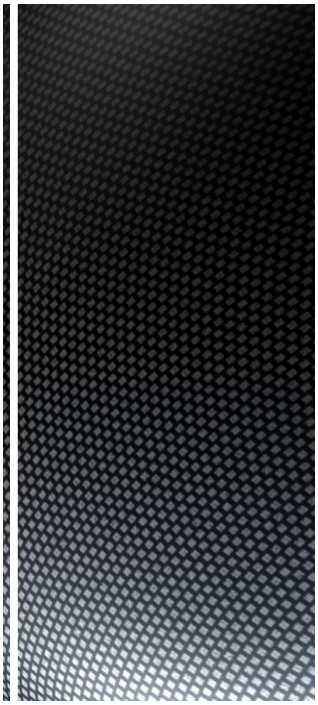


CIM (21-548)

Advanced Manufacturing Laboratory
Department of Industrial Engineering
Sharif University of Technology

Session # 2

Course Description

- *Instructor*
  - *Omid Fatahi Valilai, Ph.D. Industrial Engineering Department, Sharif University of Technology*
  - *Email: FValilai@sharif.edu , Tel: 6616-5706*
  - *Website: Sharif.edu/~fvalilai*
- *Class time*
  - *Sunday-Tuesday* *09:00-10:30*
- *Course evaluation*
  - *Mid-term* *(30%)*
  - *Final exam* *(50%)*
  - *Quiz* *(5%)*
  - *Exercise* *(15%)*

Course Description *(Continued ...)*

- *Mid-term session:*
  - *Sunday: 16th Azar 1393, 09:00 ~ 10:30*
- *Final Exam:*
  - *Tuesday: 30th Dey 1393, 15:00 ~ 17:30*
- *Reference:*
  - *Schaefer, D., Cloud-based Design and Manufacturing (CBDM): A Service-Oriented Product Development Paradigm for the 21st Century, . London: Springer, 2014*
  - *Koren, Y., "The Global Manufacturing Revolution", Wiley, 2010*
  - *Nasr, A., "Computer-Based Design and Manufacturing An Information-Based Approach",Springer, 2007*
  - *Mitchell, F.H., "CIM Systems: An Introduction to Computer-Integrated Manufacturing", Prentice Hall College Div; 1St Edition edition (January 1991), ISBN: 978-0131332997*

Course Description *(Continued..)*

- *Contents:*
  - *Globalization and Manufacturing Paradigms* *(8 sessions)*
  - *System Concepts* *(3 sessions)*
  - *Evolution of Manufacturing systems* *(2 sessions)*
  - *Manufacturing System Design* *(4 sessions)*
  - *Manufacturing Equipment Design* *(3 sessions)*
  - *Information flow in Manufacturing Systems* *(4 sessions)*
  - *Product design and Manufacturing System* *(3 sessions)*
  - *Manufacturing System Implementation* *(5 sessions)*

Course Description *(Continued..)*

- *Contents:*
  - *Globalization and Manufacturing Paradigms* *(8 sessions)*
    - *The Importance of Manufacturing to Society*
    - *The Basics of Manufacturing in Large Quantities*
    - *The 1990s: A Decade of Intensified Globalization*
    - *The Global Manufacturing Revolution*
    - *The Manufacturing Paradigm Model*
    - *Four Major Manufacturing Paradigms*

Globalization and Manufacturing Paradigms

- *The importance of manufacturing to society*
  - *Success in such a turbulent environment requires*
    - *Having a strong base of manufacturing is important to any advanced country because it impels and stimulates all the other sectors of the economy.*
    - *It provides a wide variety of jobs, both blue- and white-collar jobs, which bring higher standards of living to many sectors in society, builds a strong middle class.*

The most important benefit to society is that manufacturing creates wealth.

Globalization and Manufacturing Paradigms

- *The importance of manufacturing to society*

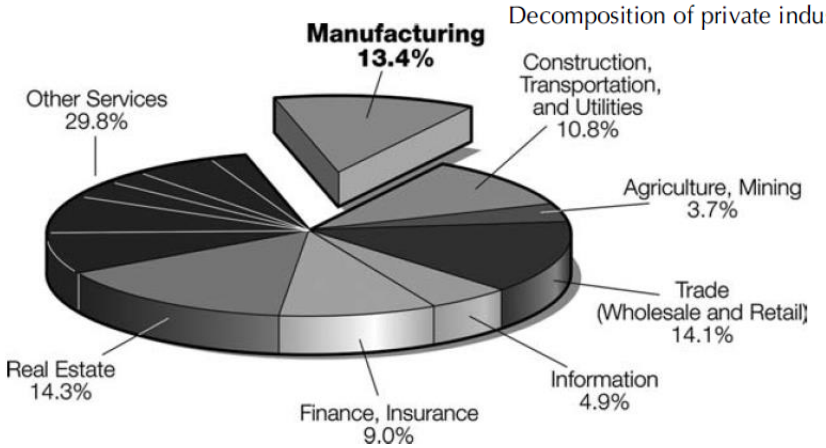
Only art, agriculture, construction, and manufacturing, and more recently the software industry, create something of value from nothing.

Manufacturing still remains the largest productive sector in the overall U.S. economy.

Globalization and Manufacturing Paradigms

- *The importance of manufacturing to society*

Decomposition of private industries in 2007.



