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Greetings,

Welcome to Baltimore, the City of Firsts! For centuries, its citizens have made technological, industrial, military, and civic innovations. This is our first conference here, and we will certainly make some firsts of our own while we are here.

Our 2012 theme, Building Global Leadership, is timely, given our commitments to building sustainable world-class facilities around the world, leading complex global projects, and deploying state-of-the-art processes for productivity and benchmarking. Our keynote and featured speakers include James J. Mulva of ConocoPhilips and LTG Thomas P. Bostick of the U.S. Army Corps of Engineers, Alistair Gibb from Loughborough University, Mark Vitner with Wells Fargo, and Stephen Ayers, the Architect of the Capitol. As global leaders, they will share their insights and wisdom with us.

At the heart of every CII Annual Conference is the meaningful industry knowledge we continuously produce. This year we will hear from a remarkable seven research teams on the following topics: construction productivity; the integration of CII front end planning products; probabilistic risk management; managing indirect construction costs; how to optimize modularization; project management skills of the future; and active safety leading indicators. And, as at every conference, you will be able to interact with the research teams during their implementation sessions. Additionally, Saudi Aramco and the U.S. Army Corps of Engineers will present case studies on how they have embraced and implemented CII Best Practices in their global operations.

This year, we are initiating a special conference event just for our future industry leaders—the Next-Generation Leaders Forum. For this year’s forum, Cam Marston, Founder & President of Generational Insight, will conduct a workshop titled How to Achieve Success in Your Workplace to give rising professionals insight into how they are perceived and what is expected of them. The career benefits this session will provide to our young talent will also strengthen the industry, since our enduring strength depends on our investment in the next generation. To stay connected to the young people who are preparing to enter the industry after high school, we have invited speakers from the National Center for Construction Education and Research, Skills USA, and the ACE Mentor Program.

Beyond useful knowledge and tools, CII conferences always give us plenty of opportunities to network and enjoy ourselves. This year will be no exception. So, please be sure to take advantage of all Baltimore’s interesting and fun places and activities. We have again planned the CII Golf Scramble, the Chairmen’s Reception, and our Welcome Mixer.

This annual gathering is for you and about you. Its success depends on your participation. So, please don’t miss this unique opportunity to learn, share, teach, and have fun. We are sure you’ll find it a rewarding and enriching experience.

Ilker Adiguzel
Annual Conference Chair

Wayne Crew
CII Director
Conference Agenda

Monday Afternoon – July 23

12:00 – 3:00 p.m. **CII Next-Generation Leaders Forum**  
(Sponsored by the Next-Generation Leaders Community of Practice)  
– Cam Marston, Founder & President – Generational Insight

3:00 – 5:00 p.m. **Get Acquainted with CII Orientation Reception**  
(Sponsored by the Membership Committee)

5:00 – 7:00 p.m. **Chairmen’s Welcome Reception**  
– Ilker Adiguzel, Director, Construction Engineering Research Laboratory – U.S. Army Corps of Engineers  
(CII Annual Conference Chair)  
– Glenn Doran, General Manager, Project Services – ConocoPhillips  
(CII Chairman)

Tuesday Morning – July 24

8:00 a.m. **Welcome from the Annual Conference Chair**  
– Ilker Adiguzel, CII Annual Conference Chair

8:05 a.m. **CII Director’s Remarks and Keynote Introduction**  
– Wayne Crew, Director – Construction Industry Institute

8:20 a.m. **Keynote Address: Reflections of Leading an Integrated Energy Company**  
– James J. Mulva, Retired Chairman & CEO – ConocoPhillips

9:05 a.m. **Coffee Break**  
Meet the VIPs – James Mulva

9:25 a.m. **Youth Outreach Introduction**  
– Ilker Adiguzel – Annual Conference Chair

9:30 a.m. **Youth Outreach: Promoting Diversity through Mentoring: The ACE Mentor Program**  
(ACE Mentor Program of America, Inc.)  
– Kelly Cantley, Bozzuto Construction Company  
– John Strock, ACE Mentor Program of America

9:50 a.m. **Plenary Presentations**

**Going Beyond Zero Using Safety Leading Indicators**  
(Leading Indicators for Safety Research Team)  
– Billy Gibbons, JMJ Associates

**Applying Probabilistic Risk Management in Design and Construction**  
(Methods for Dealing with Uncertainty – Applying Probabilistic Controls in Construction Research Team)  
– Karen Furlani, CH2M HILL

**PM Skills of the Future**  
(Project Management Skills of the Future Research Team)  
– Craig Connell, Black & Veatch  
– Sarah Scott, Fluor Corporation

**CCM: The Mark of a Professional**  
(CII–CMAA Alliance)  
– Doug Titzer, Jacobs
Tuesday Morning – July 24 (continued)

Plenary Presentations (continued)
10:30 a.m. Organizing for Benchmarking Success
   (Benchmarking & Metrics Committee)
   – Don Orndoff, Kaiser Permanente

10:40 a.m. Coffee Break
Meet the VIPs – ACE Mentor Program Students

11:00 a.m. Concurrent Implementation Sessions

Tuesday Afternoon – July 24

12:00 p.m. Lunch

1:00 p.m. Morning Implementation Sessions Repeated

2:00 p.m. Coffee Break

2:20 p.m. CII Chairman’s Remarks & Keynote Speaker Introduction
   – Glenn Doran, General Manager, Project Services – ConocoPhillips

2:35 p.m. Keynote Address: Safely Building Olympic Park
   – Alistair G. Gibb, ECI Royal Academy of Engineering Professor of
     Complex Project Management – Loughborough University

3:20 p.m. Plenary Presentations

   Leading Industry Practices for Estimating, Controlling, and
   Managing Indirect Construction Costs
   (Managing Indirect Costs Research Team)
   – Jason Klingensmith, Walbridge

   Experience Reference Index – The Global Recipe for
   Implementation Success
   (Implementation Strategy Committee)
   – Scott Cameron, The Procter & Gamble Company

NGA Campus East (NCE) Project
   (U.S. Army Corps of Engineers Case Study)
   – Mike Rogers, U.S. Army Corps of Engineers

Building Global Leadership: Engaging the Next Generation
   (Next-Generation Leaders Community of Practice)
   – Noé Hernández-Saénz, Burns & McDonnell

Construction Productivity: Faster, Smarter, Simpler
   (Construction Productivity Research Program, Phase IV)
   – Bill Boyd, Southern Company

4:10 p.m. Coffee Break
Meet the VIP – Alistair G. Gibb

4:30 p.m. Concurrent Implementation Sessions

5:30 p.m. End of Day One

Tuesday Evening – July 24

7:00 – 10:00 p.m. Family Welcome Mixer – Baltimore: A City of Firsts
   (The Baltimore Museum of Industry)
Wednesday Morning – July 25

8:00 a.m.  **Keynote Address Introduction**
- Ilker Adiguzel, Annual Conference Chair

8:05 a.m.  **Keynote Address**
- LTG Thomas P. Bostick, Chief of Engineers – U.S. Army Corps of Engineers *(invited)*

8:50 a.m.  **Coffee Break**
Meet the VIP  – Tom Bostick

9:10 a.m.  **Tuesday Afternoon Implementation Sessions Repeated**

10:10 a.m.  **Intermission**

10:20 a.m.  **Featured Speaker Introduction**
- Ilker Adiguzel, Annual Conference Chair

10:25 a.m.  **Featured Speaker: The Importance of Leadership in Project and Program Management**
- Stephen T. Ayers, Architect of the Capitol
  *(2011 Recipient of the Carroll H. Dunn Award of Excellence)*

10:55 a.m.  **Youth Outreach Introduction**
- Ilker Adiguzel – Annual Conference Chair

11:00 a.m.  **Youth Outreach: Finding the Connection: Education Meets Industry**
*(National Center for Construction Education and Research & SkillsUSA)*
- Karmen Ayres, Aberdeen High School
- Melissa Rubly, Zachry Industrial
- Ashley Webel, Washtenaw Community College
- Travis Weber, LPR Construction Company

11:20 a.m.  **Plenary Presentations**

**Adding Value through Front End Planning**
*(Integration of CII Front End Planning Products Research Team)*
- Edd Gibson, Arizona State University

**Environmental Life Cycle Assessment and Carbon Footprinting for Business**
*(Sponsored by the Academic Committee)*
- Chris Hendrickson, Carnegie Mellon University

**Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning**
*(Saudi Aramco Case Study)*
- Abdirahman Abdi, Saudi Aramco

**Modularization – How to Optimize? How to Maximize?**
*(Modularization Research Team)*
- Fred Haney, Fluor Corporation

**The Cultural Dimensions of Global Learning**
*(Professional Development Committee)*
- Mike Peters, Shaw Power Group

12:10 p.m.  **Lunch**
Wednesday Afternoon – July 25
1:00 p.m. Concurrent Implementation Sessions
2:00 p.m. Intermission
2:15 p.m. Implementation Sessions Repeated
3:15 p.m. Coffee Break
Meet the VIPs – Stephen Ayers, NCCER & SkillsUSA Students
3:35 p.m. Keynote Speaker Introduction
– Ilker Adiguzel – Annual Conference Chair
3:40 p.m. Keynote Speaker: What’s Ahead for the U.S. Economy and Construction
Mark Vitner, Managing Director & Senior Economist – Wells Fargo Securities, LLC
4:25 p.m. Closing Remarks
– Wayne Crew, Director – Construction Industry Institute
4:40 p.m. Meet the VIP – Mark Vitner
5:00 p.m. End of Day Two

Wednesday Evening – July 25
6:00 p.m. Reception
7:00 p.m. Award Recognition
– Distinguished Service
– Outstanding Researcher
– Outstanding Implementer
– Outstanding Instructor
– Professional Development
– Benchmarking Users
– Distinguished Professor

Award Presentation
– Richard L. Tucker Leadership & Service Award
7:30 p.m. Dinner Served
8:30 p.m. Carroll H. Dunn Award of Excellence Presentation
8:50 p.m. Annual Conference Chair’s Closing Remarks
– Ilker Adiguzel, Annual Conference Chair
9:00 p.m. Carroll H. Dunn and Richard L. Tucker Award Celebration
(dessert and coffee reception)
9:45 p.m. End of Conference
Reflections of Leading an Integrated Energy Company

Keynote Address: James J. Mulva, ConocoPhillips

Keynote Speaker

James J. Mulva, Retired Chairman & CEO – ConocoPhillips

Originally from Green Bay, Wisconsin, Jim Mulva received a BBA degree and an MBA in finance from The University of Texas at Austin. After serving as an officer in the U.S. Navy, he joined Phillips Petroleum Company in 1973 and became its chief financial officer in 1990, when he also became a member of the company’s management committee. He was appointed senior vice president in 1993, executive vice president in 1994, president and chief operating officer in 1994, and served as chairman and chief executive officer from 1999 to 2002. Having been president and chief executive officer of ConocoPhillips since 2002, he became chairman in 2004. Mulva retired as chairman and chief executive officer of ConocoPhillips earlier this year, after the split of ConocoPhillips into two independent energy companies.

Mulva currently serves as a director for General Electric, General Motors, and Green Bay Packaging Inc. He also also a member of the Board of Visitors for the M.D. Anderson Cancer Center in Houston.
Learning Objectives

- Understand the industry’s current progress in bringing women and minorities into the profession.
- Learn about the ACE Mentor Program’s measured success at bringing new integrated construction industry professionals into the profession with higher percentages of women and minorities than the industry average.
- Be inspired to get involved in mentoring students in their communities.
- Share strategies for engaging under-served youth in the profession.

Abstract

The ACE Mentor Program of America is a free, national after-school program in which architecture, construction, and engineering professionals encourage high school students to consider construction-related careers. ACE targets underserved communities to increase the diversity of the design and construction industries and has shown great success in guiding young women and minorities toward architecture degree programs. In this session, you will find out how this volunteer mentorship program can help the profession achieve greater diversity, nurture high school students’ aspirations, and strengthen the integrated construction industries. ACE has 62 affiliates in 36 states and over 200 communities, serving nearly 5,000 students with almost 5,000 volunteer mentors.
Featured Speakers

**Kelly Cantley**, ACE Baltimore Board Chair and Director of Business Development – Bozzuto Construction Company

Kelly Cantley is responsible for leading and overseeing the development of business opportunities for Bozzuto Construction Company. Involved in every aspect of the acquisition, planning, and implementation of new work—including providing services to existing and new third-party clients—her goal is to ensure that clients’ needs are met, from project conception to completion. Cantley was previously a business development manager for Turner Construction Company’s Maryland operations, where she handled market analysis and pursuit of construction projects across the state. Prior to working at Turner, she was an officer in the U.S. Navy’s Civil Engineer Corps. Kelly is the president of Baltimore’s ACE Mentoring Program and treasurer for the Urban Land Institute, Baltimore. She received a B.S. in Aeronautical Engineering from the U.S. Naval Academy, and an MBA from Johns Hopkins’ Carey School of Business.

*e-mail: kcantley@bozzuto.com*

**John Strock**, Executive Director – ACE Mentor Program of America

John Strock is responsible for overseeing the operations of ACE across the country. Present in 36 states and in over 200 communities, ACE reaches 8,000 high school students each year through a network of nearly 5,000 volunteer mentors. Under Strock’s leadership, the ACE national office manages national branding and marketing, fundraising, and insurance, among other concerns. During his tenure, ACE was awarded the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring, the nation’s highest honor for mentoring. With 12 years of experience in the construction nonprofit sector, he has developed a love for all facets of the construction industry. He is passionate about workforce development and is ever conscious of the need to recruit young people to fill the impending worker shortage. Strock graduated from the Virginia Military Institute with a bachelor’s degree in economics and business.

*e-mail: jstrock@acementor.org*
Promoting Diversity through Mentoring: The ACE Mentor Program

Featured Presentation Slides

Ace Mentor Program
Blueprint for the Future

Overview of ACE

career directions for students in architecture, construction and engineering

ACE Mission
To engage, excite and enlighten high school students to pursue careers in architecture, engineering and construction through mentoring to support their continued advancement in the industry.

Overview of ACE

career directions for students in architecture, construction and engineering

Affiliates
62 Affiliates Across the United States
Overview of ACE

career directions for students in architecture, construction and engineering

Why ACE is Important

➢ Construction – 2nd largest industry in the U.S., employing more than 7 million people
➢ Workforce development is a top issue for the future
➢ By year 2016, the construction industry is projected to have 1 million job openings
➢ Today, for every 5 people leaving the industry, only 1 new person enters the workforce

Overview of ACE

Statistical Profile

➢ Over 6,000 students and about 5,000 mentors
➢ Two-thirds are minority and one-third young women
➢ ACE has awarded more than $12 million in scholarships to students
➢ ACE mentoring firms have contributed more than $10 million worth of pro bono time
➢ 92% of ACE graduates enroll in future education/college

Overview of ACE

Outcomes

ACE PARTICIPANTS HAVE A HIGHER HS GRADUATION RATE AND ON TIME RATE VS NATIONAL AVERAGE

- Grad. Rate ACE 2010 Class
- Grad. Rate National 2008
- 59.5 vs 72

- Grad. Rate ACE 2010 Class
- Grad. Rate National 2008
- 46.6 vs 74.7
Overview of ACE

career directions for students in architecture, construction and engineering

Rudiments of Program

• Group Mentoring Model
• Teams of professionals meet with teams of students
• Typically fifteen 2-hour sessions, usually every other week
• Each team selects a design project and works through entire design process
• Projects often simulate real-life situations

Overview of ACE

career directions for students in architecture, construction and engineering

Affiliate Project Presentation

At conclusion of the program, teams present their projects in a public forum hosted by their local affiliate

Overview of ACE

career directions for students in architecture, construction and engineering

National Project Presentations

CONSTRUCTION INDUSTRY ROUND TABLE (CIRT) DESIGN COMPETITION AWARDS
A Partnership with the ACE Mentor Program of America

• Program: The CIRT/ACE Award competition is maintained, coordinated, and judged by Construction Industry Round Table’s CEOs
• Theme for the Program: Celebrating the innovations and contributions the design/construction community makes to the quality of American life, while understanding the issues and challenges the industry faces to deliver on this legacy
• Eligibility: Any ACE Mentor Affiliate can submit an entry to participate in the CIRT Design Competition - 30 entries in 2012
• Winners: The top three entries are invited to present at a panel of judges at the CIRT meeting in Washington DC

Notes
Notes

Overview of ACE

career directions for students in architecture, construction and engineering

Special Activities

• Field trips to construction sites
• Visit to Governmental Agencies
• Meetings at Mentor Firm's offices

Scholarships

career directions for students in architecture, construction and engineering

Scholarships

✓ Local Affiliate Scholarships
✓ Education Collaborative Program

Currently over 30 institutions have set aside money for ACE students to apply directly to the institution. This list includes trade schools. Visit the www.acementor.org for a full list.

Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring

career directions for students in architecture, construction and engineering

Jane Fonda -- Charles Thurston. Renowned structural engineer and co-founder of the ACE income program.
ACE Mentor Program was awarded the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring (PAESMEM) with a prize of $25,000.

ACE was 1 of 13 Individuals and Organizations given the award for 2010.

PAESMEM is the nation's highest award for mentoring presented by the President of the United States.

ACE National used the $25,000 prize to honor our mentors.

- Five awards of $5,000
- Money would be given to the affiliate of Exemplary Mentors
- A Named Scholarship after the exemplary mentor would be given to a student in their affiliate
- All affiliates were invited submit a nomination
- 23 Mentors were nominated
Notes

Promoting Diversity through Mentoring: The ACE Mentor Program

Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring

career directions for students in architecture, construction and engineering

EXEMPLARY MENTORS FOR 2012

James Barnes
Rhode Island Affiliate

Bryan Burke, P.E.
Frederick, MD Affiliate

Kelly Cantley
Baltimore, MD Affiliate

Alexander Chan
Eastern Pa Affiliate

Jacob Thurlow
Northeast Florida Affiliate

For More Information

career directions for students in architecture, construction and engineering

IT IS ALL ABOUT THE KIDS

THANK YOU FOR YOUR SUPPORT.

For more information
Visit us at
www.acementor.org

Will there be enough architects, construction managers and engineers to fill the industry needs ten years from now?...
Learning Objectives

- Learn a process for making a step-change in safety performance.
- Know how to develop measurable thresholds for continuous improvement.
- Understand a step-by-step approach to selecting, implementing, and using active leading indicators on projects.
- Review a list of active leading indicators that have a proven track record for improving safety performance.
- Be ready to implement an active leading indicator program to better accomplish HSE goals and objectives.

Plenary Session Abstract

The plenary presentation will first discuss the difference between using lagging and leading indicators for achieving zero, with emphasis on the advantages of leading indicators. It will further distinguish passive leading indicators (e.g., the presence of a safety program) from active leading indicators (e.g., the measurement of action in response to near-miss incidents) and explain the importance of active indicators to continuous improvement. The presenter will give details on the RT 284 finding that, for domestic construction projects, the use of active leading indicators can generate a step-change in safety performance for an owner, contractor/subcontractor, or vendor/supplier. He will also show that the effective implementation of multiple active leading indicators on a project is measurably better than implementing just one.

