowicki, and Verma 2007). Additionally, PBL can adopt a noncontract agreement structure. In our interviews, we found that firms feel the pure, multiple year firm fixed-price contract, or multiple year agreement, is a necessary
precondition for a successful PBL. In several instances, we interviewed organizations involved in PBL contracts that were either multiple year or firm fixed-price contracts or, in some cases, neither. In these cases, the providers made it clear that the short-term nature of the contracts and the constraints those contracts place on return on investment hinder their ability to make a proper investment case. The customers were just as clear that the cost-plus contracts result in uncertainty on their end and hinder their ability to plan. The non-multiple year performance strategies can work, but the suppliers’ focus on cost avoidance through investment and innovation appears reduced.

While these contractual elements of PBLs appear necessary, they are not sufficient to guarantee PBL success. An expected component of a PBL is the existence of metrics and incentives focused on performance objectives. This performance orientation is in contrast to that of traditional strategy that focuses on delivery of a product (parts) or discrete service (repairs). In fact, it is perhaps the one aspect of a PBL, by definition, that must be included in a PBL contract or agreement—otherwise the effort is not performance-based. Incentives are tied to the metrics. These metrics, and the corresponding incentives, provide the mechanism that enables suppliers to judge how well their investments function to drive down costs while meeting the customer’s performance goals. This dynamism of metrics and cost avoidance provides a governance structure that makes opportunism over the long-term contract difficult. In our discussions, it became clear that properly written incentives, along with the aforementioned long-term, preferably firm fixed-price contracts, encourage the supplier to look beyond simple efficiency gains. In these instances, suppliers are able to focus not only on what they are providing, but begin to also address the why. Using this structure, the supplier can seek better ways of delivering performance. Knowledge is, therefore, central to PBL, and the types of knowledge leading to success in PBL are the following:

1. System knowledge (technical knowledge concerning the system being sustained)
2. Supply chain knowledge (partners, relationships, customers and interactions)
3. Knowledge of the sources of new knowledge, innovation, materials, and processes

These aspects of knowledge are critical enablers for firms seeking to satisfy existing requirements, while simultaneously planning for and predicting future requirements and opportunities. Time and again, the PBL providers,
with the mix of knowledge listed above, are able to anticipate requirements and act in advance of changes either to decrease costs or forestall increases, all while continuing to hit performance targets. An example of this foundational knowledge sharing occurs during what the US Army calls “Alpha Contracting.” Instead of the arm’s-length negotiation of typical postproduction support relationships, Alpha Contracting is a PBL strategy where customers and suppliers sit down, describe the desired relationship, and address desired outcomes. Alpha Contracting represents an integrated team approach to involving principals and getting buy-in before misunderstandings can emerge (Kirzow and Sweeney 2009). Practitioners stated that Alpha Contracting establishes an improved foundation and is associated with superior performing relationships.

In addition, combining the knowledge set with a multiple year and fixed-price agreement enables the customers and providers to build an experience base. There is tacit knowledge, structure, value, and learning created by the long-term and intimate contact made essential by the tying of incentives to performance. In observing the PBL teams, it was clear that customers and providers focused on overcoming the adversarial relationship that sometimes surrounds the cost-based focus of traditional sustainment. They instead possessed a long-term outcome focus driven by a joint desire for success. It is this blending of experience, informed by the knowledge brought into the arrangement, that we designate informed experience.

When those conditions exist, the stage is set for innovation to emerge. The ecosystem (long-term, fixed-price contracts with informed experience driving the process toward outcome-focused performance and incentives) provides an environment where the provider is able to create a PBL foundation. PBL trades a near-term, efficiency-driven transactional mindset for a more entrepreneurial mindset that seeks investments that, while perhaps increasing near-term costs, result in significant and sustained long-term affordability improvements. By taking the long-term view, the providers shift their focus. The service provider develops the innovations necessary not just to meet demand, but also to improve the process by removing demand and thereby effectively changing the game.

From this discussion, we show that our research has led us to an understanding of the relationships and necessary conditions for successful PBL arrangements and subsequently successful PBL-traditional BCA. This relationship is reflected in figure 3 and builds on the essential elements of a performance-based contract (long-term and performance-oriented) and is what supports PBL as a transformational postproduction support strategy that delivers long-run value.
Conclusions
The current approach to performing BCAs lacks the following: a consistent and applicable method to model innovation; a true, multiple year implication analysis process; and a sound econometric model for creating incentive, investment, cost avoidance, and risk tradeoff studies. One senior program manager in particular who works for the DoD seemed to sum up the issue with PBL versus non-PBL BCAs:

I was just reviewing a BCA being done by an independent company. The BCA was to convert an entire system from a non-PBL post production support strategy to a PBL strategy. The BCA has been through a number of reviews. These folks had done a lot of work. But as I looked at it, it struck me that they really had not clearly defined the alternatives, they had not presented an economic analysis. They had “four alternatives” but really nothing was defined. So I did not think it was appropriate for this to go further up the chain. We got the contractor on the phone. They said the issue was that they could not figure out how to conduct the economic analysis. But, you know, their gut instinct was the PBL was a better approach.

This situation was no isolated incident; we have seen other circumstances where involved parties simply conducted a historical-based cost analysis.
and came up with the number. What happens when decision makers are faced with situations like this?

Certainly the PBL BCA is difficult. Under the current BCA process, a firm is to be applauded for providing a BCA with explanations and no numbers, as opposed to providing a number that simply ignores half the equation, that is, the innovation benefits that come to a PBL over time. Strategies like PBL are on the rise in both the public and private sector. Our research has shown that converting from a traditional postproduction approach to a PBL approach requires a totally new BCA strategy. Merely using existing BCA policy and templates will result in erroneous and costly recommendations. Failing to integrate the innovation and investment aspects of the underlying PBL econometric model when comparing a PBL with a non-PBL strategy will likely result in public funds being squandered or shareholder value not being maximized.

During the last decade, an increasing number of end-users, original equipment manufacturers, and other postproduction support providers have begun to employ a performance-based, multiple year approach that shifts the focus from return on sales to return on investment. The common elements of these PBL relationships are collaboration, long-term contracts, supplier network investments, service performance measures, and incentives that produce sustainment cost reductions for the end-user (Kim, Cohen, and Netessine 2007; Sols, Nowicki, and Verma 2007; Geary and Vitasek 2008; Randall, Pohlen, and Hanna 2010). While successful, the fundamental econometric model at the core of these PBL strategies has confounded the BCA process.

This investigation makes it clear that performance-based, outcome-focused arrangements are fundamentally different in the way they deliver postproduction support services. Unlike transactional, cost-plus arrangements, PBL contracts often seek a blend of near-term and long-term cost reductions while simultaneously maintaining or improving performance. Achieving cost reductions in near- and long-term time horizons requires a mindset focused on driving out waste in the existing processes, while also focusing on innovation and product improvements that drive down life-cycle costs.

PBL differs from traditional sustainment in that PBL takes a multidimensional approach to demand fulfillment. The first dimension is to efficiently meet demand within the current supply chain structure. The second dimension is to design out demand. That reduction is achieved through improvements in material, process, and technology.
Traditional BCA generally fails to capture time, innovation, and the impact innovation can have on both lowering costs and improving performance. When making a choice between PBL service providers, one is faced not only with a decision regarding who can do the job as it is today, but also which organization is able to provide innovations that will either improve performance and/or drive costs down in the future.

We believe there is a strong case for developing a BCA structure that not only evaluates the performance among competing traditional sustainment support options, but also evaluates the unique aspects that define a PBL. Then, a reasonable and informed comparison can be made between the two. Such decisionmaking is central in this new approach to BCA.

As we conducted our research, we found a wide range of success in PBL arrangements. Much of the variance was due to the level of investment and innovation infused in the process. When conducting a BCA, either for supplier selection or in evaluating the effectiveness of an existing contract, the analysis needs to consider the probability of innovation. We suggest creating a series of questions for the BCA built around an assessment of each of the building blocks leading to innovation. Questions critical to this approach are the following:

1. Are the incentives designed to reward achievement of the outcome?
2. Does the provider have adequate knowledge across the identified domains to harvest potential cost avoidance?
3. Does the provider have informed experience?
4. What are the possibilities for innovation in the system being sustained?
5. What timelines are appropriate for making a comparison for cost savings?

Each of these questions is designed to incorporate the building blocks for a successful PBL BCA and set up follow-on questions that provide a multiple year apple-to-apple evaluation of the bottom line. A year-to-year contract may experience immediate short-term gains, while a PBL contract may experience a near-term increase in costs as suppliers invest in innovation and longer-term life-cycle affordability improvements.

In this article, we have discussed the shortcomings of conducting traditional BCA studies in assessing the performance of PBL arrangements. In the process, we outlined the areas that distinguish PBL arrangements from traditional postproduction support contracts and thus hinder direct
comparisons in a BCA. Finally, we suggested a series of questions that should guide the discussion and development of BCAs. PBL BCA must consider multiple year cost and cost avoidance streams in order to create a more direct comparison between two different approaches to life-cycle postproduction support. The singular difference in PBL versus the traditional approach to postproduction support is that PBL seeks not only to fill demand efficiently in the short term, but also to make investments that design out demand in the long term. In this PBL is inherently resource conservative. Future research efforts should be directed at developing specific models for measuring innovation and quantifying the impact of innovations on postproduction support.

Notes
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1. Very recently, the Department of Defense (DoD) released a DoD Product Support BCA Guidebook (Department of Defense, 2011). In that document, DoD discusses the inclusion of process efficiencies, but does not directly provide a framework for addressing innovation, or reliability driven, cost avoidance governance structures inherent in a PBL strategy.

2. Non-fixed-price contracts are sometimes used successfully in PBL when the system is immature and future cost has high potential variance. During this period the risk premium associated with a multiyear contract is simply unaffordable for a given firm. In this situation, the government is in a superior position to cost-effectively bear that risk burden.

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The Effect of Risk Aversion on Manufacturer Advertising in a Two-Stage Supply Chain

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Abstract
We consider a supply chain system with a risk-neutral manufacturer as the leader and a risk-averse retailer as the follower with uncertain demand. At the beginning of the game, the manufacturer makes efforts on advertising and then the retailer decides its order quantity before demand realization. The retailer’s risk aversion is modeled by the Value-at-Risk (VaR) approach with the downside risk constraint. The analysis of equilibrium strategies indicates some characteristics of the game are different from those under risk-neutral assumptions. We find that the manufacturer can effectively prevent the risk-averse retailer from downsizing the order quantity through advertising. In order to explain the difference, we investigate the impacts of risk aversion on the manufacturer’s advertising decision and the retailer’s ordering decision. We find that the retailer with moderate degree of risk aversion orders a larger volume and receives greater advertising support from the manufacturer. Moreover, the feasible combinations of target profit and downside risk for moderate risk aversion are discussed to derive the relationship of the two parameters. In addition, we make a simple analysis of the situation with two independent retailers who have heterogeneous degrees of risk aversion.

Keywords
Risk aversion; Value-at-Risk (VaR); Stackelberg game; Newsvendor.
Introduction

The power of promotion has been identified in abundant literature on marketing as well as supply chain management. Promotional activities are implemented by suppliers as well as retailers in various manners, ranging from media advertising, events sponsorship, catalogues distribution, to salespeople’s effort. In model analysis, advertising is widely discussed as a typical promotion activity and classified into “brand advertising” and “local advertising.” Usually, brand advertising is implemented by brand owners to make their products less substitutable and to earn more profit (Shaffer and Zettelmeyer 2004). More specifically, manufacturers expect to grasp potential demand and to develop brand knowledge and customer preference through brand advertising (Huang and Li 2001). In the fiscal year of 2009, Apple’s advertising budget reached $501 million as disclosed in the Form 10-K document submitted to the Securities and Exchange Commission of America. According to Fortune magazine, Dell spent $811 million on advertising in the fiscal year 2009, while Microsoft’s spending was up to $14 billion. These industry giants make many efforts on advertising for both long-term and short-term returns, revealing the leading position of advertising among numerous marketing tools.

Most marketing studies to date focus on the performance of advertising strategy or customers’ responses to retailers’ sales effort. Another related topic is about vertical co-op advertising, the scheme in which supply chain members share the cost of local advertising. Based on the decision-making process or the game sequence, these articles (Huang and Li 2001; Jørgensen, Taboubi, and Zaccour 2003; Karray and Zaccour 2006) target the coordination of the entire supply chain performance with Pareto optimality. Generally speaking, researchers are more interested in improving advertising efficiency under classical assumptions that perfect rationality and risk neutrality are the building blocks for model construction. The emergence of behavioral economics has shed some light on this subject and proposes hypotheses that are more aligned to the decision behaviors in the real world. Many experiments and empirical studies have proved the existence of biases in decision-making, thus challenging the conventional wisdom about the supply chain optimizing solution. This article studies the mutual effects of the retailer’s risk aversion and the manufacturer’s advertising in a supply chain. We find that the equilibrium of the game is different from those of the classical model conducted under the assumption that both the manufacturer and the retailer are risk
neutral. These findings give new insights into the role of advertising in supply chains.

Proved to be influential in decision-making, the risk preference of supply chain members plays an important role in supply chain management research (e.g., Agrawal and Seshadri 2000; Chen et al. 2009). Recent studies on retailers’ ordering and pricing policies pay much attention to retailers’ risk preferences, especially risk aversion, to acquire meaningful insights for improving supply chain efficiency (Jammernegg and Kischka 2009; Tapiero and Kogan 2009). Early measures used to describe a degree of risk aversion include utility maximization and mean-variance analysis, both of which are still in use and illustrative for a number of scenarios. Lately, the introduction of financial measures such as Value-at-Risk (VaR) and Conditional Value-at-Risk (CVaR) has directly bridged risk aversion with target profit and made risk aversion more measurable. These metrics have greatly enriched the research on risk aversion and made analysis more applicable to real world operations. So far supply chain management literature using VaR and CVaR approaches mainly focuses on the inventory issues with little consideration of the impact of marketing tools. As an exploratory study, this article takes the effect of advertising into account and investigates the relationship between promotional activities and risk aversion.

This research follows the work of Gan’s (2005) on supply chain coordination with a risk-averse retailer and a risk-neutral manufacturer, where the VaR theory is employed in a constrained condition to measure the degree of the retailer’s risk aversion. We follow most of the assumptions in Gan’s work and investigate the equilibrium strategies from the manufacturer’s perspective. The aim of this study is to understand the impact of brand advertising on retailers’ decision-making. We construct a Stackelberg game in which the manufacturer acts as the leader and the retailer acts as the follower. The results suggest that the risk-neutral manufacturer increases promotional effort in a certain range determined by the degree of the retailer’s risk aversion, and that a risk-averse retailer does not necessarily order less than a risk-neutral one.

The article is organized as follows. We first review related literature. Then we propose our assumptions, propose a model with a downside risk constraint, and report the equilibrium strategies. Next, we extend the model to the situation with two independent retailers that have different target profits and downside risks. Finally, we conclude and discuss managerial implications.
Literature Review
Advertising has been widely investigated in both marketing and supply chain management research. In the literature there are many papers proposing various advertising strategies from different points of view. One branch of marketing studies focuses on advertising attributes such as information, contents, and exhibit modes (e.g., Bloch and Manseau 1999; Dukes and Gal-Or 2003). They study the performance of advertising in relation to customer choice and market demand, trying to improve advertising quality to cater to public taste. The other branch considers advertising as a pure marketing strategy, studying the efficiency of advertising in fierce market competition (e.g., Narasimhan, Neslin, and Sen 1996; Banerjee and Bandyopadhyay 2003). Usually the marketing perspective on advertising is customer-oriented, mainly concerning the performance and influencing factors of advertising as a market tool. The seller’s risk preference and other industrial behavioral features are rarely included in such analysis.

Advertising is classified into brand advertising and local advertising in most supply chain management literature. Brand advertising entails the costly differentiation efforts paid by manufacturers to foster customer loyalty (Baye and Morgan 2009), while local advertising consists of promotional activities implemented around retailers’ outlets. Because the supply chain management perspective emphasizes the interaction between upstream and downstream players, local advertising has been discussed much more frequently than brand advertising. In the line of supply chain coordination research, local advertising is considered an important factor controlled by the retailer to promote the market demand. As a result, the manufacturers need to propose well-designed contracts to encourage the retailers to invest in sales promotion. Cachon (2002) thoroughly reviewed supply chain coordination studies on newsvendor with a demand which is dependent on retailers’ promotional efforts. He proposed the necessary conditions under which the supplier would share the retailer’s promotion expense to achieve supply chain coordination. The condition indicates that the promotional cost should be observable to the supplier, verifiable to the third party, and directly beneficial to the supplier. Otherwise, the cost-sharing contract cannot be implemented.

Constrained by this rule, most studies either give particular demonstrations about the definition of the promotional effort in their model or directly choose advertising as the promotional parameters for their observable and verifiable cost structure. However, in the supply chain coordination literature, the retailer’s promotional activities have been
widely investigated, while the manufacturer’s brand advertising has been neglected. Netessine and Rudi (2000) presented a coordinating contract that integrated the advertising cost sharing and revenue sharing contract to achieve coordination. Wang and Gerchak (2001) assumed the demand for a certain product is influenced by its display level, which is arranged by the retailer. They indicated that the manufacturer should compensate the retailer with an extra holding cost to coordinate the channel. Taylor (2002) proposed a supply chain coordination contract in which the retailer receives an extra rebate from the manufacturer if the sales exceed a target quantity. The paper proved that the retailer would choose Pareto optimal promotion effort, given a proper target quantity and rebate rate. Krishnan, Kapuscinski, and Butz (2004) extended Taylor’s research to a dynamic game process. Assuming that the retailer chooses inventories ex ante and promotional effort ex post, they investigated various coordination mechanisms for different scenarios. In summary, this line of research concerns the appropriate compensation mechanism for the retailer who bears the cost of promotion that is beneficial to the supplier as well. The contracts designed for this purpose are based on the reallocation of the cost and profit to ensure the compensation would reduce the retailer’s risk without compromising the effort incentives. Although these studies derived various kinds of contracts, they are based on the same theory that the manufacturer should share the retailer’s risk in both inventory holding and advertising investment aspects. However, the fact that these studies discuss risk sharing under the risk-neutral assumption suggests that the research can be improved from the risk-preference point of view.

Besides advertising studies, another stream of literature is pertinent to risk aversion in supply chain management. Many studies take risk aversion into consideration in the area of inventory management. Early research used expected utility function and mean-variance measure to evaluate risk aversion (e.g., Eeckhoudt, Gollier and Schlesinger 1995; Chen et al. 2007; Tapiero and Kogan 2009). Recently, new methods, including VaR and CVaR, were developed with the introduction of financial measures of risk management. VaR measures the player’s maximum profit at a specified confidence level (Jorion 2006). It directly combines the profit with risk aversion. Due to the complex computational characteristics, there are limited research studies using the VaR measure. Gan, Sethi, and Yan (2005) solved a newsvendor model with a VaR constraint for the retailer’s optimal order quantities. They also designed a contract for the risk-neutral manufacturer to cooperate with a risk-averse retailer. Ozler, Tan, and Karaesmen (2009) extended
the model constructed in Gan, Sethi, and Yan’s work to multiproduct scenarios. They derived the exact distribution function for the two-product newsvendor problem and developed an approximation method for the N-product case. These studies also pay attention to risk sharing in dealing with risk aversion; however, few study the impact of marketing power on risks. Huang and Li (2001) developed three deterministic models to explain a cost-sharing scheme between a manufacturer and a retailer. For the cooperative model, they employed a Nash bargaining game and took supply chain members’ risk preference into account. Utilizing the Pratt-Arrow risk aversion function, they found that the manufacturer shares a smaller part of the local advertising cost if the retailer has a higher degree of risk aversion. Suo, Wang, and Jin (2005) presented a model that considers retailer’s loss aversion. They found that loss aversion would weaken the retailer’s incentives for sales effort and the retailer’s optimal effort level decreases as loss aversion increases. Yet none of these studies gives a thorough discussion on the interacting effect between the manufacturer’s marketing strategy and the retailer’s risk preference.