Globalization and Manufacturing Paradigms

- *Concepts:*
  - *Globalization is the integration and interdependency of world markets and resources in producing consumer goods and services*
  - *Globalization has created a new, unprecedented landscape for the manufacturing industry:*
    - *Fierce competition*
    - *Short windows of market opportunity*
    - *Frequent product introductions, and*
    - *Rapid changes in product demand.*

Globalization and Manufacturing Paradigms

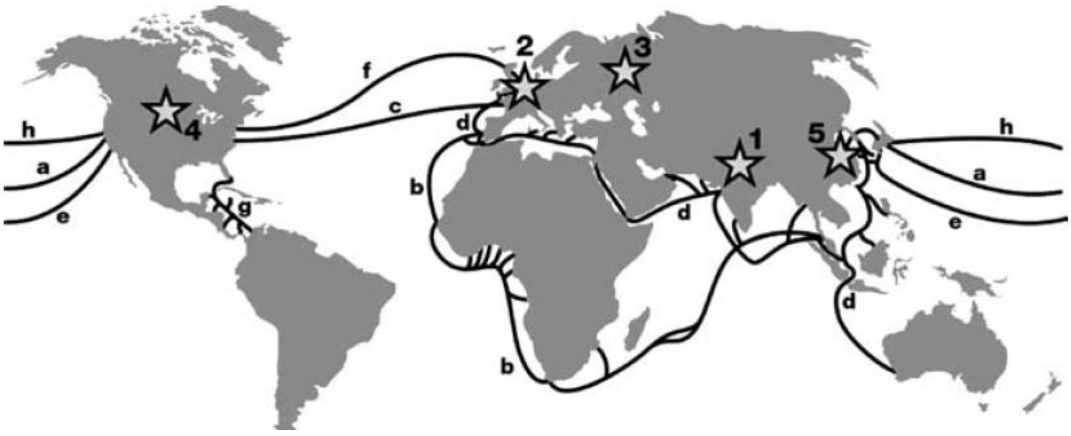
- *Concepts:*
  - *Success in such a turbulent environment requires*
    - *A global enterprise structure that can*
      - *Rapidly respond to changing markets and customer's needs.*
      - *This enterprise should be equipped with a manufacturing system that can be rapidly changed and reconfigured to respond to volatile demand.*

Globalization and Manufacturing Paradigms

Significant Events Marking a Decade of Intensified Globalization

1	1991	**India** was opened to foreign investments by "economic liberalization package," initiated by Dr. Singh, at that time India Finance Minister (he later became Prime Minister)
2	1992	The **European Union** was created
3	1992	**Russia**'s prices were freed and President Yeltsin started enterprise privatization
	1993	**Boeing** Design Center was established in Moscow with 350 engineers
4	1994	**NAFTA** (North America Free Trade Agreement—US, Canada, Mexico) was formed
	1994	**GM** decided to build engine parts in China
	1995	**Ford** India was established as a joint venture with Mahindra to assemble the Ford Escort
	1995	**Delphi** Automotive opened its first factory in China (producing batteries)
	1997	**General Motors Shanghai** (GMS) was established as a 50–50 joint venture partnership with Shanghai Automotive Industry Corp. In 2005, GMS sold 325,000 vehicles in China
	1998	**DaimlerChrysler** was formed by a merger of Daimler–Benz (the manufacturer of Mercedes–Benz, Germany) and the Chrysler Corp. (USA)
	1999	**Ford** India bought out a majority stake from Mahindra and started to produce the Ikon, Fusion, and Fiesta
5	2001	**China** joined the World Trade Organization
a–h	1992–2001	**High-capacity Transoceanic fiber-optic cable** deployments around the world

Globalization and Manufacturing Paradigms



Globalization and Manufacturing Paradigms

14

Globalization and Manufacturing Paradigms

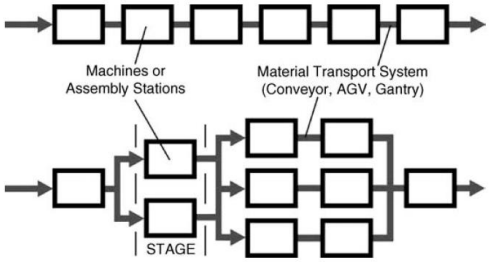
Examples of Transoceanic Fiber-optics Cables; Frequency × 1000 Within 10 Years

	Year	Cable	Frequency
a	1992	PC-4 (Trans-Pacific cable 4), connecting United States with Japan	0.56 Gb/second
b	1993	SAT-2 connecting South Africa with West Africa Portugal, and Spain	2 Gb/second
c	1996	Trans-Atlantic (TAT) cable utilizing new fiber-optic technology	20 Gb/second
d	1998	Connecting Australia and Singapore with Germany through the Suez canal	60 Gb/second
e	1999	China–United States cable network (CUCN), over 12,000 km, connecting the U.S. West coast with China, Taiwan, Korea, and Japan	120 Gb/second
f	1999	AC-1 (Atlantic Crossing) new ring-cable, connecting New York with the UK, the Netherlands, Germany, and back to NY	160 Gb/second
g	2000	MAYA-1 connecting Costa Rica and Panama to Mexico and Florida	
h	2001	PC-1 (Pacific Crossing) Japan—U.S. West Coast	640 Gb/second

15

Globalization and Manufacturing Paradigms

- *The basics of manufacturing in large quantities*
  - *When the manufacturer intends to produce large quantities of the product a more economical method is required.*
  - *If large quantities were produced in the same way as the prototype, each product could be 10–20 times more expensive than the ones produced by a well designed manufacturing system.*
  - *For large quantities of products, a manufacturing system capable of **mass production** has to be developed.*



Globalization and Manufacturing Paradigms

- *The basics of manufacturing in large quantities*
  - *In a globally competitive environment, designing a cost-effective manufacturing system and operating it efficiently is a key competitive challenge especially when competitors have an advantage in countries where labor costs are substantially smaller.*
  - *At the dawn of the twenty-first century, industries around the world used two basic types of manufacturing systems:*
    - *Dedicated manufacturing lines (DMLs) and*
    - *Flexible Manufacturing Systems (FMSs).*