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1.133 M.Eng. Concepts of Engineering Practice
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STRATEGIC MANAGEMENT ISSUES

ROLE OF THE E&C INDUSTRY

- Through planning, design, construction, operation, and maintenance activities, the E&C Industry transforms resources of labor, capital (money, materials, & equipment), and knowledge into the physical facilities required to meet a broad range of social and economic needs.

A BASIC PREMISE

- **In the economy of the future, the civil engineering profession is ideally positioned to take on an expanded role in the traditional engineering and construction industry; and to conceive and implement innovative business ideas in the future.**

SCENARIO PLANNING

- **Scenario: Description of plausible future business environment**
- **Scenario Planning: Testing of the Business Idea against multiple, equally plausible futures (scenarios)**

SCENARIO PLANNING



THE BUSINESS IDEA

- An organization's mental model of the forces behind its current and future success.
- Success= Establishing value
 - Create surplus for stakeholders
 - Create the expectation of being able to create a surplus and grow in the future
 - Reference: “Scenarios: The Art of Strategic Conversation”; Kees van der Heijden; John Wiley & Sons; 1996

GENERIC BUSINESS IDEA

**Understanding
Evolving Needs
in Society**

**Entrepreneurial
Invention**

Resources

**Distinctive
Competencies**

Results

**Competitive
Advantage**

ENTREPRENEURIAL INVENTION

- Discovering new ways of creating value for customers
- Bringing together a combination of competencies which creates this value
- Creating uniqueness in this formula in order to appropriate part of the value created

DISTINCTIVE COMPETENCIES

- Definition: Unique, hard to emulate individual organizational capabilities or combinations of these capabilities
- Categories:
 - Institutional knowledge
 - Embedded processes
 - Reputation & trust
 - Legal protection
 - Activity specific assets

COMPETITIVE ADVANTAGE

- **Differentiated product with premium price**
- **Low cost commodity product**

DIFFERENTIATED PRODUCT

- A differentiated product which cannot be matched by the competition and for which the customer is prepared to pay a superior price
- Differentiation requires deep understanding of what creates value for customers
- Profit potential derives from the premium price

LOW COST PRODUCT

- A unique low-cost way of creating or making available a non-differentiated product (commodity)
- Commodity: Open market has created a standardized and clearly defined product for which there is a continuing market
- Profit potential derives from cost leadership

RESULTS (PROFITS)

- Purpose of Strategy Development
 - To feed expectations of future profits and growth
- Actual Profits
 - Earned by the quality and efficiency of day-to-day operations

