To Reshore or Offshore: How to Objectively Decide

Harry Moser
President
Reshoring Initiative
Definitions

- **Reshoring/Backshoring/Onshoring/Insourcing**: Bringing back manufacture of products that will be sold or assembled here.
- **Transplants/FDI**: Similar logic
- **Producing near the consumer**!
- **Localization**
The Concept Works in all Countries

Reshoring: a Brazilian perspective
60% of manufacturers:
- Apply “rudimentary” total cost models
  - Wage Arbitrage
  - PPV (Purchase Price Variance)
  - Landed Cost
- Ignore 20% or more of the total cost of offshored products

Source: Archstone Consulting survey, American Machinist Mag., 7/16/09
Indexed Unit Labor Costs in the Manufacturing Sector of Selected Countries

US: Unit labor costs in manufacturing in US$

Source: Oxford Economics/Haver Analytics
The Industry-Led Reshoring Initiative

Provides

- Online Library of 3,500+ reshoring articles
- Statistics from TCO and Library databases
- Case Study template for posting cases.
- Solutions to major supply chain problems
- Motivation for skilled manufacturing careers
- Free Total Cost of Ownership (TCO) software for:
  - Companies for sourcing
  - Suppliers of parts and equipment for selling
## TCO Example: a Part

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese unit price</td>
<td>$70</td>
<td></td>
</tr>
<tr>
<td>U.S. unit price</td>
<td>$100</td>
<td></td>
</tr>
<tr>
<td># units/year</td>
<td>12,000</td>
<td></td>
</tr>
<tr>
<td>unit weight, lbs</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Shipments/year</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>product life, yrs</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Packaging*</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Payment on shipment</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Quality*</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Product liability risk*</td>
<td>0.5%</td>
<td></td>
</tr>
<tr>
<td>IP risk*</td>
<td>1.9%</td>
<td></td>
</tr>
<tr>
<td>Innovation*</td>
<td>0.5%</td>
<td></td>
</tr>
<tr>
<td>Trips/yr</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Carrying cost, rate</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>Emergency air freight %*</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Wage inflation, annual*</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Currency appreciation, annual*</td>
<td>5%</td>
<td></td>
</tr>
</tbody>
</table>

* Chinese differential vs. U.S.
TCO Comparison Example

Present and Forecast US and China Price and TCO (US$)
PPV and Landed Cost Miss a lot of TCO

TCO: 100%
LANDED COST: 87%
PURCHASE PRICE: 77%
23%
### 2012 TCO cases, China vs. U.S.

<table>
<thead>
<tr>
<th>Comparison Basis</th>
<th>% of cases where U.S. has the advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>5%</td>
</tr>
<tr>
<td>TCO</td>
<td>53%</td>
</tr>
<tr>
<td>Difference</td>
<td>48%*</td>
</tr>
</tbody>
</table>

*Conservatively 25% might return if companies shifted to TCO

Source: TCO user database
“End the practice of awarding business on the basis of price tag. Instead, minimize total cost.”

## Offshoring Multiplies Waste

<table>
<thead>
<tr>
<th>Toyota Wastes</th>
<th>Offshoring Contributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overproduction</td>
<td>Large batch shipments, filling containers</td>
</tr>
<tr>
<td>Waiting</td>
<td>Uncertain delivery/Inconsistent quality, port, customs, shared “awake time” window for discussions</td>
</tr>
<tr>
<td>Transport</td>
<td>8,000 mi. inbound (return boat $\frac{1}{2}$ full)</td>
</tr>
<tr>
<td>Overprocessing</td>
<td>More packing and unpacking, customs paperwork</td>
</tr>
<tr>
<td>Inventory</td>
<td>In transit, cycle, safety stock, uncertain delivery and quality, less ability to check and count</td>
</tr>
<tr>
<td>Motion</td>
<td>Increased cost over time – repetitive motion injuries or additional labor to compensate</td>
</tr>
<tr>
<td>Defects</td>
<td>Much higher than local sources, extra inspection of materials and tolerances, customers unhappy longer</td>
</tr>
</tbody>
</table>
CDF (Cost Differential Frontier)

- Based on lead time and variability in order rates
- Quantifies the cost of excess inventory, obsolescence and lost orders
- Developed by Prof. Suzanne de Treville, Univ. of Lausanne
- Can add 15% to 20% to the offshoring costs identified by the TCO Estimator
Local production dominates