In summary, most of the extant literature held the retailer perspective and emphasized the impact of downstream power on demand. In contrast, the upstream advertising is rarely referred to as a major parameter in the field of supply chain management. Real-world manufacturer advertising has a remarkable effect on all members of the supply chain, especially when retailers’ risk aversion is involved. This article develops a two-stage newsvendor model with a risk-averse retailer and a risk-neutral manufacturer. In our model, the manufacturer’s advertising is considered to illustrate the significant role that the manufacturer’s marketing strategy plays in risk sharing between upstream and downstream collaborations. As the VaR method is far from widely used in this criterion, we will follow the work of Gan, Sethi, and Yan (2005) to analyze the retailer’s risk aversion and the players’ decision-making process.

The Two Stage Newsvendor Model

Model Description

We now consider a Stackelberg game that consists of a risk-neutral manufacturer M and a risk-averse retailer R. In the game, M performs as the leader and R plays as the follower. Based on the newsvendor model, we suppose the transaction contains a single perishable product with a random market demand X (i.e., the deterministic quantity of X cannot be observed
before the selling season). This random market demand has a probability distribution density \( f(x) \) and cumulative distribution function \( F(x) \), both of which are known to both the manufacturer and the retailer. The timing sequence of the game is as follows. First, the manufacturer promotes its product with an advertising level \( \rho \) to enlarge the market demand at an expense \( V(\rho) \). \( V(\rho) \) increases on \( \rho \) with \( V(0) = 0, V' (\rho) \geq 0 \). Advertising extends the original demand \( X \) to \( \rho X \) when the selling season begins. Then, the manufacturer wholesales products to the retailer at a unit cost \( c \) and receives \( \omega \) for each unit, and the retailer will sell them to the market at a price \( p \) per unit. Finally, the selling season begins and the realized market demand \( \rho X \) is observed. For the simplicity of our analysis, we assume the goodwill cost and salvage value of the perishable product are zero for both players. We also assume that each player targets at optimizing its expected profit within the constraint and there is no information asymmetry.

There are two critical decision variables in the system: the manufacturer’s advertising level \( \rho \) and the retailer’s order quantity \( q \). The following analysis will focus on these two variables. Our model mostly inherits the traditional newsvendor model with promotion effort involved. The retailer’s risk aversion is transformed to a downside risk constraint presented in this part. The concept of downside risk was introduced in Gan, Sethi, and Yan’s model (2005). It is a probability that implies the biggest bearable failure rate when the agent cannot achieve his or her target profit. As a result, the retailer would keep the order quantity under a certain level to prevent the downside risk from exceeding the probability. According to the definition, we derive the constraint condition. Suppose the retailer has a target profit \( \alpha \) and downside risk \( \beta \), its risk constraint can be written as:

\[
P(\Pi \leq \alpha) \leq \beta
\]

where \( \Pi_r = p \min(q, \rho X) - \omega q \) represents the retailer’s profit.

The expected profit functions for the manufacturer, the retailer, and the supply chain system are defined as the following:

\[
\pi_m = (w - c)q - V(\rho) \tag{2}
\]

\[
\pi_r = p \min(q, \rho X) - \omega q \tag{3}
\]

\[
\pi_s = \pi_m + \pi_r = pE \min(q, \rho X) - cq - V(\rho) \tag{4}
\]

Then we solve for the distributional equilibrium strategies with the manufacturer as the leader and the retailer as the follower. The result is Stackelberg equilibrium.
Equilibrium Strategies

We begin with solving the retailer’s order quantity with the downside risk constraint. Let $q^*$ be the optimal order quantity of the retailer whose maximization problem is described in $(P_1)$:

$$
\max \pi_r = pE \min(q, \rho X) - wq
$$

s.t. $P\left(p \min(q, \rho X) - wq \leq \alpha\right) \leq \beta$

$(P_1)$

The manufacturer’s maximization problem is defined as follows:

$$
\max \pi_m = (w - c)q - V(\rho)
$$

$(P_2)$

Without loss of generality, we split the downside risk constraint into two scenarios: $q \leq \rho X$ and $q > \rho X$ (in which the variable $\rho$ is treated as a known constant because it has been decided by the manufacturer at the first stage of the game). For the first scenario, all products are sold out and constraint (1) is equal to the expression below:

$$
P(p-w)q \leq \alpha \leq \beta
$$

$(5)$

Therefore, we get the lower bound of the retailer’s optimal order quantity as $q^* = \frac{\alpha}{p-w}$. The retailer makes a profit of no more than $(p-w)q$ given its order quantity $q$. As a result, if the order quantity is less than $q^*$, the target profit $\alpha$ can never be achieved. It follows that the retailer has to order at least $q^*$ to meet its target profit. When $q^* < q \leq \rho X$, the retailer would gain a profit higher than $\alpha$ and the downside risk is zero; therefore, the constraint binds only if $q > q^*$ and $q > \rho X$.

For the second scenario $q > \rho X$, we have:

$$
P(p \rho X - wq \leq \alpha) = P\left(\frac{\alpha + wq}{p} \leq X \leq \frac{\alpha + wq}{p}\right) - F\left(\frac{\alpha + wq}{p}\right) \leq \beta
$$

$(6)$

Expression (6) relates the demand distribution function $F(x)$ to the downside risk $\beta$. With some manipulation on expression (6), we get an upper bound of $q$ as $q \leq \frac{ppE^{-1}(\beta) - \alpha}{w}$. As there are two parameters concerning the degree of retailer’s risk aversion, we must consider every possible combination of $\alpha$ and $\beta$. Therefore, we divide the scope of $\beta$ into three regions to get specific equilibrium strategies.

Let $\rho^*$ be the optimal advertising level invested by the manufacturer in the first stage and $(\rho, q)$ be the equilibrium strategy for traditional newsvendor (all the players are risk neutral). Let $(\rho^*, q^*)$ be the equilibrium
strategy for a larger $\beta$ that $\beta \geq F\left(\frac{\alpha + wq}{p\bar{p}}\right)$ and $(\rho_q^*, q^*_t)$ for the smaller $\beta$ that $F(q^*) < \beta < F\left(\frac{\alpha + wq}{p\bar{p}}\right)$. Theorem 1 describes the equilibrium strategy $(\rho_q^*, q^*_t)$ with parameters $\alpha$ and $\beta$ in different regions.

**Theorem 1:** The equilibrium order quantity and advertising level are as follows:

If $0 < \alpha \leq \frac{\bar{\rho}}{\bar{\rho} - \left(1 + \frac{w}{p}\right)} \frac{w}{p} (p - w) F^{-1}\left(\frac{p - w}{p}\right)$, then

1. when $\beta \geq F\left(\frac{\alpha + wq}{p\bar{p}}\right)$, $q^*_t = \bar{q} = \bar{\beta} F^{-1}\left(\frac{p - w}{p}\right)$, $\rho_q^* = \bar{\rho}$,

$$V(\rho)|_{\rho = \bar{\rho}} = (w - c) F^{-1}\left(\frac{p - w}{p}\right);$$

2. when $F(q^*) < \beta < F\left(\frac{\alpha + wq}{p\bar{p}}\right)$, $q^*_t = \frac{ppq^* F^{-1}(\beta) - \alpha}{w}$,

$$V(\rho)|_{\rho = \rho_q^*} = \frac{(w - c)p}{w} F^{-1}(\beta);$$

3. when $\beta \leq F(q^*)$, there is no equilibrium solution.

If $\frac{\bar{\rho}}{\bar{\rho} - \left(1 + \frac{w}{p}\right)} \frac{w}{p} (p - w) F^{-1}\left(\frac{p - w}{p}\right) < \alpha \leq \bar{\rho} (p - w) F^{-1}\left(\frac{p - w}{p}\right)$, then the equilibrium strategy is $(\bar{\rho}, \bar{q})$ with any $\beta$ that satisfies $F(q^*) < \beta < 1$.

If $\alpha > \bar{\rho} (p - w) F^{-1}\left(\frac{p - w}{p}\right)$, there is no available solution.

**Proof:** All proofs are provided in the appendix.

Note that the retailer’s target profit cannot exceed its highest revenue in the risk-neutral setting; otherwise there is no appropriate order quantity that satisfies the downside risk constraint. Theorem 1 also indicates that if the retailer raises the target profit, it has to simultaneously prepare for bearing higher downside risk to allow for available solutions. When the retailer is highly risk-averse with high target profit and low
downside risk, it is almost impossible to get equilibrium strategies because the lower-bound constraint $\beta > F(q^*)$ is violated. Moreover, with a high degree of risk aversion, the transaction cost (e.g., transportation fee, time cost, and opportunity cost) would be relatively expensive for both parties in the deal. In this situation, there is no equilibrium strategy just like the third proposition in Theorem 1.

Theorem 1 shows all the possible solutions for the game in which we are interested in several regions with closed-form expressions. These equilibrium strategies are derived for the retailer with moderate degree of risk aversion, that is, higher target profit with bigger downside risk or lower target profit with smaller downside risk. In fact, companies usually prefer medium- or low-risk aversion because the limited resource could be fully invested into profit-making. In contrast, a highly risk-averse company would have resources unnecessarily occupied to prepare for the rainy days.

The Impact of Risk Aversion on Advertising Level

An important issue is the change caused by the introduction of manufacturer’s advertising effort. Theorem 2 will specifically investigate the advertising variable $\rho^*$ and make comparison of its value when the retailer’s target profit and downside risk changes.

Theorem 2: The optimal advertising level changes with the retailer’s risk aversion rate are as follows:

When $0 < \alpha \leq \frac{\bar{\rho}}{\bar{\rho} - \left(1 - \frac{w}{p}\right)} \cdot \frac{w}{p} \left(p - w\right) F^{-1} \left(\frac{p - w}{p}\right)$ and $\beta > F(q^*)$,

the comparison of $\rho_i^*$ and $\rho_h^*$ ($\rho_h^* = \bar{\rho}$) are as follows:

If $\frac{w}{p} \left(p - w\right) F^{-1} \left(\frac{p - w}{p}\right) < \alpha \leq \frac{\bar{\rho}}{\bar{\rho} - \left(1 - \frac{w}{p}\right)} \cdot \frac{w}{p} \left(p - w\right) F^{-1} \left(\frac{p - w}{p}\right)$,

then $\rho_i^* \geq \rho_h^*$.

If $0 < \alpha \leq \frac{w}{p} \left(p - w\right) F^{-1} \left(\frac{p - w}{p}\right)$, then two scenarios are considered as follows:

1) when $F\left(\frac{w}{p} F^{-1} \left(\frac{p - w}{p}\right)\right) < \beta \leq F\left(\frac{\alpha + wq}{p\bar{\rho}}\right)$, we have $\rho_i^* \geq \rho_h^*$;

2) when $F(q^*) < \beta \leq F\left(\frac{w}{p} F^{-1} \left(\frac{p - w}{p}\right)\right)$, we have $\rho_i^* \leq \rho_h^*$. 
Theorem 2 demonstrates the $\rho$ value under different combinations of $\alpha$ and $\beta$. It is proved that the manufacturer’s willing-to-pay investment in advertising is significantly different as the degree of the retailer’s risk aversion changes. If the retailer seeks higher target profit and lower downside risk, the manufacturer increases the advertising level as a signal of increasing demand to boost the retailer’s confidence in the market. However, the manufacturer would not unconditionally keep on increasing the advertising expense. Suppose the retailer refuses to bear any possible loss or require unreasonable target profit, it is impossible for the manufacturer to heavily invest in advertising. In a case like this, the manufacturer would reduce the advertising budget or even stop cooperating to avoid a potential loss.

Furthermore, we find the lowest advertising level in the situation with a retailer who accepts a low profit as well as low downside risk. The second proposition in Theorem 2 supports this argument. If the retailer demands a very low target profit with low downside risk, in most cases it is trying to make a trial order or it is unable to afford large quantities (which will be proved in Theorem 3). The relatively lower downside risk indicates that the retailer would rather gain less than be exposed to risk. As a result, the manufacturer would also save advertising money due to the small scale and insufficient capability.

The ultimate winner for the manufacturer’s advertising support has a moderate degree of risk aversion. There are two combinative forms of target profit and downside risk, namely a high target profit with any feasible downside risk and a lower target profit with higher downside risk. Under these two conditions, the manufacturer would make more effort on advertising compared to the risk-neutral case. The first risk setting indicates that the retailer would spontaneously relax its risk constraint in pursuit of high returns. The target profit is a signal of potential purchasing in large volumes. So the manufacturer observes the signal and increases the advertising level to encourage ordering. The second setting is basically adopted by small and medium companies. The scale limitation forces them to operate with a low target profit. Therefore, they can either bear the relatively higher risk or avoid any possible risk. For the one who relaxes the risk constraint, the manufacturer would also pay more advertising effort to encourage the retailer to order more. On the other hand, the conservative retailer avoids bearing any risk and the manufacturer will not waste a large amount of money to help with its sales.

**The Retailer’s Ordering Policy**

Theorem 2 indicates that the manufacturer’s advertising budget is significantly affected by the retailer’s target profit and downside risk. Note
that a retailer with relatively low downside risk can also receive the “big investment” in advertising when its target profit is sufficiently high. So we can deduce that high target profit dominates downside risk in the manufacturer’s advertising decision. The analysis above reveals that the retailer’s risk aversion influences the manufacturer’s advertising decision. Concurrently, the manufacturer’s advertising effort also has a reverse impact on the retailer’s order quantity. Hence, the retailer’s ordering decision is complicated because of the influence from both its risk aversion and the manufacturer’s advertising effort. Theorem 3 derives some propositions in the retailer’s ordering policy.

Theorem 3: The risk-averse retailer tends to order in a larger quantity when the manufacturer’s advertising effort conforms to certain terms, including the following:

If \( \frac{w}{p}(p - w)F^{-1}\(\frac{p - w}{p}\) < \(\alpha \leq \frac{\bar{\rho}}{\bar{\rho} - \left(1 - \frac{w}{p}\right)}\). \(\frac{w}{p}(p - w)F^{-1}\(\frac{p - w}{p}\) \)

and \( \bar{\rho}_{i}^* \geq \frac{\bar{\rho}^*}{\bar{\rho} - \left(1 - \frac{w}{p}\right)} \), then \( q_{i}^* \geq q_{h}^* \);

If \( o < \alpha \leq \frac{w}{p}(p - w)F^{-1}\(\frac{p - w}{p}\) \) and

\( F\left(\frac{w}{p}F^{-1}\(\frac{p - w}{p}\)\right) < \beta \leq F\left(\frac{\alpha + wq}{p\bar{\rho}}\right) \),

when \( \bar{\rho}_{i}^* \geq \frac{\bar{\rho}^*}{\bar{\rho} - \left(1 - \frac{w}{p}\right)} \), we have \( q_{i}^* \geq q_{h}^* \);

If \( o < \alpha \leq \frac{w}{p}(p - w)F^{-1}\(\frac{p - w}{p}\) \) and

\( F\left(q^o\right) < \beta \leq F\left(\frac{w}{p}F^{-1}\(\frac{p - w}{p}\)\right), q_{i}^* \leq q_{h}^* \).

Theorem 3 challenges the conventional wisdom concerning the ordering policy of a risk-averse retailer in the newsvendor model. It is interesting that a risk-averse retailer’s order quantity is not necessarily lower than that of a risk-neutral one due to the impacts of the manufacturer’s advertising.
effort. This result sharply contrasts to the situation without manufacturer’s advertising effort. In Gan, Sethi, and Yan’s model (2005), the risk-averse retailer orders strictly less than the risk-neutral one with other parameters set as the same. It is also worth noting that this difference can only be found when the values of target profit and downside risk are restricted in specific regions. These regions are consistent with those in Theorem 2. Also, we find that high-target profit dominates downside risk in the manufacturer’s advertising decision. When the retailer’s target profit is high enough, it would order more products as long as the manufacturer provides enough advertising support. When the retailer expects low target profit, the advertising stimulation on order quantity works only if the retailer can bear higher downside risk. If it cannot relax the downside risk constraint, it should cut down the inventory level.

From theorems 2 and 3, we can conclude that greater investment in advertising can boost larger order quantities when the retailer expects high target profits. As for the retailers with low target profits, whether that advertising effort works is decided by its downside risk. On the other hand, the manufacturer also balances its advertising cost and expected revenue when facing retailers with heterogeneous degrees of risk aversion.

**Manufacturer Advertising with Two Independent Retailers**

Our model concerns the Stackelberg game with one manufacturer and one retailer. However, in reality, a large-scale manufacturer that leads a supply chain always collaborates with numerous distributors or retailers. To better understand the complicated supply chain network and gain managerial implications, we developed our model into a two-retailer game and carried out an elementary analysis. Suppose there are two retailers $R_1$ and $R_2$ as the monopolists of two independent markets and order from a common manufacturer $M$. $R_1$ and $R_2$ are both risk-averse players with different target profits and downside risks $(\alpha_1, \beta_1)$ and $(\alpha_2, \beta_2)$, respectively. There are multiple combinations of $\alpha$ and $\beta$, but only the comparable pairs of $(\alpha_1, \beta_1)$ and $(\alpha_2, \beta_2)$ matter to our analysis. Without loss of generality, we assume $R_1$ has a higher degree of risk aversion compared to $R_2$, and it can be expressed as $\alpha_1 > \alpha_2$, $\beta_1 < \beta_2$. For simplicity we let the two markets have the same distribution density $f(x)$ and distribution function $F(x)$.

The game sequence is similar to the single-retailer model: first the manufacturer advertises for the product in the two independent markets with effort $\rho_1$ and $\rho_2$; then the manufacturer wholesales products to both retailers at unit cost $c$ and receives $w$ for each unit, and the retailers will
resell them at price $p$ per unit. The two retailers' maximizing problems are defined as follows:

$$\max_{q_i, \alpha_i} \pi^r_i = pE \min\left(q_i, \rho_i X\right) - wq_i$$

subject to $p\min\left(q_i, \rho_i X\right) - wq_i \leq \alpha_i \leq \beta_i$ \hspace{1cm} (P_i)

$$\max_{q_i, \alpha_i} \pi^s_i = pE \min\left(q_i, \rho_s X\right) - wq_i$$

subject to $p\min\left(q_i, \rho_s X\right) - wq_i \leq \alpha_i \leq \beta_i$ \hspace{1cm} (P_j)

The manufacturer's maximizing problem is:

$$\max_{\rho, \pi_1, \pi_2} \pi_m = \left(w - c\right)\left(q_1 + q_2\right) - \left(V\left(\rho_1\right) + V\left(\rho_2\right)\right)$$ \hspace{1cm} (P_k)

Theorem 4: If both downside risk constraints bind, the equilibrium strategy is:

$$q_1^* = \frac{pp^*F^{-1}\left(\beta_1\right) - \alpha_1}{w}, \quad V\left(\rho\right)\bigg|_{\rho = \rho_1} = \frac{\left(w - c\right)p}{w} F^{-1}\left(\beta_1\right)$$

$$q_2^* = \frac{pp^*F^{-1}\left(\beta_2\right) - \alpha_2}{w}, \quad V\left(\rho\right)\bigg|_{\rho = \rho_2} = \frac{\left(w - c\right)p}{w} F^{-1}\left(\beta_2\right)$$

Theorem 5: When both retailers' constraints bind, the manufacturer invests higher advertising levels for the retailer with lower risk aversion that orders a larger quantity than the other with higher degree of risk aversion. The relationship of the variables is $\rho^*_1 < \rho^*_2 < q^*_i < q^*_j$.

Theorems 4 and 5 imply that the retailer's risk aversion directly impacts the manufacturer's advertising decision. The result is also in consistency with theorems 2 and 3. The manufacturer has larger strategy sets when it collaborates with multiple retailers. Although risk aversion regularly is a barrier of efficient collaboration between upstream and downstream players, the manufacturer saves money from costly publicizing activities as well. On the other hand, a risk-averse retailer may get less profit because of inventory liquidating, but it also avoids the overstock problem. In the real world, it is common that the players choose strategies according to risk considerations, and the results are not all negative effects.

