Identification of factors responsible for successes or failures in the supply chain based on real-world case studies

By
Georgios Simotas
Diploma in Naval Architecture and Marine Engineering, 2006
National Technical University of Athens, Greece

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Signature of Author

Department of Civil and Environmental Engineering
May 18, 2007

Certified by
Henry S. Marcus
Professor of Marine Systems of the Department of Mechanical Engineering
Thesis Supervisor

Certified by
Nigel H M Wilson
Professor of the Department of Civil and Environmental Engineering
Thesis reader

Accepted by
Daniele Veneziano
Chairman, Departmental Committee for Graduate Studies
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Abstract

The decision of firms from industrialized nations to outsource part or all of their supply chain activities to offshore countries, like in China, carries with it two major issues. The first is related to the costs and benefits of outsourcing and the second to risks and problems that may arise in-between the supply chain participants. A supply chain vulnerability analysis is currently performed under the “Speed to Market” project. The ultimate output of the project will be a software model capable of improving the ability of companies to ship intermediate or finished products to and from China. The purpose of my research is to identify the factors that are mostly responsible for the strength or volatility of the supply chain of a firm and come to conclusions about the questions that a firm has to answer before taking the decision to outsource. Such questions usually arise throughout the supply chain and are related to suppliers, inventories, demand forecasting and intellectual property issues.

Thesis Supervisor: Henry S. Marcus
Title: Professor of Marine Systems, Department of Mechanical Engineering
Table of Contents

Abstract ............................................................................................................................... 3
Table of Contents ................................................................................................................. 4
Acknowledgements ........................................................................................................ 6
Chapter 1 - Introduction .................................................................................................... 7
  1.1 Motivation ........................................................................................................ 7
  1.2 Scope of Research Report .................................................................................. 8
  1.3 Chapter Summary .......................................................................................... 10
Chapter 2 - Outsourcing to China ................................................................................. 13
  2.1 Overview ........................................................................................................ 13
  2.2 Incentives for Offshore Outsourcing ................................................................. 15
  2.3 Risks of Outsourcing ...................................................................................... 17
Chapter 3 - The Importance of Suppliers .................................................................... 21
  3.1 Overview ........................................................................................................ 21
  3.2 Relationships between suppliers and firms – Insightful Cases...................... 23
  3.3 Starting up or improving a relationship with a supplier ................................. 29
  3.4 Multiple Suppliers vs. Single Sourcing - Emergency Case Suppliers .......... 34
  3.5 Partnership developed on trust ..................................................................... 39
  3.6 JIT System – Beneficial but needs to anticipate possible disruptions .......... 42
Chapter 4 - Inventory Management .............................................................................. 44
  4.1 Why is inventory management important? ..................................................... 44
  4.2 How is inventory linked to demand forecasting accuracy? ......................... 45
  4.3 The trade-off between inventory level and customer service ....................... 46
  4.4 The Product Life Cycle, Demand Uncertainty, and Inventory Level .......... 47
  4.5 Inventory costs ............................................................................................... 48
  4.6 Just-In-Time Inventory Management ............................................................... 50
  4.7 Inventory Management Strategies ................................................................ 52
  4.8 Conclusions .................................................................................................... 54
Chapter 5 - Demand Uncertainty - Causes & Strategies ............................................. 56
5.1 Overview....................................................................................................... 56
5.2 Causes of the "bullwhip" effect ................................................................. 57
5.3 Strategies to eliminate the "bullwhip" effect........................................... 61
5.4 Reduce demand uncertainty using postponement................................. 63
5.5 How to organize production schedule for seasonal products.............. 65
5.6 Restructuring demand forecasting - The Gillette case.......................... 66
5.7 Functional vs. Innovative products - Differences in demand................. 69
5.8 Reduce uncertainty using risk hedging - The Victoria’s Secret case...... 70

Chapter 6 – Intellectual Property Protection................................................. 73
6.1 Overview..................................................................................................... 73
6.2 Counterfeiting business in China.............................................................. 75
6.3 The risk of logo or brand name imitation - The Toyota lawsuit............. 79
6.4 The risk of product imitation & competition from current suppliers........ 80
6.5 Strategies to Mitigate Intellectual Property Risk...................................... 82

Chapter 7 – Questions to Answer Before Outsourcing................................... 87
7.1 Overview..................................................................................................... 87
7.2 What to know before setting up a supply chain...................................... 88

Chapter 8 – Conclusions ............................................................................... 96
References & Bibliography.............................................................................. 97
Appendix.......................................................................................................... 102
Required information to answer the questions of Chapter 7...................... 102
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Chapter 1 - Introduction

1.1 Motivation

After the admission of China to the World Trade Organization in December 2001, it has become a huge manufacturing center that supports and hosts supply chain activities of firms from around the globe. This fact means that China is the epicenter of most economic and trade activities and international firms use China not only as a low cost production place, but also as a huge potential market. Many US companies outsource their manufacturing activities to low labor cost regions in China, trying to cut the total logistics cost. Other firms create regional offices or headquarters there and use China as a place where innovative solutions and new product designs can take place.

In this regard, there is growing demand for high value intermediate or semi processed goods or materials to be shipped between China and industrialized nations both ways, either directly or through hub ports. However, this brings to the table a number of issues and questions for the stakeholders of the supply chain. From the raw materials to the finished products and delivery of them on the shelf, there should be an underlying strategy that allows for performance and efficiency to be achieved. Without a well-designed supply chain strategy, an international firm may decide to outsource part or all of its supply chain activities under the common fact of low cost, but it may face very serious problems such as intellectual property protection issues, stock-outs or huge inventories in its warehouses in the US and more general problems that do not arise or are not considered when manufacturing or, in general, outsourcing, takes place near to the consumption places. Under these facts, companies look for best strategies and well-working tools to enhance their outsourcing activities, especially offshore.

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Currently, a supply chain vulnerability analysis of many US firms is performed under the “Speed to Market” project. The ultimate objective of the project will be a software model that will be valuable to both the industry and academia. Based on real-world data and available case studies and detailed analysis of a broad range of current and potential firms operating in the Asia Pacific, this model will describe and map an import-export supply chain with distinct operating characteristics in terms of process sequencing, order scheduling, logistics, and inventory management. In addition, companies will be able to use this model to improve their ability to ship intermediate goods into China, add value to them, and export finished goods out of China.

1.2 Scope of Research Report

The issues mentioned earlier together with more specific matters related to each part and participant of the supply chain of a firm lead to a number of questions that must be answered by supply chain managers before taking the decision to outsource either locally or offshore in order to achieve an acceptable or pre-determined level of strength and reliability of the supply chain. A small pool of important questions that arise when thinking of outsourcing is the following:

- What is the underlying reason of outsourcing? Is it cost-related?
- What products and technologies to outsource?
- Is the product innovative or fashionable? Is it a commodity?
- What software and technology to use in the production line?
- Can suppliers to use this software and technology in their production line?
- With whom vendors and suppliers to cooperate?
- How many suppliers should the firm use in the pool of trusted suppliers?
- What is the risk of intellectual property protection?

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3 “NOL Fellowship Programme - Speed to Market”
(project info: http://newshub.nus.edu.sg/pressrel/0602/060223b.htm)
• What is the risk of facing future competition from current vendors?
• How can a firm secure its know-how?
• What kind of relationship to develop with suppliers?
• Can this relationship be based on trust?
• Can the choice of suppliers improve the supply chain?
• What is the least possible lead time?
• What transportation mode to use?
• What is the frequency of orders?
• Has the company trusted suppliers for an emergency case?
• How high will be the vulnerability of the supply chain to outside factors, such as port congestion, port closures, physical catastrophes, terrorist attacks, after outsourcing?
• Would a production re-scheduling reduce the lay time at the plant or alongside the port?
• Where and of what size should be the plants? Should the firm build the plants and select employees or outsource manufacturing to a licensee?
• Where and of what size should be the warehouses? Are they secured?
• Which is the inventory level of each part needed in the production line?
• What kind of inventory management is used? Is there any specialized software?
• Which parts should be purchased ready-made? From which suppliers?
• Would a Just-In-Time strategy improve the Total Logistics Cost?
• Which are the costs and benefits of reduced inventory, if any?
• Does the firm size allow for such a strategy?
• What is the leading time of orders? Is it possible for further reduction? How?
• What is the possibility of disruption of a certain part/product?
• What are the consequences? Is there an emergency plan? How specialized is the product? Is there any product close to it in the market?
• What type and frequency of communication are used in-between the supply chain participants?
• Are there any visits at both sides? Would a JIT-II strategy improve the lead time of orders and the inventory cost? Can it be implemented?
• Which forecast models are used for future demand?
• How do sales promotions impact demand pattern?
• How high is the cost of stock-out? What is the cost of lost sales?
• Is the product perishable, seasonal or fashionable?
• Is the product of high or low value?
• Are there false orders and subsequent cancellations?
• Which is the level of ethical standards of employees?
• Is a firm responsible for bad working conditions at the production place?
• Which is the risk of a product boycott?
• Is it possible to face anti-globalization activities?

The above questions are representative, but not the only ones that arise or may arise when deciding to outsource in offshore countries, like in China. However, they do provide a good initial point for discussion and understanding of the strengths and vulnerabilities of both the product or activities to outsource and the firm as a whole. This research report focuses on some important factors responsible for successes or failures in the supply chain based on real-world case studies and ultimately, since not all the above issues are known, comes to conclusions about the initial, but important, questions need to be answered thinking of the option to outsource.

1.3 Chapter Summary

The first chapter introduces the motivating and underlined reasons that initiated this research and tries to give an overview of the research questions that arise and have to be answered when companies from industrialized nations decide to outsource their manufacturing activities offshore.
The second chapter presents the main reasons that lead firms to outsource their activities either locally or offshore, the activities that are usually outsourced and the risks involved in such a decision. These risks, in the form of questions, are analyzed throughout this research report.

Chapter 3 deals with one of the most important parts of a supply chain which is the suppliers. Actually, a careful choice of suppliers and a close cooperation can lead to excellent supply chains, whereas poor relationships with unknown suppliers can lead to long lead times, stock-outs and even product imitations and competition. It also deals with the case of emergency case suppliers and how important they are, since all firms either less or more are vulnerable to disruptions, catastrophes and terrorist attacks.

In Chapter 4, major issues of inventory management are discussed and emphasis is given on the product life cycle and the corresponding required safety stock levels. This is also discussed in Chapter 5 which deals with demand forecasting problems and uncertainty especially for new, fashionable or innovative products. Chapter 4 also presents the significant benefits of Just-In-Time strategy, but also demonstrates the increased exposure of the firm to disruptions caused by unpredictable events. Two cases are presented; both taken from Toyota, the Japanese can manufacturer.

Inventory management is closely related to demand forecasting accuracy. Ideally, if demand was perfectly known, each firm could order at specific time intervals, the products or raw materials would arrive in time and no stock-outs would occur; simultaneously the company would need the least possible inventory levels. However, reality is not so simple. Instead, demand fluctuations and alterations are pretty common due to many factors, such as stock-outs, introduction of new competitive products, price war of competitors, etc. This is the topic of Chapter 5 together with the causes and strategies to eliminate the bullwhip effect and the well-proven strategies of shortening the forecasting horizon, the risk pooling when aggregating demand and the benefits of postponement. Examples are taken from Barilla, the Italian pasta manufacturer, Gillette,
the huge personal care products company, and Victoria Secret, the well-known apparel manufacturer.

Chapter 6 deals with intellectual property issues that arise when outsourcing either locally or offshore and demonstrates the need to secure a firm’s know-how especially for innovative and consumer electronics products. Current state of counterfeiting in China is presented together with an example of a shoe company that faced competition from a core supplier it used to have in China.

Chapter 7 includes some of the most important questions that a firm’s supply chain managers should answer before taking the decision to outsource. Instead of answers or best strategies, Chapter 7 provides examples and guidance to make the scope of the questions more specific. Lastly, these questions as well as the underlined ones lead to the required information that needs to be included in a software model that aims to improve a supply chain.

Chapter 8 includes a summary of the factors that are important to know, when a firm evaluates the option of outsourcing. It concludes that outsourcing is beneficial and it is the trend for most firms from industrialized nations that outsource their production or other kind of supply chain activities to China. However, since there are risks in such a decision, every company has to carefully think all possible problems that may arise.

Lastly, the appendix provides a useful pool of important factors that are essential to perform a quantitative analysis in order to answer critical questions before outsourcing or shipping products between industrialized nations and China. Besides the quantitative factors, some qualitative factors are essential to take the final decision.
Chapter 2 – Outsourcing to China

2.1 Overview

Outsourcing entered the business lexicon in the 1980s and often refers to the transferring or sharing management control and/or decision-making of a business function to an outside supplier, which is specializing in that operation\(^4\). The decision to outsource is often made for the purpose of lowering firm costs, redirecting or conserving sources to focus on the core competencies of a particular business, or to make more efficient use of worldwide labor, capital, technology and resources.

Outsourcing involves a degree of two-way information exchange, coordination and trust between the outsourcer and its client. Such a relationship between economic entities is qualitatively different from traditional relationships between buyer and seller of services in that the involved economic entities in an outsourcing relationship dynamically integrate and share management control of the labor process rather than enter in contracting relationships where both entities remain separate in the coordination of the production of goods and services.

One of the most common places that firms from industrialized nations, such as the US, outsource either manufacturing or other supply chain processes is China. Business segments typically outsourced include information technology, human resources and facilities and plants. Many companies also outsource customer support and call center functions, manufacturing and engineering. The next list\(^5\) provides a representative picture of what kinds of activities are currently outsourced, including those inside the borders of a country.


• **Information Technology**: Maintenance and/or Repair, Training, Applications Development, Consulting and re-Engineering, Mainframe Data Centers

• **Operations - Administration**: Printing and Reprographics, Mailroom, Consulting and Training

• **Operations - Customer Service**: Field Service, Field Service Dispatch, Telephone Customer Support

• **Operations - Finance**: Payroll Processing, Purchasing, Transaction Processing, General Accounting

• **Operations - Human Resources**: Relocation, Workers' Compensation, Recruiting/Staffing

• **Operations - Real Estate & Physical Plants**: Facilities maintenance, Security

• **Logistics - Distribution & Transportation**: Freight audit, Consulting and training, Freight brokering, Leasing, Fleet management & operations, Fleet maintenance

Besides this list, there are some non-core supply chain activities that are also outsourced\(^6\). So, when a firm decides to outsource one or more of the above supply chain procedures, many issues arise concerning the costs and benefits as well as how to secure that the lower logistics costs do not lead to increased supply chain vulnerability. It is quite common that lower labor and land costs are the most important incentives to establish manufacturing procedures offshore. However, there are firms that use outsourcing as a tool for market entry and aim to go and stay there. Regarding the costs of outsourcing

when something goes wrong, they can be from high transportation costs and costs of imitation and competition, to lost sales due to stock-outs and long delivery times.

2.2 Incentives for Offshore Outsourcing

In today’s global marketplace, outsourcing has made itself accessible to many organizations on a national and international level. Offshore outsourcing has provided many businesses with the opportunity to harvest the benefits of lower labor costs in developing countries with few workers’ rights laws and to exploit the value of artificially manipulated foreign currencies, where the exchange rate is intentionally undervalued. Through outsourcing, companies have the ability to develop competitive strategies that will leverage their financial positions in the ever competitive global marketplace. Outsourcing is also successful in increasing product quality and/or substantially lowering firm and consumer costs. Because outsourcing allows for lower costs, even if quality reduces slightly or not at all, productivity increases, which benefits the economy as a whole. In many cases, outsourcing is viewed by many organizations as a business tactic that ultimately is more than an attempt to lower production costs.

Small companies routinely outsource their payroll processing, accounting, distribution and many other important functions due to the fact that they have no other choice. Many large companies turn to outsourcing to cut costs and enter new markets, in case of offshore outsourcing. In response, entire industries have evolved to serve companies' outsourcing needs. But not many businesses thoroughly understand the benefits of outsourcing. It's true that outsourcing can save money, but that's not the only reason to do it. It seems that today it is the best practice; however we don't know what may happen tomorrow that is going to have a global impact. On the other hand, there are some

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important reasons that may lead to the following short and long-term benefits\(^8\) if careful consideration of all factors takes place:

**Reduce costs.** Cost-cutting may not be the only reason to outsource, but it's certainly a major factor. Companies that try to do everything themselves may incur vastly higher research, development, marketing and deployment expenses, all of which are passed on to the customer. Outsourcing converts fixed costs into variable costs, releases capital for investment elsewhere in the firm, and allows avoiding large expenditures in the early stages of a business. An outside provider's lower cost structure, which may be the result of a greater economy of scale or other advantage based on specialization, reduces a company's operating costs and increases its competitive advantage. Lastly, hiring and training staff for short-term or peripheral projects can be very expensive, and temporary employees don't always fulfill firm's expectations. Outsourcing lets focusing human resources where most needed.