Product Values

- Price ($p$) = 100
- Make-to-order cost ($c_0$) = 44
- Residual value ($rv$) = 20
- Critical fractile ($c_{fr}$) = 0.70
- Minimum service level ($ms_l$) = 0.7
- Fill rate ($fr$) = 0.89
- Volatility parameter ($v$) = 0.86

Add Curve

Relative Lead Time
Some Reshorners
Water Heaters

Bringing Production back from China:
- Water-heaters, fridges, and washing machines
- Unionized facility in Louisville, KY
- 1300 jobs, renovated facility, $800 million invested

Reasons:
- Tax incentives
- High-tech new model
- Ease of design collaboration with workers: retail price -20%
- 2 tier contract
- Chinese cost: -30% becomes +6% considering inventory and delivery problems
- “Jobs at U.S. suppliers”: 20,000
Walmart’s U.S. Manufacturing program

- Walmart’s increase in U.S. manufactured purchases:
  - $250 Billion over 10 years
  - In the 10th year:
    - Approx. 300,000 manufacturing jobs*
    - Approx. 1 million total jobs**

*Reshoring Initiative  **Boston Consulting Group
Resources for Retail Suppliers

- **Purpose**: Help suppliers supply more Made in USA products
- **Developed for Walmart. Will invite all retailers**
- **Page on Walmart USA Mfg. site**, w/links to
- **Nine Resources on Initiative site:**
  - Timing
  - Product Selection
  - Revaluation
  - Competitiveness (including USCTI)
  - Suppliers
  - Retailers
  - Compliance
  - Transition
  - Financing
- **Personal contacts at 35 associations/companies/Commerce**
Precision High-Tech Metal Products

- China, Europe to Avon, MA
- Workforce has doubled in last decade
- $5 million in recent investments
- Reasons:
  - Delivery
  - Freight cost
  - IP risk
  - Rising wages
  - Labor concessions
  - U.S. energy prices
- Customers reshoring

Hydraulic Excavators

- Will triple domestic production to supply N. America
- Shift from IL and Japan to Victoria, TX
- New plant
  - 600,000 sq. ft.
  - 500 employees
- Akashi, Japan still supplies Asia
Exotic Firearms
(Foreign Direct Investment)

- Italy to Dayton, OH
- 16 jobs
- Reason:
  - Proximity to market

Customer (Pequea) reshored from China to Cicero, IL and contracted with Circle Gear & Machine Co.

Reasons:

- Quality
- Lean manufacturing
- Inventory
- Lead time
- Cost is nearly equivalent to make in US vs. China

Hybrid transmission components and transmission gear machining reshored from Japan

Battery pack assembly from Mexico

Steel forging from India

Jobs reshored to OH, IL and MI

Ford plans to add 12,000 U.S. jobs by 2015

Reason:

To be sure quality standards are followed

Source: Deseret News 8/4/10 Ford says UAW deals bring work back to its plants
Gas Turbines and Aerospace Industry

- Expanding in Parsippany, NJ plant over plants in Pennsylvania and Hungary
- Reasons to manufacture in New Jersey:
  - Highly skilled workers
  - Access to universities
- Metem’s CEO on the company’s growth: “One of the great things about gas turbines is that the U.S. really has a leadership position in that technology. We are seeing our customers bring turbine manufacturing back to the U.S. from other parts of the world.”

Aerospace Engine Parts
(Foreign Direct Investment)

- Opened plant in Crosspointe, Prince George County, Virginia, in 2011
- $170 million initial investment
- 140 jobs
- Future growth projections include another 500+ jobs and total $500 million in investment
- Reasons:
  - Lower labor costs
  - Higher Productivity
  - Do business in dollars to minimize currency risk

Transmissions and Gears
(Foreign Direct Investment)

- Germany to Gray Court, SC and Detroit, MI
- 1650 jobs in SC, TBD in MI
- Supplier for Chrysler
- Began building gearboxes for wind turbines in Gainesville, GA ($98 million investment, 250 jobs)

Reasons:
- Time to market
- Proximity to market

Sources:
● Adapted TCO
● Making decisions on a component by component basis.
● Have seen components that would have been sourced overseas now sourced domestically.
● Components that have had a unit price difference of 50% or less have been good candidates for keeping domestic.
● Size/Weight of component and tooling costs make a big difference.
Hydraulic Cylinders

● Had 100,000 ft² in Chennai, India
● Reshored to Westknoxville, TN
● 60,000 sq. ft.

