

Shanghai or Charlotte?
The Decision to Outsource to China and Other Low Cost Countries*

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Abstract

The decisions of whether and how to outsource to low cost countries (LCCs) are often very troubling and complex. The popular business press is full of success stories and sometimes shrill stories of failure and of jobs lost to other countries. Managers need to cut through the noise and understand how to approach these issues from both strategic and tactical perspectives. By tracing the experiences of four manufacturing companies, we introduce a framework for the outsourcing decision process – examining corporate strategy, operations strategy, total landed cost, and risk. Throughout, we illustrate the framework with examples. We conclude with some brief comments on the distinction between low cost country (LCC) and domestic sourcing.

1. Introduction

One can hardly pick up a newspaper or business publication today without seeing an article or editorial about outsourcing to China or other developing countries.¹ Some opinion pieces and blogs predict dire consequences if the outsourcing trend continues, while others highlight the increased standard of living that has followed similar trends in the past.² These articles reflect the challenges faced by workers, policy-makers and managers. Many employees fear losing their jobs overseas, and yet flock to Wal-Mart to buy cheap imported products. Politicians worry about constituents' jobs, trade imbalance and global competitiveness, while recognizing the stabilizing effect of strong trade relations. And managers try to balance the needs of their employees and communities with the demands of an often brutally competitive marketplace.

It is no wonder that managers are hungry for information about operations in China, India and other developing countries. They are eager to understand how to approach the complex issues of whether to outsource, where to outsource, and how to outsource to achieve the maximum benefits for their companies. They wonder if they should purchase components or finished goods, or if they should do their own manufacturing by acquiring, merging, or even starting new operations. Unfortunately, many managers make these decisions based on limited information and without a strategic context. They often do not understand the full cost of doing business overseas, choosing instead to focus only on astonishingly low unit costs.

This chapter is intended to help managers with these issues by tracing the experiences of four manufacturing companies. We begin by briefly describing the four companies and their specific concerns. We then introduce a framework for the outsourcing decision process – examining corporate strategy, operations strategy, total landed cost, and risk.³ Throughout, we illustrate the framework with examples. We conclude with some brief comments on the distinction between low cost country (LCC) and domestic sourcing.

2. The Four Companies

Firm A is a large multinational diversified industrial company with annual revenues of about \$10 billion (Table 1). In spite of having a manufacturing presence in over 25 countries and sales in more than 120 countries, managers, prior to 2003, were remarkably U.S. centric. Procurement from low cost countries lagged behind competitors. In early 2003, the CEO issued a mandate to increase the volume of purchases from LCCs by a factor of seven by 2008, while reducing the total cost of purchased components by 20%. After this initial decision to outsource from LCCs, and in particular from China, managers had significant concerns about the effect on quality and delivery performance. Furthermore, they were apprehensive about the effect of LCC sourcing on their ability to manage the global supply chain. It had only been a few years since Firm A had created the position of vice president of supply chain and aggressively pursued supply chain integration, and they were worried that their recent advances would be at risk.

¹ See Dawson (2005) for a very interesting example. Also, see Venkatraman (2004).

² Friedman (2005) is a recent best seller that addresses these issues in depth.

³ Total landed cost captures the entire cost of producing and transporting products from the origin to the destination.

[Table 1 about here]

Firm B is a manufacturer of equipment for high speed production lines for the pharmaceutical and food industries. This \$80 million company also produces highly profitable consumable products used with their equipment. They operate two factories in the U.S., one in the U.K., and one in continental Europe. The U.K. factory is mostly an assembly operation, with all components purchased from the surrounding area. The other factories manufacture and purchase components and perform final assembly and testing. Firm B has no sales in China or elsewhere in Asia because their products have exceptionally high quality, and hence are priced at a premium. In late 2003, senior managers began wondering if a manufacturing presence in China would open up the Chinese market, at least to some extent. The primary driver of the LCC discussion, however, was the vice president of operations who felt strongly that they needed to “be in China” to manufacture existing products or components. He and other senior managers, including the CEO, continually debated whether this was really necessary, and if so, whether they should purchase components from China, merge with or purchase a Chinese manufacturer, or build a new plant in China.

Firm C is a manufacturer of injection molded products for the automotive and health care industries. This \$60 million firm makes molds in their own tool shop for internal use, and also buys additional molds from small job shops in the U.S. and China. However, their primary business – over 90% of revenues – is complex molded parts. Firm C operates four factories across the U.S., in addition to a new plant just opening in a new industrial park in Mexico. The auto industry, in general, exhibits constant price pressure and active outsourcing to LCCs, while the health care industry is a bit less cost competitive. Quality requirements in both industries are very high, and health care customers sometimes even require clean room capability. Cost pressure was the initial motivation for this firm to look to China. Like Firm B, they are known for high quality and reliable delivery, but unlike Firm B, the likelihood of selling molded parts in China is low, at least in the near term. In the longer term, they anticipate that their primary customers will open or expand assembly operations in China and will require suppliers to operate nearby.

Firm D is a \$100 million manufacturer of plasma metal cutting tools, in both manual and large mechanized versions, as well as the consumable parts used with the tools. They operate one factory in the U.S., but their business is expanding rapidly and there is an immediate need for additional capacity. Approximately 50% of sales are outside of the U.S., with the majority of foreign sales in Asia to transplants and Asian customers. Managers therefore want to develop “an Asia strategy” that will help them understand whether to expand domestically or to open operations in Asia, and what the risks and benefits of each location will be. They also want to be certain that they consider all the relevant factors in their decision.

2.1. Options

These four companies ranged in the outsourcing decision process from Firm A, which had already decided to aggressively pursue LCC procurement, to Firm D, which was just beginning an investigation. The rationale for examining LCCs also varied widely, from Firm D, which had significant sales in Asia, to Firm B, where the VP of

Operations simply had a feeling that they should be in China, to Firm C, which was facing serious cost pressure. They all shared one key characteristic, however. None of the four firms had extensive experience in Asia, so the management challenges were significant, and the risks seemed high.

- These firms considered a range of options, including
- Purchasing components
 - Purchasing finished products
 - Merging with an existing firm
 - Acquiring an existing firm
 - Opening a new factory

The required risk, investment and commitment all increase from the top to the bottom of this list. Furthermore, the management expertise required to purchase components from China is trivial compared to that required when opening and operating a new plant in a different culture, halfway across the world. Yet, all options were on the table, to varying degrees, for each firm.

3. A Framework for the Decision Process

Many firms jump on the LCC bandwagon without putting the decision in a strategic context. They see reports of hundreds of firms going to China, and they assume that they have to do the same. Or they have managers who, ignoring quality and delivery performance, feel that China is the sole answer to cost pressure. Our four firms pursued the answers to their LCC questions in a variety of ways, and yet their experience suggests a framework that is generally applicable.