**Focus on core competences.** Every firm has limits on the resources available to it and every manager has limited time and attention. Outsourcing gives the advantage to redirect the resources, most often people resources, from non core activities toward activities which serve the customer, by having operational functions performed by an outside contractor. Outsourcing can help the business to shift its focus from peripheral activities toward work that serves the customer, and it can help managers set their priorities more clearly.

**Gain access to experts.** World class providers make extensive investments in technology, methodologies, and people. They gain expertise by working with many clients facing similar challenges. This combination of specialization and expertise gives customers a competitive advantage and helps them avoid the cost of chasing technology and training. Lastly, a good outsourcing firm has the resources to start a project right

away. Handling the same project in-house might involve taking months or even a year to hire the right people, train them, and provide the support they need. And if a project requires major capital investments, the startup process can be even more difficult.

Not available resources. Some companies outsource because they do not have access to the required resources. Outsourcing is a viable alternative to building the needed capability from the ground. Most small firms simply can't afford to match the in-house support services that larger companies maintain. Outsourcing can help small firms act "big" by giving them access to the same economies of scale, efficiency, and expertise that large companies enjoy. Another case is when a function is difficult to manage or out of control. In this case, the organization needs to examine the underlying causes. If the required expectations or needed resources are not clearly understood, then outsourcing won't improve the situation; it may in fact make it worse. If the organization doesn't understand its own requirements, it won't be able to communicate them to an outside provider.

Reduce risk. Every business investment carries a certain amount of risk. Markets, competition, government regulations, financial conditions, and technologies all change very quickly. Keeping up with these changes, especially those in which the next generation requires a significant investment, is very risky. Outsourcing providers manage this risk, and they generally are much better at deciding how to avoid risk in their areas of expertise. Outsourcing providers make investments on behalf of many clients, not just one. Shared investment spreads risk, and significantly reduces the risk born by a single company.

2.3 Risks of Outsourcing

Each country offers its own competitive and comparative advantage to offshore outsourcing. But, outsourcing and penetrating in a new market, such as China, includes many risks that have to be considered before going and setting up supply chain activities
there. In addition, as the world changes newer risks emerge. Today, China is doing a good job to most of the following issues. However they must be taken into account when a company decides to outsource there. Once the risks have been identified a firm has to assess the probability of occurrence and the impact to its program and supply chain and build strategies to mitigate them. Most risks can be categorized into the following three categories:

- **Geographic Risks**
  - How stable is the political system?
  - How easy is it to travel, obtain visas?
  - What is the legal framework that supports the outsourced activities?
  - How well are Intellectual Property rights enforced?
  - What are tax implications for the country?
  - How easy is it to setup an operation?
  - What are the labor laws?
  - How easy is it to exit?
  - What are the customs and duties and other licensing requirements?
  - What is the quality of the education system?

- **Project Risks (associated to the specific activity)**
  - Is there a well-defined performance and acceptance plan?
  - Is there a software development lifecycle methodology?
  - What kind of metrics are used and at what stages is data collected?
  - What is the hiring, training, rewarding and staffing process?
  - Is there a Project management process?
  - Is there a separate Quality Assurance team that looks at processes?
  - How will the firm manage technology risks?

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9 “Offshore IT Outsourcing”. http://offshoreitoutsourcing.com/Pages/it_outsourcing_risks.asp
**Infrastructure and Operational Risks**

- Does the Company have a Disaster Recovery plan?
- Can it sustain a development operation?
- How easy is it to establish voice and data communications?
- What is the quality of voice and data communications?
- Are the facilities shared with other companies?
- What kinds of physical security exist to prevent movement of digital resources?
  - What are the network security policies?
  - What is the personnel management process?
  - How are the people hired, trained, rewarded?
  - What could be cultural issues?
  - Are systems in place to support outsourcing?
  - Are people in the firm enlisted to support the outsourcing process?
  - Has the firm defined the standards to be used for outsourcing?
  - Has the firm defined success criteria?
  - Are the facilities insured? Fireproof?

All these issues must be carefully examined, since they can increase costs if they are not used in an efficient manner, and can even cause serious problems if something in the supply chain goes wrong. Criticisms of outsourcing from both management and consumers often focus on whether or not the performance or quality of the outsourced service is in accordance with the expected standards of management and consumers. How does outsourcing a service affect its quality as opposed to "in-house" work? Distance increases the difficulty of controlling the manufacturing procedures, including quality control and inventory management. Such questions arise every day when a company faces the dilemma whether or not to outsource one or more segments of its production line no matter what type the product is.
An increasingly important factor for doing successful business in China is the protection of intellectual property\(^\text{10}\). Even though there are laws protecting such property, many companies fail to do so, as their supply chain strategy does not provide for it. This strategy should carefully consider two issues; the technologies and products that will be manufactured and sold in China and with whom to cooperate. That includes monitoring the vendors, securing manufacturing and warehousing facilities, and hiring employees with high ethical standards and respecting them. In addition, as the manufacturing base of China is improved using foreign investment, Chinese knowledge will also advance, allowing for Chinese manufacturers to provide customers with higher quality products.

Concluding the above, going to China and staying there successfully can be a very difficult goal to achieve. There has been a lot of discussion regarding potential advantages of US manufacturing, since there are less shipping costs; however major supply chain changes must occur before labor cost will lose its significance.

\(^{10}\) "China and Intellectual Property", John Carroll, ZDnet.com, June 2005
Chapter 3 - The Importance of Suppliers

3.1 Overview

Procurement activities in large part support a firm’s inbound logistics and are vital to value creation. The strategic importance of sourcing is inherent in the positioning of the purchasing function in a supply chain. Purchasing activities link the firm to the greater upstream value system and allow a buying firm to obtain appropriate inputs from external suppliers\(^{11}\). A firm’s sourcing strategy is therefore a key driver of an effective supply chain. Innovations in technology and increased global competition provide opportunities and challenges that drive firms to continuously evaluate and modify their sourcing strategies.

A supplier relationship refers to the relationship between buyer and supplier and it is such that both sides at least theoretically derive benefit from it\(^{12}\). However, this has not always been the case, since, usually, such relationships have tended to be loose, with each side trying to gain maximum advantage and leverage over the other or due to loose focus on partnership issues, since most attention is paid on cost saving issues at the time of contracting. Today, there is a trend that both sides are carrying out their business in an atmosphere of co-operation and mutual advantage. This is a result of tighter supply chain structures and outsourcing strategies.

As described in the following sections, there are some general rules and strategies for starting up or improving a relationship with a supplier that are applicable to firms and companies which outsource all or part of their supply chain procedures. However, before starting up or improving a relationship with a supplier, a firm should be aware of the

\(^{11}\) “Relational Competence and Strategic Procurement Management”, Andrew Cox, European Journal of Purchasing and Supply Management, 2, 1 (1996), pp. 57–70

\(^{12}\) “Supplier relationships”, Ken Burnett, Practice Development Officer, Chartered Institute of Purchasing & Supply
costs and benefits as well as the associated risks by deciding to add a specific supplier to its pool of core suppliers. Some of the major issues that arise when taking the decision to choose a supplier are described through the following questions:

- What type of relationship does the company want to develop with its core suppliers?
- How important is the choice of a supplier in the overall improvement of the supply chain?
- Is this a short or long-term decision?
- Is the relationship with a supplier based on trust?
- Which other factors are also important? Quality? Flexibility? Location?
- Would a Just-In-Time strategy improve the supply chain?
- How vulnerable is a supplier to disruptions?
- What are the corresponding impacts of disruptions on supplier's customers?
- How would a supplier react in a potential emergency case?
- Should the company use single or multiple sourcing strategies?
- Are there discount benefits if a single supplier is chosen?
- Is the country of origin an issue?
- Does the company aim to enter this market in the future?
- What is the risk of intellectual property?
- How the company can secure its know-how?
- What is the risk of facing future competition from an existing supplier?

This report tries to give some insight in these issues through some cases that are representative of the issues stated above. The sections below give some general strategies for starting up or improving a relationship with a supplier. However, through the representative cases, the reader can see that these strategies are not followed always or the system does not work as designed when something goes wrong. In addition, it will become obvious that even companies of the same field of business react in different ways.
based on their holistic perception of outsourcing and partnership with suppliers, which is the underlying reason for different costs and benefits of their supply chain structure.

3.2 Relationships between suppliers and firms – Insightful Cases

How important can be the impacts of the exposure to supplier’s vulnerability?

Professor Y. Sheffi, in his book “The Resilient Enterprise”\(^\text{13}\), explains in detail a specific supplier-customer relationship and the impacts of a catastrophe at a supplier’s plant to its customers. Here, we provide a summary of this very insightful case; the reader can read the whole story in Professor Sheffi’s book.

In March, 2000, a storm hit the city of Albuquerque, New Mexico. During the storm, one thunderstorm struck an industrial building, which was a distant plant of Philips. A furnace in one fabricator caught fire and, immediately, alarms sounded inside the Philips plant and at the local fire station. The fire extinguishing system worked fine and in less than 10 minutes, the fire had been extinguished. A routine investigation by firemen showed that the fire was minor without any injuries, but just superficial damages. However, this event was enough to cause a huge economic impact on Ericsson, one of the two major Philips’ plant customers, and ultimately lead the company to retreat from the phone handset production market.

At Philips’s plant, as well as to any other semiconductor fabrication plant, no dirt, smoke or other particles can exist. Even the tiniest parts of soot or smoke can destroy the delicate microscopic circuits that dominate the insides of modern electronics. And during this fire, many trays of wafers were affected. With hundreds of chips per wafer, each tray of wafers represented thousands of cell phones worth of production. Even worse than the

\(^{13}\) “The Resilient Enterprise: Overcoming Vulnerability for Competitive Advantage”, Yossi Sheffi, The MIT Press, 2005
loss of the valuable chips was the damage to the clean-rooms of the plant themselves that would need a lot of time to come to their before-fire condition. Returning the clean-rooms to their prior state quickly would be a painful and time-consuming job. Philips communicated with the plant’s customers, and in particular the two most important ones - the Scandinavian cell phones manufacturer Nokia and the Ericsson. In aggregate, these two customers accounted for 40 percent of the affected orders at the Albuquerque plant.

Philips called Nokia’s chief component-purchasing manager, to explain the delay. The Philips account representative explained the evolving situation, the fire, the lost wafers, and the expected one-week delay. Nokia’s manager was not overly concerned after that first call. One-week delays happen in all global supply chains due to downed machinery, material shortages, production schedule errors, quality issues and shipping delays. Such events require prompt actions, but manufacturers usually keep a small safety stock so that production schedules and customer service are not disrupted. Nokia could easily cover a short delay with existing parts inventory and shipments from their suppliers.

Nokia’s manager communicated the news to others inside Nokia, included Nokia’s top troubleshooter. The last decided that the situation needed closer attention and reacted by placing the affected parts on a daily watch list. When Philips called Nokia’s purchasing manager again to explain the full scope of the disruption, Nokia realized that this problem was a real crisis. It would take weeks to restore the clean-rooms and restart production again, which means that the disrupted supplies would prevent the production of some four million handsets.

In response, Nokia set up a team of supply chain managers, chip designers, and senior managers to deal with the problem. The team quickly secured alternative sources for the parts. Three of the five needed parts could be purchased from Japanese and American suppliers. Because Nokia was already an important customer of these two suppliers, the suppliers agreed to the additional orders with only five days lead time. However, two of the parts came only from Philips. Nokia held meetings with Philips to stress the importance of the issue. Finally, some Philips factories worked to free up more capacity
for Nokia’s needs. Through its extraordinary efforts and intensive collaboration with its suppliers, Nokia was able to avoid market disruptions.

On the other hand, Ericsson was also an important customer of Philips’ chips for its cell phones. Just like Nokia, Ericsson received the same phone call about the fire and the expected one week delay. However, Ericsson’s reaction was very different. The company assumed that Philips would ship the chips after a short delay, that the fire was minor, and that everything would work out. The head of the consumer electronics division did not learn of the problem until several weeks later.

When Ericsson realized the size of the problem, it was too late. Its major competitor, Nokia, had already secured all of Philips’ spare capacity. Ericsson then turned to other chip makers for parts. But, unlike Nokia, Ericsson didn’t have alternative suppliers available for the chips that had come from the Philips’ plant. So, Ericsson failed to obtain needed parts from other sources.

While Philips’ lost sales were on the order of $40 million, Ericsson reported for 2000 a $2.34 billion loss in the company’s mobile phone division. This disruption was the main reason why about a year after the fire, the company announced plans to retreat from the phone handset production market. Finally, it signed a deal with Sony to create a joint venture to design, manufacture, and market cell-phone handsets. On the other hand, instead of facing lost sales, Nokia reported an increased share of handset market (from 27 to 30 percent).

The reason that this case study was included in this chapter, which deals with the relationship between suppliers and customers, is that it describes in a very detailed way some of the most important problems that may arise when setting up a poor relationship or when lacking an emergency response plan. Although both companies were hit by the same disruption, one recovered while the other exited significant parts of the business. Deep relationships with the core suppliers, knowledge of supply markets and modular engineering design were the factors that differentiated the impacts that this supply chain
disruption had on Nokia and Ericsson. A detailed analysis of the reasons that differentiated the impacts that the same event had on different customers takes place in Chapter 7.

Vulnerability of lean operations to disruptions

Again, the case described below was taken from the book of Professor Y. Sheffi\(^{14}\) and its purpose is to demonstrate the higher vulnerability of lean operations and the impacts that a disruption may have on a firm when it decides to follow a single sourcing strategy.

In January, 1995, a strong earthquake struck the city of Kobe, Japan creating real chaos in the city the full impact of which would not be realized until days, weeks and even years later. The earthquake caused huge damages to all the transportation links in and around Kobe city as well as to city’s port which accounts for twenty percent of Japan’s imports and exports.

The earthquake at Kobe demonstrated the dependency of companies on a net of infrastructure connections. Japan’s leading companies and especially car manufacturers rose significantly through reliance on their vaunted lean manufacturing systems or just-in-time systems as it is further known. Japanese companies minimized the inventory of parts stored in their plants by synchronizing their supply chains so that parts could be delivered just in time for them to be installed in the vehicles moving down the assembly lines. However, the Kobe earthquake showed that the web of infrastructure connections was highly vulnerable to physical catastrophes and that companies were not prepared for that.

Although the Sumitomo Metal Industries plant in Osaka wasn’t destroyed, it lost gas and water supplies. This factory was the sole source for most of the brake shoes used by

Toyota in all its domestic cars. Because Toyota relied on lean manufacturing, it had no or negligible inventories of the parts. Lack of brake shoes halted production at most of Toyota's car manufacturing plants all over Japan as these plants quickly exhausted their supplies. Toyota lost production of an estimated 20,000 cars (about $200 million revenue) as a result of parts shortages. Other Japanese car makers faced similar problems with suppliers or factories in the Kobe region. Since the impacts of physical phenomena can be so important, it would be beneficial for every firm that procures or outsources any kind of supply chain activities to ask its suppliers and partners for emergency case plans and evaluation of the vulnerability of the company for a series of events. In Chapter 7, a question related to this problem is presented and managers should have a clear answer before contracting with a supplier.

The Kobe earthquake also demonstrated the connectivity of global industry and operations. Virtually all of the world's global companies have operations in Japan, many of them in Kobe. Because many suppliers to multinational companies were affected, even US companies without a Kobe outpost felt the impact.

**JIT leads to supply chains with better response to disruptions**

Despite that when adopting a JIT procurement strategy a firm's vulnerability to disruption increases, it is also true that following such a procedure a firm keeps its supply chain in tight levels and gains benefits from quick response to unpredictable events that may occur. In February, 1997, an article in the Wall Street Journal\textsuperscript{15} was talking about a fire at Aisin Seiki Co.'s brake valve plant, Kariya, Japan, that entirely destroyed the huge auto-parts plant. The fire incinerated the main source of a crucial brake valve that Toyota buys from Aisin and uses in most of its cars. Most Toyota plants kept only a four-hour supply of the valve which costs only a few dollars; but without it, Toyota had to shut down its 20 auto plants in Japan, which build 14,000 cars a day. Some experts thought Toyota couldn't recover for weeks. However, five days after the fire, its car factories

\textsuperscript{15} "Toyota manages quick recovery from fire", Valeria Reitman, Wall Street Journal, May 8\textsuperscript{th}, 1997
started up again, which was a result of quick response, deep relationships with its core suppliers, and, tight and excellent supply chain structure.

“Toyota’s quick recovery,” says Yoshio Yunokawa, general manager of Toyota Machine Works Ltd., a Toyota-group maker of machine tools and steering systems, “is attributable to the power of the group, which handled it without thinking about money or business contracts.”

Even as the fire burned, Aisin officials organized a committee to assess the damage, notify customers and labor unions and, following Japanese custom, visit neighbors to apologize.

