

Council of Graduate Schools

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***The MIT Globalization Study
Implications and Questions for Graduate
Education***

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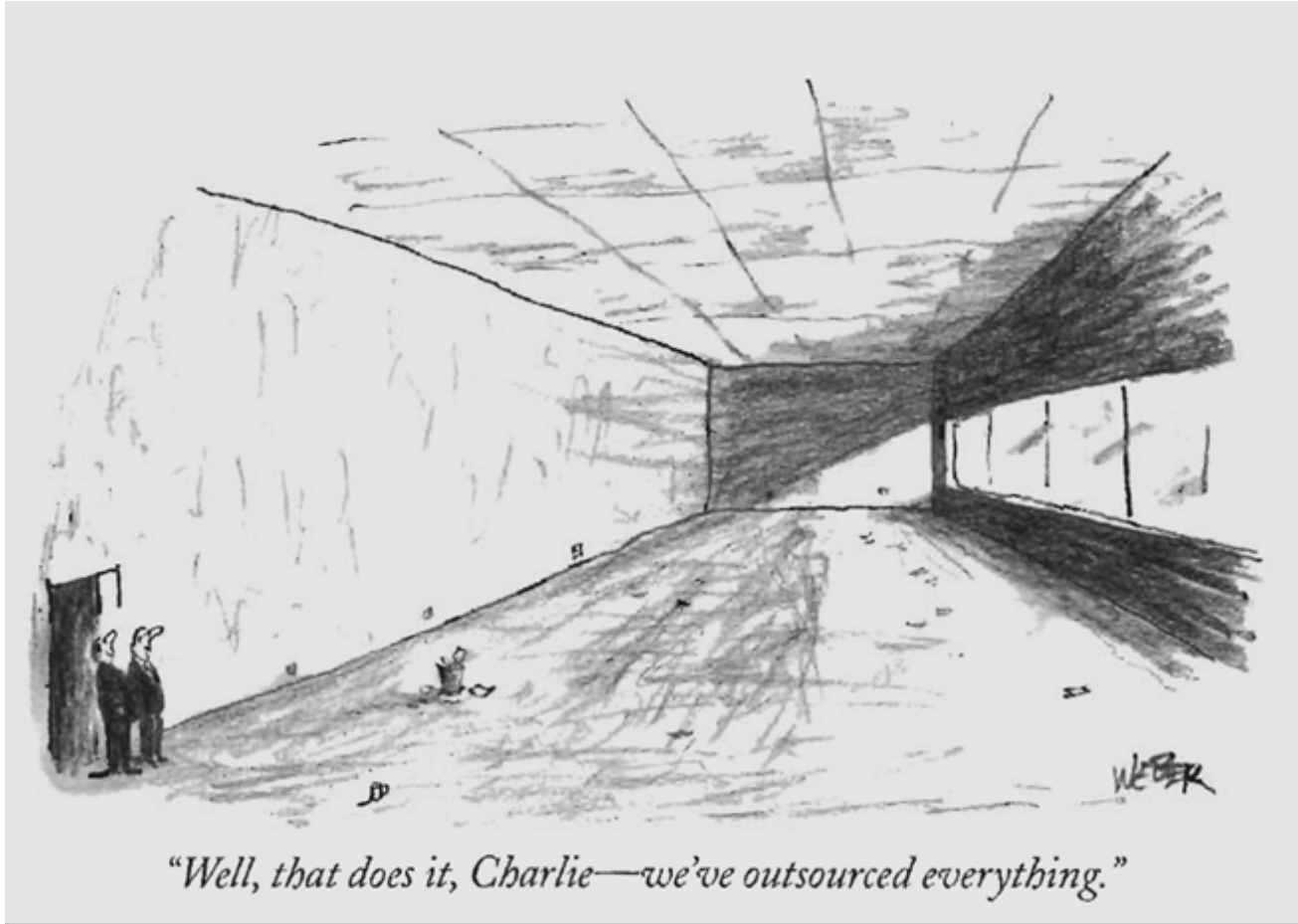
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Results reported in Suzanne Berger, ***How We Compete: What Companies Around the World Are Doing To Make It In the New Global Economy***

The Fear



Research Goal

To analyze the impact of globalization on the prospects for innovation, economic growth, social wellbeing and political stability in different societies.

