
1.963

Globalization of E&C Industry

Fred Moavenzadeh

The Construction Industry is currently in a transition state. Forces from both the demand as well as the supply side have made it necessary to re-examine the strategies for growth and competitiveness.

Engineering and Construction Industry is Concerned with two sets of issues:

- I. How demand for its output is generated and affected by modern societies.
- II. How supply system is shaped to cope with changing demand.

TOTAL CONSTRUCTION

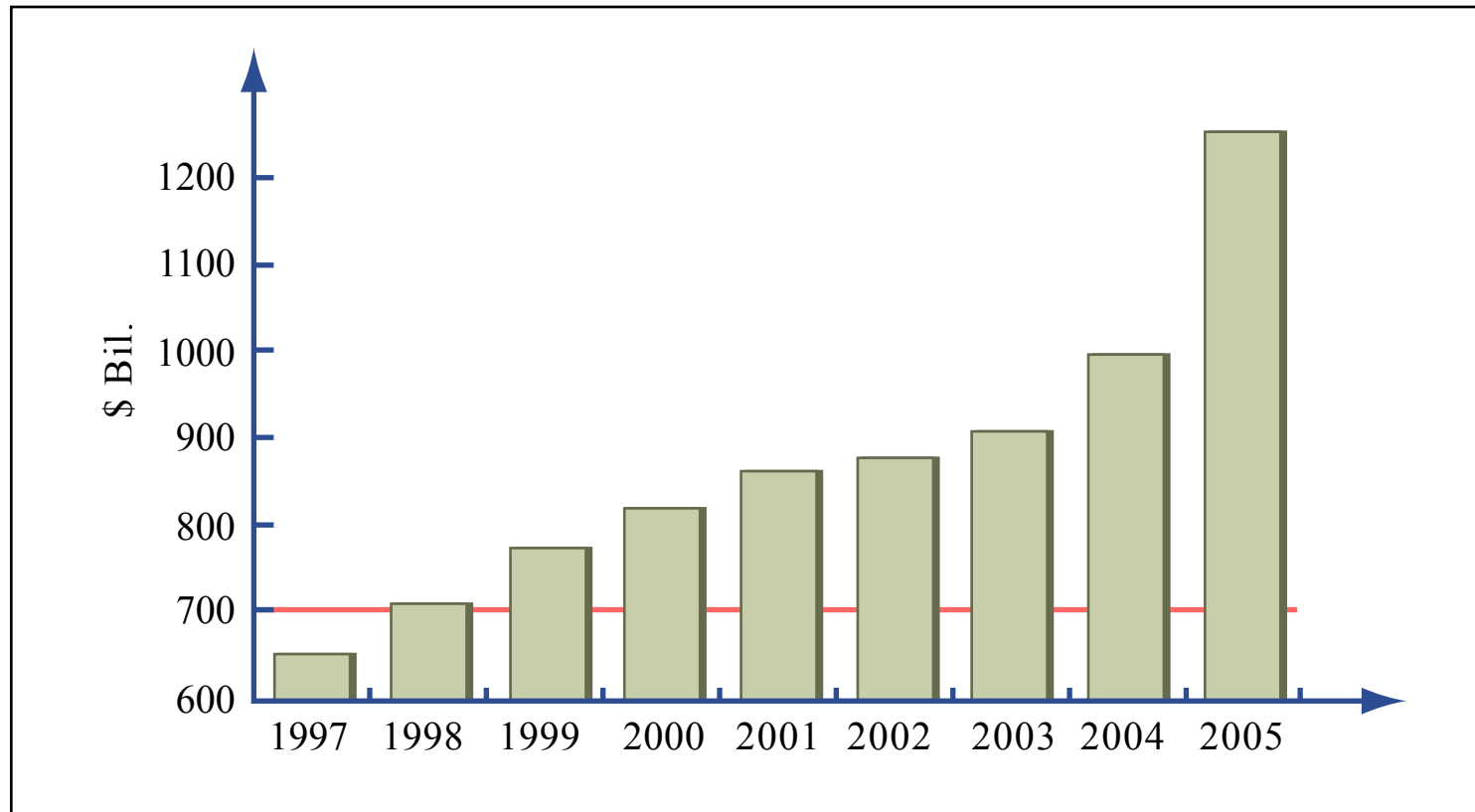


Figure by MIT OCW.

