MANUFACTURING
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Competing Against Manufacturing in Low Cost Regions: Focus on China

Final Report

March 2004

Prepared by Stone & Associates, Inc.

For NIST-MEP

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Myth—China Juggernaut

China's competitive advantage is based on low wages and an undervalued currency—it's overwhelming, and US small manufacturers can't compete against it.

Fact

It's not that simple. There are more than just two factors, and the cost differential varies. In some cases, when China's advantages are all in alignment, the cost advantage is large. In other cases, US companies can be "within range." Also, production is not migrating to China only to pursue low costs, but also to follow OEM/ manufacturing customers, or to access the domestic Chinese market.

There Are Three Major Drivers of Migration of US Production To China

I. China's Cost Advantage

II. US OEMs' Pursuit of Large & Growing Chinese Domestic Market

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I. China's Cost Advantage

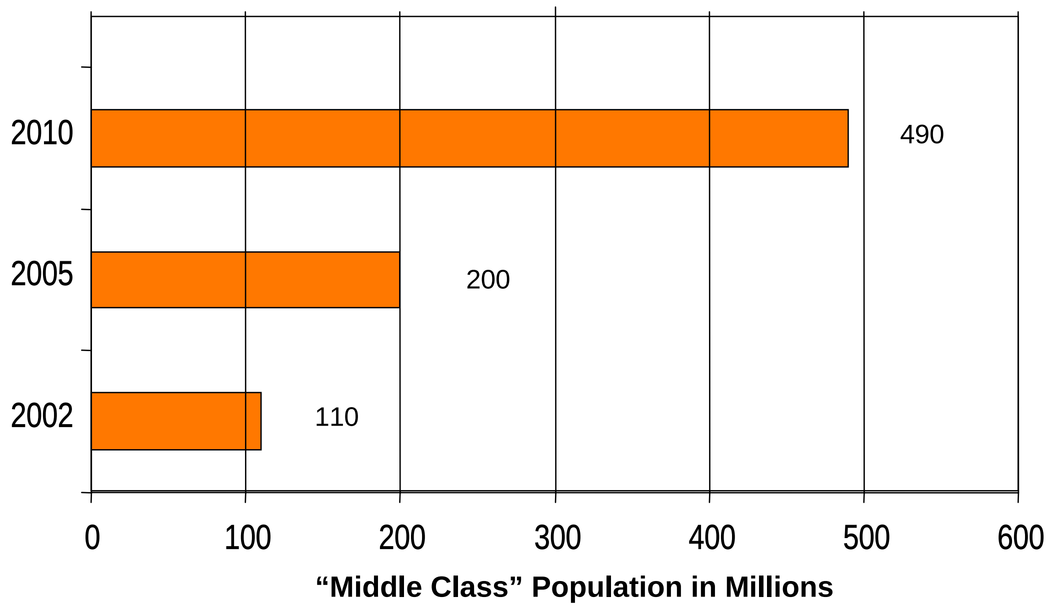
- China's cost advantage can be very large—as much as 50-75% on a part price basis

- In pursuing lower costs, US OEMs are driving their suppliers to manufacture in China and/or other low-cost regions
  - "Many of our customers now have a metric they're applying to us, and to other vendors… They want to see 65-85% (of content) produced in low-cost countries—primarily Asia, with some in Eastern Europe"; Doug Barnes, VP of Mfg for Planar Systems which is a vendor of flat panel LCDs. {The Business Journal of Portland, May 26 '03}

- There are seven major drivers of China's cost advantage
  - Lower labor rates
  - Lower cost materials/components (in some cases)
  - Undervalued currency
  - Government incentives and less regulation
  - Capital not paid back/forgiven loans
  - Tendency within China to oversupply
  - Lack of intellectual property protection (reduces cost to acquire/develop IP)

II. US OEMs' Pursuit of Large & Growing Chinese Domestic Market (or Promise of Future Market)

Chinese Middle Class Estimated to Quadruple by 2010



China 2002:

- Population 1.3 billion
- GDP $1.2 trillion,
- GDP growth rate 7.3%

Note: Middle Class definitions vary and China will not recognize the term "Middle Class" in official documents. The above estimates are based on a definition of generally having annual income of at least US$10,000, being able to purchase an apartment and take leisurely vacations annually.

Source: State Information Center; Chinese Academy of Social Sciences; Morgan Stanley cited in Presentation by Gloria Kamph, CEO of Interliance, entitled "Why China?", Electronics Supply Chain Association (ESCA) July Discussion Group, July 17, 2003

III. Domino Effect—US Suppliers Follow Customers To China

- Metal fabrication
  - "As end-items are increasingly being made in China, our company loses domestic production of components, e.g. one customer now makes 25-35% of its products overseas, which are coming in fully manufactured, and another customer moved their work overseas, so now 13 products which were manufactured in our US plant will now have to be moved overseas." {Company Interview}

- Furniture
  - "As furniture factories have moved to China, their suppliers and related businesses have followed, making the country an exceptionally efficient place to operate. Akzo Nobel, a Dutch-Swedish conglomerate that is one of the largest suppliers of furniture finishes, has closed plants in the US and Europe and is opening three factories in China. 'We can't expand fast enough' says the managing director, who predicts 90% of US furniture production would move to China in five years." {L.A. Times, "China Polishes Off Rivals", 10/21/02}

Myth—Economics of Manufacturing in China

Manufacturing is migrating to China because it is economic to do so.

Fact

Not always. There is a herd mentality in effect. When all of the hidden costs and risks are factored in, China does not always look favorable.

It depends, in part, on “what you count” in the analysis, and the answer may change since some of China’s advantages may not be sustainable (currency, government incentives, capital not paid back).

SMEs need to “educate” customers on the true cost of ownership of sourcing in China and other low-cost regions.

A “Herd” Mentality is Causing Some Firms To Migrate When it is Not Economic

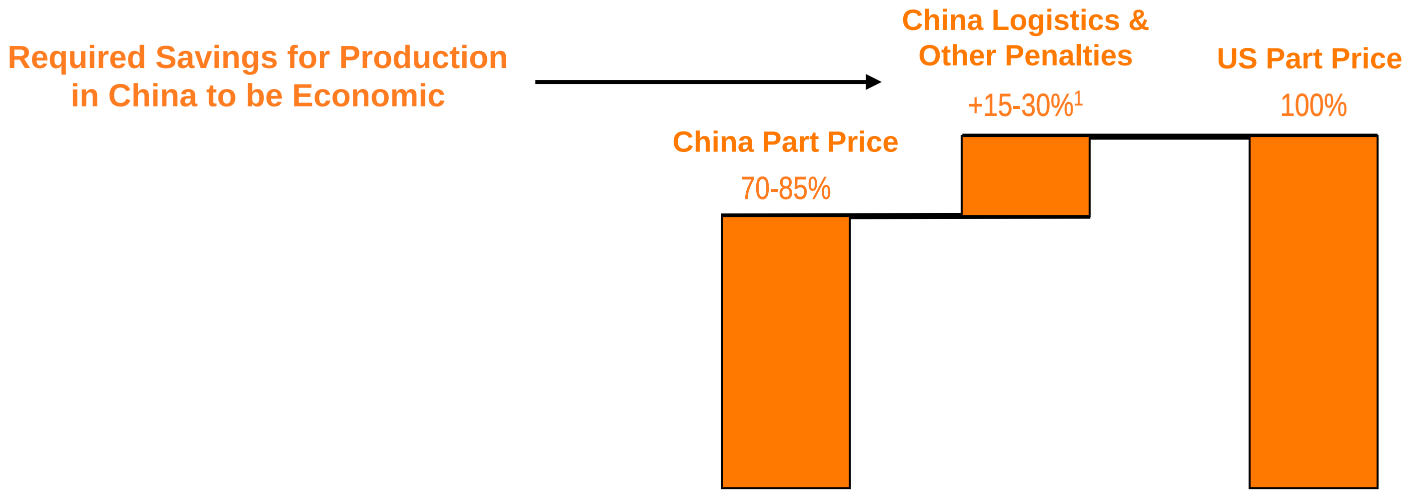
- Examples
  - “Under the policies of reform and opening up, China has attracted huge amounts of foreign direct investment. A ‘herd’ mentality to participate in the ‘Chinese miracle’ developed among global giant corporations… Global corporations now view China as central to their long-term strategy.”
    - {Peter Nolan; University of Cambridge; “System Fragility, Industrial Policy and China’s International Relations, with Special Reference to Strategic Industries”; Prepared for the US Congress, US-China Committee on Economic and Security Review Commission. Sept 2003}
  - “There is a herd mentality with OEMs in China—sometimes it makes sense, sometimes it doesn’t—not always rational decision… People tell their bosses what they want to hear—(going to China) gives a boost to the stock valuation, but you really have to do the analysis on a case by case basis.” {Interview with Technology Forecasters, 10/21/03}

A "Herd" Mentality is Causing Some Firms To Migrate When it is Not Economic (continued)

- US firms can sometimes be cost competitive if total cost is considered, but customers, blinded by low initial cost, ignore total cost
  - "Most [customers] are still focused on initial cost, especially buyers like Delphi's. He doesn't care about the total cost. He only cares about his numbers, his bonus. He could care less about the rest of it." {Company Interview}
  - "Publicized cost savings in tooling and high-volume die casting production appear so attractive… Some US company top executives are virtually mandating that a certain percentage of purchases be directed Offshore. Several purchasing agents report their own attempts to protest such mandates at their companies… 'I keep hoping top management will be enlightened by [his comparisons of prices including hidden costs]… [But] these hidden costs are buried in other budgets and assumed to be part of the price of business generally.'" {"Offshore Sourcing: The Hidden Costs"; Die Casting Development Council}
  - "I was working on a project where a moldmaker was producing 10 sets of tools to make plastic parts for 3 million laptop computers. That translates into 300k parts per tool set. In the US, that job would have been done on 3 sets of tools using higher-quality materials. So even though the initial cost was 40% less, it wasn't really saving any money." {'Congress Weighs Tariffs against Chinese Tools'; Purchasing; 10/29/2002}

Analysts Indicate That Production in China is Not Always Economic, After Logistics & Hidden Costs Are Added

- Production in China is not always economic
  - In some cases, the cost savings from China is too large to overcome.
  - But in others, once logistics and other "hidden" costs are factored in, China does not look so favorable.
  - It also depends on "what you count" in the analysis.
    - And whether price comparisons are done on the same material specifications
- Analysts in various industries indicate part price savings in China must be roughly 15-30% in order to offset these logistics and hidden costs



1. Summarized by Stone & Associates based on the following sources: Presentation by Gloria Kamph of Interliance, "Eight Steps to Successful Sourcing in China," China Sourcing Fair, October 9, 2003; Gary Larson, VP of Sales and Business development for Electronic Systems Inc, quoted in Circuits Assembly, June 2003; "Offshore Sourcing: The hidden costs"; Die Casting Development Council; US International Trade Commission, "Tools, Dies and Industrial Molds: Competitive Conditions in the United and Selected Foreign Markets, October, 2002

Analyses of Total Cost Should Include All Cost Penalties & Risk Factors

COST PENALTIES

- ❑ Freight for overseas shipment (including expediting)
- ❑ Logistics within China (infrastructure is poor)
- ❑ Duties, fees and taxes
- ❑ Additional inventory carrying costs
  - Long pipeline, additional safety stock to ensure uninterrupted supply, minimum order/container sizes, reduced flexibility in responding to demand
  - Must include all inventory costs: labor, warehousing (rent, utilities, insurance, etc.), taxes, scrap/obsolescence, cost of working capital
- ❑ Costs/lost sales due to stock-outs/unreliable delivery
- ❑ Cost of quality—impact on customer's process/costs as a result of inferior supplier quality
  - Customer scrap or yield rate
  - Rework
  - Warranty claims, and cost of litigation
  - Costs of debugging (e.g. tooling)
  - Cost of finding/eliminating defective product in a long pipeline
- ❑ Additional costs related to communication and management oversight
  - For example, travel time and costs of engineers and executives to China

Sources: Lean Directions, 'Move Your Operations to China? Do Some Lean Math First'; Womack; "Offshore Sourcing: The hidden costs"; Die Casting Development Council; manufacturingnews.com; 01/02/2003; The Great Debate: When Is It Better To Buy From China Than It Is To Produce In The US}; Calculating the Total Costs of Offshore Sourcing, Circuits assembly, June 2003; Interliance presentation to ESCA, July 17, 2003; Interliance presentation at China Sourcing Fair, October 9, 2003; Interview with Burns & Levinson, 10/16/03; Interview with iSuppli, October 29, 2003

RISK FACTORS

- ❑ Business ethics:
  - "You can get a prototype (from a Chinese supplier) that is good, but when it goes into production, you'll get a completely different part. Or the first 3 orders can be good, but then the manufacturer–who acts as a broker–subs the job out, and the next run is made by somebody else, who substitutes a different material. And sometimes you can't tell just by looking at it. In medical you can't take that risk." {Company Interview}
- ❑ Legal hassles:
  - 50% of Sino-Foreign relationships result in some form of dispute (Interliance, "Eight Steps to Successful Sourcing in China, 10/9/03)
- ❑ Corruption
- ❑ IP theft:
  - "We were approached by someone from Beijing who wanted us to set up a factory in China. But what happens is they get you over there, learn your business, want you to set up a facility and then copy you. It's a cheap way to build an industry." (Company Interview}
- ❑ Currency shifts
- ❑ Political instability

Myth—Impact on SMEs

If your customers love you as a supplier, your products are high quality and competitively priced, and you've had a close, productive relationship for many years, they won't move to China.

Fact

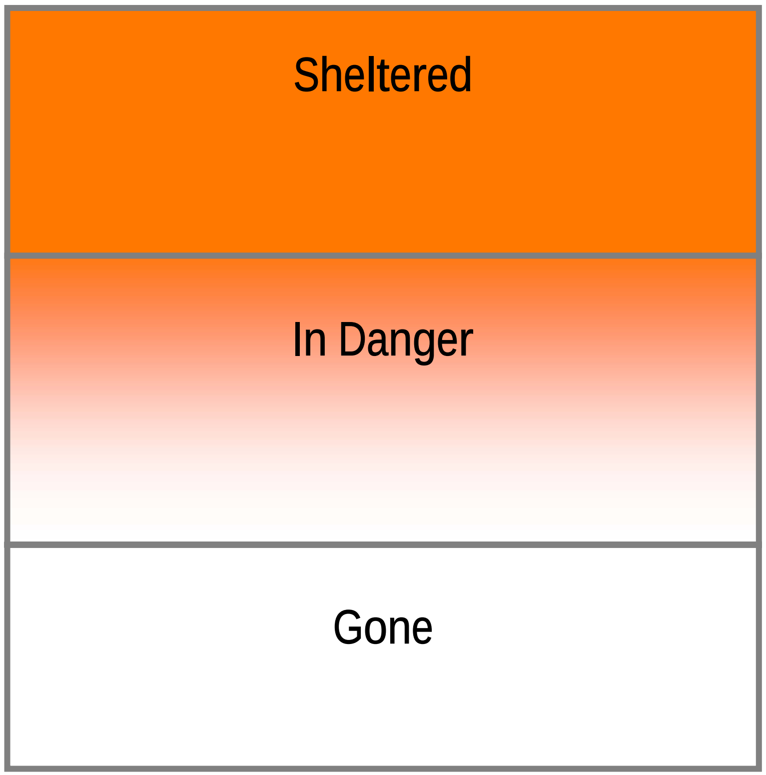
Customers can disappear without warning.

Competition From China Has Had Three Major Negative Impacts on US Small & Mid-Size Manufacturers (SMEs)

NEGATIVE IMPACTS ON US SMES
Loss of US Manufacturing Jobs & Value Added - Portion of US manufacturing has migrated to China/Offshore - Design and engineering is also migrating, particularly in electronics
Increased Competitive Pressure—Particularly on Price
Disappearance of SME Customer Base - Customers sourcing parts from China - Customers migrating operations to China (and sourcing locally) - Customers losing out to competitors based in China

➡Key Message: The major impact of competition from China (and other low-cost regions) is that your customers might disappear, without warning

SMEs Occupy Three Types of Competitive Positions vs. China in Manufacturing Businesses



- SHELTERED—Businesses or product lines with defensible competitive advantages versus China
- IN DANGER—Do not have clear basis of competitive advantage—will die a slow death unless carve out sheltered position
- GONE—Already Migrated to China or other Low Cost Region

Gone—Already Migrated To China or Other Low Cost Region

- Generally, if all the conditions below are met, the part/product is <u>Gone</u>
  - Proximity to the customer does not provide an advantage: easily shipped (e.g. not easily damaged, not bulky), long lead time is acceptable, low mix/variation, not customized
  - Easily manufactured: low complexity, low quality, high unskilled labor content
  - Higher volumes
  - Little or no engineering/design interaction necessary—commodity

- Interviewees agree that these types of products are gone
  - "[We've] already lost the high volume/low tolerance work to China… All low volume work will stay here. If it's not truckload, Chinese don't want to ship it—they're not interested in low volume parts." {Company Interview}
  - "Molding businesses are shutting down all over North America. This trend is accelerating. If it continues at the current rate, the bulk of low-end molding jobs will have moved to China within a few years." {Injection Molding Magazine, 8/03}
  - "China is going after the high volume stuff. We will do volumes of say 30k pieces per year, or 100k pieces per year. The big shops in the US might do 10k pieces per week. This is the high volume stuff the Chinese are going after." {Company Interview}

- In these products, low-cost countries like China have a cost advantage that is nearly impossible to overcome

Customers Can Disappear Without Warning

- Tooling and metalworking
  - “Our biggest customer—50% of our revenues—pulled their parts and sent it overseas and/or brought it in-house. [Was there any warning?] No. Nothing.” {Company Interview}
  - “Large [manufacturer of X] was a great customer for 50 years. Then about 6 years ago, it all went to China. Just like that.” {Company Interview}
  - “We thought we’d be immune to Offshore [competition] with these customers: Rolls Royce, Pratt & Whitney, GE. Wrong. They’re all setting up JVs in China.” {Company Interview}
  - “Just recently, 3 main customers told us they were pulling their parts and sending them to China. Because our customers were forced by their customers to set up support operations in China.” {Company Interview}
  - “My customer’s customer says you have to buy in China. My customers—the molders—don’t want to, but they have to… I’ve got guys who tell me they would pay me a 10% premium because we give them so much value. But their customers are making them buy from Offshore.” {Company Interview}

Customers Can Disappear Without Warning (continued)

- Plastics
  - "Our largest customer has moved its assembly to China. Highly automated. They are teaching the Chinese to do it." {Company Interview}
  - "Three or four years ago we had customers in office automation, computer drives. We can't do this anymore. These industries are gone." {Company Interview}
- Electronics
  - "Several major end users including Motorola, Texas Instruments and Intel have abandoned North American printed circuit manufacturers in favor of Asian suppliers." {Matthew Holzmann, 01/01/03, www.circuitree.com}

➡Survival is dependent on making sure you have a customer to serve

Myth—Successful Strategies

In order to survive and prosper, companies need to make internal improvements—Lean, automation, world-class practices

Fact

Being Lean, world-class and cost competitive is no longer enough—you need a defensible competitive advantage or shelter, based on specialty product/process capability, a service advantage based on proximity, or innovative technology

65 Successful Companies Under Pressure Employed a Combination of Nine Strategies To Survive & Grow

Primary Competitive Strategies Offer Higher Customer Value vs. Offshore; Niche Strategies (N = 65)	% of Success Stories Employing Strategy
Focus on Specialty Product or Process Capability • Product based strategies—tight tolerance; difficult to manufacture; high quality • Process based strategies—advantage based on specialized process capabilities, or skilled labor	59%
Develop Unique, Innovative Product/Process Technology	19%

Target Business Where Proximity Provides Service Advantage
• Logistics
  • Quick turn
  • High mix/variation (can't forecast demand; too expensive to hold inventory)
  • Make/customize/configure to order (domestic production reduces transport time to offset long build to order cycle)
  • JIT/kan ban, consigned inventory
  • Freight economics—too difficult to ship
  • Low volume/short runs—not of interest to the Chinese, and not worth it to set up sourcing arrangements
• Design/customer interaction
  • Intensive design/engineering interaction with the customer; frequent modifications
  • Fashion-sensitive—work closely with designers, architects, and adjust to changing seasonal fashion
  • Strong customer relationships and loyalty—personal relationships, service track record
	86%

65 Successful Companies Under Pressure Employed a Combination of Nine Strategies To Survive & Grow (continued)

Supporting Competitive Strategies Reduce Cost & Risk; Enhance Capabilities	% of Success Stories Employing Strategies
Target the Right Customers—Less Likely To Go Offshore and/or Less Price Sensitive	34%
Work To Be Cost Competitive in Manufacturing Process Through Lean, Automation, Investment • Lean • Automation • Other investment in manufacturing to reduce cost	35%
Cost Reduction Through Production in Low Cost Countries (sourcing, jv)	19%
Develop Strategic Partnerships • Complementary products • Customer and supplier partnerships	11%
Become Global Player • Worldwide presence • Worldwide production system; US focuses on design, debugging	15%
Diversify	25%

Some Strategies Are More Fundamental To Competitiveness & Survival

- All 65 companies employed at least one of the primary strategies to differentiate from low cost country competition
  - Focus on specialized products or process capabilities
  - Develop unique, innovative product or process technology (R&D-driven, patented)
  - Target business where proximity provides service advantage
    - Logistics
    - Design/engineering/customer interaction
- For only 18% of the 65 success stories did Lean seem to be a key component of their strategy and success…
  - About half of the companies (54%) were working to be cost competitive as a key part of their survival strategy, which includes Lean, automation, other investment in manufacturing to reduce costs, and offshore production (sourcing, jvs)
  - But again, none of these successful companies were relying solely on cost competitiveness as a strategy

Myth—Shelters

"Sheltered businesses" will remain viable.

Fact

Some current shelters will erode over time, as China's manufacturing capabilities increase.

The Development of China's Manufacturing Capabilities Will Cause Some Shelters To Collapse

- The development of China's manufacturing capabilities continues to pressure US manufacturers
  - Increasing "Gone" parts/products that have migrated overseas
  - Shrinking the "Sheltered" segment

- Summary of developments by driver:
  - Ease of manufacture—China's manufacturing capabilities are becoming more sophisticated
    - US and other foreign manufacturers are setting up joint ventures in China—technology transfer is explicit
    - Chinese government is working on attracting skilled Chinese émigrés back, and training skilled workers to increase manufacturing sophistication
  - Volume level—China currently focused on larger volumes, but that could change over time

The Development of China's Manufacturing Capabilities Will Cause Some Shelters To Collapse (continued)

- Summary of developments by driver (continued):
  - Proximity—Chinese tool/die/mold suppliers are offsetting shipping time with shorter lead times
  - Engineering/design interaction—even this barrier erodes over time
    - Solutions to long distance engineering interaction issues are being developed through use of the internet
    - US firms are increasingly handling new product introduction, while China handles production once the design is set
    - In the case of tool/die/mold customers, get around the engineering/change order problem by having tool/die/molds manufactured Offshore, and then modified here, as needed
    - In some cases, US manufacturers are moving R&D/engineering Offshore too

Myth—Successful Firms

If a company does a good job of serving its current customers, it will be OK.

Fact

As China's manufacturing capabilities develop (along with other low-cost regions), customers can disappear and competitive advantages can erode.

Successful companies are Adaptive: they anticipate, prepare for and adjust to disruptive market changes; they look outward and forward—beyond current customers. They focus on competitive advantage, and are able to build new advantages as the market and competitive landscape changes.

Companies Fall Along a Continuum of Adaptive Behavior

Less-Adaptive ⟷ **Highly-Adaptive**

- Don't look forward or embrace change
- Focus inward
- Respond sluggishly to market change
- Don't have adequate vision/ imagination about future market changes & potential threats

Lucky Companies

- Lucky companies are "Less-Adaptive" firms in industries under pressure that have been fortunate to find sheltered niches

➔ **Lucky companies are "OK for now," but may not have the agility to find a new sheltered position if their current competitive advantage erodes**

- Outward oriented, forward thinking, embrace change
- Able to identify and respond to a changing competitive environment
- Look ahead for new customers
- Work to build and maintain competitive advantages, and develop new competitive advantages as old ones erode (dynamic competitive advantage)

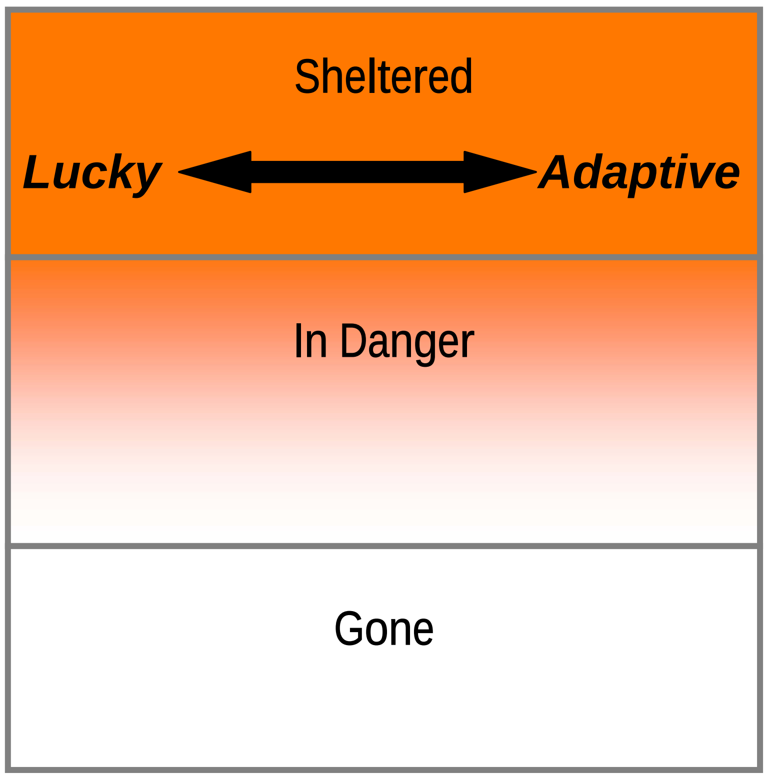
➔ **Adaptive companies have the greatest chance of continued success, because they can prepare for and adjust to changes in the competitive and market environments**

Note: Adaptiveness encompasses both a world view and a set of behaviors. Companies can exhibit some adaptive characteristics, but lack others.