Note: '*Globalization*' refers to the set of changes in the international economic arena and in the domestic economies of nations that tend towards the creation of a single world market for wages, capital, goods, and services.

The Two Questions

1. *Reorganization?*

- + What to keep within the four walls of the company?
- + What to outsource?

2. *Relocation?*

- + What to keep at home?
- + What to offshore?



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Interview Data

Companies Interviewed by Sector

Textile, Retail, Apparel	188
Electronics	187
Automotive	59
Other/industry	50
Publishing	22
	506

Note: 38 additional organizations were interviewed. This includes government officials, trade associations, and academics.

Interview Data

Country of Company Ownership	
USA	70
Germany	56
Italy	42
France	33
United Kingdom	31
Other-Europe	26
Romania	2
Israel	24
Japan	32
China	34
Taiwan	134
Other-Asia	18
Canada	4
	<hr/>
	506

Other Europe: Ireland, Monaco, Netherlands, Sweden, Scotland

Other Asia: Indonesia, Philippines, Malaysia, Thailand, Singapore,
India, South Korea



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Processes of Change

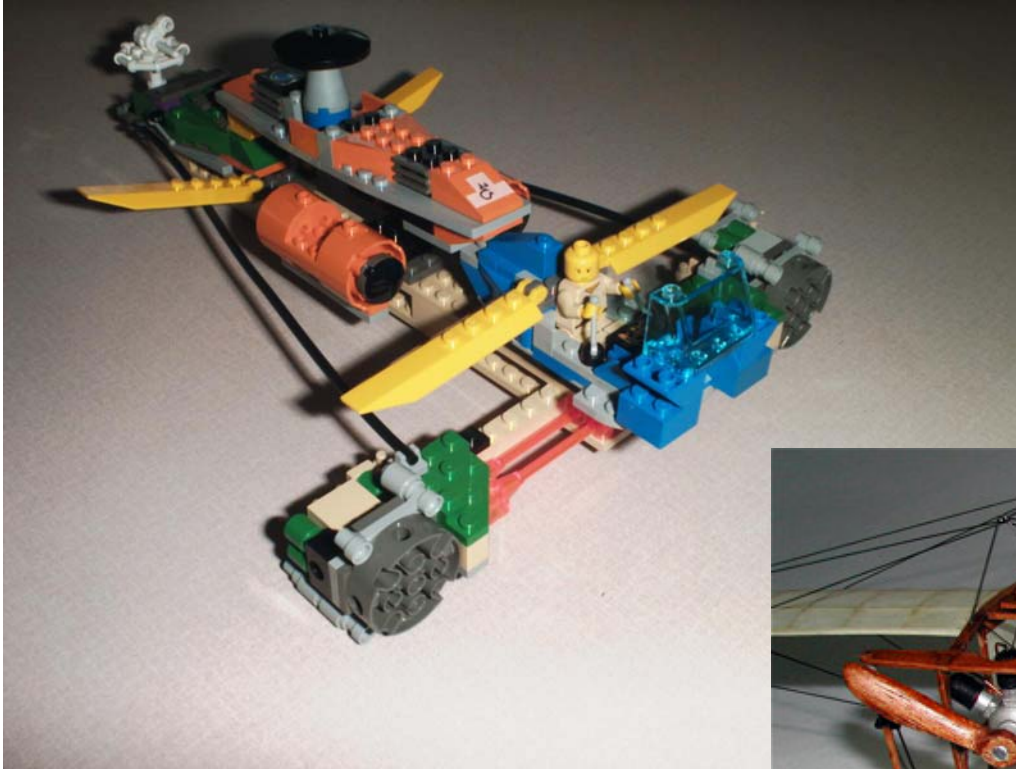
Drivers

- a. New markets
- b. Market volatility
- c. Liberalization of trade, finance and investment