GENERIC BUSINESS IDEA

**Understanding
Evolving Needs
in Society**



**Entrepreneurial
Invention**

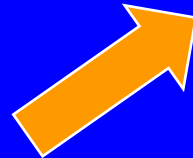


Resources



**Distinctive
Competencies**

Results



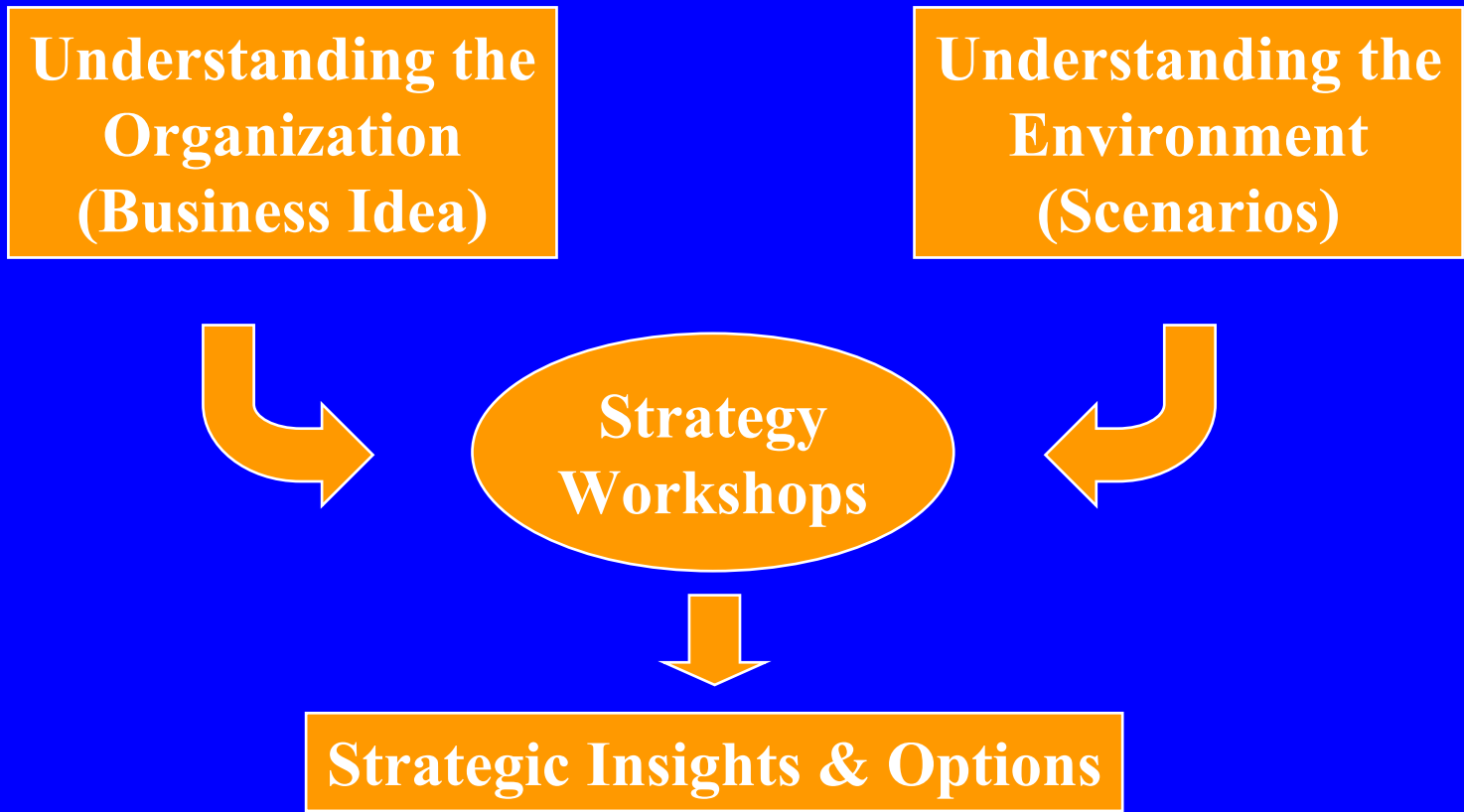
**Competitive
Advantage**



CONTRACTING BUSINESS IDEA



SCENARIO PLANNING



THE FUTURE BUSINESS ENVIRONMENT

- **An Economy in Transition**
- **Changing Nature of Organizations**
- **Strategy Options**
 - **Business as Usual**
 - **The Master Builder Of the 21st Century**

THREE WAVES OF ECONOMIC CHANGE

- Agricultural Wave
- Industrial Wave
- Information Wave
 - Information Age
 - Knowledge Economy
 - Digital Revolution

ECONOMIC PROSPERITY

- Dow at least 21,500 & likely higher
- Sources of economic strengths
 - ability to deliver customized products and services to consumers at increasingly affordable prices and convenience (direct producer-to-consumer)
 - success of Brand name products in the global market place

FEATURES OF THE INFORMATION AGE

- Rapid Technological Change
 - Just-In-Time Supply Systems
 - New Delivery Systems
 - B2B Electronic Market Place
 - Mobile Telephony

INFORMATION AGE

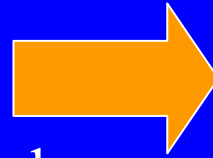
- Global Market
 - Operations, Shopping, Productivity Improvements
- Government Driven Changes
 - Deregulation/Privatization
 - Trading blocs
 - The Decline of Communism
 - China as an Economic Power

INFORMATION AGE

- Changed Face of Competition
 - Industrial Age characterized by planning, control, hierarchy, materials, processing methods, optimization, volume, scale, low cost
 - Processing of Knowledge vrs resources
 - Competitive Advantage characterized by: observation, positioning, flat organizations, missions, teams, cleverness, psychology, adaptation, speed, innovation, service, customization

CHANGING NATURE OF PRODUCTION

Producer Driven



Consumer Driven

- Top down command/control, functional skills focus
- Standardized products/services
- Assembly line methods
- Unskilled workers
- Automation of physical work

- Consumer needs back
- Customized, choice, personalized
- Network methods
- Skilled workers, knowledge workers
- Automation of routine thinking work

INFORMATION AGE

- Changed Patterns of Employment
 - 1970's: 90% of work force worked for organizations; career-based jobs
 - 1990's: downsizing, reengineering ,etc.
 - 2000+: part-time work, self-employment, independent actors (jobbers, pieceworkers, consultants, facilitators, temps, etc.),
 - Responsible for career development and continuing education
 - Emphasis on contributions and results

INFORMATION AGE

- Knowledge is the Key Economic Resource
 - Embedded in systems and databases
 - Made widely available in an organization
 - Knowledge is being systematically accumulated, shared, and purposely deployed to build distinctive competencies

CHANGING NATURE OF ORGANIZATIONS

-Fast

-Responsive

-Customizing

-Entrepreneurial

-Slow

-Inflexible

-Standardizing

-Highly managed,
planned, &
coordinated

NETWORKS OF SMALL FIRMS

- The “dinosaur” corporation of the late twentieth century was just a transitional form. In looking back we are most aware that the tiny “mammals”-entertainment production companies, construction project teams, and consultant workgroups-which operated without much public notice back in the 1990’s, were in fact the prototypes of today’s modern organization.

NETWORKS (cont'd)

- Today (2010), nearly every task is performed by autonomous teams of 1-10 people, set up as independent contractors or small firms, linked by networks, coming together in temporary combinations for various projects, and dissolving once the work is done. When a project needs to be undertaken, requests for proposals are issued or jobs to done are advertised, candidate firms respond, subcontractors are selected, and workers are hired largely on an ad-hoc basis.