Adaptive Firms Have the Best Chance of Maintaining a Sheltered Position

- SHELTERED—Defensible competitive advantage versus China/Low Cost Regions

- *Lucky*—Protected today, but need to develop agility for continued survival and growth



- *Adaptive*—Best positioned to survive and grow

- IN DANGER—Do not have clear basis of competitive advantage—will die a slow death unless carve out sheltered position

Attitude & Behavior of Adaptive Companies

- Adaptive companies EXPECT CHANGE
- Because they expect change, adaptive companies LOOK OUTWARD to assess the world around them
  - To current customers
  - To external trends
- Because they expect change, they maintain a DIVERSIFIED CUSTOMER BASE
- Because they are assessing changes to their environment, adaptive companies are CONSTANTLY EVOLVING

Adaptive Companies Are Constantly Evolving

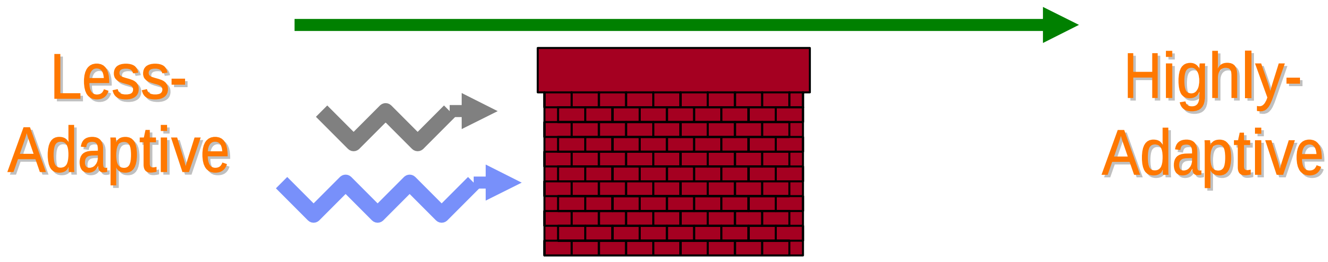
- Aggressively develop new products to better meet customer needs
  - Newly developed products/markets are the hope for the future
- Shift to customers that offer better opportunities
- Shift to new markets that offer better opportunities
  - Look for new market opportunities even when times are good
- Aggressively sell and market
- Understand and shift competitive advantages
  - In order to make adjustments to the world around them, adaptive companies must understand what they have to offer: why customers buy from them
    - i.e., adaptive companies understand their competitive advantage
    - Only with this understanding of competitive advantage can companies effectively pursue new products, customers, and markets
  - Adaptive companies also shift competitive advantages:
    - Make changes to maintain competitive advantages
    - Create new advantages as old ones disappear

It's Not Easy To Be Adaptive, and the CEO Drives Adaptive Behavior

- Adaptive companies have owners/CEOs who drive adaptability
  - Significant energy is required to do more than what is necessary for survival
- Making investments and changes before they are necessary requires the belief that "the risk of doing nothing is greater than the risk of acting."

  -- *Fish*, by Lundin, et al
  - Adaptive companies make investments in the future, ahead of the pack, to support/maintain or shift competitive advantage
  - Adaptive companies find ways to invest, while non-adaptive companies are unwilling to take risks
- CEOs carve out time for forward-looking activities
- Persevering through difficulties in instituting change requires energy and confidence
- CEOs cultivate an environment where employees embrace change & look for new opportunities

Barriers To Adaptiveness & Potential Services To Help Companies Become More Adaptive



Barriers (mainly related to the CEO)

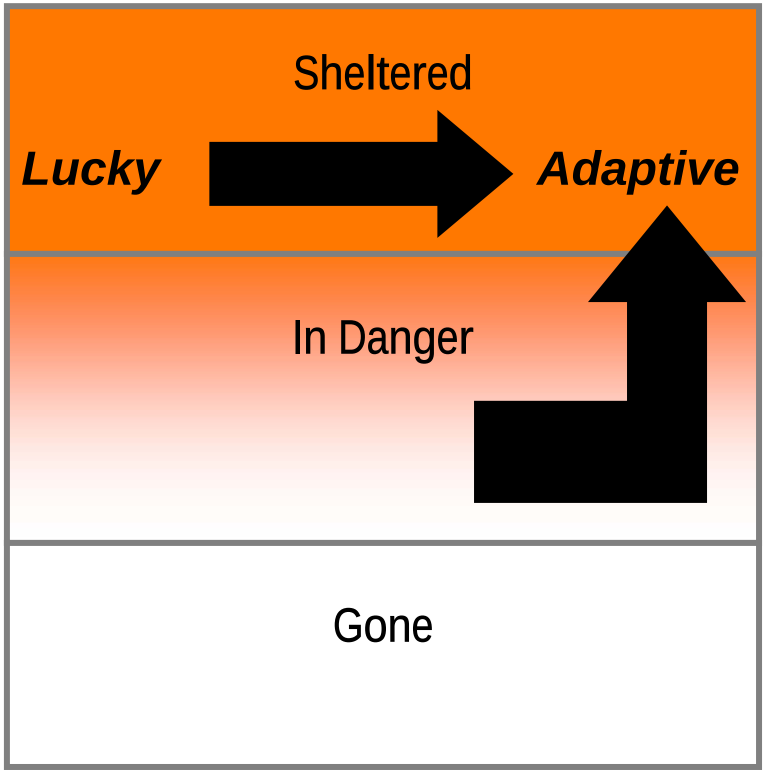
-Failure of imagination/vision
-Doesn't think about competitive advantage
-Lack of energy/spark, near retirement
-Lack of sales & marketing investment and effort (a secondary barrier that holds back the company, but may originate from the CEO's lack of vision or willingness to invest)

Service Needs (to eliminate barriers)

-Strategy assistance
-Coaching—strategy & execution
-Imagine disaster (workshop or coaching)
-Sales & marketing assistance

MEP's Goal Should Be To Develop Adaptive Companies That Have Competitive Advantages (Sheltered) vs. Chinese

- *Lucky*—Protected today, but need to develop agility for continued survival and growth
- IN DANGER—Do not have clear basis of competitive advantage—will die a slow death unless carve out sheltered position

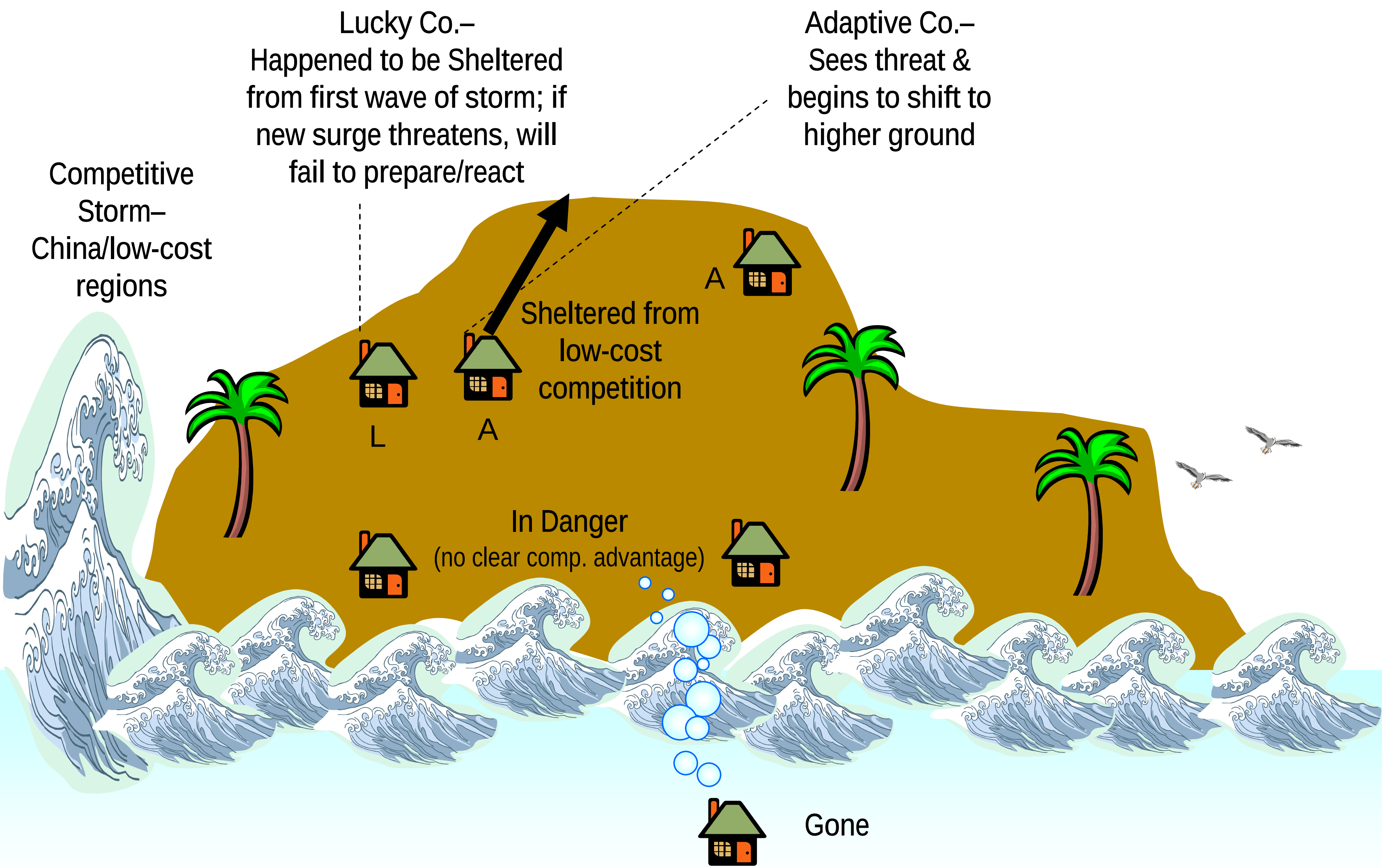


- *Adaptive*—Best positioned to survive and grow
- SHELTERED—Successful companies employed a combination of nine strategies to achieve comp. advantage:
  - Focus on specialized products or process capabilities
  - Target business where proximity to the customer provides service advantage
    - Logistics
    - Design/engineering/customer interaction
  - Develop unique, innovative technology (R&D, exports)
  - Target the right customers that are less likely to go offshore, less price sensitive
  - Work to be cost competitive in manufacturing through Lean, automation
  - Production in low-cost regions
  - Develop strategic partnerships
  - Become a global player
  - Diversify customers/markets

Adaptive Companies Have the Capability To Build New Competitive Advantages

- MEP/360vu will have the greatest impact on US manufacturing by developing Adaptive companies
  - Outward-oriented and forward-looking
    - Look ahead for market changes, emerging needs, new applications and opportunities
    - Continuously revise market strategy as competitive landscape changes shifts
  - Adaptive companies are capable of finding new competitive advantages and shelters as the market landscape changes
    - Identify and develop competitive advantages based on specialized products/capabilities, innovative technology, service advantages, etc.
    - And build business model around these advantages—make investments in R&D, product development, equipment and capabilities to support strategies
    - Find new shelters as China and other Offshore competitors attack previously sheltered businesses, such as lower volume, close tolerance work, etc.
- A cadre of Adaptive companies and leaders is critical to the competitiveness of US manufacturing
  - Adaptive leadership is best positioned to maintain competitive position

Adaptive Companies Are Able To Find New Competitive Advantages As Old Shelters Erode



MEP/360vu Should Help Companies Focus Outward On Market Changes Before Internal Improvements

- MEP/360vu services must focus outward/externally toward the market and competition
  - MEP has traditionally focused inward (Lean processes, quality, process improvement, etc.)
  - MEP's focus must shift outward, since even a "good supplier" may not survive if it has no strategic competitive advantage in the market
    - "("Lean; state-of-the-art facility;" "build up of infrastructure"; and "educated, informed, committed team") are all important components to the foundation of success. However, all of these efforts would be meaningless without the connection to the customer. We had to make a plan to utilize these assets in a way that would meet the demands of the customer, as well as challenges of a fiercely competitive landscape… Technical expertise and innovation are not the most important things anymore. Market position and selling are key." {Company Interview}

MEP/360vu Should Help Companies Focus Outward On Market Changes Before Internal Improvements (continued)

- Findings validate PBA model as the primary vehicle for coaching and mentoring CEOs to become Adaptive on an ongoing, continuous basis
  - Management must be evaluating and revising plans on an ongoing basis
  - Periodic strategic planning sessions/efforts are no longer sufficient
  - PBAs are an ideal vehicle for this continuous planning
  - Executive roundtables are another potential mechanism to encourage Adaptive thinking

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Project Objectives and Approach

Project Objectives

- Define the competitive threat to US Small and Mid-Sized Manufacturers (SMEs) posed by China's emergence as
  - A global manufacturing center
  - The most potent low-cost country competitor
- Understand the impact of Chinese competition on US SMEs
- Identify successful competitive strategies that allow SMEs to survive and grow, despite competition from China/low-cost regions
- Produce actionable results than can be used by 360vu/MEP to:
  - Explain the basis of Chinese competitive advantages to client firms
  - Provide guidance to PBAs about how to help clients survive low-cost competition:
    - Provide "content" that can be used by PBAs in talking with their clients about strategic options
  - Help 360vu determine what services are required to help companies be globally competitive vs. China
  - Help 360vu determine marketing messages that will resonate with companies under pressure from China and other low-cost countries

Approach

- Phase 1 Research
  - Conducted general secondary research on China and its emergence as a global manufacturing center
  - Selected 5 industries, that are under pressure from China, to be the focus of secondary research and interviews:
    - Metal Fabrication
    - Tool & Dies, Molds
    - Plastic Products
    - Furniture
    - Electronics

Approach (continued)

- Phase 1 Research (continued)
  - Conducted interviews with 39 “successful companies” (within 5 selected industries) to understand how/why they survive and grow despite China/low-cost region competition:
    - Companies were identified through a variety of mechanisms:
      - Published articles on successful companies
      - Referrals from Centers, the Performance Benchmarking Service and other interviewees
    - The criteria for selection were informal, but generally based on:
      - Revenue and employment growth
      - “Reputation” for being a successful or leading firm in the industry
      - Indications that the firm has made significant productivity improvements, or other dramatic improvements in performance (in some cases “turning the corner” after a difficult period during the downturn)
      - When available, information on performance in terms of profitability or cash flow
    - Interview conducted with CEO/Owner or another member of top management
  - Conducted 7 additional interviews with:
    - Industry analysts/experts (5).
    - Firms that assist other companies to do business in China (2).
  - Phase 1 interviews conducted mainly during October, 2003

Approach (continued)

- Phase 2 Research
  - Conducted interviews with 64 companies in the 360vu Market Research Panel
  - Questions focused on:
    - Competition with China/low cost countries
    - Adaptive attitudes and behaviors
  - Panel membership includes"progressive" 360vu/MEP repeat clients from small and mid-sized manufacturing companies in a variety of different industries.
  - Interview conducted with CEO/Owner or another member of top management
  - Phase 2 interviews conducted during December 2003 and January 2004
- Conclusions regarding effective strategies against China/low-cost country competition were based on a subset of 65 "successful" companies selected from both Phase 1 and Phase 2
  - Criteria for selection of "successful" companies were the same used in Phase 1
- Conclusions regarding adaptive behavior of companies were based on all of the 100+ interviews

MANUFACTURING
EXTENSION
PARTNERSHIP™

The China Juggernaut—Migration of Manufacturing To China

Myth—China Juggernaut

China’s competitive advantage is based on low wages and an undervalued currency—it’s overwhelming, and US small manufacturers can’t compete against it.

Fact

It’s not that simple. There are more than just two factors, and the cost differential varies. In some cases, when China’s advantages are all in alignment, the cost advantage is large. In other cases, US companies can be “within range.” Also, production is not migrating to China only to pursue low costs, but also to follow OEM/ manufacturing customers, or to access the domestic Chinese market.

The China Juggernaut—Migration of Manufacturing To China

- "…even successful multinational corporations… tell us that unless things change, it is only a matter of time before they have to move production to China. The same story is heard from firms in Japan, Europe, and many developing countries…"
  - Washington Times, "Made in China", May 20, 2003

- "On the commercial product side of manufacturing there has been a dramatic trend to globalization. There has also been unrelenting pressure from the financial community to return quarterly profits to the shareholders. As a result, transnational companies, including all the US primes, have been sending more and more manufacturing production Offshore… It was recently estimated that 60% of all transnational companies have already moved large quantities of their manufacturing to Asia."
  - NTMA testimony -House Committee on Small Business: "Saving the Defense Industrial Base"; 06/09/2003

The China Juggernaut—Migration of Manufacturing To China (continued)

- In the auto business, even if a domestic supplier manages to match China prices, the effort may be futile… With the consolidation of the OEMs in China, it's more than an issue of low prices... but [also] being able to coordinate JIT component deliveries & working in concert with other factories—your suppliers & their suppliers [who are in China, too]… The ongoing consolidation of US manufacturers in China will be 'the mother of all sucking sounds' and [will] mean the loss of nearly 1mm American jobs by 2010…

  - Kiplinger Business forecasts; 07/11/2003; China Pressures Build For Industrial Suppliers In the US

There Are Three Major Drivers of Migration of US Production To China

I. China's Cost Advantage

II. US OEMs' Pursuit of Large & Growing Chinese Domestic Market

III. Domino Effect—US Suppliers Follow Customers to China

I. China's Cost Advantage

- China's Cost Advantage can be very large—as much as 50-75% on part price basis

TOOL & DIE	PLASTICS
• "Chinese prices are frequently 50% of what US counterparts charge, and in some instances are <=75%, depending on the type and class of die or mold, according to Chinese TDM industry sources." {US ITC, "Tools, Dies & Industrial Molds: Competitive Conditions in the US and Selected Foreign Markets," October, 2002} • "Are customers concerned about sending (plastic injection) molds to China? Yes, but they'll get over it. Chinese molds come in at 25% of what we could do them for, (and at half the shipping time)." {Company Interview} • (Small moldmaker) has submitted bids for $50,000 to make elaborate plastics molds for the optical industry. The bids from his Chinese rivals: as low as $5,000. {boston.com "The Rise of China, Inc.", 8/19/03}	• "One of my top customers recently got bids from a Chinese producer that were 26% less than what I was selling the product for. That's 26% delivered, after shipment all the way from China." {Falcon Plastics congressional testimony, "How Trade with China Affects American Manufacturing" 5/22/03}

I. China's Cost Advantage (continued)

- China's Cost Advantage can be very large—as much as 50-75% on part price basis (continued)

FURNITURE	ELECTRONICS
• "China is undercutting US manufacturers' prices (of wood case-goods furniture) 20-40% in the retail sector. " {News & Record, 3/1/03} • "What we're finding is that the $15,000 bedroom set is now overpriced if it's made in this country. Now we have $6,000 to $7,000 (Chinese) sets made exactly the same way." {Furniture store owner, in HFN, "Shanghai surprise…", 11/25/02} • "The Chinese can do non-custom cabinets. I think they could produce at one-quarter of our cost. Add in shipping, tariffs, etc., and it's probably one-half " {Company Interview}	• Electronics company has a contract manufacturer in China for 20-30% of their production, which is 50-75% cheaper than US (material, labor, burden) {Company Interview} • Company's Asian suppliers in China and Taiwan have 30-50% cost differential vs. their US plants {Company Interview}

US OEMs Are Driving Suppliers To Manufacture in China & Other Low Cost Regions

- Auto Industry
  - According to an article in the March 17 edition of Automotive News, Tier 1 suppliers are getting the word from GM: Look for low-cost parts from S. Korea & China. Suppliers say GM's purchasing staff raises the issue when new work is discussed. In GM's jargon, suppliers are asked if they are moving business to Tier 2 & Tier 3 companies in "low-cost countries." "Low-cost countries are a huge issue," says one supplier executive, who asked not to be identified. "They're always telling us to move our stuff Offshore. They won't say we have to do this, but they'll ask what we're doing about it." GM officials say they are not mandating Offshore sourcing but are pressuring suppliers to get the lowest possible costs from their suppliers. {Tooling & Mfg Association–News Bulletins 04/18/2003; "Automotive Tier 1's Told to Look Overseas }
  - "Ford also is prodding its existing parts makers to move production to China." {The Asian Wall Street Journal: "US Car Makers' Rough Road in China—Push for Cheaper Parts Raises New Worries Over Quality Control and Need to Modernize Factories"; 06/20/2003}

US OEMs Are Driving Suppliers To Manufacture in China & Other Low Cost Regions (continued)

- Tool & Die, Molds
  - "Publicized cost savings in tooling and high-volume die casting production appear so attractive… some US company top executives are virtually mandating that a certain percentage of purchases be directed Offshore. [Despite purchasing agents' protest]." {"Offshore Sourcing: The hidden costs"; Die Casting Development Council}
  - "Many of our customers now have a metric they're applying to us, and to other vendors… They want to see 65-85% (of content) produced in low-cost countries—primarily Asia, with some in Eastern Europe." Doug Barnes, VP of Mfg for Planar Systems which is a vendor of flat panel LCDs {The Business Journal of Portland, May 26 '03}

US OEMs Are Driving Suppliers To Manufacture in China & Other Low Cost Regions (continued)

- **Molds for Injection Molding**
  - "My customer's customer says you have to buy in China. My customers—the [injection] molders—don't want to, but they have to… I've got guys who tell me they would pay me a 10% premium, because we give them so much value. But, their customers are making them buy from Offshore. I can't compete with a 30-40% (initial) price difference… Let me tell you this story: I just went to [a trade show] in Anaheim… 7 out of 10 people who stopped at the booth asked "Do you produce your molds overseas?" Now, it used to be that that would be an insult, no one would even ask that question. But, now, when I said, "no" they just walked away, automatically assuming I couldn't compete. They wouldn't hear any of the spiel, nothing. If it wasn't made in China, they wouldn't look. I've got customers who say to me that I could sell my molds if I just said that I built it in China. I'm a third generation molder. That's humiliating. Just because I make my molds here (potential) customers won't buy from me. {Company Interview}
  - "If we don't quote overseas prices (for plastics injection molds) we don't get the job. Customers demand to see both US and China prices. We bought $800K of molds for a customer this month. Going to China resulted in a $300K savings for them." {Company Interview}
- **Electronics**
  - "Some buyers are given mandates—must have x% in low-cost countries by a certain date" {Company Interview}

There Are Seven Major Drivers of China's Cost Advantage

- These drivers vary greatly depending on the industry and the specific Chinese competitor

DRIVERS OF CHINA'S COST ADVANTAGE
Lower Labor Rates
Lower Cost Materials/Components (in some cases)
Undervalued Currency
Government Incentives & Less Regulation • Preferential tax treatment (based on the Chinese government's commitment to grow manufacturing, particularly for export) • Less regulation of environment and health/safety
Capital Not Paid Back/Forgiven Loans
Tendency Within China To Oversupply • Thereby increasing competition and driving prices down (resulting from lack of usual economic penalties for oversupply—capital not paid back, overextended banking system)
Lack of Intellectual Property (IP) Protection • Reduces R&D, licensing and other costs related to IP development

China's Cost Advantage—Low Labor Rates

ESTIMATED MANUFACTURING WAGE RATE COMPARISON	
Country	$US Per Hour (all inclusive)
Bulgaria	$0.60
China	$0.70
Mexico	$1.80
Brazil	$4.50
Taiwan	$5.00
Hong Kong	$5.60
Singapore	$7.60
United Kingdom	$16.00
United States	$19.10
Germany	$28.80

Source: Deutsche Bank Securities Cited in Interliance LLC presentation, "Why China?", Electronics Supply Chain Association (ESCA) July Discussion Group, July 17, 2003

China's Cost Advantage—Low Labor Rates (continued)

- Labor rates in industries selected for analysis
  - Tool & Die/Molds
    - "In China, toolmakers are the highest paid profession in manufacturing. However, Chinese toolmakers' wages reportedly are among the lowest in the world." Annual wages range from a low of $585 for unskilled entry-level worker to $2927-$10,248 for TDM designer to TDM manager. {US ITC, "Tools, Dies & Industrial Molds"}
    - "One of our customers told me that a top mold-maker in China makes around $2.25/hr. with others making as little as $.50/hr. Our top rate guys make $18/hr. which is low compared to shops in big cities." {XCEL Mold and Machine testimony to Subcommittee on Commerce, Justice, State, the Judiciary and Related Agencies; Hearing on: The Effects of Chinese Imports on US Companies; May 22, 2003}
  - Furniture
    - Labor rates in Chinese furniture factories are $0.50-$0.75 per hour. Labor rates in the US are $15 per hour. {"The Furniture Industry [Case-goods]", Report of Univ. of North Carolina, 3/7/03}

China's Cost Advantage—Lower Cost Materials/ Components

- Quantifying China's material cost advantage is a complex issue, since the raw materials used by each industry and manufacturer are different
  - Even for two similar businesses, differences in raw materials specifications can result in very different material cost levels

- Electronics
  - *PCB Assembly services by a contract manufacturer*: "In rough terms, 75% of the price is material cost. You get a significant cost savings on fabricated parts (e.g. plastics, bent metal) purchased in China due to the labor, but that only adds up to a 3-5% advantage on overall material cost." {Interview with Technology Forecasters, 10/21/03}

China's Cost Advantage—Lower Cost Materials/ Components (continued)

- Tool & Die (From US ITC report, "Tools, Dies and Industrial Molds")
  - Chinese steel "may cost significantly less" but, TDMs often have a material specification requiring "high quality tool and mold steels," "which are available at "world wide, transparent prices."
  - On the other hand, it also acknowledges that "regional differences do exist for material costs, reflecting local market conditions, trade barriers/protection, and transportation costs," and that the "corporate structure of typical tooling manufacturers in different countries may contribute to differences in raw material costs," giving nations such as China an advantage over the US because it has "on average, larger firms."
  - It concludes that, "with the exception of China, the countries examined for this report all have well established market economies, indicating that material cost differentials are likely to be minimal. However, the situation is less clear with respect to China, where the extent of alleged market manipulation and possible government intervention is unknown."

