

How Will Western Manufacturers Survive?

The Art of High-Cost Country Sourcing

State of Supply Chain Management 2008



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1 Executive Summary

Boston Logistics' fifth annual State of Supply Chain Management study explores the challenges faced by Western manufacturers dealing with the threat of low-cost country sourcing. The central question of the study is: "How Will Western Manufacturers Survive?" Western manufacturing's share of GDP and of world production is shrinking. Faced with a reduced prominence, intense price pressure, and structurally high labor costs, there might seem to be no path to profitable growth for most Western manufacturers.

This study was based on an in-depth survey of approximately 100 manufacturers and operations management experts worldwide, and interviews with 30. Although the sample was statistically biased toward America, the study benefited from the perspectives of corporate decision makers in a variety of other developed nation such as Germany, Switzerland, Sweden and England, and in a variety of emerging economies such as China, Taiwan, Brazil, Russia, Lithuania, and Saudi Arabia.

Low-cost country sourcing is a universal phenomenon that affects companies on all continents. Driven by globalization and wide labor rate differentials, companies everywhere are shifting their repetitive and lower-value work to more economical locations in an attempt to compete on lower prices. While China is getting most of the attention today, and is indeed becoming a regional commercial hub in Asia, a large number of developing countries are setting policies, building infrastructure, and developing human and intellectual capital in an attempt to make their country more attractive to foreign investment than others. This includes India, Malaysia, Vietnam, Mexico, the Philippines, Hungary, and Brazil amongst others. Hence, we see a continuation of the trend to a broad set of countries within and beyond Asia for a long time to come.

Western manufacturers have an important decision: either to off-shore major portions of their activities to Asia and compete on low cost, or to make sure that there is a truly new approach to manufacturing and a viable competitive strategy. The US manufacturing sector has done a stunning job of adapting to radically new circumstances. Nonetheless, shareholders and Directors must ask: is there a future beyond cost reduction? Manufacturing as a percent of GDP has declined from 27% to 10%, and still another seven percent could go off-shore, leaving the US economy with a manufacturing base of only three percent of GDP. If this scenario becomes true, then manufacturing will represent about as much of the economy as farming does.

There is a bright future for Western manufacturers, as long as they follow a services-technology-premium strategy, that responds to the emerging demand for high-cost country sourcing (HCCS). This strategy involves targeting value-added services as half of revenue, using feedback to embed proprietary technology into their products, and positioning the brand as premium to allow higher prices and margins.

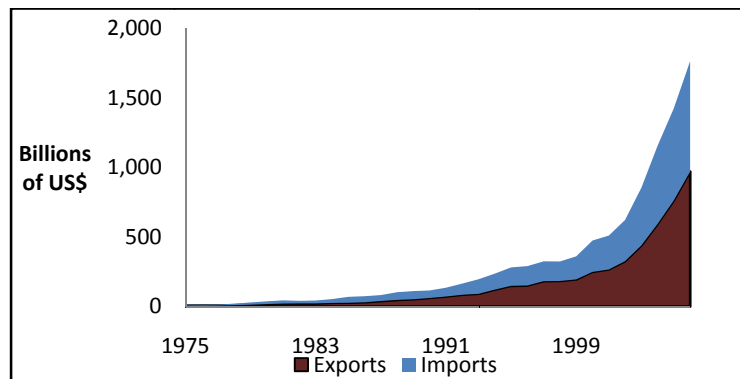
To ensure prosperity, Boston Logistics recommends that Western manufacturers follow these steps:

1. Promote leadership that can accurately identify and strengthen the core competencies and competitive differentiation of the company, and distinguish these from decisions to off-shore to save cost. In selecting the CEO, board members should consider the individual's skill set for negotiation, innovative thinking, language capabilities, and ability to operate in a global context.
2. Differentiate by layering value-added services on the product revenue to achieve customer loyalty and feedback. Enable employees and provide the flexibility needed to compete on customization and personalization through value-added services.
3. Build a strong engineering organization that can differentiate the company based on high-quality products and associated services. Assure adequate engineering expertise among top executives to ensure high quality and avoid over-emphasis on cost.
4. Set pricing to position at the premium end of the market in recognition of the differentiation and high quality.
5. Off-shore non-strategic activities to low-cost countries or divest them. Make sure executive decision-makers have first-hand experience in low-cost countries so off-shoring is done with realistic expectations.

2 Off-shoring has become a standard practice

Off-shoring is not a new phenomenon. It has been going on for years. China's exports, which had been very low and stable until about 1990, rose dramatically starting in about 1991. They accelerated between 1990 and 2005, and spiked shortly after China joined the World Trade Organization in 2001.

Figure 1: Chinese Exports



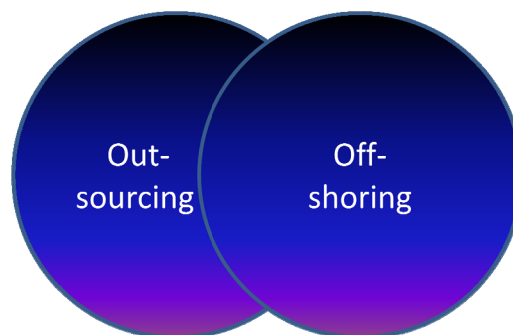
Source: Boston Logistics analysis of China National Macro Economic Statistics data

2.1 Western companies continue to outsource and off-shore production

Western manufacturers quickly noticed the opportunity related to low-cost Chinese production. Pioneer entrepreneurs sourced from China and set up entire business models based on foreign sourcing, and to serve their American and European distribution channels. This happened in a variety of industries, from retail toys to industrial parts distribution – whatever could benefit from the low cost competitive advantage compared to domestic manufacturers.

Westerners gained trust in Asian manufacturing, which caused both the value and number of off-shoring contracts to increase over time. There was also an extreme growth of outsourcing over the same period. While off-shoring refers to sourcing from overseas, outsourcing refers to the contracting of a third party to manufacture or deliver a service. China became prominent for its low-cost off-shore manufacturing capabilities, while India became a hot-spot for business process outsourcing (BPO). BPO is also a key plank of Philippine's President Gloria Macapagal Arroyo's strategy to put strong growth drivers in place.

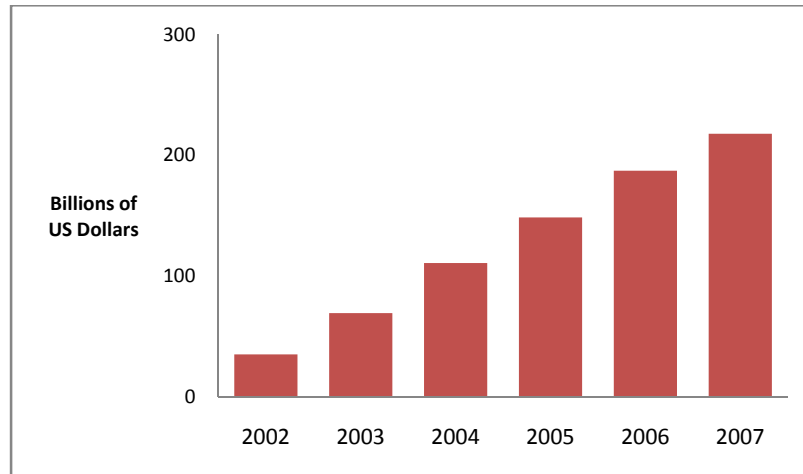
Figure 2: Off-shoring and Outsourcing



Source: Boston Logistics

The value of off-shore arrangements has increased steadily. While the number of new deals has decreased significantly in the last two years, the cumulative value of deals in place has increased. Between 1950 and 2005, the United States manufacturing environment sent millions abroad, as manufacturing's percent of GDP was more than cut in half. Most of that was due to off-shore contracts.

Figure 3: Cumulative Value of Outsourcing Contracts



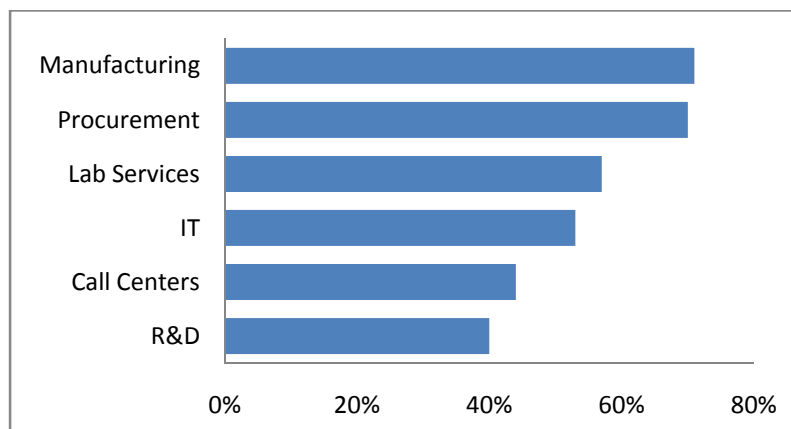
Source: Boston Logistics analysis

Outsourcing and off-shoring are not fads. Many large companies continue to outsource and off-shore significant components of their businesses. Over 87% of respondents to our survey said that they outsource some activities, and 50% said that over 20% of their company's headcount is outsourced. Even food processing is being outsourced by companies such as Hershey's, Castleberry Food Co, and ConAgra.

While we didn't ask every respondent if their outsourced activities were off-shored, it can be assumed that most of the outsourcing was off-shored. Over 85% of respondents said they off-shore some activities and 46% said that over 20% of their company's unit volume is off-shored.

The prime targets for off-shoring are manufacturing and procurement. Both of these far exceeded the amount of IT that is off-shored. Seventy-one percent of respondents said they currently off-shore some manufacturing, and 70% said they currently off-shore some procurement. Thirty-one percent have set up an international procurement office. Services are outsourced by 40-60% of most respondents – for example, lab services 57%, IT 53%, call centers 44%, and R&D 40%.