THE NETWORK ORGANIZATION

- Consists of leaders, guiding entrepreneurs, and self-managing teams in a chaotic real-time process that is organized around the ever changing needs of individual customers.

THE NETWORK ORGANIZATION

- They are fast, responsive, customizing, and entrepreneurial in contrast to assembly-line organizations which are slow, inflexible, standardizing, and highly planned, managed, and coordinated

KEY FEATURES

- Leadership at the Center
- Front-Line Browser Teams Organized Around Customers
- Back-Line Servers Teams (Experts & Specialized Products)
- The Radical Elimination of Bureaucracy
- An Internal Free Marketplace

STRATEGY OPTIONS

- **Business As Usual**
- **The Master Builder of the Future**

BUSINESS AS USUAL

- **Competitive advantage based on cost leadership**
- **Consolidators as sources of opportunity**
 - **Buyouts**
 - **Innovations in engineering and construction processes**
 - **Access to national and international accounts**

BUSINESS AS USUAL

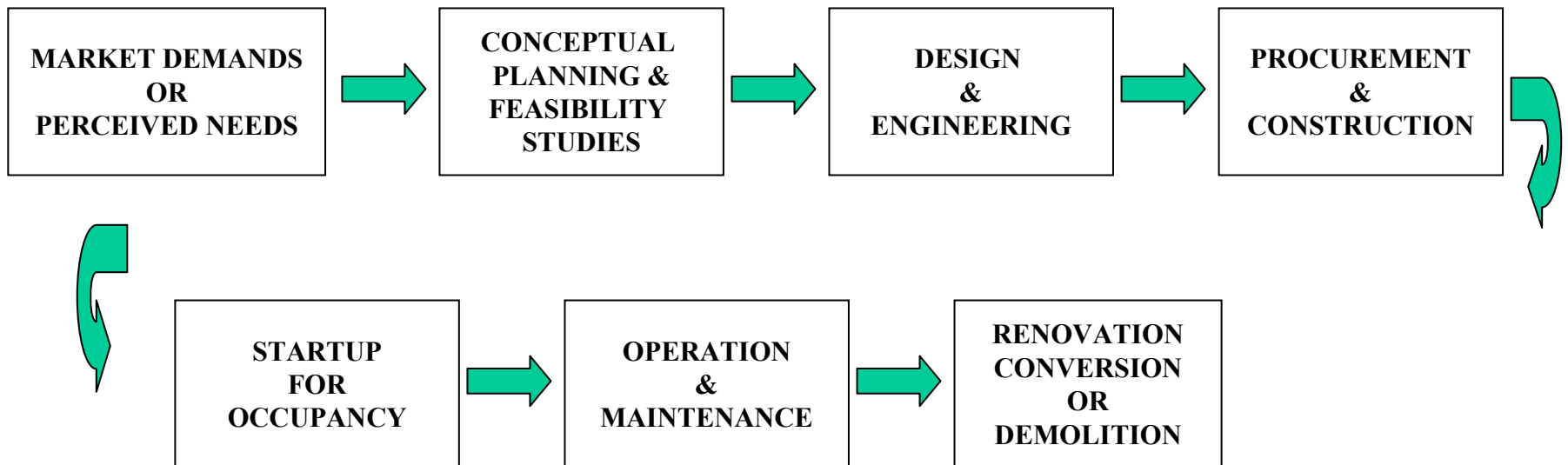
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- **Distinctive Competencies**
 - **Global outsourcing of engineering activities**
 - **Participation in B2B marketplaces to reduce supply chain, logistics, and inventory costs**
 - **Improved on-site materials and labor management processes**
 - **Increased use of off-site prefabrication methods**

THE MASTER BUILDER OF THE 21st CENTURY

- **Competitive advantage based on differentiated services at premium prices**
- **Outgrowth of design/build processes**
- **Horizontal integration to combine specialty construction tasks**
- **Vertical integration to include strategy planning, design, and operations & maintenance management**

FACILITY PROJECT LIFE CYCLE*



* Adapted from: “**Project Management for Construction**”; Chris Hendrickson & Tung Au
Prentice Hall; 1989

MASTER BUILDER OF THE 21st CENTURY

- **Distinctive Competencies:**
 - **Entrepreneurship/Technological Knowledge**
 - **Project management capabilities including schedule and cost control systems, and computer hardware/software for collaboration**
 - **Prime contracting capabilities**
 - **Maintenance management systems**
 - **Systems engineering capabilities**

SYSTEMS ENGINEERING/ SYSTEMS INTEGRATION

- 1. Concept Development (the Front-End Process)
- 2. System-Level Design
- 3. Detail Design
- 4. Refinement & Value Engineering
- 5. Post Project Evaluation
 - “Product Design and Development”; Ulrich & Eppinger; McGraw-Hill; 1995

FRONT END PROCESS

- **Identify Client Needs**
- **Establish Target Specifications**
- **Generate Concepts**
- **Select a Concept**
- **Economic Analysis**
- **Project Planning**