Most of the factory’s highly specialized machines, which make other brake parts as well as P-valves, were charred and useless. Toyota estimated that more than two weeks would be needed just to restore a few milling machines to partial production, and six months to order new machines. That was too long: Auto plants were on overdrive to meet strong domestic demand and serve the brisk-selling U.S. market. Moreover, a Toyota shutdown would damage local economies. Firms supplying the parts in the average Toyota car, along with hundreds of supporting businesses, would be hurt without Toyota orders.

Possibility for a quick comeback seemed to be minor. Toyota needed 200 P-valve variations. And chances that anyone else would quickly take up production looked distant. Toyota would close most plants for four days - the longest suspension in company history.

Toyota and Aisin called officials from some of the major parts suppliers to a meeting, at Aisin headquarters. They decided to start by taking blue prints and finding the tools and machines to create some first valves. But there still weren’t enough suppliers. So Toyota purchasing officials called more parts makers to a meeting. These officials were like family-people who work closely with Toyota from the start of a car’s design. “It was crucial because we knew each other.” Mr. Ikebuchi says. After long conversations and phone calls, these part makers agreed to make huge efforts to farm out some of their
current factory work to free up machines to make the Toyota parts. On February 6, right on schedule, the first P-valves were delivered to Toyota.

Early in the week after the fire, even Toyota’s Mr. Ikebuchi had doubts about the goal of resuming production in all plants soon. But the supplier group came through, bearing the first usable P-valves. Slowly, Toyota’s assembly lines started up again. Overall, Toyota lost production of 72,000 vehicles. But with huge efforts, overtime and extra shifts it had already nearly recouped the lost output.

This case study demonstrates the benefits of lean operations in terms of much shorter response time and reaction in case of emergency. Real life has proved that JIT strategies lead to supply chain excellence in case their higher vulnerability can be managed and mitigated. So, when a firm is concerned with what kind of relationship to build with its core suppliers, lean operations should be evaluated and if the market size of the supplier and the firm allows to follow such a strategy.

3.3 Starting up or improving a relationship with a supplier

The cases of the previous section show the different types of relationships between suppliers and firms and the possible costs and benefits they have on the corresponding supply chains. So, when deciding to outsource manufacturing or other supply chain activities, every firm comes up with the issues described at “Overview” section, since the role of suppliers in the overall performance, reliability and strength of a supply chain is crucial.

In the paper “Relational Competence and Strategic Procurement Management”¹⁶, a set of relationships is demonstrated, ranging from adversarial leverage at one end to strategic

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alliances at the other. The steps in between are identified as ‘preferred supplier’, ‘single sourcing’ and ‘network sourcing’.

Today, the current trend is that improved relationships between buyer and supplier are desirable, and forward-thinking companies are realizing that developing and enhancing such relationships is an effective way of improving the level of efficiency of the whole supply chain. Specific benefits include shared product development costs, reduced cycle time and improved delivery performance. These issues are more important for firms outsourcing to China, since the distance and leading time are much more important parameters. So, how could one firm improve its relationship with core suppliers?

The following are just a few rules for doing so:

- Investing in the supplier’s operations: For example, Toyota has about 23% of Aisin Seiki’s shares\(^\text{17}\), which makes it an important investor in the company.

- Conducting visits to the supplier’s site to offer advice on improving performance: Nokia and Ericsson as well as Toyota had not anticipated the vulnerability of their suppliers. Firms can interchange know-how with their suppliers in order to gain benefits from it through improved supplier performance.

- Promising increased business as a performance incentive: Toyota decided to keep Aisin as its almost only brake valve manufacturer due to quality and low cost. That’s why Aisin tries to continuously fulfill all Toyota’s requirements.

- Providing suppliers with regular feedback: Nokia and Ericsson could interchange design information with Philips in order to build more flexible chips that could also be purchased by other suppliers.

\(^{17}\) "Toyota manages quick recovery from fire", Valeria Reitman, Wall Street Journal, May 8\(^{\text{th}}\), 1997
• Assisting suppliers in their staff development programs: Firms can give suppliers feedback of manufacturing procedures and familiarize them with their way of doing business.

• Implementing an information sharing program: This is crucial in every supply chain and must be both ways. In the case of Ericsson, the news about the expected chips disruption did not arrived to the upper management until the problem had already been a crisis.

• Inviting suppliers on site to familiarize them with how the end-product is used. Bose Corp., MA has done an excellent work on this strategy by implementing the JIT II.18

In addition to the above main rules, further strategies for promoting positive buyer-supplier relationships include19:

• Ensuring that supplier support and development programs are an integral part of the organization’s corporate philosophy. When building deep relationships with suppliers, they should mirror the firm’s philosophy of doing business and share the same perceptions on core supply chain issues.

• Ensuring the commitment of senior management. During the initial meetings with suppliers, senior management should explain the purpose of the supplier development programs.

• Suppliers must have reassurance that they will benefit from the relationship. We could say that despite Ericsson was a significant customer of Philips’

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19 “Supplier relationships”, Ken Burnett, Practice Development Officer, Chartered Institute of Purchasing & Supply
semiconductors plant, Philips did not try to help both Nokia and Ericsson the same way. Maybe the main reason was that the relationship was more a buyer and seller relationship than a strong supply chain relationship, making Philips not expect much from this relationship.

- A program of regular meetings should be put in place. This measure has to do with the interchange of information, perceptions, strategies and aims to bring people to think as a group, like being one company.

- A supplier performance reporting procedure to enable suppliers to analyze and measure their productivity. Besides this, every supplier must have performed a vulnerability analysis to financial, strategic and operational issues and the customers should be aware of that in order to anticipate potential vulnerability and impacts on their supply chain.

All the above strategies aim to improve a buyer–supplier relationship that is already in existence no matter the size of the buyer or the supplier since they are applicable in most cases. But, how should one firm go about setting up a supplier relationship from the beginning?

The following key considerations are ground rules for negotiating a successful and mutually beneficial relationship, without that meaning that these rules are the panacea or that there are not other rules as well.

Focus on relationship issues. The importance of relationships should not take second place to contractual considerations. Cost savings together with quality, reputation and commitment to requirements are all important factors. However, these factors do not guarantee that the supply chain will work the same under disruption or more generally when things go wrong. Deep relationships secure the commitment of both parties to do their best in every case for their mutual benefit. This key consideration is mostly
applicable to long-term relationships and refers to companies that decide to outsource for more reasons than just gain reduced operational costs.

*Design appropriate procedures for pre and post-negotiation interaction.* In particular, buyers should give careful consideration to the timing of interaction with potential suppliers, use well-established negotiation procedures and develop strategies for handling possible future conflicts. Senior managers can do great work at this point by giving their expertise and insights and setting up the requirements and goals that both buyers and suppliers as a team would accomplish. The pre-negotiation analysis should involve the examination of interests and issues, the generation of all available options, the exploration of how options can be made into specific agreements, and, the evaluation of the alternatives to the agreement.

Small and medium-sized enterprises often lack the resources to implement such initiatives. With this in mind, some useful guidelines are suitable for a smaller organization:

- Choose partners with whom you are equal. The firm should be sure to define both its own and its suppliers’ expectations from the arrangement and make an in-depth assessment of both organizations. Difficulties can be expected to arise if one of the partners has to act as ‘parent’ to the other.

- Define strategies, objectives and requirements. Before developing a closer relationship with suppliers, a firm must make sure that it shares the same view with its suppliers on what form such co-operation should take.

- This relationship will always be a customer–supplier relationship. Achieving a relationship based on mutual trust and understanding requires dedication and time.
3.4 Multiple Suppliers vs. Single Sourcing - Emergency Case

Suppliers

Clearly, a manufacturer’s operations strategy and financial livelihood rely on its chosen supplier pool and thus, decisions with regard to suppliers are fundamental to successful supply chain management. A firm’s sourcing strategy is characterized by three key interrelated decisions:

(a) Criteria for establishing a supplier base
(b) Criteria for selecting suppliers (a subset of the base) who will receive an order from the firm and
(c) The quantity of goods to order from each supplier selected.

To start with, criteria for developing a supplier base are typically derived from the firm’s perception of the supplier’s ability to fulfill the objectives of quality, quantity, delivery and cost. While the supplier’s cost may be a very critical criterion for profit maximization, other dimensions can equally impact the overall profitability of the firm, especially in the long-term.

From the approved supply base, the specific subset of suppliers which will actually receive an order to fill demand for a specific product must be determined. Since all suppliers in the base meet the quality, delivery, and other objectives of the firm, dominant industry practice appears to base this decision primarily on cost considerations and robust delivery reliability capabilities. Once the selected set of suppliers is determined, the firm must allocate product requirements among them. For the allocation decision, supplier yields, order quantity policies, lead times, and transportation costs are typically considered.

Depending on the business field and the specific manufacturing or other process that the company is going to outsource, it may identify one or more suitable suppliers for that operation and then it has to ponder the pros and cons of deciding to use a sole source or
select a multiple sourcing strategy. Major pros and cons of both single and multiple sourcing are discussed below and specific examples are taken from the cases presented in the previous sections.

Single-sourcing strategies strive for partnerships between buyers and suppliers to foster cooperation and achieve shared benefits. The tighter coordination between buyer and supplier(s) required for successful just-in-time inventory initiatives encourage supplier alliances to streamline the supply network and tend to shift supply relations toward single sourcing. Whether single sourcing is optimal or not depends on a buyer’s relative size; more precisely, on the fraction of the total procurement market that the buyer accounts for in equilibrium. Only sufficiently large buyers can substantially change the allocation of production among suppliers. An example of a beneficial single sourcing strategy is that of Toyota that purchases 99% of its brake valves from Aisin Seiki Co. On the other hand, Ericsson using single sourcing from Philips failed to withstand the supplier’s disruption.

In case that a company decides that single sourcing is most suitable, it benefits from the following facts:

- Having a single source means less work to qualify the source and probably less administrative effort in dealing with only one supplier. This is a real advantage in a highly technical product where significant engineering effort is required to qualify or use a product. That’s why most car manufacturers like Toyota prefer to use a single supplier and keep a relationship with another supplier just in case of emergency.

- Since all of the volume is given to one source, the buyer has maximized his leverage based on total quantity and control of the market. The buyer should make

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20 "Single vs. Multiple Supplier Sourcing Strategies", Gerard Burke, Janice Carrilo, Asoo Vakharia, Department of Decision and Information Sciences, University of Florida, June 2004

sure that this point is emphasized during the negotiations concerning price and delivery.

- The supplier should feel a special obligation to help the buyer in terms of availability, discounts, etc. Again, in the process of awarding this business to the supplier, the fact that the buyer's company is relying on the supplier for material availability should be made clear. In our example, when the fire destroyed Aisin's plant, the company took initiatives to find other existing suppliers or identify ways of providing Toyota with brake valves as quickly as possible. This was the result of the trust that exists in this relationship. On the other hand, Philips did the same for Nokia, not because they had a strong relationship, but due to the fact that Nokia was very demanding.

Besides the above advantages, when choosing single sourcing, a firm of any size and business sector takes the risk and cost of the following issues:\textsuperscript{22}:

- It is more difficult for the buyer to be sure that he is keeping his company competitive if there is only one source. This effect can be eliminated if the firm is not contracting very long term contracts. It has to continuously look for any better supplier options if any, but without losing the relationship with its existing supplier.

- In periods of tight supply, the buyer may be at a disadvantage in being able to ask other suppliers to accept orders. That's why when Ericsson asked for cell phone chips from other suppliers, they could not free up work to offer more chips to Ericsson. This was exaggerated by the fact that Ericsson had no relationship with them, putting suppliers in a better position.

\textsuperscript{22} "The extent of single sourcing and attendant corruption risk", University of Nottingham, available through: http://jobfunctions.bnet.com/
• Other suppliers may lose interest in trying to compete for the business if they see that a sole source situation is likely to persist. That’s why the firm should not be concrete about its decision, but let possible suppliers make their offer and evaluate this offer without being affected by existing relationships. Again, the company should not lose its current partnerships while being open to new suppliers.

• There is a real risk if the single source has a catastrophic event, gets bought by your competitor, has financial problems, etc. Single-sourcing dependency also exposes the buying firm to a greater risk of supply interruption. Toyota’s brake valve crisis in 1997 provides a recent example of realized supply risk resulting from a single sourcing strategy in a JIT inventory system.

So, should a company stay with single sourcing or move to multiple sourcing? Strategically, for a relatively big company, supplier power over the buyer is weakened when the firm splits its total requirements among multiple sources. Multiple sourcing hedges the risks of creating a monopolistic supply base and supplier forward integration.

One of the main drivers behind the multi-sourcing approach is the perception that it better leverages competitive pressures. Critics of the single sourcing approach argue that handing over the IT environment to a single supplier leads to that supplier becoming ‘indispensable’ and makes it difficult to award new projects to other suppliers. That can occur through a new supplier’s efforts to win work being stymied by the incumbent supplier withholding critical operational information and denying access to relevant personnel. Multi-sourcing, however, seeks to avoid the customer being ‘locked in’ to a broad, long-term relationship with a single supplier, and to market test more projects and services on a case-by-case basis.

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23 “Single Sourcing vs. Multiple Sourcing”, Roman Inderst, University of Frankfurt and London School of Economics, November 2006

Another perceived benefit of the multi-sourcing approach is that it supports a ‘mix-and-match’ approach to procurement. This can assist customers to achieve ‘best of breed’ solutions through the allocation of different tasks to specific suppliers based on perceived strengths, which can, in turn, lead to better overall service quality.

A key risk with multi-sourcing is the potential for gaps to remain between the various tasks allocated to different suppliers. Often these oversights are not evident until a problem arises. In those circumstances, arguments about the intended scope of each supplier’s responsibilities are unlikely to give the customer any comfort, and may simply leave it carrying responsibilities it thought it had delegated to a supplier, or nursing a budget blowout as a result of having to get another supplier to perform the work on short notice.

A survey from PMP Research\(^2\) suggests that many organizations are opting for multiple suppliers in outsourcing agreements instead of favoring a single service provider. It also uncovered some possible new trends in the outsourcing market with the most important of them that some businesses now signing shorter contracts or even ending deals in order to take their facilities back under their own control.

More than two thirds of respondents (68%) said they are selecting multiple suppliers, with less than one in five (19%) preferring a single outsourcer. This doesn’t appear to be a temporary development, as 77% indicated that they will be going down the multisourcing route in the future, compared to 16% who want to stick with one supplier.

However, it wouldn’t be true to say that these developments are a response to customer dissatisfaction. Instead, organizations appear to be concerned about retaining flexibility over their outsourcing deals. Not one of those polled said they signed a contract of 10

\(^2\) "Outsourcing moves towards multiple suppliers", Gordon Smith, siliconrepublic.com, August 2006
years’ duration or longer. The majority now expect a contract to cover a period of one to two years (39%) or two to five years (39%).

Concluding, multi-sourcing offers potential advantages over the ‘single source’ approach to technology procurement, but is not a panacea. Multi-sourcing can lead to its own problems if not implemented and managed properly. Ultimately, as with any procurement methodology, the suitability of this increasingly popular approach must be assessed in light of the customer’s business requirements and the services to be outsourced. Careful planning, appropriate structuring of the contractual arrangements and management are key factors to its success.

3.5 Partnership developed on trust

Partnership sourcing has been defined by Partnership Sourcing Ltd.\textsuperscript{26} as:

“a commitment by a customer and supplier to a long-term relationship based on clear, mutually agreed objectives to strive for world-class capability and competitiveness”.

The same report includes a phrase of D. Krause, a researcher at Michigan State University, who states that:

“with a reduced supplier base, organizations need to maximize the performance of the remaining suppliers. An aggressive supplier development program can play an important part in helping the firm achieve its competitive goals.”

Partnerships are widely recognized as being a desirable objective in buyer-seller relationships. It has been suggested that smaller organizations can establish and maintain fruitful relationships with larger organizations on a partnership basis. By working in

\textsuperscript{26} “Supplier relationships”. Ken Burnett, Practice Development Officer, Chartered Institute of Purchasing & Supply
partnership, a smaller company purchasing from a much larger supplier can take advantage of resources and expertise that would be difficult to self-finance and, as a result, can offer extended services to their own customers.

What are the key drivers that lead companies to embrace the partnership philosophy? To some extent, they generally overlap with supplier relationships and include:

- Drive for lower acquisition costs
- Reduced supplier base
- Shorter product life-cycles
- Concentration on core business
- Pressures towards lean supply

Since organizations need to maximize the performance of the remaining or just of the single supplier, they choose lean supply for their operations. This strategy makes both partners work as a group that gains aggregate benefits.

The secret of why Toyota managed to recover so quickly after the fire at Aisin’s plant lays in Toyota’s small family of parts suppliers. When the fire occurred, suppliers and local companies rushed to rescue Toyota, since all of them benefit from a growing huge car manufacturer like that. Within hours, they had begun taking blueprints for the valve, improvising tooling systems and setting up makeshift production lines.