The framework (Figure 1) begins with a review of corporate strategy and examines the LCC questions in that light. If the LCC initiative does not support corporate strategy, there is no need to delve into deeper questions and implementation issues. The framework then reviews the operations strategy and again investigates how the LCC initiative supports it. Finally, it analyzes the total landed cost and risks of the different options. Once the decision has been made, a team is selected to handle implementation. In this chapter, we are focused on the decision process, leaving detailed implementation issues aside for now.

[Figure 1 about here]

4. Corporate Strategy Review

The LCC decision can be a major one indeed. Firm B, for instance, had been a significant presence in the same small town for almost 100 years. Any talk of China created anxious hallway discussions, not to mention concern in the local community. In any company, one can be certain that the decision will be scrutinized closely by all parties affected. They will ask whether this move is really necessary, whether alternatives have been considered, and what it will do to help the company and workers thrive. To answer these questions, and of course to make the best decision for all stakeholders, managers should set the context by reviewing, and perhaps updating, the corporate or business unit strategy.

See Figure 2 for a schematic of the strategy review process.⁴ The process is designed to

- Review and update the corporate mission, values and principles
- Carefully consider global trends that could impact the company's future
- Understand the competitive landscape
- Come to a shared commitment to a set of performance targets
- Engage discussion of key strategic initiatives, including the LCC outsourcing issue
- Come to a shared commitment to these initiatives
- Develop a set of performance targets for each functional area that support the company's overall targets
- Develop tactical initiatives for each function that will enable them to achieve their targets.

[Figure 2 about here.]

The first task is always to review or update the corporate mission and statement of values and principles. Any strategy review must be built on this foundation. Then, in light of competition and global trends, managers should agree on a set of performance targets for the corporation. These targets might be very specific – to grow the company by 50% in the next five years, for instance, or quite general – to increase the pace of new product introduction, say, in the automotive business. These targets, in turn, set the context for a discussion of key strategic initiatives, which might include lean manufacturing, LCC outsourcing, opening new markets, and so on. Once the team has committed to a set of initiatives, they should set or refine performance targets for each functional area. The operations group, for instance, might have a goal to reduce unit cost by 10% or improve yield to 99.5%, while the marketing group might target a certain percentage increase in market share. Likewise, an initiative to speed new product introduction will have direct implications for the performance targets of the engineering team. Finally, these targets drive a set of initiatives that set the agenda for each functional area for the next several years.

This strategy review process is broadly applicable and can be particularly helpful to companies facing a dynamic environment. Of course, strategy research has proliferated over the past several decades, providing managers with a wealth of analytical tools, from SWOT (strengths, weaknesses, opportunities, threats) analysis and five forces to hypercompetition.⁵

4.1. Firm C's Corporate Strategy Review Process

Firm C directly follow the strategy review process outlined here. They held a retreat with the goal of creating a new five year strategic plan – a far broader mandate than simply addressing the LCC sourcing issue. Participants included the Chairman of the Board and senior managers from all functional areas including operations, sales and

⁴ See Gupta & Govindarajan (2003), Grant (2005) and Collis *et al.* (2001) for more on corporate strategy.

⁵ See for instance Porter (1983) and D'Aveni (1994).

marketing, human resources, and finance. The CEO chaired the meeting, which was facilitated by an academic (this author). After several preparatory meetings among the CEO, CFO and facilitator, the retreat was convened.

The retreat began with a review of the mission, values and principles – a discussion that took a surprising amount of time considering the fact that most participants had been with the company for many years. The most vigorous debate pertained to several possible additions to the values and principles, although the group settled on a largely unchanged version. The participants then engaged in an active and wide-ranging discussion around trends and the competitive landscape. Any idea was entertained, but in depth discussion was reserved for the most pertinent issues for the firm. Important trends included, for instance, the possible shift of major automotive customers' operations to Asia. Managers also discussed whether health care customers would shift assembly operations there as well. If so, would it be a competitive advantage to have operations in-country? If not, is such a shift on the horizon? Sales and marketing personnel, who were in close contact with these customers, weighed in heavily on these discussions.

After agreeing on a core set of trends and competitive issues that were directly relevant to the firm, the discussion moved to key corporate performance targets. These included five-year targets regarding global presence, revenue and profitability. Customer composition (percent automotive, for instance) and concentration (percent to any one customer) were prominent as well. Clearly, the LCC decision must be founded on such long term corporate goals. A goal to double revenues in the next five years could lead to very different outsourcing decisions than a goal to grow revenues by 10%. Because these major targets must be shared by all senior managers, the agenda allowed for significant discussion and airing of views. After coming to agreement on a set of about five fundamental corporate goals, the discussion proceeded to strategic initiatives.

The CEO, CFO and facilitator had previously developed a short list of major strategic initiatives that would be introduced, but the participants were asked to brainstorm any initiatives that they felt were worth discussion. Following common brainstorming techniques, each participant was given a total of three votes that they could cast on one, two or three of the initiatives. The LCC decision was one on the short list, and it received a large number of votes. Other initiatives discussed included facilities decisions (open new plants, close existing plants), new markets, six sigma, lean manufacturing, and new capabilities, among others. The outcome of the discussion of each initiative was an action plan, if appropriate, that identified the manager responsible for carrying it forward.

The group debated the LCC issue at great length, focusing on China in particular. It was an expansive discussion that touched on issues of management time and expertise, product quality, customer expectations, labor relations, and many others. Ultimately, the group decided that CEO and CFO would pursue discussions with an investment bank in Beijing, which had already been identified, in a search for a mold-making firm. The goal was to buy a controlling interest in a high quality, technically advanced firm that would make molds for sale in the U.S. and China, and that could eventually expand into injection molded parts for sale in China. The group felt that achieving their aggressive growth goals required a deliberate, but expeditious, approach to this search.

As we concluded the conversations of strategic initiatives, we ran a simple exercise designed to highlight the issue of management time requirements. For each initiative that was moving forward, we asked each person to raise a hand, and keep it up,

if the initiative would significantly affect their job or require considerable time from them. The lean initiative, for instance, would have only a minor effect on sales and marketing managers, but it would require a major effort from operations managers. We moved through each initiative, keeping hands up, and then asked participants to stand if both hands were already raised. At the end of the exercise, a few people were sitting with no hands raised, most had one hand raised, and two people were standing up with both hands in the air. Senior managers readily saw the potential pitfall of limited management time and energy.

The retreat continued by focusing on each functional area, with a particular emphasis on operations, marketing, engineering and human resources. Senior managers from each function listed the performance targets that they currently tracked, and then the entire group identified a few additional measures that should be included. Finally, functional managers went to breakout sessions to discuss their functional area strategies, i.e. to set measurable targets that would help achieve the corporate goals identified earlier, and to create action plans designed to meet those targets. These strategies and action plans were shared with the entire group at the close of the meeting. Because this retreat was focused on a new five year strategic plan, these discussions covered all aspects of the business, with the China initiative playing a moderate, but significant role.

