Globalization of E&C Industry

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Session 2
The engineering & construction industry is currently in a transition state. Forces from both the demand and the supply sides have made it necessary to re-examine strategies for growth and competitiveness.
**Constructed Facilities**

**Setting Constraints**
- Establishing:
  - Limits to intrusion
  - Need for protection

**Setting Demand**
- Establishing:
  - Policies
  - Regulations
  - Norms and Standards

**Enabling Supply Provision**
- Providing:
  - Know-how
  - Management
  - Organization
The Role and Importance of Construction in Economic Development

- Construction Sector Contribution to Gross Domestic Product (GDP)
- Construction Role in Gross Fixed Capital Formation
- Construction Sector Contribution to Employment
- Construction, Industrialization and Economic Growth
  - Backward Linkages
  - Forward Linkages
  - Other Contributions
Construction

• Construction is known as the “engine of growth.”

• By any standards it is a giant.

• Some have recently called it a “sleeping giant.”

• All indications are that it is reawakening.
Two Sets of Issues of Concern to the Engineering & Construction Industry

I. How is demand for its output generated and affected by modern societies?

II. How is the industry’s supply system shaped to cope with changing demand?
Era of constant growth comes crashing down

Figure by MIT OpenCourseWare.
Total Value of Construction Put In Place

Source: US Department of Commerce Annual Value of Construction Put-in-Place in Current Dollars
Private Construction in 2004
Total $999.76 Billion

Source: Dept. of Commerce. Construction Put-In-Place. Details May Not Add Total Since All Types of Construction are not Shown Separately.
Construction Segments in 2009
Total $958 Billion

- Residential
- Lodging
- Office
- Commercial
- Health Care
- Educational
- Religious
- Amusement/Rec
- Transportation
- Communication
- Power
- Manufacturing
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<th>Rank</th>
<th>Firm</th>
<th>‘07 Revenue ($ Mil)</th>
<th>Total</th>
<th>Int’l.</th>
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A/E/C Firms Differentiation:

Four Thrust Areas

1. Technology of Assembly
   - Design
   - Construct

2. Management of Assembly on Site
   - Project Management

3. Management of Organizations Specializing in Assembly

4. Interaction of Assembled Systems with Socio-Economic Development and Environmental Protection
Product Design

Management Design

Process Design
Major Developments of the 1990’s

- Globalization and market economy
- World Trade Organization
- Financial markets and privatization
- Information technology and telecommunications
- World Wide Web and e-commerce
- Environment and sustainability
- Science and technology capability as an instrument of economic competitiveness
Consequences:

- Increased demand for movement of goods and information
- Increased demand for human resource development
- Need for increased transparency in government’s regulatory systems
- Importance of a robust science and technology infrastructure
Change

On Demand Side:
- Client
- Markets

On Supply Side:
- Technology
- Organization
Changing Nature of Demand

I. TRADE

II. ECONOMIC BLOCS

III. FINANCE

IV. ENVIRONMENT

V. TYPE OF WORK
Changing Nature of Demand

I. TRADE
- International trade in services.
- International trade in construction services and products.
- International trade in construction labor.

TREND
- Is toward further relaxation of barriers to entry into large construction markets.

IMPLICATIONS
- Increasing need to remain competitive on global basis.
Changing Nature of Demand

II. Economic Blocs:
1. North American (U.S., Canada, Mexico)
2. European Economic Community
3. Far East Centered in Japan
4. Mercusor

Trends:
1. Potential Future Bloc(s):
   - Latin America
   - Middle East
   - Indian Sub Continent

2. Realignment of Firms Within Each Bloc via:
   - Merger and Acquisition
   - Joint venturing
   - Strategic Alliances

3. Need to Expand Globally

Implications:
Further Erosion of Control over Domestic Market
Changing Nature of Demand

III. Finance

• Financial market is fully global
• New financial packaging and instruments
• Increased risk due to fluctuation in exchange rate

Trends

• Greater involvement by construction in financial packaging
• Greater equity participation
• Greater involvement in operation and management

Implications

• *A close relationship between financial firms and construction firms*
• *Financial engineering and financial packaging services*
Changing Nature of Demand

IV. Environment

• Prevention of further damage to environment
• Correction of damaged environment
• Infrastructure

Trends

• New specialization
• Increased construction opportunity
• Substantial sensitivity to sociopolitical concerns

Implications

• Niche market strategy
• New technological development
• New risk mitigation and allocation
Changing Nature of Demand

V. Type of Work

A. Energy & environment

B. Infrastructure

C. Buildings & housing

D. High-technology and industrial construction

E. Security
Changing Nature of Supply

I. Globalization

II. Manpower

III. Technological Changes
Changing Nature of Supply

I. Globalization

- Geographic
- Internal
- External

Trends

- Organizational readjustment
- Development of brand name identity
- Niche strategy
- Outsourcing

Implication(s)

- Reorganization, global perspective
Changing Nature of Supply

II. Manpower

- Demographic characteristics
- Mature labor force
- Less tolerant of physical and manual chores
- Better educated
- More mobility

Trends

- Teamwork, labor-management cooperation
- Commitment to skill development

Implication(s)

- More reliance on technology
Changing Nature of Supply

III. Technological Changes

- Advanced materials
- Automation and robotics
- Information technology
  - Sensor technology, communications technology

Trends

- Shift from on-site to off-site production
- Flexible manufacturing
- Computer-controlled production
- Smart sensors, smart agents, smart buildings

Implications

- Capital intensity
- Proprietary technology
Management of Organization

• Vertical Integration
• Horizontal Networking
• Franchising
Vertical Integration

Technological Stratification

- Niche Strategy
- Brand Name Identification
- Market Aggregation
- Market Making
Horizontal Networking

Market aggregation bargaining with

• Suppliers
• Clients
Franchising

- Marketing
- Technological know-how
- Suppliers
- Flattened organizations
Large Firms

• Global
• Vertical integration
• Proprietary knowledge

Medium Firms

• Regional independence
• Networking
• Proprietary knowledge of markets and suppliers

Small Firms

• Franchising
Projects

Computer-Based:

- Control (of time and cost)
- Inventory
- Knowledge-based systems
- Interactive systems
- Intelligent databases
Firms

- Decision support systems
- Intelligent databases
- Strategic management information systems
- Embodiment of knowledge in institutions and organizations
- Proprietary knowledge
- R&D
Historically: A Similar Situation in the 1920’s

...WHEN THE INDUSTRY’S PRODUCTIVITY INCREASED BY ALMOST AN ORDER OF MAGNITUDE DUE TO THE CONFLUENCE OF TECHNOLOGY AND MARKET

Highway Construction ➔ Market

Technology ➔ Mechanization
Surfacing

![Bar chart showing labor and capital contributions over time]

- **1920**: 100% for labor, 100% for capital
- **1950**: 20% for labor, 5% for capital
- **1970**: 15% for labor, 3% for capital
- **1980**: 21% for labor, 6% for capital

Legend:
- **Labor**
- **Capital**
Similar Opportunities Exist Today

Market Stability

Technology

- Information & Communications
- Robotics
- Engineered Materials

Infrastructure