**Conclusion**

This article is motivated by the desire to explain the manufacturer's advertising effort as a common market phenomenon that is hitherto largely neglected by supply chain researchers. We use the VaR measure to prove the impact of the retailer's risk aversion on the manufacturer's advertising decision. The two critical parameters that define the retailer's risk
aversion are investigated as a supplement to illustrate the phenomenon. Concurrently, the retailer’s ordering policy is also influenced by the manufacturer’s advertising level. To generalize the scope of our work, we discuss the case for two independent retailers with heterogeneous degree of risk aversion. As for model development, we extended the model developed by Gan, Sethi, and Yan (2005) on the downside risk analysis and designed a Stackelberg game. The approach is a combination of financial measure and game theory.

Our main focus is the relationship between supply chain members with different risk attitudes when advertising involved. According to Gan, Sethi, and Yan (2005), the retailer’s risk aversion can be classified according to the target profit and downside risk. The combination of higher target profit and lower downside risk leads to increased risk aversion. In our analysis, other matches of target profit and downside risk, especially moderate risk-aversion combinations, are investigated as a supplement to the risk-aversion study. To address this issue, we compared the equilibrium strategies derived under different risk scenarios and obtained insights into the interaction of the risk-averse retailer and the risk-neutral manufacturer.

First, there exists an upper bound for the retailer’s target profit; otherwise the equilibrium strategy is unavailable. Second, the retailer’s target profit and downside risk have direct influence on the manufacturer’s advertising investment. In other words, the manufacturer will increase its advertising effort when the retailer has a moderate degree of risk aversion, while decreasing for a highly risk-averse one. Third, although conventional wisdom suggests that a risk-averse retailer definitely reduces its order quantity, we find that a manufacturer’s advertising can effectively prevent the risk-averse retailer from downsizing inventory when its target profit and downside risk fall in specific regions. Fourth, high target profit dominates downside risk in both the manufacturer’s advertising decision and the retailer’s ordering decision. When target profit is low, these two decisions are determined by downside risk. Fifth, when there are two independent retailers with different degrees of risk aversion, the manufacturer would give more effort on advertising for the less risk-averse one.

Our main contribution is that this work highlights the impact of the downstream player’s risk aversion on the upstream partner’s decision-making. Distinguished from existing research on advertising toward end customers, this study stresses the power of advertising in the wholesale market where the manufacturer deals with the risk-averse retailer. We propose that in addition to being aware of the customer of the brand,
the manufacturer can effectively prevent the risk-averse retailer from downsizing the order quantity through advertising. This work is an exploration into the research on promotion and risk. There are still many problems unsolved and questions unanswered, for example, the introduction of competition mechanisms and designing contracts to coordinate the supply chain and reallocate market risk. Our future research will go deeper into this topic to obtain more insights for both theory development and practical application.

Appendix

Proof of Theorem 1

If \( 0 < \alpha \leq \frac{\bar{\rho}}{\rho} \left( \frac{w}{p} - \frac{w}{p} \right) \), then we have \( F(q') \leq F\left( \frac{\alpha + wq}{p \beta} \right) \).

1. When \( \beta \geq F\left( \frac{\alpha + w\bar{q}}{p \rho} \right) \), the retailer’s downside risk constraint does not bind; therefore the retailer’s order decision is the same as that of the traditional newsvendor, which is given by \( \bar{q} = \tilde{\rho}\bar{F}^{-1}\left( \frac{p - w}{p} \right) \). Then we substitute \( \bar{q} \) into Eq. (2) and solve \( \max_{\rho, m} \pi \) for the manufacturer’s optimal promotional effort \( \bar{\rho} \), which can be simply obtained through first derivative condition. The equilibrium strategy \( (\bar{\rho}, \bar{q}) \) takes the form

\[
V(\rho)_{\bar{\rho}} = (w - c)\bar{F}^{-1}\left( \frac{p - w}{p} \right), \quad \bar{q} = \bar{\rho}\bar{F}^{-1}\left( \frac{p - w}{p} \right).
\]

2. When \( F(q') < \beta < F\left( \frac{\alpha + w\bar{q}}{p \rho} \right) \), the downside risk constraint binds and the retailer’s maximization problem becomes

\[
\max_{\rho, m} \pi \bar{\rho}, \pi = \rho \min\{q, \rho X\} - wq
\]

s.t. \( P(\{1, \leq \alpha\}) = \beta \) \hspace{1cm} (P3)

We can now derive the solution to (P3), as shown below:

\[
q' = \frac{pp\bar{F}^{-1}(\beta) - \alpha}{w}
\]

On substituting this equation into (P2) and solving for \( \rho' \), we obtain \( (\rho', q') \) as follows:

\[
V(\rho)_{\rho'} = (w - c)\bar{p}^{-1}\left( \beta \right) - \frac{\alpha}{w}, \quad q' = \frac{pp\bar{F}^{-1}\left( \beta \right) - \alpha}{w}.
\]
3. When \( \beta \leq F(q^*) \), there is no such \( q \) that achieve the target profit \( \alpha \), making the whole problem unsolvable.

\[
\text{If } \begin{pmatrix} \frac{\beta}{\rho} \left( \frac{w}{p} \right) \left( p - w \right) F^{-1} \left( \frac{p - w}{p} \right) < \alpha \leq \frac{\beta}{\rho - \left( \frac{w}{p} \right)} \left( p - w \right) F^{-1} \left( \frac{p - w}{p} \right), \end{pmatrix}, \text{ then}
\]

\[
F\left( \frac{\alpha + wq}{p\rho} \right) < F\left( q^* \right) < F\left( q \right).
\]

When \( \beta \leq F(q^*) \), it is obvious that no appropriate \( q \) matches; when \( F(q^*) < \beta \leq 1 \), it can be deduced that we have \( \beta > \frac{\alpha + wq}{p\rho} \), so the downside risk constraint does not bind, and we obtain the equilibrium strategy \( (\beta, q) \).

\[
\text{If } \begin{pmatrix} \alpha > \frac{\beta}{\rho} \left( \frac{w}{p} \right) \left( p - w \right) F^{-1} \left( \frac{p - w}{p} \right), \end{pmatrix}, \text{ then } F\left( \frac{\alpha + wq}{p\rho} \right) < F\left( q^* \right) < F\left( q \right).
\]

\begin{align*}
\text{If } & \beta \leq 1, \\
\text{and } & F\left( q^* \right) < \beta, \text{ the optimal order quantity is } q, \text{ which contradicts the fact } q < q^*, \\
\text{leaving our problem unsolvable.} \\
\end{align*}

**Proof of Theorem 2**

\[
\text{If } \begin{pmatrix} \frac{w}{p} \left( p - w \right) F^{-1} \left( \frac{p - w}{p} \right) < \alpha \leq \frac{\beta}{\rho - \left( \frac{w}{p} \right)} \left( p - w \right) F^{-1} \left( \frac{p - w}{p} \right), \end{pmatrix}, \text{ obviously}
\]

we have \( \frac{w}{p} F^{-1} \left( \frac{p - w}{p} \right) < \frac{\alpha}{\rho - \left( \frac{w}{p} \right)} \left( p - w \right) F^{-1} \left( \frac{p - w}{p} \right), \)

which is in equivalence with the expression (8):

\[
F\left( \frac{w}{p} F^{-1} \left( \frac{p - w}{p} \right) \right) \leq F\left( q^* \right) \leq F\left( \frac{\alpha + wq}{p\rho} \right)
\]

With \( \beta > F\left( q^* \right) \), we can deduce that \( \beta > \frac{w}{p} F^{-1} \left( \frac{p - w}{p} \right) \) and \( F^{-1} \left( \beta \right) > \frac{w}{p} F^{-1} \left( \frac{p - w}{p} \right) \).

Given that \( v\left( p \right) = \left( p - c \right) F^{-1} \left( \frac{p - w}{p} \right) \), and \( v\left( p \right) = \frac{\left| w - c \right| p}{w} F \cdot \left( \beta \right) \), we compare \( \nu^*_\beta \) to \( \beta \) and find that \( \nu^*_\beta \geq \nu^*_\beta \).

\[
\text{If } \begin{pmatrix} \alpha < \frac{w}{p} \left( p - w \right) F^{-1} \left( \frac{p - w}{p} \right), \end{pmatrix}, \text{ then } F\left( q^* \right) \leq F\left( \frac{w}{p} F^{-1} \left( \frac{p - w}{p} \right) \right) < F\left( \frac{\alpha + wq}{p\rho} \right).
\]
Therefore, two ranges of $\beta$ are considered with the downside risk constraint binding:

When $F\left(\frac{w}{p}F^{-1}\left(\frac{p - w}{p}\right)\right) < \beta \leq F\left(\frac{\alpha + wq}{p\beta}\right)$, we have $V(\rho_{b}^*) > V(\rho^*)$ and $\rho_{b}^* \geq \rho^*$.

When $F(q^*) < \beta \leq F\left(\frac{w}{p}F^{-1}\left(\frac{p - w}{p}\right)\right)$, we have $V(\rho_{b}^*) \leq V(\rho^*)$ and $\rho_{b}^* \leq \rho^*$.

Proof of Theorem 3

If $0 < \alpha \leq \frac{\beta}{\beta} \left|\frac{w}{p}(p - w)F^{-1}\left(\frac{p - w}{p}\right)\right|$ then we get

$$q_{i}^* - q_{h}^* \geq \frac{p}{w} \rho_{i} F^{-1}(\beta) - \frac{\beta}{\beta} F^{-1}\left(\frac{p - w}{p}\right).$$

Suggested in Theorem 2, there are two scenarios in which $F^{-1}(\beta) \geq \frac{w}{p} F^{-1}\left(\frac{p - w}{p}\right)$.

When $\frac{w}{p}(p - w)F^{-1}\left(\frac{p - w}{p}\right) < \alpha \leq \frac{\beta}{\beta} \left|\frac{w}{p}(p - w)F^{-1}\left(\frac{p - w}{p}\right)\right|$ or

When $0 < \alpha \leq \frac{w}{p}(p - w)F^{-1}\left(\frac{p - w}{p}\right)$ with $F\left(\frac{w}{p}F^{-1}\left(\frac{p - w}{p}\right)\right) < \beta \leq F\left(\frac{\alpha + wq}{p\beta}\right)$.

Therefore, for $\rho_{i}^* \geq \frac{\beta}{\beta} F^{-1}(\beta) \geq \frac{w}{p} \rho_{i} F^{-1}\left(\frac{p - w}{p}\right)$, and the expression $q_{i}^* - q_{h}^* \geq 0$ is proved, leading to $q_{i}^* \geq q_{h}^*$.

If $0 < \alpha \leq \frac{w}{p}(p - w)F^{-1}\left(\frac{p - w}{p}\right)$ and $F(q^*) < \beta \leq F\left(\frac{w}{p}F^{-1}\left(\frac{p - w}{p}\right)\right)$, we directly have $F^{-1}(\beta) \leq \frac{w}{p} F^{-1}\left(\frac{p - w}{p}\right)$, so that $\rho_{i}^* \leq \rho^*$ and $q_{i}^* - q_{h}^* \leq \frac{p}{w} \rho_{i} F^{-1}(\beta) - \beta F^{-1}\left(\frac{p - w}{p}\right) \leq 0$.

Therefore $q_{i}^* = q_{h}^*$ is proved.

Proof of Theorem 4

When both retailers' constraints binds, programming $(P_4)$ and $(P_5)$ can be rewritten as:

$$\max_{\delta, x} \pi_{i}^* = \min \{ q_{i}^*, \rho_{i} X \} - wq_{i}$$

s.t. $P \left\{ \min \{ q_{i}^*, \rho_{i} X \} - wq_{i} \leq \alpha \right\} = \beta_{i}$

$(P_7)$
We can now derive the solution to programming (P₆) and (P₇), as shown below:

\[ q₁^* = \frac{p₁ p₁^{-1}(β₁) - α₁}{w}, \quad q₂^* = \frac{p₂ p₂^{-1}(β₂) - α₂}{w} \]

On substituting this equation into (P₆) and solving for \( ρ₁^* \) and \( ρ₂^* \), we obtain \( \{ρ₁^*, q₁^*\} \) and \( \{ρ₂^*, q₂^*\} \) as follows:

\[ q₁^* = \frac{p₁ p₁^{-1}(β₁) - α₁}{w}, \quad V(\rho)|_{\rho = ρ₁^*} = \left(\frac{w - c}{w}\right) F^{-1}(β₁); \]
\[ q₂^* = \frac{p₂ p₂^{-1}(β₂) - α₂}{w}, \quad V(\rho)|_{\rho = ρ₂^*} = \left(\frac{w - c}{w}\right) F^{-1}(β₂). \]

Proof of Theorem 5

As \( β₁ < β₂ \), we have \( V(\rho)|_{\rho = ρ₁^*} < \left(\frac{w - c}{w}\right) F^{-1}(β₁) < \left(\frac{w - c}{w}\right) F^{-1}(β₂) = V(\rho)|_{\rho = ρ₂^*} \).

Because \( V'(\rho) > 0 \), \( V(\rho) \) is a monotonic increasing function. Therefore \( ρ₂^* < ρ₁^* \) is derived.

As \( ρ₁^* < ρ₂^*, \quad α₁ > α₂ \), \( q₁^* = \frac{p₁ p₁^{-1}(β₁) - α₁}{w} < \frac{p₂ p₂^{-1}(β₂) - α₂}{w} = q₂^* \), \( q₁^* < q₂^* \) is also proved.

Note

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References


Industry Notes

- Travel Planning: Searching for and Booking Airline Seats on the Internet

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Abstract  
This article is based on a survey of 374 airline passengers sampled at an airport. We examine how travelers search for and then buy airline seats, determine which distribution channel dominates, calculate what percentages of online searches convert to actual bookings on the same website, and report why people switch. We also examine which travelers book, and then rebook airline seats, and why. We then measure the differences in how travelers view several Internet and website issues, the differences between Internet users and nonusers, between business and pleasure travelers, and between men and women. We update the most important reasons for airline choice, in an era when online bookings predominate. Finally, we report our findings (some counterintuitive) and their implications for airlines and third-party websites (online travel agents).

Keywords  
Airline; booking; Internet; Websites.

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University Park, PA
In 2009 domestic scheduled airlines in the United States carried about 600 million passengers on nearly 9 million flights, generating about 540 billion passenger miles (Bureau of Transport Statistics 2010). Traditionally, airlines sold their tickets via phone or through airline travel agents. But in 1994, the Web had arrived with the promise of becoming a mainstream medium of communications, and a distribution channel for travel services. At first, progress was slow, and in 1998, the Internet accounted for less than 1 percent of airline ticket sales (Brunger and Perelli 2008). However, in March 2002, Delta Airlines, suffering from the effects of the September 11, 2001, attacks, announced that it would eliminate the 5 percent travel-agent commission. The commission curtail was soon followed by the other airlines (travel agents currently typically charge travelers a $30 booking fee). This act of disintermediation became the main impetus for the growth of online reservations, bypassing travel agents. Soon, Werthner and Ricci (2005) reported that tourism had become the number one industry in terms of online transaction volume. Ramsey (2007) estimated that 61 percent of adult users of the Internet do travel research on the Web, while Mamaghani (2009) reported that 95 percent of users have done travel research on the Web. Today, approximately 6.5 percent of Web enquiries are travel-related searching (Jansen, Ciamacca, and Spink 2009). Thus, currently, most airline tickets are bought directly online on airline websites, through third-party websites (TPWs) such as Expedia, on auction websites such as Priceline, and on generic Internet search engines such as Google.

A number of reasons contribute to the increased use of the Web for airline bookings and the diminished role of travel agents for such purposes. First, the Internet is suitable for the purchase of intangible goods such as services in general and airline seats in particular. These intangible goods are considered “confidence goods” where purchase and consumption are separated by time and distance, and as such they can be described in detail for informed purchase. Second, customers expect that products purchased through the Internet will generally be cheaper (O’Connor 2003) because of lower distribution costs. In fact, Brunger (2009) found that the Internet had indeed reduced airline fares, mainly because of more efficient searches. Third, the Internet permits quick searches, decreased search costs (Sahay 2007), and provides a range of choices (Zhang et al. 2006). Fourth, TPWs permit one-stop shopping where airline seats, hotel rooms, and rental cars can all be purchased at the same time and place. Fifth, unlike hotels, airlines allow people who book on TPWs to collect loyalty rewards.

Having outlined the growing importance of the Internet for searching and buying airline seats, the rest of the paper will proceed as follows. We first state the primary objectives of our study, followed by our survey design.
Next, we will report our survey results, and then discuss the implications of our findings. Finally, we will conclude by stating the limitations of our study, and then make recommendations for further research.

**Study Objectives**

There are six primary objectives of this study. First, we want to examine how travelers search for and then buy airline seats, specifically their preferred methods (Internet, telephone, travel agents, or walking up to a ticket counter). We also want to know which distribution channel dominates in the United States among options of airline websites, non-opaque TPWs, opaque auction sites, and generic Internet search engines. Second, we want to discover what percentage of airline searches on one website actually convert to bookings on that website, and how often travelers search on one website and then switch to another, and why. Third, we want to find out what kind of travelers book and then rebook airline seats, mostly for lower rates. Fourth, we want to measure the differences in how travelers view several Internet and website issues, the differences between Internet users and nonusers, between business and pleasure travelers, and between men and women. Fifth, the most important factors affecting airline choice had been reported more than twenty years ago (Toh and Hu 1988), but we wanted an update, with recent Internet and Web factors included. Sixth, and finally, we want to know what factors affect travel frequency today.

**Survey Design**

To achieve the study objectives above, we designed a preliminary survey of airline passengers based on our prior research experience in the field, and interviews with two airline officials and one executive of a TPW. This survey was pretested among seventeen graduate students to uncover areas of confusion or misunderstanding. A final survey instrument consisting of twenty-nine questions was then constructed and distributed at Seattle-Tacoma International Airport (SeaTac). Compared to a similar survey done twenty years ago also at Sea-Tac (Rivers, Toh, and Alaoui 1991), gaining access to the passengers for the current survey was considerably more difficult. In the post-9/11 era, we had to get permission first from the Port of Seattle, and then from the Transportation Security Administration (TSA), to comply with strict security policies. Then we had to get permission from the airlines to distribute and collect the surveys at their departure gates, which they control. Our research assistant was given a Port of Seattle security vest with a security badge, and was given strict instructions from us to stick to a carefully scripted survey protocol that would lead to
Industry Notes

83

a representative sample. Note that he was able to collect the surveys only on those days and at departure gates for which he had permission from the port, TSA, and the airlines. Given all the procedural limitations, we adopted an opportunistic approach to get the largest possible sample size to minimize sampling error, maximize the reliability of estimates, and increase the power of statistical tests.

The surveys were conducted in June, July, and early August of 2010, only on those days when there was double permission from the Port of Seattle and the TSA to get into the secure areas, and permission from the airlines to distribute the surveys at their departure gates. Our research assistant collected the surveys over the seven days of the week (Monday through Sunday) to minimize the effects of daily variations in airline traffic and passenger profiles, at different times of the day (morning, afternoon, evening, and night), and from as many airlines flying on domestic routes within the United States as possible (Alaska, American, Continental, Delta, Frontier, Hawaii, Horizon, US Air, and United). Given that our study encompasses travelers’ use of airline websites as well as TPWs, he avoided Southwest Airlines and Virgin America, for both do not allow TPWs to sell their tickets. Their tickets can be purchased only through their own airline websites. He approached individuals traveling alone as well as families of all races and age groups at the departure gates of as many airlines as possible. For practical reasons, he avoided approaching adults supervising young children or caring for babies.