4.2. Corporate Strategy Review: Summary and LCC Concerns

Because the impetus for Firm C's examination of LCC sourcing was cost pressure and possible future customer requirements, the strategic discussion focused on operations and marketing issues. For other firms, the strategic LCC discussion will center on different topics. For instance, Firm A has a technological lead in many of its markets, and as a result, is often the sole source supplier of high margin products. When managers engage the conversation about LCC sourcing, they inevitably raise concerns about protecting their intellectual property and patents. Even sourcing a simple, time-insensitive component may hasten the creation of stronger competition.⁶ They also know, however, that their technological advantage will not last forever, and that their competitors are aggressively pursuing Asia strategies. Therefore, to prepare for the future, they need to maintain R&D spending, build engineering talent, and consider cost reduction initiatives that include purchasing components from LCCs. Firm B has a variety of issues that should receive attention at this stage of the analysis, but their presence in the same community for nearly 100 years means that human resource issues should be underscored. Firm D, on the other hand, is shipping so many products to Asia that they should focus on, among other things, possible marketing effects, sales growth in different regions of the world, effects of local content, and the impact on customer and market concentration.

Senior managers should provide ample opportunity for functional managers to raise concerns and questions as they pertain to LCC sourcing (Table 2). R&D and engineering managers will likely raise issues involving quality, intellectual property, difficulties with designing components that will be made in multiple countries, and design software integration. Operations managers should address capacity, total landed cost, delivery performance, quality, inventory requirements, and other supply chain issues.

⁶See Amaral *et al.* (2005) who warn that companies should carefully consider "the underlying means, motive and opportunities" of potential sources to take control from the domestic firm.

They should focus on current and future performance because today's low cost developing country may be tomorrow's high cost developed country. Likewise, today's low quality source may become tomorrow's high quality source – or competitor. Marketing managers, on the other hand, should highlight market opportunities in the foreign country, brand and image issues in the home country, pricing developments, and competitive threats and responses. And, human resources managers will certainly question the effect on the current workforce, as well as communications strategies moving forward.

In summary, the corporate strategy review is designed to identify major performance targets and strategic initiatives in the context of industry and competitive trends. As noted above, if outsourcing to a low cost country somehow violates the corporate strategy, or is not otherwise dictated by competition or other strategic initiatives, there is no need to further the conversation. For many firms, however, the opposite is true, and they should proceed to in-depth reviews of their functional strategies.

[Table 2 about here.]

5. Operations Strategy Review

Functional strategies are derived from the corporate strategy and initiatives. Our focus will be on the operations strategy, although as should be clear from the previous discussion, engineering, marketing and human resources strategies may require similar attention. The operations strategy is composed of three levels – a mission, operations objectives, and management levers (See Figure 3, Pyke (2000), and Slack & Lewis (2002)). The *operations mission* defines the direction for the operations function, as opposed to the corporate mission, which defines the direction for the company as a whole. The operations mission states a purpose for the operations and sets priorities among the objectives. It specifies the primary task that must be achieved for operations to succeed. The *operations objectives* – cost, quality, delivery (speed or reliability) and flexibility (volume, new product development, customization/product mix) – are measurable targets that should be well defined and rank ordered. We cannot emphasize enough how important it is to rank order these objectives so that all operations employees know how to make tradeoffs when they inevitably arise. And the objectives must be measurable so managers know whether they have achieved them. The *management levers* are the many and varied tools that managers use to achieve these objectives. We define ten levers, although these can change over time as new developments arise. (For instance, the supply chain lever is a relatively recent addition to the list.) Managers should specify current policies for each lever, update the policies as appropriate, and rigorously analyze whether there are inconsistencies among the policies or between the policies and the operations objectives. Our experience suggests that this process will likely identify opportunities for improvement as performance measures are created and refined, and as policies associated with the levers are adjusted to support those objectives.

[Figure 3 about here.]

An operations strategy review can include an examination of global trends, competition and key strategic initiatives, especially if these have a direct impact on the

firm's operations or supply chain.⁷ In the case of Firm C, the operations strategy review followed immediately from the corporate strategy review, so there was no need to have a separate discussion. Firm B, on the other hand, engaged an operations strategy review independently, and therefore, it was appropriate to discuss trends, competition and initiatives, such as LCC sourcing, in that context.

5.1 Firm B's Operations Strategy Review Process

Firm B had recently updated their corporate strategy, with a new emphasis on innovation and new product development, but they had not reviewed their operations strategy for several years. Therefore, the vice president of operations called a 2½ day retreat for all his plant managers, supply chain managers and senior engineering managers. The vice president, a plant manager, and the facilitator (again, this author) spent many hours interviewing senior managers from all functional areas, as well as the CEO, COO and president of the firm. They also sent out a questionnaire to each person who would be attending the retreat. (See Exhibit 1, which asks a series of questions designed to ascertain the current operations strategy and to provide a brief definition and summary of the three levels.)

5.1.1. Operations Mission and Objectives

The group spent very little time working on the operations mission because it so closely aligned with the new corporate mission. However, they took several hours to fully work through the operations objectives. Following the questionnaire in Exhibit 1, the group was asked to carefully define what they meant by quality, how they measured delivery performance, their current industry standing with regard to new products, and so on. They also highlighted differences between new equipment and consumables for each objective. After a vigorous debate, they rank ordered the objectives as follows: 1) quality, 2) delivery, 3) flexibility, and 4) cost. In spite of the prominent role of new product development in the corporate mission, it became clear from the discussion and the mission itself that quality and delivery still took precedence.

Firm B used the term "agility" instead of flexibility, so their ranking gave rise to an acronym, QDAC, which was used throughout the retreat. Every time a new initiative was discussed, several people would emphasize that the initiative should *not* violate QDAC. This is precisely how the operations objectives should influence the conversation. In fact, after the retreat, the firm ordered polo shirts with letters "QDAC" prominently displayed.

Much like Firm C's corporate strategy retreat, Firm B engaged a discussion of global trends, although in this case, the focus was a bit more operational. Nevertheless, they did raise the questions of future markets and competitive moves in Asia. These trends and the operations objectives set the context for a discussion of major initiatives, including radio frequency identification (RFID), lean manufacturing, new product development, and of course, entry into China.

