

# “Innovation Shift” to the Emerging Economies: Cases from IT and Heavy Industries

Leonard Lynn  
Case Western University  
leonard.lynn@case.edu

Hal Salzman  
The Urban Institute  
HSalzman@ui.urban.org

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# Beyond Offshoring: the traditional offshoring model

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Offshoring:

- Cost reduction
- Low value added at emerging economy sites
- Mature product/process, commodity
- Not core to the firm
- MNE in control of every aspect of technology value chain
- Minimal contribution to indigenous technology capabilities



# Beyond Offshoring: The Innovation Shift

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## Globalization:

- Technology augmenting
- High value added at emerging economy sites
- New products/processes for global economy
- Areas previously considered core to the firm
- Global distribution of activities with little “hierarchical” ordering
- Innovation and core activities developed, often experimentally, in multiple regions

Shift from offshoring to globalization occurs incrementally,  
iteratively

# The Old Globalization Model and The Old Beetle....

- > **1938:** The New York Times, reporting on a new car factory in Wolfsburg, Germany, describes the car as a "shiny black Beetle."
- > **1949:** The Beetle is exported, including two to the USA
- > **1962,** Mexico decrees that any automaker that wants to sell cars in Mexico has to produce them in Mexico



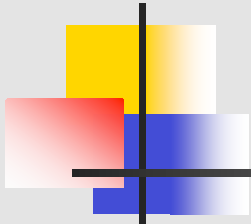
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During nearly 40 years of VW auto production in Mexico, and 25 years of Beetle production *exclusively* in Latin America, for sale in Latin America:

"Only four colleges offer a 4 year-program in manufacturing engineering and there is **no** automotive engineering program in Mexico" (as of 1998)\*.

\*Carlos Acosta, Wiselaw Switek and Carlos Calderon (1998). "Mexican Automotive Manufacturing and its Implications to Education." *Proceedings of the 2nd International Conference on Education in Manufacturing*. San Diego, California.