Implementation Session Abstract

The implementation session will begin with a review of the team's research process. The panelists (representatives from one owner, one contractor, and one vendor) will then briefly explain the difference between passive and active leading indicators. Then to stimulate discussion, the panel will then answer pre-determined questions from research team members attending the session. Following this structured question-and-answer exchange, a project manager on the team will give a testimonial on how incorporating active leading indicators helped his project team achieve superior results. Finally, the panel will open the floor to questions from the audience. At the end of the session, team members will give each audience member an electronic copy of the RT 284 implementation resource.
Plenary Session Presenter

Billy Gibbons, Global Account Executive – JMJ Associates

As Chevron Global Account Executive for JMJ Associates, Billy Gibbons leverages her 23 years of experience to create Incident and Injury-Free® (IIF) and high-performance workplaces. Before joining JMJ, Gibbons was President of DGI Safety Leadership and Ergonomics Services, where she oversaw the firm’s consulting work both in the United States and overseas. She has consulted for organizations in various industries, including large scale commercial, civil and capital projects construction, high tech manufacturing, pulp and paper, and secondary wood products. She has also worked closely with federal, state, and academic organizations, teaching and conducting research in life cycle safety in design, applied construction ergonomics, and safety management; these public organizations include the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, Oregon State University, the University of Oregon, and the University of California, San Francisco. She has been an active participant in the CII Safety Community of Practice for the last two years.

Gibbons helps JMJ’s clients develop an integrated approach to creating and sustaining an IIF environment. Part of her process is to teach them to grow the necessary organizational capabilities through effective knowledge transfer processes. This involves helping senior management develop leadership teams that deliver their organizations’ full potential. Through workshops, coaching, and consulting, Gibbons helps her clients clearly assess their challenges, recognize and commit to solutions, and then apply necessary actions. She received a B.S. in organizational psychology from Western Oregon University, and an M.S. in business administration with a management focus from Portland State University. She is also a trained international executive coach through the School of Coaching in London, England.

e-mail: bgibbons@jmj.com
Implementation Session Moderator

Billy Gibbons, Global Account Executive – JMJ Associates

e-mail: bgibbons@jmj.com

Panelists

Matthew R. Hallowell, Assistant Professor, Construction Engineering and Management Program – University of Colorado at Boulder

e-mail: matthew.hallowell@colorado.edu

Jimmie Hinze, Professor, Director of the Fluor Program for Construction Safety, Rinker School of Building Construction – University of Florida

e-mail: hinze@ufl.edu

Roger K. Smith, Regional Manager – Zurich Services Corporation

e-mail: roger.smith@zurichna.com

Samuel D. Thurman, HSE Director – Fluor Corporation

e-mail: samuel.thurman@fluor.com

David T. Wulf, HSE Manager, Project Development – ConocoPhillips

e-mail: david.t.wulf@conocophillips.com
Notes

Going Beyond Zero by Using Safety Leading Indicators
Billy Gibbons, JMJ Associates
Safety Leading Indicators Research Team

Research Team 284 Members

Team Purpose

Achieve a breakthrough in safety performance by going beyond the hyper-focus on what to avoid—incidents and injuries—and identifying what to include—measureable leading indicators.
Research Objectives

1. Identify leading indicators and their measures that can generate the next breakthrough in construction safety performance.

2. Produce tools that identify, measure, and track leading indicators, to realize this breakthrough.

To go beyond where we are . . .
We need to focus on where we want to be!

Going Beyond Zero

- Making the absence of incidents and injuries a reality through the intentional, moment-by-moment creation of project safety

- Creating a work environment in which the absence of incidents and injuries is a real possibility
What are leading indicators?

*Measures of attitudes, behaviors, practices, or conditions that influence construction safety performance*

RT 284 Finding:
Two Kinds of Leading Indicators

- **Passive** – safety strategies that are generally implemented before the construction phase begins, to set the project up for success
  - Examples: prequalification process for contractors; safety expectations in contracts; and consideration of safety in constructability reviews. We identified over 100!

- **Active** – practices or observations that can be measured and adjusted during the construction phase, and that can trigger positive safety responses
  - Examples: project leadership involvement in onsite orientations and walkthroughs; ongoing skill development for field supervision; housekeeping; safety culture surveys; and many more.

Our research revealed some pretty incredible findings, for example:

- CIW members know what leading indicators are, but most do not track, measure, and respond to them!

- The more projects implement passive leading indicators, the more they achieve world-class safety performance.

- Active leading indicators are THE KEY to realizing breakthrough safety performance!

- Our implementation session will give you everything you need to know to go beyond zero!
What you will learn in the Implementation Session:

- A brief overview of how we did the research
- Which leading indicators are most effective for realizing breakthrough results
- How to identify leading indicators for your projects and the tools to help you track and measure them
- A thumb drive to take with you!
  - all our research
  - complete list of indicators
  - all our presentation slides
  - all the tools for implementation and
  - most commonly asked questions

Based on 100 Safety Policies and Practices

![Graph showing Total Recordable Injury Rate based on Percent of Safety Policies/Practices Implemented]

1. Select "Indicators"
2. Define Actionable "Metrics"
3. Develop Measurement Process
4. Engage Responsible Parties
5. Implement
6. Analyze Information
7. Publicize Performance
8. Evaluate Effectiveness
9. Celebrate

Continuous Improvement: Learn and Adjust
Notes

Don’t miss our Implementation Session!

Moderator
Billy Gibbons, JMJ Associates

Panel
Matt Hallowell, University of Colorado
Jimmie Hinze, University of Florida
Roger Smith, Zurich
Sam Thurman, Fluor
Dave Wulf, ConocoPhillips
Going Beyond Zero by Using Safety Leading Indicators

Safety Leading Indicators Research Team 284

2012 Annual Conference Baltimore
Building Global Leadership

Notes

Agenda

• Who we are
• Our mission
• Definition of leading indicators
• Passive leading indicators
  – Methods
  – Results
• Active leading indicators
  – Methods
  – Results
• Making leading indicators work in your company

Research Team 284 Members
Going Beyond Zero Using Safety Leading Indicators

Notes

CII TRIR Trends

What can we do to accelerate improvement?

What are leading indicators?

Leading indicators are measures of attitudes, behaviors, practices, or conditions that influence construction safety performance.

There are two types...

Passive Safety Leading Indicators

Safety strategies that are generally implemented before the construction phase begins, to set the project up for success
Going Beyond Zero Using Safety Leading Indicators

Active Safety Leading Indicators

*Measures of safety strategies made during the construction phase that can trigger adjustments*

---

Studying passive safety leading indicators

What are the passive leading indicators?
- Past CII literature (best practices)
- Research Team brainstorming
  - Led to over 100 potential passive leading indicators!

How often are they implemented and which best predict strong safety performance?
- Team conducted interviews with representatives of 58 projects in the US

---

Safety Program
Passive safety leading indicator results

- 22 of the strategies were used on every project studied (the foundation elements)

Passive Leading Indicators on All Projects

1. Health & safety (H&S) manual
2. Specific safety prequalification
3. Subs participation in GC’s orientation and training
4. Subs safety standards compared to GC
5. Safety leadership training for foremen
6. Management review of craft worker training
7. Safety during constructability reviews
8. Safety in scheduling
9. Heavy eqpt inspection and approval program
10. Written site-safety plan
11. Lock-out tag-out policy

Passive Leading Indicators on All Projects

12. 100% hard hat policy
13. Stop work policy
14. Emergency response plan for the project
15. Job hazard analyses
16. Workers involvement in hazard assessment
17. Safety goals development and communication
18. Safe behavior reward and recognition
19. Near-misses investigation
20. Foremen involvement in accident investigation
21. Foremen involvement in hazard assessment
22. Regular scheduled meetings for safety personnel
10 were identified that predicted particularly strong safety performance with high statistical significance

1. Owner review and approval of CM and GC’s project safety plan
2. Participation of all contractors and subcontractors in safety meetings
3. Site-specific safety orientation for all managers
4. 100% steel-toed boots policy
5. Medical facilities on-site

10 were identified that predicted strong safety performance with high statistical significance

6. First aid log
7. Minimum ratio of safety professionals to workers
8. Worker-to-worker observation program
9. Workers involvement in perception surveys
10. Foremen involvement in policy creation and implementation

The research team identified 100 possible safety policies and practices that could be implemented.

How did the implementation of these policies and practices impact safety performance?
Notes

That's what we know about setting a project up for success but what do we do once the project starts?

The critical question: If you go onto a project and don't know the injury rate, how do you know whether it is safe or not?

Studying active safety leading indicators

- Resulted in more than 50 active safety leading indicators
The concept

- Active safety leading indicators can be measured and can alert management about the need for a positive response before an injury occurs.
- Some are strategies most companies are already doing!
  - Site safety audits
  - Toolbox meetings
- A shift toward:
  - Measurement
  - Setting thresholds
  - Implementing an action plan if the values are not desirable
Over 20 Active Leading Indicators Identified

Examples:

- Housekeeping
- Vendor orientations
- Owner safety walkthroughs
- Stop work
- Safety audits
- Positive reinforcements

Example: Safety Audits

- Almost all firms conduct safety audits BUT few measure, track, and respond in an organized fashion
- This may be a great place to start
  - Evaluate your auditing process (who, what, how often)
  - What might you measure that would predict safety?
  - What is your target?
  - What if your measurements showed unacceptable results?

Example: Positive Reinforcements

- Important for motivating workers
- Some CII member companies do this

How to shift to a leading indicator program:
- Measuring and tracking = active safety leading indicator
- Rate of reinforcements? \(\rightarrow\) Metrics
- What are your goals? \(\rightarrow\) Thresholds
- What if you don’t meet these goals? \(\rightarrow\) Action Plan
What we learned about active safety leading indicators...

- Very few leading indicators are fully implemented by general industry (case average TRIR approx. 2.0)
- Projects where leading indicators were measured and fully implemented had an average TRIR of 0.19!
- Every firm can benefit from active safety leading indicators.
- A strong foundation of safety is a prerequisite.
- A champion must be committed to success.
- The next step is to carefully select a few active safety leading indicators and implement them on your project.

In Summary

- Passive safety leading indicators: Tell you the extent to which you have set your project up for success.
- Active safety leading indicators: Tell you the safety potential of your project and provide signals when specific corrective actions should be taken.
- Let’s hear from someone who uses these every day...
Notes

Panel discussion

To the Owner Panelist:
ConocoPhillips Projects has implemented active leading indicators for several years. Please describe the current active leading indicators that you are using and the challenges you have faced implementing them globally.

Panel discussion

To the Contractor Panelist:
We have heard not only about how numerous the leading indicators can be but also that they are grouped in this research as passive and active. With our reliance for so many years on tracking safety performance based upon lagging indicators how would we select appropriate leading indicators, transition to their use, and communicate the results to the stakeholders?
Notes

Going Beyond Zero Using Safety Leading Indicators

Panel discussion

To the Vendor/Supplier Panelist:

Please give us some examples of safety leading indicators for vendors and the assignment of responsibility
Notes

Panel discussion

To the Owner Panelist (#2):
From an Owner’s perspective how important is management commitment to the Active Safety Leading Indicator program? Do you have examples for both or either scenario (important versus not important) that supports ConocoPhillips history with management commitment?

Panel discussion

To the Contractor Panelist (#2):
As far as safety performance is concerned in the contractor community, CII member companies have achieved an excellent safety record with often not much more than standard industry measurements and are “world class” in terms of construction safety performance. Explain why we should change how we report and track our safety performance.

Panel discussion

To the Vendor/Supplier Panelist (#2):
Who must respond to the Active Safety Leading Indicators for vendors—the Owner or the General Contractor?
Project Manager testimonial

- Industrial Hygiene Qualitative and Quantitative Assessments
- Supervisor/Employee Perception Surveys
- Sharing of Best Practices
- Quality of Safety Task Assessments
- Supervisor Safety Skills Training
- Crane Safety Initiative Implementation

Notes
Applying Probabilistic Risk Management in Design and Construction

Methods for Dealing with Uncertainty – Applying Probabilistic Controls in Construction

Research Team

Learning Objectives

• Understand the benefits and barriers of probabilistic risk management approaches to cost and schedule analysis on design and construction projects.

• Be able to use a sequential method for introducing more advanced approaches to risk management on a project.

• Learn how to employ the RT 280 risk register tool on an example project.

• Analyze the results and interpret the meaning of the probabilistic tool output.

• Be ready to implement the tools and takeaways from the session.

Plenary Session Abstract

The presenter will introduce Research Team 280’s progressive, three-level approach to risk assessment, which starts at risk identification, moves up to deterministic risk analysis, and culminates in probabilistic risk management. She will describe the benefits and returns on investment that companies typically realize when they take a probabilistic approach to analyzing cost and schedule risks in capital facility design and construction. To provide an overview of the research process, she will describe the team’s two surveys of risk managers at 177 responses from multinational owner and contractor organizations, and explain how the survey responses helped the team identify 12 in-depth case studies. She will also discuss the team’s rigorous analysis of the data to assess current practices, processes, and applications of probabilistic risk management. Finally, she will introduce the implementation resources the team produced to help organizations first find the most appropriate levels of risk management for their projects and then, if appropriate, apply probabilistic methods.

Implementation Session Abstract

The panel will address the current use of probabilistic risk management in the industry, discuss the types of questions that can be answered by using probabilistic analysis, and describe the benefits and returns on investment obtained by organizations implementing probabilistic methods. The panelists will introduce the team’s two implementation resources, the first of which uses a sequential method with three levels of risk analysis. Its three-level risk register process culminates in the implementation of probabilistic risk management and provides guidance on when the more advanced risk management levels should be implemented. The presenters will apply this tool to an example project to highlight key decision points, demonstrate the inputs and outputs of each risk analysis level, and show how to interpret probabilistic outputs. This tool and the team’s other implementation resource—a handy laminated reference card for understanding and interpreting the three levels of risk analysis—are both designed for any project manager who must deal with uncertainty, whether for an owner, a contractor, or an engineering firm. The session will end with a discussion of how probabilistic risk management can improve a project team’s ability to effectively manage cost and schedule, pinpoint the risks with the greatest potential impact to project objectives, and, ultimately, increase confidence in project decision making.
Plenary Session Presenter

Karen M. Furlani, Project Risk & Controls Manager – CH2M HILL

Karen M. Furlani is currently a project controls manager for CH2M HILL, at the firm’s offices in Englewood, Colorado. She is responsible for developing, implementing, and managing enterprise standard procedures and systems for project controls. With over 18 years of experience in the capital project industry, she has worked in a variety of project delivery roles as both a contractor and an owner. This experience includes risk management, project management, engineering, construction, and facilities management. Furlani also worked as a research engineer in construction metrology and advanced automation systems at the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland. She has an M.S. in engineering systems and a B.S. in civil engineering.

e-mail: karen.furlani@ch2m.com

Implementation Session Moderator

Craig Relyea, Manager, Capital Projects Planning – Eli Lilly and Company

Craig Relyea currently serves as Manager of Capital Projects Planning for Eli Lilly and Company, at the firm’s offices in Indianapolis, Indiana. He has over 35 years of global project services experience, having focused on construction project controls, contract administration, and planning and scheduling for the shipbuilding, petrochemical, power, and pharmaceutical industries. In his present role with Eli Lilly, he is responsible for developing, implementing, and maintaining corporate scheduling practices. In this capacity, he provides training and mentoring to internal and external project team members. He also provides guidance and assistance to project teams in their development and integration of project schedules.

Relyea is currently sharing his experience with several organizations: he is Vice President of the Hoosier section of the Association for the Advancement of Cost Engineering (AACE); he serves as Editorial Manager for the Scheduling Excellence Initiative Best Practice Guide of the PMI Scheduling Community of Practice; and contributes as a member of the U.S. editorial team of Planning Planet. Relyea has a B.S. in business management.

e-mail: relyeacr@lilly.com

Applying Probabilistic Risk Management in Design and Construction
Panelists

Karen M. Furlani, Project Risk & Controls Manager – CH2M HILL
e-mail: karen.furlani@ch2m.com

Amy Javernick-Will, Assistant Professor – University of Colorado at Boulder
e-mail: amy.javernick@colorado.edu

Keith R. Molenaar, Professor & Chair, Department of Civil, Environmental &
Architectural Engineering – University of Colorado at Boulder
e-mail: keith.molenaar@colorado.edu

Scott Penrod, Vice President, Estimating – Walbridge
e-mail: spenrod@walbridge.com

Brendan J. Robinson, Construction Program Executive – Architect of the Capitol
e-mail: brrobins@aoec.gov
Applying Probabilistic Risk Management in Design and Construction

Plenary Session Slides

Notes

Applying Probabilistic Risk Management in Design and Construction Projects

Karen Furlani, CH2M HILL
Methods for Dealing with Uncertainty – Applying Probabilistic Risk Management in Construction Research Team

Can You See It Coming?

Where We Are Today...
The Essential Question

What would be the benefits and implications of applying a probabilistic approach to analyzing cost estimating and schedule risks for the design and construction of capital projects?

<table>
<thead>
<tr>
<th>LEVEL 1 - RISK IDENTIFICATION</th>
<th>LEVEL 2 - DETERMINISTIC</th>
<th>LEVEL 3 - PROBABILISTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Identification</td>
<td>Risk Estimation</td>
<td>Risk Management</td>
</tr>
<tr>
<td>Risk</td>
<td>Likelihood</td>
<td>Impact</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
<td>High</td>
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<tr>
<td>Medium</td>
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<td>Medium</td>
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<tr>
<td>Low</td>
<td>Low</td>
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</tr>
</tbody>
</table>

One Thought Before We Begin

Probabilistic risk management estimates risk by using Monte Carlo analyses to determine
- what can go wrong.
- how likely it is.
- what the consequences could be.

The Research

What's being used?

Who's using it?

Why?

Where and when?