China's Cost Advantage—Currency Valuation

- China's undervalued currency is often argued as being a major contributor to China's cost advantage…
- …however not everyone agrees on how to quantify it
  - "The NAM has seen estimates from investment banks and the Manufacturers' Alliance that China's currency is anywhere from 15–50% undervalued."
    - {Falcon Plastics-On Behalf of NAM at Congressional Committee on Small Business; On The Impact of Chinese Currency Manipulation on Small Manufacturers and Exporters; 06/25/2003}
  - "China's currency may indeed be undervalued. Morris Goldstein of the Institute for International Economics, a Washington think tank, figures China's currency is undervalued by about 15%-25%. That's not insignificant, but it's well below the 40% figure China's critics bandy about ."
    - {Business Week ONLINE ASIA October 6, 2003; "China Is Getting a Bad Trade-Gap Rap"}
  - "Economists, meanwhile, estimate the Renminbi could appreciate by at least 10%-20% if the peg were abolished."
    - {"China's Big Exports: Appliances, Deflation", Financial Times, 12 Feb 2003}

China's Cost Advantage—Currency Valuation (continued)

- Some are unsure that Yuan Renminbi is undervalued at all
  - IMF: "All these [factors] together... it's difficult to find a persuasive [case] that the Renminbi is substantially undervalued."
    - {Business–Reuters; October 12, 2003; Hard to Argue Yuan Is Undervalued–IMF}

China's Cost Advantage—Government Incentives & Less Regulation

- "China has pursued industrial policies that have catalyzed its growth as a manufacturing powerhouse"
  - …particularly in increasingly higher-technology production. The Chinese Government has designated a number of "pillar industries," particularly in the high-tech area, for which it provides preferential benefits for domestic development and foreign investment.
  - Manufacturers in China are supported through a wide range of national industrial policies, which include: tariffs; limitations on foreign firms' access to domestic marketing channels; requirements for technology transfer by foreign investors; government selection of partners for major international joint ventures; preferential loans from state banks; privileged access to listings on national and international stock markets; tax relief; privileged access to land; and direct support for R&D from the government budget.
    - US-China Economic and Security Review Commission Report, as submitted to the House of Representatives' Ways and Means Committee: 10/30/2003

China's Cost Advantage—Government Incentives & Less Regulation (continued)

- China has established "Special Economic Zones," designed to promote exports and attract foreign investment, and restructure/upgrade industries."
  - These zones have the authority to provide:
    - Access to cheaper labor and land
    - A maximum 15% rate of income tax, compared to the standard 33% rate for foreign investment in non-open areas
    - Even lower taxes for export oriented high-tech projects with investments of more than $5mm
    - Exemption of income tax on foreign-invested enterprises for the first two profit-making years
    - Exemptions from import duties for production inputs and income tax on reinvested profits
      - {China's Electronics Industry, 2003, editors Michael Pecht and YC Chan}

China's Cost Advantage—Government Incentives & Less Regulation (continued)

- Tool & Die industry
  - "In 1997, China Light Industry (Yuyao) Mold City was established to be a large industrial area for mold design, manufacturing, training and other activities related to industrial molds. The project was budgeted with RMB 1 billion ($115 million)… More than 115 companies for mold production moved into Mold City and 45 mold materials distributors… During the 10th Five-Year Plan period, city authorities plan to develop more land and invite a further 200 companies to locate there. The Yuyao Municipal People's Government provides a number of incentives including exemption of income tax… and preferential treatment on payment of the city's facility building fee and land rental fee." {US ITC, "Tools, Dies and Industrial Molds"}
- Electronics
  - "China is luring outside investment with incentives like subsidized loans, tax exemptions, and a 50% discount on land" {China's Electronics Industry, 2003, editors Michael Pecht and YC Chan}
- Regulation
  - Many factories in China ignore health and safety and labor laws, and government officials enforce these rules "haphazardly." {Wall Street Journal, "Behind China's Export Boom, Heated Battle Among Factories"; 11/13/03}

China's Cost Advantage—Capital Not Paid Back/ Forgiven Loans

- Chinese companies are reputed to receive loans that are not paid back, as well as free equipment
  - "The Chinese government—which is communist—is giving machine tools that were in government run businesses, to private companies. Free, probably, who knows? So, their prices are cheap, because they didn't pay for tooling." {Company Interview}
  - "We've entered a partnership with a manufacturer (of outdoor furniture) in Guangdong. They started as a Taiwanese company. They were given an attractive lease on an existing factory to move to the mainland. Now for their new factory they've been given property, tax support, and more government support they don't tell us about." {Company Interview}
  - One interviewee with extensive experience in China reported that former state owned companies were spun out on very favorable terms—different than regular commercial companies. The government might sell owners/employees the assets for $1.00, and provide working capital, which does not have to be paid back. COGS has nothing to do with real value or financials. The government does this because they need to provide employment for the large population. {Company Interview}

China's Cost Advantage—Tendency Within China To Oversupply

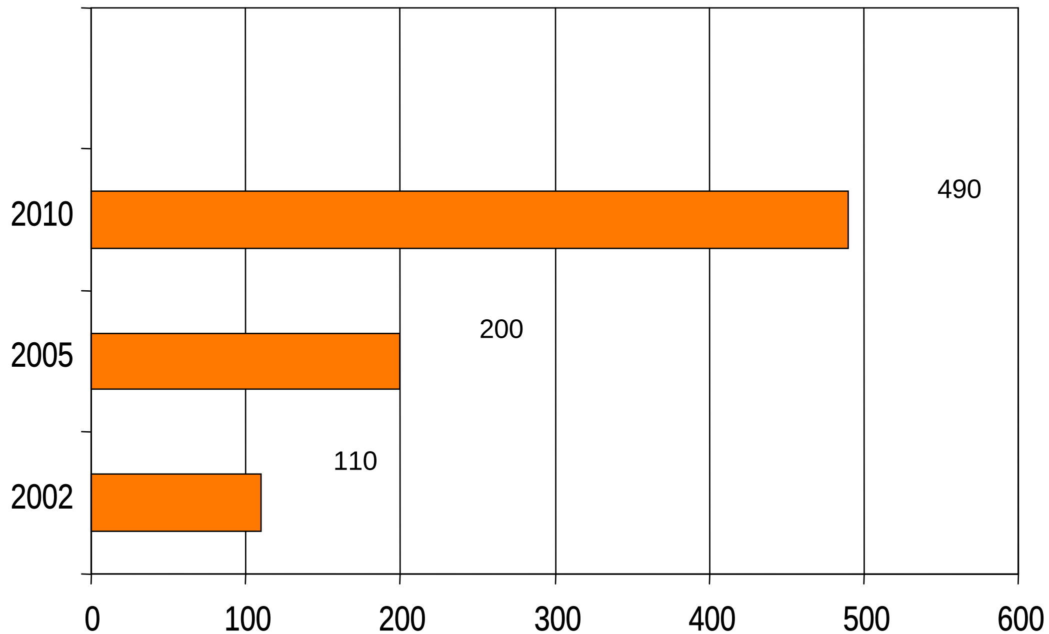
- There is a tendency within China to oversupply, thereby increasing competition and driving prices down
  - "For reasons that are peculiar to China's half-reformed economy, domestic companies often continue to boost production in an effort to expand market share long after their profit margins have receded. Even when domestic demand is satisfied 10x over and goods are stacked to the ceiling, production lines run at full tilt…
    - "86% of manufactured products are in oversupply, according to the People's Bank of China, the central bank… Result: Intense price competition and Chinese companies must look to exports to alleviate their problem…"
    - "How were these companies able to secure the financing to expand into oversupplied markets in the first place? Prevalent culture in China's half-reformed state banks—they rarely conduct research on market conditions, nor do they perform techniques such as cash-flow analysis. Instead, they lend mainly on the basis of collateral: if a company is big, it is considered creditworthy. This attitude reinforces a desire among Chinese companies to expand market share at all costs. In a typical market economy, oversupply corrects itself: a glut leads to price competition, which leads to diminished profits, which eventually puts the least efficient producer out of business, thereby restoring the balance between supply and demand. But China is not yet a full-market economy."
    - "China does not have an effective bankruptcy law… There are few bankruptcies because Beijing's ruling Communist party remains sworn to maintain social stability and is acutely sensitive to the threat of industrial unrest."
    - {Financial Times, "China's Big Exports: Appliances, Deflation", 12 Feb 2003}

China's Cost Advantage—Lack of Intellectual Property (IP) Protection

- Lack of IP protection reduces costs required for some Chinese companies to acquire technologies, new products and experience
  - "We were approached by someone from Beijing who wanted us to set up a factory in China. But what happens is they get you over there, learn your business, want you to set up a facility and then copy you. It's a cheap way to build an industry." (Company Interview}

II. US OEMs' Pursuit of Large & Growing Chinese Domestic Market (or Promise of Future Market)

Chinese Middle Class Estimated to Quadruple by 2010



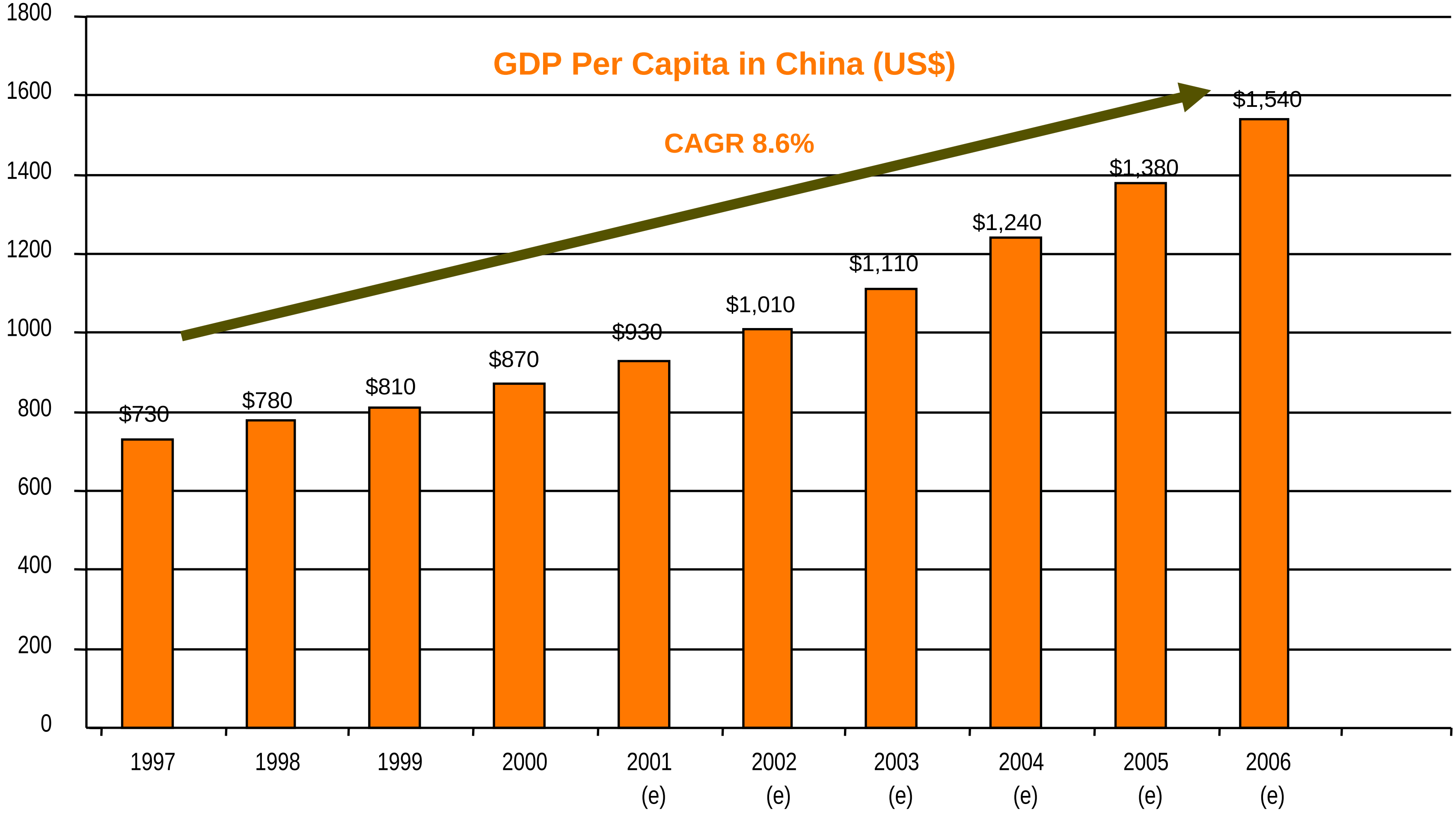
China 2002:

- Population 1.3 billion
- GDP $1.2 trillion,
- GDP growth rate 7.3%

Note: Middle Class definitions vary and China will not recognize the term "Middle Class" in official documents. The above estimates are based on a definition of generally having annual income of at least US$10,000, being able to purchase an apartment and take leisurely vacations annually.

Source: State Information Center; Chinese Academy of Social Sciences; Morgan Stanley cited in Presentation by Gloria Kamph, CEO of Interliance, entitled "Why China?", Electronics Supply Chain Association (ESCA) July Discussion Group, July 17, 2003

Per Capita Income Rising Dramatically



Source: National Bureau of Statistics cited in Interliance presentation

Examples of Growth in China's Domestic Market

- Examples of growth in China's domestic market
  - "Boeing's current market outlook for the PRC forecasts a requirement for nearly 2,400 new jets worth $197B during the next 20 yrs." (1,960 new planes to serve domestic markets; 440 for international; commercial jets will increase by a factor of 4; 87% will be regional jets & single-aisle planes; 560 will be intermediate-size, twin-aisle planes.) "By 2022… China's fleet [will be] the largest outside of the US. The need for new planes in China comes from an expected 7.1% annual increase in air travel in China from 2003 to 2022, compared to the world average of 5.1%." {"Boeing: World Commercial Fleet Doubling within Two Decades,"' 2003-09-16, Puget Sound Business Journal}
  - "China's vehicle market forecast is roughly 4 million units [in 2003], and 8-10 million units in the next 5-7 years. " {China Daily: "Mitsubishi Eyes Stake in Auto JV," 09/02/2003; "Kia Motors to Set up Plant in China," 08/11/2003}
  - The Yankee Group, Boston, estimates the number of cell phone subscribers in China will grow from about 172mm this year to 210mm next year. {7/14/03, Electronic Business News, "China's Domestic Cell Phone Makers Gather Momentum"}

III. Domino Effect—US Suppliers Follow Customers To China

- Metal Fabrication
  - "As end-items are increasingly being made in China, we lose domestic production of our components, e.g. one customer now makes 25-35% of its products overseas, which are coming in fully manufactured, and another customer moved their work overseas, so now 13 products which were manufactured in our US plant will now have to be moved overseas." {Company Interview}
- Furniture
  - "As furniture factories have moved to China, their suppliers and related businesses have followed, making the country an exceptionally efficient place to operate. Akzo Nobel, a Dutch-Swedish conglomerate that is one of the largest suppliers of furniture finishes, has closed plants in the US and Europe and is opening three factories in China. 'We can't expand fast enough' says the managing director, who predicts 90% of US furniture production would move to China in five years." {L.A. Times, "China Polishes Off Rivals", 10/21/02}
- Electronics
  - Interviewer: "When the big companies move production out of the United States, their supply chains have to follow… " Respondent: "They either go or they lose the business." {Interview with National Electronics Manufacturing Initiative CEO Jim McElroy in Manufacturing & Technology News, June 3, 2003}

Local Content Requirements & Offsets Reinforce the Need To Have a Chinese Presence To Serve Customers

- Local Content Requirements
  - "Satisfying requirements for local content can be difficult and cumbersome." {iSuppli presentation to Electronics Supply Chain Association October Discussion Group, October 15, 2002}
  - "Chinese authorities prefer investment proposals that promote exports to earn foreign exchange, introduce advanced technology, and provide technical or managerial training. Other proposal evaluation criteria include the fairness of the contract and <u>percentage of local content</u>…" {China's Electronics Industry 2003, editors Michael Pecht and YC Chan}
- Offsets
  - (re. 7E7) ...Boeing will probably require Tier 1 suppliers to source some of their parts from countries that are buying Boeing aircraft, a practice known as offset. One of the big question marks at this time, is how much of that work will go to China, a big potential market for Boeing. "I'm sure a lot of work is going to be done in China. Right now it looks like most will be Tier 2... " Boeing hasn't yet ruled out a Chinese Tier 1 supplier if the costs pencil out. "The cost to build this plane is a really important thing we're going to focus on. People are looking at where we can get a good value, and China is good at that." {"Technology is Driver in Design of New Aircraft, 2003-09-01, Triangle Business Journal}

Myth—Economics of Manufacturing in China

Manufacturing is migrating to China because it is economic to do so.

Fact

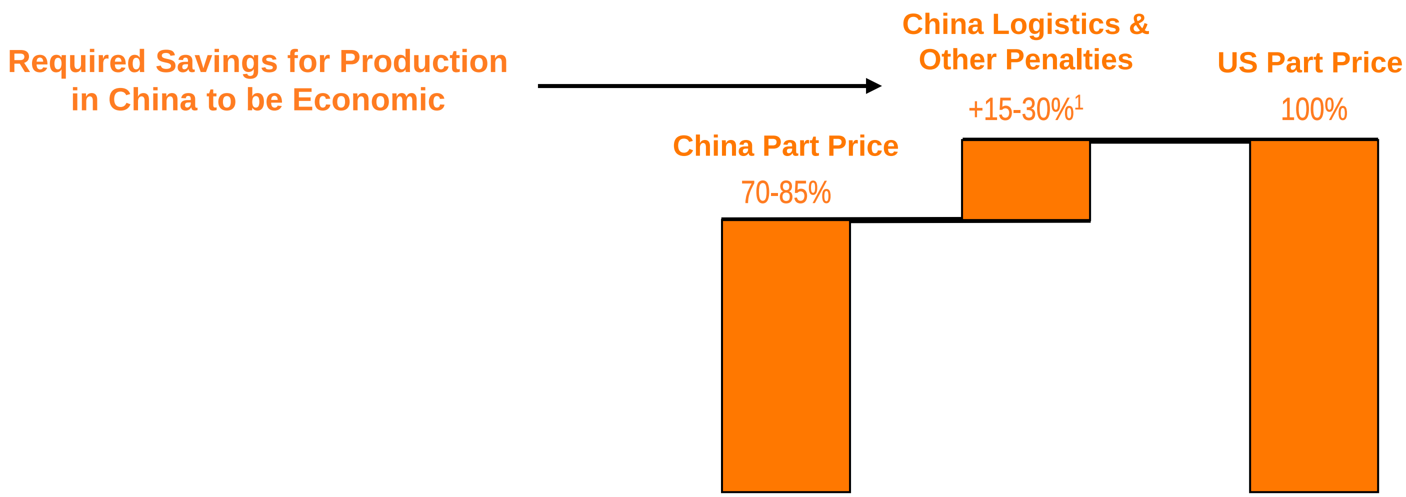
Not always. There is a herd mentality in effect. When all of the hidden costs and risks are factored in, China does not always look favorable.

It depends, in part, on "what you count" in the analysis, and the answer may change since some of China's advantages may not be sustainable (currency, government incentives, capital not paid back).

SMEs need to "educate" customers on the true cost of ownership of sourcing in China and other low-cost regions.

Analysts Indicate That Production in China is Not Always Economic, After Logistics & Hidden Costs Are Added

- Production in China is not always economic
  - In some cases, the cost savings from China is too large to overcome.
  - But in others, once logistics and other “hidden” costs are factored in, China does not look so favorable.
  - It also depends on “what you count” in the analysis.
    - And whether price comparisons are done on the same material specifications
- Analysts in various industries indicate part price savings in China must be roughly 15-30% in order to offset these logistics and hidden costs



1. Summarized by Stone & Associates based on the following sources: Presentation by Gloria Kamph of Interliance, “Eight Steps to Successful Sourcing in China,” China Sourcing Fair, October 9, 2003; Gary Larson, VP of Sales and Business development for Electronic Systems Inc, quoted in Circuits Assembly, June 2003; “Offshore Sourcing: The hidden costs”; Die Casting Development Council; US International Trade Commission, “Tools, Dies and Industrial Molds: Competitive Conditions in the United and Selected Foreign Markets, October, 2002

Production in China is Not Always Economic

- Generalization across industries about cost savings from sourcing in China
  - The assumed savings from sourcing in China might be 40%—based on lower labor and material costs and other factors. The actual realistic savings is closer to 10-20% after hidden/other costs are considered: tariff, tax & duty, transport, inventory carry cost, supply risk, quality, delivery time.
    - {Source: Interliance presentation to Electronic Supply Chain Association, October 9, 2003, "Eight Steps to Successful Sourcing in China"}
- Generalizations about setting up production in China, across industries
  - "Highly automated operations–lights out–may not save money. (These operations) are already optimized, not enough human content…It is also expensive to bring in high-priced automated machinery–the government may require that you post a bond (put money in the bank) to ensure that machinery does not end up being sold on black market."
    - {Source: Interview with Chinafacturing, 10/29/03}

Note: It may, in some cases, be possible to save money by migrating a highly automated operation to China, if it is possible to substitute additional labor for capital/automation. In other words, it may be more economic to de-automate and "throw additional labor" into the manufacturing process, taking advantage of China's low labor rates.

Production in China is Not Always Economic (continued)

- Electronics contract manufacturing/PCB assembly
  - "Sometimes it makes sense to go to China, sometimes it doesn't—it's not always a rational decision…The primary cost advantages are labor and material cost. Material cost is about 75% of the price. There is a significant advantage in fabricated parts (e.g. plastics, bent metal) because of the labor, but that only adds up to a 3-5% savings on overall material cost. (Value added) is the remaining 25% (including profit)." Labor and overhead totals about 15%. Labor (excluding benefits) is only 2%, so the potential savings is limited. Overhead is 13%, some of which is lower in China, but other portions (e.g. depreciation) are not significantly different across the world... you also must consider manufacturing capabilities, e.g. different scrap rates—both the US and Mexico are ahead of China in this area. {Source: Interview with Technology Forecasters, 10/21/03}
  - "If the process is automated, and product is not bound for a Chinese customer, the US (and other countries) might be competitive." {Interview with Technology Forecasters, 10/28/03}
  - "Labor ranges between 10-20% of the cost structure. If you have labor that costs only 1/10th of what is paid in the US, then you might knock-off anywhere from 9-14% of COGS. But people often fail to add back logistics costs and overhead which amount to 3-4%. The net result is a China cost advantage of 5-10%, which is not that large for certain kinds of products that aren't well suited for China's high velocity manufacturing model." {Interview with New Venture Research, 10/27/03}

Production in China is Not Always Economic (continued)

- Electronics contract manufacturing/PCB assembly (continued)
  - Highly automated products can also be misleading in terms of cost savings. “One of our medical customers had us bid a single-sided surface mount board with some radio frequency capability. There was only a 6-7% difference in China vs. the US. They decided to stay in the US because the total cost savings didn’t offset their perceived loss of flexibility.” {Quote is Steve Johnson of Reptron Manufacturing Services, Circuits Assembly, June 2003, “Calculating the Total Costs of Offshore Outsourcing”}
  - “We have done some very rough calculations and estimate that a 15-20% cost savings is necessary to justify moving production offshore to counter the added costs of freight, customs, homeland security fees, logistics, inventory carrying cost and reductions in cash flow.” {Gary Larson, VP of Sales and Business development for Electronic Systems Inc, quoted in Circuits Assembly, June 2003, “Calculating the Total Costs of Offshore Outsourcing”}

Production in China is Not Always Economic (continued)

- Tool & Die
  - "Chinese prices are frequently 50% of what US counterparts charge, and in some instances are as much as 75% lower, depending on the type and class of die or mold, according to Chinese TDM industry sources. [But] when TDMs are made to US specifications… initial price differential is 25-30%... And when costs related to purchasing tooling are added (such as transportation and associated customer travel related to design, production, and tryout), the Chinese cost may almost equal the initial quoted US price ex-factory." {According to Hong Kong invested Chinese TDM producers; US ITC, "Tools, Dies and Industrial Molds"}
- Die Casting
  - "American buying pros generally agree it is not worthwhile to buy die castings Offshore for anything less than a 15-20% margin, as additional "hidden costs" become evident." {"Offshore Sourcing: The Hidden Costs"; Die Casting Development Council}
- Generalization across Industries
  - "…Found that it was not uncommon for up to 25% of the total cost of a commodity bought internationally to be duties, taxes, freight and fees, etc." {Buylines: Source Abroad, but Watch Those Logistics Costs; Purchasing; 02/06/2003}

A "Herd" Mentality is Causing Some Firms To Migrate When it is Not Economic

- Assessments from various sources on the "herd mentality":
  - "Others suggest Offshore outsourcing entails many hidden costs and far fewer savings than outsourcing consultants advertise, and that Offshore outsourcing is being driven by the same "herd mentality" that helped generate the NASDAQ tech bubble."
    - {"Offshore Outsourcing And The Future Of American Competitiveness"; Assistant Secretary for Technology Policy Dept of Commerce; as presented before the ITA ISAC-13 Advisory Committee, Washington, DC, October 14, 2003}
  - "Under the policies of reform and opening up, China has attracted huge amounts of foreign direct investment. A 'herd' mentality to participate in the 'Chinese miracle' developed among global giant corporations… Global corporations now view China as central to their long-term strategy."
    - {Peter Nolan; University of Cambridge; "System Fragility, Industrial Policy and China's International Relations, with Special Reference to Strategic Industries"; Prepared for the US Congress, US-China Committee on Economic and Security Review Commission. Sept 2003}
  - "The herd mentality is a critical part of the problem also. A fundamental axiom… is that you don't get fired for doing the same thing as everyone else. This becomes the single most important investment criterion—not expected return, not risk, but doing what everyone else is doing."
    - {www.ross-jackson.com}

