

CII – The Vision and Plan

The Vision

I. GLOBALIZATION

A major force shaping business is the increasing globalization of projects owned or built by CII members.

A. Markets

- Country and regional economies will become more intertwined.
- More green field projects increasingly will be located in developing countries.
- Joint ventures and multiple ownership will be increasingly prevalent.
- Build/Operate/Transfer (BOT) projects will be more common.

B. Project Execution

- The design of major projects will increasingly be done globally to minimize cost and shorten project cycle time.
- Information systems will be globally compatible within all organizations that interface.
- Procurement will be done routinely on a worldwide basis.
- Innovation will be a driver for global competitiveness.
- Increasing geographic dispersion of integrated project teams will require better real time communications of work in progress and better management of change.
- Projects will require greater skills to align multiple partners with diverse cultures and interests.
- Offshore engineering, automation, and standardization will alter project approaches. Technical competence of certain third world organizations will develop and eventually will reach that of industrialized nations.

II. TECHNOLOGY

A. Information Technology

- Leadership in use of information technology will be a significant competitive advantage.
- Distributed, integrated project information systems will provide immediate access for decision-makers to accumulate knowledge about the status and characteristics of each project.
- Projects will be “built” in virtual reality.
- Information technologies will blur the lines between planning, engineering, construction, operations, maintenance, and decommissioning.

B. Materials Technology

- Improvements will occur in materials of construction (greater strengths, less weight, greater durability, better connections, and greater placeability).
- Materials of construction will be sufficiently well understood and modeled to allow design, selection, and procurement from standard databases.
- Construction will use more reusable/recyclable materials and components.

C. Construction and Fabrication Automation

- Simulation and control technologies will permit on-site or remote control of automated equipment. The full range of operations will be included: engineering, procurement, construction, operation, emergency management, renovation, and dismantlement.
- Automated positioning systems will allow real-time, precise measurements of the location and condition of all equipment at a project site.

III. BUSINESS RELATIONSHIPS

A. Contracting Strategy

- There will be an increase in contracts that are based on value added rather than hours worked.
- Project execution incentives will be increasingly aligned with owner corporate goals.
- Risk management will increasingly be spread among owners, contractors, and suppliers.

B. Partnering

- Owners will increasingly partner with engineering firms, construction companies, and major equipment suppliers when building new facilities.

C. Supplier Relationships

- Outsourcing of activities will continue, requiring the development of strong partnerships with suppliers and focusing on expertise relevant to the required need.
- Owners and contractors will execute sourcing strategies globally.
- Owners, contractors, and suppliers will become aligned on standard designs that are aligned with business value.
- Early delivery of supplier data will be achieved electronically. Data will include 3D models and other required information.

D. Contractor Specialization

- Increased project complexity will require more comprehensive project management skills.
- Many design personnel will become generalists interfacing with intelligent information technology (IT) systems and tools developed by specialists, and world-class specialists will be needed in core engineering disciplines to understand the fundamental basis of these complex systems.
- The complexity of the engineer-procure-construct (EPC) process will promote specialization of the contracting community. Fewer yet more sophisticated contractors will be supported by niche specialists.

E. Business Climate

- The constructed facility in 2020 will include sustainable development concepts for construction, operation, maintenance, renovation, and removal.
- There will be continual reshaping of business entities.
- Competitive advantage will come from technological improvements rather than cost reduction.
- Owners, however, will differentiate between vigorously investing in new technology and cost-saving endeavors while looking to reduce cost for commodity type facilities or non-revenue producing assets.
- Cycle time reduction will become increasingly important to business success.
- Life cycle costs will be a major consideration on projects. The tools will be available for life cycle cost based decisions.

F. Changing Owner/Contractor Roles

- Decision-making processes for capital investment projects will become more complex, with increased and quicker decision support. Project managers will communicate with business leaders and will help to make investment decisions.
- The business leaders will be driving decisions about the practices and processes used by integrated project teams. Advanced metrics will give them the basis for sound decisions.
- Surviving owners and contractors will be adept at dealing with change.

IV. CHARACTERISTICS OF PROJECTS

A. Size and Types

- Projects in industrialized nations will increasingly focus on renovation, expansion, and modernization, while green field projects will be predominant in developing regions.