How?
The Benefits

- Better manage project costs and schedule
- Better manage and prioritize risks
- Increase confidence in project decision making
- Improve collaboration and communication

Who is already using probabilistic approaches

58 percent of companies employ probabilistic risk management

The return on their investment in probabilistic approaches

- 90 percent reported ROI of at least 1:10
- 37 percent reported ROI of at least 1:100

The Levels

- Level 1: Risk Identification
- Level 2: Deterministic Approach
- Level 3: Probabilistic Approach
RT 280 Implementation Resources

IR 280-3, What’s the Risk?
- a two-sided, laminated process roadmap with outputs, benefits, requirements, and limitations for each level
- interpretation of results from probabilistic analysis

IR 280-2, Applying Probabilistic Risk Management in Design and Construction Projects
- implementation guidance with project example
- Excel-based risk registers for each level

Notes

Come to Our Implementation Session

Moderator
Craig Relyea, Eli Lilly

Panel
Karen Furlani, CH2M HILL
Amy Javernick-Will, University of Colorado, Boulder
Brendan Robinson, Architect of the Capitol
Keith Molenaar, University of Colorado, Boulder
Scott Penrod, Walbridge
## Notes

### Applying Probabilistic Risk Management in Design and Construction Projects

#### Implementation Team

<table>
<thead>
<tr>
<th>Role</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderator</td>
<td>Craig Relyea</td>
</tr>
<tr>
<td>The Panel</td>
<td></td>
</tr>
<tr>
<td>Probabilistic Approach</td>
<td>Karen Furlani</td>
</tr>
<tr>
<td>Methods &amp; Results</td>
<td>Amy Javernick-Will</td>
</tr>
<tr>
<td>Risk Tool and Examples</td>
<td>Brendan Robinson</td>
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<tr>
<td>Conclusions</td>
<td>Craig Relyea</td>
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<td>Keith Molenaar</td>
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<tr>
<td></td>
<td>Scott Penrod</td>
</tr>
<tr>
<td>Questions &amp; Answers</td>
<td>All</td>
</tr>
</tbody>
</table>

---

### Probabilistic Risk Management
Have you ever wondered...

- How much contingency do I need?
- When can I release contingency?
- What is my confidence in my cost or schedule projection?
- What is the probability of finishing the project per our cost or schedule target?
- What risks have the greatest impact on my project?
- Where should I focus my efforts?

Probabilistic Risk Management

58 percent of organizations employ probabilistic risk management

The return on their investment in probabilistic approaches

- 90 percent reported ROI of at least 1:10
- 37 percent reported ROI of at least 1:100

Why did they use Probabilistic Risk Management?

- Better manage project costs and schedules
- Better manage risks, including prioritizing risks to mitigate
- Increase confidence in project outcomes and decision-making
- Increase collaboration among team members; facilitate knowledge exchange across organization
- Communicates project cost/schedule uncertainty to organization, team members & other stakeholders
Notes

There are Barriers to overcome...

- Lack of technical expertise
- Difficulty interpreting the results
- Changing the organizational culture and structure to support formal risk management practices
- Lack of policy or procedures

Methods, Case Study Results & Findings

CII RT280

What would be the benefits and implications of applying a probabilistic approach of analyzing cost estimating and scheduling risks for design and construction of capital projects?
Learning Objectives

By the end of this session, you will be able to:

- Describe the **benefits and barriers** of probabilistic risk management approaches for cost and schedule analysis on design and construction projects
- Describe a **sequential method** for introducing more advanced approaches to risk management on a project
- Employ the **risk register tool** developed by the team on an example project
- Analyze the results and meaning of the **probabilistic analysis**

How can you have confidence in our results? Methodology

- Literature Review
- State of Practice Survey
- Case Studies
- Validation Survey
- Report Out

How can you have confidence in our results? Methodology

- Literature Review
- State of Practice Survey
- 127 respondents
- 104 Organizations
- 40 CII Companies
How can you have confidence in our results? Methodology

### Case Studies

<table>
<thead>
<tr>
<th>Company</th>
<th>Owner or Contractor</th>
<th>Public or Private Projects</th>
<th>CII Member</th>
<th>Type (Horiz., Vert., or Process)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>X</td>
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<tr>
<td>2</td>
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<tr>
<td>12</td>
<td>X</td>
<td>X</td>
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<td>X</td>
</tr>
<tr>
<td>TOTALS</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>
Level 3: Project Attributes/Triggers

- Project Cost – most common trigger, set cost values
- Delivery Method – varied from “typical” delivery method
- Novelty – new client, new project type, or new market
- Location – geographical landscape, gov’t regulations and instability

What’s the Risk?

<table>
<thead>
<tr>
<th>Definition</th>
<th>Level 3 Probabilistic</th>
</tr>
</thead>
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</table>

Notes

Applying Probabilistic Risk Management in Design and Construction
Notes

<table>
<thead>
<tr>
<th>Risk Management</th>
<th>Company Use</th>
<th>% using on 50-100% projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 3</td>
<td>Probabilistic 58%</td>
<td>46%</td>
</tr>
<tr>
<td>Level 2</td>
<td>Deterministic 56%</td>
<td>53%</td>
</tr>
<tr>
<td>Level 1</td>
<td>Risk Identification 85%</td>
<td>72%</td>
</tr>
</tbody>
</table>

Risk Tool and Examples of Probabilistic Approaches

Risk Register Tool
Applying Probabilistic Risk Management in Design and Construction

What’s Involved: Project Example

What’s Involved? Project Example

Risk Management

Risk Identification:
- Identify Risks & Opportunities
- (Progress To Other Levels If Project Warrants)
Applying Probabilistic Risk Management in Design and Construction

Level 1: Identification Workshops

**RISK IDENTIFICATION AGENDA**

1) Brief Risk ID Training
2) Review Scope, Schedule & Estimate
3) Review Design & Estimating Assumptions
4) Brainstorm for Risks
5) Review Risk Checklists

**Roll Call**

- Risk ID Facilitator
- Project Manager
- Design Lead
- PM from similar project
- Internal discipline SMEs
- External SMEs

Level 1: Identification

<table>
<thead>
<tr>
<th>Level 1 - RISK IDENTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>1</td>
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<td>3</td>
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<tr>
<td>4</td>
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<tr>
<td>5</td>
</tr>
</tbody>
</table>

Risk Management

**Deterministic Analysis:**

- Analyze Risks Through Single-Point Estimates of Potential Impacts

**Level 2**

**Level 1**

**Risk Identification:**

- Identify Risks & Opportunities (Progress To Other Levels If Project Warrants)

Is This Enough?

No

Yes
Level 2: Deterministic

Risk Management

Level 3: Probabilistic

Notes
Level 3: Probabilistic Monte Carlo Simulation

80% of the values are equal or less than 3.8Y

Level 3: Probabilistic Results
What is the range of cost or schedule?

Distribution for Total Project Costs (Current $ mil)

Mean = $22.5
85% Confidence = $24.5

Distribution for Project Schedule (Year)

Mean = 2.5 Years
85% Confidence = 3.5 Years

Level 3: Probabilistic Results
What is my confidence in cost or schedule?

Cumulative Total Project Costs (Current $ mil)

85% Confidence = $12.5
Mean = $22.5

Cumulative Total Project Schedule (Year)

85% Confidence = 3.5 Years
Mean = 2.5 Years
Level 3: Probabilistic Results
What risks have the greatest impact and where should I focus mitigation efforts?

Tornado Diagram

Risk Event: Unmitigated Mean Severity

- Historic Site
- Replace culvert over Wandering Creek
- Delay in Request for Proposal
- Change in pavement section and/or type
- Ground improvements required in stream bed
- Embankment delays

Risk Management
How much contingency do I need and when can I release it?

Risk Resolution

Historic Site Apology
Delay in Request for Proposal

Contingency

Total Risk/Contingency (5 yr)

Contingency

Time (Years)

Allocation & Risk Mitigation

<table>
<thead>
<tr>
<th>Risk</th>
<th>Identifiable Description</th>
<th>Response Action/Strategy</th>
<th>Most Likely Impact</th>
<th>Most Likely Probability</th>
<th>Actionable Risk Factor</th>
<th>Cost of Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Historic Site Apology</td>
<td>Accept</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>$897,000</td>
</tr>
<tr>
<td>2</td>
<td>Delay in Request for Proposal</td>
<td>Accept</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>$90,000</td>
</tr>
<tr>
<td>3</td>
<td>Change in pavement section and/or type</td>
<td>Mitigate</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>$200,000</td>
</tr>
<tr>
<td>4</td>
<td>Ground improvements required in stream bed</td>
<td>Mitigate</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>$30,000</td>
</tr>
<tr>
<td>5</td>
<td>Embankment delays</td>
<td>Mitigate</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>$520,000</td>
</tr>
</tbody>
</table>
Why use Probabilistic Risk Management?

- Better understand risks facing our projects and the impact of these events on project performance
- Increased certainty about project based decisions
- Increased certainty of achieving project outcomes
- Clear communication of uncertainty in project cost and schedule to team members and stakeholders

Considerations

- Understanding the process
- Organizational commitment to the process
- Proper interpretation of the results
How we are helping you: Takeaways

- RS-280-1
  - The Research Summary
- IR-280-2:
  - Implementation Resource with project example
  - Excel-based Risk Registers for each level
- IR-280-3:
  - "What's the Risk": The portrayal of outputs, benefits, requirements and limitations for each "Level"
  - Interpretation of results from Probabilistic Analysis

Questions & Answers

Team Case Study at Cal Trans Bay Bridge Project – Oakland CA

CII Research Team 280

Jeffery Bornmann, Zachry
Chris Cueva, Southern Company
Karen Furtani, CH2M Hill
Daniel Hogan, US Dept of State
Amy Javernick-Will, Univ of Colorado
Douglas Kaiser, Excel
Kathleen Marwitz, Abbott
Keith Molenaar, Univ of Colorado
Scott Penrod, Walbridge
Craig Polleyea, Eli Lilly & Company
Brendan Robinson, US Architect of the Capitol
Marie Robinson, Jacobs
Ralph Rodriguez, Kaiser Permanente
Christopher Senesi, Univ of Colorado
Michael Shirley, Tennessee Valley Authority
Learning Objectives

- Understand the challenges PMs will face over the next 10 years.
- Recognize the attributes of the successful PM.
- Learn which competencies PMs will need for success in the next 10 years.
- Be able to use the tools developed by RT 281 to build these competencies.

Plenary Session Abstract

This presentation will highlight the work Research Team 281 has done to uncover the drivers for the changes that the world will face through 2022. The presenter will ask the essential question, “Are you ready to think differently?” and will show how the team’s innovative findings and dynamic interactive tools can prepare project managers to meet the challenges of the future.

Implementation Session Abstract

The panel will present a brief overview of the research findings and then take the audience through one of the interactive tool exercises—a shortened version of the *PM Magic Deck of Action Cards* game. During the session, attendees will receive a handout for profiling the leadership and management style of a project manager and a copy of the *Meta-Tool: Project Manager Competency Development Tool Selection Guide*, presenting the relationships among the 19 disruptive forces that will influence the future, the 14 skills required to answer those forces, and the learning tools that help to develop those skills.
Plenary Session Presenters

Craig C. Connell, Vice President, Project Director, Power Generation Services – Black & Veatch

Craig Connell has been with Black & Veatch for 33 years, having spent the first part of his career in the engineering and project management of power plants in the United States, Malaysia, and the Philippines. He has also held a management position in the company’s CIO group and has served as the Director of the Corporate Project Management Office. He holds a BSME degree from Iowa State University and a MSME degree from the University of Kansas.

e-mail: connellcc@bv.com

Sarah Scott, Business Transformation Coordinator – Fluor Corporation

Sarah Scott has been with Fluor Corporation since 2006 and currently serves as a coordinator for the company’s business transformation initiative. Prior assignments included serving as a design engineer for a carbon capture project and as a project engineer. She has also worked with one of the company’s major business lines to improve customer relations and increase cost effectiveness. She has supported internal efforts to develop knowledge communities and to implement in internal web-based collaboration. She is a 2006 graduate of the University of California, San Diego, and holds a bachelor’s degree in structural engineering.

e-mail: sarah.scott@fluor.com

Implementation Session Moderator

Avi Wiezel, Chairman, Del E. Webb School of Construction – Arizona State University

Prior to his academic career, Dr. Avi Wiezel held managerial positions at construction and engineering firms in Europe and the Middle East. He has taught in four languages in Asia, Europe, and the United States at all levels—to students from bricklayers’ apprentices to doctoral students and executives. Wiezel consistently ranks among the top five percent of best teachers in the Fulton School and has received the Outstanding Faculty Member Award. He has also served as the head of the Del E. Webb School of Construction. His research focuses on human activities in construction and includes models for improving the skills of craftsmen, crews, project managers, and company executives. He is the co-author of several innovative learning tools such as the Hassle Exercise, “Project from Hell,” and the Senior Executive Magic Action Cards (SEMAC) game.

e-mail: avi.wiezel@asu.edu
PM Skills for 2022

Craig Connell, Black & Veatch
Sarah Scott, Fluor Corporation
Project Management Skills of the Future Research Team

RT 281
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Dana Riley, SABIC
Vivian Schorle, TVA
Avi Wiezel, ASU
Frank Williamson, Mustang

Evolutionary change
Notes

Skills of the future

CHANGE

technology
information
demographics
organizations

CHANGE

Prepared
Our choice

Skills used differently

Project Management of the Skills of the future
PM Skills of the Future

Implementation Session Slides

Notes

PM Skills of the Future
Professor Avi Welzel, Arizona State University

Learn Different

2012 Annual Conference • Baltimore
Building Global Leadership

RT 281 - PM Skills of the Future

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Sarah Scott, Fluor
*Co-Chair
*Academic Advisors
*Generation Y

1 THINK DIFFERENTLY
There will be a shift in focus from technical and management skills to cognitive and leadership skills

2 LEARN DIFFERENTLY
PM education will require an interactive team setting with a skilled facilitator and will emphasize leadership.

3 MANAGE DIFFERENTLY
The new way of educating PMs can be used to gain insight on the real problems of the organization.
Objectives of the implementation session

1. THINK DIFFERENTLY
   Familiarize you with the study findings, methodology, and impact.

2. LEARN DIFFERENTLY
   Allow you time to experience some of the skills in a group exercise.

3. MANAGE DIFFERENTLY
   The new way of educating PMs can be used to gain insight on the real problems of the organization.

Think Differently…

Disruptive Trends

- Globalization
- Workforce Demographics
- Technology
- New and Changing Organizations
Notes

Forces of Change

- Projects in areas with difficult conditions
- Safety issues and training beyond traditional areas
- Price/schedule/resource pressure means more competitiveness
- Global supply chains
- Relationship building at multiple locations
- Balance of traditional success factors with sustainability objectives and compliance
- More oversight and regulation

Think Differently – our Findings

Think Differently – Research Method

- Literature Review
- PM Seminars
- Reports
- 5 Thought Leaders
- 47 Gen Y
- 39 Super PMs
- Substantiation
- Data Analysis
- Review & Consolidation
Impact

BUILDING and DEVELOPMENT 100-h

PM Skills of the Future

Notes

Learning Tools

SCALE FOR EFFECTIVENESS
OF LEARNING TOOL
0: Minimal influence on the competencies
1: Some influence on the competencies
2: Improves competencies
3: Strongly improves thinking (competency)
4: Changes thinking (competency)

<table>
<thead>
<tr>
<th>LEARNING TOOLS</th>
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<tr>
<td>Dictionary of Terms (4)</td>
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<td>Power Exercise (4)</td>
<td>2</td>
</tr>
<tr>
<td>PM: Build of Action Cards Game (4)</td>
<td>3</td>
</tr>
<tr>
<td>What is: Your Mindset? Diagnosis Tool (2)</td>
<td>3</td>
</tr>
<tr>
<td>All Executive Leadership Program (88h)</td>
<td>4</td>
</tr>
</tbody>
</table>

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The Project Management Action Cards Game

Three phases:
1. Individual – Entry Level
2. Team Learning
3. Exit & Action Plan

Project from Hell... Individual Entry Level

- Sarah is your mentee and she is ready to take over her first "Project from Hell" (PFH).

- The project is plagued with all kind of problems: morale, safety, unhappy owner, inexperienced subcontractors, government audits, scope changes, remote location, and weather.

- She asks for your advice.
“PFH”

- Fortunately, you have a deck of 28 Action Cards that will help you advise Sarah.

- Read all the action cards and select the 10 actions that you think have the potential of turning the PFH around.

- Mark your selected preferences on the handout.

```
Entry Level Selection
[Handout Image]
```

“PFH”

- Sarah (Gen Y-er) is a little puzzled by the actions you recommended.

- She asks you “Are you sure these will work?” Would you mind checking with your peers?

---

**PFH - The Team Game**

The Knowledge Leader for Project Success
Owners • Contractors • Academics

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Building Global Leadership
Notes

Reality check...

This is only one of the several learning tools we are using to improve Project Management

• The PFH Card Game illustrates the power of the PM's style on the success of the project.

• You will see how your beliefs, behaviors and actions influence the project team.

Start the Game...

• Your whole team is now going to advise Sarah.

• Using the decks of 28 cards provided on your table, your team’s goals are
  1. select the top 10 action cards that will turn PFH around,
  2. explain why they will turn the project around,
  3. and rank the actions in order of their effectiveness.

Our Strategy ...

Wrap-up team play

- Dismantle the teams.
- Leave the 28 card on the table – you have your own 52...

We have skipped a number of steps

1. Adding an action card (joker) to the list.
2. Ranking the cards by sequence of implementation, cost to the company, your time investment.
3. Profiling the team’s style and creating a team Motto
4. Discussing the wisdoms learned from the game
5. Sharing knowledge with the whole class (and learning from the wisdom of the crowds).
6. Discussing the changes that will occur in the profession in the next 10 years.

The game is not over...
Exit Card Selection Game
Exit level assessment

• In the team game you have been exposed to new views about what makes a project successful.
• Individually go through the deck once more and with your newly acquired insight and wisdom select 10 cards that you now believe would have been most appropriate the straighten out the project.

Exit Level Selection

<table>
<thead>
<tr>
<th>6c</th>
<th>7c</th>
<th>8s</th>
<th>9c</th>
<th>10d</th>
<th>Jc</th>
<th>Qc</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>6d</td>
<td>6h</td>
<td>6s</td>
</tr>
</tbody>
</table>

Exit Level Assessment

• Pick-up your entry level and exit level selections.
• Count the cards in each suit (as shown below) for both cases.

Exit Level Selection

<table>
<thead>
<tr>
<th>7c</th>
<th>8s</th>
<th>9d</th>
<th>10c</th>
<th>Jh</th>
<th>Qd</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>6h</td>
<td>6s</td>
</tr>
<tr>
<td>6c</td>
<td>7c</td>
<td>8s</td>
<td>9c</td>
<td>10d</td>
<td>Jc</td>
</tr>
</tbody>
</table>

Σ = 10

What happened here …?

• Plot your final selection on the spider graph
• Plot your earlier selections on your spider graph
• What does it tell you?
Action plan

- Leadership balance off?
- Replace one action card with another.

Change the work structure to allow higher degrees of freedom to all levels of staff.

Exit Level Selection

30% / 70% → 40% / 60%

Σ = 10

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PM Skills of the Future

Manage Differently...

Impact

Learning Tools

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PM Skills of the Future

Manage Differently...

www.construction-institute.org → Implementation

PM Education...

• PM education sessions can serve as information gathering vehicles for feedback.

• Not only you learn and gain new perspectives …
  – you also gain an insight into the capabilities of your team and …
  – your company gets a better understanding of its organization and its educational needs and growth

The Future...

What will you do after applauding our session?

• Wonder if what we said is true?

• Think about what you can do to prepare for this future?

• Ponder future opportunities and challenges?