Figure 4: Percent of Activities Outsourced

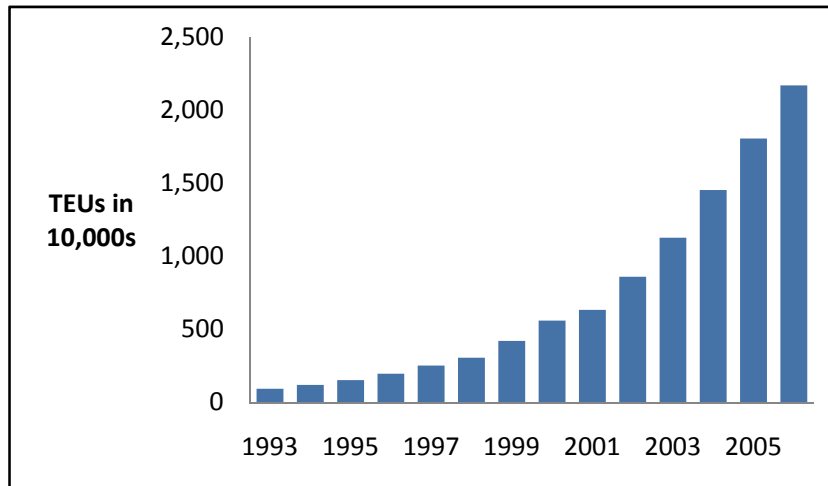


Source: Boston Logistics

2.2 China has become the regional hub for investment and commerce

China continues to grow rapidly. The Chinese economy expanded by 11.4 per cent last year, and its output now matches that of Germany, the world's third largest economy. While the southern region around Guangdong Province was the original motor of exports due to the historical importance of the Hong Kong Port, the growth has spread northward. As evidence of the booming export trade, Shanghai's port has grown significantly and is now the largest port in the world (by tonnage).

Figure 5: Twenty-Foot Equivalent Unit (TEU) Volume through Shanghai Ports



Source: Boston Logistics analysis of Shanghai International Port Group (SIPG) data

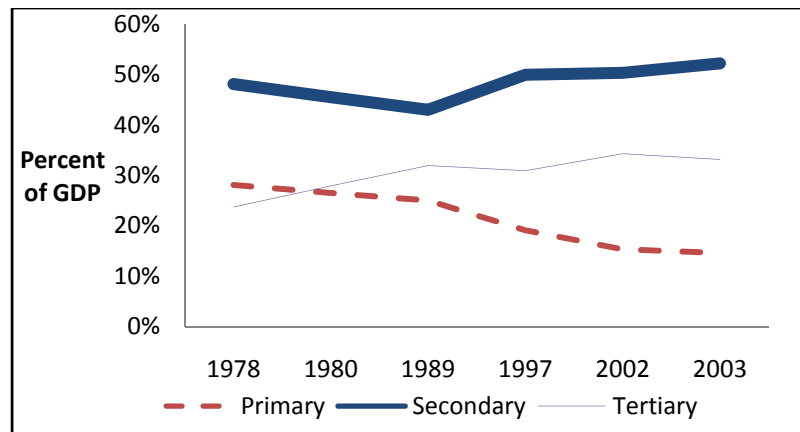
China has become increasingly more active with trading partners in the region and globally. Trade has risen from 32% of GDP in 1990, to 49% in 2000, and to 79% in 2004.¹ China's exports to industrialized countries as a percentage of total exports have drastically increased from 1980 to 2004.

As a result of China's export growth, 1.3 million US manufacturing jobs moved abroad between 1992 and 2002 (the bulk of them from 1999 to 2002).² This factor coincided with a US recession and caused the country to lose nearly 3 million manufacturing jobs from 2000 to 2003. Despite the large impact of outsourcing on Western economies, Western companies continue sending more contracts to Asia.

The secondary sector, which consists of manufacturing, and the industry as a whole represent about half of the Chinese economy, and is growing in response to the extreme increase of outsourcing and off-shoring. The tertiary sector – composed of services – has been replacing the primary sector, that of agriculture.

¹ World Bank

² USA Today

Figure 6: Chinese Economy by Sector

Source: Boston Logistics analysis of China Statistical Yearbook 2003 data

As China reinforces its leading role as a global sourcing location and Asian regional hub, many companies are relocating their regional headquarters there.

Figure 7: Some companies that are moving their regional headquarters to Asia

Corporation	Presence in Asia
Caterpillar	<ul style="list-style-type: none"> Relocation of Asia-Pacific Operations headquarters from Tokyo, Japan to Beijing, China Vice President Rich Lavin, who has administrative responsibility for manufacturing operations in Caterpillar's Asia-Pacific Division, will relocate as well
General Motors	<ul style="list-style-type: none"> Relocation of Asia-Pacific headquarters from Singapore to Shanghai \$253.7 million initiative with a Chinese partner
Goodyear	<ul style="list-style-type: none"> Relocation of Asia-Pacific headquarters from the U.S. to Shanghai
Stora Enso	<ul style="list-style-type: none"> Relocation of Asia-Pacific headquarters from Singapore to Shanghai, China
Visteon	<ul style="list-style-type: none"> Relocation of Asian headquarters from Tokyo to Shanghai
Volkswagen	<ul style="list-style-type: none"> Relocation of Asia-Pacific regional center from Wolfsburg, Germany to Beijing

Source: Boston Logistics industry research

2.3 Low-cost country sourcing is practiced everywhere

While the effects of off-shoring are felt at both local and regional levels, the phenomenon is global. American companies are off-shoring to China. European firms are off-shoring to Brazil. And Asian companies are off-shoring to other parts of Asia. The race to profit from wage differentials is universal, and in the age of the Internet, doing so is much easier.

2.3.1 The main motive for off-shoring is low cost and availability of labor

Companies go off-shore primarily to save money on labor. Forty-eight percent of respondents have rated "low labor cost" as the most important factor in choosing an off-shore sourcing location – more than twice as significant as the next largest factors: high educational level, low raw materials cost, and a good work ethic.

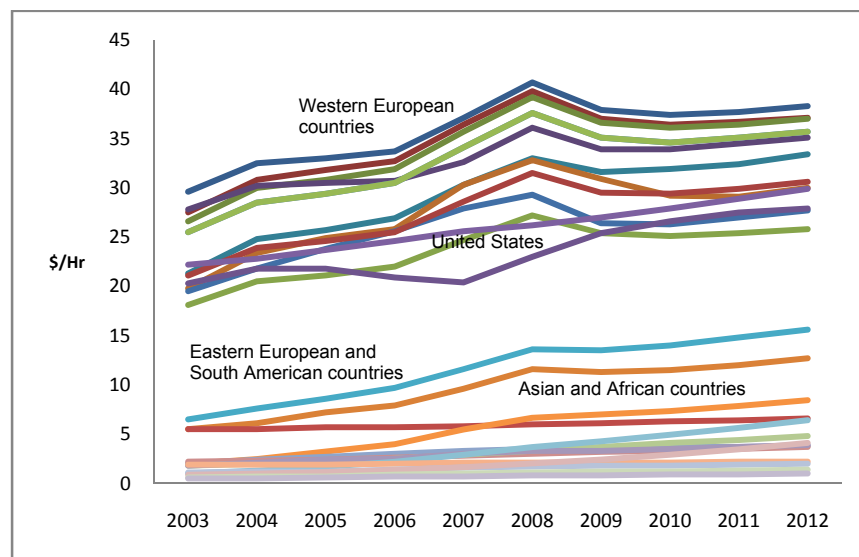
"When businesses see an opportunity to outsource to cheap labor, many do so," says a global account representative from a multinational manufacturer of air compressors. "European and US manufacturers are very

unattractive particularly because of labor unions. The unions significantly increase costs for the companies that they work for and consequently make them less competitive in the global market.” adds a private equity investor. Labor union membership grew by 311,000 members in 2007, the biggest annual gain since the government began collecting such data in 1983.³

While Western European countries top the list as those with the highest wage rates, Asian and African countries represent those with the lowest wage rates. The wide gulf between the Western European and North American countries at the top of Figure 8, and the Asian and African countries at the bottom, goes far toward explaining why off-shoring has been so pervasive over the last 10 years.

The wage differential is not just between the West and Asia. More developed regions of Asia, such as Japan and Taiwan, now face many of the same economic issues as other developed economies across the globe. According to one interviewee, “with the prospect of continued relocation of labor-intensive industries to countries with cheaper work forces such as in China, traditional labor-intensive industries are steadily being moved off-shore. Taiwan's and Western companies' future development will have to rely on further transformation into more high technology and service-oriented. Countries such as Vietnam and the Philippines are racing for the great investment opportunities offered by Western companies who are looking to outsource.” The low wages in these countries can be particularly appealing for industries that are labor-intensive, such as pharmaceuticals.

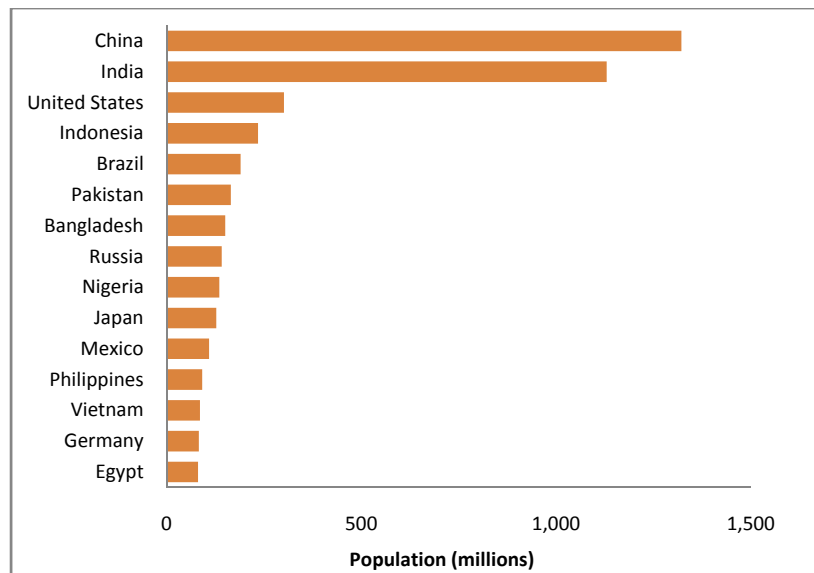
Figure 8: Growth of Labor Rates Worldwide



Source: Economist Intelligence Unit

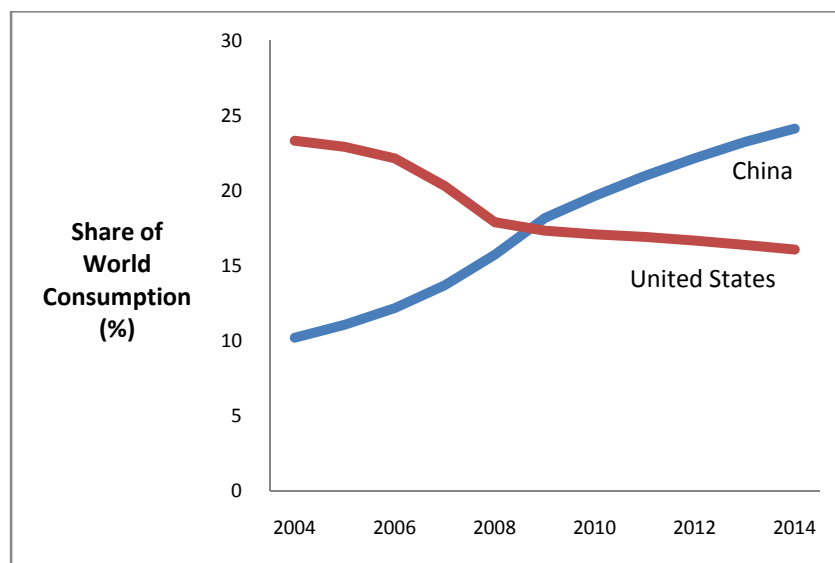
Demographics have a large influence over wage prices. The aging baby-boomers in the US are at the peak income-producing years of their careers, and are drawing salaries that are much higher than the ones that young unmarried Chinese workers with no children are willing to accept. Also China has the largest population in the world, with over 1.3 billion people, and therefore greater availability of labor. China and India together, each with over one billion people, have about three times the number of people in the next largest country, the United States.