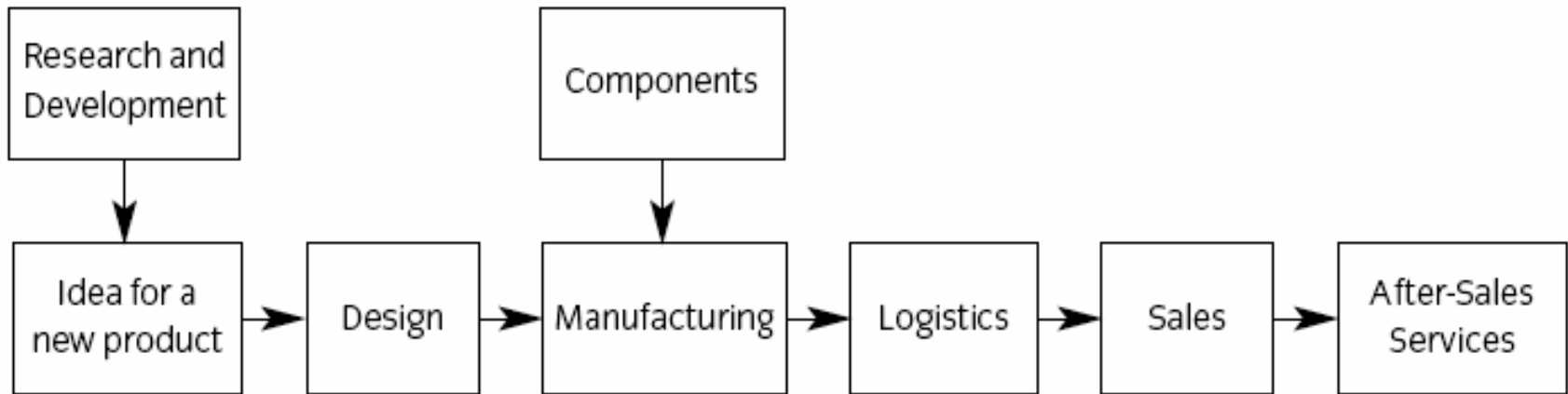
Enablers

- a. New technologies (codifiable specifications; industry standards)
- b. New spaces for production

Legos or Models?



From Ideas to Customers



Some of the Findings

Resilience of Diversity

- Many models of Success: No Silver Bullet
 - + Dell vs. Samsung
 - + Zara vs. Gap

Some of the Findings

Build on Legacies at Home

- How to Live with China
 - + Japanese Firms
 - + US Firms

Some of the Findings

Build on Legacies at Home

- How to Sustain Innovation in a Fragmented System

Changing Face of Electronics Products

- Traditional consumer electronics examples
 - Audio, Video, Telephones
- Traditional PC electronics examples
 - PCs, Laptops, Peripherals
- Examples of PC/Consumer electronics products
 - DSCs, MP3 players, Cell phones, PDAs, DVDs

Rapid convergence of consumer and PC electronics offers interesting opportunities

Electronics Value Chain

- **Multinational Companies**, eg Apple, Hewlett-Packard, Sony, Samsung
 - + Strong in Product Definition, Marketing, Distribution and Service
 - + Detailed Design and Manufacturing - often sub-contracted
 - + Product Definition requires knowledge of market
- **Original Design Manufacturer (ODM)**, eg Quanta, Foxconn
- **Contract Manufacturer (CM)**, eg Solectron, Flextronics

Product
Definition

Design

Manufacturing
& Test

Marketing &
Distribution

Service



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Opportunity for New Business Models

- *Combine* innovative product definition with special purpose chip design
- Technology developed at university
 - Brightness Adaptive Imaging
 - Low power image sensor design
- At Company
 - Innovative product definition
 - Complete re-design of image sensor and ASIC for product application



New Business Models (con't)

- HP Printers
 - Product definition
 - Ink Jet components to protect product
- Apple IPOD
 - Product definition
 - Service - I-Tunes
- Dell Computer
 - Product Distribution
 - Service