• Or …
  will you just fuggedaboutit?
Notes

The Future...
CCM: The Mark of a Professional
CII–CMAA Alliance

Learning Objectives

• Understand the need for certification and its value to owners and service providers.

• Learn about the history and growth of the program.

• Find out who uses the designation and participates in the program.

• Review eligibility and program requirements.

• Envision the future of the program, including the integration of CII Best Practices into the Certified Construction Management Body of Knowledge and examination.

Plenary Session Abstract

The Construction Management Association of America (CMAA) has developed its construction manager (CM) certification program to give owners and service providers a reliable, standards-based way to evaluate the experience and skills of construction project managers. In this session, the presenter will describe the CMAA certification program, explain how leading owners are using it, and show how CII Best Practices are being incorporated into the Body of Knowledge on which CM certification is based.

Implementation Session Abstract

In this session, leaders from CMAA’s Construction Manager Certification Institute will discuss the program’s process and procedures, and discuss the program’s process and procedures, and will share their professional and personal insights into the value of the certification.
Plenary Session Presenter

Doug Titzer, Division Vice President – Jacobs

As both an owner’s agent and a design-build contractor for at-risk projects, Doug Titzer manages a wide variety of project types for Jacobs, including federal office buildings, courthouses, research laboratories, and educational and corporate facilities. His experience includes helping designers and contractors safely meet client quality, budget, and schedule requirements during all project phases—from pre-design and design, through procurement, construction, commissioning, and warranty on new and renovation projects.

In his current position as Division Vice President, Titzer oversees Jacobs’ East PMCM Global Buildings sales organization. He is also a member of the Construction Management Association of America (CMAA), where he obtained his Certified Construction Manager (CCM) certification credential 10 years ago. He currently serves as the Secretary of the Construction Management Certification Institute (CMCI) Board of Governors, the organization that oversees the CCM accreditation process, and chairs the CMCI Examination Committee.

Titzer earned a bachelor’s of architectural engineering from The Pennsylvania State University in 1988. He believes strongly that, because such organizations as CII and CMAA focus on promoting and enhancing industry leadership, professionalism, and excellence, we have a very bright future ahead of us.

e-mail: doug.titzer@jacobs.com

Implementation Session Moderator

Doug Titzer, Division Vice President – Jacobs

e-mail: doug.titzer@jacobs.com

Panelist

Nicolas Soto, Director of Certification – Construction Management Association of America

e-mail: nsoto@cmaanet.org
CCM: The Mark of a Professional

Doug Titzer, Jacobs
Construction Management Association of America

Doug Titzer, CCM
- Manager at Jacobs overseeing Eastern U.S. PMCM Operations
- 20+ years of building program experience, in all project phases
- Secretary, CMCI Board of Governors
- Chair, CMCI Exam Committee

Mission

*Improve delivery* of capital facilities in all settings by promoting the *professional practice* of construction and program management in conjunction with the broadest possible application of recognized industry *best practices*.

construction-institute.org/alliance
Global Presence

- CII and CMAA share members
  - Black & Veatch, CH2M HILL, Jacobs, Parsons, URS, USACE, State Department OBO
- Alliance includes leaders of the integration effort.
  - Not just embracing but driving the process
- 1,700+ individual CMAA members in shared organizations

Certified Construction Manager

- A professional who has met the criteria of the CM certification program:
  - formal industry-specific education or experience
  - documented, responsible-in-charge construction management experience
  - demonstrated understanding of CMAA Standards of Practice

CMAA Standards of Practice

- Project Management
- Cost Management
- Time Management
- Quality Management
- Contract Administration
- Professional Practice
- Safety and Risk Management

IN THE FUTURE, also Best Practices (IR186-3)
ANSI Accredited

- Accredited by the American National Standards Institute (ANSI) in 2006.
- Accreditation confirms that CMCI’s processes and procedures adhere to an international standard of excellence that is mobile and in the interest of public welfare (ISO).
- Accreditation confers legitimacy.

Value of CM Certification to Individuals

- Demonstrates professionalism.
  - Increases opportunities for career advancement and enhances potential compensation.
  - Enables more effective marketing of skills.
- Builds client confidence.
- Increases credibility among co-workers.
- Shows professional dedication to owners, employers, and peers.

Value of CM Certification to Service Providers

- Independently assesses the levels of CM staff knowledge and project management skills.
- Improves quality and company marketability.
- Demonstrates company commitment to hiring qualified professionals.
- Sets expectation of competency, experience, and ethical behavior.
- Lowers liability insurance rates for companies that hire CCMs.
Value of CM Certification to Industry

- Provides a respected career path for CM professionals.
- Sets open, tested, and clear industry standards by which owners can evaluate service providers.
- Establishes reliable professional development and continuing education.

Nationwide Commitment

Owners who recognize the importance of having CCMs lead their teams.

- City of Dekalb Police
- County of San Diego
- Department of Homeland Security
- Los Angeles Unified Schools
- Massachusetts Port Authority
- Metro Washington Airport Authority
- NYC Dept. Environmental Protection
- NYC Transit Authority
- Oklahoma Department of Central Services
- San Francisco Public Utilities Commission
- Smithsonian Institution
- University of Texas
- US Army Corps of Engineers
- US Dept. Veteran Affairs
- US General Services Administration
- Virginia Dept. of Transportation
- Washington Metro Area Transit Authority

CM Certification Growth
Surveying CCMs & Owners

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Project size</td>
<td>7%</td>
</tr>
<tr>
<td>Cost control</td>
<td>4%</td>
</tr>
<tr>
<td>Complexity of a project</td>
<td>55%</td>
</tr>
<tr>
<td>Schedule management</td>
<td>5%</td>
</tr>
<tr>
<td>Transparency</td>
<td>0%</td>
</tr>
</tbody>
</table>

What do you think are the most important benefits of having the CCM certification? (check all that apply)

- Sign of professional achievement: 83%
- Assists in career opportunities: 80%
- Increased pay: 16%
- Credibility to clients or consultants: 79%

Demonstrating Commitment

- The CCM is considered the “gold standard” of personnel credentials for the construction management profession.
- It represents both the organization’s and the individual’s commitments to excellence in program/construction management.
- It is evidence of both the organization’s and the individual’s commitments to career advancement.
- It benefits both the CM industry and the public at large.

Implementation Session

- Review of process and procedures
- Eligibility review
- Examination
- Preparation recommendations
- Maintaining the CCM
- Fees and timelines
- Questions and answers
CCM: The Mark of a Professional

Implementation Session Slides

Notes

Doug Titzer, CCM

- Manager at Jacobs overseeing East US PMCM Operations.
- Over 20 years operations experience running building programs including design, procurement & construction phases.
- Secretary on the CMCI Board of Governors.
- Chair of the CMCI Exam Committee.

Nick Soto

- Director of Certification, CMCI/CMAA
- Bachelors of Science in Economics.
- Background in association management, certification and professional examinations.
- Spent the last 8 years running 4 different ANSI accredited certification programs.
CMCI
Construction Manager Certification Institute

• The Institute is the governing body responsible for administering the Construction Manager Certification Program
• The Institute is managed by a Board Governors who:
  ✓ Set policies and procedures
  ✓ Review and evaluate applications

Certified Construction Manager

A professional who has met the criteria of the CM certification program:

• Formal industry specific education or experience
• Documented, Responsible-in-Charge Construction Management experience
• Demonstrated understanding of CMAA Standards of Practice

CM Certification Process

1. Determine eligibility
2. Complete and submit full application packet
3. Be advanced to candidacy by the Board of Governors
4. Prepare for examination
5. Pass the examination
Eligibility Options

48 months Responsible-In-Charge (RIC) experience as a construction manager as shown on Qualification Matrix and one of the following:

- 4-year degree from an accredited educational institution in:
  - Construction Management
  - Architecture, Engineering (multiple disciplines), or Construction Science
- 2-year degree & 4 years additional experience in:
- 8 years experience in general design and construction.

Responsible in Charge

The Board of Governors has defined Responsible-in-Charge as follows:

“The candidate’s experience must be recognized during project execution as part of a project delivery team. The candidate must have had sufficient accountability to assure direct responsibility for the supervision of the construction management staff, for project decision making, the delivery of construction management services and communication with and coordination of the other project participants, specifically owners, design professionals, consultants, suppliers, vendors and contractors.”

Determining RIC

1. Were you empowered to make a direct impact on the successful project completion?

2. Were you directly responsible-in-charge of construction management services?

3. Did you protect the project and the owner interests?
Tips on documenting RIC Experience

This is the most critical part of the application along with your reference letters.

- Start the application by matching the qualification matrix with the projects you will write about.
- Minimize re-writing the narrative portion of documentation by using as few projects as possible.
- Focus on how your role had an impact in the area you are writing about.
- Be specific enough to convey your impact to the job (i.e., include project metrics to validate your performance).

Qualification Matrix

<table>
<thead>
<tr>
<th>PHASE</th>
<th>Pre-design</th>
<th>Design</th>
<th>Procurement</th>
<th>Construction</th>
<th>Post-construction</th>
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<tr>
<td>FUNCTION/ROLE</td>
<td>RIC</td>
<td>RIC</td>
<td>RIC</td>
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</tr>
<tr>
<td>Contract Administration</td>
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<td>RIC</td>
<td>RIC</td>
<td>RIC</td>
<td>RIC</td>
</tr>
</tbody>
</table>

RIC Experience - Minimum Total of 48 months cumulative experience required in these phases & function roles

Examples of Narratives

TIME MANAGEMENT
Pre-Design – I was responsible to ensure that certain assignments (i.e., estimates, design deliverables) were provided in time for presentations or recommendations to our client or the Board of Trustee members on the Buildings and Grounds Committee.
Procurement –
Post-Construction –

QUALITY MANAGEMENT
Pre-Design – I wrote, reviewed and worked with the University to provide a thorough RFP and design procurement process that clearly delineated the Architect’s scope of work, programmatic and construction cost constraints.
Design – I was intimately involved in the programming process with the architect’s team and provided review with other ARAMARK colleagues independent of HasRFP committee from an operational, energy efficiency, and quality standpoint. This was especially critical during the value engineering efforts.
Procurement
Construction –
Post-Construction –
CCM: The Mark of a Professional

Example: CM-at-Risk Project Management Narrative

PROJECT MANAGEMENT
Pre-Design
Design
Procurement
Construction – As a Project Manager added to the existing management team, I assisted the Senior Project Manager in making sure this fast track job was completed in time for its Fall 2003 opening. I managed specific subcontractors and worked with the design team to get all issues resolved in an expedient manner so as not to hold up construction.
Post-Construction – I managed the subcontractors to complete the punchlist, provided all warranties and training manuals, and conduct training to the schools facilities staff. With quality issues on the performance of the unit ventilators and fire smoke dampers in the building, I worked with the HVAC and electrical subcontractors and the school to help resolve climate control issues through commissioning efforts.

Project Challenges

• Focus on overcoming major milestones on owner’s behalf
• Challenges could be budgetary, schedule, quality, but also complex stakeholder issues as well
• Challenge could be:
  o Technical – but how you overcome it needs to focus
  o On management & leadership

Client/Owner Reference

3.12 Project Client/Owner Contact Information
A detailed reference is requested.

Name: __________
Current Organization: __________
Position: __________
Organization Address: __________
Phone Number: __________
Email: __________
Organization or time of project: __________

If only one project is indicated in your resume or in charge of documentation, a second reference must be given to cover your full month of responsibilities. If you are habituating documentation that more than one project, you only need to complete one reference contact for each project to fulfill the reference requirement.

• Two independent references
• References should be listed in organization chart
• Each reference is independently contacted by email
• Inform your references
• Purpose is to verify/confirm experience cited
CCM: The Mark of a Professional

**Organization Chart**

- Can be simplified for projects with significant staff size
- Not interested in other consultants unless they directly impact your relationship with the owner
- Focus on your placement & role within chart

**Advancement to Candidacy**

- CMCI Board of Governors reviews and evaluates your application
- Once approved, you are advanced to candidacy.
- You may now sit for examination.

**Standards of Practice**

- Project Management
- Cost Management
- Time Management
- Quality Management
- Contract Administration
- Professional Practice
- Safety & Risk Management

*IN FUTURE, also the Best Practices (R-105)*
CCM Examination

- 1-Year eligibility to pass the exam from the day the Board of Governors approves the application
- You may take examination a total of 3 times within that year
- Offered at secure testing locations worldwide
- Computer based examination:
  - 5 hour time limit to complete
  - 200 multiple choices questions

Exam Preparation Recommendations

- Approximately 40-50 hours to prepare using all available CMAA content channels
- Study of Body of Knowledge
  - Read thoroughly key documents that form substantial basis for examination test questions
- On line Capstone Self Study
  - Focuses on Capstone with 180 questions to confirm understanding
- On line SOP Modules
  - 8 modules of instruction
  - Requires a minimum of 16.5 hours to complete

CMAA Resources

- Professional Construction Management Course
  - Offered year round at locations across the US
  - Schedule - http://cmaanet.org/upcoming-sop-courses
- Standards of Practice Distance Learning Course
  - 8 modules available online (additional in mid-2012)
  - Details - http://cmaanet.org/sop-modules
- Becoming a CCM Webinar
  - Overview of the CCM process
  - Offered several times each year
  - Schedule - http://cmaanet.org/courses-and-events
CMAA’s Training Timeline

Designed for Owner organization interested in moving a group of qualified personnel through to achieving the CCM Credential.

<table>
<thead>
<tr>
<th>Key/Milestone</th>
<th>Complete (from Start Date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Preparation</td>
<td></td>
</tr>
<tr>
<td>CCM Application Webinar</td>
<td>Week 2</td>
</tr>
<tr>
<td>CCM Application Review Workshop</td>
<td>Week 6</td>
</tr>
<tr>
<td>Submit CCM Application</td>
<td>Week 8</td>
</tr>
<tr>
<td>Training and Education</td>
<td></td>
</tr>
<tr>
<td>Complete Initial Study of Body of Knowledge</td>
<td>Week 12</td>
</tr>
<tr>
<td>Complete on-line Cognitree Self Study</td>
<td>Week 14</td>
</tr>
<tr>
<td>Complete 2nd Cognitree Module</td>
<td>Week 20</td>
</tr>
<tr>
<td>3-day SOP Course</td>
<td>Week 22</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
</tr>
<tr>
<td>Advance to Candidacy by CMCI</td>
<td>Week 23</td>
</tr>
<tr>
<td>Take CCM Examination</td>
<td>Week 24</td>
</tr>
</tbody>
</table>

Notes

CMIT
Construction Manager in Training

- Designation recognizing young practitioners
- Links the CMIT with a seasoned mentor from professional community of CMs
- Provides career path toward earning the CCM

recertify

- Recertification of your CCM designation is required every 3 years.
- All activities must be specifically industry related.
- Points are earned through 2 identified areas for recertification: involvement in the profession and professional development.
- Recertification points can be earned anytime from the date appearing on your CCM certificate.
- A total of 45 points are needed to renew the CCM.
Ways to Earn Renewal Points

<table>
<thead>
<tr>
<th>Ways to Earn Renewal Points</th>
<th>Type</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual/Commercial to the Profession</td>
<td>Membership in industry-related organizations (e.g., NAIOP, ASOS, AIA)</td>
<td>1 point per year</td>
</tr>
<tr>
<td></td>
<td>Membership in CCMCA</td>
<td>2 points per year</td>
</tr>
<tr>
<td>Writing related to the CCM profession</td>
<td>Publications</td>
<td>8 points per article</td>
</tr>
<tr>
<td></td>
<td>Presenters, discussants, Chapter heads</td>
<td>15 points</td>
</tr>
<tr>
<td>Presentations at conferences/seminars</td>
<td>Book</td>
<td>3 points per book 6 points per event training session</td>
</tr>
<tr>
<td>Professional Organization Work</td>
<td>Chair, Committee Chair, Executive Director</td>
<td>2 points per year</td>
</tr>
<tr>
<td></td>
<td>Board Members</td>
<td>2 points per year</td>
</tr>
<tr>
<td></td>
<td>CCM Officers</td>
<td>2 points per year</td>
</tr>
<tr>
<td></td>
<td>Subject Matter Experts</td>
<td>4 points per year</td>
</tr>
<tr>
<td></td>
<td>Volunteers</td>
<td>2 points per year</td>
</tr>
<tr>
<td>Writing exam questions</td>
<td>2 points per item accepted</td>
<td></td>
</tr>
<tr>
<td>CM Professional Development</td>
<td>Attending conferences, seminars</td>
<td>3 points per conference</td>
</tr>
<tr>
<td></td>
<td>Attending CM related courses, seminars</td>
<td>3 points per day</td>
</tr>
<tr>
<td></td>
<td>Attending webinars</td>
<td>1 point per hour</td>
</tr>
</tbody>
</table>

Total needed to renew once every 3 years: 40 points

CCM Total Investment

**Education**
- Application Preparation, Training and Education
  - $775 per person *
    - Full program of webinars, workshops, on line content, and instructor lead review course
  - $525 per person *
    - Excluding on line content

**Certification**
- Application Fee $275
- Examination Fee $275
- Re-take Fee $100
- Recertification Fee $200
- 3 year cycle

*Initial total investment per person $1,325 / $1,076

Demonstrating Your Commitment

- The Certified Construction Manager is the “gold standard” in personnel credentials for the Construction Management profession.
- The CCM designation is representative of an individual’s commitment to excellence in program/construction management, career advancement and an ongoing pursuit of knowledge.
- The CCM is a benefit to both the CM industry and the public at large.
Questions?

For More Information:

Nick Soto, Director of Certification
Andrea Pavon, Recertification Associate
Certification@CMAAnet.org

Dennis Doran, VP of Professional Development
Alex Cortez, Professional Development Program Manager
PD@CMAAnet.org

7926 Jones Branch Drive, Suite 800
McLean, Virginia 22102 USA
Tel: 703.356.2622 Fax: 703.356.6388
www.CMAAnet.org
www.CMCertification.org
Learning Objectives

• Relate successful benchmarking to organizational commitment and support.
• Understand the differences between internal and external benchmarking.
• Understand the differences between relative and absolute metrics.
• Compare different sources and modes of benchmarking.
• Learn how specific companies have organized themselves for benchmarking success.

Plenary Session Abstract

Successful benchmarking requires that companies be properly organized and resourced for this best practice. This plenary will begin with a video (produced by Kaiser Permanente) about the benefits of benchmarking. The speaker will then highlight the different types and modes of benchmarking, show how his company has approached its successful benchmarking program, and explain how others can assess their benchmarking needs and put a successful program in place. He will conclude by introducing the four company case studies of successful benchmarking that will be featured in the benchmarking implementation session.