³ Washington Post

Figure 9: Largest Populations Worldwide

Source: CIA

A large population also means large demand for products and services. Soon after launching a low-cost country sourcing effort, many companies decide that supply chain management is “the tail wagging the dog,” and they try to penetrate the developing market for revenue growth rather than cost reduction, or for both. In fact, China will replace the US as the largest consumer of manufactured goods by 2009. “By sourcing in China for a few years, we have learned a lot about the local market. Today we are investing in expanding our manufacturing capabilities there and dedicating part of production to the local market. We see great potential,” mentioned the director of supply chain management of a major American company.

Figure 10: China to Replace the US as the Largest Consumer of Manufactured Goods

Source: Boston Logistics analysis of Global Insight data

2.3.2 Lenient regulatory controls also make low-cost countries attractive sourcing platforms

The less stringent pollution controls in low-cost countries keep direct costs low. An interviewee from Brazil mentioned that manufacturers in today's developed nations benefited from having limited and lenient regulations when they were industrializing, therefore most should understand how such a situation facilitates development in the nations currently in the process of industrializing.

The relative lack of intellectual property protection also results in lower costs. While lower costs can be an attractive, intellectual property loss is for several companies a major consideration when determining the extent to which industries will go off-shore.

The lack of compliance may be as much to blame as the lack of regulation. Laws and regulations in developing nations are not always very different from that of developed nations, but in rapidly-growing economies there simply aren't enough judges, attorneys or regulators, nor is there a strong enough judicial system, to enforce the laws. Therefore businesses judge for themselves whether the risk of getting caught outweighs the cost of compliance.

2.4 Manufacturing infrastructure in Asia is beginning to challenge the West

2.4.1 Manufacturers in low-cost countries are advancing technologically

China's competitive advantage in technologically advanced manufacturing has improved dramatically between 1987 and 2005, according to a study by the University of London. Using a metric that reflects the proportion of exports of a single good compared to the exports of all goods, China's advantage has become surprisingly strong in high tech. It exported 2.2 times more high-tech goods than regular goods, as a share of world consumption in 2004.⁴

Strategic industries in China have especially high ratings. These industries are already competitive on a global scale and capable of reliably delivering good quality. For example, see below the relative scores of some high-performing industries:

- Sound recorders, phonographs – 3.1
- Office Machines – 2.9
- Automatic Data processing equipment – 2.5
- Optical instruments – 2.5
- Telecommunications equipment, parts, and accessories – 1.7

With time, today's low-cost countries will join the ranks of the developed nations. "Chinese companies will do the same thing that Japanese did," says the executive director of a major automotive distributor, referring to Toyota, Nissan, and other Japanese carmakers' migration path in the US auto market.

2.4.2 Developing nations are putting unprecedented investments into infrastructure

Many of the developing countries are making massive infrastructure investments. The examples below, taken from a report by the Urban Land Institute, capture the extent to which these countries are promoting the growth of their economies:

⁴ Vaidya, Bennet, Liu

“In fast-developing China, rail use is increasing at a 30 percent annual clip. (...) Making a major investment in railways, the Chinese government just completed a \$4.2 billion rail line between Beijing and Lhasa in Tibet, which powers through mountain passes and the Gobi Desert over tracks designed to remain stable in permafrost.

Taiwan just completed a \$15 billion high-speed line between Taipei and the southern port of Kaohsiung, reducing travel time from four hours to 90 minutes. South Korea also builds bullet train corridors between Seoul and other major cities.

[In India]...Business travel and tourism growth have been hampered by inadequate airports. A \$430 million privately managed international airport is scheduled for completion in Bangalore next year. Large-scale expansions and facelifts also are underway at the Mumbai (\$515 million), Delhi (\$600 million), and Hyderabad airports...”

2.4.3 Developing societies are aggressively building intellectual and human capital

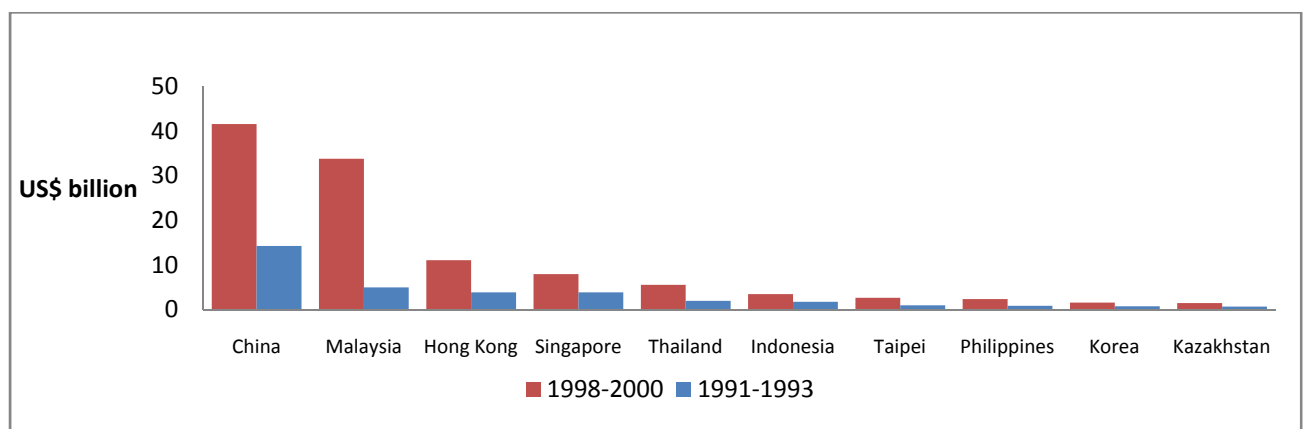
Developing countries are aggressively forming a more inviting environment for manufacturers to locate and outsource. Serving the off-shoring wave has become an industry in itself. Here are four examples:

- Vietnam is working hard to foster a receptive environment for manufacturing. Its approach is to protect intellectual property rights and offer tax breaks.
- China and other nations are using joint venture legislation to ensure that local partners acquire the intellectual property in business ventures over time.
- China is stimulating creativity amongst its youth, which includes the establishment of an advertising and graphic arts social effort. “Design is one of the most popular majors at Chinese universities today, and hundreds of design consulting firms have sprung up in Shanghai, Beijing, and Guangzhou,” according to BusinessWeek. “Design is the way companies improve their competitiveness,” says a vice-president who oversees design at appliance maker Haier Group.

Chinese policymakers are deliberately creating a favorable investment climate. Governments and policymakers are doing everything they can to ensure that fiscal and monetary conditions appeal to outside investment. The central and local governments are prioritizing maximum speed and scale of growth in the economy over maximum profits.

The policy seems to be working. China tops the list of total inflows of foreign direct investment.

Figure 11: Top 10 Destinations for Foreign Direct Investment (FDI) in Developing Asia

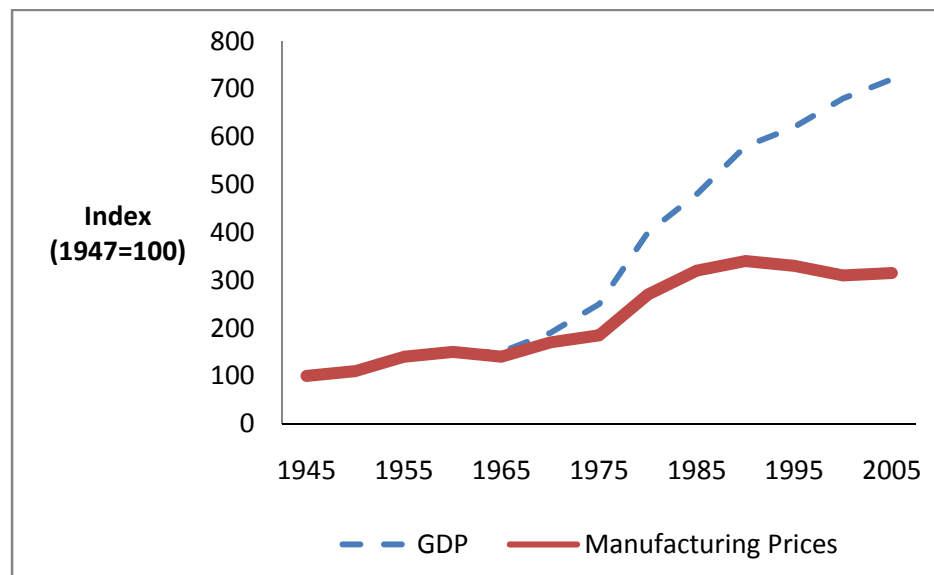


Source: Boston Logistics analysis of UNCTAD data

3 Western manufacturers are threatened by unprecedented price pressure

Western manufacturers are surviving mostly on productivity growth and squeezed margins. Prices of US manufactured goods are falling in real terms. Since 1995, prices for manufactured goods have declined 9% while non-manufacturing prices rose by 22%, according to a report by the National Association of Manufacturers (NAM). The strongest increases were in healthcare, education, and construction. Output is high and relatively constant, but price competition is fierce.

Figure 12: US GDP and Manufacturing Prices Over Time



Sources: Boston Logistics analysis of data from the Bureau of Economic Analysis and the National Association of Manufacturers

3.1 Traditional make-to-stock manufacturers are being commoditized

The outsourcing trend affects decision makers worldwide. Western traditional made-to-stock type manufacturers should be the ones most worried since the majority of Western manufacturing being substituted by low-cost country sources have been of this Supply Chain Type™. According to an operations management Professor at Babson College, a business school near Boston, “this type of manufacturing will never come back. We [US] will never make shoes again,” he says.