# The New Beetle... New Globalization



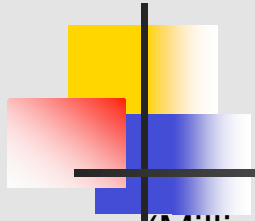
**One global Product**

**Many Different Target Markets**  
**One Production Location**

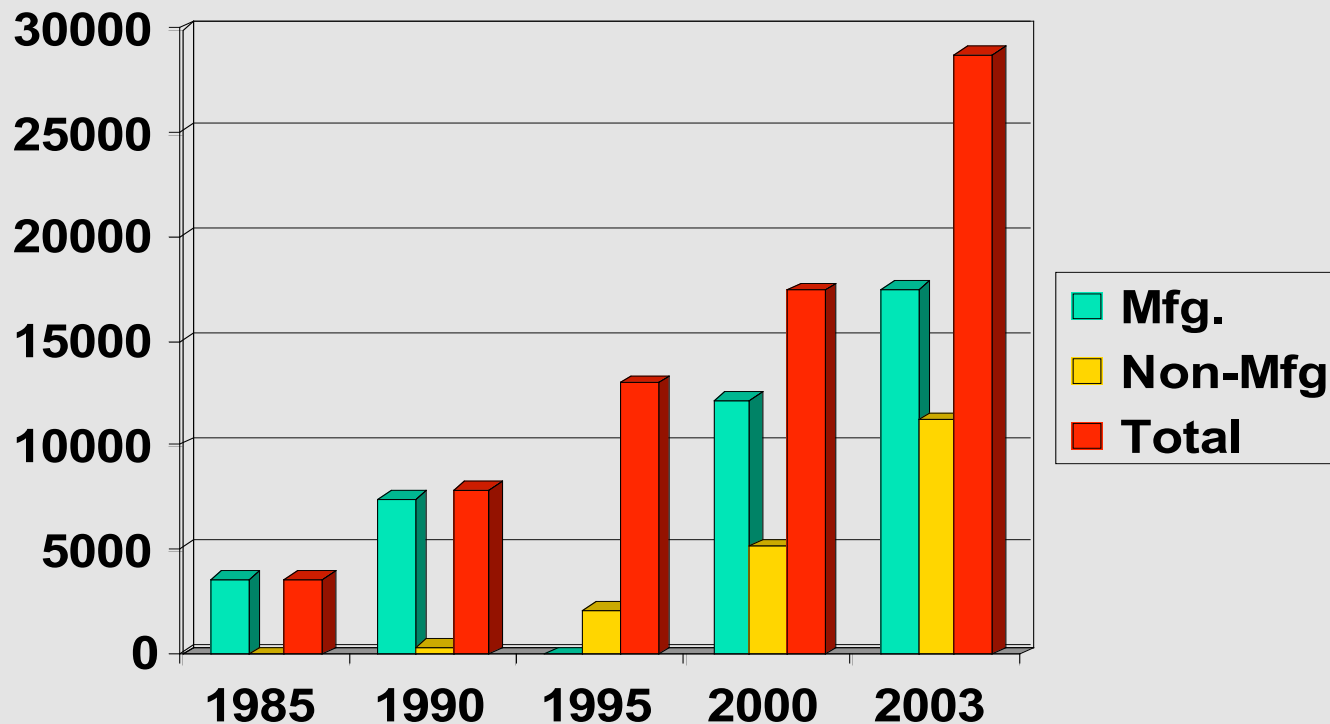


From: "Product Localization Strategies: In The Mexican And German Automobile Industry" Prof. Carlos Acosta/Universidad de las Américas - Puebla, Mexico

# U.S. Company and other nonfederal funds for industrial R&D performance abroad: 1985-2003

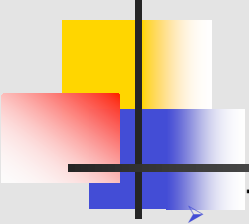


(Millions of current U.S. dollars)



Source: National Science Foundation *Science & Engineering Indicators 2006*

# Our research: themes and sample



Themes: New dynamics of globalization, R&D/engineering strategies of firms, university responses and globalization strategies, emerging patterns of global technology entrepreneurship, changing migration dynamics

➤ Sample:

MNEs based in U.S., Europe, and Japan, with engineering facilities in China, Latin America, and/or India

Technology suppliers to these firms

(N=25 MNE sites + ~12 small firms in 9 countries)

Interview respondents: managers and engineers (N>200)

Industries: Electrical/Mechanical/Power systems; Autos and Aerospace (OEM and component/parts suppliers); Information Technology (hardware and software)

# Interview Sites

	Industry	Electrical, Electronics	Heavy Industries: Power generation, vehicle mfg	IT hardware or software	Country total
Country					
	US	11	10	7	28
	Europe	3	2	1	6
	Japan	1	1		2
	South Korea	1	1		2
	Brazil	-	1	-	1
	China	7	2	3	12
	Mexico	-	3	-	3
	India	1	-	8	8
Industry total		24	20	19	63

Four sites in others industries were also studied.

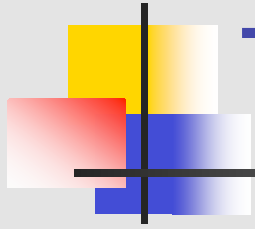




# Globally distributed engineering – Four firms

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- *ALL-IT*: Global IT services company develops and maintains large back office systems
- *PC Products (PCP)*: Global producer of software for computer systems
- *Powerstar*: US based producer of heavy electrical equipment
- *EnergySystems*: Power systems division of U.S. MNE active in wide range of industries.



# Three areas of special interest

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- What were the motivating factors?
- What were the processes by which offshoring took place?
- What have been the outcomes, and where do they seem to be leading?

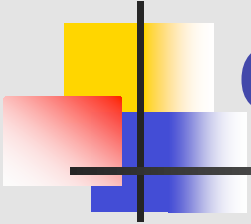


# Motivating factors & Processes

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- ALL-IT
  - ❖ Wall Street analysts require offshore plan
- PCP
  - ❖ QA teams and offshore firms address global technology needs incrementally, demonstrate capabilities
  - ❖ Tap local talent pool, facilitated by reverse migration of current employees
- Powerstar
  - ❖ New CEO had worked in Asia region; engineering first to support local manufacturing, later expanded engineering capabilities through “bottom up” push
- EnergySystems
  - ❖ Obtain local contracts required local operations

# The lure of emerging economies



Quote from Indian engineering manager who returned to India after several years in California:

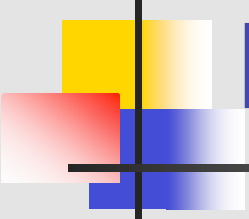
“It’s exciting to be here. It’s like Silicon Valley in the past; Bangalore feels the same way as the Valley.”



# Globalization process

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- In heavy industries, engineering first follows manufacturing
- Engineering and innovation first focuses on localization
- “Value chain creep” and local solutions lead to global innovation
- ...facilitated by re-patriation and retention of human capital



# Quote from programmer in Bangalore

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“We specialize in our areas of expertise: the U.S. has the knowledge of the legacy systems since they developed them, and we work on the new systems .... We are younger and have learned the new programming languages for these systems.”