Aisin is an archetypal supplier in Toyota’s group. Founded during World War II to make aircraft engines, it is based in Kariya, an industrial warren occupied by many other big Toyota suppliers. For most parts, Toyota has at least two suppliers. But over the years, it turned to Aisin to produce all but 1% of its P-valves because of Aisin’s high quality and low cost. The supplier shipped parts to Toyota plants under a just-in-time inventory system: several times a day, just enough valves for a few hours of production.

These deep relationships, far beyond contractual issues, indicate why Japan’s auto companies pay much attention to trust, often to the detriment of U.S. and other foreign
parts makers seeking market share here. Toyota and Aisin didn’t bother to approach any foreign companies during the crisis, a Toyota spokesman says, because “there were no foreign suppliers in a position to help us.”

That is a common approach in Japan’s groups of companies that supply and support huge companies such as Toyota. Japanese auto makers’ blood pacts with their suppliers largely explain how they can slash their costs to the bone and stay globally competitive.

A different twist on partnering that was pioneered by Bose Corp., an electronics manufacturer in Framingham, Mass., gives suppliers an inside look at their customers' operations and frees customers from having to tell suppliers what's needed and when.

In the same way that "just-in-time" was designed to link plant and floor operations in order to match manufacturing and inventory needs, Bose developed the JIT II concept to reduce the costs and time involved in day-to-day transactions with suppliers.

Bose created a seamless flow of communication by bringing in key suppliers as full-time participants in its operation, working on-site daily. These people are not clerks, but have total authority to create an order, to make it larger and smaller. Bose gains benefits by eliminating material planners and buyers.

To become a partner, a supplier company needs just three things: to be regarded as competent-preferably cutting-edge--in its specialty, basic computer capability, and a willingness to place a key employee at the host company and to take responsibility for what happens.

Customers make the suppliers faster and better than they would have been. Because of JIT II, the standard cost of a supplier to Bose may stay the same or decline over several years without the supplier company losing market share. The concept, which Bose

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unveiled a few years ago, has caught on in other large companies, including IBM, as well as in small firms.

3.6 JIT System – Beneficial but needs to anticipate possible disruptions

The earthquake at Kobe demonstrated the dependency of companies on a web of infrastructure connections. Japanese companies, especially leading carmakers, minimized the inventory of parts stored in their plants by synchronizing their supply chains so that parts could be delivered just in time for them to be installed in the vehicles moving down the assembly lines. But the Kobe earthquake exposed a vulnerability of this manufacturing paradigm. The supplier plant of brake shoes at Kobe was the sole source for brake shoes for most of the Toyota domestic cars. Because Toyota relied on lean manufacturing, it had no inventories of the parts. Lack of brake shoes halted production at most of Toyota’s car manufacturing plants all over Japan as these plants quickly exhausted their supplies.

Another major disruption occurred due to the dependence of Toyota on a single source for brake valves and holding essentially no inventory. But it also is what keeps Toyota’s production lean. Aisin gets major economies of scale that it passes on to Toyota in lower prices. Toyota acknowledges that it didn’t figure in the risk of fire.

The fire and its aftermath have left Toyota executives convinced that they have the right balance of efficiency and risk. “Many people say you might need to scatter production to different suppliers and plants, but then you have to think of the costs” of setting up expensive milling machines at each site, Mr. Ikebuchi says.

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In fact, the fire may have made the system even more efficient. Nisshin Kogyo Co., which was making the other 1% of Toyota’s P-valves, says that during the crisis it raised production efficiency 30% by speeding up production.

Mr. Kinoshita says the fire spurred Toyota to begin an effort to trim the number of its parts variations, a project that should eventually cut costs. And sole-source suppliers are moving quickly to build fail-safe mechanisms.

Toyota promised the suppliers a bonus “as a token of our appreciation,” says Mr. Okuda, its president. He adds that the auto maker will certainly remember the companies that pitched in during its crisis, which is an indication of the partnerships these type of companies want to build with their suppliers.
Chapter 4 – Inventory Management

4.1 Why is inventory management important?

Many supply chain managers believe that one of the most important points of successful supply chain management is inventory and inventory control\(^{29}\). In this report, under the term “inventory” we mean either raw materials that will be used for the production of a certain product or work-in-progress (WIP) inventory that is used to decouple processes in the supply chain or stock of end-products at retailer’s warehouse or distribution center.

Inventory and its management are closely related to the ability of a firm to accurately forecast the demand of a certain part or product in the future. In the real world, it is not always achievable to keep low inventory levels, since many factors create demand fluctuations and alterations; thus, supply and demand cannot coordinate perfectly. The problem worsens when moving upwards in the supply chain, from suppliers to retailers to final customers. Only in cases of deep partnerships, under JIT strategies, is there quite certain demand for a part or product that allows for low inventory levels. Besides the above, customer service is also a key competitive differentiation point among companies; as it is explained below, higher inventory means higher expected customer service. In such an environment, firms have to hold a certain inventory level for two reasons, to reduce costs of lost sales and to improve customer service. The motivation for each differs as firms balance the problem of having too much inventory, which can lead to high costs, versus having too little inventory, which can lead to lost sales.

Through well-planned inventory-reduction strategies in their supply chain, many firms have achieved significant cost savings. To develop the most effective logistical strategy, a firm must understand the nature of product demand, inventory costs, and supply chain capabilities. Most retailers use an inventory control approach, monitoring inventory

\(^{29}\)“Logistics, Inventory Control, and Supply Chain Management”, Frank Dooley, ChoicesMagazine.org, Q4 2005
levels by item, whereas, manufacturers are typically more concerned with production scheduling and use flow management to manage inventories.

At this point, it should be noted that there are many factors that make inventory management more difficult, since they are responsible for higher uncertainty or fluctuations in demand. Such factors are sales promotions, the seasonality of a product, economies in procurement such as forward buying and quantity discounts which lead to increased inventories, the bullwhip effect (see next chapter), introduction of a new product with no-history and other factors that will be examined at the next chapter. In this chapter, the report tries to give an insight into the important relationship among inventory level, costs and customer service, so as to enlighten the parameters that a logistics analysis should take into account.

4.2 How is inventory linked to demand forecasting accuracy?

Inventory management is influenced by the nature of demand, including whether demand is derived or independent. A derived demand arises from the production of another product. For example, when Toyota knows the demand for a certain car, it can simply compute the demands for the parts, materials, and components needed to produce that car. So, for example, Aisin will have to produce a certain number of brake valves daily and keep just a very low inventory level, just in case Toyota asks for more valves. Generally, manufacturers of all sizes use such calculations, which are part of flow management to manage inventories, schedule deliveries for inputs, and manage capacity.

Independent demand arises from demand for an end product. End products can also be found throughout a supply chain. For example, a Toyota car or a Nokia cell-phone is an end product. By definition, an independent demand is not perfectly known, meaning that extra units or safety stock must be carried to secure availability of the product at the right place at the right time. Managing this uncertainty is the key to reducing inventory levels and meeting customer expectations. Supply chain coordination and information
interchange through electronic data interchange systems can decrease the uncertainty of intermediate product demand, thereby reducing inventory costs.

4.3 The trade-off between inventory level and customer service

In general, the availability of inventory provides better customer service. The Item Fill Rate (IFR) measures how often a stock keeping unit (SKU) is available. A common metric of customer service, IFR is expressed as the percentage of time that customers can obtain the item they seek. For example, a firm may set its customer service order policy at 95%, seeking to fill 95% of the orders for an item from inventory.

However, things are not always so simple. Customers might not obtain what they seek for several reasons. The seller may have run out of a product due to an inaccurate forecast or the supplier may have shipped an incorrect package size or product or may have shipped the order after a delay. In other cases, products in inventory may be unfit for sale because of damage or an expired shelf life. Finally, a seller may not have the capability to accurately track inventory in its stores or distribution centers.

To avoid shortfalls or stock-outs firms keep a higher safety stock. As more customer service is provided, a firm can expect sales to increase. However, as a firm tries to provide perfect customer service, logistical costs increase exponentially. Also, if a firm holds too much inventory, it can lead to low inventory turnover and hide operational problems. For example, carrying too much stock means that a firm might not discover that its supplier is frequently late with delivery times. In other words, paying too much for inventory is like paying the cost of long delivery times, long lead times and other malfunctions in the supply chain. However, this is clearly an inefficient way of managing a supply chain in general and inventory in particular.
4.4 The Product Life Cycle, Demand Uncertainty, and Inventory Level

The structure of independent demand and logistical requirements vary during the four stages of the product life cycle, namely the introduction, growth, maturity, and decline. During introduction, logistics must support the business plan for product launch, while preparing to handle potential rapid growth by quickly expanding distribution. At market maturity, the logistical emphasis shifts to become cost driven. In the decline stage, cash management, inventory control, and the timing of stopping production become critical. Over-abundance of products in the late maturity or decline stage will eventually result in old-fashioned products that will be sold after hard discounts under very low profits. The obvious difficulty is predicting how long each stage will last and how quickly sales will fall in the decline stage.

The life cycle strategy typically involves getting to profitability quickly, recovering design and startup costs, then sustaining high profits for as long as possible, and finally acting decisively for products in decline to minimize losses. Understanding this life cycle can help managers to select logistical tactics, inventory levels and supply chain designs. The ultimate goal for companies should be to have accurate demand forecasts, so as to hold as little inventory as possible. But as we will see at the next chapter this is not always viable. So, firms and suppliers have to keep a safety stock to satisfy their consumers' demand.

Another life cycle attribute is that demand uncertainty shifts as we progress through time. Product managers face substantial uncertainty during the introduction and growth stages (where no past statistics are available), relative stability during maturity, and increasing uncertainty in decline. This uncertainty drives forecasting accuracy and the level of safety stock required to meet customer service expectations.

High demand variability in the introductory stage means it is difficult, if not impossible, to forecast demand. Thus, high levels of inventory must be held to meet even minimal customer service levels. In contrast, lower variability during maturity means that demand
forecasts are more accurate. However, inventory levels may still be large because they are based on larger sales volumes together with high service levels (95% or more).

Two other sources of uncertainty also drive the level of inventory. First, demand can vary from day to day, week to week, or seasonally. It may also change dramatically when a competitive product enters the market. Second, there may be variability in lead time, or the time from when an order is placed until delivery is made. This may be due to supplier’s inability to be on time or due to transportation and port issues, like the west coast port closure in 2002 that created huge delays.

In the past, forecasting demand used to be more exact because products stayed in the mature product life cycle phase for longer time. Today, many companies find it far more difficult to forecast sales because of the multiple product configurations and the shorter product life cycle. Also, more sales may come from products in the erratic earlier stages of life, as opposed to sales from products in the mature stage of the life cycle.

4.5 Inventory costs

Inventory management is an important aspect of working capital management because inventories themselves do not earn any revenue. Holding either too little or too much inventory incurs costs.

The costs of carrying too much inventory are opportunity cost of foregone interest, warehousing costs, damage and pilferage, obsolescence and insurance. When carrying too little inventory a firm may incur the costs of lost sales, delayed service, higher freight rates, order administration and loss of quantity discounts. All above costs fall into one of the following three categories:

- carrying costs of regular inventory and safety stock
- ordering or setup costs
- stock-out costs (costs of lost sales)
Inventory control systems balance the cost of carrying inventory against the costs associated with ordering or shortfalls. First, carrying or holding cost is comprised of capital costs, service costs, storage costs, and risk costs. A carrying cost involves the opportunity cost for holding inventory. If the firm did not have money tied up in inventory, it could either use the savings to make investments in other assets or pay down debt. Carrying costs can be minimized by making frequent small orders, like in JIT strategies, but this increases ordering costs and the risk of stock-outs. Risk of stock-outs can be reduced by carrying "safety stocks" (at a cost) and re-ordering ahead of time.

The service costs are often masked in a firm's fixed costs. A firm should determine how much of its insurance and tax expense is associated with inventory. This is especially important in states that have an inventory tax. A firm has cash outlays for warehouses and materials handling equipment, either owning or leasing space from a distributor. In either case, the firm should determine how much is spent on space. Inventory risk reflects characteristics of the product. Some items are more prone to be stolen, others are more likely to be damaged, yet others may become obsolete before a sale is made. In any case, risk means that if too much inventory is held, a certain proportion of the inventory will be unavailable for production or sale.

To determine the cost of carrying inventory, a firm needs to know the average quantity of inventory, an inventory carrying cost, and the average cost per unit of inventory. Regardless of the carrying cost rate being used, as a firm holds more inventory, carrying cost increases.

Firms carry extra inventory to guard against uncertain events. The purpose of the safety stock is to provide protection against stock-outs. Safety stock costs just like regular inventory. The level of safety stock required to guard against a stock-out depends upon the customer service level, the standard deviation of demand of the product, and lead time.

Managing the uncertainty surrounding safety stock is the key to reducing inventory levels. But in today's competitive environment, it is difficult to lower safety stock
requirements for two reasons. First, some buyers, especially large retailers like Wal-Mart, are requiring higher customer service levels. Since Wal-Mart is a huge buyer, it has the power to ask its suppliers to keep higher safety stock levels. Second, the product mix for many firms includes more new products with the corresponding greater demand variability. Thus, most firms seeking to reduce safety stock can only do so by focusing on aggressively cutting lead times. But when we talk about firms that outsource part or all of their supply chain processes, especially in China, we have to keep in mind that lead times are quite high amounting from one to three or four months.

The second cost to consider is ordering costs. Ordering costs include a cost for transmitting the order, receiving the product and placing it into storage, inbound transportation, and processing the invoice.

Finally, stock-out costs involve lost sales when no inventory is on hand. Such costs fall as inventory and customer service levels increase. The relationship between stock-out costs and inventory depends upon the accuracy of the demand forecast and the ability of the firm to recognize and react to a change in demand. Stock-out costs depend on how a customer reacts to a stock-out, the frequency of stock-outs, and the availability of substitute products. Stock-out costs can be very high if a lack of substitute products means that a customer will switch suppliers. In contrast, if buyers simply substitute a different product, stock-out costs may be minor.

4.6 Just-In-Time Inventory Management

The overall management philosophy of an organization can affect the way in which inventory is managed. Just-In-Time (JIT) production management organizes production so that finished goods are not produced until the customer needs them, thus minimizing finished goods carrying costs, and raw materials are not accepted from suppliers until they are needed. Large organizations have the power to insist that suppliers hold stocks

30 "Just-In-Time Inventory Management Strategy & Lean Manufacturing", David Broyles et al., Kansas State University, April 2005

31 "Inventory Reduction: Getting Lean, Mean and Effective", R. Michael Donovan
of raw materials and thereby pass the carrying cost back to the supplier. Thus, JIT inventory strategies reduce bottlenecks and stock holding costs. But, one may ask “Why don’t all firms use a JIT strategy?” The answer is that a firm in order to organize its supply chain under JIT strategy needs to develop deep relationships with its suppliers and have enough market power, in other words to be a big buyer.

Top companies must be fast and react quickly to changes in customer demand and do it with as little inventory as possible. Today, manufacturers do not want to stockpile large quantities of raw materials, suppliers do not want to keep large amounts of work-in-process inventory and, retailers do not want to pack their warehouses or distribution centers with finished goods. The reason is that if they do so, it costs too much, requires too much working capital, and contributes to erratic and longer lead times.

Many executives believe that large inventories are a major concern for the overall efficiency of the supply chain. In addition, the money unnecessarily tied up in inventory could be better spent elsewhere such as: new product development, expanded marketing and sales, modernization, reengineering, expansion, acquisitions, debt reduction among others. Even though inventories are under constant analysis and manipulation, still most manufacturers consistently carry too much inventory. Yet, well-intentioned efforts to reduce inventory, more often than not, get only temporary results.

The major underlying factors of high inventories may be poor forecasting, inadequate product specifications, ineffective production scheduling, low quality, bottlenecks, long cycle times, product and process problems, high costs, poor vendors and wrong performance metrics. For instance, poor sales forecasts are often used to schedule production and vendors sometimes for months in advance, especially when outsourcing to a distant place like China. When actual customer demand is less than what was forecasted, as is often the case, inventory quickly accumulates and salable throughput decreases. Then, the cycle just keeps repeating itself, further compounding cash flow, profits and service problems.
By streamlining the entire supply chain, a company can reduce inventory, improve time to market, compress cycle times, free up more cash, decrease costs, and improve profitability. World class manufacturers have allocated the necessary resources to speed up the order-to-delivery cycle and improve the entire supply chain with the result clearly visible in service performance and the reduction of all forms of inventory.

Manufacturers are establishing electronic data interchange (EDI) with suppliers. Through this window, suppliers for example, can find out when the manufacturer will run out of the item they supply and automatically restock it. This streamlining of the supply chain enables manufacturers to reduce inventory buffers, decrease cycle time and achieve significant cost reductions.