There are seven types of supply chains, according to Boston Logistics’ Supply Chain Type™ framework. While make-to-stock manufacturers currently comprise nearly half of all companies, their numbers will shrink by 15% between now and 2035. These companies, which are mostly at the “maturity” stage of their product lifecycles, are the first ones to migrate off-shore, since their manufacturing approach is usually repetitive and easy to copy, and their technology is often limited.

Figure 13: Western Manufacturing Over Time by Supply Chain Type

Supply Chain Type™	% of Sales 2005	% of Sales 2035	Change
Extraction	5%	2%	-3%
Process Manufacturing	13%	10%	-3%
Make-to-Stock Manufacturing	42%	27%	-15%
Make-to-Order Manufacturing	12%	23%	+11%
Distribution	9%	14%	+5%
Reselling	19%	24%	+5%
Total	100%	100%	0%

Source: Boston Logistics

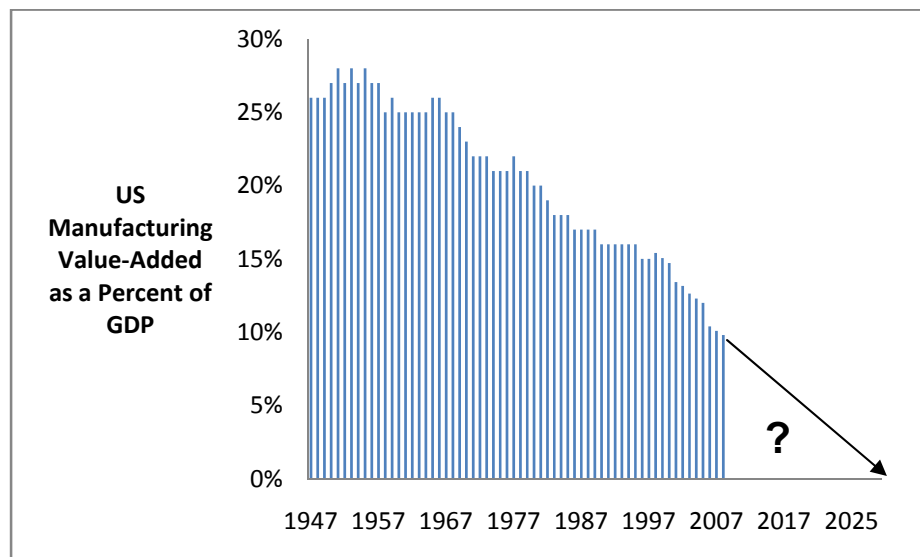
3.2 Western manufacturers are staying alive through productivity improvements

Competitive pressure has led to higher productivity through a substitution of high-cost labor with lower-cost capital, and hence more profitable businesses. Non-farm productivity increased by 2.9% per year since 1995 according to NAM.

Simply put, productivity has kept manufacturing alive. US productivity rose 4% between 1979 and 2006 when measured by the inflation-adjusted value of output per hour.⁵ Productivity rates in North America continue to be the highest. Western European manufacturers have been seeing a resurgence of profitability in early 2008, according to Kevin Gardner, Head of Global Equity Strategy at HSBC.⁶

Still, manufacturing has declined from 25-30% of US GDP after World War II to 10% of US GDP today. We can roughly say that the difference has been off-shored or that domestic production has absorbed price decreases over the period.

Figure 14: US Manufacturing Share of Nominal GDP



Sources: Boston Logistics analysis of data from the Bureau of Economic Analysis and the National Association of Manufacturers

⁵ Weinstein

⁶ The Economist

3.3 Some industries and companies might be better off getting out

A frog, when placed into a pot of boiling water, will jump out to safety as soon as he touches the scalding hot water. However, the same frog, if placed into a pot of cool water that is progressively heated to boiling temperature, will stay in until he dies from the heat.

The same is true of manufacturers who may have a long history in an industry that is under competitive and trade pressure. While the smartest thing may be to jump out, some manufacturers have been in their business for so long that they don't know what they could do if they were to exit it.

Privately-held businesses are the most likely to stay in business after the luster has worn away and profit is very thin. One plastic molder stayed in business through two generations after hard-discounting Chinese competition started hitting prices hard. It eventually sold to a larger competitor, who then had the same problem and was forced to shut down.

If the companies had considered getting out earlier, they may have saved far more retained earnings and capital spending from their hard-earned years of investing in their companies.

3.4 A number of scenarios could reduce the price differential

The cost advantages from low-cost country sourcing could decrease, especially for the US. Several "swing variables" could reduce China's advantage as a low-cost country source, and could even cause a reversal of the trend. None of the variables individually are likely to reverse the trend, but a "perfect storm" could.

China's advantages as a low-cost country source have decreased. Intervening variables include:

- Labor cost increases
- Exchange rate revaluations
- Low US interest rates
- Increasing shipping costs
- Dual sourcing
- Environmental concerns

3.4.1 China's labor cost is rising

The main reason attributed to China's growing share in the global markets is that it can produce goods at relatively lower cost than its competitors due to lower wages. The average Chinese wage is three to four times lower in China than in the Latin American countries.

However, rising wages have started to change how companies operate in China. U.S. corporations and their suppliers are starting to rethink where to locate facilities, whether deeper into the interior (where salaries and land values are smaller), or even farther afield, to lower-cost countries such as Vietnam or Indonesia. Already, higher labor costs are beginning to price some manufacturers out of more developed Chinese cities such as Shanghai and Suzhou. "There is a break point where people will say this is too expensive," says a general manager at the Suzhou plant of an American manufacturing company.

3.4.2 Exchange rate changes are moderating off-shoring benefits in the US

Over last three years, the dollar has devalued by 12% against the Euro and 13% against the Chinese Yuan. This has helped US manufacturers' export competitiveness and dampened the thirst for off-shoring. Conversely,

Europe's export competitiveness has been challenged by a rising Euro. If the US dollar continues to depreciate against the Chinese yuan, this could begin to tilt the balance in favor of sourcing from domestic US companies.

3.4.3 High shipping costs are reducing the amount of off-shoring that is economical

Fuel cost has increased by 15%, and steel cost has increased dramatically over the last several years. Both of these factors have made ocean shipping a lot more expensive. If current trends continue, the cost of shipping could begin to make Chinese goods less attractive to American and Western importers.

"The delta is no longer as advantageous," observes the Supply Chain Manager for an US importer.

Since only about 20% of international sourcing cost is transport (to the US from Asia, at least), a significant further rise in freight rates could eventually change the sourcing decision.

3.4.4 Regulatory and social considerations may keep manufacturing onshore

Several regulatory and social changes that are underway are increasing the cost of off-shored goods and services. These include environmental regulations and protectionist and social policies.

3.4.4.1 Environmental concerns and regulatory measures could level costs

"China is growing at double digits because it's taking it from the environment. That cannot be sustained forever," opines a Supply Chain Director, referring to pollution from manufacturing. If China and other nations take air pollution more seriously, the "free ride" that manufacturers are currently getting may end up costing money. That money would further reduce the differential between Chinese and Western delivered costs.

Whether it comes from factories or from transportation, pollution controls could affect the overall competitiveness of Chinese goods. One interviewee living in China adds "a CO2 emissions and future introductions of emission quotas may become impactful. I don't believe shipping things back and forth across the world will be feasible in the long run. Sooner or later reality will catch up with us and I wouldn't be surprised if in the future there will be a reversal in trends, with some manufacturing being moved back to the West."

3.4.4.2 Protectionist policies could limit future off-shoring

Protectionist policies could also affect the competitiveness of Western manufacturers. Western laws concerning displaced workers, import taxes, job security, and non-tariff barriers could tilt the balance between low-cost countries and Western manufacturers. For example, the American state of Massachusetts gave extraordinary tax breaks to keep defense contractor Raytheon's activities from moving elsewhere. .

While not a direct tax or protectionist measure, regional trading blocs could create a different competitive dynamic from the current "East vs. West" paradigm. "NAFTA can compete with Asia," says the Vice President of Purchasing for an American company.

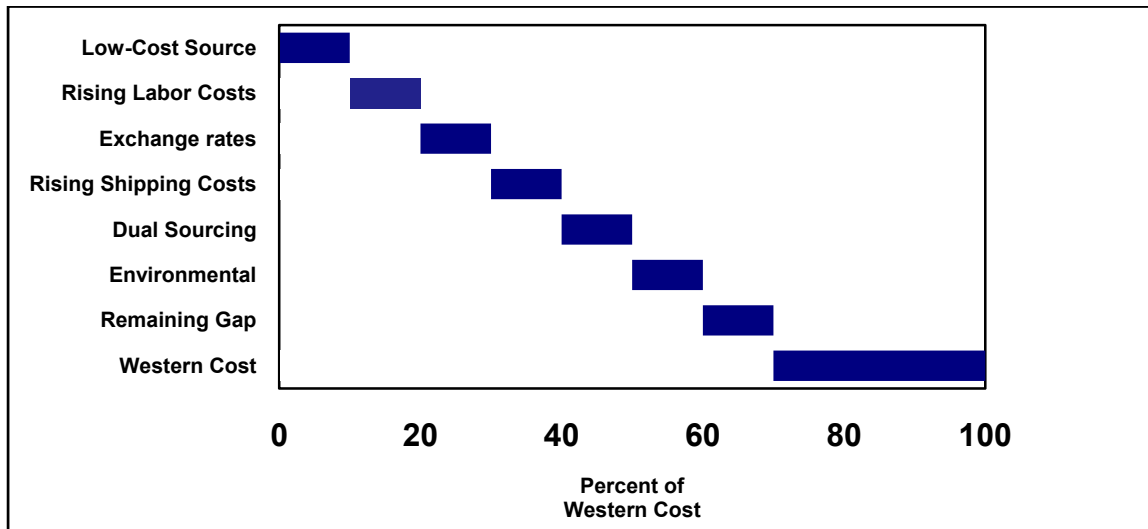
3.5 However, Western manufacturers will remain the high-cost producers in almost all scenarios

If all these scenarios become reality, the combination of circumstances could make a serious dent in the off-shoring trend, or even reverse it. This is especially true in the US, where domestic manufacturers are currently

advantaged by a low exchange rate and high shipping costs. It is less true in Europe, where a strong Euro and lower shipping costs from Asia are likely to ensure a continuation of the off-shoring trend.

However, in all but the most extreme combination of circumstances, the Western manufacturers will remain the high-cost producers. The current price differential between Western manufacturers and low-cost country sources is so large that it would take a “perfect storm” of economic circumstances to close the gap.