● Reasons:
  ● Fast delivery vs. 5 wks on the water
  ● Fewer supply chain problems
  ● If a quality problem, no more bad units en-route

Source: Knoxvillebiz.com Ed Marcum 8/7/10
Circuit Boards

- Woodridge, IL
- Supplies heavy equipment companies
- Had quality issue with a Chinese component
- Found local IL source
- Result:
  - Quality problem fixed
  - Inventory cut by 94%
  - $25M order
U.S. Reshoring is Happening!

- BCG: MNI actively reshoring: 7% / 16% ('12/'14)
- Medical Devices: Of the 49% that outsourced offshore, 45% are returning
- Plastics News: 70% of plastics industry manufacturers have or will soon reshore
- Alix Partners: U.S. favored over Mexico: 55% / 31%
- AGMA/ABMA: Members or their customer reshored: 54% (5/1/15)
## The Bleeding has Stopped

<table>
<thead>
<tr>
<th>Manufacturing Jobs/Year</th>
<th>2000-2003 Annual Average</th>
<th>2015</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Offshoring</td>
<td>~240,000</td>
<td>~60,000</td>
<td>-75%</td>
</tr>
<tr>
<td>New Reshoring &amp; FDI</td>
<td>12,000</td>
<td>67,000</td>
<td>+ 400%</td>
</tr>
<tr>
<td>Net Jobs Gained</td>
<td>~220,000</td>
<td>~0</td>
<td>N/A</td>
</tr>
</tbody>
</table>
BCG’s Tipping Point Industries

- Computers and electronics
- Appliances/electrical equipment
- Machinery
- Furniture
- Plastics and rubber
- Fabricated metals
- Transportation goods

U.S. Manufacturing Nears the Tipping Point, Boston Consulting Group
## Reshored Industries: Top 10

<table>
<thead>
<tr>
<th>Industry</th>
<th>Jobs</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation Equipment</td>
<td>13823</td>
<td>33</td>
</tr>
<tr>
<td>Electrical Equipment, Appliances, Components</td>
<td>9240</td>
<td>58</td>
</tr>
<tr>
<td>Computer/Electronic Products</td>
<td>3483</td>
<td>25</td>
</tr>
<tr>
<td>Machinery</td>
<td>2860</td>
<td>20</td>
</tr>
<tr>
<td>Apparel/Textiles</td>
<td>2154</td>
<td>46</td>
</tr>
<tr>
<td>Fabricated Metal Products</td>
<td>1721</td>
<td>39</td>
</tr>
<tr>
<td>Food</td>
<td>1628</td>
<td>9</td>
</tr>
<tr>
<td>Wood Products</td>
<td>1028</td>
<td>18</td>
</tr>
<tr>
<td>Medical Equipment</td>
<td>738</td>
<td>17</td>
</tr>
<tr>
<td>Hobbies</td>
<td>723</td>
<td>29</td>
</tr>
</tbody>
</table>

Sources: Reshoring Initiative Library.

Cases 2007 through 12/31/14.
## Negative Reasons not to Offshore

<table>
<thead>
<tr>
<th>Negative Reasons not to Offshore</th>
<th>Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality/rework/warranty</td>
<td>116</td>
</tr>
<tr>
<td>Freight cost; Lead time/time to market</td>
<td>90 each</td>
</tr>
<tr>
<td>Rising wages</td>
<td>63</td>
</tr>
<tr>
<td>Total cost, TCO</td>
<td>62</td>
</tr>
<tr>
<td>Delivery</td>
<td>45</td>
</tr>
<tr>
<td>Inventory</td>
<td>42</td>
</tr>
<tr>
<td>Communications</td>
<td>26</td>
</tr>
<tr>
<td>Intellectual property risk</td>
<td>23</td>
</tr>
<tr>
<td>Loss of control</td>
<td>22</td>
</tr>
<tr>
<td>Supply chain interruption risk, Travel cost</td>
<td>21 each</td>
</tr>
</tbody>
</table>