A "Herd" Mentality is Causing Some Firms To Migrate When it is Not Economic (continued)

- Assessments from various sources on the "herd mentality" (continued):
  - "Standard neoclassical economic theory posits that capital automatically migrates toward investments where it can earn the highest return, but in practice, the process does not always work so efficiently, sometimes resulting in boom-bust cycles of under—and over—investment… The social dynamics of such "herd behavior" are especially strong when a relatively small number of actors base their decisions on the same information and have good knowledge of what the others are doing. The automotive industry provides just such an environment."
    - {"The Automotive Industry in Vietnam: Prospects for Development in a Globalizing Economy"; Funded by Alfred P. Sloan Foundation; T. J. Sturgeon; July, 1998}
  - "…[CEO meeting another:] "He put a plant in China so I have to have one. My shareholders won't think I look good unless I have a plant in China too.'"
    - {www.manufacturingnews.com; 04/01/2003; "Lean Is A Winning Strategy During Economic Downturn- The Common Attributes Of The Shingo Prize Winners"}
  - "The herd mentality takes people to China… Nonetheless, the savings there 'may not be so great as one would suggest.'"
    - {www.internationalreports.net; "Major manufacturers View Malaysia as Advantageous Launch Pad for Asian and Global Markets; 2003}

A "Herd" Mentality is Causing Some Firms To Migrate When it is Not Economic (continued)

- Electronics related assessments
  - "There is a herd mentality with OEMs in China—sometimes it makes sense, sometimes it doesn't—not always rational decision… People tell their bosses what they want to hear—(going to China) gives a boost to the stock valuation, but you really have to do the analysis on a case by case basis." {Interview with Technology Forecasters, 10/21/03}
  - "Some of it [migration to China] is a bandwagon effect. It's a little blind in some ways, since being in China is assumed to be low-cost, which isn't always automatic." {Interview with New Venture Research, 10/27/03}
  - "We are seeing more small companies looking into production in China. Sort of the 'hand wringing' stage. Customers are insisting. Often it isn't economic. There is a herd mentality. Paranoia." {Interview with iSuppli, 10/29/03}

A “Herd” Mentality is Causing Some Firms To Migrate When it is Not Economic (continued)

- Electronics related assessments (continued)
  - “Each time in the past decade that we have asked brand-name electronic product companies to rank their criteria for manufacturing outsourcing decisions, they have reported “pricing” as their dominant concern. Yet, our newest study of global contract manufacturing pricing practices indicates that many product companies’ assumptions are inaccurate. In some low-cost regions, we have found six-fold differences between what the product companies think they are paying for labor, and what they are actually being charged…
  - …The typical error fostering this gap is the assumption that country by country comparisons of workers average hourly compensation directly correlate with total costs. In truth an assembly worker’s compensation as a percentage of total manufacturing costs is dramatically different in various global regions. Although some costs—such as equipment depreciation, building costs and administration costs—can be roughly similar across countries, other costs—such as logistics, utilities, regulation-related costs and other key cost categories—can be surprisingly different. Therefore, labor costs do not necessarily walk in step with hourly wage differences… Mad dashes to move manufacturing to widely recognized low-cost regions can squeeze out time to evaluate additional costs incurred by the switch, as well as hidden costs companies will experience in the new region.”
    - Pamela Gordon, Pres of technology Forecaster Inc, in Electronic Business, 6/1/03

Sometimes US Firms Can Be Cost Competitive if Total Cost is Considered

- But, customers, blinded by low initial cost, ignore total cost
  - "Most [customers] are still focused on initial cost, especially buyers like Delphi's. He doesn't care about the total cost. He only cares about his numbers, his bonus. He could care less about the rest of it." {Company Interview}
  - "Publicized cost savings in tooling and high-volume die casting production appear so attractive… some US company top executives are virtually mandating that a certain percentage of purchases be directed Offshore. Several purchasing agents report their own attempts to protest such mandates at their companies… "I keep hoping top management will be enlightened by [his comparisons of prices including hidden costs]… [But] these hidden costs are buried in other budgets and assumed to be part of the price of business generally." {"Offshore Sourcing: The Hidden Costs"; Die Casting Development Council}
  - "I was working on a project where a moldmaker was producing 10 sets of tools to make plastic parts for 3 million laptop computers. That translates into 300k parts per tool set. In the US, that job would have been done on 3 sets of tools using higher-quality materials. So even though the initial cost was 40% less, it wasn't really saving any money." {'Congress Weighs Tariffs against Chinese Tools, Molds" Purchasing; 10/29/2002}

Sometimes US Firms Can Be Cost Competitive if Total Cost is Considered (continued)

- But, customers, blinded by low initial cost, ignore total cost (continued)
  - "No one disputes Asian tools are cheaper, but many question if the total cost is really cheaper. If your real goal is to save money, the initial cost of the mold is the wrong place to start… If you buy a tool that produces flash or needs a lot of maintenance, you certainly aren't saving a lot of money. In the long run you can always explain why more expensive tooling is cheaper. Reasons range from faster cycle times to reduced warranty costs for finished products." {'Congress Weighs Tariffs against Chinese Tools, Molds"; Purchasing; 10/29/2002}

Analyses of Total Cost Should Include All Cost Penalties & Risk Factors

COST PENALTIES

- ❑ Freight for overseas shipment (including expediting)
- ❑ Logistics within China (infrastructure is poor)
- ❑ Duties, fees and taxes
- ❑ Additional inventory carrying costs
  - Long pipeline, additional safety stock to ensure uninterrupted supply, minimum order/container sizes, reduced flexibility in responding to demand
  - Must include all inventory costs: labor, warehousing (rent, utilities, insurance, etc.), taxes, scrap/obsolescence, cost of working capital
- ❑ Costs/lost sales due to stock-outs/unreliable delivery
- ❑ Cost of quality—impact on customer's process/costs as a result of inferior supplier quality
  - Customer scrap or yield rate
  - Rework
  - Warranty claims, and cost of litigation
  - Costs of debugging (e.g. tooling)
  - Cost of finding defective product in a long pipeline
- ❑ Additional costs related to communication & management oversight (e.g. time/costs for engineers & executives to visit China)

Sources: Lean Directions, 'Move Your Operations to China? Do Some Lean Math First'; Womack; "Offshore Sourcing: The hidden costs"; Die Casting Development Council; manufacturingnews.com; 01/02/2003; The Great Debate: When Is It Better To Buy From China Than It Is To Produce In The US}; Calculating the Total Costs of Offshore Sourcing, Circuits assembly, June 2003; Interliance presentation to ESCA, July 17, 2003; Interliance presentation at China Sourcing Fair, October 9, 2003; Interview with Burns & Levinson, 10/16/03; Interview with iSuppli, October 29, 2003

RISK FACTORS

- ❑ Business ethics
- ❑ Legal hassles
- ❑ Corruption
- ❑ IP theft
- ❑ Currency shifts
- ❑ Political instability

Cost Penalties—Examples

- Costs associated with sourcing from China
  - “(We had)… a paint problem… on a safety-critical part… we had 3 months of product on the water potentially with the defect… we were air shipping steel parts… for months while the supplier tried desperately to double their production to cover the replacement of the bad stock. As the "bad" stuff flowed up from the port of Charleston, we had two flows of visually identical parts in the plant, one to the inspection area we set up and the other to the line. Then we had to store the defects securely so they couldn't be accidentally mixed into production or used by 2nd or 3rd shift when they ran out of the "good" stuff. After the logistic issues were resolved, and we returned to "normal," there was a question of what to do with the defects. Of course, the supplier helped all they could by telex, but we were responsible to set up a rework supplier, train them, certify them and monitor the quality of their work.” {Deere and Co-manufacturingnews.com; 01/02/03; “The Great Debate: When Is It Better To Buy From China Than It Is To Produce In The US? Ten Manufacturing Practitioners Say It Boils Down To More Than Cost”}

Cost Penalties—Examples (continued)

- Costs associated with sourcing from China (continued)
  - In most of the world, cutting the costs of electronics procurement often involves employing the concepts of supply chain management, using techniques like JIT manufacturing, VMI and inventory velocity. In China, cutting procurement costs often involves bypassing taxes and duties, which can be extremely onerous… Companies frequently employ techniques that can cut these costs, but that lead to supply chain inefficiency. Companies often ship products through 3rd parties or out of the country and back in again to avoid taxes. This increases transportation and handling time and boosts the number of parties that handle goods, leading to higher rates of merchandise breakage and loss… Furthermore, while China has made great strides in infrastructure, it is still weak in this area relative to other electronics-producing nations. The next effect of these factors is inflated logistics costs… Logistics costs in China represent 20% of GDP, as compared with 10.5% in the US, according to the China Logistics Alliance Network.
    - {"Opinion: China Poses Supply Chain Hurdles for US firms"; ebnonline, 3/7/03}

Risk Factors—Examples

- Risk factors, such as business ethics, legal hassles, corruption, IP theft, as well as potential currency shifts and political instability, all undermine the attractiveness of China
  - "China isn't reliable [shaky ethics]. You can get a prototype (from a Chinese supplier) that is good, but when it goes into production, you'll get a completely different part. Or the first 3 orders can be good, but then the manufacturer—who acts as a broker—subs the job out, and the next run is made by somebody else, who substitutes a different material. And sometimes you can't tell just by looking at it. In medical you can't take that risk." {Company Interview}
  - 50% of Sino-Foreign relationships result in some form of dispute {Interliance, "Eight Steps to Successful Sourcing in China, 10/9/03}
  - "It's our largest customer who has put the most pressure on us to go to China. But they refuse to send their drawings to China—they have fears about intellectual property. Their solution? They send more commodity-type production to China. For non-commodity products they will not let the supplier know what the molds are used for, even the industry in which they will be used." {Company Interview}

Risk Factors—Examples (continued)

- Risk factors, such as business ethics, legal hassles, corruption, IP theft, as well as potential currency shifts and political instability, all undermine the attractiveness of China (continued)
  - The hidden cost of doing business with China is that there are always issues that require minor concessions. “Someone will buy a million-dollar piece of equipment, but they won’t have budgeted for the system that stabilizes electricity for it.” {Sacramento Business Journal, June 2, 2003, “Scaling the Great Wall”}
  - Comments at the China Trade Challenge seminar indicate that corruption continues to be a significant issue. {China Trade Challenge, Worcester, Mass, October 22, 2003, sponsored by AIM and Mass MEO}

Some of China's Advantages May Not Be Sustainable

- Capital not paid back
  - The banking system cannot fail to collect on loans forever
  - Fewer examples of state run companies being spun off on favorable terms
- Currency
  - Potential re-valuation
- Labor
  - As China's development continues, wage rates can be expected to rise (though slowly given the abundant supply of available labor)

MANUFACTURING
EXTENSION
PARTNERSHIP™

Impact on Small and Mid-Size Manufacturers (SMEs)

Myth—Impact on SMEs

If your customers love you as a supplier, your products are high quality and competitively priced, and you've had a close, productive relationship for many years, they won't move to China.

Fact

Customers can disappear without warning.

Competition From China Has Had Three Major Negative Impacts on US Small & Mid-Size Manufacturers (SMEs)

NEGATIVE IMPACTS ON US SMES
Loss of US Manufacturing Jobs & Value Added - Portion of US manufacturing has migrated to China/Offshore - Design and engineering is also migrating, particularly in electronics
Increased Competitive Pressure—Particularly on Price
Disappearance of SME Customer Base - Customers sourcing parts from China - Customers migrating operations to China (and sourcing locally) - Customers losing out to competitors based in China

➡Key Message: The major impact of competition from China (and other low-cost regions) is that your customers might disappear, without warning

SMEs Occupy Three Types of Competitive Positions vs. China in Manufacturing Businesses

Sheltered
(Success Stories)

In Danger

Gone

- SHELTERED—Businesses or product lines with defensible competitive advantages versus China
- IN DANGER—Do not have clear basis of competitive advantage—will die a slow death unless carve out sheltered position
- GONE—Already Migrated to China or other Low Cost Region

- In general, these categories do not align with industries or NAICS codes
- A successful manufacturer has “sheltered” parts of its business
  - A company may have had parts/products which are now “**Gone**”, and other parts/products “**In Danger**”; but must have enough “**Sheltered**” product lines that company is successful/growing

Drivers/Barriers That Determine Which Portions of Manufacturing Are Gone vs. Viable

- Four drivers or barriers to competition from China/low-cost regions determine which portions of US manufacturing remain viable
  - If proximity to the customer is required due to service requirements, it favors US manufacturers
  - If the product is difficult to manufacture (niche/specialty product or process capability, high quality or performance requirements; innovative technology) it favors US manufacturers
  - If the product or market is low volume, it favors US manufacturers
  - If the product or business requires extensive engineering/design interaction, it favors US manufacturers

Gone—Already Migrated To China or Other Low Cost Location

- A high wage, high factor cost nation such as the US is uncompetitive in certain manufactured products

- Generally, if the following conditions are met, the part/product is *Gone*
  - Proximity to the customer is not required: easily shipped (e.g. not easily damaged, not bulky), long lead time is acceptable, low mix/variation, not customized
  - Easily manufactured: low complexity; low quality; high, unskilled labor content
  - Higher volumes
  - Little or no engineering/design interaction necessary: commodity

- In these products, countries like China have a cost advantage that is nearly impossible to overcome
  - Migration of these types of products is not new:
    - In search of lower costs, manufacturing shifted to Mexico, to Taiwan; and so forth
    - Then, as economies in low-cost areas mature, labor and other factor costs increase
      - For example, now products are being moving from Mexico and Taiwan to China
  - But there will always be another low-wage/low-cost region

Gone—Already Migrated To China or Other Low Cost Location (continued)

- Interviewees agree these types of products are Gone
  - “[We’ve] already lost the high volume/low tolerance work to China… all low volume work will stay here. If it’s not truckload, Chinese don’t want to ship it—they’re not interested in low volume parts.” {Company Interview}
  - “Standard stampings will go away. China will take those.” {Company Interview}
  - “Guys who are losing work are the guys with the big runs—the multi-spindle guys. Those guys are hurting.” {Company Interview}
  - “Molding businesses are shutting down all over North America. This trend is accelerating. If it continues at the current rate, the bulk of low-end molding jobs will have moved to China within a few years.” {Injection Molding Magazine, 8/03}
  - “China is going after the high volume stuff. We will do volumes of say 30k pieces per year, or 100k pieces per year. The big shops in the US might do 10k pieces per week. This is the high volume stuff the Chinese are going after.” {Company Interview}

Manufacturing Employment Has Declined in the Five Industries Selected for Analysis

INDUSTRY EMPLOYMENT 1997-2003 (000s) Industries Selected for Study								
NAICS Code	Industry Description	1997	1998	1999	2000	2001	2002	2003 (Sept/ Oct)
332	Fabricated Metal	1696	1740	1728	1753	1676	1548	1470
3327	Machine Shops, Turned Products, Screw, Nut, Bolt	358	371	359	365	348	318	305
333511	Industrial Mold Manufacturing	57	57	55	54	50	45	42
333514	Special Die/Tool, Die Set, Jig & Fixture	110	110	106	104	95	83	82
333515	Cutting Tool & Machine Tool Accessories	This code not provided separately.						
334	Computers & Electronics	1803	1831	1781	1820	1749	1521	1379
337	Furniture	615	641	665	680	642	605	576
3261	Plastic Products	724	729	735	738	699	668	652

Source: Bureau of Labor Statistics

During 1997-2002, Imports as a Percent of US Domestic Consumption Increased

IMPORTS AS A PERCENT OF CONSUMPTION FOR SELECTED NAICS CODES				
NAICS Code	Industry Description	1997	2002	1997 vs. 2002
332	Fabricated Metal	8.4%	10.9%	+2.5%
334	Computers & Electronics	36.0%	42.7%	+6.7%
337	Furniture & Related	12.7%	20.5%	+7.8%
326	Plastics & Rubber Products	8.1%	10.2%	+2.2%
Part 3335	Tool & Die, Molds	NA		

- Interview data suggests that import penetration has proceeded even faster in 2003.

Source: International Trade Administration, Census Bureau (M3 series)

During 1997-2001, Imports From China as a Percent of Consumption Have Also Increased

CHINESE IMPORTS AS A PERCENT OF CONSUMPTION FOR SELECTED NAICS CODES			
NAICS Code	Industry Description	1997	2001
3261	Plastic Products	1%	2%
332	Fabricated Metal	1%	2%
- 3322	- Cutlery & Handtools	4%	7%
- 3325	- Hardware	2%	4%
- 3326	- Spring & Wire Products	2%	2%
- 3327	- Machine Shops	0%	0%
- 3329	- Other Fabricated Metal	2%	4%
334	Computers & Electronics	3%	5%
333511	Industrial Molds	0%	0%
333514	Special Die, Tool & Molds	0%	0%
333515	Cutting Tools	1%	1%
337	Furniture & Fixtures	2%	6%
- 33712	- Household & Institutional Furniture	4%	10%
- 337121	- Upholstered Furniture	0%	2%
- 337211	- Wood Office Furniture	1%	1%

Imports From China Have Continued To Increase, Taking a Significant Jump in 2002

SITC	Imports by Commodity	1998	1999	2000	2001	2002
0	Food & Live Animals	730	863	1,021	1,144	1,505
1	Beverages & Tobacco	24	19	33	40	48
2	Crude Materials, Inedible, Except Fuels	521	511	614	595	634
3	Mineral Fuels, Lubricants & Related Materials	388	248	730	387	416
4	Animal & Vegetable Oils, Fats & Waxes	9	6	7	6	6
5	Chemicals & Related Products	1,441	1,674	1,809	2,065	2,423
6	Manufactured Goods Classified Chiefly by Material	6,969	8,315	10,287	10,804	13,374
7	Machinery & Transport Equipment	21,599	26,397	34,947	34,944	46,217
8	Miscellaneous Manufactured Articles	38,727	42,819	49,475	51,068	59,136
9	Commodities/Transactions Not Classified Elsewhere	748	933	1,139	1,228	1,408
Total		71,156	81,786	100,063	102,280	125,168
SITC	Top 10 Commodities	1998	1999	2000	2001	2002
894	Toys & Sporting Goods	11,167	11,639	12,925	12,672	14,869
851	Footwear	8,008	8,434	9,195	9,758	10,227
752	Automatic Data Process Machines	2,809	4,006	6,310	5,961	9,145
821	Furniture & Bedding Accessories	2,183	3,262	4,476	5,018	6,957
764	Telecommunications Equipment	2,823	3,434	4,579	4,690	6,401
759	Parts for Office Machines & ADP Machines	2,468	3,208	3,843	4,052	5,216
763	Sound Recorders & TV Recorders	1,321	1,754	2,585	3,065	4,488
775	Household-type Electric & Non-electric Equipment	1,466	1,836	2,380	2,802	3,232
893	Articles of Plastics	1,784	2,111	2,481	2,653	3,175
813	Lighting Fixtures & Fittings	1,434	2,052	2,524	2,340	2,887

A 2001 Study By the US/China Security Review Commission Confirmed That China & Mexico Are Major Drivers of U.S. Job Losses

- Pilot study on "Impact of US-China Trade Relations on Workers, Wages & Employment", June 30, 2001*

PRODUCTION SHIFTS FROM THE US TO CHINA, MEXICO & OTHER LATIN AMERICAN COUNTRIES (Oct. 1, 2000-April 30, 2001) Announcements in the media (Media Tracking Study N=287)			
Location Where Production is Moving	Estimated Jobs Lost	% of Announced Production Shifts	Comment
China	34,900	29%	85% of companies shifting production were US based multinationals
Other Asia	9,061	14%	
Mexico	29,267	52%	
Other Latin America	708	5%	

* Prepared for the US-China Security Review Commission/US Trade Deficit Review Commission by a team of researchers led by Dr. Kate Bronfenbrenner, School of Industrial Relations, Cornell University

China/Low Cost Region Competition Has Been Partially Responsible for a Massive Loss of Manufacturing Value Added & Employment—Example of the Furniture Industry

- Overall
  - The US lost 73,000 jobs overall in furniture and fixtures between December 2000 and December 2002 {BLS, cited in News & record, 3/1/03}
  - In the past few years, China's furniture shipments are up 80% while shipments from US plants have fallen 11% {"The Fight to Furnish"; News & Record, 3/1/03}
- Subsectors
  - Case-goods has been a US-dominated furniture category for decades, based mostly on the availability of quality hardwoods in the South. "Domestic manufacturers were able to counter imports' impact when they were running their plants at full capacity. But when the economy turned south, and the domestic manufacturers were confronted with too much capacity, something had to give, and it was domestic plants." {Jerry Epperson, in High Point Enterprise, 2/11/02}
  - In plants that make furniture only for the home, 43,500 jobs disappeared between December 1999 and November 2002—currently, about 250,000 people work in plants making residential furniture in the U.S. {BLS, cited in News & Record, 3/1/03}
  - Makers of wood furniture lost about 25,000 factory jobs between the end of 1999 and November 2002—currently about 105,000 people work in wood furniture plants. {BLS cited in News&Record, 3/1/03}

China/Low Cost Region Competition Has Been Partially Responsible for a Massive Loss of Manufacturing Value Added & Employment—Example of the Furniture Industry
(continued)

- Examples—Firm Layoffs
  - La-Z-Boy, the country's second largest furniture manufacturer—sales down 9.2% vs. same quarter last year… firm has closed plants. {Toledo Blade, 8/13/03}
  - Imports keep climbing but declining sales of Hooker Furniture's domestically produced furniture leaves employees in Virginia and North Carolina working less than 40 hours per week and facing one-week factory shutdowns in each of three upcoming months. Last month, (the company) announced plans to close a plant in Kernersville, N.C.—the first closing in the company's 79-year history. The closing affected 270 workers. {Roanoke Times, 6/24/03}

China/Low Cost Region Competition Has Been Partially Responsible for a Massive Loss of Manufacturing Value Added & Employment—Example of the Furniture Industry

(continued)

- Closures & Layoffs—Past 2 Years {News&Record, 3/1/03}:
  - The largest manufacturer of residential furniture—Furniture Brands International—closed plants manufacturing several of its lines:
    - Thomasville closed one of four plants in Thomasville, NC, 425 jobs lost
    - Thomasville closed a plant in West Jefferson, NC, 239 jobs lost
    - Thomasville closed plants in Mississippi and Tennessee, 390 jobs lost
    - Four Lane furniture factories in Virginia were closed, 1,100 jobs lost
    - Broyhill Furniture Industries cut jobs in Lenoir and Conover, NC citing a shift in production to China, 236 jobs lost
  - La-Z-Boy had several rounds of job cuts:
    - Closed plants in N. Wilkesboro, NC, Waynesville, NC, and White Deer, PA, 750 jobs lost
    - Closed plants in Virginia and Alabama, 310 jobs lost

China/Low Cost Region Competition Has Been Partially Responsible for a Massive Loss of Manufacturing Value Added & Employment—Example of the Furniture Industry
(continued)

- Closures & Layoffs—Past 2 Years {News&Record, 31/03} (continued):
  - Lexington Home Brands closed or down-sized several plants:
    - Closed Mocksville, NC plant, 360 jobs lost
    - Down-sized plants in Lexington, NC, 150 jobs lost
    - Closed a plant in Spruce Pine, NC, 296 jobs lost
  - Drexel Heritage Furnishings:
    - Closed its oldest plant in Drexel, NC, 120 jobs lost
    - Cut administrative staff, 175 jobs lost
  - Universal Furniture Ltd. closed a plant in Goldsboro, NC and stopped production at a plant in Morristown, TN—the company was later purchased by China-based Lacquercraft, 431 jobs lost
  - Klaussner Furniture cut jobs in its Asheboro, NC, plant, 133 jobs lost
  - Stanley Furniture closed a plant in West End, NC, 400 jobs lost
  - Bassett Furniture Industries closed a plant in Dublin, GA, 300 jobs lost
  - Palliser cut jobs in its Troutman, NC, plant, 85 jobs lost
  - Council Craftsmen eliminated jobs when the company was sold to a conglomerate in May 2002 (High Point Enterprise, 11/27/02), 40 jobs lost

China (& Other Low Cost Regions) Are Rapidly Increasing Their Share of Global Electronics Production

Electronics Manufacturing Services (EMS) Production Forecast by Region ($US Billions)								
Region	2001	2002	2003	2004	2005	2006	2007	CAGR 2002-2007
Americas	**47**	**41**	**44**	**46**	**49**	**47**	**47**	**3%**
United States	37	29	28	27	26	23	20	-7%
Mexico	10	12	16	19	23	24	27	18%
Europe	**18**	**17**	**18**	**20**	**23**	**26**	**28**	**10%**
Western	13	11	11	10	8	7	6	-11%
Eastern	5	6	7	10	15	19	22	30%
Asia Pacific	**31**	**29**	**34**	**42**	**53**	**67**	**79**	**22%**
China	16	18	25	31	41	54	65	29%
Non-China	15	11	9	11	12	13	14	5%
Total	**96**	**87**	**96**	**108**	**125**	**140**	**154**	**12%**

Source: iSuppli Corp. data, June, 2003, published in ebnonline 6/19/03

Design & Engineering Functions Are Also Migrating To China & Other Low Cost Countries

- China
  - Last year Chinese universities produced more than 450,000 graduates with tech degrees—close to the total for the United States. And many Chinese nationals gain tech degrees in the United States and Europe and return to ply their trade in China. {Electronic News, 11/4/02, "China's Perfect Storm"}
- Low cost regions
  - PCAST Preliminary Draft Findings and Observations (President's Council of Advisors on Science and Technology's Subcommittee on Information Technology Manufacturing and Competitiveness):
    - US technological preeminence is not assured:
      - Global R&D Centers are emerging around manufacturing centers overseas
      - Labor costs for R&D design capabilities are 1/3-1/10 of the US in India and Asia
      - Confidence in foreign design capabilities is slowly growing, and management of global design systems is improving too
      - The proportion of foreign math and science graduates of US schools is increasing and there is a growing tendency for foreign students to return home
    - The US "innovation ecosystem" can be damaged via deterioration of its high-tech anchors—R&D or manufacturing. While the threat is not imminent, if either of the anchors are lost, what will companies decide 10 to 20 years from now? {Manufacturing & Technology News, October 3, 2003}

Design & Engineering Functions Are Also Migrating To China & Other Low Cost Countries (continued)

- China electronics industry
  - "Many design decisions are being made in China," said Chene. 'Designers in China are designing PDAs, smart phones (and other products for the Chinese market), and for all markets. It's a big change for this business, and it will reshape the entire semiconductor industry. {3/3/03, "Sharp Microelectronics Products for sale in China"}
  - Development of the design function in China {6/20/03, Electronic News, "The Waking Giant"}:
    - 400 design houses in China—1/3 multinationals, 2/3 indigenous—beginning to turn out chip designs using engineering talent that has just graduated from Chinese universities in and around Beijing and Shanghai
    - "Every major EDA (electronic design automation) company is working with the Chinese government and one or more universities in China to train design engineers, and most see China as a major source of business in the next few years."
    - "Chinese design houses have a significant cost advantage" driven by cheap labor, subsidies from the government, and "contract pricing based on time spent on the design plus a percentage of the final business."
      - $12-15k per designer vs. 80-150k in the US (not including benefits)

Design & Engineering Functions Are Also Migrating To China & Other Low Cost Countries (continued)

- China electronics industry (continued)
  - “Chinese designers are being trained using the latest tools and methodologies.”
  - “The brain drain that was underway a decade ago has slowed to a crawl, in part because of the downturn in the electronics industry outside of China and in part because of the liberal stock options policies of Chinese companies.”
  - China is rapidly moving from simpler to more sophisticated designs, e.g.; now churned out simple ASIC designs (largely from multinationals). But the pace is accelerating.