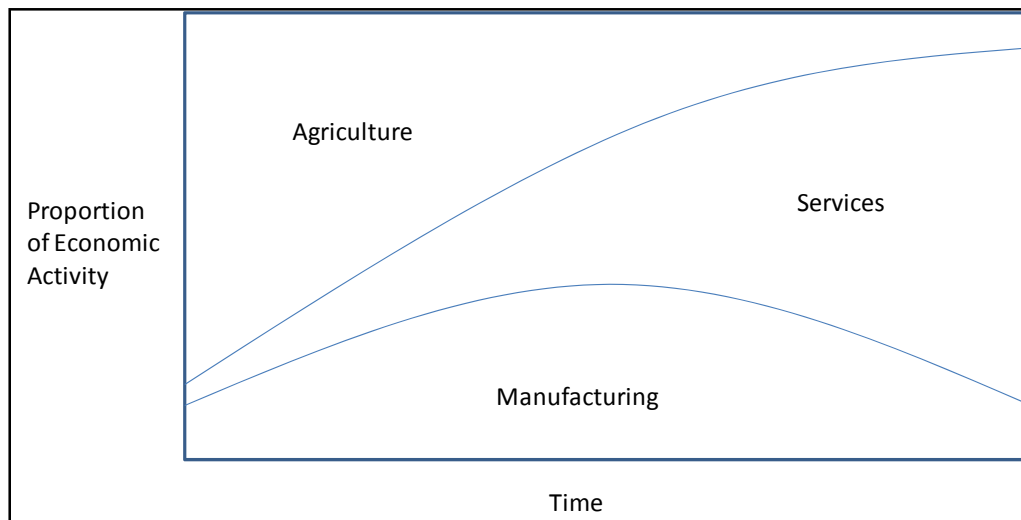
Figure 15: Difference between Western and Emerging Economy Costs – Illustrative



Source: Boston Logistics

Furthermore, even if economic circumstances such as exchange rates changed to favor Western manufacturers, the lifecycle of economies over time would tend to result in a decline in manufacturing in favor of a growing service sector.

Figure 16: Changing Structure of Employment during Economic Development



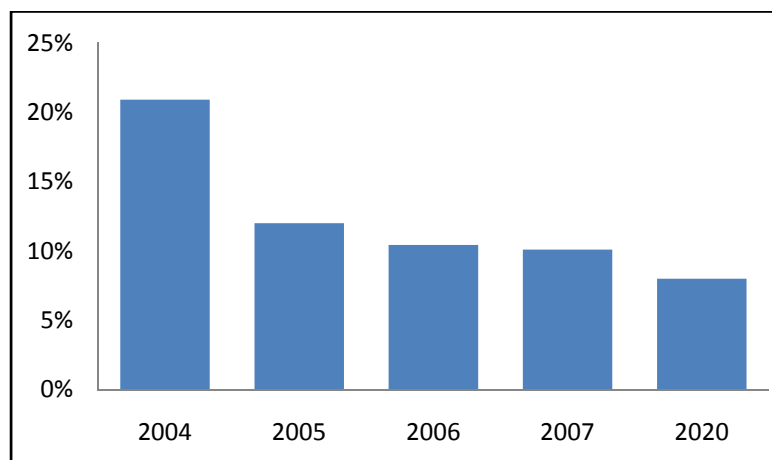
Source: Based on a framework from Bernstein (*Industrialization and Post-industrialization*)

4 Can Western manufacturers survive?

At the current rate of outsourcing and off-shoring, Western manufacturing is arguably in danger of being marginalized. Should Western manufacturers accept that manufacturing is past its prime and off-shore entirely, or is there hope? Some Western companies are outsourcing their entire manufacturing operations to low-cost countries. This can be seen particularly in made-to-stock manufacturing such as in lighting and electronics. The two largest lighting producers fabricate their electronic drivers and ballasts abroad. According to a private equity investor interviewed, this is also the case for Vizio, the largest LCD TV seller in America that manufactures 100% of its products in Asia.

Agile manufacturing companies have opted to redefine their core competency. While production happens aboard and costs are minimized, these companies can focus elsewhere. As a result, manufacturing's contribution to GDP has been decreasing significantly. The trend is expected to continue at least for the next fifteen years, however at a diminishing pace.

Figure 17: US Manufacturing Contribution to GDP – Projection



Source: Boston Logistics analysis of data from CIA, NAM, EIU, and Global Insight

4.1 How much more off-shoring will occur?

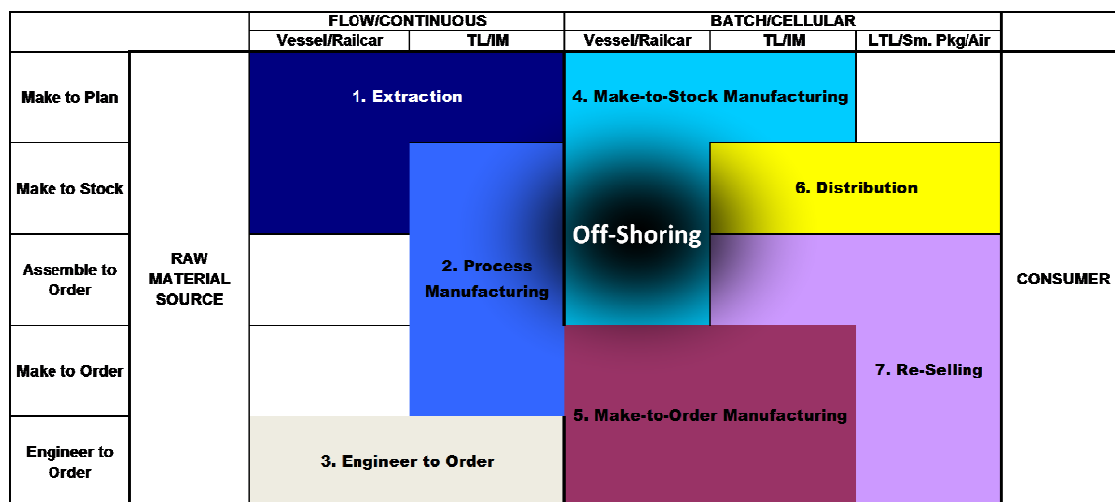
US manufacturing has already experienced a steep decline due to off-shoring, it now comprises about 10% of the US economy. Despite this steep decline, companies are eager to continue off-shoring. Seventy-seven percent of respondents to Boston Logistics' survey expect their company to increase the headcount that they off-shore over the next five years. Nearly two-thirds of the remaining US manufacturing base can still be off-shored. Only 3% of GDP is un-off-shorable, leaving 7% more that could go off-shore. The 3% of GDP derives from certain business segments that are not able to, or do not significantly benefit from off-shoring all manufacturing.

Segments that would have the greatest reason to stay include:

- Bulk materials (Extraction supply chains).** The transport costs of bulk materials is high as a percent of product price, which makes it harder to off-shore economically. The majority of bulk material handling consists of the primary sector (extraction) and is not in manufacturing, nevertheless much is also used by manufacturers within their products. According to a logistics manager at an imports company in Panama, Samsung produces its consumer electronics in Asia, except for televisions, which they manufacture in Mexico due to better access to bulk materials.

- **Capital-intensive production processes (Engineer-to-Order and some Process Manufacturing supply chains).** Several capital-intensive production processes take long to pay-back the investment necessary to set it up. Therefore many manufacturing plants of such type are opting not to relocate. Nevertheless, many are also aiming to address local demand at the low-cost country where they off-shore at and in such cases, the pay-back period can be shorter, and therefore classify it as a good investment. For example oil & gas companies are putting their plants in China due to the huge internal market.
- **Short lead-time items (Distribution supply chains).** Short leadtime items include critical spare parts, just-in-time (JIT) items required for flexible manufacturing, non-canned food products (\$33b), and luxury goods and impulse buys. It may also include items that can be rapidly assembled in the local market.
- **High-precision or high-quality products.** Such items are often manufactured within automated processes to generate greater accuracy and reliability. Automation in the developed nations such as Japan and the US is significantly more efficient since investing in them has proved to be more financially advantageous than paying high labor cost. According to an European interviewee currently living in Shanghai, "because of high wages in the West, we have done a good job of replacing man with machine wherever possible, and these automated production processes are often much more stable than manual equivalents available in China."
- **National Security Products.** To maintain technological and innovative advantages over other nations and to comply with health and safety issues, manufacturing of several national security products are best done domestically. "Most of our products could never be manufactured abroad." says an engineer at a major US manufacturer specializing in defense, homeland security, and other government markets throughout the world. National security products consist of
 - Computers
 - Electronics
 - Marine
 - Materials, Chemicals, Micro-organisms, and Toxins
 - Materials Processing
 - Navigation and Avionics
 - Nuclear Materials, Facilities, and Equipment
 - Propulsion Systems, Space Vehicles, and Related Equipment
 - Sensors and Lasers
 - Telecommunications and information security

Figure 18: Propensity to Off-Shore by Supply Chain Type™



Source: Boston Logistics

4.2 Can you rebuild the capability in the future if you need to bring it back?

Once manufacturing activity is completely or mostly off-shored, it is very difficult and costly to bring that expertise back. It is natural that as outsourcing becomes increasingly common and sources of traditional manufacturing are mostly off-shore, labor in developed nations focus on their alternative competencies. If the bulk of manufacturing continues off-shored for another five years, the labor force will lose its manufacturing expertise, and reversion will be difficult or near-impossible.

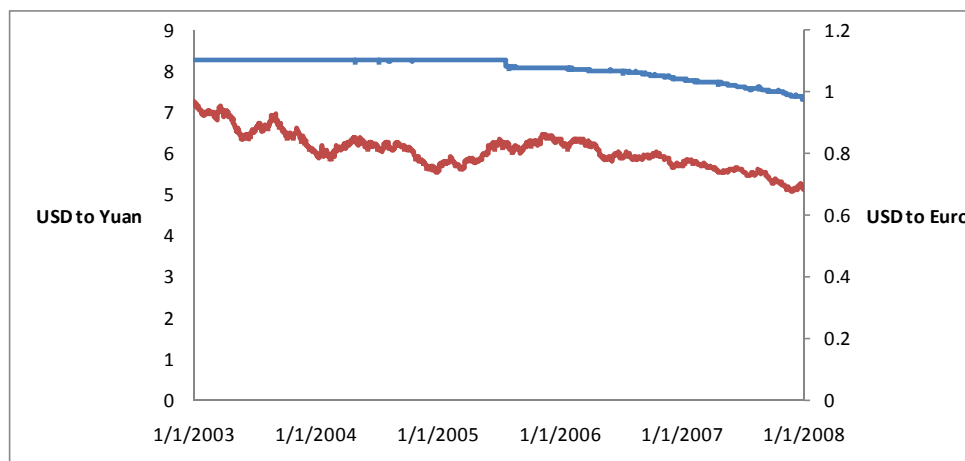
Governments should preserve some manufacturing skill sets which can be used in the long run to deal with any manufacturing opportunity or necessity that might emerge in the future. Economies should not rely entirely on a narrow set of industries. Sixty-nine percent of respondents said their country needs a diversified economic base, and 49% of respondents said that a manufacturing base is very or extremely important to their countries' future economic growth.