## Positive Reasons to Reshore: Top 10

<table>
<thead>
<tr>
<th>Positive Reasons to Reshore</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image/brand</td>
<td>58</td>
</tr>
<tr>
<td>Automation/technology</td>
<td>53</td>
</tr>
<tr>
<td>Re-design of the part</td>
<td>40</td>
</tr>
<tr>
<td>Government Incentives; Walmart</td>
<td>35 each</td>
</tr>
<tr>
<td>Skilled workforce availability/training</td>
<td>34</td>
</tr>
<tr>
<td>Higher productivity; Lean or other business process improvements; Manufacturing/Engineering joint innovation</td>
<td>27 each</td>
</tr>
<tr>
<td>U.S. price of natural gas, chemicals, electricity</td>
<td>18</td>
</tr>
<tr>
<td>Contracted/Customers Reshoring</td>
<td>16</td>
</tr>
</tbody>
</table>

Top Countries From Which Reshored

<table>
<thead>
<tr>
<th>Global Region</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>241</td>
</tr>
<tr>
<td>North America</td>
<td>37</td>
</tr>
<tr>
<td>Western Europe</td>
<td>12</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>194</td>
</tr>
<tr>
<td>Mexico</td>
<td>27</td>
</tr>
<tr>
<td>Canada</td>
<td>10</td>
</tr>
<tr>
<td>Taiwan</td>
<td>9</td>
</tr>
<tr>
<td>Japan</td>
<td>8</td>
</tr>
<tr>
<td>India</td>
<td>7</td>
</tr>
<tr>
<td>Italy</td>
<td>6</td>
</tr>
<tr>
<td>Korea, Malaysia, Hungary</td>
<td>3 each</td>
</tr>
</tbody>
</table>

Countries Reshoring Include

- Canada
- France
- Italy
- Japan
- Korea
- Netherlands
- Switzerland
- UK*

* Our TCO Estimator adapted online at Cranfield U.
## Nearshoring in Mexico and Canada

<table>
<thead>
<tr>
<th>Country</th>
<th>Jobs</th>
<th>Cases</th>
<th>Jobs/Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>5900</td>
<td>11</td>
<td>536</td>
</tr>
<tr>
<td>Canada</td>
<td>1530</td>
<td>7</td>
<td>219</td>
</tr>
</tbody>
</table>

Source: Reshoring Library  
Mexico is surely understated.
Reshoring More Effective than Exporting: Much More Competitive at Home!

<table>
<thead>
<tr>
<th>Where Made</th>
<th>Where Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>U.S.</td>
</tr>
<tr>
<td>China</td>
<td>China</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Made</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$100</td>
<td>$115</td>
</tr>
<tr>
<td></td>
<td>$100</td>
<td>$85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Difference</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>30%</td>
</tr>
</tbody>
</table>

Based on TCO being 15% higher for exports
Positives:
- Workforce 100,000s above 10-20 year trend lines
- Shale Gas

Negatives:
- Trade deficit not declining
- USD high
- Productivity growth low
Objective of Reshoring

- Balance the $500 billion trade deficit:
  - 4 million manufacturing jobs
  - Cut U.S. budget deficit by about 50%
  - Reduce unemployment about 4 percentage points
  - Strengthen the middle-class
  - 30% increase in manufacturing
  - If spread over 20 years: 25% extra annual capital equipment investment
  - Allow productivity and growth in mfg. employment
Gaining support in Washington, DC

- Commerce Dept:
  - 2012 budget specifies TCO.
- Links:
  - [http://nist.gov/mep/reshoring.cfm](http://nist.gov/mep/reshoring.cfm)
  - [http://business.usa.gov/program/reshoring-initiative](http://business.usa.gov/program/reshoring-initiative)
- Testified at Congressional hearing on 3/28/12
- Working actively with SelectUSA
- Calls from:
  - US-China Economic and Security Review Commission
  - White House National Economic Council
Politics

Reshoring based on TCO and CDF: A partial alternative to protectionism!
But how do apprenticeships and credentials pay?

Education pays...

Education pays in higher earnings and lower unemployment rates.

Education Pays

<table>
<thead>
<tr>
<th>Unemployment rate in 2011 (in %)</th>
<th>Median weekly earnings in 2011 (in $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctoral degree</td>
<td>2.5</td>
</tr>
<tr>
<td>Professional degree</td>
<td>2.4</td>
</tr>
<tr>
<td>Master's degree</td>
<td>3.6</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>4.9</td>
</tr>
<tr>
<td>Associate degree</td>
<td>6.8</td>
</tr>
<tr>
<td>Some college, no degree</td>
<td>8.7</td>
</tr>
<tr>
<td>High school diploma</td>
<td>9.4</td>
</tr>
<tr>
<td>Less than high school diploma</td>
<td>Average: 7.6%</td>
</tr>
<tr>
<td>Average: $797</td>
<td></td>
</tr>
</tbody>
</table>

Note: Data are for persons age 25 and over. Earnings are for full-time wage and salary workers.


