



CONSTRUCTION INDUSTRY INSTITUTE®

PLANNING A GLOBAL
VIRTUAL ENGINEERING TEAM:
A TOOL FOR SUCCESS

Construction Industry Institute

3M	ABB Lummus Global
Abbott	ALSTOM Power
Air Products and Chemicals	AMEC
Alcoa	AZCO
Amgen Inc.	Aker Kværner
Anheuser-Busch Companies	BE&K
Aramco Services Company	Baker Concrete Construction
BP America	Bechtel Group
Biogen Idec	Black & Veatch
CITGO Petroleum Corporation	Burns & McDonnell
Cargill	CB&I
Chevron	CCC Group
Codelco-Chile	CDI Engineering Solutions
ConocoPhillips	CH2M HILL
Dofasco	CSA Group
The Dow Chemical Company	Day & Zimmermann International
DuPont	Dick Corporation
Eastman Chemical Company	Dresser-Rand Company
ExxonMobil Corporation	Emerson Process Management
Genentech	Fluor Corporation
General Motors Corporation	Fru-Con Construction Corporation
GlaxoSmithKline	Grinaker-LTA
Intel Corporation	Harper Industries
International Paper	Hatch
Kraft Foods	Hilti Corporation
Eli Lilly and Company	Hyundai Engineering & Construction
Marathon Oil Corporation	JMJ Associates
Merck	Jacobs
NASA	Kellogg Brown & Root
NOVA Chemicals Corporation	Kiewit Construction Group
Naval Facilities Engineering Command	J. Ray McDermott
Ontario Power Generation	M. A. Mortenson Company
Petroleo Brasileiro S/A - Petrobras	Mustang Engineering, L.P.
Praxair	R. J. Mycka
The Procter & Gamble Company	Parsons
Rohm and Haas Company	Perot Systems Corporation
Sasol Technology	Primavera Systems
Shell Oil Company	S&B Engineers and Constructors
Smithsonian Institution	The Shaw Group
Solutia	Technip
Southern Company	Victaulic Company
Sunoco	Walbridge Aldinger Company
Tennessee Valley Authority	Washington Group International
U.S. Army Corps of Engineers	WorleyParsons Limited
U.S. Bureau of Reclamation	Yates Construction
U.S. Department of Commerce/NIST/ Building and Fire Research Laboratory	Zachry Construction Corporation
U.S. Department of Energy	Zurich
U.S. Department of Health & Human Services	
U.S. Department of State	
U.S. General Services Administration	
U.S. Steel	
Weyerhaeuser Company	

Planning A Global Virtual Engineering Team: A Tool for Success

**Prepared by
Construction Industry Institute
Global Engineering Work Force Research Team**

**Research Summary 211-1
September 2006**

© 2006 Construction Industry Institute™.

The University of Texas at Austin.

CII members may reproduce and distribute this work internally in any medium at no cost to internal recipients. CII members are permitted to revise and adapt this work for their internal use provided an informational copy is furnished to CII.

Available to non-members by purchase; however, no copies may be made or distributed and no modifications made without prior written permission from CII. Contact CII at <http://construction-institute.org/catalog.htm> to purchase copies. Volume discounts may be available.

All CII members, current students, and faculty at a college or university are eligible to purchase CII products at member prices. Faculty and students at a college or university may reproduce and distribute this work without modification for educational use.

Printed in the United States of America.

Contents

<i>Chapter</i>	<i>Page</i>
Executive Summary	v
1. Introduction	1
2. Findings	3
3. Components of the Global Virtual Engineering Team (GVET) Execution Planner	7
4. The Global Virtual Engineering Team Execution Planner	10
5. Conclusions and Recommendations	13
Appendix A: Global Virtual Engineering Case Study	15
Appendix B: Global Virtual Engineering Team Tool	24

Executive Summary

Over the past several decades, substantial changes in the political and technological climate worldwide have enabled more widespread use of “global teams”—geographically dispersed individuals working together through electronic and wireless media to complete mutual goals. The concept of “virtual teams,” a mid-1980s concept, has also evolved with the recent surge of globalization and technological developments and has taken on a new impetus.