A six-page professionally printed survey containing twenty-three questions for our study, plus another six courtesy questions for the Port of Seattle was distributed. Altogether, we managed to get 374 useable survey responses over a three-month period. Between 85 percent and 90 percent of those approached agreed to fill out the survey. Thus, nonresponse bias is not deemed to be an issue. While there were some nonresponse items, they are not rampant, except for questions about high-tech services provided by the Port of Seattle. We coded and entered the data onto Excel spreadsheets and used SPSS 1.70 to run appropriate statistical tests and analyses. The results and our findings are reported below.

Survey Results and Findings

We had 374 usable survey responses from the departing passengers (51% male/49% female). Sixty-five percent of the respondents had college degrees, with an average age of forty-one years old, and an average annual household income of $91,000. Among the respondents, 29 percent declared themselves primarily as business travelers and 71 percent as primarily
pleasure travelers. This distribution is almost similar to a previous survey of hotel guests (Toh, DeKay, and Raven 2008). Note that we allowed the respondents to identify their own travel status, because behavior and attitudes are more related to self-perception than an arbitrary definition, such as the number of trips they made a year for business purposes. Together, they made an average of seven round-trips per year, and 56 percent of the respondents were frequent flier members, belonging to an average of two programs. Thus, our convenience sample appears to be balanced and representative of the general population of travelers. The sample is not dominated by “road warriors”—defined as people who travel frequently, often at full fares in the premium classes—who make up two-thirds of the passenger revenues earned by our domestic airlines (Toh, Fleenor, and Arnesen 1993).

The most remarkable change in the way travelers search for and book airline seats in the last fifteen years or so is the widespread use of the Internet. Results show that 82 percent of the respondents had used the Internet to either search for or book their airline seats for the flight they were taking at the time of the survey. For their particular flights, there were 833 Internet searches, 68 percent of which occurred on TPWs, also called online travel agents, listed in order of popularity as the following: Expedia, Travelocity, Orbitz, Kayak, Cheapsites, Sidestep, Yahoo!, Allegiant, and Travel Axe. The other 15 percent occurred on websites of airlines on which they flew, 8 percent on generic Internet search engines (Google and Bing in that order of popularity), 5 percent on auction websites (Hotwire and Priceline in that order of popularity), and the remaining 4 percent on other airlines’ websites. Our results are not surprising, as found in a study by Morosan and Jeong (2008) that people have a favorable attitude toward TPWs. Some reasons for the popularity of TPWs, notably Expedia, are that they provide price as well as package bundling (Carroll, Kwoknik, and Rose 2007), and make it easier for buyers to compare airlines and fares 24/7 (Cho and Agrusa 2006).

Among those respondents who had used multiple sites, when asked which one they spent the most time searching, they reported, in descending order: Expedia (37%), Travelocity (18%), Orbitz (17%), websites of airlines on which they flew (9%), Kayak (5%), auction sites (3%), Cheap Flights (2%), and less than 2% for all the others combined. Thus, we can see that TPWs are the most popular search sites, followed by websites of airlines on which they flew, while auction sites and generic search engines are much less popular in airline searches. When asked where they booked their airline seats, they reported in descending order: Expedia (33%), their own airline’s website (27%), Travelocity (17%), Orbitz (16%), while only three people booked on auction sites. Thus again, the TPWs dominate.
When asked which channel they used most often to search for a flight, the results were, in descending order: Internet (83%), travel agent and corporate travel planner (14%), telephone (3%), and walk-in counter (less than 1%). When asked which method they used most often to book, the results were somewhat similar, in descending order: Internet (79%), travel agent and corporate travel planner (16%), telephone (3%), and walk-in counter (2%). Note that only a few (2%) who had searched on the Internet had switched to brick-and-mortar travel agents. Although these traditional travel agents play a decreasing role in domestic airlines ticket sales, they still book a large number of international flights (Pearce and Schott 2005) and trips for the cruise industry (Toh, Rivers, and Ling 2005).

Also note that there were 833 reported sites searched on the Internet, but only 264 reported bookings on the Internet, a ratio of 3.2 site searches per booking, indicating that there was a lot of search-then-switch activity. For their flights, 231 out of 264 who booked on the Internet (88%) admitted that they had searched on one or more websites, but switched to another when booking. Notably, our results also show that only 13 percent of those who had searched on airlines’ sites switched to TPWs when they were booking, and only 10 percent of those who had searched on TPWs switched to airlines’ sites when booking. Furthermore, results of a chi-square test for independence was significant (p < 0.0001), indicating that within the four types of search engines (airlines, TPWs, auction sites, and generic sites), travelers who switched tended to remain within the same type of website when they were booking. Also, 95 percent of those who had searched on the Internet also booked on the Internet. When those who had switched were asked why they had switched, the reasons given, in descending order, were: found lower fare (66%), registered on that website (17%), convenience (10%), avoid fees (3%), more secure site (2%), bonus miles (1%), and others (1%). Among those who had changed their reservations, the reasons given, in descending order, were: lower fare (75%), more convenience (13%), registered on the website (12%), and others (0%). Thus again, lower fares are the most compelling reason to change flight reservations.

We next compared the demographic characteristics between those who book on the Internet and those who do not. Among those who used the Internet most often to either search or book their flights, 20 percent declared themselves as primarily business travelers and 80 percent as primarily pleasure travelers. Because among all travelers 29 percent had declared themselves primarily as business travelers and 71 percent primarily as pleasure travelers, this result suggests that pleasure travelers are more likely to use the Internet than business travelers. In fact, whereas
only 56 percent of business travelers used the Internet, the corresponding figure for pleasure travelers was 93 percent, a significant difference ($p < 0.0001$). This result is consistent with the fact that pleasure travelers pay for their own seats and the perception that the Internet provides the widest selection of flights and fares (Brunger 2009). There was no significant difference between the average ages of those who used and did not use the Internet, albeit the average annual household income of the former was $89,000 versus $100,000 for the latter, a marginally significant directional difference ($p = 0.07$). The difference in annual household incomes of the two groups further attests to the attraction of the Internet as a source of cheap fares for those to whom airline travel is less affordable.

The average degree of agreement score (from a low of 1 to a high of 5) with the statement that the Internet allows for quick flight and fare comparisons was 4.73 versus 4.29 for those who did and did not use the Internet, respectively, a significant directional difference ($p = 0.001$). With respect to the statement that the Internet offers the lowest air fares, the respective average scores were 4.29 versus 3.86 ($p = 0.02$). As to the importance of the travel agent or corporate travel planner, among those who used the Internet the average score was 2.80 versus 3.32 for those who did not, again a significant directional difference ($p = 0.001$). Finally, among those who made their own reservations, 94 percent used the Internet, while among those whose reservations were made by others, the figure was only 54 percent, a significant directional difference ($p < 0.0001$). Note that all four results are significant in the intuitively expected direction.

A counterintuitive finding was that among those who used the Internet, the average number of round trips made over the last twelve months was 6.5, compared to 10.7 made by those who did not use the Internet, and the difference was significant ($p = 0$). One would argue that those who travel often have more incentive to learn how to make online bookings to get cheaper flights. A possible explanation to this seemingly counterintuitive finding is that those who travel often are typically business travelers whose corporations make the reservations. In fact, among those who declared themselves as business travelers, 36 percent said they used a travel agent or corporate travel planner, compared to only 4 percent of those who declared themselves as pleasure travelers.

More interestingly, while gender division among those who used the Internet was nearly equal (49% male/51% female), of those who did not use the Internet, 62 percent were male. Considering that our sample was almost a 50/50 split by gender, the gender directional difference among those who did not use the Internet is impressive. Measuring directly, among females 86 percent used the Internet, while the corresponding figure among males was only 78 percent,
a significant directional difference (p = 0.04). This difference is partly due to the fact that percentage-wise fewer women are business travelers compared to men. Among women, 14 percent returned to the Internet to find a lower fare, whereas only 12 percent of males reported doing so. In other words, the result suggests that women are more aggressive price shoppers than men when doing travel research on the Web. Among those who used auction sites, the gender split was 52/48 percent, again favoring women. Measuring directly, we found that among females, 8 percent used auction sites, whereas among males, the corresponding figure was 7 percent, an insignificant difference, but in the intuitive direction. Even more interesting is the fact that 66 percent of the women switched when searching for a flight and subsequently booking for the flight, but the corresponding figure for men was only 55 percent, which was directionally significant (p = 0.02). All of these figures point to the fact that women are more frequent and intensive users of the Internet, and are savvier at finding lower fares. In fact, when asked for the reason for switching, the majority of women (62%) mentioned lower fares.

We now report the differences between those who use the Internet for searching/booking travel and those who do not, and between respondents who considered themselves as business and pleasure travelers. Results of the comparative analysis are reported in Table 1 with scores in a Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Likert-type scale is the most frequently used scale in survey questionnaire research (Cook, Hepworth, and Warr 1981), and is considered the most useful in behavioral research (Kerlinger 1986).

**Table 1**/Significant Directional Difference in Degree of Agreement toward Beliefs in Internet Usage in Travel Planning (Increasing scale of agreement from 1 to 5)

<table>
<thead>
<tr>
<th>A. Users versus Nonusers of the Internet</th>
<th>Mean</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor</strong></td>
<td>Internet Users</td>
<td>Non-Internet Users</td>
</tr>
<tr>
<td>Internet is most convenient for comparing flights/fares</td>
<td>4.73</td>
<td>4.29</td>
</tr>
<tr>
<td>Internet offers the lowest airfares</td>
<td>4.29</td>
<td>3.86</td>
</tr>
<tr>
<td>Book late to get lower airfares</td>
<td>2.40</td>
<td>3.89</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Business Travelers versus Pleasure Travelers</th>
<th>Mean</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor</strong></td>
<td>Business</td>
<td>Pleasure</td>
</tr>
<tr>
<td>Check on Internet then contact travel agent for lower fare</td>
<td>2.38</td>
<td>2.69</td>
</tr>
<tr>
<td>Wait and check for lower fares over time</td>
<td>2.95</td>
<td>3.35</td>
</tr>
<tr>
<td>Check for lower fares later and rebook if necessary</td>
<td>2.19</td>
<td>2.72</td>
</tr>
</tbody>
</table>
We next report the differences between those who use the Internet for traveling and those who do not, between respondents who considered themselves as business and pleasure travelers, and between males and females. Results of the comparative analysis are reported in table 2 with scores, also in a Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Results of our investigation into traveler beliefs are reported in table 3.

Table 2/Significant Directional Difference in Degree of Importance Placed on Factors Considered in Choosing Airlines and Flights (Increasing scale of agreement from 1 to 5)

<table>
<thead>
<tr>
<th>A. Users versus Nonusers of the Internet</th>
<th>Mean</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>Internet Users</td>
<td>Non-Internet Users</td>
<td>p-value</td>
</tr>
<tr>
<td>Convenient departure and arrival time</td>
<td>4.45</td>
<td>4.68</td>
<td>.007</td>
</tr>
<tr>
<td>No baggage fees</td>
<td>3.92</td>
<td>4.13</td>
<td>.072</td>
</tr>
<tr>
<td>Seat selection</td>
<td>3.73</td>
<td>4.30</td>
<td>.023</td>
</tr>
<tr>
<td>Recommendation of travel agent/corporate travel planner</td>
<td>2.80</td>
<td>3.32</td>
<td>.001</td>
</tr>
<tr>
<td>Non-stop flight</td>
<td>4.16</td>
<td>4.51</td>
<td>.002</td>
</tr>
<tr>
<td>Depart and arrive on time</td>
<td>4.32</td>
<td>4.64</td>
<td>.001</td>
</tr>
<tr>
<td>Strong preference for a particular airline</td>
<td>3.17</td>
<td>3.54</td>
<td>.007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Business Travelers versus Pleasure Travelers</th>
<th>Mean</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>Business</td>
<td>Pleasure</td>
<td>p-value</td>
</tr>
<tr>
<td>Seat selection</td>
<td>3.88</td>
<td>3.74</td>
<td>.095</td>
</tr>
<tr>
<td>Frequent-flier program</td>
<td>3.82</td>
<td>3.29</td>
<td>.001</td>
</tr>
<tr>
<td>Lower airline fares and fees</td>
<td>4.33</td>
<td>4.59</td>
<td>.004</td>
</tr>
<tr>
<td>Recommendation of travel agent/corporate travel planner</td>
<td>3.04</td>
<td>2.85</td>
<td>.092</td>
</tr>
<tr>
<td>Non-stop flight</td>
<td>4.45</td>
<td>4.11</td>
<td>.000</td>
</tr>
<tr>
<td>Depart and arrive on time</td>
<td>4.58</td>
<td>4.28</td>
<td>.001</td>
</tr>
</tbody>
</table>

| C. Males versus Females                        | Mean |  |  |
| Factor                                          | Males | Females | p-value |
| Lower airline fares and fees                    | 4.35  | 4.66 | .000 |
| Non-stop flights                                | 4.29  | 4.16 | .081 |
| Depart and arrive on time                       | 4.44  | 4.32 | .071 |
| Strong preference for a particular airline      | 3.34  | 3.15 | .048 |
A few significant correlations among traveler behaviors are worth noting. Frequently checking for lower fares later and rebooking if necessary is correlated with the behavior of contacting the travel agent to see if lower fares are available \((r = 0.55, p < 0.0001)\). Likewise, frequently checking for lower fares later and rebooking if necessary is also correlated with the behavior of waiting and checking for lower fares over time \((r = 0.46, p < 0.0001)\), and searching on auction sites \((r = 0.43, p < 0.0001)\). In other words, those who are fare sensitive exhibit this characteristic consistently. Conversely, those who tended to book early to get lower airfares also booked early to get good flights \((r = 0.74, p < 0.0001)\). Results of our investigation into factors used to choose airlines and flights are reported in table 4.
Noteworthy correlations among travelers in this regard are the fact that those who placed a lot of importance on service quality also placed a lot of importance on convenient departure and arrival times ($r = 0.40, p < 0.0001$), on seat selection ($r = 0.50, p < 0.0001$), and on the quality of the website ($r = 0.44, p < 0.0001$). Also, those who placed a great deal of importance on their flights departing and arriving on time also placed great importance on nonstop flights. Thus, the quest for comfort and quality is manifested consistently.

Let us look at the factors that affect the frequency of travel. The correlation matrix shows that the number of round-trip flights taken annually is consistently and positively correlated with age ($r = 0.03$), education ($r = 0.15$), and income ($r = 0.32$). It appears that only income is a reasonably good predictor of the frequency of travel. We then conducted independent sample t-tests on the means of the number of round-trips taken in a year. The average for males was 8.14 and for females 6.19, a significant difference ($p = 0.006$). The corresponding figures for those who do not use the Internet and those who do were 10.59 versus 6.30, respectively, again a significant difference ($p < 0.0001$). However, the biggest difference was found between business and pleasure travelers at 12.94 and 4.81, respectively, a significant difference ($p < 0.0001$). Why did all of these occur? Upon further inquiry, we found that among males the percentage of business travelers was 42 percent, whereas for females it was only 18 percent. Among those who do not use the Internet the percentage of business travelers was 73 percent, whereas for those who do use the Internet, the percentage of business travelers was only 20 percent. Thus, the best predictor of air travel frequency, relatively to all other observations, is the type of traveler. In this survey, business travelers who are mostly male and do not use the Internet fly much more often than pleasure travelers.

**Implications**

Our survey results show that 82 percent of airline travelers use the Internet to either search for or book their airline seats. Among the searches, 68 percent occurred on TPWs and only 19 percent on airlines’ websites, with generic search engines and auction sites being unimportant. More interestingly, 88 percent of our respondents said that they searched on one or several websites and then switched to another when booking. However, switching activities occurred mainly within the same types of travel search site, and mainly for reasons of price. Furthermore, 95 percent of those who searched on the Internet also booked on the Internet.

In relating the foregoing results into managerial implications, we underscore two important notions. First, whereas the commissions paid by
hotels to the TPWs in the hotel industry range between 15 and 30 percent, those in the airline industry are well below 5 percent, and can be null in many instances. This difference in commissions can be attributed to the different industry structure in that the hotel industry is said to be “fragmented,” while the airline industry is a well-established oligopoly. Second, TPWs accept very low commissions from the airlines because an airline seat is considered to be the “bottle of milk at the back of the store,” in that it must be sold before travelers will buy hotel rooms and rental cars in a price or product package.

Airlines want to sell through their own websites because they want to build customer loyalty through their frequent-flier programs. In addition, airlines want to manage their customers through the entire flight process by giving them reminders and email alerts of schedule changes. They also want to get rid of excess inventory by sending email alerts to their frequent-flier members on special deals in order to avoid lowering their fares on the Internet and cheapening their brand. On the other hand, airlines also realize that the bulk of airline tickets are sold through TPWs and must, therefore, work with them. Commissions must be reasonable, because TPWs provide a very important service of one-stop shopping. TPWs want the flying public to buy through them not because of the meager commissions they earn on the sale of airline tickets, but because of the increased possibility of selling higher-margin items such as hotel rooms. How can both the airlines and TPWs get travelers to buy from their own websites?

One possibility for the airlines is to offer bonus frequent-flier miles when booking through the airlines’ own websites and to take care of their customers via email from the beginning to the end (Alaska Airlines excels in this practice). TPWs, on the other hand, should not charge for bookings (a practice that ended recently). They should offer best-rate guarantees by insisting on fare parity (same price on all websites by individual airlines), and make their websites more attractive by offering price bundling (one-stop shopping) and creative product bundling (discounted integrated packages). They should also inform the traveling public that, whereas they cannot offer hotel loyalty points, airline seats sold through TPWs are eligible for frequent-flier miles.

We also discovered that auction websites are a dismal failure in the airline industry. In our survey, only 5 percent of the searches occurred on auction sites, with only three seats sold (less than 1%), compared to 13 percent of all hotel rooms sold on auction sites (Toh, DeKay, and Raven 2011). Note that on hotel auction sites, one can specify the approximate location of the hotel as well as the number of stars to ensure quality. In contrast, in the
case of airline auctions, one is leery of leaving at midnight from Seattle to Miami with long stopovers in Denver and Atlanta. Thus, online channels are better off developing auction sites for hotels than for airlines. Generic search engines such as Google and Bing are not major players currently, but may become popular in the future. Results from the Port of Seattle survey suggest that airlines and TPWs must pay attention to the growing practice of travelers printing their boarding passes online (31%) and the willingness of passengers to use their mobile phones as boarding passes (71%).

In regard to the demographic characteristics of air travelers, websites should be designed to be more attractive, especially to the more educated but less wealthy people. Those who travel most often are business people, 36 percent of whom rely on their corporate travel planners or travel agents for seat reservations. Thus, both the airlines and TPWs cannot totally ignore corporate travel planners and travel agents, who together account for 16 percent of domestic airline ticket sales (higher in the case of international air travel).

Results reported in table 1 suggest that Internet users, compared to their counterparts, tend to consider the Internet as the most convenient for comparing flights and fares and tend to agree that it offers the lowest fares. This result suggests that TPWs should continue their practice of listing flights in ascending order of price, and not allow vendors to get higher page positions by paying for them (a common practice in selling hotel rooms). Internet users are also wise not to book late to get lower airfares. A separate study (Raven, Toh, and DeKay, 2011), involving time-series observations of fares on TPWs in the spring of 2010, conclusively shows that airfares tend to almost uniformly rise over time. The more fare-sensitive pleasure travelers, compared to business travelers, tend to check on the Internet, then contact their travel agent for lower fares, wait and check for lower fares over time, and check for lower fares and rebook if necessary.