BLS has some data on the employment status of the civilian noninstitutional population 25 years and over by educational attainment, sex, race, and Hispanic origin online.

The Census Bureau also has some data on educational attainment online.
### Local Skilled Workforce Recruitment

<table>
<thead>
<tr>
<th>Issue</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Trades” and “vocations” image</td>
<td>Call them “Professions”</td>
</tr>
<tr>
<td>“Middle skills”</td>
<td>“Technical Skills”</td>
</tr>
<tr>
<td>Manufacturing career image due to offshoring</td>
<td>Industry collect and media report the local reshoring case of the month. Use our Case Studies feature.</td>
</tr>
</tbody>
</table>
### Economic Development Program
Starting in PA, MS, Central NY

<table>
<thead>
<tr>
<th>Action</th>
<th>Source/Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify local imports by U.S. or foreign companies</td>
<td>Datamyne</td>
</tr>
<tr>
<td>Suggest to companies they source locally</td>
<td>EDO/MEP/ etc.</td>
</tr>
<tr>
<td>Train companies on TCO to overcome issue of higher local price</td>
<td>Reshoring Initiative</td>
</tr>
<tr>
<td>Needed further cost reductions</td>
<td>MEP/ Comm. College/ Technology Suppliers/EDO</td>
</tr>
</tbody>
</table>
CSR Estimator Will Provide

- For companies:
  - Standard tool to include externalities in sourcing decisions.
  - Identification of the products with the best shareholder and sustainability returns.
  - Help justifying the marginal opportunities
  - Recognition for success,

- For advocates:
  - Tool to advance an economically and environmentally sustainable economy.
Useful Tools

- ACETool
  - Cost Differential Frontier
- TCO Estimator
- Using the TCO Estimator: A How-To Guide
- Library
- Submit a Case Study
- Economic Development Program
How You Can Use the Free Tools

- Decide what to produce in-market
- Sell against imports
- Identify prospects that are reshoring and FDI
- Help customers decide to produce more domestically
- Offer to local governments to encourage domestic manufacturing
- Identify applications where your technology could enable domestic mfg.
How to Get Started

- Ask about pain and opportunities:
  - Delivery/air freight *(W. Coast dock delays)*
  - Orders lost due to delivery or slow response
  - Quality
  - Excess inventory
  - Travel
  - Late night calls
  - IP loss or risk
  - Regulatory issues
  - Purchase price rising
  - Corruption
  - Violence
  - Natural disasters or political instability
Selling using TCO

- Focus on profit impact, risk management, strategic benefits
- Overcome mandates
- Many Supply Chain Managers believe
- Work with natural allies:
  - Lean, Green, compliance, quality, line management
- Maximize the advantages of proximity
- Match “Chinese” price or ......?
Investing using TCO

- By understanding:
  - the advantage of producing near the consumer, and
  - the small TCO gap instead of the large price gap
- U.S. companies can:
  - justify domestic investment, process improvement, automation, training, etc.
- And do not have to sacrifice quality, delivery, time-to-market, or employees to be competitive and profitable.
A non-profit with 28 sponsors

Platinum

AMT
THE ASSOCIATION FOR MANUFACTURING TECHNOLOGY

Bank of America
Merrill Lynch

Gold

dgs
MARKETING ENGINEERS’

United Grinding
KÖRBER SOLUTIONS

NMA
THE AMERICAN RESOURCE

Silver

Mazak
Your Partner for Innovation

NTMA
PRECISION

PMA
PRECISION METALFORMING ASSOCIATION

The Wessel Group

sme
Making the future. Together.

AME
Association for Manufacturing Excellence
A non-profit with 28 sponsors

Bronze
- spi (the plastics industry trade association)
- FMA
- Royal Products
- AFS
- DOOSAN

Steel
- Swiss Machine Tool Society
- BIG KAISER
- ERA
- NIMS

Iron
- California Coalition Metals
- Canadian Tooling & Machining Association
- EROWA system solutions
- MSSC
- Starrag
Help Reverse the Offshoring Flood Now!

Contact:
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