In addition, many manufacturers, like BOSE, MA, are actively consolidating their supply bases following a single vendor partnership approach that is a much closer and more cooperative relationship with selected suppliers. By becoming an integral, larger part of the customer’s and supplier’s businesses, both parties gain greater business leverage. The manufacturer or the supplier, in many cases, actually helps the other to improve operations and thereby reduce material costs, improving delivery timing, and the like.

4.7 Inventory Management Strategies

Inventory management and forecasting are strategic issues. Companies that recognize this fact can typically provide higher levels of service to their customers and post higher profits. Developing a comprehensive inventory strategy involves a number of departments, including fulfillment, marketing, and merchandising, as well as inventory control. It also involves implementing inventory best practices\(^\text{32}\). Below are some practices that will most likely benefit a business:

Synchronize promotions. Successful strategic inventory management relies on tying creative and marketing plans to merchandising plans. In that way, a firm will avoid the bullwhip effect (see next chapter). In other words, higher inventories will occur just before higher demand is expected due to planned promotions.

Rebuild the organizational structure. To implement more-streamlined inventory practices, many companies have adopted a new organizational structure. The merchandising department handles product selection, sourcing, and development and works with the creative department on promotions. The inventory control group is primarily responsible for overseeing the prior season's category and item history, working with the merchants on assortment planning, managing the inventory, forecasting, reordering, receipt planning, and vendor communication and compliance.

Enforce vendor compliance. The inventory control team is generally responsible for administrating vendor compliance policies because they communicate most frequently with the vendors. One of the basic goals of a compliance program is to push inspection up the supply chain. Problems can be more readily corrected and fixed with less cost if they are identified before product ships to the distribution center rather than upon arrival at the DC. Compliance policies should include routing guides, item specification sheets, retail and direct packaging, accounting and paperwork standards, company contact lists, chargeback policies and schedules, and advance shipment notice and systems standards.

Track key inventory metrics. An industrial engineering axiom states that what isn't measured can't be improved. From an inventory perspective, the metrics are the same for online sales as for catalogs, although the forecasting systems requirements for Internet promotions may be different from those for catalog inventory.

Identify lost demand. To capture and plan for phantom, or shadow, demand, catalogers must record order information in the contact center. For Web sales, analytic systems are starting to have the capability to report when items move in and out of a customer's order process. Once you've captured the metrics, you need to report to the merchants the consequences of being out of stock in cases when customers substituted items for those
that were sold out. Then the numbers need to get into merchandise planning for the next season.

**Track inbound receipts.** Inbound tracking of receipts not only benefits the fulfillment operation but also helps inventory management. Smaller companies often lack this capability, and it can really hurt their DC planning and their customer service. But many freight consolidators and carriers, including United Parcel Service and FedEx, offer tracking services.

**Create coverage reports.** Coverage is defined as having sufficient quantities of products already in the DC when a promotion is in-home. Companies need to develop coverage reports to show how much is in DC vs. the initial demand projected. Because most orders take place in the first four weeks after the drop of a catalog to a mailbox, if a firm doesn't have sufficient quantities of a product by the time the catalogs hit mailboxes, it’s going to create backorders early in the promotion.

**Balance under-stock/over-stock.** What is the balance point between the cost of being out of stock on an item and the cost of overstock is not easy to calculate. But, managers should try to have estimates that are quite helpful for the approximate level of inventory required.

### 4.8 Conclusions

Inventory levels are affected by customer service expectations, demand uncertainty, and the flexibility of the supply chain. For products with relatively certain demand and a long product life, it should be relatively easy to maintain desirable customer service standards even as inventories are reduced. However, for products characterized by erratic demand, a short life cycle, seasonality$^{33}$, or products with multiple configurations, a more

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$^{33}$ "Seasonality and Promotions as they Impact Inventory Management", NBDS.com, available through: http://jobfunctions.bnet.com/
responsive supply chain and larger buffer inventories may be needed to meet a desired customer service level.

Consumers are demanding more customer service from firms throughout the supply chain. Firms with high customer service levels may gain a competitive advantage over those that do not have the supply chain capabilities in place or the ability to manage them. Firms who understand their demand recognize stock-out costs and carry appropriate levels of inventory are ultimately better able to effectively manage inventory and provide the desired service level to customers.
Chapter 5 – Demand Uncertainty - Causes & Strategies

5.1 Overview

Without a fairly accurate sales forecast, managing inventory is essentially impossible. There is no way to determine optimal inventory levels and a corresponding production schedule without a projection of sales. Deciding on quantity of shipments received from suppliers is also out of the questions without a forecast. As forecasting ability for a product is improved, a company is able to reduce the inventory level for this product and thus gain benefit from reduced inventory handling costs. But, is it so easy to predict the demand for a product? The answer is no, since there are many factors that are responsible for demand fluctuations and alterations. Besides this, many firms continue to design products with even shorter life cycles. This fact together with possible high lead time or many intermediate entities make the demand forecasts being too distant from real demand and the result is the so-called bullwhip effect.

An example of this uncertainty comes from the consumer electronics industry, which is notorious for risk stemming from short product lifecycles. Consider the fulfillment process at the digital camera and camcorder division of a global consumer-electronics company. The company has regional offices throughout the world. These offices deal with customers in their region and coordinate with the company's headquarters for orders and fulfillment. Each region comprises one or more countries. Customers in a region include electronics retail chains like Circuit City or Best Buy in the US and Dixons in the UK as well as distributors. So, demand predictions at the retailer’s side for a new product are translated to orders to regional offices, which in turn are evaluated and passed to headquarters. In case that there is lack of communication or coordination between these links, it is very possible that the demand forecasts will include many sharp curves, despite the fact that the demand at retailer’s shelf may be much smoother. So, how can a firm improve its forecasting ability in order to reduce the inherent demand uncertainty for a product? Below, major causes and strategies of demand uncertainty are examined. However, these strategies are not all applicable to every firm. Also, they have to be adjusted in order to offer the maximum possible benefits.
5.2 Causes of the “bullwhip” effect

The objective of supply chain management is to provide a high velocity flow of high quality, relevant information that will enable suppliers to provide an uninterrupted and precisely timed flow of materials to customers. However, unplanned demand oscillations, including those caused by stock-outs, in the supply chain execution process create distortions. There are numerous causes, often in combination, which will cause these supply chain distortions which ultimately lead to the “bullwhip effect”. The most common general drivers of these demand distortions are customers, promotions, sales, manufacturing, policies, processes, systems and suppliers.

The factor that mainly contributes to the bullwhip effect is the lack of coordination between the supply chain participants. A distributor may perceive a small increase in a retailer’s order as an indication of future demand growth, rather than a temporary or seasonal fluctuation. Expecting higher demand in the future, the distributor orders too much from the manufacturer, in order to be prepared for the anticipated demand. The manufacturer now has a magnified order signal and, forecasting even higher future orders, may order an even larger amount from its suppliers. When the actual demand is much less than the expected at the retail level, the distributor ends up with too much inventory and then cuts back on orders, and even stops ordering completely, and the process repeats up the chain.

The bullwhip effect has in the past been accepted as normal, and in fact, thought to be an inevitable part of the order-to-delivery cycle. Yet, the negative effect on business performance is often found in excess inventories, quality problems, higher raw material costs, overtime expenses and shipping costs. In the worst-case scenario, customer service

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goes down, lead times lengthen, sales are lost, costs go up and capacity is adjusted. So, which are the causal factors that create supply chain oscillations?

**How do sporadic sales promotions impact demand patterns, cost and margins?**

Many companies that conduct sales promotions that affect current inventory and the supply pipeline do not understand the impact, on a quantitative and qualitative basis, of what their sales promotion policies and practices actually do\(^\text{36}\). In many cases the sparks that trigger the fluctuations are set due to promotions or discounts. A common complaint from the manufacturing side of the business, and a common reason for severe demand distortions that cause supply chain oscillations, are unforecasted and "unknown" sales promotions. Promotions and discounts cause customers to buy more during the promotions and buy less later.

**Does the sales incentive plan contribute to demand distortions?**

Sales targets, quotas and commission accelerators when applied to an extended quota period, such as three months, will often cause demand distortion. Management needs to examine the rationale for sales incentives to be based on shorter-intervals rather than three months or longer. Typically, shorter measurement periods promote a smoothing of demand resulting in decreased ordering lumps resulting in a dampening of the bullwhip effect.

**Are there false orders and subsequent cancellations and which are the causes?**

In general, there are two underlying causes that are responsible for false orders. First, the customer does not have confidence in supplier’s ability to rapidly and reliably supply product. In other words, firms do not believe the supplier will ship their orders on-time.

\(^{36}\) "Seasonality and Promotions as they Impact Inventory Management", NBDS.com, available through: http://jobfunctions.bnet.com/
As a result, they will hedge by placing higher than projected demand on the manufacturer in the hope they will receive what they need, when they need it and then, when product availability is considered satisfactory, cancel the balance of future orders. These “false” orders often result in excess purchased material in inventory and in the pipeline as well as underutilized capacity. Second, sales personnel who will not meet their quota for a time period that would accelerate commissions and qualify them for a bonus, will often have added or change orders placed by a cooperative customer to achieve quota. The customer in turn may later cancel, or return, part or all of the order, as well as expect some benefits and/or special treatment from the salesperson in the future for providing that service.

**Do transportation incentives trigger demand?**

Transportation discount incentives for volume orders will often cause customers to accumulate orders and then release lumps of demand. After thoroughly examining the impact that this incentivized distortion has on hampering a supply chain planning capabilities, and the resultant associated costs, it is helpful to examine the freight incentive practices.

The batching of orders and shipments can also start the fluctuations. Many companies order only once a month or once every two weeks, creating an order “spike” for their suppliers. In addition, suppliers’ salespeople, motivated by quarterly bonuses, typically create incentives for their customers to order more than they need toward the end of each quarter, causing over-supply in the last month of the quarter followed by low order volume in the next month.

**Has the company developed partnerships based on trust with its customers?**

With distributors often suspicious of a manufacturer’s ultimate intentions, especially with the possibility the distributor will be removed from the sales chain, and, the manufacturer selling directly to end-users, there is no desire to frequently share customer volumes, demand patterns and inventory positions. On the other hand, this mistrust contributes to
demand oscillations, stock-outs, higher inventories and lost sales for the manufacturer and distributor. Developing a workable and effective solution is essential. For whatever individual or combination of causes that creates demand surges and oscillations, these lumps of demand explode out through the supplier network and the supplier network often extending lead times due to unexpected, and often false, increases in demand. Then, the supplier network may not be able to get raw material in a short enough lead time which reverses in the supply chain as it causes their and your delivery lead time to lengthen.

Then, the product manufacturer tells their distributors who tell their dealers that lead times have increased due to supply problems. The bullwhip effect is now traveling the other way down the supply chain. And, it may get worse with another similar effect going up the chain again as longer lead times cause customer’s replenishment planning systems to start new, and very often, false demand for future supply coverage. This new surge in demand often causes decisions to be made that will increase capacity unnecessarily as the demand ultimately dissipates. As unnecessary demand variability complicates the supply chain planning and execution processes, the following undesirable effects increase in their severity as they negatively impact operating performance:

- Schedule variability increases
- Capacity is overloaded and/or under-loaded
- Cycle times lengthen
- Working and safety stock inventories increase
- Overall costs increase
- Customer service levels decrease
- Sales and profits decrease
5.3 Strategies to eliminate the “bullwhip” effect

The most effective process for smoothing out the oscillations of the “Bullwhip Effect” will be firms and suppliers understanding what drives demand and supply patterns and then, collaboratively working to improve information quality and compressing cycle times throughout the entire process. One of the most important measures against the bullwhip effect is information sharing and tight coordination. Sharing of demand information and synchronized planning across the supply chain are crucial for this purpose. Barilla, an Italian pasta manufacturer, is a case example. Pasta is a product that has both low demand and supply uncertainties. Yet, as a result of the retailers’ over-reactions to demand signals, orders that are batched to make full truckloads, promotions, and order exaggerations, a high level of demand fluctuations occur, leading to significant waste and losses. The next figure shows the amplification of demand fluctuation of Barilla’s product from the distributor to the manufacturer. Through information sharing and coordinated replenishment programs initiated by Barilla, the supply chain efficiency was greatly improved. Inventory dropped by close to 50%, and stock-out rates were down to almost zero as a result of the tight coordination.

In general, a firm may find opportunities for improvement by adopting some or all of the following actions to minimize the bullwhip effect and increase business performance.

- Minimize the cycle time in receiving projected and actual demand information.
- Establish the monitoring of actual demand for product to as near a real time basis as possible.
- Understand product demand patterns at each stage of the supply chain.
- Increase the frequency and quality of collaboration through shared demand information.
- Minimize or eliminate information queues that create information flow delays.

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37 “Supply Chain Management: Cracking the Bullwhip Effect”, Part III, Michael Donovan. Performance Improvement


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- Eliminate inventory replenishment methods that launch demand lumps into the supply chain.

Figure 1 - The bullwhip effect of Italian pasta manufacturer Barilla (ref. 38)

- Eliminate incentives for customers that directly cause demand accumulation and order staging prior to a replenishment request, such as volume transportation discounts.
- Minimize incentivized promotions that will cause customers to delay orders and thereby interrupt smoother ordering patterns.
- Offer products at consistently good prices to minimize buying surges brought on by temporary promotional discounts.
- Identify, and preferably, eliminate the cause of customer order reductions or cancellations.

Even the most modern of Supply Chain Management systems cannot automatically stop the “Bullwhip Effect”. It’s a demand management process problem with very broad
implications because it often encompasses policies, measurements systems, practices and, in some cases, the very core of an organization’s value and belief system. However, following one or more of the strategies above, the impacts may be eliminated as in the case of Barilla.

5.4 Reduce demand uncertainty using postponement

Postponement strategies offer opportunities to achieve delivery of products in a timely and cost-effective manner by rearranging the conventional production and logistics structures, which are often designed and managed autonomously. Actually, they enable companies to improve responsiveness to shifting customer demand, thus gaining benefits of improved customer service levels and reduced inventory costs.

By employing the concept of postponement and combining it with a holistic view of the supply chain, some companies have managed to significantly increase their performance. The logic behind postponement is that risk and uncertainty costs are tied to the differentiation (form, place and time) of goods that occurs during manufacturing and logistics operations. To the extent that parts of the manufacturing and logistics operations can be postponed until final customer commitments have been obtained, the risk and uncertainty of those operations can be reduced or fully eliminated. The notion of manufacturing postponement is to retain the product in a neutral and non-committed status as long as possible in the manufacturing process. This means to postpone differentiation of form and identity to the latest possible point.

Postponement strategies enable companies to design products that are customized and assembled quickly and inexpensively once actual customer demand is known - as

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39 “Postponement and Information Systems in a supply chain”, Krishman Anand, Northwestern University, IL and Haim Mendelson, Stanford university, CA

40 “The adaptive Supply Chain: Postponement for Profitability”, Lisa M. Prats, Oracle Corporation and Cap Gemini Ernst & Young, 2003
opposed to building products in bulk and storing them in warehouses until demand increases. By holding inventory closer to customers, companies can transition from a "push" oriented supply chain to a "pull" or demand-driven supply chain, resulting in improved order fill rates, wider product offerings and increased top line revenue.

The most celebrated example of a postponement strategy in the apparel industry is Benetton, in which the company redesigned their sweater manufacturing process from dye first, knit second, to knit first, then dye; thereby postponing the color destination of the product. Similarly, HP postponed their localization step for their Deskjet Printer (localizing the printer for different country needs) from the factory to distribution. The new processes may actually be more costly, but when product demand is unpredictable, pursuing a “responsive” supply chain strategy is more appropriate than a “cost-efficient” strategy.

In "The Adaptive Supply Chain: Postponement for Profitability" (ref. 40) at the 2003 APICS International Conference and Exposition, it is stated that the majority of companies that have implemented postponement strategies are realizing significant improvements in customer satisfaction, inventory costs and more accurate demand forecasting. The study also determined that nearly half of responding companies have not implemented postponement strategies because of little knowledge of postponement benefits and associated costs, perceived technology limitations and ineffective organization alignment.

Key study findings, which refer to more than three-hundred fifty supply chain professionals at both large and mid-sized companies across numerous industries include:

- 91% of respondents using postponement strategies have realized significant improvements in customer satisfaction and inventory costs
- 73% of respondents said that increased difficulty to forecast demand is a key driver for implementing a postponement strategy; 60 percent said that customers demanding higher levels of customization is a primary driver
56% of respondents noted that a lack of understanding of postponement strategies and technology limitations are significant inhibitors

50% of respondents said that the biggest postponement implementation challenge is aligning the organization

5.5 How to organize production schedule for seasonal products

It seems that seasonal products are getting more and more seasonal, in other words, the peak period is getting shorter. Big global retailers, like Wal-Mart or Cosco, want to receive items just before customers want them. They don't want to sit around holding dead inventory from fall until Christmas. That puts pressure on distributors, which in turn put pressure on manufacturers, and so on, the pressure moves in the supply chain. The same thing happens within each company. The pressure is passed from the customer service department to the finance department to production to warehouse to shipping, and so on. Each department gets hit with a demand wave in their respective peak seasons and is responsible for companies sitting with a more or less empty warehouse for the greater part of the year.