An examination of table 2 suggests that business travelers, compared to pleasure travelers, place greater importance on seat selection, frequent-flier miles, recommendation of the travel agent or corporate travel agent, nonstop flights, and on-time performance. Business travelers fly more often, purchase more expensive seats, and are more reliant on travel planners and agents. The implication for the airlines is that the fare-insensitive business travelers must be reached through superior service rather than lower fares. Superior service can be achieved by offering priority seat selection, more frequent-flier miles, priority boarding, and VIP lounges for business class and even full fare passengers.
Examining table 3 on travel behavior, it appears that using the Internet to compare flights and fares, checking multiple sites to get lower fares, and using the Internet to get lower rates are considered most important for Internet users. Results reported in table 4 also indicate that lower fees and fares and service factors are considered the most important factors in airline selection. From table 4 it appears that there is little importance placed on preference for a particular airline, because frequent-flier programs have been shown to be less important in the choice of an airline than service factors and price (Toh and Hu 1988). All of this behavior relates to the fact that in the airline industry, price is paramount, and that for most travelers an airline seat is considered a commodity. The implication for the airlines in this respect is that yield management (Toh and Raven 2003) is very important. Airline seats are perishable and excess capacity exists except during peak holiday periods. Hence, coupled with the low variable cost of carriage (meals are no longer provided), fares must be low enough to fill otherwise empty seats with discretionary pleasure travelers, without unnecessarily sacrificing yield. For the TPWs, they must recruit as many airlines as possible, even though the commissions are very small or nil. This is because although there is supposed to be general fare parity, Raven, Toh, and DeKay (2011) have shown that convergence of the lowest fare available occurs only 18 percent of the time among TPWs. This figure suggests that 82 percent of the time, the lowest fare is dictated by the non-uniform presence of a deep discount carrier. The operational imperative for the TPWs is clear—recruit as many airlines as possible, and put the lowest-cost carrier on top of the search screen.

Our next observation is perhaps the most interesting. It is clear from our results that women, compared to men, are not only more frequent and savvy users of the Internet in travel research, but also more aggressive price seekers. Specifically, women are more likely to use the Internet, more likely to switch, more likely to return to the Internet to find a lower fare, and slightly more likely to use auction sites. Women also place greater importance on getting lower airline fares and fees, and place less importance on preference for a particular airline. Why did these confounding results occur? Bimber (2000) contended that women are less likely to use the Internet, and Ono and Zavodny (2003) report that they use the Web less often. The Pew Internet and American Life Project (2004) reported that 78 percent of men like to do business online, compared to only 71 percent for women. Despite these contradictory results, we do not find our findings surprising. In a recent piece on gender, Kim, Lehto, and Morrison (2007) showed that in
the case of travel planning, women ascribed higher perceived importance to travel websites, searched more on websites, and do so more frequently. In a separate parallel study based on a survey of 249 hotel guests (Toh, DeKay, and Raven 2011), we were also able to confirm their counterintuitive findings.

The implications are that airlines and TPWs should pay greater attention to women in travel website design. A recent study by Zhang et al. (2009) suggests that people are relying heavily on recommendations for trip planning, so perhaps TPWs should sponsor links to reviews of hotels by women for women, with a lot of visual aids and safety features. After all, TPWs earn the bulk of their revenues from the sale of hotel rooms, not airline seats.

Our survey results show that only 13 percent of airline travelers return to websites to find a lower fare, suggesting that once a reservation is made, travelers are largely content with their choices and will stop searching. It follows that airlines are free to lower their fares to get rid of distressed seat inventory as the day of departure approaches, if they so wish. As we have noted, airlines prefer to do this via email alerts to their loyal customers. This strategy is made more compelling by the observation in table 3 that travelers did not agree with the wisdom of booking late to get the lowest fares.

Finally, we note in table 4 that service quality (convenient departure and arrival times, on-time performance, and nonstop flights) is paramount in the minds of travelers. All these service factors are within the airlines’ control, and information on these factors should, therefore, be made available to airline passengers, whenever possible. The recommendation of the travel agent and corporate travel planners was rated as the least important consideration. Thus, airlines should promote directly to the flying public via mass advertisements, and target their frequent-flier program members. However, airlines should have strong relations with corporate travel planners to capture the lucrative business travel market. Less attention could be paid to brick-and-mortar travel agents, who are on the decline, except for international air travel and cruises.

**Limitations and Recommendations for Further Research**

There are several limitations of our study. First, our survey protocol of approaching passengers about to embark on a flight led to a convenience survey by necessity. However, we are not aware of a probabilistic sample done on a study of this nature, because it would require having a list of the population (only a theoretical possibility) and the power to enforce compliance (even the Census Bureau cannot achieve this). We took all the precautions to get a representative sample by surveying all seven days of
the week at different times of the day, by surveying passengers from as many airlines as possible, and by targeting both sexes and all racial and age groups. The demographic breakdown of our sample indicates that the sample consists of a reasonably diverse group of air travelers. We acknowledge, however, that because we approached people in the act of traveling, frequent fliers are likely to be overrepresented in the sample, compared to the population of fliers.

Second, because of the length of the survey (twenty-nine questions), we realize that there will inevitably be nonresponse items. In this respect, we expect that most of nonresponses will pertain to the difficult questions on hypothetical high-tech boarding and baggage issues posted by the Port of Seattle. An example of such questions is “Would you be willing to use your mobile telephone as a boarding pass if this service was offered by your airline?” Conceding that difficult questions can lead to nonresponse items, which in turn can lead to abandonment (Lee, Hu, and Toh 2004), we took the precaution of attaching the six high-tech questions at the end of our twenty-nine-item questionnaire. Structuring the questionnaire as such also has an additional advantage in that should participation fatigue occurs (Toh and Hu 1996), it is less likely to affect the earlier part of the survey that pertains primarily to our study on Internet usage.

Third, we acknowledge that all survey results are idiosyncratic to the data collected, the survey results themselves can be distorted (see Lee, Hu, and Toh 2000), and accuracy can depend on travel frequency (Hu, Toh, and Lee 2000). This limitation raises the question as to whether data collected in Seattle can be generalized toward the whole country. Fortunately, Seattle is a very racially diverse medium-sized cosmopolitan city with heavy industries (such as Boeing), light industries (such as Microsoft), and service industries (such as the Port of Seattle). It is also a thriving tourism destination with a growing cruise center, and is a gateway to Asia by ship and air. Given its diversity and representativeness, Seattle is often used as a test market city for new products and advertising campaigns. Moreover, it can be reasonably assumed that about half of the 374 airline passengers who responded to our survey were out-of-towners returning home from a visit to Seattle. Thus, our sample is actually quite geographically dispersed.

However, there is still the unresolved issue of the surveys being administered only in the summer of 2010. Recall that the surveys could be collected only on those days when the Port of Seattle and the TSA gave us permission to operate within the secured areas of the airport, and when the airlines also gave us permission to distribute and collect the questionnaires at their departure gates. It took several months to get permission from
the Port of Seattle, and not all airlines responded in a timely fashion to our requests. Thus, we collected our surveys as quickly as possible when everything lined up and, even so, it took us nearly three months. We accordingly acknowledge that there could be some seasonality bias in our results. However, this bias is mitigated by the fact that whereas the frequency of travel is affected by the season, searching and booking behavior are largely invariant to seasons.

In summary, in spite of the previously discussed limitations, the study findings were drawn from a reasonably balanced and representative sample of respectable size. We are grateful to the Port of Seattle, the TSA, and the cooperating airlines, as well as our obliging respondents, for allowing us to collect data from real travelers in a real-life setting, just prior to airplane embarkation. Our recommendation for further research is a replicated study that is conducted during other seasons of the year, and involves different airlines.

References


Logistics Innovation in China

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Abstract
The purpose of this research is to explore logistics innovation at third-party logistics (3PL) firms in China. Case studies of 3PL firms in Taiwan, Hong Kong, and Mainland China (Greater China region) have been conducted. Based on interviews, observation and documentation, a qualitative case-study approach has been followed. Drawing on case-study findings, the driving forces, barriers, and effects of logistics innovation on 3PL firms in China are discussed. Customer requirements, environmental factors, efficiency and effectiveness enhancement, and provision of wider service portfolios and differentiation are strong rationales for 3PL firms to innovate in China. In comparison, cost, time, and employee ability are crucial barriers hindering 3PL firms from innovating in China. Logistics innovation can lead to positive operational performance by increasing efficiency, effectiveness, and service portfolios. Logistics innovation is also positively related to the enhanced relationship with clients, growing sales, reputation and financial performance.

Keywords
Logistics innovation, Third party logistics, Drivers, Barriers, China
Introduction

In recent years, China has emerged as a production center in Far East Asia. Many firms are operating in China to take advantage of low costs and a growing market. Firms tend to use local logistics firms in order to strengthen their supply chain (Jiang 2002). There is a growing trend for firms to outsource their logistics operation in China (Hong, Chin, and Liu 2004). In the meantime, the booming economy of China and its status as a member of the World Trade Organization (WTO) have changed and modernized the traditionally regulated logistics and distribution system (Jiang and Prater 2002). Consequently, the logistics industry in China has been growing. The growth of the logistics market in China has provided opportunities for logistics firms (Lai et al. 2008).

However, most of the logistics firms in China tend to concentrate heavily on transportation and warehousing. They do not have sufficient value-added service provisions and logistics information management, which may negatively affect their sales and subsequent revenue (Hong, Chin, and Liu 2007; Zhou et al. 2008). In order to survive in the market, logistics firms in China have to constantly seek new ways to serve their clients and increase their service quality (Wang et al. 2006).

When firms select logistics service providers in China, they focus on service quality and performance, range of services, geographical coverage, and capability to meet market changes (Lu and Dinwoodie 2002; Qureshi, Kumar, and Kumar 2008). Limited number of service offerings and lack of awareness of the logistics concept have caused customer dissatisfaction (Hong, Chin, and Liu 2004). Logistics firms in China are aware of the challenges and highly value improving customer service and providing quality service (Wang et al. 2008). Many logistics firms attempt to enhance their competitiveness by offering more comprehensive service packages (Hong and Liu 2007). Further, logistics firms try to differentiate themselves in the market through innovation and provision of customized services to their clients (Cui, Su, and Hertz 2009).

Innovation is essential for third-party logistics (3PL) firms in China. Through innovation, 3PL firms can reap first-mover advantage and obtain competitive advantage (Wagner and Franklin 2008). Further, innovation can help 3PL firms to increase customer loyalty (Flint, Larsson, and Gammelgaard 2008). However, according to Wagner (2007), 3PL firms have relatively low capacity to generate innovation. Wagner (2008) points out that there are fewer service and process innovations in the logistics industry than in other industries. Flint et al. (2005) and Wagner (2008)
highlighted the fact that there is scant knowledge of innovation in logistics research. To our knowledge, research on logistics innovation in China is almost nonexistent.

The purpose of this research is to explore logistics innovation at 3PL firms in China. Drawing on the findings from case studies of 3PL firms in Taiwan, Hong Kong, and the Mainland of China, the driving forces, the barriers, and the effects of logistics innovation on 3PL firms are investigated. This research is divided into three parts. The first part highlights the theoretical and methodological issues in studying logistics innovation at 3PL firms. In the second part, empirical findings and analysis of case studies are presented. Finally, research limitations and further research suggestions are discussed.

**Literature Review**

*Definition of Third-Party Logistics Firm*

A number of different terms have been introduced to describe generally the concept and practice of professional logistics services in business in recent years. These terms range from third-party logistics (3PL), logistics outsourcing, logistics alliance, contract logistics, to logistics partnership (Selviaridis and Spring 2007; Marasco 2008). A summary of some influential definitions is presented in table 1. These terms carry similar messages and are often used interchangeably. As Berglund (2000) points out, these terms, especially “third-party logistics” or “3PL,” are quite carelessly used. Terms like “logistics alliance” and “partnerships” have been applied with the intention to capture the essence of 3PL without using the elusive term itself (Skjoett-Larsen et al. 2006). These terms actually construe different meanings and are not exactly the same. We support Andersson’s (1995) and Berglund’s (2000) contention that there is hitherto no consensus on the definition of third-party logistics in the literature. Due to the overlapping definitions and meanings, the concept of 3PL service provider is somewhat blurred.

As table 1 presents, these definitions tend to emphasize the fact that a 3PL firm is an external company carrying out logistics activities as service offerings on behalf of the shipper. However, these definitions underestimate the problem-solving ability and customer adaptation of 3PL firms (Hertz and Alfredsson 2003). Further, 3PL firms do not merely replace shippers in providing logistics solutions that are traditionally done in-house. They are customer-oriented and supposed to be innovative. In addition, these definitions do not consider the fact that 3PL firms can play different roles in supply chains. Certain elements of the client’s strategy shape the outsourcing decision
Industry Notes

and requirements, which, in turn, influence the role of 3PL firms within the supply chain (Bolumole 2003). 3PL firms can provide value-added services and virtual logistics in an integrated way, acting as a supply chain logistics coordinator or a logistics process integrator (Bolumole 2001). As a “tool” used by their clients (Fabbe-Costes, Jahre, and Roussat 2009), 3PL firms can also contribute to supply chain integration and performance. In addition, 3PL firms can play a critical role in linking users to their major vendors and customers, thereby facilitating supply chain integration (Lieb and Bentz 2004).

The 3PL firm in this research is defined as an external company that provides basic or value-added logistics services to its customers for a reasonable service fee under a longer-term business relationship. A 3PL firm usually does not own the title of the goods. Activities carried out by the 3PL firms are highly customized and integrated, as opposed to those that stand alone. The cooperation between a 3PL firm and its customers should be an intended continuous and mutually beneficial relationship.

Logistics Innovation and Influential Factors

Logistics innovation has a unique nature since it often arises not because of a formal plan or process, but rather as an ad hoc response to a customer request (Wagner and Franklin 2008). However, there is not a common and

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lieb</td>
<td>1992</td>
<td>The use of external companies to perform logistics functions that have traditionally been performed within an organization. The functions performed by the third party can encompass the entire logistics process or selected activities within that process.</td>
</tr>
<tr>
<td>Virum</td>
<td>1993</td>
<td>The services offered by a middleman in the logistics channel that has specialized in providing, by contract, for a given time period, all or a considerable number of logistics activities for other firms.</td>
</tr>
<tr>
<td>Sink et al.</td>
<td>1996</td>
<td>Third-party logistics services are multiple distribution activities provided by an external party, assuming no ownership of inventory, to accomplish related functions that are not desired to be rendered and/or managed by the purchasing organization.</td>
</tr>
<tr>
<td>Murphy and Poist</td>
<td>1998</td>
<td>A relationship between a shipper and third party that, compared with basic services, has more customized offerings, encompasses a broader number of service functions, and is characterized by a longer term, more mutually beneficial relationship.</td>
</tr>
<tr>
<td>Berglund</td>
<td>2000</td>
<td>A phenomenon that in simple words can be described as the outsourcing or subcontracting of logistics operations to external service suppliers. A provider of 3PL is consequently an organization that provides logistics.</td>
</tr>
<tr>
<td>Bask</td>
<td>2001</td>
<td>Relationships between interfaces in the supply chains and third-party logistics providers, where logistics services are offered, from basic to customized ones, in a shorter or longer relationship, with the aim of effectiveness and efficiency.</td>
</tr>
</tbody>
</table>
consistent understanding of the meaning of logistics innovation across the organization (Oke 2008). Flint et al. (2005, 114) treat logistics innovation as “any logistics related service from the basic to the complex that is seen as new and helpful to a particular focal audience.” According to Oke (2008), logistics innovation should include technological developments, service, and service product innovations. In contrast, Wagner and Busse (2008, 2) define innovation as “a subjective novelty which is the result of a conscious management process and which aims at economic exploitation.” They claim that logistics innovation should be manageable and serves an exploitation purpose (Wagner and Busse 2008). This article adopts Wagner and Busse’s definition and support the idea that logistics firms need to regard imitation as innovation (Wagner and Busse 2008).

Several researchers have shed light on influential factors on logistics innovation. Chapman, Soosay, and Kandampully (2003) investigate the factors that result in logistics innovation. They propose that knowledge, technology, and relationship networks are keys. Soosay and Hyland (2004) examine and compare factors driving innovation in distribution centers in Australia and Singapore. They find that financial reasons, customer orientation, employee orientation, a leading-edge status in the industry, operational performance, competition, and shareholder orientation are driving forces for innovation (Soosay and Hyland 2004). Soosay and Sloan (2005) find that customer satisfaction and intended continuous improvement are the most important driving forces. Panayides and So (2005) empirically point out that organizational learning mediates the relationship between relationship orientation and logistics innovation. Flint, Larsson, and Gammelgaard (2008) find that direct antecedents to logistics innovation contain the extent of supply chain learning management and innovation management. Wagner (2008) proposes that acquisition of knowledge, and training and education lead to the generation of logistics innovation. In addition, Grawe, Chen, and Patricia (2009) empirically show that customer orientation and competitor orientation positively affect logistics innovation.

Moreover, multiple factors that might impede the management of innovation by logistics firms are stated in literature. Examples are lack of clear definition of innovation, reactive versus proactive innovations, peculiar customers, ineffective transfer of knowledge, inability to protect innovations with patents, technology as a major source of innovation, lack of effective development processes, and difficulty in concept testing (Oke 2004, 2008). Gellman (1986) investigates innovation performance of railroads under deregulation and claims that regulation, labor
Influence, and lack of channel member innovation are barriers to innovate. In addition, Gammelgaard (2008) reveals four potential pitfalls, including improper cooperation, lack of openness, loss of diversity necessary for innovation due to long-term relationships, and information abusing and resource-consuming due to information sharing.

Researchers have also examined the effects and outcomes of logistics innovation under various contexts. Persson (1991) argues that logistics innovation can lead to competitive advantages. Twede (1992) presents that packaging innovation can lead to differentiation and competitive advantage. Richey, Genchev, and Daugherty (2005) identify the positive relationship between logistics innovation and operational service quality. Panayides and So (2005) find that logistics innovation is positively related to logistics service-provider effectiveness. Further, according to Wallenburg (2009), innovation can help logistics firms to increase customer loyalty.

In sum, in recent years researchers have shed light on driving forces, barriers, and effects of logistics innovation in different contexts. However, there is little research that investigates these three aspects of logistics innovation in a holistic way. Therefore, this research tries to fill this gap by examining the driving forces, barriers, and effects of logistics innovation simultaneously. Figure 1 serves as a framework that guides the data collection and analysis in this study.

**Methodology**

This research is based on multiple case studies. Empirical data have been collected through semi-structured interviews, observations, and documentation with three 3PL firms in China. Several motivations have spurred our choice of case-study method. First, according to Feagin, Orum, and Sjoberg (1991), case study is an ideal method when a holistic, in-depth investigation is required. Second, the review of existing literature underpins the weak understanding of the nature of innovation in logistics sector, confirming the need for more theoretical development. Case studies can help logistics researchers generate new concepts and theories (Arlbjorn

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**Figure 1** Influencing Factors and Outcomes of Logistics Innovation
Third, logistics research is usually dealt with practical-oriented problems. The case-study approach allows researchers to gather first-hand information to develop knowledge and gain relevance (Naslund 2002).

This research followed the process suggested by Ellram (1996). Three case companies were chosen using purposeful sampling (Yin 2003). They were selected based on their market reputation in logistics innovation, openness to share their experience, willingness to participate in our research, and the research project budgetary constraints. Initial contacts with key persons at each case company were made to get their support to this study. Through those key persons, interview participants were selected based on snowball effect. These participants are all managers who are familiar with business in the Greater China region.

An interview protocol was first developed and sent to the interviewees prior to the interview in order to facilitate the interview process. The protocol provided interviewees with a clear understanding of research background and purpose. It included key questions and interview guidelines. In order to discover as much information as possible, we kept the questions open and broad, and then delved in depth about logistics innovation. In total twenty interviews were conducted; each took around ninety minutes to complete and was conducted on site at the company facility. A summary of interview participants is shown in table 2. In order to facilitate the interview process, we followed the interviewees’ preference and used different languages accordingly. Specifically, twelve interviews were conducted in Mandarin, five in Cantonese, and three in English. All of the interviews were recorded by digital recorders and transcribed afterwards. We also translated all of the interviews into English, the translated transcripts of which were sent back to interviewees for comments and clarifications.