Source: U.S. Department of Commerce Annual Value of Construction Put-in-place in current dollars, 2004 Data is preliminary

Private Construction

in 2004

Total \$999.76 Billion

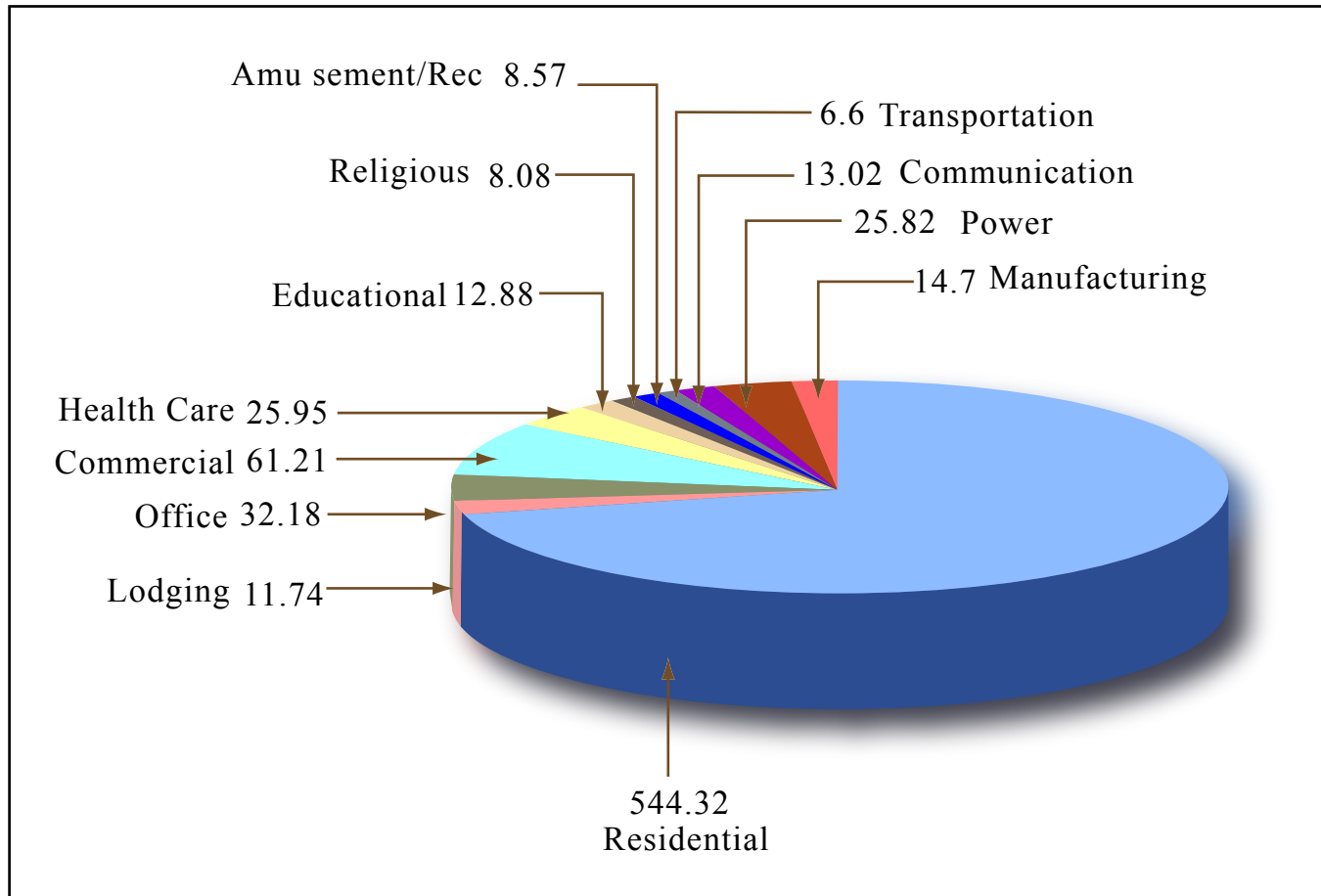


Figure by MIT OCW.

Source: Dept. of Commerce. Construction Put-In-Place. Details May Not Add Total Since All Types of Construction are not Shown Separately.