Engineers—Salary Requirements

Country	Annual Salary Requirements
United States	$70,000
Hungary	$25,690
China	$15,120
Russia	$14,420
India	$13,580
Source: Ron Hira, Columbia University, Cited in Manufacturing & Technology News, July 3, 2003	

But Concerns About Protection of Intellectual Property Will Keep Some Core Technologies & R&D in the US

- "You probably shouldn't be using your core technology in China. The laws on intellectual property in China are good. But once you lose your IP, it's too late."
  - {Karen Sutter, Director of Business Advisory Services for the US-China Business Council, "Is China Eating Oregon's lunch?" Oregon Business Magazine, April 2003}
- "Protection of IP rights remain elusive, and ongoing violations continue to hamper China's software and electronics design industries."
  - {Ebnonline, "China Overcoming Market Hiccups"; 7/21/03}
- Company Example—Pixelworks:
  - "Some of the 45 Chinese workers they employ perform R&D to support local production. The most cutting edge engineering is still done in Oregon. Keeping the high-end R&D at home is the industry standard, and they don't expect that to change {"Is China Eating Oregon's lunch?" Oregon Business Magazine, April 2003}

China is Exerting Tremendous Competitive Pressure on US Manufacturers

- Tool & Die/Molds
  - “Mold builders, some other machinery makers & toolmakers are in dire straits… They can't raise prices because of competition, but their costs in areas such as healthcare rose an average of 4% per year in the ‘90s. Industry tends to go where the lowest costs are, which now happens to be China.” {“News: Can manufacturing make a comeback?”; Industrial Distribution; June 1, 2003}
  - “Moldmakers supplying the plastic injection molding market (just one example) fear extinction, as company after company closes its doors following lost business to low-priced Chinese competitors.” {The FABRICATOR; “Siege planning or strategic planning?” April 24, 2003}

- Fabricated Metals
  - I see a lot of activity, a lot of bidding going on... “However, like us, the smaller companies are being challenged by the bigger companies, and the bigger companies are being challenged by overseas fabricators... Moving work overseas might be unpopular among workers, but times being what they are, OEMs are being forced to cut wherever they can to stay afloat. And that means exporting work to emerging economies.” {The FABRICATOR: “Press Brakes: the Quest for a Happy Ending; Manufacturers, Users Hope Technology is the Ticket, June 26, 2003}

China is Exerting Tremendous Competitive Pressure on US Manufacturers (continued)

- Electronics—Printed Circuit Boards
  - "Large domestic printed circuit board manufacturers have moved Offshore, primarily to China, while small PCB manufacturers are closing, unable to compete with the low-cost Asian competition. The potential number of US military printed circuit board suppliers has been dramatically reduced having a significant impact on future US technological innovation and availability for military applications." {Letter being written by military PCB suppliers to Congress, attached to Aug 2, 2001 testimony of Dave McCurdy, President Electronic Industries Alliances Before the United State-China Commission, Bilateral Trade Policies and Issues between the US and China}

China is Exerting Tremendous Price Pressure on US Manufacturers

- Metalworking
  - "We had to layoff 20% this year… We won't survive the near term while corporate America figures out that China is NOT the answer. In 2000 we had almost 500 employees. Now we're down to 300… We're dying slowly. It's a matter of time." {Company Interview}
  - (Company interviewed) is setting up operations in China to produce some components… Owner did this reluctantly. Has been steadily laying off people—hates it. "Dying slow death." Hope this will help. Already sourcing some product from China. {Company Interview}
- Plastics
  - "Are customers concerned about sending molds to China? Yes, but they'll get over it. Chinese molds come in at 25% of what we could do them for, and at half the shipping time of US companies?" {Company Interview}
- Electronics
  - "The Chinese competition is brutal—they have devoured the high volume piece of the market which is what has caused the shrinkage in my business." {Company Interview}

Companies Interviewed in Phase 2 That Are Currently "Under Pressure" From China/Low-Cost Regions Grew At Lower Rates In 2003, & Were Less Likely To Be Profitable

Category: Competitive Pressure		% Profitable	Avg. '03 Revenue Growth
Under Pressure	Direct Competition from China/Low-Cost Countries or Impact on Customer Base	78% (n=36)	2.9% (n=32)
Not Under Pressure	No (or Limited) Direct Competition/No Impact on Customer Base	90% (n=21)	14.3% (n=20)
Total	-	82% (n=57)	7.3% (n=52)

Note: The distribution of companies interviewed in Phase 2 by industry and size class is not representative of the universe of U.S. small manufacturers. However this data is indicative of the differences in performance between companies under pressure and those that are not.

Almost ¾'s of Companies Under Pressure (Phase 2) Are Suppliers (vs. Finished Goods/OEMs)

Category: Competitive Pressure		# Panel Companies	Percent of Category
Under Pressure	Direct Competition from China/Low-Cost Countries or Impact on Customer Base	Supplier 31 Fin Gds/OEM 11	74% 26%
Not Under Pressure	No (or Limited) Direct Competition/No Impact on Customer Base	Supplier 5 Fin Gds/OEM 17	23% 77%
Total		Supplier 36 Fin Gds/OEM 28	56% 44%

Note: The distribution of companies interviewed in Phase 2 by industry and size class is not representative of the universe of U.S. small manufacturers. However this data is still indicative of the differences between companies under pressure and those that are not.

Minnesota Technology Survey on the Impact of Chinese Competition on SMEs

If you don't make any changes in response to Chinese competition, what do you predict will be the impact of that competition on your sales over the next several years? Specifically… (mean percentage → *)	
Percent *loss* in sales this year, 2002 (n = 56)	-20.4
Percent *loss* in sales next year, 2003 (n = 50)	-19.5
Loss in sales over the next three years, through 2004 (n = 36)	-34.2
Loss in sales over the next five years, through 2006 (n = 20)	-35.0
* Includes *only* those respondents who gave a percentage (i.e., base does *not* include respondents not answering or "don't know" answers).	

Source: "Impact of China-based Manufacturing on Greater Minnesota Manufacturing Companies," March 2003, Minnesota technology Inc.

Customers Can Disappear—Without Warning

- Tooling & Metalworking
  - “Our biggest customer—50% of our revenues—pulled their parts and sent it overseas and/or brought it in-house. [Was there any warning?] No. Nothing.” {Company Interview}
  - “Large [Manufacturer of X] was a great customer for 50 years. Then about 6 years ago, it all went to China. Just like that.” {Company Interview}
  - “We thought we’d be immune to Offshore [competition] with these customers: Rolls Royce, Pratt & Whitney, GE. Wrong. They’re all setting up JVs in China.” {Company Interview}
  - “Just recently, 3 main customers told us they were pulling their parts and sending them to China. Because our customers were forced by their customers to set up support operations in China.” {Company Interview}
  - “My customer’s customer says you have to buy in China. My customers—the molders—don’t want to, but they have to… I’ve got guys who tell me they would pay me a 10% premium—because we give them so much value. But their customers are making them buy from Offshore.” {Company Interview}

Customers Can Disappear—Without Warning (continued)

- Plastics
  - "Our largest customer has moved its assembly to China. Highly automated. They are teaching the Chinese to do it." {Company Interview}
  - "Three or four years ago we had customers in office automation, computer drives. We can't do this anymore. These industries are gone." {Company Interview}
- Electronics
  - "Several major end users including Motorola, Texas Instruments and Intel have abandoned North American printed circuit manufacturers in favor of Asian suppliers." {Matthew Holzmann, 01/01/03, www.circuitree.com}

➡Survival is dependent on making sure you have a customer to serve

SME Customers Are Disappearing—Customers Sourcing Parts From China

- Castings/Foundries
  - “Even companies that complement their own castings with some imports are feeling squeezed by fewer jobs and more competitors. Everyone that has a garage is in the import business. There's tremendous competition, even on the Chinese product coming in…
  - …Last year China became the world's largest foundry producer, based on tonnage, pushing the US into 2nd place,” Lessiter said. US imports of foundry products have doubled in 4 years, from 7% to 15% of the US market. Meanwhile, US foundries have plummeted from 4,000 in 1980 to just 2,600 today. The Chinese companies are "very aggressive in marketing and getting their parts here, and there is some thought that dumping is going on," said Lessiter, adding that he has little hope the deluge of imports will lessen. {Lost Foundries: Hot-metal Firms Fall as Foreign Casters Come on Strong; ‘02-11-11}
- Stampings
  - Purchasing manager at a manufacturer of metal stampings and fabrications in Pennsylvania: "We continue to lose work to China. We are writing some new business for 2003 but expect smaller components to be sourced Offshore by our customers.” {Tom Stundza; Purchasing; March 6, 2003}

SME Customers Are Disappearing—Customers Sourcing Parts From China (continued)

- Metalworking/machining
  - …machining services, castings and fabricated metal parts... Contract manufacturers in the Midwest are taking a beating from increased outsourcing to China. "My business is down 40% this year, and we just can't compete," said a major company that offers machining services. He fears major suppliers will go out of business, creating domestic shortages. He is particularly irked that his US customers dropped demands for challenging and expensive quality certifications when they moved to Chinese sources. {"Tip Sheet; Key Metrics and Supply Alert;" Purchasing; June 19, 2003}
  - Shops offering machining services in the US are feeling a huge impact from the [foreign] outsourcing trend. The two owners of New England Prototype laid off all of its employees due to lack of work. "We are living from one week to another," says Leo Perrin, one of the owners. Some 13% of the machine shops in MA closed in '01-'02. {'Tip Sheet; Key Metrics and Supply Alert"; Purchasing;7/17/03)

SME Customers Are Disappearing—Customers Migrating Operations To China

- General
  - Large US manufacturers are turning to overseas suppliers or moving plants to foreign countries to take advantage of cheaper labor, lower taxes and less regulation… "Unlike typical business downturns of the past, when manufacturers simply cut back and waited for recovery, in the current downturn manufacturers are rapidly relocating outside the US, and large numbers of small and mid-sized US manufacturers are closing down permanently due to foreign competition." {Manufacturers Blame Woes on Foreign Competition: Story is Different for Large Firms; 2003-04-21;The Business Journal of Tampa Bay}
- Auto
  - Unfortunately, most US suppliers are unlikely to supply Chinese auto production. “In the auto business, even if a domestic supplier manages to match China prices, the effort may be futile… With the consolidation of the OEMs in China, it's more than an issue of low prices... but [also] being able to coordinate JIT component deliveries and working in concert with other factories, your suppliers and their suppliers [who are in China, too]… The ongoing consolidation of US manufacturers in China "will be 'the mother of all sucking sounds' and [will] mean the loss of nearly one million American jobs by 2010. {Kiplinger Business Forecasts, July 11, 2003; “China Pressures Build For Industrial Suppliers In the US”}

SME Customers Are Disappearing—Customers Losing To Competitors Based in China

- Metalworking
  - "(We are) not losing business to China, but our customer base is." {Company Interview}
  - "China hasn't had a big impact on us, but it has had a big impact on our customers." {Company Interview}

MANUFACTURING
EXTENSION
PARTNERSHIP™

Competitive Strategies of Successful Firms

Myth—Successful Competitive Strategies

In order to survive and prosper, companies need to make internal improvements—Lean, automation, world-class practices

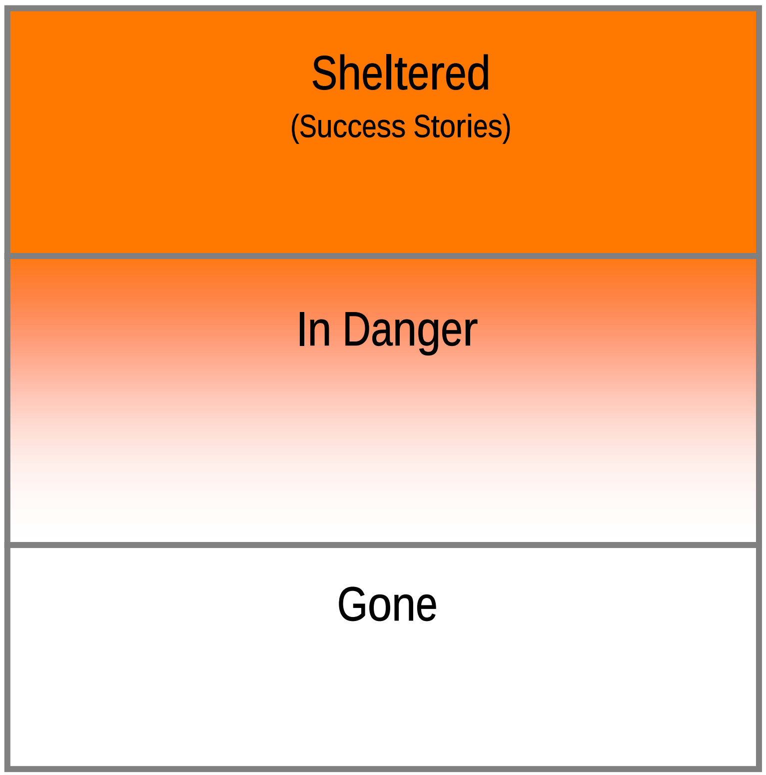
Fact

Being Lean, world-class and cost competitive is no longer enough—you need a defensible competitive advantage or shelter, based on specialty product/process capability, a service advantage based on proximity, or innovative technology

Competitive Strategies of Successful Companies—Overview

- The project identified 65 successful companies
  - Interviewed by phone or in person.
  - Additional data obtained from secondary sources.
- The main objective of the interviews was to identify why/how they survived and prospered despite intense Chinese/Offshore competition in their industries
- Nine strategies were employed by these successful companies
  - Rarely did companies employ just one strategy.
  - Rather, each company employed a mix of strategies.

Competitive Strategies of Successful Companies—Overview (continued)



- **Successful companies employed a combination of nine strategies to survive and grow (find shelter) despite competition from China/Offshore**
  - Focus on specialized products or process capabilities
  - Target business where proximity to the customer provides service advantage
    - Logistics
    - Design/engineering/customer interaction
  - Develop unique, innovative technology (R&D, patented)
  - Target the right customers that are less likely to go offshore and/or are less price sensitive
  - Work to be cost competitive in manufacturing through Lean, Automation
  - Offshore production (sourcing, JV)
  - Develop strategic partnerships
  - Become a global player
  - Diversify customers/markets

65 Successful Companies Under Pressure Employed a Combination of Nine Strategies To Survive & Grow

Primary Competitive Strategies Offer Higher Customer Value vs. Offshore; Niche Strategies (N = 65)	% of Success Stories Employing Strategy
Focus on Specialty Product or Process Capability • Product based strategies—tight tolerance; difficult to manufacture; high quality • Process based strategies—advantage based on specialized process capabilities, or skilled labor	59%
Develop Unique, Innovative Product/Process Technology	19%

Target Business Where Proximity Provides Service Advantage
• Logistics
    • Quick turn
    • High mix/variation (can't forecast demand; too expensive to hold inventory)
    • Make/customize/configure to order (domestic production reduces transport time to offset long build to order cycle)
    • JIT/kan ban, consigned inventory
    • Freight economics—too difficult to ship
    • Low volume/short runs—not of interest to the Chinese, and not worth it to set up sourcing arrangements
• Design/customer interaction
    • Intensive design/engineering interaction with the customer; frequent modifications
    • Fashion-sensitive—work closely with designers, architects, and adjust to changing seasonal fashion
    • Strong customer relationships and loyalty—personal relationships, service track record
	86%

65 Successful Companies Under Pressure Employed a Combination of Nine Strategies To Survive & Grow (continued)

Supporting Competitive Strategies Reduce Cost & Risk; Enhance Capabilities	% of Success Stories Employing Strategies
Target the Right Customers—Less Likely To Go Offshore and/or Less Price Sensitive	34%
Work To Be Cost Competitive in Manufacturing Process Through Lean, Automation, Investment • Lean • Automation • Other investment in manufacturing to reduce cost	35%
Cost Reduction Through Production in Low Cost Countries (sourcing, jv)	19%
Develop Strategic Partnerships • Complementary products • Customer and supplier partnerships	11%
Become Global Player • Worldwide presence • Worldwide production system; US focuses on design, debugging	15%
Diversify	25%

Some Strategies Are More Fundamental To Competitiveness & Survival

- All 65 companies employed at least one of the primary strategies to differentiate from low cost country competition
  - Focus on specialized products or process capabilities
  - Develop unique, innovative product or process technology (R&D-driven, patented)
  - Target business where proximity provides service advantage
    - Logistics
    - Design/engineering/customer interaction
- For only 18% of the 65 success stories did Lean seem to be a key component of their strategy and success…
  - About half of the companies (54%) were working to be cost competitive as a key part of their survival strategy, which includes Lean, automation, other investment in manufacturing to reduce costs, and offshore production (sourcing, jvs)
  - But again, none of these successful companies were relying solely on cost competitiveness as a strategy

Firms Interviewed Are Employing a Mix of These Strategies, Not Just One

- Most firms interviewed employed a combination of these nine strategies
  - Only a handful of success stories appeared to be pursuing only one of these strategies
- Example—Electronic Component Company's strategies:
  - Specialized capabilities
    - High power applications
  - Innovative technologies—goes after niches where have special capability or innovation
    - Patented automation equipment
    - Proprietary designs in specific applications
  - Leverage proximity
    - Lower volume, more complex—requires enormous engineering and design interaction/support for the customer
  - Diversification
    - Made sure not to be overly focused on telecom
  - Value added services
    - Design and engineering support

Specialty Strategies—Focus on Tight Tolerance, Difficult To Manufacture, High Quality Products

- Product Based Strategies—focus on tight tolerance; difficult to manufacture; high quality products
  - Company manufactures "close tolerance, small to medium-sized fabrications and assemblies that are often too tolerance-critical or just too difficult for less skilled fabricators." These include prototypes and pre-production; company moving into short production. {Company Interview}
  - Due to its remote location, injection molder made decision from its inception to concentrate on technologically difficult products, mostly for automotive. "We do the tough projects no one else wants to mess with. We look for China-proof jobs—high complexity, thin tolerances—products for which the customer doesn't want to risk a blip in the supply chain. " {Company Interview}
  - Micro-precision machining. "Our focus is on critical parts—these components are staying in the US." Company "manufactures a variety of close tolerance products… many are proprietary, and some are developmental." {Company Interview}
  - "We sell to companies in (Canada), Mexico, Boston. We focus on products where 100% reliability is key, and which have high volumes. Safety critical parts, parts which go into products which can't fail, need 0 scrap rate." {Company Interview}
  - "[We] make higher complexity parts; high tolerance, high value-added. Parts that are critical—they MUST be RIGHT. China can't do this. Not reliable… Our key is in our high tolerance parts. Customers can't afford for this to be wrong." {Company Interview}
  - "Our current strategy is to make products China can't do—close tolerance, lower volume." {Company Interview}
  - "Our competitive advantage is high precision/high tolerance/low volume. China is getting better, but they're not there yet." {Company Interview}

Specialty Strategies—Specialized Process Capabilities

- Process Based Strategies—specialized process capabilities
  - Investment casting/lost wax process allows: "greater design freedom (complex intricate shapes easily cast—assemblies cast as one part), greater alloy selection, improved surface finishes, greater opportunity for cost and weight reduction, precision tolerances." {Company Interview}
  - "We focus on highly engineered plastics, which replace metal parts. We have a niche product, not patented. It uses custom versions of available engineering grade resins—exotic materials not everyone can mold. We are heavily involved with product innovation (automotive), trying to get people to convert from metal to plastic." {Company Interview}
  - Company has high precision, high tolerance, special machining capabilities—round, straight. {Company Interview}
  - Company makes high quality catheter guide wires and mother medical guide wires. "China has no capability for fine coiling—yet… Medical guide wires and orthodontic parts won't go away any time soon." {Company Interview}
  - "The substantial investment in equipment would give our customers more design flexibility, greater productivity, significant opportunities for materials savings, and lower costs for medium—to high—volume runs." Company expanding and will add perpendicular injection molding for multi-material processes. Most customers are medical. {Company Interview}

Specialty Strategies—Specialized Process Capabilities
(continued)

- Specialized capabilities are sometimes based on skilled labor
  - ‘Our high complexity parts are so competitive—we have overseas customers” [Source of capability?] “Not equipment, equipment anybody can buy… Our capability comes from our knowledge base which has been built over time. It’s because we have experience making these difficult to manufacture parts/materials.” {Company Interview}
  - “Experience takes a long time to develop. Every part is different—techniques are different depending on the material and what needs to be done. This takes experience—what happens when you do this to this material. AND the first time has to be right. If you have to do it again—there goes your profit.” {Company Interview}

Develop Unique, Innovative Product/Process Technology

- Innovative product or process technologies (R&D-driven, often patented, high percentage exports)
  - Company has a proprietary coating process which eliminates secondary operations and "is so good, (the company) exports to Korea, Australia, Canada, Mexico, France, Germany, Italy." {Company Interview}
  - Electronics company focuses on high-end of smaller, growing market niche, where product performance (heat transfer) is critical. Proprietary technology offers advantages vs. competing products. "The technology is relatively new. We have things that even our US competitors can't do. And the market is small—around $500 MM. The Chinese focus on bigger markets." …Greater than 50% of their ship-to locations are in Asia. {Company Interview}
  - Instruments company focuses on high-end, high-price markets. "We just made a $10mm investment in a patented technology to meet (our customer's) performance requirements. It required materials knowledge and 'American ingenuity', and the ability to precisely machine many small component parts." {Company Interview}
  - Electronic components company has invented and patented 2 machines, including one for automated (specific operation), which allows them to out-compete China on both cost and quality (used in some specialized areas, not whole line). {Company Interview}

Targeting Business Where Proximity Provides Service Advantage—Logistics

- Proximity important—quick turn, high mix/variation, customize to order
  - "I have one customer—his work can't be done overseas. He is selling to retail and they don't give him any lead time. He would have to have a huge inventory. I can ship him a truckload of parts in 3 days, provide different colors, etc. We're almost to the point we're one company." {Company Interview}
  - "Upholstered furniture companies need to be able to compete on lead time and variety. Delivery time from China is 16 weeks and the Chinese can't do the variety of finishes and fabrics required. Furniture companies promise their customers 'quick ship', which China can't do." {Company Interview}
  - Upholsterers make most product to order. And there are many choices… hundreds of fabrics, many finishes. Furniture retailers promise their customers "quick ship"—delivery times less than 16 weeks. Upholstered furniture companies need to be able to compete on (1) lead time and (2) variety. If a product is labor-intensive, or if it's one frame, one finish, one fabric, then US companies cannot compete. {From interview with V.P. Operations, Upholstered Furniture Company}
  - "[Our] business model is short run, quick turnaround, complex parts. We can't compete on price with China, but this service can't be provided by China so it doesn't matter." {Company Interview}
  - "[We] pride ourselves on fast turnaround times for high-production jobs," accomplished by running equipment "as fast as possible." Company attributes its ability to do this to its close working relationship with its equipment vendor. {Company Interview}

Targeting Business Where Proximity Provides Service Advantage—Logistics (continued)

- Inventory management—JIT/kan ban, consigned inventory, etc.
  - (Custom molder) offers warehouse and distribution services for one of its customers. “It’s all about adding value to the relationship. Give your customers more than they expect. That’s the key to keeping them manufacturing in the US.” {Company Interview}
  - “We provide value over the life of the part: JIT, inventory consignment, (R&D, material, complementary parts) etc. We make their life easy. We make it hard for them to abandon us just for price. We provide things China cannot provide such as kanban. What they get from us is not worth delays in shipment, etc.” {Company Interview}
  - “We work with you on delivery; we can do kan ban.” {Company Interview}
  - “Also, we are a Lean facility. China cannot JIT to US.” {Company Interview}

Targeting Business Where Proximity Provides Service Advantage—Logistics (continued)

- Freight economics
  - Certain products are not economic to ship: bulk out. i.e. “shipping air”; freight cost disproportionate to cost of product; or easily damaged
  - “I make large parts. I made the decision to do this from the beginning. You might be able to get 800 into a (shipping) container. It’s not worth the cost to ship them. If you make small pieces—5,000 in a box, 20,000 in a container—you’re in trouble.” {Company Interview}
  - Modern Plastics Blow Molding Index, comprised mostly of markets for bottles, forecasts continued expansion for 2003, based on accelerating retail sales. Many of these operations are captive or dedicated and are located near production. {Modern Plastics, Jun 1, 2003; Dec. 2002}
- Low volume/short runs
  - “We’ve always focused on small quantities and we’re well respected for it. Our $5,000 purchase order provides too small an opportunity (for cost cutting); besides our small runs are too small for China (to be interested).” {Company Interview}
  - “If it’s not a truckload, Chinese don’t want to ship it. They’re not interested in low volume parts.” {Company Interview}