Demand forecasts have often been inaccurate, especially at the first stages of a product introduction into the market. When forecasting, it is important to notice whether or not the product is seasonal or not. In case it is seasonal, there are several issues to consider regarding its production schedule. Ultimately, a firm needs to decide whether or not it wants to produce the product at a constant level throughout the year, thus building up inventories and selling them off during the busy season, or whether or not it wants to produce products at a level that chases demand, which means producing the items right before you can sell them.

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41 "Is it sporadic or is it seasonal?", Effective Inventory Management, available through: http://jobfunctions.bnet.com

The first issue to look at is the holding cost of the product. If holding costs are very low relative to the revenue received per unit, it may be worthwhile to produce at a constant level. Even if the firm only sells the product during the fall (i.e. during Christmas period), production in winter that is held as inventory during spring summer may be worthwhile if holding costs are low enough. Chances are, if the product is that seasonal, it is not worthwhile to produce at a constant level.

Another issue to look at is how chasing demand may affect the production schedule. If the firm decides to produce only during four months of the year in order to accommodate the four months worth of seasonal demand that it has, it should consider how intensive those four months will be. If the company produces a plethora of other products, then this may be a simple reallocation of resources. Ideally it would have another product that just so happens to be sold during the remaining seasons.

Another important factor in determining the choice of production schedules is how the suppliers will respond. Perhaps they will prefer that the firm produces all at once so it can have large quantities sent to it which may result in quantity discounts. However, it is also possible that suppliers would prefer to produce at a constant level.

5.6 Restructuring demand forecasting - The Gillette case

As it is described in the article “How Gillette Cleaned Up Its Supply Chain”\textsuperscript{43}, in 2002 Gillette was facing severe supply chain problems, the most important of which were the low service levels and dissatisfied customers. The company decided to start an organization re-structuring based on the premise that “the value chain begins and ends at the retailer's shelf”. By that time, Gillette had failed to meet its goals for effective

\textsuperscript{43} “How Gillette Cleaned Up Its Supply Chain”, Mike Duffy, Supply Chain Management Review, January 2004
customer service. In personal care products (deodorants and shave preparations) its performance had been especially awful. Gillette managers conceded that customer service levels in personal care lines were low, approximately 80-percent, despite earlier expectations that overall service would be at 98 percent by the first quarter of 2002. Even more important was that while Gillette’s products were constantly in demand, the company could not reliably ship to its customers’ requirements. The overhaul did not happen by implementing sophisticated software. It came from a focus on process and people. Specifically, it meant spotlighting four key areas:

1. minimizing complexity
2. improving demand planning
3. improving product supply
4. implementing a new value-chain organization.

At this point, we examine the re-designing of Gillette’s demand-planning processes. Gillette did have such processes, but they were not effective. Actually, the company had a top-down approach to planning, which means an approach that was focused on a financial number rather than a unit planning number and reflected a goal for what its managers wanted to sell, not a clear-eyed view of how many units the company really could sell. The first area of focus was to be free from the financial commitment from the demand plan. That enabled Gillette to generate an unbiased prediction of true customer demand.

The next area concerned SKU forecasting of open-stock items (the regular-turn items that are constantly replenished on the shelves). Gillette had excellent software in place, but they weren't leveraging its full capabilities to model the transaction history and to incorporate business intelligence. The company used IT experts and trained its planners on statistical modeling and tool usage so they could take full advantage of the software's capabilities. In addition, the managers hadn't been using account-level forecasts to derive the demand plan. Now, they're partnering with some of our key accounts on collaborative
order forecasts, not only for open stock and promotional forecasts but also for any activity that might affect consumer demand.

Another area with great significance was promotions. Historically, Gillette had concentrated on the dollar accuracy of forecasts rather than the unit accuracy. As a result, the company had plenty of shipment inaccuracies; the dollar figure may have been right but the actual shipments failed to meet customer requirements. Now, managers work closely with sales to ensure that dollar forecasts are translated into unit forecasts and that all parties own and are held accountable for that final expectation. While variability in the supply chain is never good, its impact is dampened if it can be predicted. Segmenting the forecast down to open stock, displays and special packs has allowed Gillette to accommodate spikes in demand that the company knows will occur due to factors such as seasonality and promotions. All above measures taken by Gillette in 2002 proved to be very successful: customer service levels up by 10 percent, inventories down by 25 percent, costs cut by 3 percent.

In addition to the organizational restructure that took place in 2002, a recent study of Atul Agarwal and Gregory Holt, "Reducing Inventory by Simplifying Forecasting and Using Point of Sale Data" \(^{44}\) concludes that further improvements are possible if Gillette changes its forecasting horizon from one month to one week.

Gillette gains the benefits of risk pooling by aggregating the demand of all of its customers in centralized DC's. There is essentially one large safety stock to cover demand uncertainty of all of its customers. When an order is unusually high, another may be unusually low and the two will cancel each other out. The safety stock which Gillette maintains is related to its ability to predict the total orders from all of its customers. Thus, improving the forecast of one of its customers in isolation (even one as large as Wal-Mart) won't necessarily have a significant impact on safety stock.

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\(^{44}\) "Reducing Inventory by Simplifying Forecasting and Using Point of Sale Data", Atul Agarwal and Gregory Holt, MLOG Thesis, 2005
Among others, the study examines the impact on forecasts of shortening and simplifying the demand planning process. By improving the forecast of orders from their customers, vendors like Gillette can reduce safety stock inventory which is held as protection against unpredictable demand. Gillette currently produces a forecast each month of what its customers will order. Much of the data used in this forecast is collected early in the month. This forecast is then used over the next month to determine how much product to produce. Thus, by the end of any given month, production is being determined by data which is from 4 to 8 weeks old. Since forecasts tend to deteriorate with time, it's easy to see that the forecast made by Gillette suffers from inaccuracy caused simply by the passing of time. The study concludes that by switching to a simple moving average updated weekly, Gillette can save 6 days of safety stock. By adding in various other simple improvements to the forecast such as correcting for bias, it can reduce the required days of safety stock to 14, for a total of a 33% reduction in safety stock.

5.7 Functional vs. Innovative products - Differences in demand

Demand uncertainty is linked to the predictability of the demand for the product. Functional products are ones that have long product life cycles and therefore stable demand, while innovative products are products that have short life cycles with high innovation and fashion contents—and which, as a result, have highly unpredictable demand. Fashion apparel, high-end computers, the latest integrated circuits, and mass customized goods are examples of innovative products, while household consumable items, basic foods, oil and gas, and basic clothing are examples of functional products. Clearly, different supply chain strategies are required for functional versus innovative products.

Functional products tend to have less product variety than innovative products, where variety is introduced due to the fashion-oriented nature of the product or the rapid introduction of new product options due to product technology advancements. Demand for functional products is much easier to forecast, while demand for innovative products
is highly unpredictable. Due to the differences in product life cycle and the nature of the product, functional products tend to have lower product profit margins, but the cost of obsolescence is low; whereas innovative products tend to have higher product profit margins, but the cost of obsolescence is high.

5.8 Reduce uncertainty using risk hedging - The Victoria’s Secret case

There are supply chains that utilize strategies aimed at pooling and sharing resources in a supply chain so that the risks in supply disruption can also be shared. It is therefore a risk-hedging strategy. A single entity in a supply chain can be vulnerable to supply disruptions, but if there is more than one supply source or if alternative supply resources are available, then the risk of disruption would be reduced. A company may want to increase the safety stock of its key component to hedge against the risk of supply disruption, and by sharing the safety stock with other companies who also need this key component, the cost of maintaining this safety stock can be shared. Such inventory pooling strategies are quite common in retailing, where different retail stores or dealerships share inventory. Distributors such as Ingram-Micro have also provided similar pooling of inventory for their customers. The Internet plays a key role in providing information transparency among the members of the supply chain that are sharing inventory. Having real time information on inventory and demand allows the most cost-effective transshipment of goods from one site (with excess inventory) to another site (in need).

The United States is one of the world’s largest markets for apparel products. Most apparel companies in the United States distribute their products through a variety of channels, such as wholesale, catalog, and Internet, as well as through their own retail stores. In the last decade, supply chain technologies driven by the Internet have provided apparel companies with considerable competitive advantage.
Limited Brands operates more than 3,700 stores in the United States including an apparel business, an intimate apparel business, and a personal care products business. Currently, Limited Brands is focusing on its core players, which are Victoria’s Secret and Bath and Body Works. Victoria’s Secret’s business strategy has evolved from a shop-and-copy system to a branded concept, that of selling innovative, technologically advanced products at reasonably high profit margins. At the same time, the company is somewhat risk averse and does not rely solely on its fashionable bra launches for all of its sales. It distributes risk by having a mixed assortment of fashion and basic goods, which in turn adds complexity, in that the brand has to operate two supply chains; one for each of these types of products.

The operating model at Victoria’s Secret Stores is to achieve desired brand recognition through innovative product development, glamorous bra launches and high shelf availability of its products. Most of the Victoria’s Secret Stores’ new product introductions are offered in both fashion styles with less predictable demand as well as basic products with stable demand. This mix of fashion and basic items helps Victoria’s Secret to distribute risk, to ensure profitability and to offer compelling value to customers. The company identifies that there is not a single all-in-one supply chain solution for both of these categories of products and therefore it maintains different supply chains for each product category.

On the demand planning and forecasting, Victoria’s Secret uses two promotion channels; the Catalog and Web businesses that are governed by separate strategies. This is primarily because the drivers of demand for the two channels are different. For the catalog, the demand forecast is mapped against the curve of the product life cycle from the point the catalog is mailed to when 98% of the product is sold. Moreover, circulation of printed books is the primary driver of sales. Within a catalog, dynamics related to location of the display of product, and to the model selected for the display, are sales

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45 “Supply Chain Strategies in the Apparel Industry: The Case of Victoria’s Secret”, Sumit Kumar, MLOG Thesis, 2005
drivers. Once Direct has visibility as to the actual product layout of the catalog, it re-
forecasts the demand several weeks before it is mailed, and subsequently adjusts its
purchase orders. For the web, on the other hand, the forecast is based on individual item
performance on an hourly, daily or weekly basis.
Chapter 6 – Intellectual Property Protection

6.1 Overview

Firms from industrialized nations evaluate any kind of outsourcing question whether vendors have sufficiently robust security practices and if vendors can meet the security requirements they have internally. While most companies find offshore vendor security practices acceptable, the risk of security breaks or intellectual property protection is inherently raised when working in international business.

Although a trade secret misappropriation is not necessarily more likely to occur when a U.S. company outsources its work offshore to popular Asian countries like India and China, which are both WTO members and therefore subject to the TRIPS obligation, than in the United States, the lack of a well-established legal infrastructure for protection of trade secrets in those Asian countries raises the consequences of such an occurrence.\(^{46}\) India, for example, continues to struggle in its efforts to deter trade secret theft, notwithstanding its adoption of revised laws that are designed for better protection of trade secrets and its relatively strong cultural bias towards protection of trade secrets compared to other Asian countries.

China, on the other hand, is under an annual review for compliance with the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) obligation of World Trade Organization (WTO) until and through 2011. Aside from the lack of an established or well-established legal infrastructure for protection of trade secrets in India and China, U.S. companies that outsource their works there have been unable to rely on the legal systems of these countries when their trade secrets are misappropriated.\(^{47}\) Most observers find the legal system of India or China far less responsive and predictable than the legal

\(^{46}\) "Intellectual Property", Outsourcing Law (http://www.outsourcinglaw.com/intellectual_property.htm)

system of the United States or the United Kingdom. This is because little or no precedent exists involving a misappropriation of trade secrets there. Under these facts, a U.S. company with a loose trade secret protocol faces even greater risks of experiencing a misappropriation when its trade secrets are sent offshore to India or China.

On the legal side of the intellectual property protection issue, in the Agreement on Trade-Related Aspects of Intellectual Property Rights, all members of the World Trade Organization are obligated to announce procedures and remedies under their domestic law with a vision that trade secrets of both their nationals and everyone else are protected and enforced more consistently across country borders. Moreover, the agreement regulates the following issues:

- How basic principles of the trading system and international IP agreements should be applied
- How to give adequate protection to IP rights
- How countries should enforce those rights in their own territories
- How to settle disputes on IP between members of the WTO

The same agreement mandates criminal sanctions for unlawful disclosure of trade secrets. Additional deterrence measures include:

- Creating a dedicated center with an existing third-party organization exclusively servicing one company’s offshore outsourcing needs
- A project-by-project contract with one or more existing third-party organizations that are not dedicated to any single company
- A joint venture with one or more partners. The new entity is ultimately transferred to partners after transition period.

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Companies leveraging the cost savings and expertise promised by outsourcing typically place their most critical intellectual property in the hands of outsourcing providers. To minimize the significant risks associated with this transfer of IP, the attorneys charged with structuring the outsourcing deal will want to:

- Guard against the service provider’s unauthorized use or disclosure of the company’s trade secrets.
- Ensure that the service provider will refrain from using third-party trade secrets in the course of its work on the company’s behalf.
- Secure ownership of new trade secrets or other types of IP rights created by the service provider in the course of its work on the company’s behalf and through use of the company’s trade secrets.
- Indicate remedies for acts of misappropriation. Although outsourcing transactions with domestic providers pose such risks, the risks are even more profound when the service provider is located in China and India, which have weaker IP laws, less transparent and efficient courts, and less predictability in the process. In addition, the lack of recordkeeping burdens a company from conducting their usual due diligence. Accordingly, the contracting stage is uniquely important in cross-border transfer of the firm’s IP.

6.2 Counterfeiting business in China

In the luxury retailer industry, major firms are advertising their luxury goods in the capital and fashion magazines, thus creating a desire for brand name style. However, many times the reality is out of reach for most consumers. Despite recent legal crackdowns against counterfeit goods and heightened discretion among knockoff vendors, an unquenchable demand for fakes still exists49. The underlying reason is that despite the fact that lots of people are starting to know good quality and appreciate

49 "Fakes still have their niche in China", Ann Mah, International Herald Tribune, May 2006
beautiful expensive things, they can’t afford the real thing, but still want the prestige of a name brand; that’s why they buy fakes.

However, luxury retailers started fighting counterfeiters. In a joint complaint, Chanel, Louis Vuitton, Prada Holding, Burberry Group and Gucci blamed a Silk Alley, Beijing landlord for copyright infringement. A Beijing court ruled that the landlord must pay 100,000 Yuan in damages and assume liability for knockoff products sold on his property. Through their legal efforts, luxury retailers hope not only to increase sales, but also to protect their stylish status. Actually, brand name products are selling the status that their label represents. Unless luxury retailers start taking care of themselves, consumers will feel the brand doesn’t care enough to preserve its image.

On the other hand, there is doubt whether legal crackdowns will boost sales for luxury retailers. Probably, people who buy knockoffs are not in the market for the real stuff. If the product is no longer available at the price they can afford, then consumers will turn to something else. In the end, a growing selection of mid-priced brands may move consumers away from knockoffs. Right now, there are no good quality mid-priced brands and no good local designers, but it is sure that they’re going to be there.

In the high-tech industry, fake electronic goods and telephones are so convincing in China and reach consumers earlier than their authentic counterparts that some buyers are left believing the real thing is the fraud and its maker the knockoff artist\textsuperscript{50}. One prominent example of the phenomenon is the Chocolate phone of LG Electronics. Customers were surprised to see the imitation Chocolate phone; it was exactly like the real one in design. LG took so long to get a Chinese version ready, that by the time they launched theirs into the market, the copied Chinese version had been on sale for so long that LG’s phone was seen as the fake item copying the ‘original’ Chinese version\textsuperscript{51}.

\textsuperscript{50} “\textit{In China, fake tech products look so real the real ones look fake\textquotedblright}, Paul McNamara, November 2006, available through: http://www.networkworld.com/

\textsuperscript{51} “\textit{Fake Chinese electronics selling better than the originals!\textquotedblright}, Alex Zaharov-Reutt, November 2006, available through: http://www.itwire.com.au/content/view/
Another example is the PlayStation Portable (PSP). Initially designed to come out with in a version that contains a standard GSM mobile phone, a Chinese manufacturer came out with a phone that looks very much like a PSP, although not as wide, with a stack of pirated Nintendo games thrown in for good measure to beef up its gaming credentials, even if those games have been shamelessly ripped off from Nintendo.

Samsung is said to have been so concerned by seeing its phones copied on the Chinese market that it tracked the distribution channels back to the source and discovered the electronics guys responsible for copying their latest products. After offering them a job with Samsung and a chance to go legitimate, they are reported to have declined the offer, saying that they were able to make more money by simply continuing in their pirate ways.