B. Special Considerations

- Owners will need increased flexibility in manufacturing facilities. Facilities will be capable of responding quickly to changes in the marketplace. Reconfigurable manufacturing plants will be commonplace.
- Operations, maintenance and de-commissioning will be increasingly important design issues.
- Project complexity in developing countries will be increased because of multi-government involvement and project execution in remote locations.

V. PLANNING, DESIGN, AND CONSTRUCTION PRACTICES

A. Planning

- Pre-project planning systems will be greatly improved to focus on project selection. Increased emphasis will be placed on early project alignment and support.
- Early identification and release of critical equipment will be vital.
- Baseline type specifications and designs will be common.
- “Design to Capacity” and “Design for Plant Life” will be commonplace.
- Pre-appropriation assessments of planning completeness and readiness will be standard practice. Use of open book assessment tools such as the Project Definition Rating Index (PDRI), with scores correlated to outcomes, will be routine.

B. Design and Specification Standardization

- Standardization will be driven by cost, schedule, and quality.
- Engineering will be accomplished using single data entry into fully integrated and automated project processes. Dramatically improved design cycle times will be achieved using rule-based design for standard systems.
- EPC project systems will be integrated with owners’ business systems.

C. Construction Techniques

- Pre-fabrication will increasingly be used to minimize site work.
- New systems will be developed to combat field delays caused by inclement weather.
- New systems will be developed to reduce use of scaffolding and other false work.
- Construction will use intelligent tools such as handheld computers interfacing directly with intelligent engineering systems and site positioning systems.
- A significant amount of field welding will be automated.
- Most insulation work will be performed in the shop.

D. Work Process Improvement and Benchmarking

- Streamlined, integrated processes for reviews of proposed facilities will involve all stakeholders and regulators to drastically reduce review durations.
- Benchmarking and metrics will be increasingly more important and will be used in real time.

VI. WORK FORCE

A. Engineering and Home Office

- Advances will be made in the construction industry to:
 - Attract and retain engineering graduates.
 - Better accommodate dual career families.
 - Improve productivity through advances in technology.
- Collaborations between industry and academia will drive U.S. leadership in technical competence and inventiveness.

B. Construction Labor in Developed Countries

- Projects will use a smaller but more broadly competent work force.
- Labor will be less mobile; labor base will be local to work.
- Craft labor availability will become more critical, and minimizing craft labor content of a project will drive design.
- Construction personnel will have the equivalent of two years’ advanced technical training.
- Labor will be greatly reduced by automation and much more work will be done by far fewer people.
- Labor cooperatives will be used in open-shop areas to provide training.
- High performance work teams will be widely used to improve project performance and to make the industry more attractive as a career. This trend is currently being addressed as a breakthrough topic.

The Plan

Background: CII has drafted its Vision 2020 document to describe the opportunities and challenges facing its members in the next century. Vision 2020 will provide the basis for roadmaps describing how CII will achieve this vision. Each year, members will be asked to identify the trends currently or potentially affecting their businesses and critique the Vision 2020 and roadmaps of CII.

CII will analyze and focus on these trends in allocating resources. The most significant currently identified trends are:

- A) Fully integrated and automated project processes.
- B) Owner requirements resulting in expanded or modified contractor roles.
- C) Globalization of the industry.
- D) Reduced project cycle time.
- E) Increased role of suppliers.
- F) Changes in the skilled work force.

Trend A—Fully Integrated and Automated Project Processes (FIAPP)

This trend describes the seamless integration of information flow to and from all participants throughout the entire project life cycle. It extends from the owner's original statement of needs for the facility to as-built and as-maintained data for facility operation and maintenance. Features include one-time data entry; inter-operability with rules-based design, construction, and operation processes such as virtual construction and construction automation; and user-friendly input/output techniques such as 3D videos guiding crafts personnel during construction.

CII believes that this trend will revolutionize the industry. CII must be a leader in this trend to bring competitive advantage to its members. CII will develop and maintain an automation vision that is integrated with business needs. CII will develop a roadmap for FIAPP that will be useful to business and engineering leaders and that will drive a significant portion of future CII activities.