Implementation Session Abstract

In the implementation session session, four panelists will present case studies of successful benchmarking in different industry sectors: oil & gas (ConocoPhillips), pharmaceutical/biotechnology (Eli Lilly and Company), and E&C contracting (Alstom Power and Burns & McDonnell). These presenters will describe the ways their respective companies have organized their resources for successful benchmarking. Each will present his or her company’s organizational chart of internal resources and explain how they interface with CII and with other benchmarking outlets. They will also discuss the use of internal and external metrics. After presenting brief histories of benchmarking in their companies, enumerating the benefits they have accrued from benchmarking, and discussing what the outlook for continued benchmarking may be, the panel will open up the session for questions from participants.
Plenary Session Presenter

Don H. Orndoff, Senior Vice President, National Facilities Services – Kaiser Permanente

As Senior Vice President of Kaiser Permanente’s National Facilities Services, Don Orndoff is in charge of the firm’s 64-million-square-foot real estate portfolio. With a focus on excellence in design, construction, and facility life cycle management, he leads more than 2,700 employees and manages an annual capital construction budget of $3 billion. Before joining Kaiser Permanente in February 2010, he served as director of the U.S. Department of Veterans Affairs (VA) Office of Construction and Facilities Management in Washington, D.C., where he was responsible for the planning, design, construction, lease management, and maintenance of more than 5,400 VA health care facilities. In that role, he had direct accountability for the life cycle management of the agency’s $87 billion health care infrastructure. As director, Orndoff worked closely with the VA’s 21 regional leaders to improve facilities across its aging portfolio. Additionally, he directly oversaw the design, development, and deployment of new work processes that saved the department more than $300 million.

Prior to his work with the VA, Orndoff served as a commissioned officer for more than 29 years in the Civil Engineer Corps of the U.S. Navy. During his service, he worked for eight years as the assistant to the commander for facilities management, where he was responsible for sustaining the Navy’s entire 171-facility inventory across 80 bases worldwide, valued at more than $170 billion. He also served as the Navy’s commanding officer and officer in charge of construction for all Navy bases in Japan. Don received his bachelor’s degree in architecture from Virginia Tech University and a master’s degree in construction engineering from UC Berkeley. He also received executive business management training from Dartmouth College. Don is a licensed registered architect in Virginia. He is a member of the American Institute of Architects, the Society of American Military Engineers, the National Institute of Building Sciences, and the Healthcare Facilities Institute.

e-mail: don.h.orndoff@kp.org
Implementation Session Moderator

**Don H. Orndoff**, Senior Vice President, National Facilities Services – Kaiser Permanente
  
  *e-mail: don.h.orndoff@kp.org*

Panelists

James J. Blaschke, Manager, Cost Estimating – ConocoPhillips
  
  *e-mail: james.j.blaschke@conocophillips.com*

Tamara Lynam, P&I Quality Manager – Burns & McDonnell
  
  *e-mail: tlynam@burnsmcd.com*

Gerald R. Oegema, Project Manager – Alstom Power
  
  *e-mail: gerald.r.oegema@power.alstom.com*

Jonathan D. Pitcher, Director, Design Engineering & Project Control, Global Facilities Delivery – Eli Lilly and Company
  
  *e-mail: pitcherjd@lilly.com*
Organizing for Benchmarking Success

Plenary Session Slides

Notes

Organizing for Benchmarking Success
Don H. Orndoff, Kaiser Permanente
Benchmarking & Metrics Committee

2012 Annual Conference - Baltimore
Building Global Leadership

About Kaiser Permanente

Recognized as one of America’s leading health care providers and not-for-profit health plans

12.5M members 547.9B operating revenue 15,853 physicians 167,178 employees 9 states and the District of Columbia 37 hospitals 615 medical offices

Focus on Clinical Quality and Satisfaction

Kaiser Permanente Ranks Highest in J.D. Power and Associates Member Satisfaction Study (in five regions) – 3/21/12

Kaiser Permanente Ranks No. 1 in Customer Loyalty in the 2012 Satmetrix Net Promoter® Benchmark Study - 3/21/12

5 Kaiser Permanente Regions are Among the Top 10 Medicare Health Plans in the Country in NCQA’s Rankings - 10/21/11

Kaiser Permanente Leads the Nation in 11 Effectiveness of Care Measures: 2011 National Committee for Quality Assurance’s Quality Compass – 10/10/11

Kaiser Permanente’s Redesigned Treatment Detects Sepsis Risk Earlier and More Often - 10/10/11

* Improved processes of care and evidence-based treatment algorithms led to earlier detection of patients at risk for sepsis
* Sepsis is an infection that is spread via the bloodstream
* Septic shock is the No. 1 cause of death in U.S. hospitals - U.S. DHHS
Notes

Video

Healthcare Benchmarking Video

Healthcare Benchmarking Web Site
https://www.healthcarebenchmarking.org/

Come to our Implementation Session!

Moderator
Don Orndoff, Kaiser Permanente

Panel
James Blaschke, ConocoPhillips
Tammy Lynam, Burns & McDonnell
Jon Pitcher, Eli Lilly and Company
Rick Oegema, Alstom Power
Organizing for Benchmarking Success

Implementation Session Slides

Notes

Organizing for Benchmarking Success

CII Benchmarking and Metrics Committee

Agenda

• Safety
• Moderator’s Comments
  – Don Orndoff, Kaiser Permanente
• Panelists
  – James Blaschke, ConocoPhillips
  – Tammy Lynam, Burns & McDonnell
  – Jon Pitcher, Eli Lilly and Company
  – Rick Oegema, Alstom Power
• Q&A

Organizing for Capital Project Benchmarking

James Blaschke
ConocoPhillips
Notes

Benchmarking at ConocoPhillips

- All projects require a benchmarking report at AFD and AFE (funding) gates as well as project close-out. Many projects are benchmarked at AFF (screening).
- Benchmarking reports include both cost and schedule and include both internal and external benchmarks.
- CoP benchmarking team does following activities:
  - Project Benchmarking (AFD, AFE, close-out)
  - Portfolio Benchmarking – by sanction year – both performance and predictability
  - Organizational benchmarking
  - Technology benchmarking (pipelines, platforms, subsea, etc.)
- Currently, ConocoPhillips is only an upstream org and thus only benchmarks upstream projects.
- Portfolio Analysis – report includes entire company performance as well as individual BU performance across all ConocoPhillips projects.

Use of Benchmarking at ConocoPhillips

- Benchmarking is a key company strategy for ConocoPhillips.
- Project benchmarks are reviewed by CEO and Board of Directors.
- Portfolio analysis is reviewed by Senior management to determine trends in performance and project predictability (risk).
- Portfolio analysis is provided to internal public relations who is responsible for communications with Wall Street.
- Business Units request benchmarking data for use in negotiations with all types of contracts (Engineering, Procurement, Construction, EPC, etc.).

Predictability vs. Performance

- Very key differences – a project can be a competitive project, but over budget and a project can be on budget, but not competitive.
- Predictability – INTERNAL BENCHMARKING – how a project tracks against AFE budget for cost and schedule
  - ConocoPhillips historical database
  - Cost metrics used to do high level cost estimate validation
- Performance – EXTERNAL BENCHMARKING – is a project competitive vs. industry
  - External database with competitors cost information
  - Cost and schedule vs industry
- Both Predictability and performance are key metrics tracked in portfolio benchmarking and provided to management.
External Benchmarking - Performance

- Performance = competitiveness of project against industry
- 3rd party used to determine industry average for cost and schedule
- Benchmarking services used
  - Performance Forum
  - CII
  - Conquest
- Compile all project benchmarking into one portfolio analysis
  - By region
  - Includes both cost and schedule
- Portfolio analysis published in analyst report to stockholders
- External benchmarking required for ALL projects at AFD, AFE and project close-out phases

Internal Benchmarking - Predictability

- Predictability = Performance against budget
- Internal benchmarking done for high level cost estimate validation
- Internal benchmarking database
  - Currently an in-house developed application
  - This year, switching to EOS - enterprise application to provide global access by all our Business Units
  - Database contains all cost and schedule metrics used to measure project at all stage gates (AFF, AFD, AFE)
- Project cost and schedule reports generated monthly by project
- Compile all project costs and schedule into one monthly portfolio analysis (similar to performance data)
Organizing for Benchmarking Success

Notes

Agenda
• Goals of our Program
• Barriers
• Plan for Success

Goals
1. Internal Benchmarking
2. External Benchmarking (thru CII)

Barriers
• History
• Alignment
• Resources (or time)
Plan for Success

Phase 1 – Complete
Phase 2 – In Progress
Phase 3 - Future

Phase 1 - What Metrics to track?

- Project Level
- Discipline Level
- Item Level

Phase 1 - Centralized Reporting

- Safety & Health Database
- Project Attribute Database
- Centralized Reports

Notes
Notes

Phase 2

- Develop the internal work process
- Show people the value

Project Team Org

TRIR – Burns & McDonnell
(Includes Subcontractors)
Phase 3 – Discipline/Item Level Metrics

Benefits to BMcD

• Continuous Improvement
• Performance Validation
• Reference Data for Improving our Project Planning

"Success is the sum of small efforts, repeated day in and day out." - Robert Collier
Notes

Organizing for Capital Project Benchmarking

Jon Pitcher
Eli Lilly and Company

Capital Project Delivery Organization

Organizing for Benchmarking

- Benchmarking is the responsibility of a Director (CII “Benchmarking Manager”)
- Projects are selected in consultation with that Director’s peers
- Individual Project Managers are accountable for collecting the data
Best Practices that Help Ensure Successful Data Collection

- Value is well understood
- Participation is rewarded
- Timing of data collection minimizes the “pain”
- Data collection cost (CII) is modest

Best Practices that Help Ensure Successful Data Collection for CII

- Pre-loading of data
- Reminder close to project completion
- Data Entry Options
- Validation

Types of Benchmarking at Lilly

- Project Cost, Schedule and Dimensions
- Project Delivery Systems
- Technology and Design Features
Recent Benchmarking Activity

- IPA – 3 Delivery System studies since 2002
- CII Pharma/Biotech Specialty Metrics – 49 projects submitted since 2004
- CII Safety Survey – Annual Participant
- CII Value of Best Practices 2007 – Participant
- Kling Laboratory Group – Annual Participant

How Lilly Uses the Results

- Project Cost, Schedule and Dimensions (CII Specialty Metrics)
  - Source of external benchmarks to compare with internal metrics and the proposed project (i.e., “should cost” versus “will cost”) — required at all final funding requests.
  - Data to assist in pre-conceptual estimating (e.g., average Lang Factors)
  - Indications of design inefficiencies

Typical Benchmarking Slide at a Funding Request
How Lilly Uses the Results

• Project Delivery Systems (IPA Studies)
  – Indications of weaknesses in the Project Delivery System and thus areas for improvement
  – Confirmation that improvements have been effective

• Technology and Design Features
  – Assisting with establishing designs that comply with current Good Manufacturing Practices (GMP)

Organizing for Benchmarking of Projects

Rick Oegema
Alstom Power Inc.

Project Execution Organization
Organizing for Benchmarking

- Benchmarking is the responsibility of the Vice President of Project Execution; Benchmarking Manager is a direct report to the VP
- All projects are benchmarked
- Individual Project Managers are accountable for collecting the data
  - Input coincident with project milestones
  - Final input coincident with close-out reporting

Best Practices that Help Ensure Successful Data Collection

- Participation is rewarded
  - A factor in a PM’s annual performance evaluation

- Timing of data collection minimizes the “pain”
  - Data are collected when the people who own the data are still on the project

- CII Data collection is incorporated into Processes
  - Project Execution Gate Review process includes Benchmarking data collection milestones

Best Practices that Help Ensure Successful Data Collection for CII

- Reminder close to project completion
  - PM’s reminded of benchmarking requirement for close out of project

- Data Entry
  - PM’s given option to self-enter data or complete a paper questionnaire for BM to enter

- Validation
  - Internal validation by the assigned Benchmarking Associate or the Benchmarking Manager
Recent Benchmarking Activity

- CII Benchmarking Project Central – 44 projects submitted since 2004, 3 more in progress
- CII Safety Survey – Annual Participant
- CII Value of Best Practices 2007 – Participant

How Alstom Uses the Results

- Project Cost, Schedule and Dimensions (CII Specialty Metrics)
  - Source of external benchmarks to compare with internal metrics
  - Internal metrics used to compare results between Alstom projects
  - External CII benchmarks used to compare with other companies executing similar projects

Alstom Power Project Cost Growth (N=24)
Organizing for Benchmarking Success

Notes

Alstom Power Change Cost Factor (N=24)

Change Cost Factor

2001 2002 2003 2004 2005 2006 2007 2008 2009

0.100 0.120 0.140 0.160 0.180 0.200 0.220 0.240 0.260

Alstom Power Project Schedule Growth (N=27)

Project Schedule Growth

2001 2002 2003 2004 2005 2006 2007 2008 2009

0.000 0.050 0.100 0.150 0.200 0.250 0.300 0.350

Alstom Power Project Schedule Factor (N=24)

Project Schedule Factor

2001 2002 2003 2004 2005 2006 2007 2008 2009

0.800 1.000 1.200 1.400 1.600 1.800 2.000 2.200 2.400 2.600
Abstract

Historically, the construction of Olympic facilities has been plagued by cost and schedule overruns, and, more importantly, by injury and death to construction workers. For the 2012 Olympics in London, the project team had to build an Olympic Park on time, on budget, to quality—without any injuries or fatalities. The presenter will discuss the findings of health and safety research on the construction of this large and complex project.

The construction challenge was enormous: 8.35 kilometers of waterways in and around the park; one of the largest European urban parks to be built in 150 years; 100 hectares of new parklands; 10 rail lines; five permanent venues; 30 new bridges; and 80,000 seats in the main stadium. With a peak workforce of 14,500 people, the project required 46,000 to work more than 77 million hours. Having awarded more than 1,300 direct contracts, the Olympic Delivery Authority (ODA) estimates that a total of 75,000 companies won contracts. Since the ODA vision included the “protection of the health and safety of everyone involved in [the] work or affected by it,” the organization was committed to “[going] beyond eliminating preventable illnesses, injuries, business losses, and environmental harm,” and extending its commitment to “enhancing the well-being of all involved” in the project.

Various research projects formed part of the health and safety legacy for London 2012 including investigations into communications; supply chain; design–CDM; worker engagement; leadership; measuring culture; preconditioning for success. The research on the project’s communications work, funded by the Institute of Occupational Safety and Health and the Health & Safety Executive of the United Kingdom generated some of the following key findings:

- The people were more than competent.
- The client was committed to the project.
- The project had commitment at all levels.
- Management was engaged and made a real effort listen to workers.
- Project communication were excellent, with supervisor huddle meetings, “You said–We did” boards, health and safety forums, and walk-around inductions.
- Project planning and organising was successful, since the team was given time to set up sites before starting and benefited from a three-month look-ahead schedule.
- Review and learning was robust, with the collection and analysis of statistics for patterns, lessons learned, and a site-wide forum.
Keynote Speaker

Alistair G. Gibb, ECI Royal Academy of Engineering Professor of Complex Project Management – Loughborough University

Alistair Gibb is responsible for knowledge creation and best practice assimilation for ECI across the European organization. Gibb is a chartered engineer and chartered builder, who, after having had a career in civil engineering and construction management, joined Loughborough University in 1993. He has been closely involved with ECI since the mid-1990s, mainly as Project Director of the Safety, Health & Environment task force. Internationally, he is coordinator of the Conseil Internationale de Batiment working commission on construction health and safety. He has led many health and safety research projects, funded both by government and industry, and has published research on technical innovation—particularly in offsite construction. He is a founding member of the influential U.K. industry body, Buildoffsite, and has led several overseas trade missions.

e-mail: a.g.gibb@lboro.ac.uk
Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

Managing Indirect Costs Research Team

Learning Objectives

• Learn about leading industry practices for estimating, controlling, and managing indirect construction costs (IDCC).

• Know which tools can help practitioners do their jobs better.

• Be able to develop more realistic IDCC estimates to enhance communication and trust between owners and contractors.

• Adopt an operational definition for indirect construction costs.

• Learn to leverage the relationship between IDCC functions and project performance.

Plenary Session Abstract

Today’s globally competitive business environment pressures owners of capital improvement projects and the contractors who build them to pursue all opportunities to increase the value attained by project investment. All construction projects incur significant indirect construction costs. At times, these costs are misunderstood or neglected. Collaborative project teams, who use leading industry practices to estimate, control, and manage indirect construction costs, will engage in more purposeful planning, gain enhanced trust and understanding among project parties with respect to these costs, and improve the probability and predictability of overall project performance.

Nearly 90 percent of the 56 industry experts interviewed for this research believe that project performance can be improved with better handling of indirect construction costs. Research Team 282 has sought to fill this performance gap by offering two contributions to the industry: a categorical framework for indirect construction costs, which can be used as a communication and prioritization tool; and an industry-targeted guidebook, which includes consideration check-lists, process flowcharts, and representative practical tools that specifically address four key indirect construction cost functions. These four functions are the following: 1) construction management and supervisory personnel, 2) major construction equipment, 3) scaffolding, and 4) temporary provisions. This research aims to improve the delivery of capital projects by furnishing industry practitioners with the tools they need to advance indirect construction cost practices.

Implementation Session Abstract

The moderator and panelists will introduce the implementation guide created by Research Team 282. This how-to manual (called the “playbook”) for indirect construction costs offers comprehensive consideration checklists, detailed process flowcharts, and practical tools that can be applied immediately, or that can be used as a resource to improve current company procedures. Because all capital improvement
projects incur indirect construction costs, the playbook offers value for all members of the construction industry. Owners and contractors interested in improving project performance should attend this implementation session.

Taking inspiration from the ESPY Award shows, Research Team 282 will present awards in key categories of indirect construction costs—with awards for implementation of leading practices. Having been nominated in advance of the session, companies will win for their excellence in estimating, controlling, and managing in four key indirect construction categories: 1) construction management and supervisory personnel, 2) major construction equipment, 3) scaffolding, and 4) temporary provisions. The winners will describe their accomplishments in their acceptance speeches and will challenge their peers to seek improvement. No tuxedos or ball-gowns are required for admission—only an interest in increasing the probability and predictability of project success. Owners and contractors who want to strategically optimize the overall value obtained from their investments in indirect construction costs are invited to follow the “red carpet” to an unforgettable training session—one that will provide practical tools for immediate process improvements.

Plenary Session Presenter

Jason Klingensmith, Assistant Chief Estimator – Walbridge

Jason W. Klingensmith is Assistant Chief Estimator at Walbridge, an ENR Top 50 construction company founded in Detroit in 1916. Having joined Walbridge in 2007, he is responsible for the evaluation of owners’ requirements during planning and design phases, and leads program budgeting, contract administration, budget/cost monitoring, change order support, and extra work reviews. With 20 years of total experience in the construction industry, he has worked as a project manager, project engineer, and estimator on a variety of projects, including new manufacturing facilities, retail establishments, warehouses, office buildings, and municipal and aviation facilities.