Counterfeit products are everywhere. Whenever there is a branded product—from software and cars to music and prescription drugs—there is a forgery somewhere in the world. Lately, however, it’s getting tougher to spot the fakes. Counterfeiters have matured from their garish early years to rival genuine industries in speed and efficiency. And in honing their craft, they’ve gone from annoying multinational companies to posing a serious competitive threat.

According to the World Customs Organization, counterfeiting accounts for 5 to 7 percent of global merchandise trade, equivalent to lost sales of as much as US$512 billion last year. At the industry level, phony car parts, from fenders and windshields to engine blocks, cost the automotive companies roughly US$12 billion a year. In one Chinese city, an estimated 80 percent of automotive parts are said to be counterfeit. The pharmaceutical industry thinks 10 percent of medicines circulating in the world market today are counterfeit. Also fake mobile phones and their parts are ubiquitous.

While counterfeit products are in markets throughout the world, business is particularly ascending in China, which is home to two-thirds of the world’s pirated goods. Last year alone, China took out of the market 85 million counterfeit publications, from books and
movies to computer discs. According to the Business Software Alliance, more than 90 percent of PCs in China are using pirated operating systems.

There is no need to wonder why pirating goods, manufacturing knock-offs and violating intellectual property rights is a winning strategy. It allows Chinese companies to skip the investment necessary to create and develop products and go directly to profits, without brand building, advertising, or research and development issues. The counterfeiters mature and develop capabilities and strategies that rival the multinationals. Many of these firms boast highly skilled workforces, high-tech distribution networks and sophisticated manufacturing facilities.

Although this activity is illegal, the Chinese government finds itself in a bind. Estimates indicate that in 2004, counterfeit products accounted for nearly 8 percent of the nation's GDP. However, in an effort to continue enticing foreign direct investment, the government is enacting laws and regulations to fight counterfeiting. Yet building the Chinese legal framework for IP protection will take many years, if not decades. For one thing, there are more incentives to break IP laws than reasons not to.

The real question that arises when thinking about outsourcing is whether firms from industrialized nations can ignore the opportunities offered by the Chinese market or whether they can expose their business to an IP risk. Many firms want to do business in China, but the risk exists. Many managers support that the risks are worth taking, but after careful consideration of all issues. Doing business in China requires a multifaceted approach to IP protection that emphasizes prevention while using all possible avenues to enforcement.
6.3 The risk of logo or brand name imitation - The Toyota lawsuit

In August 2003, Toyota Motor Co took on China’s Geely Group in a one-day hearing over its allegation that Geely copied its logo and deceived customers by claiming its Merrie cars used Toyota engines.\(^{52}\)

Toyota asked for US$ 1.7 million and was the first lawsuit involving vehicle trademarks heard in China. Toyota’s move was the first in a series of intellectual property infringement cases involving a wide number of industries.

Toyota says that the logo on the Merrie vehicle’s hoods, hubcaps, steering column and trunk hood looks like Toyota’s stylized “T”. In addition, a survey commissioned by Toyota revealed that two out of three car buyers mistake Geely’s logo for Toyota’s trademark, helping Geely garner sales. Toyota also alleges that Geely misled its customers by claiming that Merrie cars used Toyota engines.

As China becomes more integrated into the world economy, one can expect many such cases arising in the Chinese court system. Before its entry into the World Trade Organization, China’s climate for intellectual property was “anything goes” and now a new order is settling in. Other possible cases that may soon appear on the docket involve General Motors and Starbucks.

GM claims that a $5,800 minicar called the QQ, made by Chery Automobile, resembles its Spark model, which it produces at a $100 million joint venture with two Chinese partners. GM is investigating how Chery developed the QQ. Starbucks, the Seattle-based coffee chain, is considering a lawsuit against Shanghai-based Xingbake for allegedly copying its logo and Chinese-language name.

6.4 The risk of product imitation & competition from current suppliers

New Balance\textsuperscript{53} is a Boston, MA based athletic apparel company, which manufactures footwear and athletic shoes for men, women and children. Its market consists of 120 countries, in all six continents. Subsidiaries are located in the UK, France, Germany, Sweden, Hong Kong, Singapore, Australia, New Zealand, Mexico, Canada, Japan and South Africa.

One factor that makes New Balance unique is that the company remains committed to domestic manufacturing, owning and operating five manufacturing facilities in the US and one in the UK. The “Made in USA” logo does not appear only on New Balance’s shoes, but to their manufacturing and social strategy as well. Making shoes at home also shortens the supply chain and decreases transportation costs and costs associated with importing products and increases the job positions offered in the United States.

However, domestic production accounts only for 25\% of New Balance’s total production. As any major athletic shoe company, New Balance manufactures 70\% of its global output in China. Low labor cost and decreasing shipping costs are the main reason for this transition. Moreover, New Balance wants to exploit the opportunities given by the Beijing Olympic Games in 2008. Even though manufacturing in China and penetrating the Chinese market seems very promising for a giant like New Balance, the risk of product imitation always exists.

In order to begin its activities in the South East region of Asia, New Balance signed a contract with a Taiwanese supplier, who was one of the top suppliers for New Balance for many years. In 1995 New Balance decided to increase production for global sales and to sell New Balance shoes in China’s domestic market. Mr. Chang, the Taiwanese

supplier, held an exclusive distribution agreement with New Balance, apart from the manufacturing agreement he already had. However, his strategy started differentiating from New Balance’s strategy, since his goal was to increase market share in the low-cost shoes market. Instead, New Balance wanted Mr. Chang to increase the production of more expensive models. Mr. Chang started selling low-cost shoes domestically and later on started exporting to Japan (a major market for New Balance) at a lower than indicated price. After a while, Mr. Chang created a new brand, the “New Barlun” enterprise, and flooded the market by selling unauthorized New Balance designs at a third of nominal price.

After that, New Balance stopped any relationship with Mr. Chang and shifted production to other Chinese factories. New Balance started a giant legal struggle and changed their perception of fighting against counterfeits, since the most costly activity is legal fight. The loss cannot be measured only in monetary terms. The most significant is that the company might lose its brand name and reputation in case it does not handle the problem quickly and efficiently.

Today, New Balance has hired private investigators that go onsite and try to find fake shoes in China. The most important for New Balance is to hit copies right in the factory. If the shoes reach the market it is difficult to locate them as they spread into many locations, sometimes even unknown. Moreover, if the market is flooded with fakes, customers are reluctant to buying your products even from the factory store, hitting both your reputation and your market share.

In general, the problems begin when strategic issues not arranged in the primary contract are of different importance for the two partners. In the case of New Balance, Mr. Chang was legally the exclusive distributor and one of the top manufacturers. New Balance should not mix those actions, in order to prevent losing control. He also disclosed to the headquarters the potential in China and was encouraged to increase production. He also invested in retail stores, expanding production capacity, inventory and he was also in a binding distribution agreement. Certainly, New Balance did not have a strong contract in
hands and gave Mr. Chang the freedom to decide on his own for the strategy of a large company in a huge market like China.

6.5 Strategies to Mitigate Intellectual Property Risk

The risk of intellectual property exposure to potential counterfeiters can be mitigated by following the four-step protection strategy\textsuperscript{54}, which should be embedded into the overall company's strategy to do business in China.

**Determine which products to outsource.** When deciding the most appropriate products to manufacture offshore, products in the mature phase of their lifecycles are obvious candidates, since manufacturing offshore presents less IP risk, and improves the product line's competitive positioning as costs are lowered. However, there are times when it makes sense to produce leading-edge products offshore. Most of the automakers and the major consumer electronics companies produce some of their top products offshore due to the highly competitive nature of their global industry or to serve the local market. But before making an offshore decision, these companies perform a thorough evaluation of the IP contribution to the product's competitive position and consider its phase in the product life cycle. Once a decision is made, for example to produce the product in China, then decisions about IP protection measures are made, evaluating the IP risk against the benefits. A very important issue is whether a firm manufactures in-house or outsources to a contract manufacturer. So while many mobile phone manufacturers make advanced phones in China, they do so in their own facilities as opposed to getting a contract manufacturer to do it.

**Define your IP risk.** Protecting intellectual property rights in China requires identifying all the potential risks in producing a product there. Companies should assess these risks across the entire value chain, from product design and sourcing through manufacturing

\textsuperscript{54} "Staying Ahead of China's Counterfeiters", Laurent Petizon, Lian Hoon, Stephen Hayers, ATKEARNEY.com
and distribution. For example, at the design stage, it’s critical to closely guard blueprints in the China design unit from potentially unscrupulous components suppliers. In the manufacturing process, look for joint-venture partners replicating the manufacturing process in another unauthorized facility under a different brand name. And in the distribution function, look for unauthorized distributors simultaneously dealing in counterfeit products.

Part of determining risk is identifying the real intellectual property within the product and mapping its core competence against the company’s entire product range. If a product contains intellectual property that is also at the heart of a wider portfolio of products, a lot more than the revenue from that individual item could be at risk. The company could be exposing its entire product line to copying, and with it, the company’s entire future. In these situations, the IP of any given product must be viewed in context of all products across the entire company.

**Manage risk exposure.** Protecting intellectual property requires managing your risk exposure. Questions to ask include: How important is the IP in securing revenues? How vulnerable is the product or brand to imitation? Sometimes findings at this stage are surprising. For example, we’ve seen cases in which a multinational thinks its technology IP is critical to sales because customers purchase the product for its high-end functionality and quality. However, in its China operations, customer service is more essential to sales, rendering the technology IP much less valuable. Once you establish what is truly valuable in intellectual property terms in China, you must craft all relevant protection strategies around this core. Protection strategies can be based on different mechanisms such as the speed of innovation, product complexity or exclusive supplier relationship.

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83
Develop a transfer plan. Implementing an IP-protection strategy requires launching several work streams at once. Determining these work streams begins with answering a few questions:

- What is the best partnering approach for doing business in China?
- What is the estimated time frame for the transition?
- How should the program management team be structured?
- How should the organizational changes and interfaces be defined?
- How will information flows be controlled?
- When will changes be communicated?
- What will be the financial return on the plan and when will it be realized?

The answers will help managers decide for the best IP-protection strategies for their companies. But beyond the legal patents, copyrights, lobbying and relationship building there are some other measures that can help the way of protecting intellectual property. The next figure illustrates A.T. Kearney’s approach. How a company implements it depends on the type of risk it faces. For example, the left side of the graph represents products for which customer loyalty is low, such as consumer electronics. Products in this group are usually commodities and a certain degree of imitation, whether in the form of reverse engineering or outright duplication can be expected. Depending on the importance of the intellectual property, a company may focus on one or more of the proposed measures.

Outpace imitation. The most intuitive way to counter IP violations is to outpace imitation. In other words, quickly introduce new products, improve existing products as often as possible and build brand image. This forces rapid evolution of customer markets, reduces product lifecycles and interrupts competitors’ ability to respond. For example, global cell phone manufacturers responded to the rapid launch of fake products by

56 “Staying Ahead of China’s Counterfeitors”. Laurent Petizon, Lian Hoon, Stephen Hayers, ATKEARNEY.com
China's domestic cell phone manufacturers. To recapture market share lost in 2003, the global companies used their stronger product development capabilities to add accessories such as cameras to their core handsets.

![Figure 2 - Business Strategies to protect intellectual property (ref. 56)](image)

**Manage imitation.** Instead of waiting for a Chinese firm to copy a certain product, it is better to offer licenses or joint ventures to these firms. In this way, the multinational continues to secure revenues and control while giving locals a chance to compete. Some multinationals have taken this a step further by selling production expertise to the Chinese firms. If done properly, the company gets insight into the processes the Chinese have in place—which can prove quite valuable in keeping ahead of the competition. The attraction for the local company is that it becomes a legal user of the intellectual property, and may potentially increase revenues as a result.

**Block imitation.** Companies can block IP imitation by identifying and controlling core competencies or sub-products within the supply chain. Consider, for example, the secrecy
that surrounds formulas used by iconic brands such as McDonald’s, Kentucky Fried Chicken and Coca-Cola. This approach is not restricted to chemical mixes, however. The details of critical production processes can be kept confidential by using preloaded software algorithms in any machinery that resides in an offshore manufacturing plant. Some companies protect their business by using manufacturing modules. In this approach, the company keeps critical IP in a separate location and then ships the modules to their offshore operations for final processing or assembly. Multinationals in industries as diverse as auto parts and power equipment favor this strategy.

**Discourage imitation.** You can discourage imitation by raising barriers across the entire supply chain. For example, using tracking technology such as radio frequency identification, or RFID, will separate genuine products from the imitations. Companies can follow up by taking legal action against customers and end-users in Western countries that purchase the counterfeit products. This forces buyers in these countries to pay attention (to make sure they purchase only genuine products) and is yet another obstacle for counterfeiters.

Yet, there is no single or simple solution to protecting intellectual property in China. The ideal checklist includes obtaining comprehensive local protection in the form of patents, copyrights or trademarks for your products, lobbying with the growing number of protection agencies, and developing sensible business strategies that take IP risk into account. Companies that approach the IP problem holistically, understanding what is truly valuable and what is not, will not only profit from a more secure environment but also from more deliberate marketing and supply chain strategies.
Chapter 7 - Questions to Answer Before Outsourcing

7.1 Overview

This chapter does not introduce any new issues related to the supply chain structure of firms, nor does it indicate any best practices that have led to excellent supply chains. Instead, it does provide a list of questions that either a firm’s supply chain managers or a shipper have to answer or ask before taking the decision to outsource supply chain activities either locally or offshore, like in China.

The previous chapters work as the pool for extracting the major problems that may arise when outsourcing. Through the cases studies presented it is clear that problems can arise throughout the supply chain, including the suppliers, vendors, manufacturers and finally the retailers. These problems are in most cases related to inventory management, long lead times, product imitation, demand uncertainty, failure to cover demand, failure to ship and arrive on the shelf on time etc.

It was also demonstrated that some problems can be prevented, whereas others are not easy to predict. In this first category we could classify problems due to poor relationship between supply chain participants, whereas in the second category the problems arise due to unpredictable events like earthquakes, hurricanes and other physical phenomena.

A firm can increase the strength of its supply chain by studying and implementing best strategies that would have prevented disruptions to the companies that occurred. The questions presented below are not the panacea. Despite they are very important, they can work only as the starting basis when discussing the issue of outsourcing or shipping products globally. In addition, they do not cover the cost and benefits of outsourcing in terms of lower labor costs, lower land costs and in general monetary benefits that the company will gain in case it decides to outsource, but they try to give an insight to the problems that may arise and that are not easily identified at the first stages of outsourcing.
or before going and setting up a plant or a vendor contract offshore. Their purpose is to make managers think of “What can go wrong?” In many times the answer of this question makes the idea to outsource worthless whereas in other cases makes managers re-evaluate the whole supply chain strength under the fact of outsourcing. In most cases, when a company identifies the possible problems and evaluates the possibility of disruptions, it can build stronger supply chains and be better prepared for the problems that may arise and that is exactly the purpose of the questions presented below. Based on these facts as well as on the fact that a firm cannot always have all the information needed to take a decision, we present the questions that are both important and relatively easy to start thinking about the possible negative effects of an outsourcing activity.

### 7.2 What to know before setting up a supply chain

On of the most important questions before setting up a supply chain that involves offshore outsourcing is “What is the main reason of going offshore” Is it just cost savings? Lower labor and land costs? Lower taxes” In these cases, the costs and benefits of going offshore can be evaluated and the firm can relatively easy take a decision. On the other hand, there are firms that aim to enter a new market by going and setting up a plant or headquarters offshore and this strategy requires a completely different approach than just sending manufacturing in another country. The following question demonstrates this issue.

- **Can outsourcing be used as a tool for market entry and access?**

When companies started outsourcing to offshore countries, they did that due to the significantly lower manufacturing costs there. But year by year these countries are developing and their buying power increases which imply that the firms that outsource their production or other kind of activities there could use outsourcing to enter these new markets and gain share of the large potential profits. Outsourcing is a very good way of starting business abroad, since people come in contact and work for the company and by
word of mouth the fame and brand name spreads out. It works perfect for countries that are currently developing and the labor and land costs are too low. It may not work in the future for the same countries, but in this case firms can still preserve their market share there and outsource to other developing countries. Firms in the consumer electronics sector, in the apparel and fashion sectors and the automotive industry can easily start doing business abroad and outsourcing is a significant incentive to go and stay there. In addition, firms that aim to gain a significant market share can open headquarters there and have top managers to direct the outsourcing and commercial activities. China and India are two huge markets that are now opening to international firms, since the family income increases year over year. Despite that any firm cannot ignore the huge potential profits of entering a market like China and India, it should be really careful and have well-designed and tested plans before outsourcing due to the high level of counterfeiting, imitations and other kind of problems that may occur.