Active Projects include:

Research Team 136:	Jobsite Wireless Computing
Research Team 150:	Fully Integrated and Automated Project Processes
Research Team 151:	Radio Frequency Identification Applications in the Construction Industry
Research Team 152:	3D CADD and the Fully Integrated and Automated Project Processes
Research Team 155:	Electronic Simulation in Construction

Trend B—Owner Requirements Resulting in Expanded/Modified Contractor Roles

A major trend that continues to have significant impact is owner downsizing, decentralizing, and shifting of responsibility to contractors. This results in a rapid shift of owner/contractor roles and interfaces.

CII will respond and provide leadership to address this trend with sharply focused research and activities that:

1. result in products and processes that address the needs of the business leader and that build competitive advantage for owner members through their capital projects.
2. improve the effective communication, teamwork and especially alignment between the business leader, owner capital project professional, contractor, and suppliers.
3. provide guidance for CII owner member companies as to the most effective core competencies and the type of structure to maintain internally in their capital project processes.
4. provide guidance for CII owner and contractor members on how to structure their staffs and interaction, regardless of where the owner operates in the range from few to many capital project core competencies.
5. promote uniform capital project work process management within owner organizations.

Trend C—Globalization of the Industry

Over the past decade, CII member companies have experienced a continually increasing amount of their work being done outside North America. Companies are finding it increasingly difficult to function in countries where they have had no previous experience. CII will:

1. establish and maintain a network among member companies to share relevant experiences.

2. evaluate need for and conduct periodic forums to share “in-country” experience among CII members.
3. maintain an active Globalization Committee that will periodically monitor globalization issues and recommend those that are appropriate for further action through CII research.
4. establish alliances with appropriate counterpart organizations in other geographic regions.

Trend D—Reduced Project Cycle Time

Competitive pressures on time-to-market have created great pressure to reduce project cycle times. CII has conducted two beneficial studies in this area. One examined characteristics of projects executed on an emergency basis. The other analyzed the potentially positive impact of complete automation on cycle time reduction. Additional research needs to be conducted in this critical area and must be coordinated with following strategies that have a complementary effect on cycle time reduction:

1. Fully integrated and automated project processes.
2. Increased role of suppliers.

This trend is currently being addressed as a breakthrough topic.

Trend E—Increased Role of Suppliers

Suppliers are critical to automated work processes and cycle-time reduction and are significant contributors to project success. They provide numerous innovative technology drivers.

CII should seek out and recruit suppliers for membership who play significant roles in the EPC process.

Supplier members would be considered “Contractors” from a membership balance standpoint; and therefore would be limited in numbers (less than 10).

Candidate supplier members should be leaders in their areas of expertise and must be able and willing to participate in CII activities.

CII should target for membership the leading companies in the information technology industry, process machinery industry, and process automation industry.

The Strategic Planning Committee should monitor the participation of supplier members in CII and make further recommendations as to how CII may take maximum advantage of CII suppliers’ input in the research process.

Trend F—Changes in the Skilled Work Force

CII will focus on ensuring that skilled resources (craft, technical, and supervisory) availability (quantity, mix, and location) are matched with demand, and that productivity is continuously improved through:

1. attracting and retaining quality people for the construction industry.
2. cooperating with alliance partners for research, education, training, and recruiting.
3. utilizing benchmarking and metrics to identify improvement opportunities and evaluating benefits of recruiting, training, skill-development, and retention programs.
4. educating members and the public on impacts of destructive practices such as use of scheduled overtime to attract workers.
5. interfacing with the Sloan Program for the Construction Industry to support efforts to address this strategic choice.
6. continuing appropriate CII research.

CII will put specific emphasis on leading the integration of high performance work system concepts into the construction industry.

SEARCH FOR BREAKTHROUGHS

Background: Historically, CII has conducted research with emphasis on identifying best practices. While emphasis remains on such research, CII desires more effort to be directed to breakthrough performance. Early attempts pointed to the need for a special process to identify breakthrough. In 1997, a Breakthrough Committee was formed with specific charge to:

- a) develop a process that will ensure adequate generation of breakthrough research and other ideas.
- b) develop a continuing list of appropriate breakthrough opportunities.
- c) interface with standing committees for the core processes.