Klingensmith holds a Master of Science degree in civil engineering from Wayne State University in Detroit, and a Bachelor of Science degree in civil engineering from the University of Michigan. He is a professional engineer, registered in the state of Michigan. He is a member of the American Association of Civil Engineers, Chi Epsilon (National Civil Engineering Honor Society), and the Engineering Society of Detroit.

e-mail: jklingensmith@walbridge.com
Implementation Session Moderator

Scott E. Murray, Project Controls, Principal Consultant – WorleyParsons

Scott Murray has been a manager of project controls in the engineering business for the past 22 years, with a focus on hydrocarbon processing and chemical projects. Murray has developed tools and procedures to estimate, control, and manage small-to-medium-sized engineering projects in the range of $1 million to over $100 million of total installed cost. He routinely trains project managers, engineers, and designers in project management, project control, and progress measurement methods. He also actively participates in business development efforts as a “doer-seller,” working on proposals and giving capability presentations to current and potential clients.

Murray has served on many professional committees, including the Professional Advisory Council Committee for San Jacinto College, and was instrumental in developing the college’s construction management degree program. While serving in the U.S. Navy, Murray spent nine months in the Indian Ocean during the 1980 Iran hostage crisis and participated in the evacuation of American citizens from Lebanon in 1982.

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Panelists

David W. Albosta, Director of Project Controls – Foster Wheeler USA Corporation
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J. Brandon Davis, Director, Industrial Manufacturing – URS Corporation
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Mohamed El-Gafy, Assistant Professor – Michigan State University
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Maren Gersich, Project Engineer – Abbott
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Edward J. Jaselskis, Jimmy D. Clark Distinguished Professor – North Carolina State University
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Keith Kwok, Section Manager – Ontario Power Generation
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Andy Pearson, Strategic Sourcing – DuPont
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Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

Plenary Session Slides

Notes

Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

Jason Klingensmith, Walbridge
Managing Indirect Costs Research Team

RT 282 Team Players

David W. Albosta
Foster Wheeler

Timothy C. Becker
North Carolina State University

J. Brandon Davis
URS

Mohamed El-Gafy
Michigan State University

Maggie E. Friedemann
ExxonMobil

Maren Gersich
Abbott

Edward J. Jaselskis
North Carolina State University

Katy P. Johansson
ExxonMobil

Jason Klingensmith
Walbridge, Vice Chair

Keith Kwok
Ontario Power Generation

Scott E. Murray
WorleyParsons

Ronald J. O’Leary
Air Products and Chemicals

Andy Pearson
DuPont/Pioneer, Chair

Glenn VanderLingen
Procter & Gamble

Research Goal

Find the leading industry practices to better estimate, control, and manage indirect construction costs.
How well do you know your IDCC?

If you aren’t actively controlling, forecasting, and managing them, you should be.

IDCC represent 10–40% of project costs

Why don’t you make the same effort for IDCC that you do for direct costs?

IDCC

The supporting elements of a project that are not a part of the final product.
Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

Notes

Total Project Cost

<table>
<thead>
<tr>
<th>Indirect Construction Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project manager</td>
</tr>
<tr>
<td>Contest staff</td>
</tr>
<tr>
<td>Field supervisors</td>
</tr>
<tr>
<td>Tower crane</td>
</tr>
<tr>
<td>Shared scaffolding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Direct Construction Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct labor</td>
</tr>
<tr>
<td>Trade-specific foremen</td>
</tr>
<tr>
<td>Materials</td>
</tr>
<tr>
<td>Trade-dedicated equipment</td>
</tr>
<tr>
<td>Trade-dedicated scaffolding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Direct Non-constr. Costs</th>
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</thead>
<tbody>
<tr>
<td>Profit</td>
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<tr>
<td>Bonds</td>
</tr>
<tr>
<td>Insurance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Owner Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering/Design</td>
</tr>
<tr>
<td>Owner’s management</td>
</tr>
<tr>
<td>Financing</td>
</tr>
<tr>
<td>Land cost</td>
</tr>
<tr>
<td>Due diligence</td>
</tr>
</tbody>
</table>

Indirect Construction Cost Framework

<table>
<thead>
<tr>
<th>Construction Equipment</th>
<th>Project Supervision</th>
<th>Temporary Construction</th>
<th>Temporary Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road &amp; Site Vehicles</td>
<td>Project Management</td>
<td>Temporary Roads/Parking</td>
<td>Temporary Office &amp; Services</td>
</tr>
<tr>
<td>Small Tools &amp; Consumables</td>
<td>Field Supervision</td>
<td>Temporary Enclosures</td>
<td>Temporary Field Facilities</td>
</tr>
<tr>
<td>Major Construction Equipment</td>
<td>Project Administration</td>
<td>Utilities/Trades</td>
<td>Scaffolding</td>
</tr>
<tr>
<td>Construction/Field Services</td>
<td>Mobilization &amp; Project Maintenance</td>
<td>Communication &amp; Computers</td>
<td>Temporary Housing &amp; Camps</td>
</tr>
</tbody>
</table>

The team assembled an aggregated chart of accounts for 497 individual IDCC cost descriptions under these categories.

Which of your IDCC are most important? most challenging? most wasteful?
Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

**Owners & Contractors Agree**

**Notes**

**Ranking of Most Important IDCC Categories**

**Most Challenging IDCC Category**
Notes

**Most Wasteful IDCC Category**

![Graph showing the most wasteful IDCC categories](image)

**What are the Leading Industry Practices?**

**Artifacts**
- Tools
- Forms
- Procedures

**Playbook Key Elements**

![Playbook elements](image)
**Do Better IDCC Practices Affect Performance?**

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Neutral</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>13</td>
<td>28</td>
</tr>
</tbody>
</table>

N=56

**Come to our Implementation Session**

**Moderator**

Scott Murray, WorleyParsons

**Panelists**

David W. Albosta, Foster Wheeler  
Brandon Davis, URS  
Mohamed El-Gafy, Michigan State University  
Edward J. Jaselskis, North Carolina State University  
Keith Kwok, Ontario Power Generation  
Ron O’Leary, Air Products and Chemicals  
Andy Pearson, DuPont/Pioneer
Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

Implementation Session Slides

Notes

Indirect Construction Costs

- Indirect construction costs are supporting elements that are not a part of the final product.
- 10% to 40% (and sometimes higher)

Tactical Objectives Are

Define
Identify
Investigate
Document
Validate
Publish
**Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs**

---

**Why Use the Playbook?**

- Facilitates communication.
- Useful for both owners and contractors.
- Ready for immediate implementation.
- The more playbook, the better the performance.

---

**Essential Question**

*Which best or innovative practices are now available or utilized for managing indirect construction costs?*

---

**RT 282 Research Methodology**

1. Understanding indirect construction costs (IDCC)
2. Investigating and documenting leading practices for estimating, controlling, and managing IDCC
3. Verifying data analysis and validating hypothesis
Understanding Indirect Construction Costs

- Literature Review
- IDCC Operational Definitions
- Framework
- Key IDCC

Investigation of Leading Practices

Collect Quantitative Information: Identified with CII Benchmarking & Analytics group to collect targeted IDCC data on the 10 most important IDCCs.
Collect Qualitative Information: Data Collection Interviews (DCI). Subject matter experts detail practical & tools for estimating, controlling, and managing non-important IDCCs.

14 extensive project surveys;
13 short surveys

Difficult to provide meaningful conclusions

Investigation of Leading Practices

Collect Quantitative Information: Identified with CII Benchmarking & Analytics group to collect targeted IDCC data on the 4 most important IDCCs.

56 Subject Matter Experts
Implementation Guide “Playbook”

- Industry-targeted guide of practices related to estimating, controlling, and managing IDCC
- Documented Leading Practices
  - Consideration Checklists
  - Process Flowcharts
  - Representative Tools
- Dedicated Chapters
  - Major Construction Equipment
  - CM and Supervisory Personnel
  - Scaffolding
  - Temporary Provisions
  - Advanced Practices

Notes

Consideration Checklist for Estimating Major Construction Equipment (MCEQ) Costs

Process Flowchart for Estimating MCEQ
Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

Notes

IDCC Tools

(MCEQ, 2)

Major Construction Equipment Planning Worksheet

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Project No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>ABC</th>
<th>XYZ</th>
<th>123</th>
<th>456</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Quarter</td>
<td>123</td>
<td>456</td>
<td>789</td>
<td>012</td>
</tr>
<tr>
<td>2nd Quarter</td>
<td>345</td>
<td>678</td>
<td>901</td>
<td>234</td>
</tr>
<tr>
<td>3rd Quarter</td>
<td>456</td>
<td>789</td>
<td>012</td>
<td>345</td>
</tr>
<tr>
<td>4th Quarter</td>
<td>678</td>
<td>901</td>
<td>234</td>
<td>456</td>
</tr>
</tbody>
</table>

| Total          | 3456 | 7890 | 1234 | 5678 |

Assumption and clarification notes:

Playbook Validation

- Review by Research Team and DCI Subject Matter Experts
- Three Case Studies

<table>
<thead>
<tr>
<th>Project</th>
<th>Performance</th>
<th>% of Applicable Considerations Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Project 1</td>
<td>5.6</td>
<td>90%</td>
</tr>
<tr>
<td>Case Project 3</td>
<td>4.9</td>
<td>91%</td>
</tr>
<tr>
<td>Case Project 2</td>
<td>3.6</td>
<td>82%</td>
</tr>
</tbody>
</table>

How well does your company estimate, control, and manage IDCC?
Are you or your company interested in achieving process improvement and learning the leading industry practices for estimating, controlling, and managing IDCC?

If so, the IDCC Playbook is right for you.

Indirect Construction Costs Awards Show

Andy Pearson to present the Award for Temporary Provisions
Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

Notes

What are Temporary Provisions?

Temporary Roads/Parking
- Construct Temp. Roads
- Maintain Temp. Roads
- Build Temp. Parking Lots

Temporary Enclosures
- Build Temp. Enclosures
- Dewatering
- Maintain Temp. Enclosures
- Temporary Fencing

Temporary Office & Services
- Set-up Office Trailer
- Lease Expense
- Messing's
- Delivery
- Office Supplies & Consumables

Temporary Field Facilities
- Portable Toilets
- Trash Service
- Drinking Water
- Trades
- Warehouses
- Off-site Storage
- Fire Extinguishers
- Lunch Tent

Temporary Provisions

Optimize Temporary Provisions Costs

Indirect construction costs
Available Implementation Resources

Processes

Checklists

Tools

It's Time to Pick the Winner!!!!

TEMPORARY PROVISIONS
AWARD

Keith Kwok

to present the Award for
Major Construction Equipment
MCEQ Playbook Considerations

- Requirements
- Sourcing
- Site Utilization Plan
- Schedule
- Operations
- Cost

Key IDCC Categories
Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

Notes

David Albosta
Foster Wheeler
to present the Award for
Construction Management and
Supervisory Personnel

Construction Management &
Supervisory Personnel

- Checklist Table 3.3 for Estimating Construction Management and Supervision.
  - Walks you through very specific questions which are
grounded to making sure that proper staffing levels are
estimated based on specific conditions for your project.
- Consideration Checklist for Controlling Construction Management and Supervision Table 3.4.
  - Guides you through important questions that need to be
addressed that will enable you to better control
Construction Management.

Table A-3: Consideration Checklist for Estimating Construction Management &
Supervisory Personnel (NCMA P Cost).

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Have high-level documents been issued?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>Has project delivery method been reviewed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>Has contract type been reviewed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>Have specific construction services requirements (e.g.,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>existing requirements, on-site field staff, utility</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>equipment/lease provisions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A5</td>
<td>Has the project design been reviewed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A6</td>
<td>Have the project mobilization been reviewed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A7</td>
<td>Does the project have any special requirements?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A8</td>
<td>Have the preliminary project schedules been reviewed with</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>support from NCMA?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A9</td>
<td>Has the project has the number of field supervisors?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A10</td>
<td>Have the project requirements for field staff positions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>been identified?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A11</td>
<td>Have project risks and issues been considered with</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>respect to NCMA?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In terms of project scope and work order tracking?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If yes, are additional personnel required to supervise</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>the work?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A12</td>
<td>Additional personnel required because of the</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>sequencing of working activities distributed over larger</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>area?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A13</td>
<td>Have the amount of overtime worked to be managed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>been considered?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A14</td>
<td>Has the creation of new NCMA staff been considered?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Notes

**Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs**

<table>
<thead>
<tr>
<th>Table A4—Considerations Checklist for Managing Construction Management &amp; Supervisory Personnel Costs</th>
</tr>
</thead>
</table>
| A. Check the Status of CMASP Plan  
A.1. Have survey points been conducted from office to field personnel including review of the CMASP plan?  
A.2. Have any changes been made to the CMASP plan?  
A.3. Have any changes been approved?  
A.4. Is there any impact on CMASP cost?  |
| B. Remedies Solutions to Generate Variances in CMASP Outcome to Plan  
B.1. Are changes being regularly monitored to improve quality, execution, and performance of CMASP?  
B.2. Have any changes in CMASP been considered to improve project performance?  
B.3. Have any changes been considered to change CMASP performance?  |

### Construction Management & Supervisory Personnel

- Checklist for Managing Construction Management and Supervision Table 3.5.
- Provides an easy to use guide that contains leading industry practices and questions as it relates to Managing Construction Staff.
- The Playbook provides tools and graphs that help manage and control Construction staff as well.
- Tool 3.4 allows us to track Construction staff man-hours by month.
Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

Notes

### Project Staff - Estimated vs. Actual

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Actual Hours</th>
<th>Estimated Hours</th>
<th>Difference</th>
<th>Total Hours</th>
</tr>
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<tbody>
<tr>
<td>Jan</td>
<td>50</td>
<td>55</td>
<td>-5</td>
<td>105</td>
</tr>
<tr>
<td>Feb</td>
<td>45</td>
<td>50</td>
<td>-5</td>
<td>95</td>
</tr>
<tr>
<td>Mar</td>
<td>55</td>
<td>50</td>
<td>5</td>
<td>105</td>
</tr>
<tr>
<td>Apr</td>
<td>60</td>
<td>55</td>
<td>5</td>
<td>115</td>
</tr>
<tr>
<td>May</td>
<td>65</td>
<td>60</td>
<td>5</td>
<td>125</td>
</tr>
<tr>
<td>Jun</td>
<td>70</td>
<td>65</td>
<td>5</td>
<td>135</td>
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<tr>
<td>Jul</td>
<td>75</td>
<td>70</td>
<td>5</td>
<td>145</td>
</tr>
<tr>
<td>Aug</td>
<td>80</td>
<td>75</td>
<td>5</td>
<td>155</td>
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<td>Sep</td>
<td>85</td>
<td>80</td>
<td>5</td>
<td>165</td>
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<tr>
<td>Oct</td>
<td>90</td>
<td>85</td>
<td>5</td>
<td>175</td>
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<tr>
<td>Nov</td>
<td>95</td>
<td>90</td>
<td>5</td>
<td>185</td>
</tr>
<tr>
<td>Dec</td>
<td>100</td>
<td>95</td>
<td>5</td>
<td>195</td>
</tr>
</tbody>
</table>

**Total Hours:** 1950

### Project Staff - Budget vs. Actual

- **Total Budget:** $50,000
- **Actual:** $45,000
- **Difference:** $5,000

**Graph:**

![Graph showing project staff budget vs. actual](image)

*It's Time to Pick the Winner!!!!*

**CONSTRUCTION MANAGEMENT AND SUPERVISORY PERSONNEL AWARD**
Notes

Leading Industry Practices for Estimating, Controlling, and Managing Indirect Construction Costs

Brandon Davis

URS

to present the Award for
Scaffolding

Scaffolding

• Scaffolding is challenging and frustrating.
• Scaffolding has a visible impact on direct construction costs and schedules.
• Scaffolding is a difficult component for many people to estimate, manage, and control.

Scaffolding

• Toolkit
  – Checklists
  – Questions
• Reminder
**Notes**

**Scaffolding**

- Will owner or contractor supply scaffolding?
  - On larger projects, and often on sites where owners have multiple simultaneous projects, centralized scaffolding makes sense, eliminates waste, and saves money by using bulk purchasing power.
  - Centrally controlled scaffolding comes with its headaches too, but that is part of the decision-making process when different options are considered.

**Scaffolding**

- Engage project management and, potentially, a scaffolding vendor/contractor in the estimating and planning process.
- Rules of thumb are used for scaffolding.
  - Good for double-checking the plan.
  - But a detailed scaffolding plan is recommended.

**Scaffolding**

- Arrange meetings and activities for doing a look-ahead for scaffolding planning.
- Look back on scaffolding usage to date, analyzing variances from budget and documenting lessons learned.
Scaffolding

- 75 considerations in the scaffolding checklists
- 3 process flow charts
- 6 example tools

Advanced Practices

- Real-time, Online Equipment Tracking
- Advanced Small Tools Inventory System
- Trade Worker Amenity Services Delivered at Workface (e.g., “quenching service”)
- Advanced Laydown Yard Management System

(Source: https://www.onlinemaster.com/industrial-tool-vending.html)

Questions Please

Notes
Experience Reference Index – The Global Recipe for Implementation Success

*Implementation Strategy Committee*

**Learning Objectives**

- Understand how implementation requirements differ, depending on an organization’s experience implementing CII research and its particular organizational characteristics.

- Recognize how organizations’ perspectives on implementation differ from one another and how they are changing.

- Know how to use the Experience Reference Index.

**Plenary Session Abstract**

The presenter will discuss the ways implementation requirements differ on the basis of familiarity with CII research findings, implementation experience, the geographic deployment of the organization, and other organizational characteristics. Using the theme and style of a current reality TV show, *Iron Chef* or *Chopped*, the presentation will answer the question: What is the correct recipe for a successful outcome? Based on ISC research, the speaker will introduce one secret ingredient for implementation success.

**Implementation Session Abstract**

The implementation session will examine two cases of attempts to implement CII practices in an organization. The judge will briefly discuss the secret ingredient for implementation success set forth in Dr. Paul Chinowsky’s study for the ISC. In each case examined, the focus will be on which elements of the key ingredient were missing or poorly implemented. The judge will analyze each case, applying the product of his research, the Experience Reference Index.
Plenary Session Presenter

W. Scott Cameron, Global Process Owner, Project Management – The Procter & Gamble Company

Scott Cameron has spent over half of his 41-year career managing capital projects within a variety of Procter and Gamble business areas. He is a recipient of P&G’s highest engineering honor, the Prism Award, which recognizes knowledgeable individuals who make sustained contributions to the company. Award recipients are sought after as a resource and as a role model for other P&G employees.

Cameron has been a member of the CII Implementation Strategy Committee since 2006, and currently is a liaison with the CII Strategic Communications Committee. He has also served on the advisory boards of the NASA Academy of Program and Project Leadership and the Southwest Ohio Project Management Institute. He holds B.S. and M.S. degrees from Iowa State University.

e-mail: cameron.ws@pg.com

Implementation Session Moderator

Paul S. Chinowsky, Professor, Department of Civil, Environmental, and Architectural Engineering – University of Colorado at Boulder

Dr. Paul S. Chinowsky is currently conducting research in two areas: the management of organizations in the AEC industry and the impact of networks on high performance teams. In the management area, he has published the book entitled Strategic Corporate Management in Engineering that introduces civil engineering organizations to the concepts of strategic management.