# Outcomes

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- ALL-IT
- PCP
- Powerstar
- EnergySystems

# Gains from Offshoring — EnergySystems

## ➤ Cost drives offshoring, but capacity justifies it

- ❖ “You can’t just look at the costs — that’s not the full story. If we didn’t hire over there, we wouldn’t hire at all. When you have more resources, you can do more stuff and those projects are going to generate money”

## ➤ Emergent Engineering

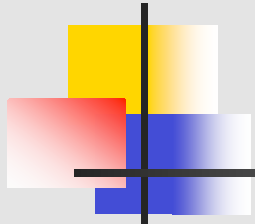
- ❖ Procedures less developed/enforced: “Since the Chinese do not have the same fixed procedures and references as other parts of [Company], they come up with some creative ideas about how to do things...think of things in new ways...”
- ❖ “We’ve been doing things the same way for so long, and have so many procedures, that we don’t always look at problems and design in new ways” [W]
- ❖ “People are looking at things with a whole new set of eyes. [At China site] it is a pretty excited bunch. They get really excited about what they do, and they are not burdened with a lot of prior history stuff. As long as the organization manages that well, this provides a great benefit. They are willing to try things that we may have convinced ourselves here that wouldn’t work. [S]
- ❖ “At [US site] they think their ideas are naturally better, and difficulty is convincing people at [US site] that this may not be true.”



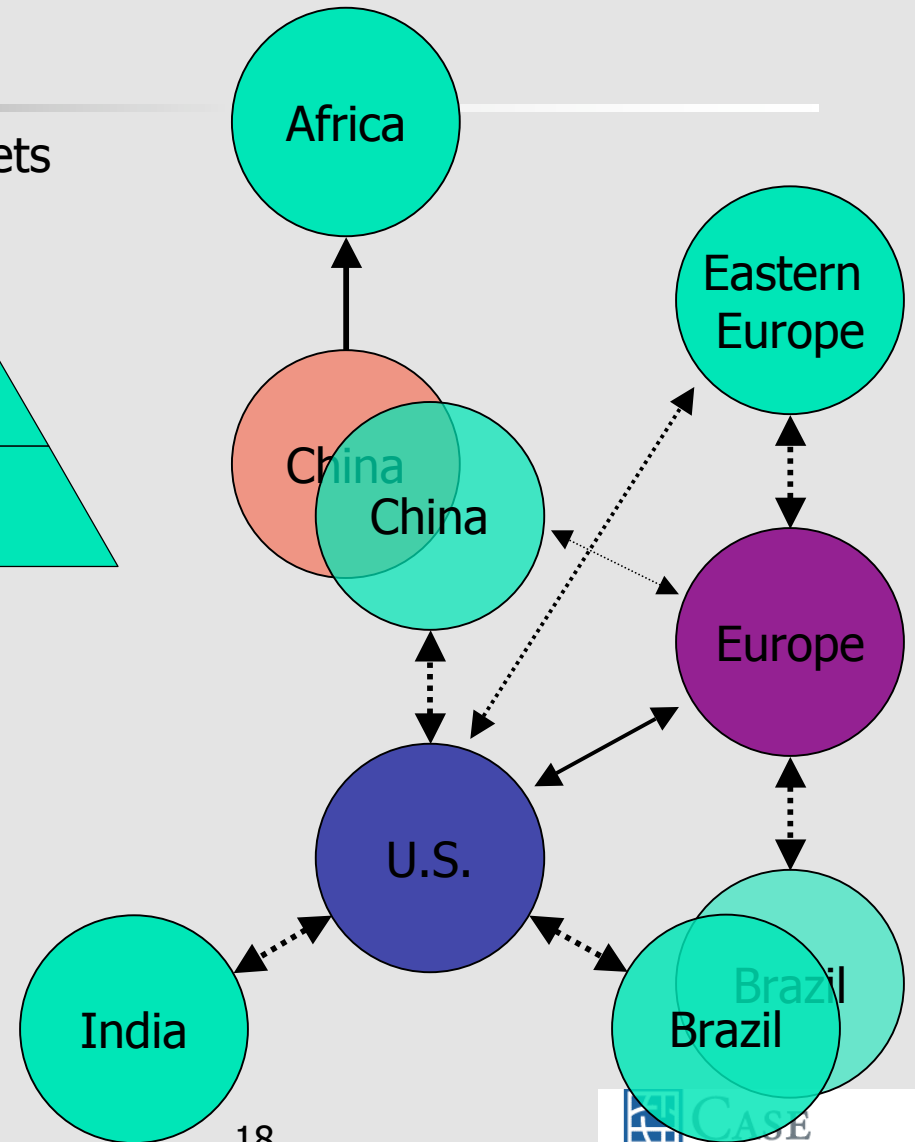
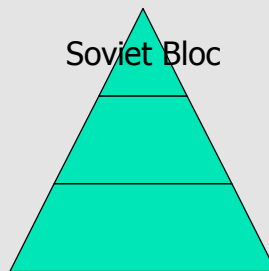
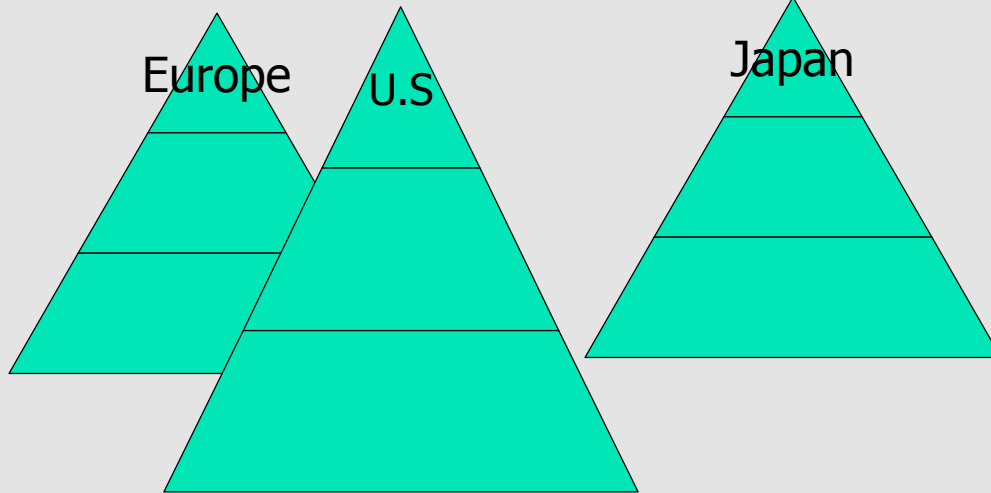
# Globalization & Innovation Shifts