In Chapter 3, the relationship between suppliers and firms was evaluated through the perspective of the depth of the relationship and what the firm and the supplier will do in case of an emergency. Three representative case studies were used in order to demonstrate the importance of suppliers and the fact that cost savings are important only when everything in a supply chain works as designed. The next three questions deal with this issue.

- How many suppliers should a firm include in the pool of trusted suppliers?
  Should the company keep relationship with smaller suppliers for an emergency case?

This question could also be interpreted as whether it is better to rely on a single supplier or use multi-sourcing. It is not easy to answer the question in a straightforward way. Instead, the answer is highly dependent on the type of product, the size of the buyer, the number of other suppliers offering the same product, the importance of disruptions and stock-outs and the inventory strategy of the buyer. We saw that both Nokia and Erickson were procuring the microchips for their cell-phones by almost one single supplier. The
work “almost” refers to Nokia, which had a strategy to procure about 95% of the needed microchips from Philips in order to gain discount benefits and keep a strong relationship with a well-known supplier. The remaining 5% of microchips were procured from other smaller suppliers that Nokia used to have. And this was the cornerstone that helped Nokia recover from the catastrophe at Philips’ plant at Mexico. Since Nokia had a good relationship with smaller suppliers, they were willing to produce more and help Nokia avoid disruptions when the catastrophe at Philips’ plant occurred.

On the other hand, Erickson solely relied on Philips without procuring any parts from other suppliers. Even if a sole supplier is the best and even it offers the most competitive prices, it is true that the buyer is completely dependent on this supplier. When a disruption of any kind occurs at the supplier’s side, the supplier’s customers may face the disruption impacts in a greater degree. When Erickson realized the disruption due to the catastrophe at Philip’s plant, it tried to find other suppliers to procure the required chips. But this was extremely difficult and the available suppliers were not willing to help Erickson, since they hadn’t any relationship in the past.

This example shows that a firm has to balance the benefits of discounts, short lead times and just-in-time benefits of procuring from one supplier with the costs of disruptions that may occur due to dependence on that single supplier. This case study also demonstrates another important issue that firms should be aware of; Nokia and Erickson are top competitors in the cell-phone industry and both of them were using the same supplier for the procurement of cell-phone microchips. Although this may not always be an obstacle, it does hide some risks, like those in the case of Philips. In such as case, the impacts faced by a firm due to the disruption at supplier’s side are highly dependent on the response and reaction of the other firm. Erickson had to deal not only with the disruption at Philips’ plant, but also with the fact that Nokia had already come in contact with Philips to secure all available production and reached almost all smaller suppliers to increase production and thus cover Nokia’s needs.
What kind of relationship to develop with supplier(s)? Is the relationship based on trust?

Today, supply chain managers realize that monetary benefits from outsourcing is only an issue of the total strategy of outsourcing and firms must secure their manufacturing or other type of outsourcing by building deep relationships and interchange information and key strategies with their suppliers to succeed in the coming years.

When a company procures the parts or semi-final products from a supplier, especially in an offshore country like China, it has to build a strong supply chain capable of withstanding disruptions, long lead times, delays, stock-outs and inventory costs. In order to achieve this goal, the firm needs to build strong relationships with its suppliers and be sure that they are going to support the firm at each step of procurement and production.

Examining again the case of Nokia and Erickson we see that both companies didn’t have a strong relationship with Philips. Instead, their relationship was based more on monetary issues. But, Nokia reacted quickly and asked Philips as well as smaller suppliers for help. After the disruption and until the production at Philips plant reached the before catastrophe levels, these two companies behaved like being one company. They agreed to find available capacity at all Philips’ plants and together dealt with the problem. On the other hand, Erickson showed that its relationship with Philips was very loose. Managers didn’t meet together to build a strategy to deal with the problem, nor did they start finding available chips in the market. Erickson had to deal with the problem on its own, whereas Nokia was closely cooperating with Philips. However, it has to be noted that this reaction was a result of Nokia’s strategy to act immediately when problems arise; Philips was just doing what Nokia’s managers were asking for.

We could certainly say that most firms are in the case of either Nokia or Erickson. They outsource some of their supply chain activities or procure parts and products either locally or from offshore countries and in most times they pay most attention to monetary
issues when contracting with a supplier. However, the reality shows that they are seriously exposed to disruptions and higher vulnerability.

A firm that is worldwide known for strong relationship with its suppliers is Toyota, the giant Japanese car manufacturer. Toyota has a very limited pool of trusted suppliers for parts or products required to build its cars. In many cases, Toyota follows a single sourcing strategy whereas in the rest it follows a strategy like Nokia; it procures close to 95% of a single supplier and the rest 5% from smaller suppliers. Using this strategy, it benefits from discounts and short lead times together with reduced inventory due to JIT strategies, while simultaneously reduces the exposure to disruptions by keeping relationship with smaller suppliers that could help in an emergency case. When a disruption or a similar situation occurs, Toyota together with its close suppliers work to solve the problem. Suppliers trust Toyota and Toyota trusts its suppliers and this fact is far beyond monetary issues. It offers strength to the supply chain and makes a company feel strong to compete with other firms. In other words, Toyota, as well as all other firms that follow this strategy, work closely with their suppliers like they are part of the firm. They interchange information and strategies and in many cases firms buy shares of their supplying companies, like Toyota that has about 30% of Aisin, the Toyota’s almost single brake valve supplier.

- What is the level of exposure to suppliers’ disruptions?

When a company decides to outsource, it is ultimately exposed to the vulnerability of its suppliers. In some cases, disruptions and problems to suppliers may not cause a big problem to a firm. In other cases, like when JIT strategies are followed, a problem at a supplier’s side ultimately becomes a problem to the firm. That’s why big firms and companies that outsource their activities perform a vulnerability analysis and on-site visits to supplier’s place to inspect and estimate possible problems and ultimately the exposure of the firm to these problems. Based on the strategy of a firm, the result of this analysis will show whether or not it is willing to select that single supplier or vendor to be in its pool of trusted suppliers. Again, one can see that in complex supply chains, like
those of big firms from industrialized nations, most issues are interrelated and a possible best strategy for one goal may create problems to other parts of the supply chain. To conclude, the level of exposure is very important and governs the decision to choose a supplier.

In Chapter 4, some important issues about inventory management are discussed. In the same chapter, the benefits of reduced inventory, under JIT strategy, are presented in a short way and simultaneously the risk of exposure to disruptions is analyzed. There are a lot of issues related to inventory; however, in this report the goal is to focus on issues related to outsourcing. This leads to questions related to the relationship between a firm and its suppliers and the transportation means that are available to deliver the products or raw materials on time at the required places. Below, some important issues that have to be solved before outsourcing are presented in a question and answer form.

- **Is it feasible to implement a JIT strategy?**

Through the case studies presented in Chapters 3-6 one can see that there are significant benefits when implementing a Just-In-Time strategy, which do not only refer to monetary benefits, but also to better response and communication and coordination between the two or more participants of this “joint venture”. On the other hand, a JIT strategy increases the risk of disruptions and problems in a supply chain. For that purpose, top firms ask their suppliers to keep a safety inventory level Just-In-Case that something goes wrong. So, before taking the decision to outsource, a firm has to evaluate the option of JIT and estimate the possible costs and benefits. In general, this strategy is applicable for big firms that implement almost single sourcing and keep deep relationships with their suppliers. So, the answer to the question whether or not to implement a JIT strategy will come after the decision of the firm of the strategy to follow with suppliers and the size and brand name of suppliers. A new trend in supplier-customer relationship is the JIT-II strategy that allows supplier’s managers to visit and work at customer’s facilities. The benefits of such a strategy are shorter lead time of orders, lower inventory levels and better response to fluctuations in demand.
What kind of transportation modes to use? What are the cost, time and reliability of each mode?

In general, raw materials and products are transported using air or ocean transportation and for large quantities ocean transportation may be the only option. From a supply chain point of view, moving semi-finished or finished products on a ship carries with it three issues. The first refers to the low cost of transportation compared to air transportation, if feasible, the second to the increased transportation time and the last one to the reliability of the mode, which means the time variability. Firms that outsource in offshore countries and move their products by ship usually face the problem of late deliveries and the result is to run out of products and incur stock-out costs. Under these facts and before taking the decision to outsource a firm must evaluate all possible transportation modes and pay special attention to the reliability factor, which is usually hidden under the lower cost of a mode over another.

Are there quantity discounts on orders? Are there discounts on transportation cost? Is it worthy to pay a higher inventory cost?

It is quite common that big suppliers offer quantity discounts to their customers and this is an important incentive for firms to buy large quantities, in many cases long before the demand period. However, this decision should be taken under consideration of all factors. Commodity products are safer to be procured in larger quantities since the demand is approximately known, whereas for fashionable products this decision could lead to stockpiles of the product in warehouses and many lost dollars. On the other hand, since the demand for functional problems is known with only a small variance, a firm could decide to procure the required amount of products or raw materials close to the time needed for production or for sale and this would ultimately lead to a JIT strategy. So, quantity discounts have to be evaluated in accordance to the procurement strategy and the demand forecasting accuracy in order to gain the benefit of discounts, if any, and avoid the cost of increased inventory.
- Is it feasible to use the strategy of postponement to deal with demand uncertainty and long lead time of offshore outsourcing?

Postponement strategies enable companies to design products that are customized and assembled quickly and inexpensively once actual customer demand is known - as opposed to building products in bulk and storing them in warehouses until demand increases. By holding inventory closer to customers, companies can transition from a "push" oriented supply chain to a "pull" or demand-driven supply chain, resulting in improved order fill rates, wider product offerings and increased top line revenue.

In Chapter 6, the strategy of postponement was presented and it is clear that it leads to significant benefits, in case that it can be implemented. It is also clear that all firms would like to customize their products as late as possible in the supply chain in order to gain benefits from better demand forecasting as the time of customization approaches the time that real demand will occur. But the strategy of postponement is not easy to implement for both product design and product transportation issues. Especially for firms from industrialized nations that outsource in China, the lead time may be from 30 days to 2 or 3 months and the impacts of the high lead time are even worse for products with small life cycle compared to lead time.

- Can the firm secure its know-how? What is the risk of product imitation? With whom vendors to cooperate?

The increasing problem of counterfeiting business in China makes firms look for ways and strategies to deal with this problem. But the results of these strategies are not always the expected and it is a common fact that this problem cannot be solved through the legal way. As a result, firms have to be very careful in the choice of vendors and suppliers and build strong relationships that will prevent the risks to face product imitation and competition from their licensees, nor will their products be easy to imitate since there will be a Chinese partner that protects company’s rights.
Chapter 8 - Conclusions

China’s admission into the World Trade Organization in 2001 made it a very attractive destination for outsourcing manufacturing activities. Large multinational firms have moved the largest part of their manufacturing base there, mainly in order to gain the benefits of low labor and land cost. In addition, many firms use outsourcing as a tool for market entry.

But, going offshore is neither so simple, nor does it always work as designed. The economy is not completely a market driven economy, thus restricting the benefits of competition. The complex public sector and state’s interference in many commercial activities slows and restricts the procedure of establishing relationships with factories, manufacturers and local authorities. Even more important is the fact of the huge counterfeiting business in China that a firm should be aware of in order to protect its know-how. Another issue is that occasionally manufacturers go bankrupt, which will create tremendous disruption if a firm is doing business with them. Therefore, it's smart to be flexible and maintain some diversity when it comes to sourcing its consumer products.

Concluding, there are many aspects regarding a company’s strategy that must be designed and executed well in every detail in order for outsourced manufacturing activities to offer gains. Low labor cost is a major attractiveness for those activities; however, risks implied by the remote location as well as the difference in culture and economic nature can hide traps that might create severe problems and deplete any gains offered by cheap labor. Supply chain managers should take all factors involved in such a decision seriously to avoid such problems.
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Chapter 8 - Conclusions


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Appendix

Required information to answer the questions of Chapter 7

Question: Can outsourcing be used as a tool for market entry and access?

Quantitative Parameters:
(For the first four parameters, 5-year data are essential to understand the trend of each parameter)
- Land cost
- Labor cost
- Inflation level
- Average family income
- Exchange rate and Currency fluctuation
- Taxes
- Number, price and market share of similar products

Non-Quantitative Parameters:
- Available network of suppliers and vendors
- Counterfeiting levels

Land and labor costs are crucial to determine the cost of owning or renting space for headquarters, plants or warehouses. Inflation is needed to take into account future increases in land, labor, telecommunications and transportation costs. The average family income mirrors the buying power of the people in the country and it could be used to extract conclusions about the willingness to buy a product at a given price. The exchange rate and currency fluctuations can seriously affect the profits, since all transactions in the new market will be in the local currency. Another important issue is if the company’s income will be taxable or not and what is the VAT. Last, the availability, number and price of similar products can show whether or not a product can have a similar market success and give an idea about the market price.
Question: How many suppliers should a firm include in the pool of trusted suppliers? Should the company keep relationship with smaller suppliers for an emergency case?

Quantitative Parameters:
- Market “size” of each supplier
- Price policy: Product cost, Discounts
- Lead time of orders
- Reliability of delivery on time
- Probability of disruptions
- Cost of stock-out (lost sales cost)

Non-Quantitative Parameters:
- Type of product: Innovative or Commodity?
- Do other firms procure from the same supplier?
- Can the supplier offer a JIT procurement strategy?

Big firms from industrialized nations use to procure most parts from big, trusted suppliers, so the market size of the supplier should be included in this analysis. High product cost and absence of discounts may rule out smaller suppliers. On the other hand, discounts are an important incentive to procure from a supplier, but their importance is decreased if the inventory cost is high. Lead time and reliability of delivery are very significant and are evaluated in conjunction with the possibility of using JIT strategy and the ability to accurately forecast demand. Lead time should be small compared to the total product life. The cost of stock-outs, which is the result of disruptions, together with the pre-defined customer service level may lead to multi-sourcing strategy to increase the probability of product availability on time. In case of innovative products it is safer to develop deep relationship with a single supplier. The number and size of other firms procuring from the same supplier must be taken into account in an analysis.
Questions:
- A. What kind of relationship to develop with supplier(s)? Is the relationship based on trust?
- B. What is the level of exposure to supplier’s disruptions?

Quantitative Parameters:
- Market size of the firm and the supplier
- Size of orders
- Frequency of orders
- Supplier vulnerability analysis: scenarios, probabilities and impacts
- Frequency of supplier disruptions: Past data
- Cost of stock-out

Non-Quantitative Parameters:
- Long-term strategy of the company
- Innovative character of the product, if any
- Demand pattern

A. Large firm and supplier size allows implementing JIT strategy, in case that the reliability of product delivery is high. Also, the size and frequency of orders together with the procurement strategy may govern the type of relationship to develop. For example, frequent orders of small size to be delivered on time lead to JIT strategy and a deep relationship with a supplier. In addition, innovative product design requires trusted supplier(s) to secure a company’s intellectual property rights.

B. However, JIT increases vulnerability. An analysis of a supplier’s vulnerability provides useful data to estimate the expected cost of disruptions, in case that the probability of the vulnerable scenarios and the corresponding impacts in terms of cost can be estimated. Stock-out cost, which is the cost of lost sales from customers that will turn to other competitive market products, determines whether or not it’s safe to procure from that specific supplier.
Questions:
- A. What kind of transportation mode to use? What are the cost, time and reliability of each mode?
- B. Is it feasible to implement a JIT strategy?

Quantitative Parameters:
- Type and number of available modes
- Total cost using each mode or combination of modes
- Total delivery time using each mode
- Product life
- Inventory cost
- Size of orders
- Frequency of orders
- Lead time of orders
- Stock-out cost

Non-Quantitative Parameters:
- Reliability of each transportation mode
- Demand pattern

A. The type and number of available modes corresponds to the number of existing departures from the place of origin to the place of destination. Production can be scheduled to minimize the layoff time at plant or alongside the ship. Most products are moved in containers, so the cost per container has to be known for both land and ocean transportation. Also, the speed of the mode or the trip time has to be known. The lead time of orders compared to the total product life may govern the choice of a mode.

B. High reliability of delivery on time allows implementing JIT strategies. High inventory cost may lead to procuring small quantities frequently, using multiple carriers.
Question: Are there quantity discounts on orders? Are there discounts on transportation cost? Is it worthy to pay a higher inventory cost?

Quantitative Parameters:
- Discount percentage
- Inventory cost
- Transportation cost
- Product life cycle
- Average time in warehouse/shelf,
- Frequency of orders, demand?

Non-Quantitative Parameters:
- Long-term firm’s strategy
- Demand pattern
- Stage of product life cycle

If quantity discounts are offered, they have to be evaluated in conjunction with the inventory cost. The transportation cost is expected to be the same or less, if transportation discounts are available for batching of orders. The total product life is needed to be compared with the time that has passed since the product launched the market, so as to check the possibility of stockpiles that the firm will not be able to sell at preferred price. In case that the demand pattern is almost stable and predictable, the amount of procurement is determined by the inventory cost. Also, the introduction of new products may affect the demand for that product and this has to be taken into account.