Dr. Chinowsky has worked with organizations of all sizes, both public and private, to address business and strategic planning. Prior to joining the Colorado faculty, Dr. Chinowsky was a professor at Georgia Tech for eight years in civil engineering. Prior to returning to academia, Paul was a knowledge-based systems consultant for Stone & Webster Engineering in Boston.

Dr. Chinowsky has been recognized as CII’s Outstanding Researcher. He received his undergraduate and Master’s degree in Architecture from Cal Poly San Luis Obispo in California and his doctorate in civil engineering from Stanford.

e-mail: paul.chinowsky@colorado.edu
Panelists

William C. Beck, Vice President, Integrated Quality Services Global – WorleyParsons
  e-mail: william.beck@worleyparsons.com

W. Scott Cameron, Global Process Owner, Project Management – The Procter & Gamble Company
  e-mail: cameron.ws@pg.com

Tracie M. Griffitt, Director of Engineering – Jacobs
  e-mail: tracie.griffitt@jacobs.com

Christine Merdon, Chief Operating Officer – Architect of the Capitol
  e-mail: cmerdon@aoc.gov

Hiram A. “Speedy” Warner III, Project Controls Manager – SAIC Constructors
  e-mail: hiram.a.warner.iii@saic.com
Experience Reference Index – The Global Recipe for Implementation Success

Plenary Session Slides

Notes

The Global Recipe for Success
W. Scott Cameron, Procter & Gamble
Implementation Strategy Committee

Implementation Strategy Committee (ISC)

ISC Mission

- Engage members to increase implementation of CII practices.
- Promote member participation in CII activities.
- Help members use CII knowledge to implement new work practices and manage change.

WHY?
CII Outstanding Implementers

- Erik Jonsson
  DHI
  2004
- Mohammad Al-Zubair
  Saudi Aramco
  2005
- Bernard Fedak
  U.S. Steel
  2007
- Martin Hunt
  Shaw Foundation
  2004
- Marc Philippine
  SoSteel
  2006
- Steve Wiggers
  Ahmanson/Bosch
  2006

- Derek Crump
  Cigli
  2007
- Erik Jonsson
  DHI
  2004
- Craig van der Stroth<br>  2004
- Sander den IJser
  ABB
  2004
- Van der Kaars
  ABB
  2004
- Burt Krey
  SABC
  2004
- Jack Burt
  Workbooks
  2011
- Dave Damon
  Merchant
  2011

ISC Annual Conference Proposal-generation Meeting

food
network
travel
CHANNEL
Experience Reference Index – The Global Recipe for Implementation Success

Notes

CII Box of Stuff = Recipe for Success

IR 246-2 Implementation Planning Model Steps to Success
IR 108-3 CII Best Practices Guide
Implementation Assistant
CII Best Practices
CII Best Practices Guide
Implementation Assistant

RB 246-1A Management Role in CII Practice Implementation
IR 186-2 Implementation Model and Knowledge Structure
Implementation Toolbox

The Secret Ingredient
Learning Objectives

- Understand what to consider prior to implementation.
- Be able to evaluate your organization in terms of experience with implementation.
- Learn how these considerations modify the base CII model of implementation.

Experience Reference Index (ERI)

- Need to recognize experience is a primary factor in preventing implementation crashes.
- ERI provides a framework for focusing business needs and support during implementation.
- ERI incorporates
  - experience
  - index elements (general areas affected by experience)
  - index specifics (focal points requiring attention).

Elements to Successful Integration
Join Our Chefs

Christine Merdon
Architect of the Capitol

Join Our Chefs

“Speedy” Warner
SAIC Constructors

Our Culinary Expert Judge

Dr. Paul Chinowsky
University of Colorado
Come to our Implementation Session

Your Host,
Bill Beck
Worley Parsons
Experience Reference Index – The Global Recipe for Implementation Success

Implementation Session Slides

Notes

The Global Recipe for Success
Implementation Session
Implementation Strategy Committee (ISC)
Host Paul Chinowsky, University of Colorado

ISC Mission

• Engage members to implement CII Practices
• Promote participation in CII activities
• Use CII knowledge to implement work practices and manage change

Join our Hosts

• Bill Beck
  – Worley Parsons
• Paul Chinowsky – “Judge”
  – University of Colorado
Join our Chefs

• Christine Merdon
  – Architect of the Capitol
• “Speedy” Warner
  – SAIC Constructors
• Traci Griffitt
  – Jacobs Engineering
• Scott Cameron
  – Procter & Gamble

Learning Objectives

• Provide an understanding of the considerations participants should be aware of prior to implementation

  • Participants will have the opportunity to
    – Evaluate their organizations in terms of experience with implementation,
    – Understand how these considerations modify the base CII model of implementation

From Our Judge

THE SECRET INGREDIENT
The Secret Ingredient – Understand Your Needs – The ERI

- How to Achieve Better Implementation – A Model for IC Success
  - A Planning Model For Success: IR246-2

- Executive Support for the IC
  - RS 246-1a

- The Implementation Assistant

- Different Levels of Engagement Require Different Support Models
  - Support for the IC (Current)

---

Response Summary

- 70 Unique Companies – 37 Owners and 33 Contractors

- 22 Overlap

<table>
<thead>
<tr>
<th>Attribute</th>
<th>BOA Respondents</th>
<th>IC Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Respondents</td>
<td>47</td>
<td>49</td>
</tr>
<tr>
<td>Number who have undertaken CII practice implementation</td>
<td>34</td>
<td>32</td>
</tr>
<tr>
<td>Experience with CII</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New to Process: 10</td>
<td></td>
<td></td>
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<tr>
<td>First Implementation: 9</td>
<td></td>
<td></td>
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<tr>
<td>Good Understanding: 25</td>
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<td>Formalized Processes: 2</td>
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<td></td>
</tr>
<tr>
<td>Formalized Processes: 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

BOA: IC Characteristics

- Understanding of Proposed Practice
- Established Organization Network
- Personal Link to Projects
- Familiarity with CII
- Personality Characteristics

Experienced Implementer – Change in focus to the IC’s network and the link to projects. Realization that projects will be the key to success for a practice.
IC: Resource Control

---

Experienced Implementer – Begin to move focus to communications as the understanding of the importance for communicating the implementation PROCESS and OBJECTIVES.

---

Implementation Barriers - IC

almost identical barriers identified by new and by experienced implementers

---

Experience Reference Index (ERI)

- ISC Research has identified: Unreasonable Goals and Expectations are a primary factor in crashes
- ERI provides a framework for focusing needs and support during implementation
- ERI incorporates:
  - Experience
  - Index Elements (Specific Areas Affected by experience)
  - Index Specifics (focal points requiring attention)
Levels of Experience

- New to CII
- First Implementation
- Repeat Implementation
- Integrated Processes
- Subdivision
  - Local/Regional
  - National/Global

Index Elements

- Implementation Champion Characteristics – As the level of experience matures for an organization, the focus of required IC resources changes.
- Resource Requirements – The scope of required IC resources changes based on the scope of the implementation.
- Implementation Plan Focus – The scope of this implementation plan needs to consider different elements depending on the level of experience. As illustrated, initial implementations need to focus on a very specific scope, while later implementation efforts need to include broader organization considerations.
- Senior Leadership Requirements – Implementation cannot succeed without the support of senior leadership.
- Organization Scope – This consideration includes both geographic and strategic scope considerations.
## Notes

### First Implementation

<table>
<thead>
<tr>
<th>IC Characteristics</th>
<th>Local/Regional</th>
<th>Natl/Global</th>
</tr>
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<tr>
<td></td>
<td>Understanding of Practice</td>
<td>Link to Division or Regional Mgt</td>
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</table>

**Resource Reqs**
- Implementation Planning
- Personnel
- Project Access

**Implementation Plan Focus**
- Viability
- Timeframe
- Success Story

**Senior Leadership Requirements**
- Resource Allocation
- Empowerment
- CIO Engagement

**Organization Scope**
- Single Group or Project
- Education
- Change Audit

### Repeat Implementation

<table>
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<tr>
<th>IC Characteristics</th>
<th>Local/Regional</th>
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<tr>
<td></td>
<td>Understanding of Practice</td>
<td>Organization Network</td>
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</tbody>
</table>

**Resource Reqs**
- Implementation Planning
- Personnel
- Budget
- Communications

**Implementation Plan Focus**
- Communications
- Internal Integration
- Runners

**Senior Leadership Requirements**
- Resource Allocation
- Communications Assistance
- CIO Engagement

**Organization Scope**
- Limited Project Groups
- Visible Returns
- Community of Practice

### Integrated Processes

<table>
<thead>
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<th>IC Characteristics</th>
<th>Local/Regional</th>
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</table>

**Resource Reqs**
- Implementation Planning
- Budget
- Communications

**Implementation Plan Focus**
- Communication
- Support
- Strategies

**Senior Leadership Requirements**
- Communications Assistance
- Active in CII
- Allocation of Hours
- Visible Support

**Organization Scope**
- Institutional Integration
- Measurable Benchmarks
- Full Organization Awareness
What Level of Expertise DO You Have?

- Using a current or planned area of implementation, what are the key elements from the chart that require attention. What is it that you need?

TO OUR CHEFS AND THEIR USE OF OUR INGREDIENT – ALLEZ CUISINE

BON JOUR!
Notes

Recipe

Serves: __________

- The Project
- The Use of the CES Ingredient
- The Result
- Helpful Hints

Library of Congress Module 3 & 4

The Project

Project Facts

Module 3 & 4 Fort Meade, Maryland

Project Team

Building Systems
- Post-tension precast concrete panels,
- Tapered built-up roof system on metal decking and concrete
- Smooth-faced block masonry units for interior and exterior
- Building systems for the Book Storage Modules 3 & 4 project include:
  - Building superstructure,
  - Super-flat concrete slab floors, (24,000 SF)
  - Environmental control systems, including cold rooms (50 Degrees, 30% relative humidity
  - Fire detection and suppression systems, including multiple levels of precision-placed sprinklers,
  - High density shelving and storage systems,
  - Sloped, sealed reflective long-lasting white roof,
  - Airtight filters.
### Library of Congress, Modules 3 & 4  Fort Meade, MD

<table>
<thead>
<tr>
<th>Construction statistics</th>
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<tbody>
<tr>
<td>Construction start date</td>
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<td>1,043 days</td>
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<td>Original project budget</td>
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<td>Design development estimate</td>
<td>$30,000,000</td>
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<td>Construction document estimate</td>
<td>$33,471,000</td>
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<td>Initial construction contract amount</td>
<td>$31,340,000</td>
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<tr>
<td>Final construction cost</td>
<td>$33,267,995</td>
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</table>
Notes
Experience Reference Index – The Global Recipe for Implementation Success

**Our use of the ingredient (CII practices)**

- **What is our ERI?**
- **First Time Implementer/Local Regional**
  - Developing Operational Objectives (Architect of the Capitol (AOC), Library of Congress (LOC), U.S. Army Corps of Engineers (USACE), A-E and Contractor
  - Personnel Involvement - Ownership

- **What was approach to using the ingredient on the project:**
  - Senior Leadership Support
  - Team Charter
  - Lessons Learned Chart

---

**Recipe**

- Targeted CII Best Practices
- Team Building
- Lessons Learned
- Alignment

---

**Repeat Implementation**

<table>
<thead>
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<th>IC Characteristics</th>
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<td>Communications</td>
<td>Integration</td>
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<table>
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<th>Senior Leadership Requirements</th>
<th>Local</th>
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<td>Team Engagement</td>
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<tr>
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<th>Local</th>
<th>Next/Global</th>
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<tr>
<td>Involved Project Teams</td>
<td>Visibility Across</td>
<td>Network Involvement</td>
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<tr>
<td>Visible Practice Leadership</td>
<td>Consideration of Complete Organization</td>
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</tbody>
</table>
Team Charter – Operational Objectives

Personnel Involvement – Project Ownership

Senior Level Support
LOD, AOC, USACE, A-E and Contractor at Ribbon Cutting
Our result from using Best Practices

- There was one recorded safety incident not related to the performance of construction.
- There were ten total requests for equitable adjustments totaling $695,000. The project owner and CM successfully resolved all such requests for a combined $420,000.
- Being proactive vs. reactive resulted in higher quality, lower cost and meeting schedule deadlines.

Effects/Results of Using Secret Ingredient – the ERI!

- Helped implement Team Building
- Early support from Key Executives
- Risk Mitigation
- Improved Communication

Our Tip

- What can you convey to the audience – takeaways.
  - Start CII Best Practices early
  - Followed CII principles
  - Follow the implementation process as a guide to a successful implementation program.
  - Identified problems early
  - Use the secret ingredient – ERI!

Bon Appetit!!!
Notes

Experience Reference Index – The Global Recipe for Implementation Success

My Story Today
• SAIC ERI Map 2007
• The Project
• The Use of the Secret Ingredient
• The Result
• SAIC ERI Map 2012
• My Tip For You

Experience Reference Index

<table>
<thead>
<tr>
<th>First Implementation</th>
<th>Local / Regional</th>
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<td>• Org. Position</td>
<td>• Understanding of Practice</td>
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<td>• Link to Sr. Management</td>
<td>• Organization Network</td>
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<tr>
<td>Implementation Plan Focus</td>
<td>• Viability</td>
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<td>• Timeline</td>
<td>• Network Connection</td>
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<td>• Success Story</td>
<td>• Business Story</td>
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<td>Senior Leadership Requirements</td>
<td>• Resource Allocation</td>
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<td></td>
<td>• Empowerment</td>
<td>• Communications Assistance</td>
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<td>• CHE/Equipment</td>
<td>• Network Access</td>
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<td>Organization Scope</td>
<td>• Single Group or Project</td>
<td>• Single Region</td>
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<td>• Education</td>
<td>• Network Engagement</td>
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<td>• Change Audit</td>
<td>• Change Audit</td>
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<tr>
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<td>• Benchmarking Development</td>
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</table>
Project Facts

Victorville, CA in the Mojave Desert

1. 58 acre site, filled with building, parking, driveways and minimum landscaping
2. 280,000 SF production building
3. 550,000 SF warehouse building, 42 dock doors
4. 18,000 SF administration building
5. Cast in situ, tilt up construction for all exterior walls
6. Structural steel infill with bar joist roof supports, metal deck + insulation
7. Single ply TPO roof, 40 mils and 60 mils
8. Three each 650 HP boilers, RO and NANO water treatment systems
9. Glycol chiller system, refrigeration room, electrical room (4 MW service)
10. Compressed air system, ESFR sprinkler system, Fire Alarm system
11. LEEDs Silver

Bottling and Warehouse Facility, Victorville, CA

Design began: September 2007
Owner purchased land: February 24, 2009
Began site work: March 15, 2009
Received Building Permit: April 17, 2009
First Concrete Poured: May 21, 2009
Make first produce: December 2009
Certificate of Occupancy: February 24, 2010
Finish Construction: April 2010
Our use of the secret ingredient – The ERI

• What is our ERI?
  – Was not used at the time, not a CII Member

• What are the major issues?
  – Large site, tight schedule, craft integration, safety management

• What was our approach to using the secret ingredient on the project?
  – Communication and senior management support
Notes
Notes

Our Result from the Use of Design for Safety

- **Result of the project** –
  - 300,000 Man-hours, 2 Incidents

- **What was interesting that you learned** –
  - Not necessarily real interesting but a good point just the same
good communication throughout the dining experience
(project) between customers and staff provides great results

### Experience Reference Index

<table>
<thead>
<tr>
<th></th>
<th>New to CII</th>
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<tbody>
<tr>
<td></td>
<td>Local / Regional</td>
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<td><strong>Resource Requirements</strong></td>
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<td>Visible Support, CII Engagement, Allocate Hours</td>
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<tr>
<td><strong>Organization Scope</strong></td>
<td>Personnel Involvement, Operational Objectives, Needs Analysis</td>
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Our Tip

- **What can you convey to the audience – takeaways.**
  - Safety starts at the beginning and ends at the end
  - Management Support – Even though we were not CII members at the time, we were supported by senior management who knew the value CII resources would provide.
  - Use the secret ingredient, the ERI
  - Follow the implementation process as a guide to a successful implementation program.
  - Recognize there will be barriers along the way – be prepared to address them.
Closing Remarks

- Did we address the objectives we stated at the beginning?
- Considerations participants should consider
  - Characteristics
  - Resource Requirements
  - Implementation Focus
  - Senior Leadership
  - Organization Scope

Closing Remarks

- Local and Global!!!
- Size of Projects
- Matrix vs hierarchical
- Collaboration Model
- Internal vs External Staff
- COP
- Mature Implementers

Call to Action

- Understand Your Implementation Needs
- Understand the Opportunities and Risks in Implementation
- Pick Up Handouts On Your Way Out
- Time to Ask Questions
Learning Objectives

• Know the dos and don’ts of using the Early Contractor Involvement (ECI) acquisition method—a form of Integrated Project Delivery.

• Recognize the merit of integrating project governance with partnering structure for Integrated Project Delivery.

• Grasp the criticality of engaging owner leadership to manage change as technology and mission evolve.

Plenary Session Abstract

This session will offer an overview of the U.S. Army Corps of Engineers’ NGA Campus East (NCE) project, an effort that was completed in 2011 and that recently won a CMAA national project achievement award, in addition to numerous local and national awards for design, craftsmanship, and construction management. The speaker will explain how this $1.4 billion project came in on budget and finished six months early—in part, by using the novel Early Contractor Involvement acquisition method and several building construction technologies. And, although it met the demanding requirements of a highly sophisticated and well organized client, the NCE experience of the Corps of Engineers’ Integrated Program Office (NGA/IPO) offers a rich trove of lessons learned. He will also give highlights of the many lessons learned on the project.

Implementation Session Abstract

During this session, the speaker will explain how using the Early Contractor Involvement acquisition method and several building construction technologies used on the highly successful NGA Campus East (NCE) project can make a difference in the industry. He will also share the “Top Ten Lessons for the Leader.” Among these, some are general lessons, while others focus specifically on using the ECI method. He will also give details on how the project and program management of the NCE made the project such a resounding success.
Plenary Session Presenter

Michael J. Rogers, Chief of the Environmental Munitions and Design Center, Baltimore District – U.S. Army Corps of Engineers

From 2006 through 2011, Rogers served as Program Manager and Chief of the NGA Integrated Program Office for the Baltimore District, located at Fort Belvoir, Virginia. In this post, he led a team of about 150 professionals engaged in the $1.7 billion BRAC design and construction program for the National Geospatial-Intelligence Agency. He is currently Chief of the Environmental Munitions and Design Center for the Baltimore District. Other positions have included acting Chief of Engineering, Deputy Chief of Programs and Project Management, Program Manager for the District of Columbia Schools Program, and Project Manager for the Spring Valley Formerly-used Defense Sites project in Washington, D.C. Following the 9/11 attack on the Pentagon, he helped lead the efforts to select a conceptual design for the Pentagon Memorial.