- As a mature technology, shift in IT from product to process innovation and the offshore advantage....
  - ❖ Offshore IT:
    - CMMI (Capability Maturity Model® Integration)—process & methods
    - Formalization & Explicit Knowledge due to distance – transformation from an art to a process/method
- Indigenous engineering and science
  - ❖ Reflects local conditions
  - ❖ Addresses global needs

# From dominant hierarchy to strong network node: Emerging Innovation Centers



Technology, Collaborators, Markets



# Challenges of Globalization

*How to structure organization and strategy for mutual gain?*

- “Home court advantage” is diminished – there may declining comparative advantage to the home market/location for future growth
  - ❖ Growth market location
  - ❖ Technology expertise that depends on context
- Offshoring driven by strategy, not cost
  - ❖ Careful about the offshoring bandwagon
  - ❖ Careful about disinvesting in domestic capacity (internal and collaborations, e.g., with universities)
- Cross-boundary engineering is new engineering paradigm across
  - ❖ Disciplines/technology types/modalities
  - ❖ Organizations
  - ❖ Countries & Culture
  - ❖ Time & Distance
- Growth markets require engineering outside domestic experience
  - ❖ Technology needs different
- Collaboration skills different from:
  - ❖ traditional *engineering* skills
  - ❖ traditional *team* skills
  - ❖ traditional *managerial* skills

# Comments/Suggestions Welcome

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Leonard Lynn

[Leonard.Lynn@Case.Edu](mailto:Leonard.Lynn@Case.Edu)

Hal Salzman

[HSalzman@ui.urban.org](mailto:HSalzman@ui.urban.org)



# The Challenges of Offshoring & Outsourcing

- Driven by cost, stay for innovation
  - ❖ understanding real costs shifts strategy – from seeking low cost to seeking strategic advantage (innovation, local market presence)
  - ❖ Senior management wants both speed/low cost *and* high quality and standard process – goals in conflict.
- Offshore outsourcing blends two strategies in high risk strategy
  - ❖ creating competitors
- The challenge of offshore engineers: managing expectations for cutting-edge engineering
  - ❖ transferring knowledge and technology
- Offshore investment can lead to onshore disinvestment
  - ❖ can lead to loss of core competencies (company and country), especially in times of overcapacity