4.3 Is it more profitable to just sell out?

If the future of the manufacturing business is waning, shareholder value may be maximized by selling the business right away. With a cheap dollar and newfound wealth in blossoming economies, there is no shortage of buyers. A European interviewee who sold part of his family business to Asian investors says that "the Asian economic growth has increased the buying power of their people. Today, many more can afford Western companies."

If the American Dollar continues declining in value, Western corporations will become even more attractive to foreign investors and we might observe a strong trend of international mergers and acquisitions.

Figure 19: US Dollar Exchange Rate



Source: Boston Logistics analysis of Oanda data

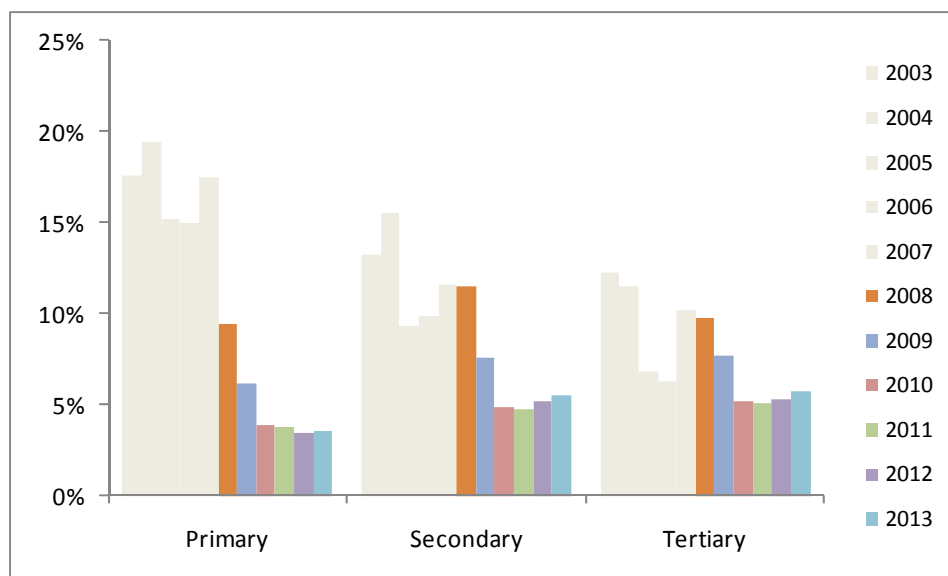
5 Western manufacturers can thrive by filling a critical void in high-quality customized products and services

Western manufacturers can survive, and become highly profitable by pursuing a business model that stimulates differentiation and focus through technological advancements and service offerings. Combining the creation of new technologies with the implementation of services offerings is central to successful manufacturing in the West.

5.1 Manufacturing earns a premium, especially in technology industries

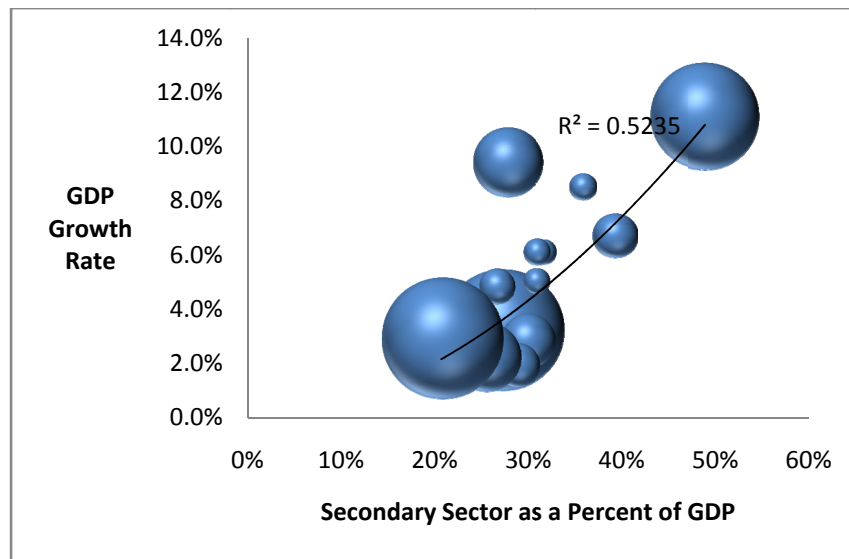
Certain manufacturing industries can offer high-growth opportunities in developed Western economies. Survey respondents were most bullish on the future of service industries – especially biotechnology, pharmaceuticals, and medical devices. Seventy-seven percent of survey respondents agreed that manufacturing is composed of both low-value segments, which are targets for off-shoring, and more complex activities that will most likely stay onshore. Technology and services are large and growing sectors as a proportion of the economy, but their growth rates are not higher than the growth in manufacturing.

Figure 20: World Sales Growth Rate by Sector (2006 to 2007)



Source: Boston Logistics analysis of Global Insight data

Statistically, the manufacturing sector contributes to a high rate of GDP growth. The higher the degree of manufacturing in an economy, the higher the country's growth rate. For the top 20 countries, 52% of the variation in GDP growth is correlated with the presence (or not) of a strong manufacturing sector.

Figure 21: Correlation Between Secondary Sector Prominence and Economic Growth

Source: Boston Logistics analysis of CIA World Factbook data

Services are playing an increasingly larger role in economies worldwide. The average economy in Organization for Economic Cooperation and Development (OECD) countries consists of over 60% services, according to sources at the OECD. Professional associations like the Institute for Supply Management (ISM) have been working for a long time to increase membership of service provider or manufacturing firms that also provide services. The effort has been successful; today strictly manufacturing member companies make up less than half of the membership. They are gradually reflecting the economy in which they live.

Figure 22: Stages of Economic Development

Characteristics	Preindustrial, Agrarian	Industrial	Postindustrial, Knowledge-based
Leading economic sector	Agriculture	Industry	Services
Nature of dominant technologies	Labor – and natural resource – intensive	Capital-intensive	Knowledge-intensive
Major type of consumer products	Food and hand-made clothes	Industrial goods	Information and knowledge services
Nature of most production processes	Human-nature interaction	Human-machine interaction	Human-human interaction
Major factor of economic wealth/growth	Nature's productivity (soil fertility, climate, biological resources)	Labor productivity	Innovation/intellectual productivity

Source: World Bank

5.2 Differentiation on high quality is a sustainable business model for Western nations

There will be a huge market at the low end, but Western manufacturers cannot afford to migrate to the low end of the spectrum since their labor costs are too high to export competitively to Asia. There will always be a low-cost option and a high-cost option. So rather than giving up manufacturing as a whole, Western manufacturers need to learn how to effectively be the high-cost option. In the words of a Wall-Street investment banker, “The economy will always demand manufacturers of premium/niche/high-end products which don’t compete by price but compete by quality and/or unique attributes.”

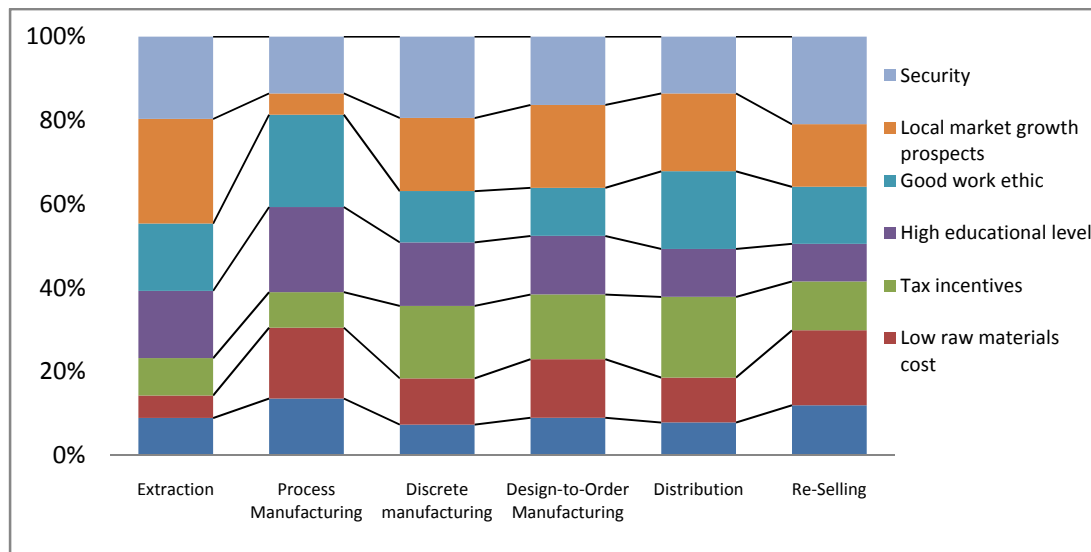
5.2.1 Quality is more important to Western manufacturers than low cost

“Quality will be important. Cost is always a driver, but not the main one,” explains an economics professor. Practitioners agree. Cost concerns only about 30% of survey respondents’ key success factors. Other factors are much more important to manufacturers’ choice of off-shore production locations; these vary by Supply Chain Type™. For example, the local market growth prospects are more important to extraction companies than to process manufacturers since raw materials can often only be sold economically where they are extracted, whereas the output of process manufacturing operations can often be sold on worldwide markets.

While 60% agreed that low cost is “quite important” or “very important,” approximately 40% said that cost is not driving their business model (of those, the largest share said that cost is “somewhat important.”) Costs will always be one of the major considerations in businesses as a whole, but outsourcing must balance cost reduction with operational excellence to be truly competent.

Low-cost countries typically have trouble achieving the quality levels accepted as the standard in Western industrialized nations. Eighty percent of manufacturers have increased quality control on goods made off-shore, according to a study by the American Chamber of Commerce.