All empirical data, mainly interview transcriptions, were analyzed according to the qualitative coding processes (Miles and Huberman 1994; Ellram 1996). The primary aim of coding is to systematically derive core categories and facilitate cross-case analysis. Open coding was first conducted to break down data in order to analyze, conceptualize, and develop categories. Then, axial coding was done to make connections among categories developed in the open coding. Further, a central category of the analysis relating to other categories was selected (Strauss and Corbin 1990). Last, cross-case analysis was conducted to generate unique categories.
Empirical Findings
Description of Case Companies

Oriental Logistics
Oriental Logistics was founded in Hong Kong during the Asia financial crisis and the return of Hong Kong to Mainland China in 1997. In the beginning, it only provided warehousing services and very limited transportation services. Due to its client-centric partnership model, it has become a 3PL firm and grown dramatically in China together with its clients. Currently, Oriental Logistics has operations in Hong Kong, Guangzhou, Beijing, Shanghai, and Taiwan. Its clients are from both industrial and consumer goods sectors.

Table 2/List of Interviewees of 3PL Firms in Greater China Region

<table>
<thead>
<tr>
<th>Company</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimerco</td>
<td>Corporate Vice President</td>
<td>Head office, Taipei</td>
</tr>
<tr>
<td></td>
<td>General Manager</td>
<td>Head office, Taipei</td>
</tr>
<tr>
<td></td>
<td>Corporate Marketing Manager</td>
<td>Head office, Taipei</td>
</tr>
<tr>
<td></td>
<td>Director, Northern China</td>
<td>Beijing Office, Beijing</td>
</tr>
<tr>
<td></td>
<td>Assistant General Manager, Northern China</td>
<td>Tianjin Office, Tianjin</td>
</tr>
<tr>
<td></td>
<td>MNC Team</td>
<td>Tianjin Office, Tianjin</td>
</tr>
<tr>
<td></td>
<td>Assistant Manager</td>
<td>Beijing Airport, Beijing</td>
</tr>
<tr>
<td></td>
<td>Manager, Import Department</td>
<td>Beijing Airport, Beijing</td>
</tr>
<tr>
<td></td>
<td>Manager</td>
<td>Beijing Airport, Beijing</td>
</tr>
<tr>
<td></td>
<td>Export Manager</td>
<td>Beijing Airport, Beijing</td>
</tr>
<tr>
<td></td>
<td>In-House Representative</td>
<td>Tianjin Airport, Tianjin</td>
</tr>
<tr>
<td>Oriental Logistics</td>
<td>Management Accounting Manager</td>
<td>Head Office, Hongkong</td>
</tr>
<tr>
<td></td>
<td>Senior Project Manager</td>
<td>Head Office, Hongkong</td>
</tr>
<tr>
<td></td>
<td>Senior Operation Manager</td>
<td>Head Office, Hongkong</td>
</tr>
<tr>
<td></td>
<td>Assistant General Manager, Marketing Dept.</td>
<td>Head Office, Hongkong</td>
</tr>
<tr>
<td></td>
<td>Senior Operation Manager</td>
<td>Head Office, Hongkong</td>
</tr>
<tr>
<td></td>
<td>General Manager</td>
<td>Head Office, Hongkong</td>
</tr>
<tr>
<td>Schenker Logistics</td>
<td>General Manager, Central/ North China</td>
<td>Shanghai Office, Shanghai</td>
</tr>
<tr>
<td></td>
<td>Managing Director</td>
<td>Taipei Office, Taipei</td>
</tr>
<tr>
<td></td>
<td>Director, South China</td>
<td>Hongkong Office, Hongkong</td>
</tr>
</tbody>
</table>
Dimerco Express Group

Dimerco Express Group (DEG) started as an air freight forwarder. With the development of the firm, it has turned into a 3PL firm specialized in Asia Pacific and North America and offers integrated logistics services. Many clients of DEG’s are dealing with high-value products and demand express services. In China, DEG has more than twenty offices. DEG is also the first logistics company listed in the Taiwanese stock market.

Schenker Logistics

Schenker Logistics is a 3PL firm in the DB Schenker group. Schenker Logistics in China offers the same services as the other parts of Schenker Logistics, including sea, air, land, contract logistics, and exhibition logistics. It has been providing different kinds of services in China for more than thirty years. There are six industries on which Schenker Logistics focuses in China. The first three are the automotive industry, the electronic industry, and the manufacturing industry. The rest are within the “emerging” industries, including health care, aerospace, and luxury goods. Schenker Logistics has a wide network in China, covering most of the major cities.

Driving Forces

A number of driving forces have been identified from our case studies as summarized in table 3. Among these driving forces, customer requirements constitute a key driving force to innovate at all of the case-study companies. Customers have different businesses and operations in China, and as such they have various demands. Also, with the growth of customers’ supply chains, customers require a wider variety of services and customized solutions.

Table 3/Driving Forces to Logistics Innovation

<table>
<thead>
<tr>
<th>Driving Forces</th>
<th>Oriental Logistics</th>
<th>Dimerco Express Group</th>
<th>Schenker Logistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer requirement</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Environmental factor</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Enhance efficiency</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Enhance effectiveness</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Provide wider service portfolio</td>
<td></td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Differentiation</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Increase geographical coverage</td>
<td></td>
<td>x</td>
<td>√</td>
</tr>
<tr>
<td>Growth</td>
<td>√</td>
<td>√</td>
<td>x</td>
</tr>
</tbody>
</table>

Note: √ – considered as a driving force; x – not considered as a driving force
All three case companies place great importance on customer requirements and constantly search for better ways to meet them. They train their employees to enhance their logistics and supply chain management knowledge. In order to better understand customers’ requirements, they try to look at customers’ positions in the entire supply chain and conduct research on customers’ product characteristics. Next, they take each customer’s situation into consideration and try to develop new solutions and customized services accordingly.

Situational factors comprise another critical driving force. All of the case-study companies are aware of the complexity of Customs procedures and governmental policies. In terms of the logistics service market, Hong Kong and Taiwan have a sufficient supply of shipping and air freight services, whereas Mainland China’s experiences supply shortages. As a result, all three case-study companies try to leverage the advantage of Hong Kong and Taiwan to meet the challenge of service supply constraint in Mainland China.

The current economic recession has seriously affected the firms operating in China. All three case-study companies have attempted to find new ways to help clients decrease operational costs and inventory.

Operational efficiency is essential for logistics firms. All three case-study companies have been proactively working on their internal systems and processes in order to enhance efficiency. Specifically, they try to adopt advanced IT technology and improve their operations systems. They also constantly look at their internal operations processes and re-engineer the processes. Concurrently, they investigate customers’ operations processes and business settings in order to identify potential areas for improvement. In turn, they often come up with new solutions and new service packages.

All three case-study companies focus on their service quality. This focus is closely related to their strategies in China. They all believe that high-quality services can provide a basis to differentiate themselves in the China market. They use various key performance indicators to measure their service quality and identify areas for improvement. They continuously work in new ways in order to improve their service quality and enhance their service effectiveness.

All three firms work hard to develop new service offerings in order to widen their service portfolio. They try to maintain good services relating to logistics operations as well as develop value-added services to facilitate customers’ physical flows. They also integrate services relating to customers’ financial and information flows to enhance total supply chain
effectiveness. As a result, customers can achieve better performance in their supply chains. All three firms strive for providing customers one-stop shopping as a means to differentiate themselves in the market.

Oriental Logistics and DEG specifically mentioned growth as a driving force. This is probably due to the fact that Oriental Logistics and DEG are medium-size firms and focus mainly on the China market. Compared to Schenker Logistics, a major global logistics player, they are relatively small. They cannot match the economy of scale and synergistic effects of larger companies. Speedy innovation and new service development can help small- and medium-size firms gain more business and grow in size. In turn, they can enhance their supply chain competencies to compete with the global players on scale, efficiency, and effectiveness.

Barriers

As shown in Table 4, all three case-study companies regard cost and time as barriers to innovation, of which cost is considered to be of a greater concern. In many cases, their new ideas are attractive and the potential benefits may be substantial, but customers are normally reluctant to accept them due to high costs of development. Many customers in China treat logistics as a source of costs and are not aware of the fact that better logistics performance can create more business value and lead to competitive advantage. Thus, they are not willing to invest more money in logistics innovation. Since logistics innovation usually requires changes of rules and processes in the supply chain, it takes times to communicate and implement among supply chain members. However, the longer it takes, the riskier uncertain causes may hold back or even stop the innovation efforts.

In addition, all three case companies mention employees’ capability as a barrier to innovate. Their employees, especially ones working in daily

<table>
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<tr>
<th>Table 4/Barriers to Logistics Innovation</th>
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<tbody>
<tr>
<td>Barriers</td>
</tr>
<tr>
<td>Cost</td>
</tr>
<tr>
<td>Time</td>
</tr>
<tr>
<td>Employee ability</td>
</tr>
<tr>
<td>Resource</td>
</tr>
<tr>
<td>Unqualified suppliers</td>
</tr>
<tr>
<td>Internal communication</td>
</tr>
</tbody>
</table>

*Note: ✓ – considered as a barrier; × – not considered as a barrier*
operations, do not have very strong education backgrounds. They are reluctant to change. Many of them have very little or even no knowledge of logistics and supply chain management. In many cases, it is hard to explain to them the benefits of certain innovation and changes. As a result, they are not willing to adapt and modify their working methods, which make the innovation implementation difficult. Therefore, all three companies have invested heavily in training to upgrade their employees’ logistics and supply chain management knowledge and capability.

Oriental Logistics and DEG specifically shed light on the issue of resources as their barriers to innovation. In essence, these two firms are medium-size firms. Comparing to the global giants, they have relatively fewer resources to invest in innovation. They are tied up with daily operations and tend to put resources into their operations. However, successful innovations require constant investment and investigation. Even though the potential benefits are great, it usually takes a fairly long time to achieve the economic returns. Therefore, small- and medium-size firms can be less innovative due to limited resources.

DEG and Schenker Logistics regard unqualified suppliers as another barrier to logistics innovation. These two firms outsource certain activities to local logistics service providers, particularly in Mainland China. Local logistics service providers are usually good at following customer instructions. However, they are not innovation-oriented. It is very seldom that local logistics service providers proactively come up with suggestion and innovative ideas. When DEG and Schenker Logistics bring up new solutions, local logistics service providers often have a hard time comprehending and cooperating. Thus, DEG and Schenker Logistics are forced to give up certain ideas. In comparison, Oriental Logistics does not mention unqualified suppliers as a barrier. In fact, Oriental Logistics is very aware of the problems associated with using local logistics firms. They strive to develop their comprehensive logistics capability to avoid relying on local logistics providers.

Among the case-study companies, only Schenker Logistics highlights internal communication as a barrier to innovation. Schenker Logistics’ clients are mainly global firms. The global clients operate their supply chain globally. Schenker Logistics in China might come up with new ideas for operations in China. However, since their clients’ operations in China is only part of the global operation, any change or modification might affect the entire supply chain. Hence, Schenker Logistics in China needs to communicate with its headquarters and other affected offices in order to ensure internal rules or norms are not violated and support is
available. Usually, the internal communication process is time consuming. Misunderstandings during the communication process can terminate the whole innovation process. In contrast, being smaller and flatter, Oriental Logistics and DEG enjoy the efficient communication. They even specifically mention that their prompt communication and decision-making mechanisms have helped them to react faster to market changes.

Effects of Logistics Innovation

All three case-study companies have experienced positive effects of logistics innovation. Table 5 presents our findings. These effects can be categorized into operational and financial aspects. Operationally, logistics innovation can lead to efficient and effective operations as well as wider service portfolios. Through logistics innovation, logistics firms can either provide more logistics-related services or combine other value-added services into the total service package. In sum, logistics innovation allows logistics firms to generate customized solutions that create more value to their customers and themselves.

Financially, all case-study companies enhance their financial performance as a result of customer satisfaction gained through logistics innovation. In turn, they can enhance the relationships with their clients. Clients tend to retain the relationships because of the logistics firms’ innovative capability. In many cases, logistics firms even obtain more businesses from the same clients. Moreover, logistics innovation can help logistics firms capture a better reputation in the market. Satisfied clients would also refer these logistics firms to their suppliers and customers. Therefore, new businesses can be created. Logistics innovation also helps logistics

Table 5/Effects of Logistics Innovation

<table>
<thead>
<tr>
<th>Effects</th>
<th>Oriental Logistics</th>
<th>Dimerco Express Group</th>
<th>Schenker Logistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Wider service portfolio</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Enhance relationship with clients</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Growing sales</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Reputation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Positive financial performance</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Note: ✓ – considered as a positive effect of logistics innovation; × – not considered as a positive effect
firms to differentiate themselves in the marketplace, allowing them to gain competitive advantage and achieve better business performance.

**Discussion**
All three case-study companies have paid great attention to their clients since they value the relationships with their clients. Customers’ requirements have been found to be the most crucial driving force for logistics innovation. Clients’ new service requirements are usually a reflection of market changes, such as a reaction to a new demand of the clients’ customers, and the strategic direction of clients. Logistics innovation can help logistics firms meet clients’ changing requirements and lead to customer satisfaction. Satisfied clients tend to retain and even strengthen the relationships with their logistics firms. This finding coincides with the findings of Panayides and So (2005)—relationship orientation is positively related to logistics innovation. Relationship orientation plays a critical role for healthy supply chains.

All three case-study companies constantly interact with their clients and try to obtain more knowledge about their clients. They study clients’ product characteristics and market positions to better understand clients’ operations. Further, they examine clients’ supply chains to take a holistic view of clients’ supply chains and find logistics innovation opportunities. For instance, they investigate clients’ operations in China and their role in the global supply chain. They also research clients’ suppliers and customers in terms of location and requirements. Internally, our case companies educate their employees and provide them with logistics and supply chain management knowledge. The purpose is to foster supply chain orientation (Mentzer et al. 2001) so their employees can take clients’ suppliers and customers into consideration when serving them. In this way, they can proactively design innovative solutions to better operate clients’ supply chains. Thus, we propose that supply chain orientation is positively related to logistics innovation.

It is crucial to point out that logistics firms handle logistics operations as their businesses. Like all firms, logistics firms need to make money and grow. Logistics firms are usually operating in highly competitive markets. Our case-study companies confirm that they face fierce competition in China. Instead of lowering prices at the expense of service quality in order to compete, our case companies choose to focus more on innovation so they can differentiate themselves and create higher profit by providing quality services, and innovative and customized solutions. Therefore, we propose that market force is positively related to logistics innovation.
All three case companies strive for delivering superior customer value to their clients. It drives the case companies to innovate. This finding supports what Grawe, Chen, and Patricia (2009) found: customer orientation is positively related to service innovation. However, our case companies not only listen to their clients carefully, but also try to understand clients’ latent and unmet needs. They do not simply follow clients’ ideas and develop new solutions reactively. On the contrary, they proactively generate innovative ideas and present them to clients. They respond to market intelligence obtained from current and potential clients as well as competitors. By using the market information, they try to apply the latest technology and broaden service packages for their clients. It indicates that our case companies are essentially market-oriented (Jaworski and Kohli 1993; Slater and Narver 1999). Thus, we propose that market orientation is positively related to logistics innovation.

All of the case companies have a strong desire to grow. They continuously look for opportunities to obtain more business and try to exploit the opportunities. They always come up with new suggestions and offer wider service portfolios in order to get more business from existing clients. They also combine value-added services with their basic service package to increase sales from current clients. Our case companies target their clients’ business partners and try to develop customized solutions for them to expand their client bases. Furthermore, they conduct market research to identify unmet needs in the market. They work out business plans to fulfill those unmet needs and attract new customers. All these opportunity seeking and exploiting behaviors indicate that our case companies are entrepreneurial-oriented (Slater and Narver 1995; Hult and Ketchen 2001). Their strong desire to grow and their entrepreneurial spirit lead them to constantly innovate. Therefore, we propose that entrepreneurial orientation is positively related to logistics innovation.

In table 5, the empirical data demonstrate that logistics innovation can lead to various kinds of positive effects. Similar to those of Richey, Genchev, and Daugherty (2005) and Panayides and So (2005), the findings also indicate the positive relationship between logistics innovation and operational performance. The empirical results further confirm Wallenburg’s (2009) study that logistics innovation can lead to customer satisfaction and customer loyalty. The case studies have clearly shown that logistics innovation can result in positive financial performance. All case companies claimed business performance improvements, financial gains, and reputation and customer loyalty (brand value) are results of the logistics innovation
efforts. Thus, it is proposed that logistics innovation can create tangible and intangible supply chain effects (to both 3PL and their clients, even to their 3PL firms’s suppliers).

From the above analysis in this section, a theoretical conceptual model is conjectured in figure 2. The findings on barriers complement existing literature and provide additional insights. Particularly, cost and time have been regarded as the biggest obstacles to logistics innovation. This finding is consistent with current logistics outsourcing practice. Many firms outsource their logistics operations because they want to reduce cost rather than create value through innovation (Cui, Su, and Hertz 2009). These firms often have a basic understanding of logistics management, but are not aware of the fact that enhanced logistics operations can generate competitive advantage. As a result, they are reluctant to support and invest in new supply chain enhancement ideas.

Conclusion
This research has served as an initial attempt to explore logistics innovation in China. Drawing on case-study findings of 3PL firms in Taiwan, Hong Kong, and Mainland China, we systematically investigated the driving forces, barriers, and effects of logistics innovation. It is found that customer requirements, situational factors, efficiency and effectiveness enhancement, provision of wider service portfolios, and differentiation are key rationales for 3PL firms to innovate in China. Equally, increased geographical coverage and growth also play positive roles in driving innovation in 3PL firms.

In comparison, cost, time, and employee capability are key hindrances to innovation in 3PL firms in China. In addition, limited resources, unqualified suppliers, and ineffective internal communication are potential
constraints to logistics innovation. Logistics innovation can lead to positive supply chain effects for supply chain members. First, logistics innovation can result in positive operational performance by increasing efficiency, effectiveness, and service portfolio. Second, logistics innovation can enhance relationships with clients, grow sales, uplift reputations, and enhance financial performance.

Supply chain orientation, market orientation, and entrepreneurial orientation are positively related to logistics innovation. These orientations are all part of the business strategies with strong linkage to the future resource deployments in supply chains. Additionally, the existing literature rarely discusses the influence of market forces on logistics innovation. However, the empirical findings in this research indicate that market forces play a crucial role on the innovation of 3PL firms. Therefore, it is proposed that market forces are positively related to innovation. A theoretical conceptual model to link the drivers and supply chain effects to logistics innovation is developed in this study. A follow-on quantitative study to examine the validity and reliability of this conceptual model will contribute further to the theoretical foundation of logistics innovation.

References


Expect the Unexpected: Supply Chain Disruption and Opportunity for US Companies—A Business Case

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Opus College of Business  
University of St. Thomas  
Minneapolis, MN 55403-2005, USA

Abstract  
Many researchers have revealed that US companies acknowledge the inevitability of supply chain disruptions in a global environment. These companies employ strategies that vary from proactive, reactive, resilient, to no supply chain risk management (SCRM) strategies to mitigate risks and ensure business continuity. When a company’s competitive advantage is speed to market, it is only logical that its front-end low-cost country sourcing (LCCS) decision model should include a Disruption Contingency Plan (DCP) as one of the factors for evaluation. In this research, we focus on the company’s financial performance with or without the up-front DCP in a closed loop outsourcing decision model, exploring and analyzing its relative effect on the firms’ Economic Value Added (EVA). In doing so, we reason, the decision to adopt low-cost outsourcing in foreign countries should not be reached without addressing the company’s speed-to-market capability. Using a US company that manufactures industrial printers as an example, various scenarios and options are explored for EVA comparisons in terms of a company’s ability to maintain normal sales, and capture competitors’ market share during supply chain disruptions. This example links the relevance among the outsourcing decision, the up-front DCP, and the company’s EVA during supply chain disruptions. Even when disruption strikes, there is still an opportunity for profitability.

Keywords  
Speed to market, Supply Chain Disruption (SCD), Disruption Contingency Plan (DCP), Outsourcing, Economic Value Added (EVA).