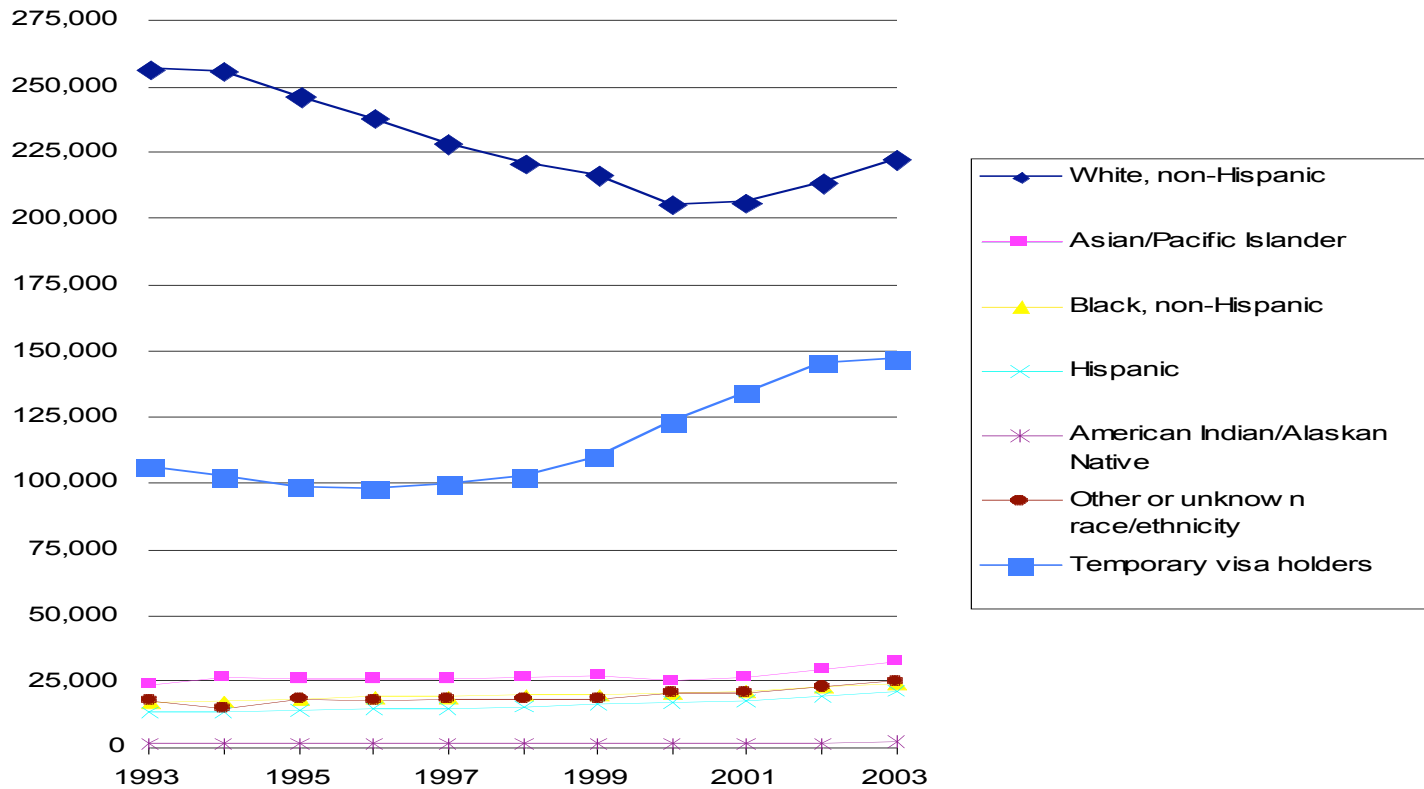


# Trends & Industry/Company Experiences in Global Engineering

- New product lifecycle pressures:
  - ❖ Need to recoup investment and profit more quickly because of IP loss;
  - ❖ creates pressure for product life cycle that is determined by the length of time it takes to copy and compete
  
- Loss of domestic capacity drives high degree of offshoring and outsourcing
  - ❖ Extensive offshoring/outsourcing begets more and more, with consequent loss of inhouse or domestic capacity
  - ❖ Offshore/outsourced firms may have goal of becoming global competitors (unlike domestic suppliers where market niche, capabilities, and institutional arrangements lower risk of creating competitors via outsourcing)
  - ❖ Firms are weakening their funding and collaboration with U.S. colleges because they are hiring offshore instead of domestic graduates
  
- Offshore labor and skills uncertain:
  - ❖ McKinsey & Co. predict talent shortage\*
    - Misperception about potential because focus is on the quantity of engineers, not depth and experience of talent available

# Human Capital Flows

**STEM Graduate Enrollments by Race/ethnicity and Visa Status**



# New Globalization Flows of technology & human capital