Targeting Business Where Proximity Provides Service Advantage—Design/Engineering/Customer Interaction

- **Intensive design/engineering interaction with customer; frequent modifications; value added design services**
  - "Increasingly, domestic vendors will be relegated to supplying only components and subassemblies subject to frequent engineering changes and upgrades, such as complex machining systems, high-end computers, air bags, dashboards and instrument panels. Relying on suppliers across the Pacific for these sophisticated items is too risky." {Kiplinger Business Forecasts, July 11, 2003; Title: China Pressures Build For Industrial Suppliers In the US }
  - "We also target work where there's lots of concurrent engineering—the kind of thing that is difficult for overseas companies to do because of the time, shipping, language." {Company Interview}
  - "We focus on complex parts where an engineer has to work with someone at the customer to develop the part—we partner with customers on the engineering. These kinds of parts don't face Offshore competition." {Company Interview}
  - The design and user support is hard to offshore—particularly since they generally need it yesterday. Need quick turn, don't have time to wait for China response. {Company Interview}
  - "Our R&D department works on new applications… with customers on R&D." {Company Interview}
  - The company works together with the customer on R&D. "We get involved with the customer." {Company Interview}

Targeting Business Where Proximity Provides Service Advantage—Design/Engineering/Customer Interaction
(continued)

- Intensive design/engineering interaction with customer; frequent modifications; value added design services (continued):
  - "We encourage customers to work with us at the design stage for manufacturability, lower cost, better product." {Company Interview}
  - Plastics molder provides product design for its customers. Says supplier/partner: "(They) are not only a leading producer of plastic… but have far more design experience than most players in this field." {Company Interview}
  - "Product innovation is a large part of our business—working with customers to get them to switch from metal to plastic parts." {Company Interview}
  - "We are increasing our engineering capabilities to be involved in the design phase of projects." {Company Interview}
  - Company offers "one-stop-shopping with teams of designers, moldmakers and molders." {Company Interview}
  - "(Process) needs to be value-engineered. In the end you should get a cheaper part… work starts at the design phase. That's our forte." {Company Interview}
  - "We debug all our tools before they go out the door. For our customers to do this costs (them) money. So we do it. We consider it customer support." {Company Interview}

Targeting Business Where Proximity Provides Service Advantage—Design/Engineering/Customer Interaction
(continued)

- Intensive design/engineering interaction with customer; frequent modifications; value added design services (continued):
  - "We provide superior engineering support; educate (the) marketplace on how to convert highly machined parts to castings; add value to the customer by reducing overall cost." {Company Interview}
  - Cable assembly company provides value added to its medical customers by assisting in meeting FDA requirements: maintaining a design history file and medical device file. "The medical market requires business and quality control that Asian suppliers don't have yet." {Company Interview}
  - "Early design involvement… will help determine the castability of product design. Suggestions may be made to improve casting design or performance and/or recommendations may be made to determine the most cost efficient way to produce a high quality part... [We] offer a broad range of creative design and cost effective advantages over products that can be manufactured from traditional processes such as machining, die casting, forging, powdered metal, stamping, permanent mold, welding, and assembly." {Company Interview}
  - "We also target work where there's lots of concurrent engineering… We try to show customers innovative ways to save total dollars." {Company Interview}

Targeting Business Where Proximity Provides Service Advantage—Design/Engineering/Customer Interaction
(continued)

- Fashion sensitive—work closely with designers, architects, and adjust to changing seasonal fashions
  - High-end cabinet makers, as well as architectural woodworkers, work closely with designers,architects and customers:
    - "We sell very high-end all-wood customer cabinetry. We are not touched at all by China. Our competitors are US or European. We deal directly with consumers, architects, builders, developers. Our customers want to be able to touch the cabinets. They wouldn't want to buy Chinese products. We put our cabinets in $1-2 MM homes—they don't want cabinets from China." {Company Interview}
- Strong customer relationships and loyalty—personal relationships, service track record, responsiveness
  - "In the end, we have to be faster than our Asian competitors, and offer more in the sale. Some [manufacturers] are providing services, such as benchmarking and training, along with the best available product quality… Products are more easily copied than services. Product life is getting shorter and shorter, but services are much more difficult. That is the one thing that can differentiate us from our foreign competitors." {'News: Can manufacturing make a comeback? While plants are priced out of the US market, there are fewer young people interested in manufacturing jobs of any kind'; Industrial Distribution; 06/01/ 2003}
  - "Key to our success is customer relationships… Customers know that [I] will fix the problem, [I] will track it down and take care of it… My customers know that I am the "go to" guy…" {Company Interview}
  - "We work on jumping through hoops. We make it easy for customers to work with us." {Company Interview}

Targeting the Right Customers—Less Likely To Go Overseas, and/or Are Less Price Sensitive

- Targeting the Right Customers
  - "We are positioning ourselves in industries unlikely to migrate to China; for example, those needing JIT, and Japanese (auto) transplants. Long-term you need to find protected products, protected markets. We (spend a lot of time) analyzing what's going on in the global marketplace." {Company Interview}
  - "We're looking at medical (to replace large electronics customer moving Offshore)—it's 65% of our business now, on purpose. American society is geared to (medical equipment). There's lots of development and lots of products. And it's less likely to go overseas—for other reasons: risks, logistics, no one wants to take the chance of sending it Offshore." {Company Interview}
  - "We are targeting companies that will continue to make things here. We sell to high-tech plants with no people in them—our best customer has done what we have done (lots of automation). We sell to large sophisticated auto companies. Now we are targeting the transplants. They (are concerned about) technology, the relationship with them is much healthier (than with Big 3). All our new business is focused here." {Company Interview}
  - "Our current strategies are to 1) make products China can't do—close tolerance, lower volume; and 2) move to industries that won't move, like medical, dental drills, and ["Made in USA"] products." {Company Interview}

Work To Be Cost Competitive—Lean

- Examples
  - “We have a focus on Lean—it’s our process strategy. We’ve been doing Lean formally for the past 5 years, but actually 13 years without its ‘title’—it takes that kind of time to do it right. You need a long-term commitment to have this strategy, committed leadership, a certain breed of people.” {Company Interview}
  - “We practice Lean manufacturing. We believe in employee empowerment, but the work’s hard and most people don’t want to do it. We use temps to screen employees and hire one of out every 25 we see.” {Company Interview}
  - “We deliver a good quality product on time, at a low price. We have a diversified product line and provide good customer service. We went Lean in 2000 to be able to do this. It was truly a leap of faith. (Used MEP)” {Company Interview}

Work To Be Cost Competitive—Automation

- Examples
  - “The key to (our) competitive advantage is automation. We have been investing in technology from the beginning to make (us) faster/quicker. (You have to be) innovative, move with the times. Have to invest so you’re not in a me-too business.” {Company Interview, machine shop}
  - “We’re committed to labor reduction. We have an inline molding and assembly process based on a redesigned product (metal parts eliminated from metal/plastic part) for example.” {Company Interview}
  - “The only way to compete with lower labor cost is through automation—take labor out… Guys who didn’t invest are all going out of business.” {Company Interview}

Work To Be Cost Competitive—Automation (continued)

- Preemptive investment in automation has helped to protect some industry segments
  - "Office furniture manufacturers… have always been more forward-thinking than (residential furniture) manufacturers. They've always been willing to invest in manufacturing and management technologies—Lean is part of their DNA." {Steve Walker, NC State, Interview 10/3/03}
    - Imports of office furniture represent less than 14 % of total consumption, and are not growing.
  - This contrasts with the residential furniture segment: "Historically, (residential furniture manufacturers) have neglected manufacturing. We as an industry have historically thought in terms of a 1-2% increase in efficiency a year, if that. The industry has the least number of engineers per capita of any American industry." {Lee Houston, Wood and Wood Products, June 2003}
    - Imports of residential furniture are now over 40% of domestic consumption, growing dramatically, and the domestic industry has been decimated.
  - Manufacturers of mid-range kitchen cabinets have been investing in technology for a long time.
    - "Look at the kitchen cabinet industry. They responded as an industry by getting more efficient with build-to-order products and collaborating on certain aspects (all buy their doors from large manufacturers who make only doors). They did such a good job that imports are no longer a major threat to their industry." {Lee Houston, Wood and Wood Products, June 2003}
    - In kitchen cabinets, imports represent only 4% of US consumption in 2001.

Work To Be Cost Competitive—Manufacturing Process

- Investing in the manufacturing process
  - (Injection molder's) plant capabilities are another key to the company's competitiveness. "We have invested in production capabilities. For example, we have a gas-assist molding process that takes 10% out of the piece part cost." {Company Interview}
  - We stay ahead of the competition with new equipment. We're the only one in the country with (specific type of equipment)." {Company Interview}
  - "We're a privately held, employee-owned business which invests heavily in our facilities and our operating capabilities. We can control our production so efficiently, that we can accommodate your changing scheduling demands. We build 99% of our own tools giving us total control over the intricate programming and machining processes and saving you time and money... " {Company Interview}
  - World-class company. Has state-of-the-art machining equipment, secondary operations. {Company Interview}
- Investment in new equipment /processes can fundamentally change the economics of manufacturing a product, such that US firms can be competitive
  - "For a typical job where one of our Swiss-type machines replaces some multiple setup process, we can reduce labor, increase efficiency, and improve tolerances—all at once." {Company Interview}
  - "We will build customized equipment to meet customer demand/requirements." Customized equipment makes parts "cheaper and better." {Company Interview}

Reduce Costs By Sourcing in China/Low Cost Regions

- Outsourcing portions of product line, or components
  - Medical electronics company outsources 20-30% of its business to contract manufacturers in China. The company "would be having a tough time without this relationship. Higher volume products are outsourced—they are 50-75% cheaper than US production" on a part price basis. Also looking into getting lower cost design help overseas. {Company Interview}
  - "We buy imported wood parts, occasional tables (product line extension), fabric (raw material)." {Company Interview, upholstered furniture company}
- Developing offshore JV or partner
  - The US facility is focused on low volume (electronic components). Higher volume production is in Eastern Europe JV and China partner. "You need both high and low volume—and you need different production processes and mindsets for each type of business. We use our (overseas) facilities for different levels of volume. The China JV is how we compete against Offshore/Chinese competitors in the higher volume businesses." {Company Interview}

Develop Strategic Partnerships/Alliances

- Alliances with customers, suppliers
  - "We form partnerships and alliances with suppliers/customers/vendors to leverage marketing, help pricing. Do this primarily in the automotive market. (Large chemical company) has helped us expand our markets. And their facilities engineering group helped optimize design for our new facility." {Company Interview}
  - "We target customers who are willing to be partners. We have long-term relationships with customers and suppliers—we get all three together. Customers and suppliers are often much larger than us. You need to be able to mesh systems, philosophies, spend money for development. You can't spend a lot of time on small customers. Either the customer or the supplier could be the catalyst; suppliers may drive this process. The relationships are not industry-specific." (The company developed partnership criteria and eliminated customers who did not fit the criteria in the late 1980's. This strategy, while successful, is becoming more difficult to implement as customers begin to look Offshore). "It's getting harder to do partnerships; lots of companies are looking at short-term opportunities." {Company Interview}
- …and even competitors
  - Formed strategic alliance with supplier and with competitor (to expand products offered). Developed alliance with flat supplier—to complement their rounds. {Company Interview}

Become a Global Player

- Building global presence
  - A small thermo-former (sales around $10-15 MM) has formed a strategic alliance with a much larger international company (sales in excess of $50 MM) with facilities in Europe and Asia. "We can (now) design and form on three continents." {Company Interview}
  - Injection molder has set up a JV with a Chinese company to make molds and do some molding. "I needed a presence in China and they needed a presence in the US, so we agreed to a percentage of the profits on work shared in each other's company with no money changing hands." Not taking work from US molders but is offering an option to companies who need to produce in China for that market. "One customer wants all of his molds sent to (Chinese company) and all his US molds sent to (us). I can market myself as a global company by teaming up with a company in China." {Company Interview}
  - "As we expand our manufacturing infrastructure… we're also exploring joint venture and partnering opportunities in other parts of North America." Plastic molding company has just formed a JV with a Mexican manufacturer. The JV was formed because one of the molder's major customers was moving operations to Mexico and the move was necessary to keep the business. The Mexican firm wanted to enter the market (medical) in which they had no presence. {Company Interview}

Become a Global Player (continued)

- Providing value added services as part of global outsourcing—supply chain management, quality management, new product introduction and debugging
  - “We are going to become a global sourcing house. We are going to leverage our engineering and logistics strengths. We recognize the competitive environment that demand low-cost solutions to molds (price pressure is in this area). We will develop the capability to provide engineering and design services for customers, find low-cost mold suppliers, take low-cost molds in-house and make them production-ready. We are just starting down this path but feel this is where our future lies.” {Company Interview}
  - (What is your strategy for competing with Offshore?) “We have to ride the wave. We move products that are mature and have appropriate characteristics Offshore, but handle it under our banner. We provide significant value added as managers of the supply chain and quality. We may have to coordinate purchases from 6 part houses and assemblers. We work with all parties to identify and solve manufacturing/supply chain issues. The big medical guys don’t want to waste time managing the supply chain for a $10 part.” {Company Interview}

Diversify

- Examples
  - Diversification is one part of strategy for electronic components company—“not too many eggs in the telecom basket.” Diversification made it easier for the company to weather the telecom bust. {Company Interview}
  - “You can’t diversify enough. For example, if you concentrate on automotive and it tanks, you will be in trouble. It is paramount to have other markets. If you have one customer, when they leave or get bought, the business is over. We have diversification in industries and processes—you have to be able to jump through hoops.” {Company Interview}
  - “The secret to our success has been product diversification. No downturn in any industry has brought us down.” {Company Interview}
  - “We’re highly diversified.” Machining company serves customers in aerospace, energy, medical, telecommunications and “other demanding customers.” {Company Interview}

Medical & Aerospace/Defense Markets Tend To Be Sheltered—Manufacturing Remains in the US

- Medical and aerospace/defense markets are highly sheltered due to:
  - Critical quality, performance or safety requirements—the products cannot fail
    - More focus on innovative and proprietary technologies
    - Less price sensitivity
    - FDA and other quality certifications required
  - Proximity provides a service advantage
    - Significant design/engineering interaction with customers (and FDA).
    - Lower volumes
  - Defense legal restrictions
    - Buy-American provisions
    - Limits on export of arms technology

Medical & Aerospace/Defense Markets Tend To Be Sheltered—Manufacturing Remains in the US (continued)

- Manufacturers serving these markets employ a combination of the strategies previously discussed, to carve out a sheltered position:
  - Focus on products/parts with critical quality or safety requirements
    - Who are also less price sensitive (targeting the right customers)
  - Development of innovative new medical or defense technologies
  - Leverage proximity to provide advantage
    - Design/engineering interaction
    - Navigating the FDA approval process
    - Lower volume niches

Medical & Aerospace/Defense Markets Tend To Be Sheltered—Manufacturing Remains in the US (continued)

- Examples
  - "Medical has always been big. We saw a softening in other industries and we immediately shifted focus. We are growing medical now." {Company Interview}
  - "Medical is 65% of our business now—on purpose." {Company Interview}
  - "We got into medical a long time ago, because it was a good fit… Medical engineering and design will stay here… we do NASA, and Raytheon… Not about to beat us up on price on this stuff." {Company Interview}
  - "Aero and medical are doing well. Medical is down, but it's almost recession-proof—doesn't have the high peaks and lows. Aero is picking up now." {Company Interview}
  - Company focuses on medical, aerospace and high-tech manufacturing (AS 9000). "Our customers NEED our parts to be RIGHT… Customers demand absolute precision and accuracy in their parts." {Company Interview}
  - Focus on medical and aerospace—flying. "Medical is geographically sensitive; customers want to come in and watch because parts are critical." {Company Interview}
  - Company's focus is on high-end, high-price markets—particularly medical and law/military/security. "We make high-end, Class A only, high-priced products. The medical guys want only the best—no products from overseas. They have product liability concerns. On the industrial side we sell a product for $10K, the Offshore competitor sells it for $500. But it doesn't work. A non-technical buyer might get fooled." {Company Interview}

Medical & Aerospace/Defense Markets Tend To Be Sheltered—Manufacturing Remains in the US (continued)

- Examples (continued)
  - Company has a significant military/aerospace/high reliability segment. “Our business is growing, even though overall the market is shrinking. Why? Strong reputation—quality, strong engineering department, and we have been in this business for a long time.” {Company Interview}
  - Company’s focus on medical market… shelters them from Offshore competition. FDA requirements for trace-ability are one reason. Once a product is validated by the FDA customers are reluctant to change… FDA requirements are a key barrier. Once a medical product has been validated by the FDA, customers don’t want to change cable assemblies and re-certify—“once you’re in, you’re in.” {Company Interview}

The Competitive Threat Changes as China's Manufacturing Capabilities Increase

Myth—Shelters

"Sheltered businesses" will remain viable.

Fact

Some current shelters will erode over time, as China's manufacturing capabilities increase.

The Development of China's Manufacturing Capabilities Will Cause Some Shelters To Collapse

- The development of China's manufacturing capabilities continues to pressure US manufacturers
  - Increasing "Gone" parts/products that have migrated overseas
  - Shrinking the "Sheltered" segment
- Summary of developments by driver:
  - Ease of manufacture—China's manufacturing capabilities are becoming more sophisticated:
    - US and other foreign manufacturers are setting up joint ventures in China—technology transfer is explicit
    - Chinese government is working on attracting skilled Chinese émigrés back, and training skilled workers to increase manufacturing sophistication
  - Volume level—China currently focused on larger volumes, but that could change over time

The Development of China's Manufacturing Capabilities Will Cause Some Shelters To Collapse (continued)

- Summary of developments by driver (continued):
  - Proximity—Chinese tool/die/mold suppliers are offsetting shipping time with shorter lead times
  - Engineering/design interaction—even this barrier erodes over time:
    - Solutions to long distance engineering interaction challenges are being developed through use of the Internet
    - US firms are increasingly handling new product introduction, while China handles production once the design is set
    - In the case of tool/die/mold, customers get around the engineering/change order problem by having tooling manufactured Offshore, and then modified here as needed
    - In some cases, US manufacturers are moving R&D/engineering Offshore too

China's Manufacturing Capabilities Are Becoming More Sophisticated

- China's manufacturing capabilities are increasing
  - "China and India have long supplied low-end iron castings like manhole covers, but now the Chinese especially are rapidly moving into casting finer alloys to make more complex pieces." {Lost foundries: Hot-metal firms fall as foreign casters come on strong; '02-11-11; Puget Sound Business Journal}
  - "The Chinese government is assiduously working with its fast growing high-tech industries and academic research institutes to implement, support and develop international technical and quality standards… They are trying to build their infrastructure… They are trying to link the provinces with their test labs to make a national network, and they've made a lot of progress." {manufacturingnews.com; March 3, '03; "It's Everyone Out For A Forward Pass: China Is Aggressively Pursuing New Role In International Standards'}
  - "For a number of years, China couldn't compete in quality, but they're getting better,“ Boston Chapter of the NTMA {Precision Manufacturers Feel the China Syndrome; 2003-03-17; Boston Business Journal}
  - "Overseas parts will get technologically better and better—making it harder to compete." {Company Interview}

Foreign Manufacturers Are Transferring Know-How

- US and foreign manufacturers are setting up joint ventures in China, and transferring technology and capabilities
  - "(Reel to reel molding)—there is not going to be much work here in the future. Our largest customer has moved assembly to China. The process is highly automated. They are teaching the Chinese how to do it. The Chinese used to specialize in high volumes, low complexity; now they are taking work requiring high quantities and high technology." {Company Interview}
  - The quality of Chinese furniture is improving. How? As more US furniture makers sell more imported furniture under their brand name they have to make sure the imported furniture meets the company's quality standards. Most American companies doing any significant importing have sent managers from the United States to China to work with the plants. {News & Record, 3/1/03}
  - Some Chinese TDM firms, particularly foreign-invested producers, have grown very rapidly through technology transfer and the acquisition of advanced, globally available machinery and software. The exposure of Chinese TDM producers to advanced TDMs and also training by foreign workers has allowed the Chinese TDM industry to leapfrog stages of development. {US ITC, "Tools, Dies and Industrial Molds"}

Foreign Manufacturers Are Transferring Know-How (continued)

- US and foreign manufacturers are setting up joint ventures in China, and transferring technology and capabilities (continued)
  - "[Ford] predicts that… by the end of 2020, the production of Chinese autos will reach 10mm. Ford has cooperated with Chinese firms in parts supply, tech transfers, R&D." {"China's Auto Industry Benefits World: Ford Executive"; Xinhua News Agency; 02/05/2003}
  - "China will build its largest manufacturing base for numerical control machine tools in Beijing with the [help of] Japan's Okuma Corp… work on the JV will begin in June [2003]. It is expected to start operating in October 2003." {From Automotive News, 03/17/ 2003; original source: Alestron, 05/29/2002; "China to Build Largest Numerical Control Machine Tool Plant"}

The Chinese Government is Attracting & Training Skilled Labor

- The Chinese government is working to attract skilled Chinese émigrés back to China, and train skilled workers to increase manufacturing sophistication
  - “Shanghai… is launching a massive recruitment campaign to attract over 10,000 Chinese who have completed high-level education and training overseas in the coming 2-3 years. Such a move is regarded by local officials as essential to creating a pool of professional expertise that can strongly bolster Shanghai's envisioned future as a global metropolis…” “Overseas-educated students returning home… have set up more than 2,400 enterprises in Shanghai…(they) are running… new & high-tech companies in IT, biological medicines, auto manufacturing & new materials…” {“Shanghai Attracts Overseas Students”; China Daily; 09/01/ 2003 and “Returned Students Play Increasing Role in Shanghai”; People's Daily; 02/24/03}
  - “A highly skilled technical workforce is being trained and employed… China is graduating 300,000 engineers per year as compared to about 30,000 graduating from US universities.” {manufacturingnews.com; 07/03/2003; “MIT Professor Says China Has Assembled All The Ingredients Necessary For Economic Success”}

In Some Cases, China Offsets Shipping Time With Shorter Lead Times

- Sometimes the proximity requirement can be overcome
  - The plight of the US tool/die/mold (TDM) industry worsened when Chinese TDM lead times offset shipping time:
    - "Chinese TDM industry sources indicate that their lead times are generally shorter than those of US TDM producers… For example, for a given TDM, if China's lead time is 6 weeks, US is 3 months." {US ITC TDM report}
    - "…found that [Chinese TDM] shops now possess the capabilities to meet or exceed the performance of many shops in the US. Mr. Siwek made this comparison by soliciting competitive quotes from an American and a Chinese mold-maker. The Chinese supplier provided better quality and customer service at a substantially lower cost than the US shop. While the US shop was 1 week late in making delivery, for example, the Chinese supplier met [the] requested delivery date." {www.mmsonline.com: "Rapid Traverse Technology and Trends Spotted By The Editors of Modern Machine Shop; Chinese Competition In Die/Mold"; October 2002}
  - Electronic components example
    - "Asian suppliers are smart about condensing the lead time with suppliers in order to make up for shipment time." {Company Interview}

Over Time, Chinese Competitors May Migrate Down To Medium & Lower Volume Business

- Example
  - The Chinese competition is brutal—they have devoured the high volume piece of the market—which has caused shrinkage in the business. The Chinese are going after the large, industry leaders like GE. Now they are starting to go after the medium volume stuff as well, e.g. automation. {Company Interview}

Requirement To Be Located in the US For Engineering/ Design Interaction Relaxes Over Time

- Engineering/design interaction is a barrier that will erode over time
  - Solutions to engineering interaction issues are being developed through use of the internet:
    - Eastman Kodak owns a manufacturing facility in China. Engineers in Rochester, NY can view the exact same diagnostics as the workers in China by using the Internet. This allows them to assist in troubleshooting problems. “If China runs into trouble, I bring it up on the computer and look at it. It is much easier for me to actually see it than for them to try and describe what is happening over the phone, especially with the language barrier.” {Modern Materials Handling, “Manufacturing Spotlight: E-manufacturing E’zing into factories”, 05/15/2002}
  - US firms are increasingly handling new product introduction, while China handles production once the design is set:
    - Example of metal fabrication company: has partnerships with companies in Asia, and uses the US facility to be the engineering experts that “get the wrinkles out” of new product introductions. Once the wrinkles are out production may be transferred offshore, but at least this strategy allows them “to keep playing” {Company Interview}
    - “[We] worked with this startup company for 2 years and then when their product took off they go to China with the volume. They continue to use us as a second source - leave us a little bit here as a carrot.” {Company Interview}

Requirement To Be Located in the US For Engineering/ Design Interaction Relaxes Over Time (continued)

- Engineering/design interaction is a barrier that will erode over time (continued)
  - In the case of TDM, customers get around the engineering/change order problem by having TDMs manufactured Offshore, and then modified here, as needed:
    - "US tooling manufacturers are commonly asked to modify tooling purchased from Offshore sources… change orders often occur after the tooling is shipped from a remote location to the US." {US ITC, "Tools, Dies and Industrial Molds"}
  - US manufacturers are moving R&D Offshore too:
    - "Lexmark is my largest customer. They've taken all their manufacturing out of this country, and they're in the process of taking R&D too." {Company Interview}

Characteristics—Successful Firms

Myth—Successful Firms

If a company does a good job serving its current customers, it will be OK.

Fact

As China's manufacturing capabilities develop (along with other low-cost regions), customers can disappear and competitive advantages can erode.

Successful companies are Adaptive: they anticipate, prepare for and adjust to disruptive market changes; they look outward and forward—beyond current customers. They focus on competitive advantage, and are able to build new advantages as the market and competitive landscape changes.