Introduction  
This study is inspired by the following observation, an insight many supply chain managers and executives may not have considered: When a company’s competitive advantage is speed to market, how can it maintain its normal sales level during a supply chain disruption and at the same time manage to overtake a competitor’s market share for normal or above-normal profits?
To answer this question, we must first understand how the complexity of the supply chain has increased through companies’ expanded global operations in recent years, in terms of commodities, top trading countries, and expanded geographical boundaries. We have chosen the electronics industry in this study because the authors have experience working in the manufacturing sector of this industry (industrial printers and medical goods). International trade data from 2002 to 2009 show the trends in the context of supply chain complexity. The shipping distances are longer, affecting push-pull strategies, and the longer lead time, increased inventory carrying cost, and transportation cost are affecting financial performance. More importantly, is a company's supply chain design exploitable to sustain its competitive advantage in speed to market?

Based on import statistics from 2002 to 2006 provided by the US International Trade Commission, we see an upward trend for computers, peripherals and components, television receivers and video monitors, telephone and telecommunication equipment, and medical goods. We see a downward trend for radio and television broadcasting equipment, photographic cameras and equipment, and prerecorded media. The top six leading trade countries in electronics for the United States are China, Mexico, Japan, Malaysia, Taiwan, and Korea. China, Mexico, and Malaysia are trending upward, whereas Japan, Taiwan, and Korea are trending steadily downward (US International Trade Commission 2007). The upward trend of US imports during 2002 to 2006 was disrupted by the economic downturn in recent months as consumer buying power has been reduced, causing a negative chain reaction across all industries. The downturn has impacted both imports and exports. Note, however, that many exports to China and Mexico are component consignments to suppliers in those countries. For example, semiconductors are sent to China for computer and cellphone assemblies, and Maquiladora operations in Mexico finish assembly using US-consigned components (US Census Bureau 2009).

From these statistics we may infer that the demand-driven US market drives more and more companies to low-cost foreign suppliers to achieve lean and just-in-time operations. Witnessing the recent declines in the trade data, one cannot ignore the economic impact. In one industry after another, supply chains have been stretched further than they have ever been in the past and lean, just-in-time production schedules have made the consequences of a disruption more severe (Bosman 2006). With increasing supply chain complexity, key questions are (1) how should a company maintain its speed to market capability when a supply chain disruption
strikes? and (2) how will the company be able to achieve even better financial performance when the disruption is across the industry?

To answer these questions, we first review relevant studies on the subject. Key findings are listed in the literature review section. Second, we describe our framework and method for further analysis in the methodology section. Third, using an industrial printer company as an example, we analyze the data to test the proposed framework. Results of this analysis are listed in the analysis section. The research limitations section acknowledges the narrow scope of this research. The managerial implications section considers what supply chain managers need to know. The last two sections contain our conclusions and recommendations for future research.

**Literature Review**

Four areas of related work will provide insights into our research questions. They are supply chain disruption and its effect on financial performance, risk-mitigating strategies and business continuity plans, concerns for managing globalization and outsourcing risks, and customer footprints.

**Supply Chain Disruption and Its Effect on Financial Performance**

As part of its 2006 research on risk management, Accenture found that 73 percent of companies have experienced supply chain disruptions in the past five years. Of those, executives at nearly 33 percent of responding companies said it took more than one month to recover, and 36 percent said it took between one week and one month to recover. The vast majority (94%) said the disruption affected profitability and their company’s ability to meet customers’ expectations. Fifty-six percent said the impact on customers’ expectations was moderate or significant (Byrne 2007).

The more global the operations become, the more the supply chain risk grows. In the 2006 global operations study, Accenture found that few companies develop their global operations strategies with specific attention to managing supply chain risks. Seventy-five percent of respondents acknowledged that they have not fully integrated risk mitigation with their global operations strategies, and nearly 10 percent have done nothing (Byrne 2007).

So, what are the most frequent causes (factors) for supply chain disruptions? Accenture research indicates that the most frequent causes of disruption are those associated with supply chain partners, raw materials, and natural disasters—one factor from each of the three categories shown in figure 1. It is surprising that the more controllable events are generally the sources of the greatest disruption (Byrne 2007).
Research conducted by Hendricks and Singhal (2005) provides evidence of the economic consequences of disruptions. An analysis of financial performance of nearly 800 instances of disruptions at publicly traded firms reveals that most of these disruptions seemed to be caused by the firm’s inability to tightly manage and control its internal and external supply chain network. Companies that suffer from supply chain disruptions experience an average of 36.5 percent lower stock returns relative to their benchmarks over the three-year time period that begins one year before and ends two years after the disruption announcement date. In addition, these disruptions have a significant negative across-the-board effect on stock prices, profitability, and share-price volatility. After adjusting for industry and economic effects, the average effect of disruptions in the year leading to the disruption is an average 107.5 percent drop in operating income, a 7 percent decrease in sales growth, and 11 percent increase in cost. The average percentage change in Return on Assets and Return on Sales are 114.5 percent and 92.2 percent, respectively. The disruptions have a debilitating effect on performance. Firms do not quickly recover from disruptions and they continue to operate for at least two years at a lower performance level after experiencing disruptions. The bottom line—disruptions devastate corporate performance (Hofman 2006). For example, in March 2000, a lightning bolt that struck a Philips semiconductor plant in Albuquerque, New Mexico, created a ten-minute blaze that contaminated millions of chips.
and subsequently delayed deliveries to one of its largest customers, Sweden’s Ericsson. As a result, Ericsson reported a $400 million loss because it did not receive chip deliveries from the Philips plant in a timely manner (Handfield 2007).

Deloitte’s risk management study, *Disarming the Value Killers*, contained a major finding that various significant capitalization losses were credited to events that were considered unlikely and for which many companies failed to plan. Many companies lost more than 20 percent of their market value in the month after the negative event, and it often took more than a year before their shares regained their original levels (Bosman 2006).

One recent study argues, de facto, that supply chain disruptions are unavoidable and, as a consequence, all supply chains are inherently risky. Firms need to identify factors that must be considered when making decisions about whether to enact or implement specific operational and supply chain policies, practices, and initiatives (Handfield 2007). Other studies and articles corroborate the importance of planning. For example, Hendricks and Singhal (2005) suggested that planning and execution be integrated and synchronized. Anderson, Britt, and Favre (2007) emphasize the critical step of setting explicit outcome targets for revenue growth, asset utilization, and cost reduction. In addition, they highlight the importance of advance planning that specifies funding, leadership, and expected financial results.

*Risk-Mitigating Strategies and Business Continuity Plan*

Some articles and studies suggest using risk-mitigating strategies for business continuity. Bear in mind that they are focused on back-end processes and analysis. In other words, continuity planning is made after the processes have already been established. For example, a study done by the Risk Management Institute (RMI) at Northern Kentucky University shows that supply chain risk is a function of threat, vulnerability, and consequence. This model uses a fact-based quantitative approach to prioritize risk from a cross-functional perspective (Li 2008). “Supply Chain Interruption” and “Supply Exces Share Disaster Strategies” indicated the importance of having broad and deep business continuity plans that cover a wide range of contingencies, such as disaster recovery, safety of employees, retrieval of backup business data, emergency communications, possible relocation of business operations to an alternative location, and sourcing of goods from alternative suppliers. Procter & Gamble’s well-tuned business-continuity plan was used to illustrate its ability to find capacity for markets after Hurricane Katrina (Bednarz 2006; Brazeau 2006).
Concerns for Managing Globalization and Outsourcing Risks

In a study titled “Managing Business Risk in 2006 and Beyond” conducted by Harris Interactive, close to half of the more than 600 financial executive respondents said risks associated with globalization and outsourcing are only a low priority or concern for their organizations, potentially leaving their supply chains vulnerable. On average, respondents indicated the majority of their risk-management budgets are allocated to risk control (loss prevention) rather than risk transfer (buying insurance). North America–based companies are roughly twice as likely as their overseas counterparts to cite insufficient time, inadequate personnel, and insufficient budgets as the biggest obstacles to addressing top risks (Brazeau 2006). Many companies rush to revamp their supply chains without giving much thought (or data analysis) to the likelihood of supply chain disruption. As they outsource to China, Hungary, India, Malaysia, the Philippines, Vietnam, and other developing countries, they often unknowingly take on greater exposure to natural disasters, lower safety standards, and less reliable legal systems, among other risks (Bosman 2006).

Customer Footprints

It is important to minimize the impact of disruptions on a company’s financial performance. Equally important is recognizing the need to meet customer expectations in a timely manner, despite any disruptions. It would be a mistake to focus only on trying to manage catastrophic supply chain disruptions. Just as one major disaster can wipe out a company or product line, so too can a series of minor disruptions. For example, if a company is consistently a week late in meeting customer demand, or if retailers’ shelves are routinely not stocked with its products, the chances of the company staying in business fall precipitously. In short, good supply chain management considers more than costs; it also considers customer satisfaction (Bosman 2006). In fact, the loss of customers’ goodwill outweighs everything else. Simply doing the back-end mitigation of supply risk (Pickett 2006), having enterprise risk management and a business continuity plan, or buying insurance is not enough. A company must push the preventative process up front, prior to any disruptions.

Methodology

Based on the literature review, we developed a simple framework that incorporates a Disruption Contingency Plan (DCP) to provide business
continuity and opportunity to increase market share in the event of supply chain disruptions, thus creating normal or above-normal profits. The following simple equivalent expressions sum up the proposed framework for the DCP.

Disruption Contingency Plan $\equiv$ Business Continuity + Market Share $\equiv$ Normal or Above–Normal Profits

Today, low-cost country sourcing (LCCS) has become a standard competitive strategy in many industry sectors (Handfield 2007). The electronics industry is no exception. For example, a US Midwest-based industrial printer manufacturer outsourced some of its product lines to China and ocean-freighted them back to a distribution center for inventory (push) and final light assembly (pull) to American markets. For companies that have yet to explore LCCS options or for those that desire to reevaluate their supply chains, a rather elegant approach to further differentiate themselves from their competitors is to set up a front process, such as DCP, to evaluate all the potential pitfalls before a decision is made. In an adapted closed-loop outsourcing decision model (Kumar and Eichhoff 2005/2006), we have identified a point where such a DCP should be placed. Figure 2 displays each decision point in detail. The LCCS exercise starts with a “make or buy” action, followed by extensive points of internal and vendor assessment. DCP is the last line of defense right after the risks and the total cost have been considered. An “N” (“No”) denotation for DCP will lead to a “Do Not Outsource” decision.

Within the contingency plan, a broad and deep business continuity plan should be covered, such as disaster recovery, safety of employees, retrieval of backup business data, emergency communications, and possible relocation of business operations to an alternative location. More importantly, when it comes to meeting market demands to prevent loss of customers’ goodwill, a thorough plan that examines a comprehensive list of “what if” scenarios is essential for getting products to customers in a timely manner, thus ensuring mutual profitability. Not only that, when competitors are also impacted by the disruption, companies positioned to get products to the market will likely gain market share for above-normal profits.

In constructing “what if” scenarios, triangular distribution is used to estimate the duration of disruption, given the limited sample data. It is based on knowledge of the minimum and maximum and a guessed model value (Brighton Webs Ltd. 2008). Maximum disruption period is estimated at 12 weeks, minimum at 2 weeks, and the guessed mode at 6 weeks. The mean is 6.7 weeks with one standard deviation at 5 weeks.
Two main business alternatives—single sourcing and dual sourcing—are presented to compare a company’s existing supply chain without a DCP and a redesigned supply chain with a DCP during each disruption period after safety stock runs out. The first alternative (single sourcing) is used to compare an existing supply chain without a plan and a redesigned supply chain with a DCP.
supply chain with a plan. It explores the options of maintaining above safety stock inventory, using alternative transportation, buying business interruption insurance, and having extra capacity to ensure normal profits since the first two costs are the biggest factors in the supply chain. The second alternative (dual sourcing), used to further examine the redesigned supply chain with a plan, combines “near shoring” and “dual sourcing” concepts to reach above normal profits (Sheffi 2001; Pochard 2003; Bartholomew 2006; Rizza 2007; Lee and Whang 2008). And finally, Economic Value Added (EVA) is used for both single sourcing and dual-sourcing alternatives to measure the company’s financial performance. The invested capital (above safety stock inventory) and the cost of capital should be considered. EVA is based on the residual wealth calculated by deducting cost of capital from its operating profit (adjusted for taxes on a cash basis).

Analysis
The previously described industrial printers are used for analysis purposes. The particular printer model is one of many product lines marketed by a mid-sized US company. Printer cost is based on a specific model made in China at $550. Printer selling price is gathered from a period of five weeks to arrive at an average of $850. Selling, general and administration (S G&A) expense is estimated at 25 percent of sales. The standard “rule of thumb” for inventory carrying cost is 25 percent of inventory value on hand. Total inventory costs can be estimated as follows:

<table>
<thead>
<tr>
<th>Cost of capital</th>
<th>6%–12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxes</td>
<td>2%–6%</td>
</tr>
<tr>
<td>Insurance</td>
<td>1%–3%</td>
</tr>
<tr>
<td>Warehouse Expenses</td>
<td>2%–5%</td>
</tr>
<tr>
<td>Physical Handling</td>
<td>2%–5%</td>
</tr>
<tr>
<td>Clerical &amp; Inventory Control</td>
<td>3%–6%</td>
</tr>
<tr>
<td>Obsolescence</td>
<td>6%–12%</td>
</tr>
<tr>
<td>Deterioration &amp; Pilferage</td>
<td>3%–6%</td>
</tr>
<tr>
<td>Total</td>
<td>25%–55%</td>
</tr>
</tbody>
</table>

In our analysis, the inventory carrying cost is estimated at 25 percent and is broken down into cost of capital at 10 percent and the rest at 15 percent. Income Taxes are estimated at 35 percent. The additional inventory tied-up
capital is insured at a 2 percent premium rate. The following assumptions are made:

1. Demand is certain at 100 units per week.
2. Lead time to inventory is certain at seven weeks (two weeks production and four to five weeks in ocean transit).
3. Safety stock is set at two weeks.
4. The distribution center receives one container load (200 units) every two weeks.

For illustration purposes, table 1 (T1), table 2 (T2), and table 3 (T3) are created for the single-sourcing alternative; and table 4 (T4) and table 5 (T5) are created for the dual-sourcing alternative.

**Table 1/(Single Sourcing) An Illustration of Annual EVA Effect with No SC DCP during Each Stock Out Situation Ranging from Scenario A at Two Weeks Stock Out to Scenario E at Six Weeks Stock Out**

<table>
<thead>
<tr>
<th>Weekly Demand</th>
<th>$850</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Scenario A</th>
<th>Scenario B</th>
<th>Scenario C</th>
<th>Scenario D</th>
<th>Scenario E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printer Quantity</td>
<td>5200</td>
<td>5000</td>
<td>4900</td>
<td>4800</td>
</tr>
<tr>
<td>Extra Inventory</td>
<td>(200)</td>
<td>(300)</td>
<td>(400)</td>
<td>(500)</td>
</tr>
</tbody>
</table>

**Income Statement**

| Sales | $4,420,000 |
| CGS | $2,860,000 |
| Gross Margin | $1,560,000 |
| Gross Margin Percentage | 35% |

| S G&A 25% | $1,105,000 |
| Extra Inventory Carrying Cost 15% | $1,062,500 |
| Extra Risk Insurance Premium | $1,041,250 |
| Transportation (Airfreight) | $1,020,000 |
| Total S G&A | $998,750 |

**Inventory Covered by Insurance**

| Operating Profit (EBIT) | $455,000 |
| Income Taxes 35% | $159,250 |
| Net Operating Profit after Tax | $295,750 |
| Capital Charges 10% (Invested Capital X Cost of Capital) | $284,375 |

**Economic Value Added (EVA)**

<table>
<thead>
<tr>
<th>Annual</th>
<th>T1 - 2 wks out</th>
<th>T1 - 3 wks out</th>
<th>T1 - 4 wks out</th>
<th>T1 - 5 wks out</th>
<th>T1 - 6 wks out</th>
</tr>
</thead>
<tbody>
<tr>
<td>$295,750</td>
<td>$284,375</td>
<td>$278,688</td>
<td>$273,000</td>
<td>$267,313</td>
<td>$261,625</td>
</tr>
<tr>
<td>Compared to Normal Sales</td>
<td>($11,375)</td>
<td>($17,063)</td>
<td>($22,750)</td>
<td>($28,438)</td>
<td>($34,125)</td>
</tr>
<tr>
<td>OP Profit Percentage Change</td>
<td>-4%</td>
<td>-6%</td>
<td>-8%</td>
<td>-10%</td>
<td>-12%</td>
</tr>
</tbody>
</table>
Table 1 illustrates extreme circumstances when a company’s existing supply chain is not prepared for disruptions. Scenario A, a two-week stock-out situation, occurs when the safety stock runs out. The same situation applies to three to six weeks (triangular distribution mean). Its annual EVA is shown in the bottom section at each stock-out situation. The degree of percentage change is reflected in the bottom section. The effect is negative compared to normal annual sales revenue because the company’s existing supply chain does not have any inventory to meet market demands. The likelihood of losing customers’ goodwill is very high.

Table 2 (Single Sourcing) An Illustration for the Redesigned Supply Chain to Achieve Normal Annual Sales by Using Hybrid Options in Preparing for DCP

### Table 1: Existing Supply Chain

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$2,860,000</td>
<td>$2,860,000</td>
<td>$2,860,000</td>
<td>$2,860,000</td>
<td>$2,860,000</td>
<td>$2,860,000</td>
</tr>
<tr>
<td>B</td>
<td>$3,300</td>
<td>$3,300</td>
<td>$3,300</td>
<td>$3,300</td>
<td>$3,300</td>
<td>$3,300</td>
</tr>
<tr>
<td>C</td>
<td>$3,750</td>
<td>$3,750</td>
<td>$3,750</td>
<td>$3,750</td>
<td>$3,750</td>
<td>$3,750</td>
</tr>
<tr>
<td>D</td>
<td>$4,200</td>
<td>$4,200</td>
<td>$4,200</td>
<td>$4,200</td>
<td>$4,200</td>
<td>$4,200</td>
</tr>
<tr>
<td>E</td>
<td>$4,650</td>
<td>$4,650</td>
<td>$4,650</td>
<td>$4,650</td>
<td>$4,650</td>
<td>$4,650</td>
</tr>
</tbody>
</table>

### Table 2: Redesigned Supply Chain with DCP

<table>
<thead>
<tr>
<th>Weekly Demand</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales per Unit</td>
<td>$850</td>
</tr>
<tr>
<td>CGS per Unit</td>
<td>$550</td>
</tr>
</tbody>
</table>

### Income Statement

**Sales**
- $4,420,000
- $4,420,000
- $4,420,000
- $4,420,000
- $4,420,000
- $4,420,000

**CGS**
- $2,860,000
- $2,860,000
- $2,860,000
- $2,860,000
- $2,860,000
- $2,860,000

**Gross Margin**
- $1,560,000
- $1,560,000
- $1,560,000
- $1,560,000
- $1,560,000
- $1,560,000

**Gross Margin Percentage**
- 35%
- 35%
- 35%
- 35%
- 35%
- 35%

**S G&A 25%**
- $1,105,000
- $1,105,000
- $1,105,000
- $1,105,000
- $1,105,000
- $1,105,000

**Extra inventory Carrying Cost 15%**
- $16,500
- $24,750
- $33,000
- $41,250
- $50,000
- $2,200

**Extra Risk Insurance Premium 2%**
- $2,200
- $3,300
- $4,400
- $5,500
- $2,200

**Total S G&A**
- $1,105,000
- $1,123,700
- $1,133,050
- $1,142,400
- $1,151,750
- $1,144,700

**Inventory Covered by Insurance**
- $110,000

**Operating Profit (EBIT)**
- $455,000
- $436,300
- $426,950
- $417,600
- $408,250
- $399,900

**Income Taxes 35%**
- $159,250
- $152,705
- $149,433
- $146,160
- $142,888
- $142,888

**Net Operating Profit after Tax**
- $295,750
- $283,595
- $277,518
- $271,440
- $265,363
- $341,445

**Capital Charges 10% (Invested Capital X Cost of Capital)**
- $11,000
- $16,500
- $22,000
- $27,500
- $33,000

**Economic Value Added (EVA)**
- $295,750
- $272,595
- $261,018
- $249,440
- $237,863
- $330,445

**Compared to Normal Sales**
- ($23,155)
- ($34,733)
- ($46,310)
- ($57,888)
- $34,695

**OP Profit Percentage Change**
- –8%
- –12%
- –16%
- –20%
- 12%
Table 3/(Single Sourcing) An Illustration for the Redesigned Supply Chain to Achieve above Normal Annual Sales Revenue by Using Hybrid Options in Preparing for DCP