From “Made in America” to “Made All Over”

1980s

Emphasis on proximity

Bring together research, development, design, production and marketing to promote innovation, quality and efficiency

Locate core firm activities close to lead customers and best suppliers to promote JIT & mutual learning

TODAY

Massive fragmentation of production systems

Redistribution of activities between “home” societies and “host” societies (globalization) in search of cheap land and labor and market access

Redivision of production between brands, product definition and design, contract manufacturers, assemblers, distributors, retailers

Some Implications for EECS

Our graduates will work in a world in which the fragmentation of research, product definition, design, manufacturing, distribution, and service require them to know how to:

- **Determine core capabilities** within their own company
- **Locate and access** complementary functions and production capabilities both domestically and internationally;
- **Coordinate activities** and cooperate with partners across their own company and with other companies around the world;

New Growth Markets in Emerging Economies

- As large emerging societies such as India and China achieve enough wealth, their markets will demand goods that are tailored to their specific needs.
- Who will be the leaders in these new markets?
- Can our graduates learn these new markets?
 - **Recall how Japan spent 20 years to learn US market to be able to design products for the US market.**

Some Implications for EECS

Our graduates will design goods and services in a world that has market requirements that are different from our home markets.

- Need to understand modern culture of emerging economies to design goods/services that satisfy their specific needs.
- These needs will change quickly over time.
- Example: At present China wants two types of electronic goods
 - Extremely low cost with “just enough” functionality
 - High end designer “gadgets”
 - BUT WHAT ARE THE DETAILS?



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One Idea: Internationalize MIT EECS VI-A Program

WHAT IS MIT EECS VI-A Program?

- A cooperative education program that combines practical experience in industry with academic studies.
- Industry based Masters of Engineering Thesis Project performed at the company
- MIT EECS faculty advisor visits company each summer
 - Discuss status of each student thesis project
 - Meet with company executives to ensure continued support for students and program
 - Discuss current research topics

Responsibilities of VI-A Students and Companies

- Students are “Ambassadors for MIT-EECS”
 - Provide highest quality engineering work at company
 - Ensure future students will have similar opportunities by respecting your commitments
- Companies are “Hosts to MIT-EECS students”
 - Provide interesting projects involving state-of-the-art technology during the summer internship and the thesis project
 - Provide VI-A Fellowship to fund MEng project
 - Identify company *technical* champion to interact with MIT faculty liaison

VI-A International

- Program coordinated with MISTI to provide cultural/language assistance
 - Ensure students have some language skills and more importantly cultural skills
- Graduates
 - Learn engineering in a globalized environment
 - Offer US perspective at foreign locations
 - Experience at working/living abroad
 - This program is one prototype for the future of engineering education

MISTI MIT International Science and Technology Initiatives

To internationalize MIT education and research

- With the globalization of science, technology, and economy, we need to prepare our students for leadership in a new world
- Important centers of innovation are opening outside our own society
- To educate our students to access these advances in science and technology, we need to prepare them for lives and careers that span national boundaries

MISTI International Internships

- Since 1983, MISTI has placed more than 2300 students into companies and labs from Beijing to Berlin. 60 % have been in engineering. 40% were grad students
- All programs are open to undergraduates, graduates, and recent alumni
- MISTI places students from all areas of study
- Training in the language and culture of the host country precedes stay abroad
- All expenses paid

Should we educate the world's best students or is that giving away our advantage?

- In the 1980's foreign students stayed in the US and contributed to advancing the electronics/semiconductor industry, as well as other industries.
- Currently, foreign students are returning home after some experience here or even right after school.
- **If we learn to maintain contact with these students they can serve as a network to global production systems.**

Summary: We Must Ensure Continued Leadership in Engineering Education

- Provide on campus preparation for foreign experiences.
- Offer experiences that teach students how to work in a world of a distributed research, design, production, marketing, and distribution.
- Design programs that enable students to become familiar with large emerging markets.
- Attract the best students from around the world to study in US engineering schools.