Companies Fall Along a Continuum of Adaptive Behavior

Less-Adaptive ⟷ **Highly-Adaptive**

- Don't look forward or embrace change
- Focus inward
- Respond sluggishly to market change
- Don't have adequate vision/ imagination about future market changes & potential threats

Lucky Companies

- Lucky companies are "Less-Adaptive" firms in industries under pressure that have been fortunate to find sheltered niches

➔ **Lucky companies are "OK for now," but may not have the agility to find a new sheltered position if their current competitive advantage erodes**

- Outward oriented, forward thinking, embrace change
- Able to identify and respond to a changing competitive environment
- Look ahead for new customers
- Work to build and maintain competitive advantages, and develop new competitive advantages as old ones erode (dynamic competitive advantage)

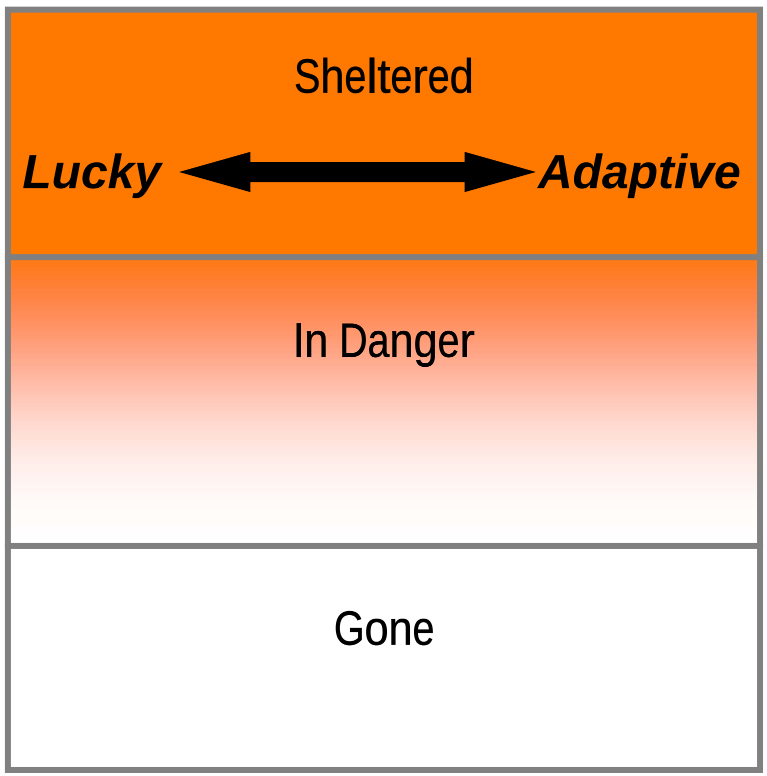
➔ **Adaptive companies have the greatest chance of continued success, because they can prepare for and adjust to changes in the competitive and market environments**

Note: Adaptiveness encompasses both a world view and a set of behaviors. Companies can exhibit some adaptive characteristics, but lack others.

Adaptive Firms Have the Best Chance of Maintaining a Sheltered Position

- SHELTERED—Defensible competitive advantage versus China/Low Cost Regions

- *Lucky*—Protected today, but need to develop agility for continued survival and growth



- *Adaptive*—Best positioned to survive and grow

- IN DANGER—Do not have clear basis of competitive advantage—will die a slow death unless carve out sheltered position

Adaptive Manufacturers Have a Greater Chance For Survival

It is not the strongest of the species that survive,
Nor the most intelligent,
But the one most responsive to change.

-- Charles Darwin

Attitude & Behavior of Adaptive Companies

- Adaptive companies EXPECT CHANGE
- Because they expect change, adaptive companies LOOK OUTWARD to assess the world around them
  - To current customers
  - To external trends
- Because they expect change, they maintain a DIVERSIFIED CUSTOMER BASE
- Because they are assessing changes to their environment, adaptive companies are CONSTANTLY EVOLVING

Adaptive Companies Expect Change

- Adaptive companies expect the market landscape to change
  - "…key is the realization that our industry has changed and it will not be returning to its prior state [and] companies... have to change, as well. It is important to understand our new business climate and develop a strategy that will allow us to succeed and prosper. Simply put, successful companies change... Company strategies... are like the pebbles in the stream, always moving and changing with the current environment."
    - "The times, they are a-changin'; How can manufacturers survive the changing landscape without changing their values?"; Industrial Distribution; Mar 1, 2003

Adaptive Companies Look Outward—To Current Customers

- ... to avoid being caught unaware; to sidestep potentially disastrous trends
  - “Stay close to the customer—get to know what’s happening. Before our customers shift products overseas, we know well in advance… We have solid relationships with decision makers. They tip us off… We’re in the know, not on the sideline.” {Company Interview}
- ... to identify opportunities
  - Direct communication between customers and technical people yield ideas for innovation, and opportunities to “add value.”
  - [How do you determine what kind of value-added your customers might want?] “My partners and I work on the floor and we work with the customers. There’s no layer of management here for customers to get through. You get directly through to us. We work hard to stay ahead... Close relationship with customers can provide a “heads up.” {Company Interview}

Adaptive Companies Look Outward—To External Trends

- Industry trends
  - [Heavily involved in industry association to “stay on top of things”] “I don’t really have time for this, but I do it. This way I can see the (market) shifts, and I can understand what’s happening.” {Company Interview}
- Changes in other industries that might represent market opportunities
  - [We] keep our eyes open… In fact somebody was reading a trade publication and said, ‘hey this (new product) is going to be huge!’ And that’s how we ended up in it.” (Subsequently became very large product for them.) {Company Interview}
- Shifts in the overall business/economic climate
  - “Today we have China, India, tomorrow something you’ve never heard of. There are lots of emerging markets…” {Company Interview}

Adaptive Companies Expect Change, So They Work To Maintain a Diversified Customer Base

- Adaptive companies maintain a diversified customer base to reduce risk
  - “There was a shop that was the admiration of the industry. Its big customer was (large company). When they went, the shop closed up. It was one thing my father preached: don’t put too many eggs in one basket. You can’t look at the short term.” {Company Interview}
  - (Owner of electronics components company) says he couldn’t have predicted just how far the tech sector would fall, but he knew it wouldn’t be wise to put too many eggs in that basket, so he didn’t. “Companies that put all of their eggs in the telecom basket grew at phenomenal rates—100%—but it was total chaos. We grew 30%, which was still fast and very chaotic.” He kept the company’s portfolio diversified. {Company Interview}
  - "When I got here we had two customers. It took 2 years to get out from that situation. When the downturn hit, if we hadn't diversified, we would have been out of business." "Times are changing so fast you have to diversify. We've turned down business with one of our biggest customers to keep their concentration down.” {Company Interview}

Adaptive Companies Are Constantly Evolving

- Aggressively develop new products to better meet customer needs
  - Newly developed products/markets are the hope for the future
- Shift to customers that offer better opportunities
- Shift to new markets that offer better opportunities
  - Look for new market opportunities even when times are good
- Aggressively sell and market
- Understand and shift competitive advantages
  - In order to make adjustments to the world around them, adaptive companies must understand what they have to offer: why customers buy from them
    - i.e., adaptive companies understand their competitive advantage
    - Only with this understanding of competitive advantage can companies effectively pursue new products, customers, and markets
  - Adaptive companies also shift competitive advantages:
    - Make changes to maintain competitive advantages
    - Create new advantages as old ones disappear

Adaptive Companies Are Constantly Evolving: New Products

- Aggressively develop new products to better meet customer needs
  - “We’re developing new/better products all the time. Always looking for ways to improve the value of [our product]… “How can we serve [customers] better? What new products are they looking for? What do they need?“ {Company Interview}
  - "Because of low cost imports, we were forced to become better and more inventive. We've become proactive in creating new products. We've become more innovative." "We're always improving: building better products & offering more options & services to be the supplier of choice. In 5-10 years we expect sales to have increased significantly. We will diversify our product line continuously through product development.“ {Company Interview}
  - "We develop new products all the time. We have to keep coming out with new flavors and other things, to show customers that we're on top of things. We usually come out with something new every 2 months or so.” {Company Interview}

Adaptive Companies Are Constantly Evolving: New Products (continued)

- Newly developed products/markets are the hope for the future
  - "We've lost customers in our core products (circuit boards, cable harness assemblies, electronic controls)" to China. But, this company already had in development one new proprietary product, and has now developed two more, all of which utilizes the company's traditional manufacturing capabilities. All three products serve different markets, which are all sheltered from China. {Company Interview}
  - Currently losing business to China and anticipates losing 1/3 of the business for the product that represents half of traditional revenue. But, even before anyone began worrying about China, this company had begun work on a product that is now awaiting patent approval, that is "going to open lots of doors." Company is sure that the new product will "pick up the slack" from lost China sales. "[It's] not just promising, but extremely promising." {Company Interview}
  - Job shop, metal fabricator under intense pressure from China: "We're developing new target market now." {When you look out 3-4 years, will your company be different?} "Yes. Maybe dramatically. I hope that our customer base will be completely different and it will be if this market we're developing takes off. It's a niche. But that's where our growth potential is. That's were ALL our growth potential is." {Company Interview}

Adaptive Companies Are Constantly Evolving: Shift Customers

- Adaptive companies assess the viability of current customers…
  - "You can't just look at current projects with a customer. You have to look at your customer. Your customer might lose the war." {Company Interview}

- …purposely targeting and shifting to customers who offer the best opportunities
  - "We try to choose our customers: are they at the top of their field; can they sustain themselves?" {Company Interview}
  - "We have key customers, customers we target. They have to meet our criteria: they need to be involved in a growing industry or hold a market strength position. {Company Interview}
  - "We are targeting companies that will continue to make things here. We sell to high-tech plants with no people in them—our best customer has done what we have done (lots of automation). We sell to large sophisticated auto companies. Now we are targeting the (automotive) transplants. They (are concerned about) technology, the relationship with them is much healthier (than with Big 3). All our new business is focused here. {Company Interview}
  - (10 years ago) management made the strategic decision to focus on engineered plastic parts. Applying this focus to existing customers meant 55-70% of them didn't fit the profile and the company began divesting many of them. (Sales initially fell, but profits have increased). {Company Interview}

Adaptive Companies Are Constantly Evolving: Shift Markets

- Shift to markets that offer better opportunities
  - "We're looking at medical (to replace large electronics customer moving offshore)—it's 65% of our business now, on purpose… It's less likely to go overseas—for [many] reasons." {Company Interview}
  - "We chase emerging technology, we research new products and go after them." {Company Interview}
  - "We are positioning ourselves in industries unlikely to migrate to China; for example, those needing JIT, and Japanese (auto) transplants. Long-term, you need to find protected products, protected markets. We (spend a lot of time) analyzing what's going on in the global marketplace." {Company Interview}
  - "Our current strategies are to 1) make products China can't do—close tolerance, lower volume; and 2) move to industries that won't move, like medical, dental drills, and ["Made in USA"] products." {Company Interview}
  - "We saw a softening in other industries and we immediately shifted focus (to medical). We are growing medical now. It's doubled in the last couple of years." {Company Interview}

Adaptive Companies Are Constantly Evolving: Find New Markets Even When Times Are Good

- Look for new market opportunities even when times are good
  - “We’re looking to develop a completely unrelated product. Is there something our equipment is suited for, or do we have to make an investment in equipment?” {why? current product is growing and profitable} We don’t want all our eggs in one basket. [current product] has product liability [issues]. We want to diversify into something else—spread the risk.” {Company Interview}
  - Company is making “buckets” of money, but aggressively making changes: “We’re hoping to cut out middlemen in future (distributors). Go direct to final customer.” “Currently developing new products: 1) larger version of current product, 2) completely unrelated product … to sell into Far East [construction] market.” {Company Interview}

Adaptive Companies Are Constantly Evolving: Aggressively Sell & Market

- Adaptive companies are aggressive sellers and marketers
  - "Technical expertise and innovation are not the most important things anymore. Market position and selling are key. There's been a shift to this. Opportunities are there, you just have to dig to find them." {Company Interview}
  - Owner went to an aircraft symposium, suppliers were told: in future, they will no longer supply Boeing, Boeing will snap modules together, it won't buy parts. Many suppliers left thinking: I lost the business. "But you have the opportunity to try: chase the part. I went to a subtier supplier in Italy & said 'I used to supply this part to Boeing, give me a chance to supply you.' Sometimes it's yes, sometimes no, but there's a chance." {Company Interview}
  - "What's different about China? One thing… for the first time we've had to make strategic marketing a core skill. In the past you could rely on word of mouth, your reputation. This is not good enough any more. We've hired a person for his business development expertise. He's looking at new markets for us." {Company Interview}

Adaptive Companies Are Constantly Evolving: Understand Competitive Advantage

- Adaptive companies understand their competitive advantage
  - A supplier of truck components understands their niche is low volume, high engineering “changeability”, high customization work—which is sheltered from low cost country competition
    - 1,000 pieces is a lot for them, and often do customized runs of 8-10 units for a specific customer requirement. This work is protected vs. offshore competitors. The higher volume work is shifting to China and Mexico.
    - They recently acquired another unprofitable company. They understand that to make the acquisition profitable they will need to shift business to lower volume, high changeability niche where they have an advantage vs. offshore companies. {Company Interview}

Adaptive Companies Are Constantly Evolving: Understand Competitive Advantage (continued)

- Only with an understanding of competitive advantage can companies effectively pursue new products, customers, and markets
  - Metal fabricator is “good at bending steel,” and its Lean initiative has resulted in a rapid turnaround time. They are aggressive at acquiring new process capabilities for new applications that match these strengths. For example they are starting to bend aluminum extrusions (complex shapes), and will be able to offer a much shorter lead time than existing competitors. {Company Interview}
  - Prototype shop is taking advantage of trend toward very short runs, which it is better positioned to take on (cost-wise) vs. production houses: “Our company has changed a lot in the last 2-3 years. Everything has changed.” {Company Interview}
  - Company which licenses a coating process developed in 1945, continues to refine the process to keep it an “ultra-pure, versatile (specific type) of coating.” Recently introduced other versions of the coating to address specific applications or “engineering demands,” including one specifically designed for medical products. {Company Interview}

Adaptive Companies Are Constantly Evolving: Make Changes To Maintain Competitive Advantage

- Adaptive companies make changes to maintain their competitive advantage
  - "We're adding more computerized equipment. With the new equipment, our prices will fall on direct-to-plate work. It's a major cost savings." Competitive advantage for this printer is in quality and relationships, but these don't matter if costs are not competitive. {Company Interview}
  - Company invested $1.7 million to keep up with customer requirements. "High speed machining is the future. The big guys are all doing it. They're producing at 3x what mom & pops are doing, unattended." {Company Interview}
  - "We're always improving: building better products & offering more options & services to be the supplier of choice. We're taking market from our direct competitors." {Company Interview}

Adaptive Companies Are Constantly Evolving: Create New Competitive Advantages

- Adaptive companies create new competitive advantages when necessary
  - "We used to compete on price and didn't worry about quality. But, when [industry slowed down], only the customers who [had lots of work] needed supplies, and they were more demanding about the performance of those parts." Company made dramatic changes and is now growing (doubled sales in '03) because it offers incomparable quality. {Company Interview}
  - Electronic equipment manufacturer: Last year, high quality and responsive service were no longer enough to hold off growing competition. Company switched to offering more customization. Business is booming because company's new competitive advantage, greater flexibility in customization, is in high demand and is not easily replicated. {Company Interview}
  - Foundry (castings): Made a decision 5 years ago to move into specialized aluminum castings—particularly light-weight, safety-critical components in automotive. "Everything is about reducing weight in the automotive industry." The company considered a more established casting process, "but it didn't make sense to enter a market in which there were a lot of foundries with a lot of experience." After 9/11, 7 of top 20 customers started sourcing product in China. But safety-critical aluminum castings now represent their future, and are largely sheltered from competition from low-cost regions. {Sources: Company Interview and article not cited to protect confidentiality}

It’s Not Easy To Be Adaptive

- Adaptive companies have owners/CEOs who drive adaptability
- Significant energy is required to do more than what is necessary for survival

> “You will find that [for] every great business organization [there was] an enthusiast, a man consumed with earnestness of purpose, with confidence in his powers, with faith in the worthiness of his endeavors.”
>
> -- B.C. Forbes

It’s Not Easy To Be Adaptive (continued)

- Making investments and changes before they are necessary requires the belief that “the risk of doing nothing is greater than the risk of acting.”

  -- *Fish*, by Lundin, et al

  - Adaptive companies make investments in the future, ahead of the pack, to support/maintain or shift competitive advantage
  - Adaptive companies find ways to invest, while non-adaptive companies are unwilling to take risks

- CEOs carve out time for forward-looking activities

- Persevering through difficulties in instituting change requires energy and confidence

- CEOs cultivate an environment where employees embrace change & look for new opportunities

It's Not Easy To Be Adaptive: Making Investments/Changes Before They Are Necessary

- Making investments and changes before they are necessary requires the belief that "the risk of doing nothing is greater than the risk of acting."
  - "You need vision. You need a leap of faith. You can't hold onto the rock. You have to take chances, risks. It's uncomfortable (to extend yourself). You need alliances and sometimes those alliances aren't comfortable… The market is unforgiving today—not like it was in the past. It comes up on you fast. You have to take calculated risks." {Company Interview}
  - "We've survived because we were unafraid of risk." {Company Interview}
  - Company was always profitable, but not this year, because of the move to a bigger facility and $100k spent on marketing. "But we're expecting a good future." {Company Interview}

It's Not Easy To Be Adaptive: Make Investments Ahead of the Pack

- Adaptive companies make investments in the future, ahead of the pack, to support/maintain or shift competitive advantage
  - "2 years ago, we had to make a decision on how to modernize. Typical answer would have been to buy equipment to make parts faster or more productive… We had to make a decision—high production or lost foam… (We bought) a beginners system in lost foam. It wasn't a profit center for awhile. We subsidized the learning with the rest of the business (lost foam jobs are growing, sand-casting is deteriorating)… No one is getting bonuses right now because all of our profit is going into building lost foam." {Company Interview}
  - "We got our first laser 7-8 years ago, while other companies waited and said, "hmmm, maybe we oughta… It's hard. You can't just jump in. It's a big investment. There's a long learning curve. We just jumped into laser. We kept working at it—we pushed it hard. We did the same thing 25 years ago with wire EDM. We were one of the first with production quantity. You have to spend money to make money. You have to take risks." {Company Interview}
  - " …we have a process development lab—'lights out' manufacturing—the only labor is to load and unload. Do we need this today? No. Will we need it in five years? Yes." {Company Interview}
  - {Investment in a downturn? That's tough.} "I bought equipment that I didn't have any work for. I did it to set myself up for the future." {Company Interview}

It's Not Easy To Be Adaptive: Find Ways to Invest

- Adaptive companies find ways to invest even when times are tough
  - "During the downturn we reinvented ourselves. "(How did you afford this?) "With some personal checks. It's tough to do, but we found the money. We're leveraged pretty high right now. But you either invest or go out of business." {Company Interview}
- ...or when they're good
  - "We've put aside money to invest in additional (equipment). We spent a lot of money last year preparing for (this) jump (in demand). We're more prepared than ever." {Company Interview}
- Less-adaptive companies are often unwilling to take risk,
  - Which translates into an unwillingness to make investments, especially in new technologies/processes aimed at new markets/customers
    - Investing now when times are tough? "No. There's no money for investments now. This was all done before. Not a lot of money to spend in the last couple years. I've spent a lot of time thinking about this. It's risky {to invest}. I'm waiting to see if the economy turns around. We might not need to do this." {Company Interview}
    - "We're staying with our existing market. Manufacturing equipment is the constraint. We would have to buy new equipment to go into other markets." {Company Interview}

It's Not Easy To Be Adaptive: CEOs Carve Out Time For Forward-Looking Activities

- CEOs/Top Managers carve out time for forward-looking activities: planning, meeting with potential partners, exploring new applications, etc.
  - {How did you get the idea for this innovative product that is very different from core products?} "I work[ed] with my staff. That's where the [product] idea came from. We crunched a lot of numbers for it. We did a lot of market research—more than we did when we got into business." {Company Interview}
  - The CEO determines future plans regarding new products and markets, based on market information from the sales force, asking customers about problems, asking state/pollution control agencies about problems… travels to trade shows internationally—brings ideas back… Strategic planning is informal, mainly the CEO—annual written plan mainly for himself, living document, used for market planning, niches, particularly international business. {Company Interview}
  - How do we find opportunities? "I'm it. I have 2 salesmen, I'm one of them. We visit job sites, go to trade shows." {Company Interview}
  - {How did new __ opportunity come up?} Interviewee is constantly "looking for something new—talked with [supplier] for 4 yrs—tried a few small things, kept in touch, kept calling & asking 'what's new?'"…Supplier [eventually] called him, he saw an opportunity & brought it to the team. Now it's starting to take off. [Company] got in on the ground floor. {Company Interview}

It's Not Easy To Be Adaptive: Persevering Through Difficult Change

- Persevering through difficulties in instituting change requires energy and confidence
  - Lean conversion in 1995: "My father is type A. It was hard. We had to change the culture of this place. He was used to running everything. We needed everyone to have a sense of ownership… Had we not done it, we would not be here today. We're not all the way there yet, but we've made good progress. {It couldn't have been easy. In 1995 few companies were talking about Lean. And with your father…} It took 3 years for Lean to show some changes, to see that we were making headway… It's hard work. Takes a lot of energy. The amount of energy! [You have to have the right people…] …We had major turnover in both plants. In (the other plant) all our department heads left. They couldn't cope with the open style… Someone needs to be super driven to make (Lean) happen. My father was skeptical. It took awhile before he was converted." {Company Interview}
  - "We're overhauling our system—we've got new values, we're working together. We didn't lose anybody, but there were some who weren't sure it would work, who were really uncomfortable. It was the guys with specific skills like the shipping guy & the tool & die guy—guys who've been here forever & wanted to protect their fiefdoms. They were the ones who felt most threatened by change. But, everyone has come around & it's all worked extremely well. I'm more comfortable than the [previous owners] in the progressive management style… We've got momentum now. We're about to really break through to a whole new level of performance." {Company Interview}

It’s Not Easy To Be Adaptive: Employees Embrace Change

- Owners/CEOs cultivate an environment where employees embrace change & look for new opportunities
  - “[At our company] everyone keeps their eyes open [for new opportunities].” {Company Interview}
  - “We have a culture of change. You always have to be one-upping yourself. We work as a team, reading, studying, reviewing opinions.” {Company Interview}
  - [All 8 employees meet every Monday morning to discuss the management book they are all reading together.] “Our focus is on where the company is going. I CANNOT EMPHASIZE ENOUGH THE BENEFIT OF THIS. It’s our core ideology. It has the most important impact on our success. Some of these guys haven’t read a book since high school. But I buy a book for everyone, and everyone reads them… We talk about where we’re spending our money, where we’re going. For example, no one is getting bonuses right now because all of our profit is going into building [new process that is replacing “commodity” process]. Everyone knows this. They might not have understood, if I made all the decisions, but, everyone understands where the money is going. We talked about it before hand.” {Company Interview}

Past Adaptive Behavior Pays-Off in Improved Performance—Company Interview Examples

- Organizational and cultural change improves quality: metalworking example
  - Jan 2003: “We’re overhauling our system—we’ve got new values, we’re working together… This new value structure, the good work ethic… everyone really appreciates it. Everything is newer, nicer, better—all the time. People would struggle on their own before, now they ask for help and are willing to work together. Productivity is up, quality is up. We’ve got momentum now. We’re about to really break through a whole new level of performance.”
  - Jan 2004: [The company] has dramatically improved its quality such that customers are talking about being willing to give them a 20% premium because they outperform the competition. “Had a fantastic year—more than doubled sales.” Hopes to double sales again in 2004.
- Company reinvented itself during downturn, and added services and capabilities: sheet metal shop example
  - 6 yrs ago [company] was a small sheet metal machine shop. “During the downturn, we reinvented ourselves." Added new processes and added equipment to enhance capabilities, e.g.; heat treating, assembly. Lowered costs, increased service. Also, stayed competitive by offering kitting services: realized he could save costs in manufacturing by grouping like processes; he could do 75% of the work in-house and manage the kitting of lots of tiny, “garbage” parts, saving the customer money and effort, and giving him higher margins.
  - "We've had tremendous growth. We're swamped. We can't keep up."

Past Adaptive Behavior Pays-Off in Improved Performance—Company Interview Examples (continued)

- Shift competitive advantage: spring manufacturer example
  - Jan 2003: "Business is becoming more and more difficult and when demand is tight, global competition gets worse—ALL competition gets worse. Quality has been key to our success. So service is becoming more & more important. When competition comes down to dollars and we can't compete [on cost], we have to have something to offer: we need to have better service. I want to reach the next quantum level. Quality management/ISO 9000 applies to everything—management system umbrella for improvements on all fronts. Lot of people talk about ISO, but that's all it is—talk. Don't want to talk, want to do. I believe in it."
  - Jan 2004: Was "in danger" (under a lot of pressure from China), but shifted to sheltered. "There's no way to compete on some things. You have to get over it. But there are other things where we can be competitive… We're competing now on service… We've made changes to our culture which have given us the intangibles: shorter lead time, better on-time delivery. These initiatives also improved cost… We're working smarter. We're working on better customer relationships—that's where the most benefits are."

- Looking forward to anticipate and exploit trends: example of electrical components company acquisition
  - Company's goal is to double business every 5 years. Started looking for acquisition 5 years ago. Looking forward, saw two trends: 1) New high volume production will be in China/Asia, and lower volume work will shift to Mexico; 2) Consolidation will occur, as many small shops had formed around 1-2 customers. In pursuit of growth, and in response to these trends, they recently acquired another similar company—doubled size overnight. The acquisition provides a low cost facility in Mexico, and presence in series of new markets.
  - The 5 year process was important in finding the right company, i.e.; would have been difficult to start recently and find the right company. The acquisition was a response to long term trends they perceived early on, and this "early" start helped lead to today's growth.

How Can 360vu Help Companies Become Adaptive?