As noted above, for Firm B quality was absolutely the most important objective. Reliable, on time delivery was a close second. They supply equipment for other

⁷ In fact, some authors (e.g. Miltenburg (1995)) include "initiatives" or "projects" as a fourth level of operations strategy. These projects typically apply to more than one management lever and through them to the objectives.

manufacturers, and they *will not* delay the opening of a high speed production line because their equipment is late. And they will not shut down a customer's line because of a machine failure. Their new corporate mission had highlighted new product introduction as being critical to continued success. Therefore, while cost was an important consideration, it was not the principal driver of performance. They could charge a 10 – 20% premium because of their technology, quality and delivery performance. This context was critical to the discussion of a China strategy. If the primary reason for “being in China” was to reduce cost, it should be clear from QDAC that such a move must not damage quality, delivery performance, or their ability to efficiently introduce new products. Therefore, the group focused intensely on the effect on product quality if components were to be manufactured in China. They also noted that delivery times would increase from a week to about eight weeks, which would require careful planning and more inventory. Engineering managers, furthermore, carefully considered the challenges of designing and developing new products if some components were to be sourced from half way around the world. Of course, these factors do not preclude a China strategy, but they do suggest that thorough planning is necessary.

It would be appropriate to note at this point that Firm B decided not to open manufacturing operations in China. Nor did they immediately pursue a joint venture or acquisition. Rather, they decided to purchase a fairly complex, but non-critical component as a way to begin understanding the process of doing business in China. They knew that manufacturing in China was not an immediate need, but they also knew that their competitors were moving fairly aggressively into low cost countries. Therefore, they felt strongly that they needed to begin the process in a low risk way so they could be positioned for the future. This fruitful discussion followed directly from a close examination of the ranking – QDAC – and the measurements of the operations objectives.

5.1.2. Ten Management Levers

The next level of operations strategy contains the ten management levers (Figure 3 and Exhibit 1). During the operations strategy retreat, managers from Firm B worked through each of the ten levers, citing current policies and looking for inconsistencies, opportunities and points of leverage. This was a lengthy discussion that we will not review in detail here. We will, however, provide one example. The plant manager in the major U.S. plant had been working on lean manufacturing for several years, and progress was remarkable. Flow times had decreased from three weeks to 26 hours, quality had improved, inventories had decreased, and customer satisfaction was higher. It had been a stunning success. One of the principles of lean manufacturing is to reduce work-in-process inventories in conjunction with a pull, or Kanban, system, and it had served Firm B well. One concern that surfaced during the retreat, however, was that their renewed emphasis on innovation and new products might be at odds with their lean initiatives. To effectively operate a lean system, a firm should have limited variety and a fairly predictable and stable demand pattern.⁸ A rash of new products, unfortunately, will by definition be less predictable and stable, at least until they have been on the market for some time. Therefore, the plant manager was tasked with preparing their lean manufacturing system for an increased number of new products, probably by increasing inventory levels and process task times. Again, this is exactly the right outcome –

⁸ See Silver *et al.* (1998), Chapter 16.

adjusting production planning and inventory policies to be consistent with the operations objectives.

After a review of the ten levers in general, it is often desirable to use them as a tool for examining major initiatives. For instance, when considering LCC sourcing, managers can use the ten levers to help identify all the relevant operational issues. The inventory lever, for example, will highlight the required adjustments to inventory policies if lead times increase or become more variable. The supply chain lever should raise the issue of collaboration with suppliers and the possibilities or difficulties of doing so with a new partner. If collaboration decreases, how will that impact quality, forecasting, inventory management or production scheduling? Using the quality management lever, managers can ask whether the new supplier has six sigma or other quality programs in place. Are their systems compatible with ours? Will our customers care? The new products lever should focus on the processes used to introduce new products. What software is used? How do they handle the handoff from design to manufacturing? Are their processes compatible with ours? As a final example, the process and technology lever raises the question of production layout and equipment. Is their equipment capable of consistently meeting the required tolerances? These discussions can take a significant amount of time, so during the retreat with Firm B, we raised the issues, engaged brief discussions, and then assigned relevant managers to follow up with more detailed information.

Thus far, we have considered corporate and functional strategies, with a particular emphasis on operations strategy. The goal of these extensive discussions is to be certain that any proposed LCC outsourcing decision complements and advances competitive success. Furthermore, they are designed to illuminate potential pitfalls, inconsistencies, and requirements for management attention. If the proposal passes muster at this point, it is time to examine total landed cost and risk in complete detail.

6. Total Landed Cost

Most firms will have a fairly good sense of the cost of outsourcing to an LCC before engaging the corporate and functional strategic discussions. Firm D, for instance, was just beginning the LCC discussion, but they had a clear sense of the current cost of transporting products from their U.S. plant to their customers in Asia. They also were developing numbers on the cost of manufacturing in Asia, but these were still fairly rough. As they began discussions of an “Asia strategy” retreat, the total landed cost was clearly part of the agenda, although they recognized the need to set the context with the larger strategic considerations. Supply chain managers at Firms A and B had already created total landed cost models that captured most of the relevant costs, although they did not include some of the soft costs discussed below. A total landed cost model should include:

- *Inbound materials.* The cost of buying raw materials and components for the LCC factory. Many companies are able to capture significantly lower raw materials and component costs by buying from other LCC factories. However, if those sources are not available, or do not have the required quality, the firm may not be able to take advantage of these sources.
- *Inbound logistics.* The cost of moving materials and components to the LCC factory. Factories that are close to raw materials sources will benefit here, but

again, if the current domestic source is the best choice, the firm may find itself moving materials across the ocean, and then shipping finished product back.

- *Manufacturing at the LCC site.* Consider labor, assembly and equipment costs (such as molds or other asset specific investments). Yield rates, setup times and costs, and quality costs may be taken into account as well. It may not be necessary to break out all these costs if the per unit cost is sufficient for the analysis.
- *Overhead at both the LCC site and domestically.* Consider information technology infrastructure, communications, duplicate functions, legal personnel, and so on. Be careful not to double count the costs if some of these components appear in other categories.
- *Customs, duties and taxes.* These figures clearly change over time as nations modify their trade relations. Plant location can make a difference if there are special short or long term tax advantages to certain regions. Finally, some countries give incentives for not repatriating profits, so it is important to involve accountants, lawyers and tax experts.
- *Inventory at the LCC site.* Raw materials, work in process and finished goods inventory. Consider who owns the inventory, how much is required to meet the throughput needs, and the cost. Note that regulations in the LCC may influence inventory ownership.
- *Outbound logistics.* Consider the costs and lead times for the following:
 - LCC plant to the port
 - LCC port to domestic port
 - Domestic port to distribution centers
 - Pick and pack operations at the distribution centers (and plants, if appropriate)
 - Distribution centers to customers
- *Domestic inventory.* The cost of inventories at the domestic site will increase if lead times increase or are more variable. Many companies use inventory formulas that are based on average demand, forecast errors, service level targets, and lead times. If these formulas are already employed, it is straightforward to calculate the increased inventory cost due to an LCC supplier.⁹
- *Travel.* The travel costs for managers to visit suppliers. One manufacturer did not include these costs in its decision, yet they sent two managers to Taiwan several times each year to meet with their supplier. As it happens, this cost did not overwhelm the unit cost savings, but it clearly should be included in an outsourcing decision.
- *Translation.* Firm C hired a person fluent in Chinese to help insure that all documents were accurate in both languages. These costs can be fairly minor, but Firm C was also considering a full time person for the first year or two of operation – although this person would serve other functions as well. These costs clearly should be included in the analysis.