A, E&C Firms Differentiation:

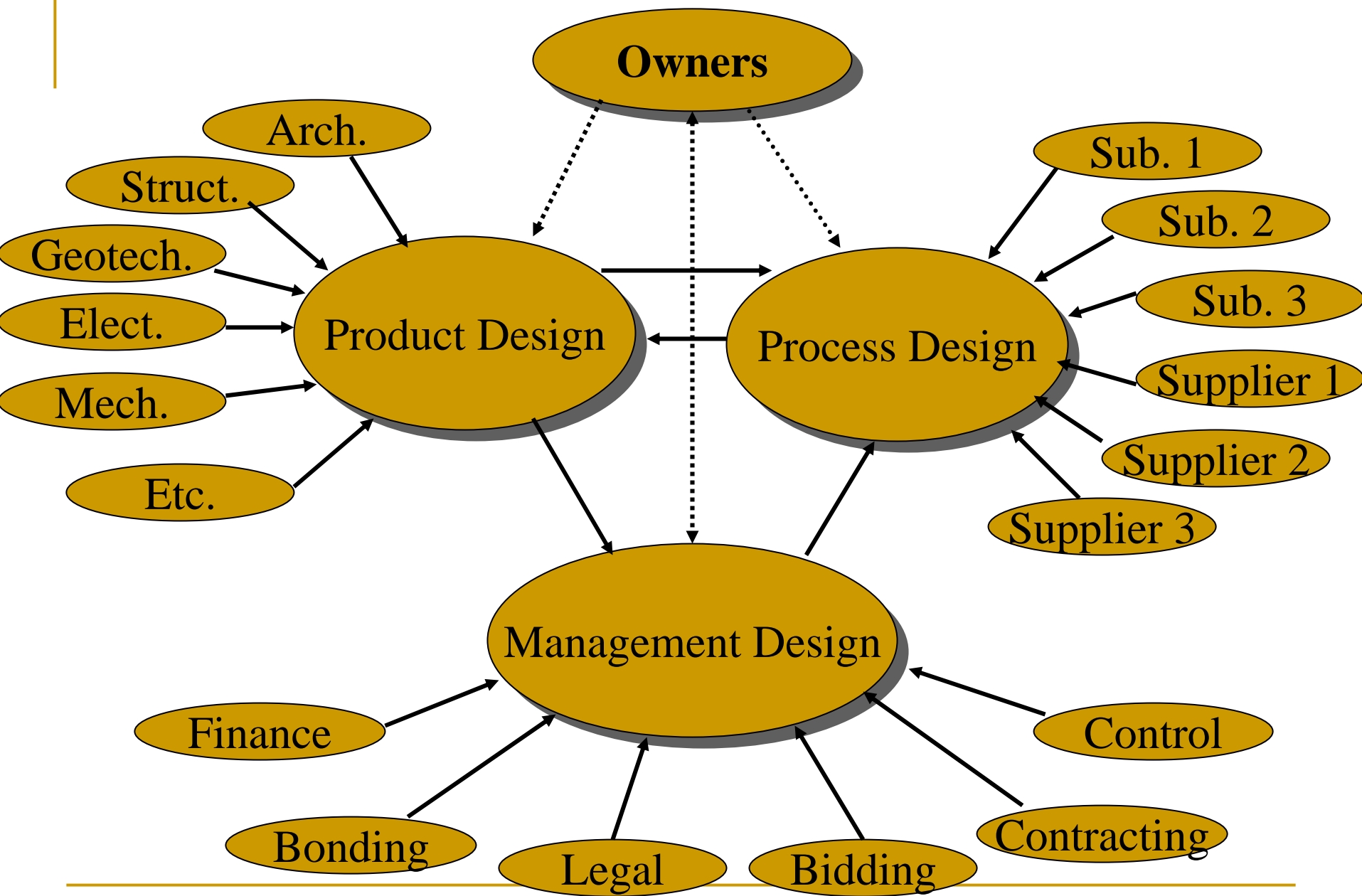
Four Thrust Areas

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

Process Design

Management 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 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:

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

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
- Out Sourcing

Implications

- *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

- *More Reliance on Technology*

Changing Nature of Supply

III. Technological Changes

- Advanced Materials
- Automation and Robotics
- Information Technology
 - Sensor Technology, Communication Technology

Trends

- Transfer from On-Site to Off-Site Production
- Flexible Manufacturing
- Computer Control 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

Project

Computer Based

- Control: Time and Cost
- Inventory
- Knowledge Based Systems
- Interactive System
- Intelligent Databases