Redesigned Supply Chain with DCP

<table>
<thead>
<tr>
<th>Weekly Demand</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales per Unit</td>
<td>$850</td>
</tr>
<tr>
<td>CGS per Unit</td>
<td>$550</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario A</th>
<th>Scenario B</th>
<th>Scenario C</th>
<th>Scenario D</th>
<th>Scenario E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Sales</td>
<td>$200</td>
<td>$300</td>
<td>$400</td>
<td>$500</td>
</tr>
<tr>
<td>Extra Sale</td>
<td>$300</td>
<td>$450</td>
<td>$600</td>
<td>$750</td>
</tr>
<tr>
<td>Tied up Capital</td>
<td>$165,000</td>
<td>$247,500</td>
<td>$330,000</td>
<td>$412,500</td>
</tr>
<tr>
<td>Risk Insurance Premium 2%</td>
<td>$3,300</td>
<td>$4,950</td>
<td>$6,600</td>
<td>$8,250</td>
</tr>
<tr>
<td>Extra Capacity</td>
<td>600 available</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Income Statement

Sales | $4,420,000 | $4,505,000 | $4,547,500 | $4,590,000 | $4,632,500 | $4,675,000
CGS | $2,860,000 | $2,915,000 | $2,942,500 | $2,970,000 | $2,997,500 | $3,025,000
Gross Margin | $1,560,000 | $1,590,000 | $1,605,000 | $1,620,000 | $1,635,000 | $1,650,000
Gross Margin Percentage | 35% | 35% | 35% | 35% | 35% | 35%
S G&A 25% | $1,105,000 | $1,131,750 | $1,142,375 | $1,153,000 | $1,163,625 | $1,174,250
Extra Inventory Carrying Cost 15% | $24,750 | $37,125 | $49,500 | $61,875 | $8,250 |
Extra Risk Insurance Premium (Airfreight) | $3,300 | $4,950 | $6,600 | $8,250 | $3,300 |
Transportation (Airfreight) | $31,500 |
Total S G&A | $1,258,250 |
Inventory Covered by Insurance | $165,000 |
Operating Profit (EBIT) | $455,000 | $432,200 | $420,550 | $410,900 | $401,250 | $581,200 |
Income Taxes 35% | $159,250 | $150,570 | $147,193 | $143,815 | $140,438 | $203,420 |
Net Operating Profit after Tax | $295,750 | $281,630 | $273,358 | $267,085 | $260,813 | $377,780 |
Capital Charges 10% (Invested Capital X Cost of Capital) | $0 | $16,500 | $24,750 | $33,000 | $41,250 | $16,500 |
Economic Value Added (EVA) | $295,750 |

Compared to Normal Sales

<table>
<thead>
<tr>
<th>Annual</th>
<th>T3 - Extra Sales</th>
<th>T3 - Extra Sales</th>
<th>T3 - Extra Sales</th>
<th>T3 - Extra Sales</th>
<th>T3 - Extra Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>$263,130</td>
<td>$248,608</td>
<td>$234,085</td>
<td>$219,563</td>
<td>$361,280</td>
</tr>
<tr>
<td>OP Profit Percentage Change</td>
<td>-11%</td>
<td>-16%</td>
<td>-21%</td>
<td>-26%</td>
<td>-25%</td>
</tr>
</tbody>
</table>

Compared to Normal Sales

<table>
<thead>
<tr>
<th>Annual</th>
<th>T3 - Extra Sales</th>
<th>T3 - Extra Sales</th>
<th>T3 - Extra Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>$32,620</td>
<td>$47,143</td>
<td>$61,665</td>
</tr>
<tr>
<td>OP Profit Percentage Change</td>
<td>-11%</td>
<td>-16%</td>
<td>-21%</td>
</tr>
</tbody>
</table>

an additional 200 units at $110,000 are carried with $2,200 insurance premium during normal times. EVA shows negative percentage value doubled to -8 percent in comparison with that of existing supply chain at -4 percent. It can be assumed without further analysis that not too many companies would be willing to see negative EVA just to prepare for supply chain disruptions (SCDs). Therefore, Scenario E is presented just to cover the EVA shortfall. It illustrates that to maintain normal annual sales revenue, the redesigned supply chain would use a hybrid of carrying additional inventory during normal times (200 units at $110,000), insure additional inventory under business interruption insurance ($110,000 for 200 units), and ship airfreight for available capacity (400 units). It can be done with careful planning. EVA shows positive percentage change at 12 percent from normal sales.

Scenarios A to D in table 3 provide illustrations with an objective to achieve above-normal annual sales revenue. Here, an additional 300 units

Weekly Demand 100
Sales per Unit $850
CGS per Unit $550

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100 Units</td>
<td>$200</td>
<td>$300</td>
<td>$400</td>
<td>$500</td>
<td>$600</td>
</tr>
<tr>
<td>B</td>
<td>150 Units</td>
<td>$200</td>
<td>$300</td>
<td>$400</td>
<td>$500</td>
<td>$600</td>
</tr>
<tr>
<td>C</td>
<td>200 Units</td>
<td>$200</td>
<td>$300</td>
<td>$400</td>
<td>$500</td>
<td>$600</td>
</tr>
<tr>
<td>D</td>
<td>250 Units</td>
<td>$200</td>
<td>$300</td>
<td>$400</td>
<td>$500</td>
<td>$600</td>
</tr>
<tr>
<td>E</td>
<td>300 Units</td>
<td>$200</td>
<td>$300</td>
<td>$400</td>
<td>$500</td>
<td>$600</td>
</tr>
</tbody>
</table>

Printer Quantity $200
Extra Inventory 300
Tied up Capital $165,000
Risk Insurance Premium 2% $3,300
Extra Capacity 600 available

Economic Value Added (EVA) $295,750

Compared to Normal Sales $32,620
OP Profit Percentage Change -11%
at $165,000 are carried with a $3,300 insurance premium during normal times under scenario A. EVA shows the negative percentage value at −11 percent to normal sales in comparison with that of existing supply chain at −4 percent. Given that not many companies would be willing to see negative EVA just to prepare for SCD, scenario E is presented to cover the EVA shortfall. It illustrates that to maintain above-normal annual sales revenue, the redesigned supply chain would use a hybrid of carrying additional inventory during normal times (300 units at $165,000), insuring additional inventory under business interruption insurance ($165,000 for 300 units), and shipping airfreight for available capacity (600 units). With these implementations, EVA shows positive percentage change at 12 percent from normal sales. Figure 3, created from the bottom three rows of tables 1–3, shows a comparison of tables 1–3 in terms of EVA and speed to market between the existing supply chain and the redesigned supply chain during SCD. The abrupt rise showing positive EVA in figure 3 represents scenario E in tables 2 and 3. When the DCP in the redesigned supply chain includes speed-to-market factor, above-normal sales is attainable even during SCD.

Figure 3 EVA and Speed-to-Market Analysis between an Existing Supply Chain and the Redesigned Supply Chain Using Hybrid Options during SCD
Tables 4 and 5 illustrate effects of added “near shoring” and “dual sourcing” processes. In addition to outsourcing to China for 90 percent of supply ratio at $550 per printer, the redesigned supply chain also uses a back-up supplier in Mexico for 10 percent of supply ratio at $630 per printer (15% higher cost). During normal times, the China supplier supplies 4,680 units, while the Mexico supplier supplies 520 units. In Table 4, to achieve normal annual sales revenue during SCD, the redesigned supply chain uses a hybrid of dual sourcing with one supplier much closer to the United States (Mexico), plans for extra capacity from the back-up supplier, and insures the cost difference between the two suppliers under business risks.
Table 5/(Dual Sourcing) An Illustration for the Redesigned Supply Chain to Achieve Above-Normal Annual Sales Revenue by Using Near Shoring, Dual Outsourcing, and Insurance in Preparing for DCP

Redesigned Supply Chain With DCP

<table>
<thead>
<tr>
<th>Weekly Demand</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Per Unit</td>
<td>$850</td>
</tr>
<tr>
<td>CGS per Unit China</td>
<td>$550 (90% Volume)</td>
</tr>
<tr>
<td>CGS per Unit Mexico</td>
<td>$630 (10% Volume; Capable of extra capacity)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario A</th>
<th>Scenario B</th>
<th>Scenario C</th>
<th>Scenario D</th>
<th>Scenario E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printer Quantity</td>
<td>5200</td>
<td>5300</td>
<td>5350</td>
<td>5400</td>
</tr>
<tr>
<td>Extra Inventory</td>
<td>4680</td>
<td>4,500</td>
<td>4,410</td>
<td>4,320</td>
</tr>
<tr>
<td>Dual Sourcing Qty - China</td>
<td>520</td>
<td>800</td>
<td>940</td>
<td>1,080</td>
</tr>
<tr>
<td>Dual Sourcing Qty - Mexico</td>
<td>4,680</td>
<td>4,500</td>
<td>4,410</td>
<td>4,320</td>
</tr>
<tr>
<td>Risk Insurance Amount</td>
<td>$64,000</td>
<td>$75,200</td>
<td>$86,400</td>
<td>$97,600</td>
</tr>
<tr>
<td>Risk Insurance Premium 2%</td>
<td>$1,280</td>
<td>$1,504</td>
<td>$1,728</td>
<td>$1,952</td>
</tr>
</tbody>
</table>

Income Statement

| | Sales $4,420,000 | $4,505,000 | $4,547,500 | $4,590,000 | $4,632,500 |
| | CGS $2,901,600 | $2,979,000 | $3,017,700 | $3,056,400 | $3,095,100 |
| | Gross Margin $1,518,400 | $1,526,000 | $1,529,800 | $1,533,600 | $1,537,400 |
| | 34% | 34% | 34% | 33% | 33% |
| | S & G&A 25% | $1,105,000 | $1,127,300 | $1,138,379 | $1,149,228 | $1,160,077 |
| | Extra inventory Carrying Cost 15% | $1,128,810 | $1,139,883 | $1,150,956 | $1,162,029 | $1,173,102 |
| | Extra Risk Insurance Premium | $1,280 | $1,504 | $1,728 | $1,952 | $2,176 |
| | Total S & G&A | $1,105,000 | $1,128,810 | $1,139,883 | $1,150,956 | $1,162,029 |
| | Operating Profit (EBIT) $413,400 | $461,190 | $469,004 | $472,971 | $476,898 |
| | Income Taxes 35% | $144,690 | $161,417 | $162,791 | $165,450 | $166,914 |
| | Net Operating Profit After Tax | $268,710 | $299,774 | $302,326 | $304,879 | $309,984 |
| | Capital Charges 10% | | | | | |
| | Economic Value Added (EVA) $268,710 | $299,774 | $302,326 | $304,879 | $309,984 |
| | Compared to Normal Sales | | | | | |
| | OP Profit Percentage Change -9% | 1% | 2% | 3% | 4% | 5% |

Interruption insurance. For example, in scenario A, to achieve normal annual sales revenue, the redesigned supply chain has the Mexico supplier ship 180 more units (difference between 700 units and 520 units) because the China supplier has no products to ship due to SCD. The cost difference between the two suppliers is insured for $56,000 at a 2 percent premium rate ($1,120). During the disruption, the redesigned supply chain is not only able to maintain normal sales revenue with dual sourcing, but its insurance also covers the cost difference, resulting in no EVA (0%) change compared to normal annual sales revenue. The issue of this dual sourcing model is the −9 percent EVA during normal times. Because the company may not be willing to have −9 percent EVA during normal times just to prepare for SCP,
certain trade-offs and checks and balances need to be done for better EVA during normal times (e.g., lower suppliers cost, and adjust supply ratio).

In Table 5, the redesigned supply chain uses the same approaches as those in Table 4, but with an objective to achieve above normal annual sales during SCD. For example, in scenario A, to achieve above-normal annual sales, the redesigned supply chain has the Mexico supplier ship 280 more units (difference between 800 units and 520 units) because the China supplier has no products to ship due to SCD. The cost difference between the two suppliers is insured for $64,000 at a 2 percent premium rate ($1,280). As in Table 4, the redesigned supply chain is not only able to achieve above-normal sales revenue with dual sourcing during the disruption, but its insurance also covers the cost difference, resulting in positive EVA (from 1% to 5%) change compared to normal annual sales. The issue of this dual sourcing model is the −9 percent EVA during normal times. Again, since the company may not be willing to have −9 percent EVA during normal times just to prepare for SCP, certain trade-offs need to be done for better EVA during normal time. Based on data from the bottom three rows of Tables 4 and 5, Figure 4 shows a comparison of Tables 4 and 5.

Figure 4 EVA and Speed to Market Analysis between an Existing Supply Chain and the Redesigned Supply Chain Using Near Shoring, Dual Sourcing and Insurance during SCD.
in terms of EVA and speed to market between the existing and redesigned supply chain during SCD. The slightly upward EVA represents the benefits of achieving above-normal sales revenue. When the DCP in the redesigned supply chain includes speed-to-market factor, above-normal sales revenue is attainable even during SCD, although further trade-off analysis needs to be done to bring EVA closer to zero percent during normal times.

**Managerial Implications**

Supply chain managers should be aware that even minor supply chain disruptions can have a negative impact on financial performance because small disruptions have a cumulative effect. While Accenture’s research tells us that the more controllable events actually cause the greatest disruption, managers ought to rethink how they manage their existing supply chains. When numerous studies demonstrate that SCD is fundamentally inevitable, what can managers do to brace for the impact? What can managers do, not only to absorb the impact, but also to transform into the company’s competitive advantage?

Savvy managers should always expect SCD, whether minor or major. Safeguard or risk mitigation is usually in place only to prevent the loss of normal sales. But what about when the impact is industry-wide? Will the company suffer along with others? Or, on the contrary, will it thrive? A smart manager will have a plan that allows for the opportunity to increase market share when SCD strikes. Never let a good crisis go to waste. Even before the off-shoring decision is made, strategies such as risk transfer (disruption insurance), near shoring, and dual outsourcing should be considered (Pochard 2003; Kumar, DuFresne, and Hahler 2007; Wu and Tomlin 2008). A strong off-shoring strategy must include a sound contingency plan to maintain normal sales levels. However, those who expect and are prepared for supply chain disruptions will have greater opportunities to achieve normal or above normal profits in the long run.

**Research Limitations**

The scope of this research is narrow, focusing on incorporating a disruption contingency plan into a closed-loop outsourcing decision model. It emphasizes the market share opportunity when the plan is placed according to a company’s competitive advantage in speed to market. Only one product line is used for illustration. Factors such as quality, capacity, demand uncertainty, lead time uncertainty, degree of disruption and Mexico-US transportation expediting cost are not included in the analysis.
Conclusions and Recommendations for Future Research

This research shows that in addition to maintaining business continuity, smart companies can plan above and beyond for opportunities to increase market share during supply chain disruption. The supply chain risk model developed by RMI at Northern Kentucky University is a very good tool to include in the business continuity analysis for maintaining normal sales. To reach a real trade-off in our model, DCP ⇔ Business Continuity + Market Share ⇔ Normal or Above-Normal Profits, variables mentioned in the research limitations should be considered and extensive analyses must be performed.

Our model is far more complex than it appears on the surface. A systematic approach with good data would be required. Specifically, factors such as quality, capacity, demand uncertainty, lead-time uncertainty, degree of disruption, and Mexico-US transportation expediting costs should be considered in developing a comprehensive closed-loop outsourcing decision model. Further research on system capabilities would be helpful in assisting companies that are willing to invest to sustain a workable DCP strategy.

References


Book Review


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The maritime transportation industry consists of firms engaged in the liner trade, tramp services, private carriers, shoreside services providers, and an array of intermediaries. From the standpoint of freight movers these industry segments can be further disaggregated into container lines, breakbulk carriers, roll-on roll-off lines, liquid bulk carriers, and dry bulk carriers. Passenger transporting carriers, mainly cruise lines and ferry operators, round out the list of vessel operating firms. Port facilities, whether owned or operated by private firms or public agencies, also require stevedoring firms, breakbulk facilities, barge and lighterage providers, bunkerage and ships stores provisioners, and tugboat operators. Any book calling itself a handbook of this business would, by definition, need to be a most complex undertaking that would likely be presented as a multivolume offering.

One cannot engage in a thorough understanding of the maritime business without first also obtaining a grounding in the roles of the intermediaries involved, which can be segmented into those focusing on carriers and those for shippers. Ship agents and shipbrokers arrange for vessel charters, long-term and voyage, respectively. The other intermediaries could include the insurance carriers, nonvessel-operating common carriers (NVOCC), coopers, marine surveyors, and freight forwarders. Added to these would also be the admiralty law firms—that specific branch of the legal profession dealing with contracts and disputes most often involving losses.
The various rules governing liability, the flagging sovereignty of vessels, laws of cabotage, and vessel crewing are unique to this mode. Practitioners are involved with arranging for transportation, insuring the goods during movement, loading and unloading cargo, conducting linehaul transportation, preparing documentation, coordinating between participants including shippers and consignees, and settling legal disputes. Therefore, to say that the maritime industry is in serious need of a comprehensive handbook that could serve as a roadmap for the uninitiated as well as the novice practitioner is to merely state the obvious.

Inasmuch as Webster defines a handbook as “a) a book capable of being conveniently carried as a ready reference manual; and b) a concise reference book covering a particular subject,” the work reviewed clearly is neither. Second, a handbook usually suggests utility for a certain audience, in the case of this book, supply chain practitioners, again a matter that could prove doubtful given the esoteric nature of many of its chapters. Finally, a handbook typically attempts to focus its topical coverage within clearly established parameters, which does not appear to be the case given the aforementioned key issues of the industry.

Following the editor’s comments, which comprise chapter 1, one encounters a valuable discussion of supply chain efficiency in general and port efficiency, specifically, in its addressing of both bulk as well as containerized cargoes. The principal message is that any given port is an element in myriad supply chains, each with a different set of strategic imperatives, is one worth remembering. This is especially the case given, that ports must respond to a range of different demands expressed by shippers and consignees dealing in cargoes of different values, volumes, temporal sensitivities, and regulatory restrictions. Any single port will thus be a node in potentially thousands of individual supply chains.

The remainder of the book consists of fifteen chapters representing an eclectic mix of topics that includes the various issues of shippers and consignees dealing with ports, terminals, containerized cargoes, the liner industry, and how the maritime industry fits into the overall theme of integrated logistics—indeed representing a far-too-brief primer on these topics. Among the final chapters one finds the treatment of such perhaps out-of-scope topics as investment in the European ferry markets, hedging in the Capesize forward freight market, and the training of dual-purpose officers. All three chapters make for interesting reading, but each is clearly out of place with the twelve preceding chapters and are hardly issues worthy of coverage in a handbook intended for a general audience.
Moreover, these three chapters do not share common themes with one another, prompting the reader to question their utility for a book intended for a general audience.

The foregoing comments, however, is not to suggest that this book carries no merit, because it clearly does. Those potential readers who look for this volume to fill its intended niche of being a handbook will, of course, be disappointed that it is not a reference manual per se to which they can turn in search of answers to questions of a practical nature. For those students of logistics and supply chain management, including many academics, the book may prove valuable insofar as each chapter contains a robust list of cited materials.
Air Transport

Book Reviews

Collaboration and Relationship Management

Information Systems and Technologies

International Transport

Logistics/Physical Distribution/Supply Chain Management
**Maritime Transport**


**Motor Transport**


**Notes and Comments**


**Research, Education, and Professional Development**


Pohlen, T. L. “Meeting the Challenge of Educating the Transportation and Logistics Professional: The American

Transport Policy