⁹ See, for example, Chapter 7 of Silver et al. (1998).

- *Relationship management.* Often these costs are captured in overhead or the procurement function. However, the time and cost associated with managing a relationship with a company in a different time zone, culture and language can be significantly higher than managing a domestic supplier. This category should focus on the incremental cost of managing the LCC relationship, to the extent that it has not been accounted for in overhead, translation, travel or other costs.
- *Soft costs.* These include, for instance, the cost of managers getting up at 3:00 a.m. to place phone calls to their supplier. Management time and stress fit here, if they have not been captured in the relationship management costs. These costs can be exceptionally difficult to specify, and yet when we talk to managers, they rise to the surface immediately.

The LCC outsourcing decision should account for as many of these costs as can feasibly be specified. Our experience suggests that for many firms, even after accounting for all these costs, LCC sourcing is significantly cheaper than their current domestic source. Nevertheless, it would be shortsighted to ignore any of these components. Typical models of total landed cost will not include soft costs or some of the other components, such as translation costs. We include them here not to suggest that they should be used in every model, but that managers should incorporate them, quantitatively if possible, in their decision process.

7. Risk

If the LCC initiative is consistent with the corporate and operations strategy, and it appears that the total landed cost is sufficiently lower than the current domestic source, one would expect managers to move ahead aggressively. Before doing so, however, it is critical to carefully examine multiple risk factors that will likely arise with LCC sourcing.

Of course, *currency risk* increases with any offshore source, as firms that lived through the Asia financial crisis of the late 1990s will attest. Related to currency risk is *political risk*, a broad topic that is worth careful thought.¹⁰ In the post-9/11 world, for instance, imports from Muslim countries may be treated much more stringently than those from other countries, even if there is no evidence associating that country with terrorist activities. In the case of China, analysts wonder if its corrupt political system can manage its massive economic growth over the long term. Will changes in the banking system, or in agricultural policies, spur layoffs and widespread strikes? How will China deal with the Taiwan issue, and what effect will that have on stability in the region? Similar questions can be asked of any low cost country, although the answers will vary widely and by definition will be highly uncertain. Nevertheless, we would strongly encourage managers to assess political risk and the potential fallout from large scale disruptions to their supply chains. At the very least, they should have backup plans that can be quickly adopted in the event of a disruption.

We have discussed *quality risk* in the context of operations strategy and Firm B's QDAC priorities. As another example, Firm A had an experience that animated their discussion of LCC sourcing. They changed steel suppliers after many years with a single

¹⁰ See Bremmer (2005) for an in-depth discussion of political risk, and www.aon.com/politicalrisk for a political and economic risk map.

source whose quality and delivery performance were excellent, but whose price had increased well above the competition. When the new supplier, chosen after a careful review and qualification process, delivered its first shipment, operators at Firm A found that acceptable quality had decreased from well above 90% to less than 50%. And that was a new *domestic* supplier! The procurement manager responsible for shifting millions of dollars of business to LCC sources was understandably concerned with quality risk, and he made sure the group heard about it. Firm A's response was to identify experienced partners to help find and qualify sources so that quality risk would be minimized.

Lead time risk increases as well. Longer lead times tend to amplify the well known "bullwhip effect," which can cause difficulties with forecasting and inventory management.¹¹ Furthermore, if a firm has been buying domestically for years, its procurement managers may not have the tools to analyze the effects of long and variable lead times. Assuming airfreight is too expensive, they will have to make adjustments to inventory and production planning policies. Even with correct inventory policies, however, the risk of shortages can increase dramatically because of potential disruptions to a long supply chain. And managing that risk can be difficult when the supplier resides in another country, in a vastly different time zone, and speaks another language. Several years ago, a hiking boot company, which bought almost its entire product line from Asia, spent \$200,000 in airfreight charges because a key supplier was going to deliver late. A year later, they ordered early to avoid the risk of more airfreight costs. As it happens, this time the supplier delivered right on time (i.e. much earlier than the true need), and the firm ran out of storage space. Boxes of boots were stored in the back of 18 wheel trucks in the parking lot. For weeks, workers had to dig through piles of boxes to ship orders to customers.

One other risk that should be highlighted is *intellectual property risk*, which, as noted above, was an important concern for Firm A as a technological leader in its industry. Certain countries are known for piracy of intellectual property, with little recourse in the courts.¹² Many companies who outsource in these countries therefore choose products and components that are not on the leading edge of technology. Costs may increase in the near term, but intellectual property risk is reduced. Alternatively, they open and manage their own facilities to better maintain control.

7.1. Risk and Uncertainty

Ideally, a firm would adjust all their costs by the relevant risk factors. So, for instance, they would modify inventory calculations to account for risk and variability in lead times. Unfortunately, some risk factors create such high levels of uncertainty that such adjustments are infeasible.¹³ What is the probability of China attacking Taiwan? If they do attack, what is the probability of a complete collapse of trade between the U.S. and China, at least for a time? How long would that collapse last? These questions are

¹¹ See H. Lee *et al.* (1997).

¹² See Dietz *et al.* (2005) for comments on protecting intellectual property, and Massey (2006) for a history of intellectual property rights protection in China.

¹³ The Analytical Hierarchy Process may be useful in weighing tangible and intangible factors. See Saaty (1990).

extraordinarily difficult to answer. Therefore, we suggest dividing the risk factors into two categories – a) short term or quantifiable and b) long term or difficult to quantify.

The first category includes currency, lead time and quality risks. Rigorous due diligence in choosing suppliers can certainly mitigate quality and lead time risk. Residual uncertainty associated with these risks, and with currency risk, is often quantifiable in the form of probability distributions. The currency exchange problem, for instance, is well studied, and firms typically assign their treasury departments to develop hedging strategies. Moreover, based on the dynamics of currency exchange rates, sophisticated firms are able to quantify the option value of excess plant capacity. Likewise, inventory policies easily can be adjusted to account for variability in lead times.¹⁴ These methods generally rely on expected value calculations or the use of constraints in an optimization model. As long as the underlying uncertainty is represented by a fairly well understood probability distribution, these tools can be quite effective.