With their resources dispersed in various geographical locations, global companies have many challenges, both managerially and technologically. It is now possible to adopt virtual teaming strategies that improve communications and management, but these teams have cultural, economic, political, and technological aspects that must be evaluated and addressed in order to be successful.

CII established the Global Engineering Work Force Research Team to develop a detailed understanding of the critical activities required for successfully implementing a global engineering team. The goal was to develop an implementation tool to address the comprehensive issues involved in establishing successful global virtual engineering teams.

The research team has concluded its study. The final product of the team, the Global Virtual Engineering Team (GVET) Execution Planner (CII Implementation Resource 211-2), provides a vehicle for creating an execution plan to address issues related to organization, scope definition/work sharing, communication, quality, project control, and technology at both the company and project levels. The Planner, which can be used in various phases of a project, also provides a method for capturing and managing specific lessons learned related to each category. The following chapters describe the research approach, findings, and conclusions. An Appendix provides a description of the Execution Planner. The Excel™ spreadsheets that comprise the Planner are available through CII.

Introduction

Outsourcing, in which North American companies hire expertise from European, Asian, and Asian Pacific countries at a lower price compared to their Western counterparts, is controversial. Just as manufacturing jobs have moved overseas, so have service jobs—including higher skilled engineering jobs. Proponents of outsourcing claim that new jobs will continue to be created in most industries, except publishing, communications, and software. Detractors claim that outsourcing is a short-term reaction to the marketplace, not a long-term strategy. The ability for an industry to sustain its knowledge base, they claim, is at risk if the ability to develop it is given away.

CII first funded a study of virtual teams in 2000, when its Making Virtual Teams Work Research Team examined reasons for using virtual teams and the success factors involved. CII chartered the Global Engineering Work Force Research Team in 2004 to expand this initial investigation. The new research team was to analyze the use of virtual teams for global (that is, international or multinational) engineering design projects.

The research team felt it important to define a global virtual engineering team (GVET) to best represent the related practices of the construction industry. After reviewing several definitions in the literature, the research team defined GVET as:

A group of geographically dispersed individuals organized through communication and information technologies that needs to overcome space, time functional, organizational, national, and cultural barriers for the completion of a specific engineering task.

The research team started with a literature search on the following themes:

- A definition of a global virtual engineering team (GVET)
- Global virtual teaming
- Global offshore outsourcing

The literature indicates that the shift from traditional to global virtual teams will require a keen understanding of work characteristics and situational constraints in order to define the strategic objectives for optimal performance. The key areas for GVETs include the following:

- Organization
- Scope definition and work sharing
- Communication
- Quality
- Project control
- Technology

The need to develop tools and information to manage a GVET is clear. The research team established two key deliverables:

- The current status of global virtual engineering teams, tools used, and successful work processes.
- A planning tool for establishing and maintaining the global engineering work force.

The following chapters describe how this was accomplished and the results of the study.

Findings

The literature did not specifically address issues explicit to the engineer-procure-construct (EPC) industry. Several different quantitative and qualitative techniques were used during the course of the research including questionnaire surveys, interviews, case studies, and focus groups.

Early on the research team used an online survey to gather general data on the current use of GVETs in the construction industry. A total of 46 surveys were received from 13 owner and 20 EPC companies. Several companies had multiple responses from various employees.

Table 1 highlights the respondents' views on the impact of GVETs on cost, schedule, and quality. The majority of both owner and EPC companies in the survey had greater than five years of experience working with GVETs on multiple projects. The overwhelming view—85 percent of the owners and 90 percent of the EPC companies—held that virtual teaming does reduce engineering cost. The perceived impact on construction cost, however, was that only 20 percent of those surveyed believed GVETs contributed to some construction cost savings. A disparate view was found on the impact on engineering time and overall project schedule. Most owners thought that both were about the same or slightly improved. Thirty percent of the EPC companies, however, thought that GVETs slightly increased engineering time. This delay, according to those surveyed, did not have an adverse impact on the overall project delivery time. Finally, a majority of both owners and EPC companies believed that virtual teaming has little impact on work quality.