Figure 23: Importance of Cost and Other Factors by Supply Chain Type™



Source: Boston Logistics

5.2.2 Business conditions are more friendly toward manufacturers in industrialized nations

The business environments in developing nations are often less friendly to foreign investors than those in developed nations. The high probability of encountering complications can be inhibiting. Some of the major challenges are:

- Lack of transparency
- Unfriendly tax regimes
- Cumbersome and costly labor regulations
- High costs of bankruptcy
- Arcane government filing requirements, such as visa applications
- Costly capital requirements
- Unpredictable regulation and controls
- Inadequate or limited infrastructure that can lead to supply chain unreliability and disruptions
- Weak legal protections and slow judiciary processes

For Western companies, intellectual property protection is one of the most difficult aspects of sourcing from China. Not only is the regulatory environment weak, but even when cases go to court and win, favorable judgments only result in collection 30% of the time. The lack of enforcement gives intellectual property thieves little reason to be honest.

Getting a phone or setting up electric service is often a good test of how bureaucratic the local system is. It takes about 45-90 days to get connected to the electrical grid in India (up to 90), and 10-30 in Brazil. Physical infrastructure is often limited, too. The average speed of trucks and buses in India is 30-40 kilometers per hour. India, China, and Brazil have regular power outages that directly reduce productivity.

The lack of quality and reliability, as well as product recalls, pose major impediments to companies that outsource to low-cost countries. These issues can affect the company's reputation, customer loyalty, and sourcing strategies, all of which need time and capital investment to develop. "People increasingly do not want to take products from China, because of the recalls and lack of reliability that most manufacturers are providing," notes one interviewee.

Even if they could get beyond the challenges of sourcing under these conditions, Western manufacturers generally prefer to have a high-quality and high-reliability operation, even if it means higher cost. "I don't want a low-margin business, even if that is where the growth in volume is," say 36% of respondents when asked if they would change their company's product mix toward lower-end simpler products that have smaller margins. For example, in medical devices, cost is an issue but it is much more important to have quality. "We need to protect our margins, but we will not go to any cheap place. All of our suppliers get audits and there are eight criteria on which they are graded," offers one Western manufacturer who is very cautious when sourcing from low-cost countries.

5.2.2.1 When low-cost countries develop good business infrastructure, they become high-cost!

China's infrastructure is developing, but its costs are rising, too. Salaries rose by seven to nine percent in big cities such as Shanghai, Beijing, Tianjin, and Guangzhou, according to the US-China Business Council. Moreover, wages in smaller cities such as Chengdu, Hangzhou, and Wuhan rose by the same percentage. Dongguan labor rates went up 40% in 2005 for the Yongjin group.

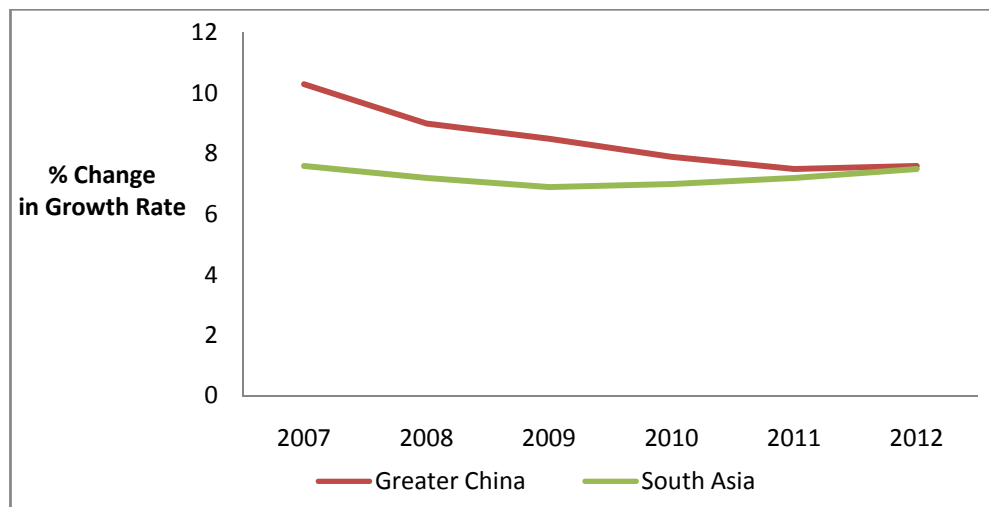
The average 2006 turnover rates in Beijing were about 15% for professionals, which was mostly due to offers of higher wages. An American electrical equipment conglomerate reported 20% turnover at its Suzhou factory as other multinationals moved in. Turnover in some low-tech industries approaches 50%, according to the Institute of

Contemporary Observation, a Shenzhen labor research group. Guangdong Province says 2.5 million jobs remain unfilled there.

The rise of corporate social responsibility through measures such as SA8000 and CSC9000T standards that oblige Chinese exporters to employ humane work practices and respect the environment could further increase costs beyond tightness in the labor market. In addition, a new labor contract law protects employees who have worked more than 10 years with a company from being let go without reason. According to a study by the American Chamber of Commerce, two thirds of companies operating in China feel that China is losing its competitive advantage due to rising labor costs. Sixty-five percent reported a negative impact on business operations due to difficulty of getting and keeping skilled technical and managerial staff, which further pushes labor costs up.

How long will China's star burn bright before ceding the "low-cost" title to another country? Over half (55%) of survey respondents said that they expect China to remain dominant for the next 10 years. Forecasts from the Economist Intelligence Unit indicate that by 2012, China's growth rate will be rivaled by Southeast Asian nations. Some interviewees thought that China would be the low-cost country of choice for the next five years, and others thought 10 years was more accurate. "20 years," says an economics professor. "There is a lot of manufacturing in China and billions of people ready to do it. However, it is very hard for the Chinese government to continue controlling the economy. So [it will continue to be a low-cost haven for] maybe 20 years more."

Figure 24: Growth Rates in China vs. Southeast Asia



Source: Boston Logistics analysis of Economist Intelligence Unit data

Whether it is 5 years or 20 years, cost pressure from low-cost country sourcing won't go away anytime in the next generation. When China becomes "high-cost," its crown will be passed on to a successor nation – one with inferior infrastructure that warrants a low cost. Which country will that be? The Supply Chain Director from a public agency recalls that "some time ago it was Japan. There will always be a cheaper place to buy. But the cycle is getting increasingly faster. We will always be looking for countries to source from."

Instead of one enormous factory like China, regional low-cost manufacturing hubs may develop, especially if manufacturers opt to "near-source" more, or buy from lower-cost countries near them. In this case, the winners might be dispersed among each continent:

- American companies may outsource more to Mexico, Costa Rica, or Brazil. "We should not forget that South America offers low-cost opportunities. It is not only about China," says the Indirect Procurement Director for a specialty chemical company. A US fitness equipment manufacturer is looking at regional manufacturing. The US subsidiary of a major European electronics firm recently shifted its off-shore production from China to Tijuana, Mexico in a near-sourcing move. Costa Rica is also emerging in the eyes of some admiring procurement executives. "Mexico and Costa Rica are

easier with logistics since they are at least half of the distance away, and they have no intellectual property issues, observes the Director of Supply Chain for a US medical products company.

- In Eastern Europe, the Eastern Bloc countries are the obvious target. While the Czech Republic and Hungary were considered low-cost havens a number of years ago, Latvia, Lithuania, and Belarus may now be supplementing or even replacing them in that role. Factories that have been liberated from Soviet rule have become low-cost production options for European multinationals. Lithuania may already be cresting; large Lithuanian textiles and electronics industries are shrinking as salaries increase to European levels and production of goods moves east to Belarus and Ukraine. Slovakia is becoming the car assembly capital of the Eastern bloc. Kia built a modern automated factory that employs 2,000 people and will build 250-300,000 cars/year. VW has been there a long time, and employs 9,000 people to build the same number of vehicles, so efficiency is improving.
- In Asia, Vietnam is expected to be ASEAN's star growth performer. Vietnam's development will maintain its breakneck speed: the country will average real economic growth of 7.7% a year in 2008-11, according to the Economist Intelligence Unit.

6 The opportunity hinges on developing a response to the emerging demand for high-cost country sourcing (HCCS)

Some believe that barriers should be erected to prevent the import of Asian goods, and the accompanying downward pressure it puts on wages. The mainstream public may like to believe that with time, “this too will pass” and manufacturing will resurge. Both outsourcing and off-shoring appear to be a result of globalization, and may never go away.

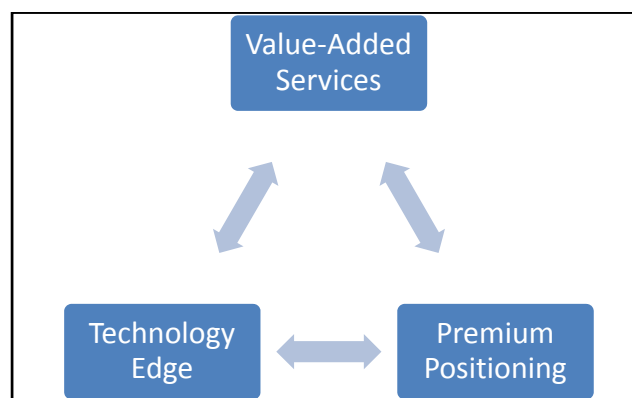
If low-cost country sourcing cannot be prevented and will not recede over the next few years, then Western manufacturers need to cease trying to compete on low cost, and build competitive advantage another way. What is the way?

Manufacturers can achieve growth by leveraging the “service-technology-premium” cycle, which combines value-added services, technology, and a focus on premium quality. The “mutually reinforcing cycle of technical and commercial advances...bring full circle the link between the economy's services-intensity and its information-intensity, creating a huge, growing market for the most advanced information technologies that the economy's goods-producing industries can deliver.”⁷

- Value-added services extend the life of manufactured products and increase the value of the product to the buyer.
- Technology, when embedded in the product design, makes the product difficult to copy or reverse engineer.
- Premium quality differentiates the products in the marketplace and pre-empts comparison with low-cost competition.

The three factors interact to combine a virtuous cycle of high margins and high growth. Value-added services provide feedback that can be used to improve the product. Technology can be used to embed advanced product design and features, as well as to rapidly innovate and launch new products that can help manufacturers stay a step ahead of competitors. Premium quality, which is to some degree already perceived as a result of both value-added services and technology, serves as a basis for higher prices and margins.