If a dramatic event occurs, however, by definition it will not be captured by commonly used probability distributions. The Asian currency crisis of the late 1990s, for instance, caught many managers by surprise. The best hedging strategies were useless in the face of a crisis of this magnitude. This leads to the second category of risk factors – those that are long term or difficult to quantify. In this category, we would consider political and intellectual property risks, as well as crisis events that dramatically affect currency exchange rates, lead times and quality. A political crisis in China could totally interrupt supply lines, resulting in unacceptably long lead times. Whereas inventory policies can easily be adjusted for moderately increased lead time variability, such adjustments would be woefully inadequate during a crisis. But accurately adjusting inventory policies for extremely rare events is very difficult. Therefore, we recommend that, in the normal course of business, managers use tools appropriate for the risks in the first category, while at the same time explicitly preparing for risks in the second category. Tools for this second category often focus on careful backup plans and alternate sources of supply, all developed in advance.¹⁵ For this reason, we regularly advocate that managers considering China or another LCC source should maintain a domestic backup. Other tools include insurance coverage and retaining key knowledge and skills in house. Short term costs may increase, but long term value, even the likelihood of survival, may be enhanced.

8. Domestic Sourcing

One may wonder what the fundamental difference is between domestic sourcing and LCC sourcing as described here. Why not use the same framework for any decision to outsource, or to change from one domestic supplier to another? We would suggest that the framework does indeed apply to any sourcing decision. Procurement and supply chain managers need to account for total landed cost, regardless of the source, and place the decision in the context of the firm's operations and corporate strategy. Nevertheless, there are some essential differences.

Of course, as noted above, LCC sourcing may dramatically increase risk. Logistics and supply chain problems can be magnified, as can issues with taxes, customs

¹⁴ See Silver et al. (1998), Section 7.10 for instance.

¹⁵ See H. L. Lee (2004) and Chopra & Sodhi (2004) for excellent discussions on managing supply chain risk.

and duties.¹⁶ Furthermore, LCC sourcing intensifies management stress because of differences in culture, business climate, negotiating styles, time zones and language. These differences are quite distinct from domestic sourcing and have been discussed at length in this chapter. Managers should not underestimate them.

LCC sourcing, on the other hand, may create opportunities that are not available from domestic sources. For instance, sourcing in a country can open the local market due to local content regulations. Furthermore, product configurations developed for the local market can help balance capacity and possibly even reduce customs. Finally, tax incentives are often available in developing countries as they try to create jobs and transfer technology.

In our experience, LCC sourcing just *feels* different for companies that do not have extensive global experience. The firms discussed in this chapter took this decision very seriously and were willing to take ample time to set it in a strategic context and to understand the implications for their management teams. The result was carefully weighed decisions with paced and deliberate plans for moving forward. For Firm A, this meant shifting millions of procurement dollars offshore, whereas for Firm B it meant buying just one component from China. Nevertheless, based on total cost and strategic analyses, Firm A maintained domestic sources for many parts, which highlights the fact that LCC sourcing is not an all-or-nothing decision.

9. Summary and Conclusions

Too often, firms take a purely tactical approach to low cost country sourcing. They focus entirely on unit cost and justify the decision on this factor alone. In our experience, this is by far the most common LCC sourcing pitfall, although implementation problems are frequent as well. In particular, due to weak preparation and analysis, managers are caught off guard by late deliveries, poor quality, insufficient capacity, culture or negotiation conflicts, and so on. We submit that the four stage decision process described in this chapter captures a best practices approach.

First, excellent firms approach the LCC decision in the context of a corporate strategy review. Is the decision consistent with the mission, values and principles of the firm? Does it respond adequately to competition, global trends and specific corporate performance targets? It may not be necessary to undertake a full corporate strategy review for each LCC decision, but managers should be very clear that it is consistent with existing strategy.

Second, these firms conduct a careful operations (and marketing, if appropriate) strategy review. An analysis of the four operations objectives – cost, quality, delivery, and flexibility – will force managers to highlight important operational considerations other than cost. As tempting as LCC unit costs may be, firms should be meticulous in examining the effect of the decision on quality, delivery performance and new product introduction. Furthermore, the ten management levers serve to elicit a broad array of potential issues, problems and opportunities. Best practice firms will ensure that the ten levers are adjusted for the new LCC source and that they are consistent with the other levers and with the operations objectives.

¹⁶ It is worth noting that in some industries domestic lead times are *more* variable than those from international sources. The same inventory formulas referenced above could be used to analyze either case.

Third, best practice firms develop a comprehensive total landed cost model that includes easily quantifiable costs, such as customs, duties, inventory, and inbound and outbound logistics, as well as soft costs, such as relationship management and management stress. If a cost is difficult to quantify, it is still wise to include it in the list, even without a specific number attached. It can thus serve as caution for decision makers.

Finally, these firms carefully examine the multiple risk factors that arise with an LCC decision. For the quantifiable ones, such as increased lead time variability, they adjust the relevant cost accordingly. For the difficult to quantify ones, they employ a number of tools including explicit backup plans and alternate sources of supply.

The LCC sourcing decision can be very difficult and emotionally charged. The four stage decision process described in this chapter will not eliminate the intense anxiety that workers and managers often feel, but it may well diminish it. And it will certainly ensure that the decision is grounded in careful analysis.

	Firm A	Firm B	Firm C	Firm D
Firm Size	\$10 billion	\$80 million	\$60 million	\$100 million
Products	Diversified industrial: Auto parts Electrical parts	Production equipment; Consumables	Molds; Plastic parts	Plasma metal cutting tools
Current Manufacturing Base	25 countries Many factories	3 countries 4 factories	2 countries 5 factories	1 country 1 factory
Firm Strategy	Technological leadership; Consistent quality; JIT delivery; Low cost	High quality; New technology; Reliable delivery; Premium price	Consistent quality; Reliable delivery; Complex parts; Low cost	Consistent quality; Technological leadership; Premium price
Markets	120 countries	U.S. and Europe	U.S.	U.S., Europe, Asia
Impetus for LCC sourcing	CEO mandate; Cost pressure	VP Operations' gut feel that they should "be in China"	Cost pressure; Future markets	Shortage of capacity; Huge sales in Asia; Develop "Asia strategy"
Concerns	Quality of LCC parts; Delivery of LCC parts; Managing global supply chain; Intellectual property	Effect on the domestic workforce and community; Quality of LCC parts; Delivery of LCC parts; New product introduction	Quality of LCC parts; Delivery of LCC parts; Managing the global supply chain Management time and expertise	Impact on sales growth and customer/market concentration

Table 1: The Four Firms

Function	Potential Issues and Concerns
R&D and Engineering	Intellectual property Patents Product design across different countries and cultures Quality of product designs Design software integration Creation of a future competitor
Operations and Supply Chain Management	Capacity Total landed cost Delivery performance Quality Process capability Six sigma or other quality programs Inventory requirements Longer and more variable lead times Managing the supply chain Collaboration Forecasting Production scheduling
Marketing	Market share Effect on the brand Effect on pricing Competitive threats and responses Creation of a future competitor
Human Resources	Effect on morale of the current workforce Communications with the workforce and community