- In order to identify barriers to adaptive behavior…
- …and to determine potential services that might help companies become more adaptive…
- …the 64 companies interviewed in Phase 2 were divided into two categories:
  - Highly-Adaptive—do not appear to need help to become more adaptive
  - Less-Adaptive—have adaptive characteristics, but need some help to become more adaptive
  - 32 companies were classified in each category
    - Not by design; 32 companies appeared to be highly-adaptive enough that they did not require assistance
- The discussion/analysis of barriers and potential services focuses on the second group of "Less-Adaptive" companies

Barriers To Adaptiveness: The CEO is the Pivotal Decision Maker

- In small and mid-sized companies, the CEO drives decision-making and planning
  - Either the CEO basically made all decisions with the assistance of one or two others, often a Sales & Marketing manager
  - …or a management team (consisting of the CEO and several other top managers), made decisions, but the CEO played a pivotal role

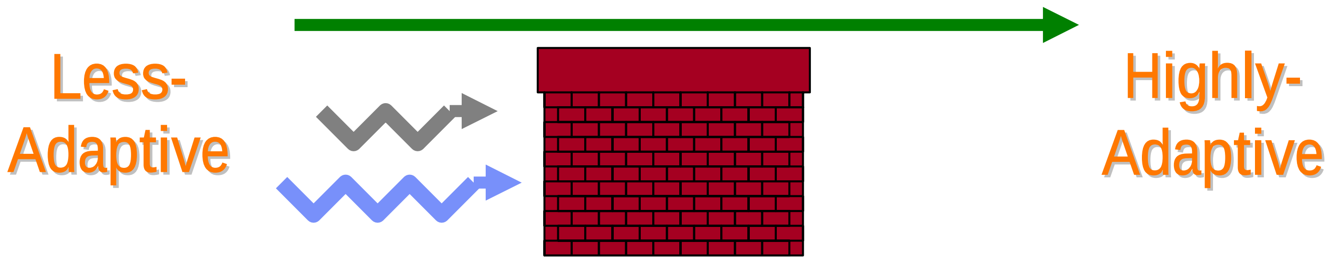
- Examples
  - "Our planning? It's not formalized. We get together a couple of times a year: a couple of key managers, including the sales manager, and myself." {Company Interview}
  - "Our planning involves myself, my brother and two other principals." {Company Interview}
  - "How do we plan? No formal process—are you kidding? It's just the four of us—myself, my husband, my sister who answers the phone and my brother-in-law." {Company Interview}
  - "It's just me and a sales guy." {Company Interview}
  - "New product planning begins with myself (CEO) and my partner, and the Director of Sales." {Company Interview}
  - "How do we determine our future plan? I (CEO) do it, based on market information from the sales force, state agencies. I travel to trade shows and bring ideas back." {Company Interview}
  - "A management group meets weekly." {Company Interview}

Barriers To Adaptiveness
Two Key Aspects of CEO Adaptiveness

- Vision & Imagination—having a vision, being forward-looking, and having the imagination to explore new products, markets, and customers—often outside the company's experience
  - Highly-Adaptive: "We have relationships with (manufacturers) all over the world. We diversify—have plenty of product to offer to replace what goes to China. We're always looking for new products with limited competition." {Company Interview}
  - Less-Adaptive: "We're trying to sell into all markets and retain our existing business." {Company Interview}

- Willingness To Take Action & Risks
  - Highly-Adaptive: "We didn't wait until the recent price pressures. We began educating ourselves (management group) in 1996/97. We have a Lean initiative. This drives cost from our product and also gives us greater agility." {Company Interview}
  - Less-Adaptive: "We are staying with our existing markets. Manufacturing equipment is the constraint. We would have to buy new equipment to go into other markets." {Company Interview}

Summary—Barriers To Adaptiveness & Potential Services To Help Companies Become More Adaptive



Barriers (mainly related to the CEO)

-Failure of imagination/vision

-Doesn't think about competitive advantage

-Lack of energy/spark, near retirement

-Lack of sales & marketing investment and effort (a secondary barrier that holds back the company, but may originate from the CEO's lack of vision or willingness to invest)

Service Needs (to eliminate barriers)

-Strategy assistance

-Coaching—strategy & execution

-Imagine disaster (workshop or coaching)

-Sales & marketing assistance

Barriers To Adaptiveness

Barriers to Adaptiveness	% of Companies
Barriers—mainly related to the CEO	
• Failure of imagination/vision	47%
• Doesn't think about competitive advantage	31%
• Lack of energy, spark (possibly near retirement)	22%
• Lack of sales & marketing investment, effort (secondary barrier that originates from CEO)	31%
Total Companies Classified as Less-Adaptive	N = 32

Note: Barriers are identified by the interviewer, based on responses during the interview, and require some degree of subjective judgment.

Barriers—Failure of Imagination/Vision: CEOs in Companies Sheltered Today, Mistakenly Assume They Are Protected in the Future

- 47% of CEOs interviewed, in companies classified as Less-Adaptive, had difficulty envisioning the future, or imagining a changing competitive environment
  - Most of these companies were sheltered today from low-cost country competition by patents, freight costs, customer requirements for customization, etc.
  - They felt protected from offshore competition, not only today <u>but going forward</u>
  - They mistakenly assumed that their shelter is *permanent* and defensible, which keeps them from watching out for and quickly reacting to changes.
    - Statements that include words like, "never", "always", or "can't", are clear indicators of this mistaken assumption:
      - "It's too expensive to ship our product—it's too heavy (relative to value)…We don't think China will ever represent a significant threat." {Company Interview}
      - "We're competing now on service (custom products) where China is paying higher raw material costs or where freight matters. We're not looking beyond (our product)…There will always be a market for (our product)." {Company Interview}

Barriers—Failure of Imagination/Vision: CEOs in Companies Sheltered Today, Mistakenly Assume They Are Protected in the Future (continued)

- As a result, these companies don't look beyond their current markets/product line
  - "Have we thought about expanding beyond our traditional market? I've often wondered if we could market our product in a completely different field. But I can't think of anyone who could take advantage of this technology". {Company Interview}
  - "How are we responding to risks (patent expiration)? We're getting better at what we do. And we're talking to a patent attorney about throwing some new patents around the old one". {Company Interview}
  - "We don't experience Chinese competition, all our work is with designers. We did look at a new market, but that was 15 years ago". {Company Interview}

Barriers—Failure of Imagination/Vision: CEOs in Companies Sheltered Today, Mistakenly Assume They Are Protected in the Future (continued)

- This lack of vision often results in companies playing "catch up" i.e., being reactive rather than proactive
  - "We are beginning to consider new markets." [Is this new?] "Yes, this is a change for us. Result of changes in the market and depressed demand, and there are not a lot of new prospects." {Company Interview}

- …"playing catch-up" can sometimes be too late
  - One company lost its major customer, resulting in a decline of over 50% in sales. While they are now focusing on selling existing capabilities to new markets, the business is unprofitable and is up for sale—may have acted too late to save the business. {Company Interview}

Barriers—Don't Understand Competitive Advantage

- For 31% of companies classified as Less-Adaptive, CEOs/Top Managers don't have a clear understanding of their competitive advantage.
- Examples:
  - When asked about their competitive advantage, company was non-responsive: "They ask me can you make it? Then they ask at what cost, and when can you deliver it. Then they ask the price. And then they tell me if I am going to get the job." {Company Interview}
  - "Difficult to do cold calls. How do [we] differentiate from [other suppliers] who called this week?" {Company Interview}

Barriers—Lack of Energy/Spark

- 22% of company CEOs interviewed (in Less-Adaptive companies) lacked energy/spark; in some cases they were near retirement
  - Excerpts from one company interview:

Question	Response
How do you respond to China/low-cost competition?	"Sell harder."
Do you think about whether your customers will be around in the next few years?	"Yes think about it, but there is nothing we can do about it."
Who will your target customers be in a few years?	"Not sure."
Are you making other changes to prepare for the future or respond to imports from China?	"No good ideas."

Barriers—Lack of Sales & Marketing

- Insufficient sales and marketing resources is a sign of unwillingness to invest in the future
- For 31% of Less-Adaptive CEOs, lack of sales and marketing support was a factor holding back their attempts to explore new products/markets
  - "I'm it. I have two salesmen. I'm one of them. Help? Yes, I could use some but haven't had time to (find it)." {Company Interview}
  - "I've often wondered if we could market our product in a completely different field. But I can't think of anyone who could take advantage of this technology… (Anyway), it's just myself and my sales guys, but my sales force is too small to focus on specialty market segments" {Company Interview}
  - "Basically I and one other person do all the research and make the sales calls. We could use help identifying new markets." {Company Interview}
  - "We don't have a sales force, that may have to change. We are going to have to pick targets and go after them. We talk about it, but haven't done (much) yet. Word of mouth brings in business." {Company Interview}

Services Needed By Companies Classified as Less-Adaptive

- The study identified several potential services for Less-Adaptive firms:
  - *Strategy*
    - Assistance to develop or refine their strategies (ranging from fine-tuning existing strategies to initiating a strategic process within the company)
    - Help them focus on competitive advantage: How can the company offer greater value than offshore (and domestic) competitors?
  - *Coaching*
    - Assistance in developing strategic direction or…
    - Staying on track with plan, keeping focused on forward-looking activities
  - *Imagine Disaster*
    - Workshop or coaching to generate “healthy paranoia” about the possible loss of customers/markets, and potential responses
  - *Sales & Marketing*
    - Some companies need additional sales/marketing beyond their traditional level of effort
    - Low cost selling/marketing techniques make it easier for Less-Adaptive companies to invest in future business
    - Strategy and coaching services (above) will lead to sales and marketing services, as CEOs are encouraged to imagine future threats and invest in future business.

Services Needed By Companies Classified as Less-Adaptive (continued)

Services Needed	% of Companies
Strategy Assistance	72%
Coaching—Strategy and/or “Stay on Track”	56%
Imagine Disaster (Workshop or Coaching)	38%
Sales & Marketing Assistance	34%
Total Companies Classified as Less-Adaptive	N = 32

Note: Service needs are determined by the interviewer, based on responses during the interview, and require some degree of subjective judgment. These services are needed to help the company become more adaptive, but are not necessarily an indication of the company’s willingness to buy these services.

Services—Strategy Assistance

- 72% of Less-Adaptive companies needed help to define their strategies
  - As a starting point, these companies need help to focus on competitive advantage:
    - How can they offer greater value than offshore (and domestic) competitors?
    - What are their unique or core capabilities? And which markets care about these capabilities?
  - The level of assistance required varied:
    - A few exhibited considerable adaptive behavior, and while they needed some strategic help, it was minimal
      - Company wants to diversify, but is just now in the early stages of planning. {Company Interview}
    - The majority needed more help defining direction
      - Company is looking for higher-margin work, but has not targeted customers or markets. {Company Interview}
      - Company personnel talk about picking targets and go after them but "haven't done much yet." {Company Interview}
    - About a third needed help to just start the process
      - Company not aggressive seeking new markets or product niches. "We are trying to sell into all markets and …retain our existing business." {Company Interview}
      - Company has not identified viable markets and doesn't believe they can do anything to prevent loss of their customers. {Company Interview}

Services—Coaching & Imagine Disaster

- 56% of the Less-Adaptive companies would benefit from coaching services of two types:
  - Assistance in developing or refining their strategic direction
  - Assistance to help companies "stay on track" with their plan, or remain focused on forward-looking initiatives

- 38% needed to develop a healthy "paranoia" regarding the potential loss of customers or other disruptive events
  - This group might be assisted through a seminar, or coaching, that helps them to "imagine disaster"
    - i.e., imagine and prepare for "disasters" such as loss of customers to China, or technology change that replaces current products

Services—Sales & Marketing

- **Investment in sales and marketing staff and resources is critical for a company to pursue new customers, markets and products**
  - 34% of Less-Adaptive companies needed increased sales and marketing efforts
    - "Yes, we (have found) some new applications. But it takes so much time to develop the new stuff. We don't have a sales arm, so we do all the work." {Company Interview}
    - "If I had a larger sales force we could identify more opportunities. But I can't afford to add to my sales force." {Company Interview}
    - "We need help marketing. Basically I and one other person do the work and make the sales calls. What I need is contact names—90% of selling is having a contact." {Company Interview}
  - For some, they were discovering the need for the first time
    - "We don't have a sales force (everyone here is a salesman). That may have to change." {Company Interview}

- **Low cost selling/marketing techniques make it easier for Less-Adaptive companies to invest in future business**

- **Strategy and coaching will also lead to sales/marketing services, as CEOs are encouraged to imagine future threats and invest in future business.**

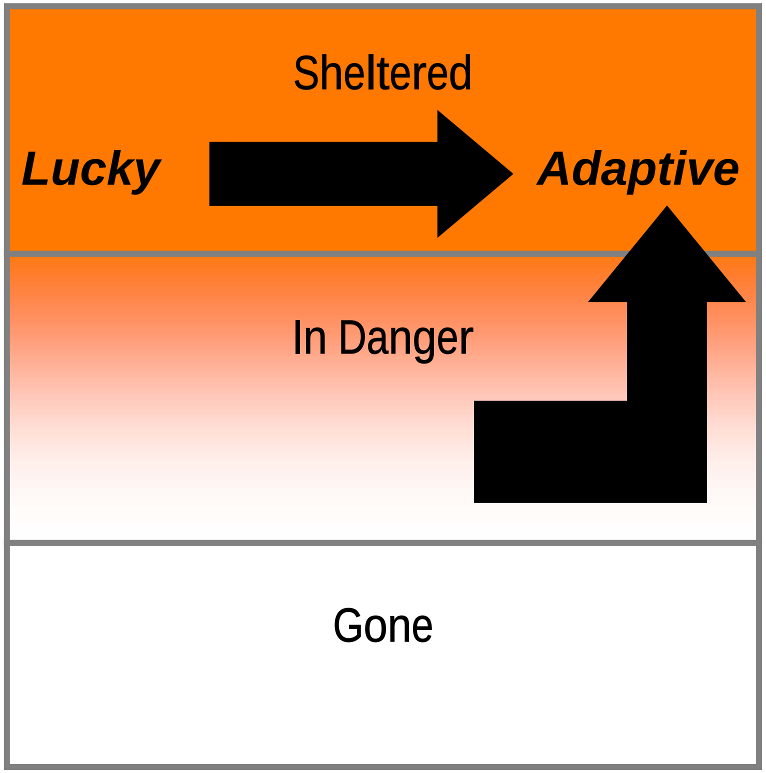
Implications For 360vu/MEP

MEP's Goal Should Be To Develop Adaptive Companies That Have Competitive Advantages

- *Adaptive*—Best positioned to survive and grow

- *Lucky*—Protected today, but need to develop agility for continued survival and growth

- IN DANGER—Do not have clear basis of competitive advantage—will die a slow death unless carve out sheltered position

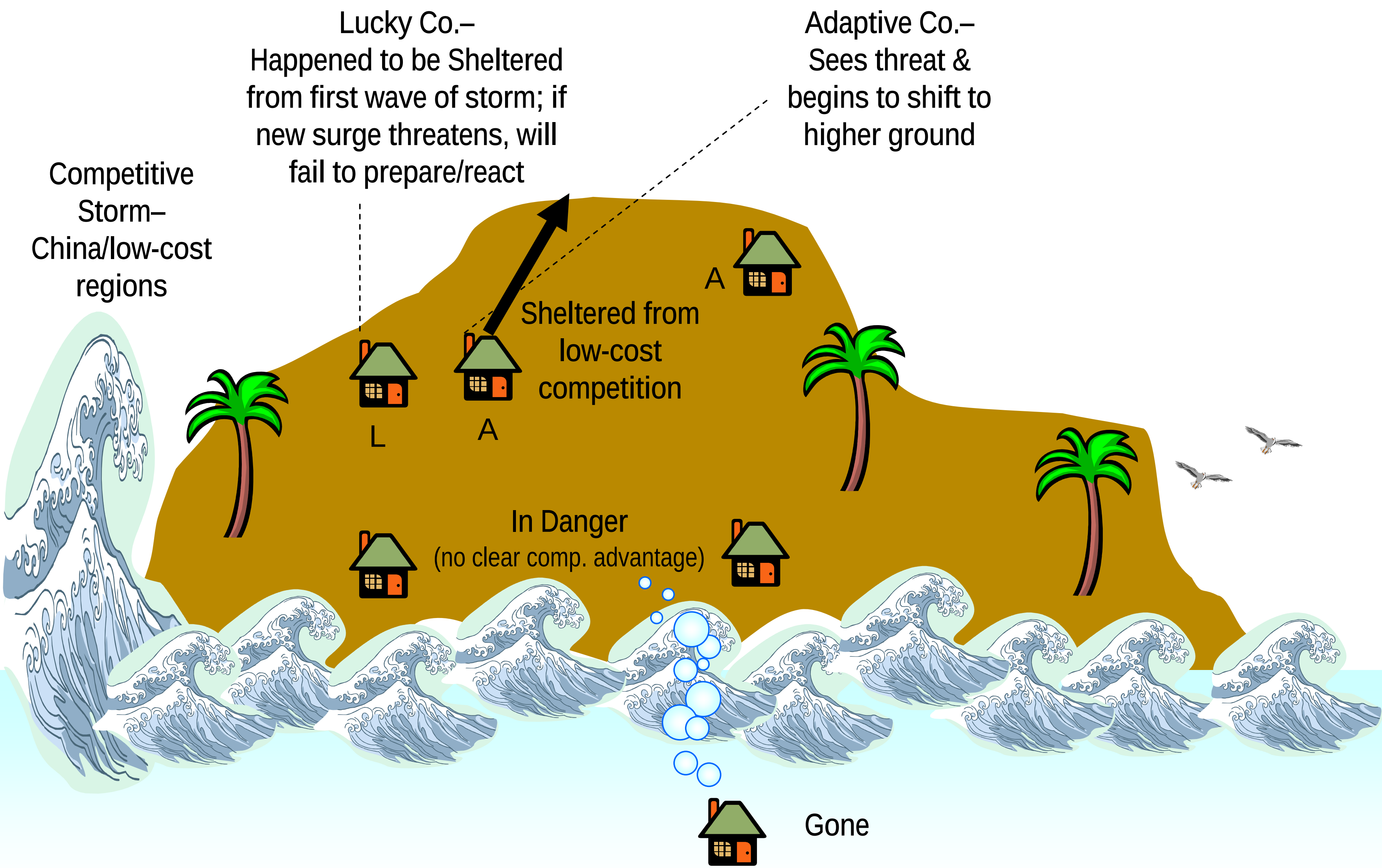


- SHELTERED—successful companies employed a combination of nine strategies to achieve comp. advantage:
  - Focus on specialized products or process capabilities
  - Target business where proximity to the customer provides service advantage
    - Logistics
    - Design/engineering/customer interaction
  - Develop unique, innovative technology
  - Target the right customers that are less likely to go offshore, less price sensitive
  - Work to be cost competitive in manufacturing through Lean, automation
  - Production in low-cost regions
  - Develop strategic partnerships
  - Become a global player
  - Diversify customers/markets

Adaptive Companies Have the Capability To Build New Competitive Advantages

- MEP/360vu will have the greatest impact on US manufacturing by developing Adaptive companies
  - Outward-oriented and forward-looking
    - Look ahead for market changes, emerging needs, new applications and opportunities
    - Continuously revise market strategy as competitive landscape changes shifts
  - Adaptive companies are capable of finding new competitive advantages and shelters as the market landscape changes
    - Identify and develop competitive advantages based on specialized products/capabilities, innovative technology, service advantages, etc.
    - And build business model around these advantages—make investments in R&D, product development, equipment and capabilities to support strategies
    - Find new shelters as China and other Offshore competitors attack previously sheltered businesses, such as lower volume, close tolerance work, etc.
- A cadre of Adaptive companies and leaders is critical to the competitiveness of US manufacturing
  - Adaptive leadership is best positioned to maintain competitive position

Adaptive Companies Are Able To Find New Competitive Advantages As Old Shelters Erode



MEP Should Help Companies Focus On Competitive Advantage & Become Adaptive

- Helping Sheltered companies to become more Adaptive will put them in a better position to survive if their current advantages or shelter collapses
  - For example,Offshore competition may start to put increasing pressure on low volume sheltered segments:
    - Many smaller US electronics contract manufacturers have carved out small volume niches in the US, which are not high volume enough to attract Chinese competitors
    - However, Technology Forecasters suggested in an interview that Mexico may start going after this low volume work, in response to loss of share in electronics production to China
      - Mexico is being forced to shift its activities to higher mix, more complex work, and they may start going after previously Sheltered business
  - Adaptive companies will be more successful at anticipating and responding to these types of changes in the market

MEP Should Help Companies Focus On Competitive Advantage & Become Adaptive (continued)

- Helping "In Danger" companies to focus on competitive advantage and become Adaptive may prevent their demise
  - Several "progressive" metal fabricators and machining companies interviewed are experiencing significant setbacks as a result of competition from China:
    - Despite having having adopted some World-class practices (quality systems, employee empowerment, online/e services)
  - Their "nonadaptiveness"hampered them from:
    - Proactively preparing for potential loss of business, for example, as customers move their operations to China, or commodity business comes increasingly under attack
    - Identifying new opportunities as old ones disappeared, and aggressively selling and marketing to realize these new opportunities
    - Setting up JVs and partnerships to offer production in China at an early stage

➔ Adoption of world-class practices is not enough—must focus on competitive advantage

MEP/360vu Should Help Companies Focus Outward On Market Changes Before Internal Improvements

- MEP/360vu services must focus outward/externally toward the market and competition
  - MEP has traditionally focused inward (Lean, quality, process improvement, etc.)
  - MEP's focus must shift outward, since even a "good supplier" may not survive if it has no strategic competitive advantage in the market
    - "("Lean; state-of-the-art facility;" "build up of infrastructure"; and "educated, informed, committed team") are all important components to the foundation of [our] success. However, all of these efforts would be meaningless without the connection to the customer. We had to make a plan to utilize these assets in a way that would meet the demands of the customer, as well as challenges of a fiercely competitive landscape… Technical expertise and innovation are not the most important things anymore. Market position and selling are key." {Company Interview}

MEP/360vu Should Help Companies Focus Outward On Market Changes Before Internal Improvements (continued)

- Project findings validate PBA model as the primary vehicle for coaching and mentoring CEOs to become Adaptive on an ongoing, continuous basis
  - Management must be evaluating and revising plans on an ongoing basis
  - Periodic strategic planning sessions/efforts are no longer sufficient
  - PBAs are an ideal vehicle for this continuous planning
  - Executive roundtables are another potential mechanism to encourage Adaptive thinking

Strategic Questions For Use By PBAs in Assisting Clients

- The Appendix provides a list of strategic questions that PBAs can use to help their clients develop strategies for survival and growth
  - The questions can be posed directly to clients
  - Or can serve as a guide or tool to supplement a PBA's own mentoring/coaching processes

Adaptive Companies Make Evolutionary Changes To Stay Competitive

- Adaptive companies make incremental adjustments over the years to remain competitive
  - A machining company interviewed made changes years ago that laid the groundwork for today's adaptiveness and competitive advantages:
    - Started Lean conversion 8 years ago
    - Brothers took over from the father years ago, and brought in the talent so they did not have to baby-sit the production floor
    - Shifted their focus to selling and marketing
    - Took 4 years to develop an alliance with another company with complementary products {Company Interview}
  - Another machining company example: "(We've survived because) we were unafraid of risk… We got our first laser 7-8 years ago, while other companies waited and said "hmm, maybe we oughta… We just jumped into laser. We kept working it—we pushed it hard." Now laser is a major piece of their business. {Company Interview}
- Unfortunately, this implies it will be challenging for some companies that react "late" to market changes
  - It is difficult in a downturn environment to make the necessary investments to build new competitive advantages, and it takes time to make these adjustments

Assist Currently Sheltered Companies To Effectively Service Their Customers

- Some companies are sheltered from Offshore competition because proximity provides an advantage in certain businesses
  - Short runs/high mix/variation
  - Quick turnaround
  - Customize or make to order
  - JIT/Kan ban
- MEP/360vu can help these companies effectively serve their customers and maintain their positions, by providing Lean and other services related to manufacturing flexibility and reducing lead time
  - Allows these companies to more cost effectively meet customer requirements:
    - Provides margin for investment in innovation, new products/markets/capabilities
  - "Keeps the door closed" to competition from Low Cost regions
- However, they must also develop an Adaptive mindset, so they can adjust if their shelter collapses or their customers disappear

Help Customers Understand Total Cost of Ownership & the "Real" Economics of China

- OEM customers are pressuring SME suppliers to produce in China and other low-cost regions, often without doing a thorough analysis of all relevant costs and risks

- MEP/360vu should develop and provide a framework to clients that helps them consider all costs and quantify their value to customers (not just part price):
  - Freight/logistics (overseas and within China)
  - Duties/fees/taxes
  - Inventory carrying costs
  - Product quality or performance differences
    - Impact on customer's manufacturing, scrap/yield, or customer return rate
  - Value added services
    - Engineering/design support/ESI to reduce design cost
    - Kan ban/consigned inventories

Help Customers Understand Total Cost of Ownership & the "Real" Economics of China (continued)

- MEP/360vu should develop and provide a framework to clients that helps them consider all costs and quantify their value to customers (not just part price) (continued)
  - Reliability of delivery
    - Reduced safety stock
  - Quick turnaround
    - Reduced inventory
  - Hidden costs of operating in China
    - Visits by engineering staff
    - Corruption
    - IP theft
    - Etc

Help Companies To Be Cost Competitive, But Also Help Them "Find Shelter" & Become Adaptive

- Assist companies to become Lean, automate, and adopt manufacturing technologies that reduce costs
  - Keep the "door closed" to competition from Low Cost regions:
    - Heavy losses in some US industries—such as tool & die and case-goods in wood furniture—might have been reduced if they had been more competitive in terms of
      - Cost
      - Lead time
  - When appropriate, help firms outsource a portion of their production to China or other low-cost locations:
    - To help the rest of the company survive in the US, including low volume/high complexity production, design/ engineering and HQ/management functions
- But being cost competitive is not enough—help clients find Sheltered businesses and become Adaptive