Firms

- Decision Support Systems
- Intelligent Database
- Strategic Management Information Systems
- Embodiment of Knowledge in
 Institution and Organization
- Proprietary Knowledge
- R&D

Historically a Similar Situation Existed 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

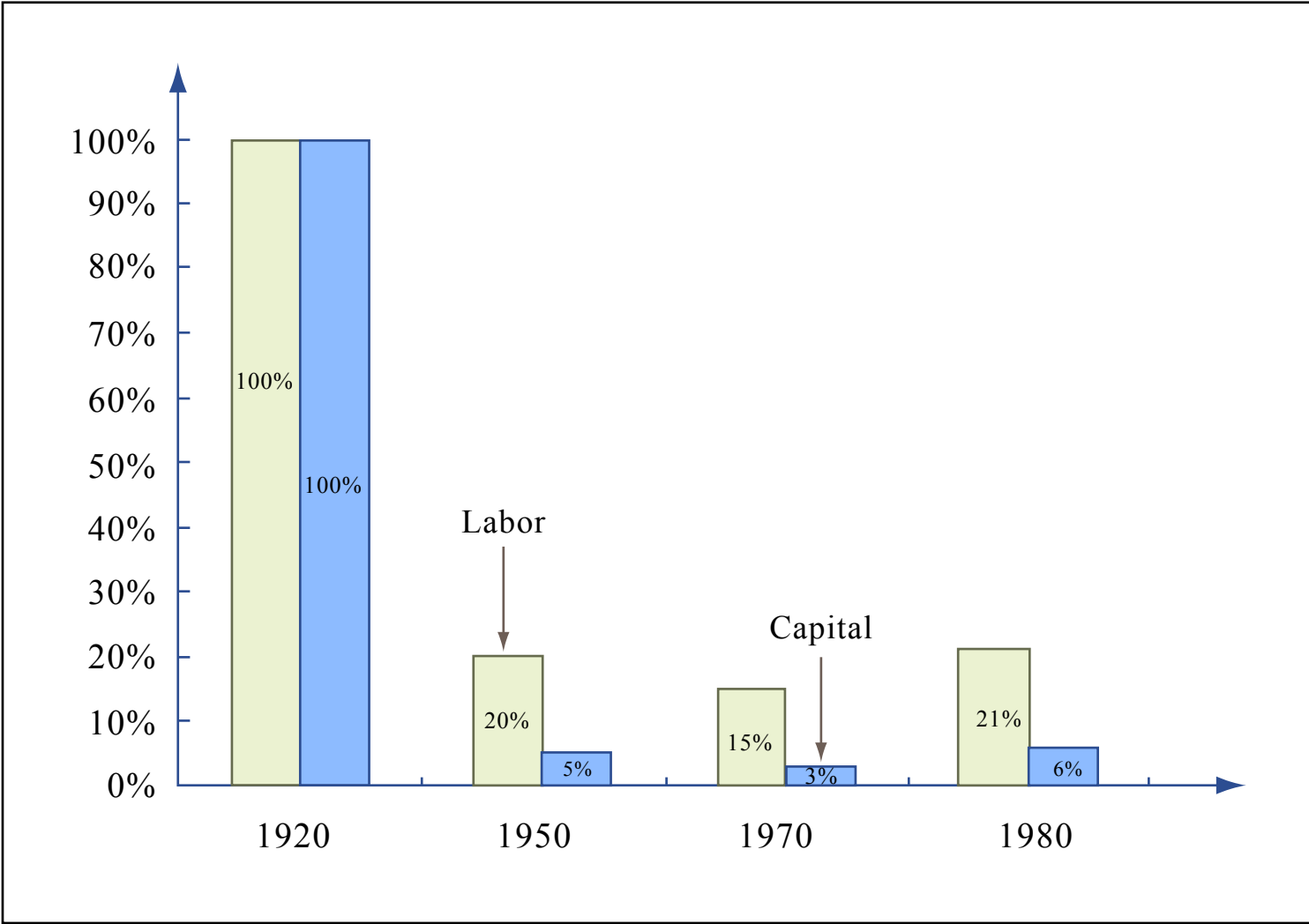


Figure by MIT OCW.

Similar Opportunities Exist Today

Market Stability  Infrastructure

Technology

- Information & Communication
- Robotics
- Engineered Materials