Table 2: Concerns of Different Functions

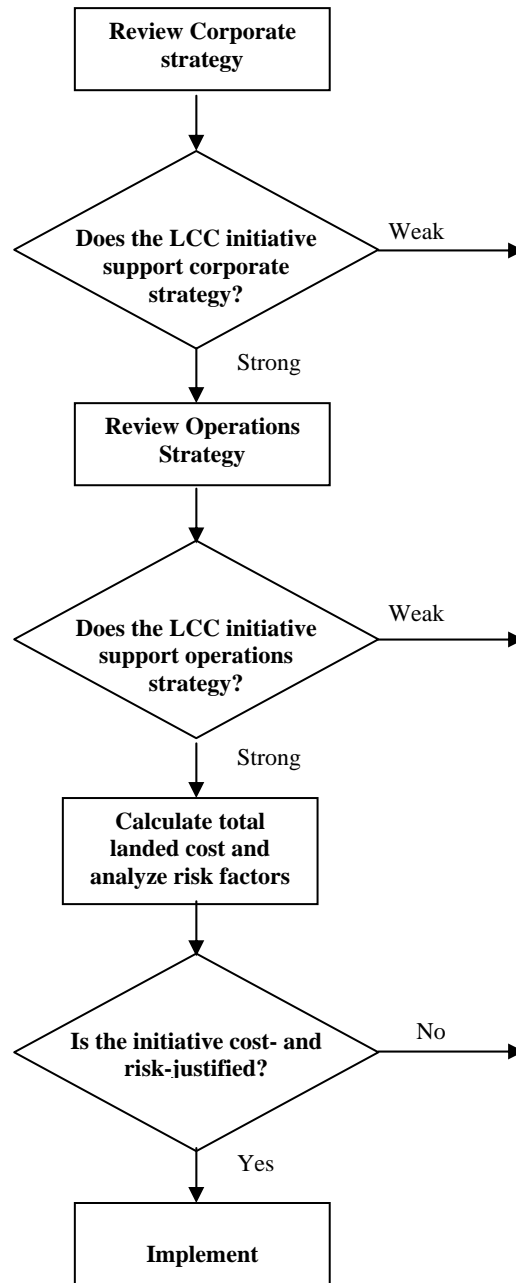


Figure 1: Framework for the LCC Decision

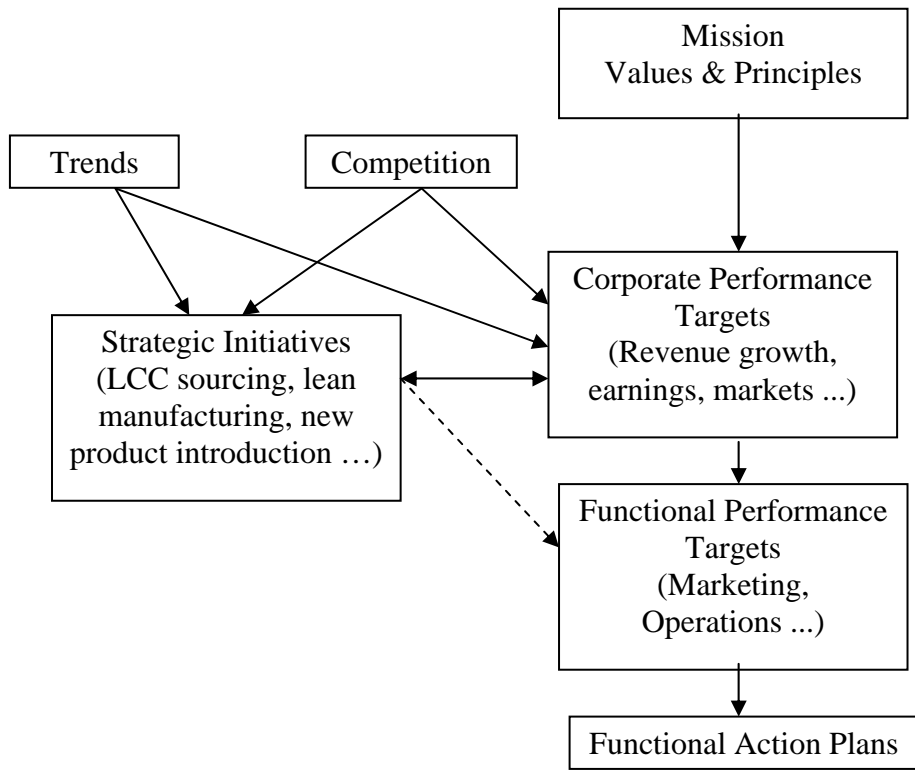


Figure 2: Corporate Strategy Review

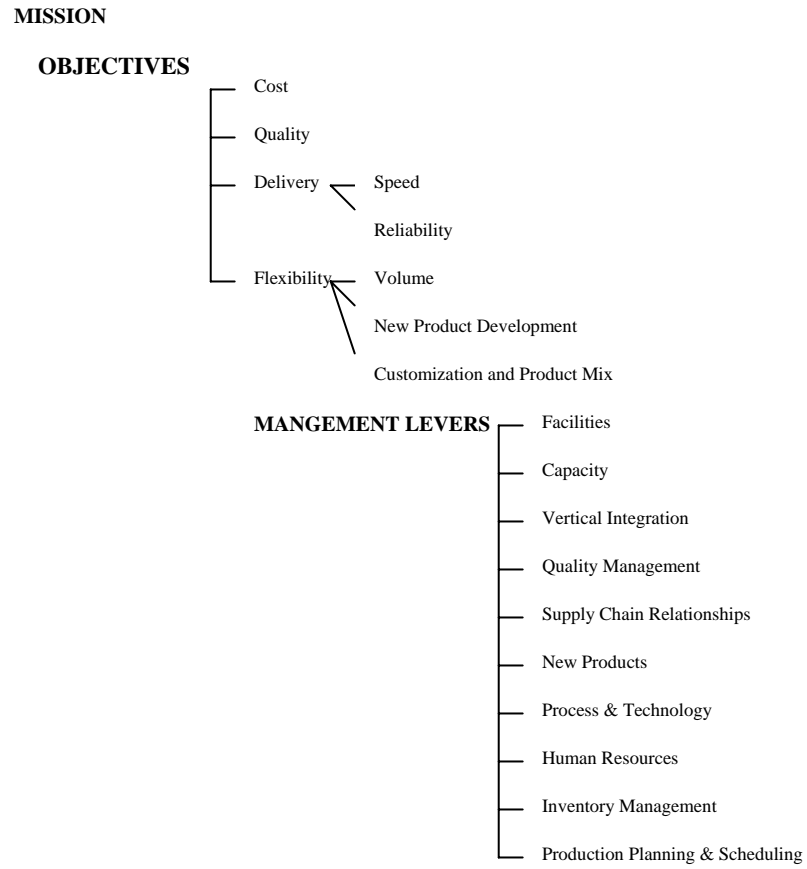


Figure 3: Operations Strategy Framework (from Pyke (2000))