Figure 25: The Services-Technology-Premium Cycle



Source: Boston Logistics

⁷ US Department of Commerce policy memo

6.1 Developing more value-added services

The software business went a long way toward popularizing revenue models based on recurring subscriptions. Subscription revenue is more stable than product revenue, and can usually be locked in for longer periods of time. For example, telecommunications providers offer 12-month contracts, whereby the equipment is offered at a steep discount, but the recurring revenue stream from the subscription is worth many times the cost of the hardware. "Software is a great business. First you have an initial sale with upfront revenue, and then that is followed by recurring maintenance and service revenues," explains a private equity investor. An example is Monotype Imaging Inc., which owns several of the fonts that are used everywhere. They sell the rights for people to use their fonts.

Customization and personalization help make products more tailored to the needs of users. Often manufacturers deliver customization and personalization through value-added services. These are normally related to the product, for example:

- Maintenance and repair
- Replacement parts
- Warranties
- Financing
- Outsourced services

Manufacturers should optimally make about 13% of their offering service-related. Boston Logistics used Monte Carlo analysis to determine the optimal split between products, services, and technology investments. Viewing the sectors as independent investments with risk profiles (betas) of their own, we modeled the return and the risk of investing varying amounts in each sector. The analysis took into account the sales growth and the volatility of returns that were achieved in these sectors from 1986 through 2006. It also factored in the risk that could come from mergers and acquisitions, and from the challenges of running organizations in each case (the more capital-intensive businesses had lower organizational risk). After considering 688 different possible probabilistic outcomes, the model showed that the optimal split between products, services, and technology was 87% products and 13% services. In other words, services and high-tech goods far outweigh the return from traditional manufactured goods.

Figure 26: Optimal Split Between Services And Manufactured Goods

BENEFIT

	Goods	Services
Sales	36,753,518	53,746,755

RISK (Raw Data)

Risk Ratings	Market Risk	M&A Risk	Org. Risk
Goods	2.1	1	0
Services	0.7	1.5	2

RESULT

	Goods	Services
Optimal Split	87%	13%

Source: Boston Logistics

6.2 *Creating new technologies based on user feedback*

The user feedback that is gleaned through value-added services can be used to create new technologies, or improvements upon existing technologies. Even product updates and new features for existing products can be valuable to customers. Boston Logistics tracks several indicators of innovation for 36 categories of products. These indicators include:

- Research and development (R&D) expenditures as a percent of sales
- Technological breakthroughs and incremental innovations
- Customer perceptions of innovation by supplier
- Supplier innovation from competitive forces, with a special eye on industry concentration

Interviewees were clear that low cost was not the way to stay in business in the long run – manufacturers need to have superior product technology. They were also emphatic that the executives in charge of manufacturing need to be excellent technical experts and not cost managers.

“We will differentiate ourselves through technology and innovation,” said a forward-thinking manufacturer interviewed. Innovation is a necessary response to globalization and competitive pressure.

Cisco is a good example of a company that innovates by using feedback. The company operates an internal idea laboratory whereby new ideas bubble up through an organic network. The company is a thought leader in innovation, having recently sponsored several executive white papers and related material on Innovation through The Economist Intelligence Unit.

6.3 *Focusing on premium quality market segments*

The services and technology feedback naturally creates an image of higher quality. But this needs to be reflected in higher prices in order to capture the higher margin and profit benefits that come with the service-technology-premium strategy.

“Premium is the natural way of things. My view is that manufacturers should figure out how to differentiate their product so as to be successful in the global market, no matter where they are located. If not, they will be doomed both domestic and overseas,” says one management consultant who we interviewed.

Survey respondents agreed. A quarter (24%) of them said their business will become more focused on the premium segment, compared to 18% who said it will become more commodity-driven. “Western countries will have greater scientific and technological development. The less developed will focus on Manufacturing and in the growth of industry,” said a Brazilian executive.

One reason why premium is successful is that manufacturers don't have to give up the intellectual property to off-shore suppliers who could become their competitors. For example, a European electrical conglomerate interviewed outsources the lower end of its product range to China, but keeps total control over its top-secret intellectual property by manufacturing the strategic products in the West.

There will always be a low-cost option and a high-cost option. So rather than give up manufacturing as a whole, Western manufacturers need to learn how to effectively be the high-cost option.

7 What should you do?

The off-shoring phenomenon has deep roots and long-term implications. While the trend seems to be decelerating, manufacturing infrastructure, organization, and strategies of companies in the West have been profoundly changed. In many cases, this has resulted in improved productivity and competitiveness, and a stronger basis for sustaining profitability in the long term.

Manufacturers will need to make several changes, if they haven't already, to ensure that they occupy a lucrative position in tomorrow's global and competitive environment. They must make sure that they belong to a market segment with strong demand and possess technological expertise. Also, they must layer value-added services on top of manufactured products; these "product-services" increase customer loyalty and profitability, and tap the innovation capabilities of the enterprise, which cannot be commoditized. Finally, they would be wise to develop a special competency and brand as high-quality producers, and either off-shore low-end, repetitive and labor-intensive work or cede that market segment to competitors.

The phenomenon is so impactful that every stakeholder must adjust course before it is too late. We offer recommendations here for several stakeholders, including:

- Directors serving on Boards of manufacturing companies
- CEOs of manufacturing companies in each of seven Supply Chain Types™
- Managers of people and systems, which must undergo significant retraining and redesign to remain competitive. They must also decide on the best move to advance their careers in the midst of the upheaval

7.1 Recommendations for Boards of Directors

Boards must ensure that the governance structures of their companies provide a level playing field for talented staff from all areas of the world to rise to the top. Future leadership needs to include talent from both high-cost and low-cost countries, depending on the corporate strategy. Rising stars need to see that they have access to the leadership role, even if they are not from the headquarters country of the company.

In selecting the CEO, Board members should consider the individual's skill set for finance and negotiation, how his or her language capabilities will contribute to (or hinder) his or her ability to achieve dramatic results with global teams, and his or her openness to move to where the action is, even if that means long periods of expatriation from their home country. As one interviewee put it, the CEO needs to move, travel, and talk to stakeholders worldwide. For example, an American specialty chemical company just announced that after 125 years with American CEOs, it has named a German to the top post.

Directors need to ensure that the path to corporate leadership is geared to attract and retain talent from engineering and marketing as well as finance and costs management. "Get the bean counters out of the top levels of manufacturing," says one supply chain Director. "They are the ones who are putting things overseas."

7.2 Recommendations for CEOs of each Supply Chain Type™

CEOs may have the largest responsibility of any actor in the manufacturing organization. Their agenda must be shaped not by polemic or simplistic policy, but by robust frameworks that consider the competitive dynamics that are unique to the company's industry, and also the "big picture" of what's happening in manufacturing as well. Therefore, their actions must be guided by the type of supply chain that their companies occupy.

Using Boston Logistics' classification of Supply Chain Types™, we offer recommendations for companies operating in the following types of supply chains:

- Companies in Extraction industries (Type I), which includes agriculture, mining, oil & gas, and similar environments, will either be protected from the off-shoring phenomenon, or they will be completely driven by it. If transportation cost is high as a percent of the product, the off-shoring trend may not be a dominant concern. However, if the product is higher-value and transportable across long distances, such as oil, gas, and precious minerals, they need to be aware that their activities will be hotly contested, and they will need to plan on rapidly moving up the value stream to hold onto competitive advantage in the face of low-cost tollers and processing plants.
- Companies in Process Manufacturing industries (Type II) are in jeopardy of losing expensive R&D activities to low-cost competitors, but may be somewhat more sheltered in manufacturing if the plants are highly asset-intensive. They should off-shore R&D, focus on high-end products, layer on premium products, add services to products, and using technology.
- Companies in Make-to-Stock manufacturing environments (Type III) are at risk of being undercut by off-shore sources that can offer low-cost repetitive manufacturing. They are also at risk of losing intellectual property to competitors with low-cost business models. Therefore, we strongly recommend that Type III companies quickly focus on high-quality market segments, differentiate by adding services to products, and use technology to competitive advantage both in manufacturing processes and in market focus.
- Companies in global distribution (Type V) and Reselling (Type VI) supply chains should move marketing and sales as well as production and supply chain to Asia and the Middle East, which have the highest growth rates of many world areas.

7.3 Recommendations for managers

Managers are responsible for preparing their organizations with the skills and resources that will be needed to adapt to the new realities quickly enough to overcome the imminent challenges and prosper in the long-run, which can in the case of limited resources be two conflicting objectives. We recommend the following action steps:

- Build a strong engineering organization that can differentiate the company based on high-quality products and associated services. Do not over-emphasize cost efficiency programs, except in that they can also produce higher reliability and quality products.
- Enable employees and provide the flexibility needed to compete on customization, personalization, and value-added services. In the words of one interviewee, "the number one thing would be to establish a good, reliable information network that enables employees to do the best job possible. You can't rely on gut, you have to know! An information network that connects everyone that you do business with, customers, suppliers, and manufacturing, is the only way you can make good decisions."
- Hire marketing talent that can position the brand in the premium offering to capture the pricing and margin benefit of the investments made in technology, engineering, and information.
- If the company's decision is to use off-shore sources, learn the economics of low-cost country sourcing first-hand by living abroad for at least a year. This will require cultural and language preparation.



Boston Logistics helps supply chain executives make critical supply chain decisions that involve investment and risk by forecasting the evolution of supply markets and technologies. We provide:

- **Supply Chain Research** that helps investors and policy makers quantify the benefit of emerging technologies and decide whether or not to invest in them
- **Analysis** that help purchasing managers decide how, where, and when to buy critical externally-purchased materials and services
- **Supply Chain Consulting** services that support high-stakes decisions such as acquisitions, outsourcing, off-shoring, and make-or-buy

Research Coverage

Industries	Commodities	Supply Chain Types™
<ul style="list-style-type: none"> • Aerospace & Defense • Automotive & Transportation Equipment • Chemicals/Plastics • Consumer Goods • Distribution & Wholesaling • Energy • Electrical & Electronics • Machinery & Equipment • Metals & Minerals • Oil & Gas • Paper, Pulp & Packaging • Pharmaceuticals • Professional Services • Retail • Telecom Equipment • Transportation & Logistics 	<ul style="list-style-type: none"> • Chemicals/Plastics • Contract Mfg • Electronics • Hardware • Metals • MRO • OEM • Office Supplies • Paper & Packaging • Parts & Equipment • Professional Services • Services – Non-Prof. • Services – Professional • Transportation • Chemicals • Compressors • Drilling • Electrical • Gas Turbines • Heat Transfer • Instrumentation • Pipe • Pipe Fittings • Power Transmission • Pumps • Structural Steel • Valves • Vessels 	<ul style="list-style-type: none"> • Customer Direct/Retail • Physical Distribution • Continuous Flow Manufacturing • Design to Order Manufacturing • Discrete/Batch Manufacturing • Pure Services