Exhibit 1: Operations Strategy Questionnaire

1. How would you define *cost* for Firm B? Is your goal to be the low cost provider, competitive with the industry, or do you charge a premium?
 - a. What measurements do you use for *cost*?
2. How would you define *quality* for Firm B?
 - a. What measurements do you use?
3. How would you define *delivery* for Firm B? Is it important to have rapid delivery of products? Services? Service parts? Or is reliable delivery more important?
 - a. What measurements do you use for delivery?
4. How would you define *flexibility or agility* for Firm B? How often do you introduce new products? Is this important? Is your product line broad enough? Should it be reduced? Do you have issues with seasonality?
 - a. What measurements do you use for each of these?
5. Assuming that sometimes it is necessary to make tradeoffs among these four objectives, how would you rank order them in terms of importance to Firm B?

Cost	_____
Quality	_____
Delivery	_____
Flexibility	_____
6. For the *facilities* lever
 - a. Where are your facilities located?
 - b. Should you consider a different location?
 - c. How are they focused? In other words, what activities are performed at each location?
 - d. Are these policies consistent with the objectives you defined above?
7. For the *capacity* lever
 - a. When do you expand or contract capacity? Before or after demand swings?
 - b. Do you need to make expansion or contraction decisions now?
 - c. Are these policies consistent with the objectives you defined above?
8. For the *vertical integration* lever
 - a. How do you make decisions to outsource components or production?
 - b. Are you considering new outsourcing decisions now?
 - c. What is outsourced currently?
 - d. Are these policies consistent with the objectives you defined above?
9. For the *quality management* lever
 - a. How do you pursue quality now?
 - b. Do you have a TQM program, or another similar initiative?
 - c. Do you use teams or other decentralized quality initiatives?
 - d. Do you use Statistical Process Control?
 - e. Are these policies consistent with the objectives you defined above?
10. For the *supply chain relationships* lever
 - a. What supply chain initiatives are you currently using?
 - b. What are you considering?

- c. Do you employ e-procurement? Strategic alliances? Vendor managed inventory? Coordinated forecasting, planning or replenishment?
 - d. Are these policies consistent with the objectives you defined above?
11. For the *new products* lever
- a. Do you use cross-functional teams for new product development?
 - b. Do you involve suppliers?
 - c. Do you have a formal system of milestones?
 - d. Are these policies consistent with the objectives you defined above?
12. For the *human resources* lever
- a. Do you use a bonus system in manufacturing?
 - b. Do you cross train you people?
 - c. What other HR policies do you employ?
 - d. Are these policies consistent with the objectives you defined above?
13. For the *inventory* lever
- a. When do you trigger inventory orders?
 - b. How many do you order at a time?
 - c. How often do you review inventory status?
 - d. What service targets do you set?
 - e. Do you use inventory management software?
 - f. How are forecasting decisions made?
 - g. Are these policies consistent with the objectives you defined above?
14. For the *production planning and scheduling* lever
- a. When do you trigger production orders?
 - b. How many units are ordered at a time?
 - c. Do you employ MRP? Kanban? Other lean manufacturing tools?
 - d. Are these policies consistent with the objectives you defined above?
15. Are the policies in each of these levers consistent with those in other levers?

References

- Amaral, J., Billington, C. A., & Tsay, A. A. (2005). Safeguarding the Promise of Production Outsourcing. *Interfaces, forthcoming*.
- Bremmer, I. (2005). Managing Risk in an Unstable World. *Harvard Business Review*(June), 51-60.
- Chopra, S., & Sodhi, M. S. (2004). Managing Risk to Avoid Supply-Chain Breakdown. *Sloan Management Review*(Fall), 53-61.
- Collis, D. J., Pisano, G. P., & Rivkin, J. W. (2001). *Strategy and the Business Landscape: Core Concepts*. Upper Saddle River, NJ: Prentice-Hall.
- D'Aveni, R. (1994). *Hypercompetition*. New York: The Free Press.
- Dawson, C. (2005, February 21). A 'China Price' for Toyota. *Business Week*, 50-51.
- Dietz, M. C., Lin, S. S.-T., & Yang, L. (2005). Protecting Intellectual Property in China. *The McKinsey Quarterly*(3), http://www.mckinseyquarterly.com/article_page.aspx?ar=1643&L1642=1621&L1643=1635&srid=1617&gp=1640.
- Friedman, T. L. (2005). *The World Is Flat: A Brief History of the Twenty-First Century*. New York: Farrar, Straus and Giroux.
- Grant, R. M. (2005). *Contemporary Strategy Analysis: Concepts, Techniques, Applications* (5th ed.). Malden, MA: Blackwell Publishers.
- Gupta, A. K., & Govindarajan, V. (2003). *Global Strategy and Organization*. New York: John Wiley & Sons, Inc.
- Lee, H., Padmanabhan, P., & Whang, S. (1997). The Bullwhip Effect in Supply Chains. *Sloan Management Review*, 38(3), 93-102.
- Lee, H. L. (2004). The Triple-a Supply Chain. *Harvard Business Review*, 82(10), 102-.
- Massey, J. A. (2006). *The Emperor Is Far Away: China's Enforcement of Intellectual Property Rights Protection, 1986-2005*. Forthcoming, Summer, *Chicago Journal of International Law*.
- Miltenburg, J. (1995). *Manufacturing Strategy: How to Formulate and Implement a Winning Plan*. Portland, Oregon: Productivity Press.
- Porter, M. E. (1983). Industrial Organization and the Evolution of Concepts for Strategic Planning: The New Learning. *Managerial and Decision Economics*, 4(3), 172-180.

- Pyke, D. F. (2000). *A Framework for Operations Strategy*. Unpublished Note, Dartmouth College, Hanover, NH.
- Saaty, T. L. (1990). *Multicriteria Decision Making: The Analytic Hierarchy Process*. Pittsburgh: RWS Publishers.
- Silver, E. A., Pyke, D. F., & Peterson, R. (1998). *Inventory Management and Production Planning and Scheduling* (3 ed.). New York: John Wiley & Sons.
- Slack, N., & Lewis, M. (2002). *Operations Strategy*. New York: Prentice Hall.
- Venkatraman, N. V. (2004). Offshoring without Guilt. *Sloan Management Review*, Spring, 14-16.