Rogers has served in a variety of assignments with USACE since 1988, including water resources planning, structural design, construction management, and program and project management, for both environmental remediation and vertical design and construction business lines. As a project manager, he has twice led teams that were recognized nationally within USACE as Project Delivery Team of the Year Honor Award recipients. In 2008, he was recognized as the USACE Program Manager of the Year.

He graduated with a B.S. in civil engineering from Virginia Tech in 1988 and earned an M.S. in engineering at The Johns Hopkins University in 1995. He is a registered professional engineer in the State of California, a certified PMP, and a Designated Design-Build Professional.

e-mail: michael.j.rogers@usace.army.mil
Implementation Session Moderator

Michael J. Rogers, Chief of the Environmental Munitions and Design Center,
Baltimore District – U.S. Army Corps of Engineers
  e-mail: michael.j.rogers@usace.army.mil

Panelists

Thomas S. Bukoski, Director, NGA Executive Secretariat – National Geospatial-
Intelligence Agency
  e-mail: thomas.s.bukoski@nga.mil

Keith Couch, Senior Vice President – Clark Construction Company
  e-mail: keith.couch@clarkconstruction.com

Michael Phillips, Senior Vice President/Business Unit Leader – Balfour Beatty
Construction
  e-mail: mphillips@balfourbeattyus.com

John E. Robinson, Jr., National Director, Government Sector – KlingStubbins
  e-mail: john.robinson3@jacobs.com

David Thompson, Senior Vice President – RTKL Associates Inc.
  e-mail: dthompson@rtkl.co
NGA Campus East (NCE) Project

Plenary Session Slides

Notes

NGA Campus East – a case study
Michael Rogers
U.S. Army Corps of Engineers

NGA Campus East

Agenda:
Project Description
Implementation Strategies
Lessons Learned
Questions

What is NGA Campus East (NCE)?

• New 2.4 million square foot campus for 8,500 employees of the National Geospatial-Intelligence Agency
  – Consolidation to Fort Belvoir, VA, from multiple legacy sites in the Washington, DC area
• Transformational opportunity for the Owner
• $1.7 billion design & construction program
• Pilot test for a new acquisition approach
Unique aspects

- Size
  - The largest single project authorized in the 2005 Base Realignment and Closure Act (BRAC) and the largest Military Construction project since the Pentagon was built in 1943

- Security Requirements
  - 90% of the facility is Secure Compartmented Information Facility (SCIF) space

- Extensive IT requirements

- Aggressive timeline – legislated completion date
Overall Phasing Scheme

NGA Campus East (NCE) Project

NGA Campus East Team

How did we do it?

<table>
<thead>
<tr>
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<th>CII Best Practice</th>
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<tbody>
<tr>
<td>Early Contractor Involvement</td>
<td>Constructibility</td>
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<tr>
<td>Partnering</td>
<td>Partnering</td>
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<td>Integrated Master Schedule</td>
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<td>Risk Management</td>
<td>Project Risk Assessment</td>
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<tr>
<td>Safety Management</td>
<td>Zero Accident Techniques</td>
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<tr>
<td>Commissioning</td>
<td>Planning for Startup</td>
</tr>
<tr>
<td>Lessons Learned</td>
<td>Lessons Learned</td>
</tr>
</tbody>
</table>
Results

- Construction completed six months ahead of schedule
- Project completed on-budget
- Agency maintained mission while deploying into the new campus
- Owner satisfaction is high
Notes

Come to our Implementation Session

Moderator
Michael J. Rogers, U.S. Army Corps of Engineers

Panel
Thomas Bukoski, National Geospatial-Intelligence Agency
Keith Couch, Clark Construction, LLC
Mike Phillips, Balfour Beatty Construction
John Robinson, KlingStubbins
Dave Thompson, RTKL, Inc.
NGA Campus East (NCE) Project

Implementation Session Slides

NGA Campus East – a case study

Speakers

• Michael Rogers - Moderator
  – U.S. Army Corps of Engineers
• Thomas Bukoski
  – National Geospatial-Intelligence Agency
• Keith Couch
  – Clark Construction Group, LLC
• Mike Phillips
  – Balfour Beatty Construction
• John Robinson
  – Jacobs (Kling-Stubbins)
• Dave Thompson
  – RTKL Associates, Inc.

NGA Campus East

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Project Description
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NGA Campus East (NCE) Project

Notes

Results
- Construction completed six months ahead of schedule
- Project completed on-budget
- Agency maintained mission while deploying into the new campus
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Project Description

OWNER’S REQUIREMENTS

What is NGA and What Do We Do?
National Geospatial-Intelligence Agency (NGA) is a National Intelligence and Combat Support Agency

Mission:
Provide Timely, Relevant, and Accurate GEINT in support of National Security

GEINT Definition:
"The exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth; GEINT consists of imagery, imagery intelligence, and geospatial information."

Know the Earth ... Show the way ... Understand the World ...
Mandated by law!

- 6 years from authorization to completion
- Design & Build a 2.4 million square foot facility with planned 25% growth
- Provision state-of-the-art IT and a “Tier 2 plus” Data Center
- Transition all the necessary systems
- Move 8500 people and all of their personal and professional information from 6 sites
- All while maintaining our operations ...

More than a Construction Project

- BRAC presented an opportunity to:
  - Reduce operating costs
  - Enhance force protection
  - Leverage a “clean slate” design to:
    - Modernize IT infrastructure and operations
    - Optimize business practices, both operational and enabling
    - Change culture

Prioritized Cultural Attributes

- Trust: Promote a culture of trust within NGA
- Collaboration: Increase collaboration across the organization
- Ownership: Reinforce the NGA mission
- Learning & Teaching: Create a learning environment
- Fun & Friendly: Create a fun and friendly work
Notes

Project Organization

NGA Campus East (NCE) Project

Project Description

FACILITY DESIGN OVERVIEW

Pre-Design activities that led to success

- Tours of existing NGA facilities w/ pros & cons assessment
- Tours of 10 Peer Facilities w/ pros & cons assessment
- Cultural Transformation and Visioning Initiatives
- Macro and Micro Programming
- 5 Design Charrettes
- Time due to site selection delay
Notes
Notes
Notes
Notes

Project Facts

- Chilled water capacity is 31,500 gpm
- 4,000 chilled beams in the facility
- 792,000 lineal feet of electrical wire
- 264,000 lineal feet of conduit
- 1000 electrical panel boards
- 4,605,600 strand feet of fiber optic cable
- 63,741,400 pair feet of copper twisted pair
- 2,710 Communications Cabinets
- 85 main IT spaces
NGA Campus East (NCE) Project

Notes

Project Overview

PHASING

NCE Phasing

- The BRAC mandated schedule required aggressive phasing to complete on time
- Phasing occurred on multiple levels:
  - Joint Use or Use & Possession for early access by NGA IT and Security contractors
    - 250,000 sf increments
  - Formal Acceptance via DD1354
    - 1,000,000 sf increments
  - IT System Tests, User Acceptance, and Deployment of Mission
    - 50-500 people per week, for 39 weeks

Main Office Building Constructed by “Segment”
Formal Acceptance was by “Bar”

Overall Phasing Scheme

IMPLEMENTATION STRATEGIES
Crosswalk of Implementation Strategies and CII Best Practices

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<thead>
<tr>
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<tr>
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Implementation Strategies

EARLY CONTRACTOR INVOLVEMENT

Fast-Track Early Contractor Involvement

Traditional D-B-B

- Design
- Preconstruction
- Construct

Conventional Design-Build

- Design
- Preconstruction
- Construct

D-B "Fast-Track"

- Design
- Preconstruction
- Construct

"Fast-Track" using ECI

- Design
- Preconstruction
- "Negotiation"
- Construction Elements
Notes

ECI Rationale

• Schedule – potential to save up to a year on the project duration
• Integration – leverage integrated design and construction expertise
• Quality and Mission Success – enable extensive owner participation during design

Design/Construction Schedule Integration

• First major integration effort
• Redefine Bid Package components and deadlines
• Increase major bid packages from 12 to 30+
• Commit to expedited reviews and contract awards
• Account for key NGA contracts (IT, security, deployment)
• Results

<table>
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<tr>
<th>Milestone / Anchor Points</th>
<th>Plan Completion</th>
<th>Actual Completion</th>
<th>Schedule Improvement (Months)</th>
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<td>CUP/ANCHOR PTA - CONDITIONED AIR AVAILABLE TO TECH CENTER</td>
<td>11/1/2009</td>
<td>7/15/2009</td>
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<td>TECH CENTER ANCHOR PTA - READY FOR ACT/VE IT INSTALLATION</td>
<td>11/18/2009</td>
<td>7/15/2009</td>
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<tr>
<td>ANCHOR POINT B1 (1ST RISER SOUTH TOWER) - SEGMENT</td>
<td>9/19/2010</td>
<td>7/25/2009</td>
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<td>ANCHOR POINT C (1ST NORTH RISER)</td>
<td>9/19/2010</td>
<td>8/16/2010</td>
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<td>ANCHOR POINT D (1ST 200K SF) - SEGMENT</td>
<td>8/22/2010</td>
<td>2/22/2010</td>
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<tr>
<td>ANCHOR POINT F (BENEFICIAL OCCUPANCY NORTH TOWER)</td>
<td>10/22/2011</td>
<td>4/13/2011</td>
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<tr>
<td>GARAGE CONSTRUCTION COMPLETE</td>
<td>8/27/2011</td>
<td>7/30/2010</td>
<td>13</td>
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<tr>
<td>VISITOR CONTROL CENTER COMPLETE</td>
<td>9/15/2011</td>
<td>12/21/2010</td>
<td>9</td>
</tr>
</tbody>
</table>
Early Subcontractor Procurement

**ETFE Roof**
- New US Product
- 2 Known Suppliers in World
- Neither Supplier would Bond
- Contractor View “ETFE = Risk”

Early Subcontractor Procurement

**Mechanical**
- Part A – U/G + Preconstruction
- Part B – Target Price for Balance of Work (Alternate)
- Design Assist Subcontract
- Best Value Procurement

Early Subcontractor Procurement

**Precast Garage**
- Originally CIP Concrete
- Value Engineered to Precast
- Procured on Design-Assist Basis
- Drove Cost Down
- Speed of Delivery
NGA Campus East (NCE) Project

Notes

Implementation Strategies

PARTNERING

One Team Goals & Objectives

- **Goal:**
  - Complete NCE by September 15, 2011 (complete = operations safely deployed and mission ready in new facility)

- **Objectives:**
  - Achieve Complete safety and security
  - Achieve Timely & Effective Information Flow and Decisions Through One Team
  - Provide Strong, Disciplined Program and Project Management
  - Work Smart – Anticipate, Communicate, Address Risk Early
  - Create a Legacy Project
Partnering was Congruent with Program Governance

Integrated Membership
Integrated Rhythm
Project Focus
Issue Resolution

Program Board

Executive Leadership Team

Notes

NGA Campus East (NCE) Project

Integrated Master Schedule

• Why?
  – 3 Government Contracting Entities, 6 Prime Contracts
  – Fast-tracked construction
  – Phased, overlapping activities among contracts
  – Dependency on external activities

• How?
  – Defined key set of coordination points across all contracts
  – All contractors provided monthly schedule updates to a project controls team
  – 30,000+ activities analyzed and distilled down to an executive summary

Schedule Management
Notes

NGA’s Schedule

- NCE Anchor Points
- Design JV activities
- CBB activities
- Critical Path
- AIT activities
- BOSC activities
- NGA Master Schedule activities
- STP/ITC activities
- Deployment activities

Riser and Floor Space Turnover Status

<table>
<thead>
<tr>
<th>Turnovers</th>
<th>Control Date</th>
<th>Current Date</th>
<th>Space Cond.</th>
<th>A Form Control Status</th>
<th>Trend</th>
<th>Comment</th>
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<tr>
<td>Segment A (Riser)</td>
<td>17 Aug 19</td>
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<td>14 Sep 19</td>
<td>16 Nov 19</td>
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<td>19 Mar 19</td>
<td>10 Jan 19</td>
<td>1</td>
<td>On Schedule</td>
</tr>
</tbody>
</table>

Implementation Strategies

RISK MANAGEMENT
Risk Management

- Risk – a potential situation that could adversely impact the project’s cost, schedule or technical performance.
- Issue – an existing condition that will adversely impact the project.
- Opportunity – a potential situation that could favorably impact the project.


Risk Management

Risk Identification → Risk Analysis → Risk Tracking → Risk Mitigation Planning → Risk Mitigation Plan Implementation


Risk Management

R/I/O Quad Sample

<table>
<thead>
<tr>
<th>Risk Title</th>
<th>Probability</th>
<th>Likelihood</th>
<th>Impact</th>
<th>Mitigation Plan</th>
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</thead>
<tbody>
<tr>
<td>R1</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
<td>Step 1: Identify potential risk sources.</td>
</tr>
<tr>
<td>R2</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
<td>Step 2: Survey risk areas.</td>
</tr>
<tr>
<td>R3</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Step 3: Implement mitigation planning.</td>
</tr>
</tbody>
</table>

Notes
Notes

Risk Management

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Negligible</th>
<th>Marginal</th>
<th>Significant</th>
<th>Critical</th>
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<tbody>
<tr>
<td>Near Certain (90-99%)</td>
<td>5</td>
<td>12</td>
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<tr>
<td>Highly Likely (60-79%)</td>
<td>4</td>
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<td>18</td>
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<td>Likely (40-59%)</td>
<td>3</td>
<td>10</td>
<td>14</td>
<td>20</td>
<td>23</td>
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<td>Unlikely (20-39%)</td>
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<td>7</td>
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<td>Remote (1-19%)</td>
<td>1</td>
<td>6</td>
<td>8</td>
<td>9</td>
<td>16</td>
</tr>
</tbody>
</table>

Implementation Strategies

SAFETY MANAGEMENT

Safety

• Zero/Zero Goal
• Zero Tolerance
• Safe Plan of Action
• Near Miss/Post Accident Review
• Weekly Foreman’s/Safety Manager Meetings
Implementation Strategies

COMMISSIONING

Notes

CUP Commissioning

- Distribute 35 KV Power
- Distribute 44 Degree Water
- Distribute 52 Degree Water

Problem

- CUP Turnover July 2009
- MOB Turnover April 1, 2011
- MOB Design Complete June 1, 2009
- How to Commission CUP?
Notes

Solution: Integrated Approach
- Designer - Pre-Functional Test Scripts
- Owner’s Authority Wrote Functional Test Scripts
- Contractor’s Commissioning Coordinator Organized the Subcontractor Effort
- Much Longer Commissioning Period
- Made Decisions as Team

LESSONS LEARNED

Lessons Learned
OWNER PERSPECTIVE
Lessons Learned from NGA

- Create a clear vision, commit to it early and share it with everyone
- Compile a dedicated project team with an operational focus, committed to the mission
- Engage and communicate as much as you can as often as you can.
- Find ways to get people involved in what they can influence early and keep their interest

Lessons Learned

AGENT’S PERSPECTIVE

Lessons Learned from USACE

- Key Success Factors:
  - Owner leadership and engagement supported rapid issue resolution & enabled “real-time decision making”
  - Partnering was integrated into the management of the project
  - Fast-tracked Early Contractor Involvement acquisition
    - Very flexible approach
    - Significant cost & schedule benefits
    - Complicated to administer
Lessons Learned:

**DESIGNER PERSPECTIVE**

Lessons Learned from RTKL/Kling Stubbins

- Flexibility – changing procurement, phasing, mission, & technologies
- Leveraging communications – FTP, email, VTC, BIM
- Team Building within the JV and our Consultants
- Having Fun – Working as a team toward a common goal has significant positive results for everyone.

Lessons Learned:

**BUILDER PERSPECTIVE**
Lessons Learned from Clark/Balfour Beatty

- Active, Engaged Government Client
- Creative Safety Program
- Contract Form allowed for Creative Management
- Infrastructure Management Important
- Team Organization Critical
Learning Objectives

• Appreciate the fact that an optimal balance of training, coaching/mentoring, and hands-on experience (70-20-10) is imperative to engaging and fully developing next generation leaders.

  – Understand that development activities are most effective when they are flexible and tailored to the individual; one size does not fit all.
  – Learn that skills/concepts are best absorbed when they are taught with a good foundation and followed by practical application.
  – Recognize that mentoring/professional development can be accomplished during a time of limited resources.

• Relate organizational value to the involvement of young talent in CII activities and the Next-Generation Leaders Community of Practice.

Plenary Session Abstract

The speaker will stress the urgent need to close the industry’s current generational gap, highlighting the importance of effective knowledge transfer and the development of emerging talent. Because traditional development and mentoring programs can become passive checklists of activities that provide minimal value to the developing employee and the sponsoring organization, he will introduce two development stories that demonstrate alternatives. He will show that, through careful integration of training, mentoring/coaching, and hands-on experience, CII member organizations can achieve meaningful knowledge transfer and accelerate the development of the next generation of global leaders.

Implementation Session Abstract

Two teams—one composed of a contractor mentor and mentee, and another made up of an owner administrator and a learner—will discuss the unique features of their relationships and professional development plans. They will explain how their respective plans have been developed and customized to provide the maximum benefit to both sides of these relationships. Included will be examples of how involvement in CII activates such as the Annual Conference and CII’s Next-Generation Leaders Community of Practice can enhance young professionals’ experience and broaden the reach of these development programs.
Plenary Session Presenter

Noé Hernández-Saénz, Manager of International Business Development, Process & Industrial – Burns & McDonnell

As Manager of International Business Development for Burns & McDonnell’s Process & Industrial division Noé Hernández-Saénz is responsible for the firm’s international business development and operations growth. His primary focus is on the oil, gas, petrochemical, food, and consumer products market sectors. Prior to joining the company in early 2010, Hernández was part of URS Corporation, where he played various roles in EPC construction management, project management, strategic planning, and business development on a variety of oil, gas, chemical, and industrial manufacturing projects. He is a member of the CII Benchmarking & Metrics Committee and is a founding co-chair of the Next-Generation Leaders Community of Practice. Hernández is a civil engineer from Universidad de Coahuila in Mexico, holds the PMP credential, and has an MBA in project management from Jones International University.

e-mail: nhernandez@burnsmcd.com

Implementation Session Moderator

Michael Bankes, Southern California CSA Department Director – Fluor Corporation

Michael Bankes has over 17 years of experience in home office engineering, engineering management, field engineering, and construction contracts management for Fluor Corporation, having worked on a variety of project types, including oil and gas, power generation, and infrastructure. Currently serving as Director of Civil/Structural/Architectural Engineering at the Fluor offices in southern California, Bankes is responsible for the home office engineering execution of all projects in southern California. He is also in charge of the development and maintenance of Fluor’s global practices and procedures related to civil/structural/architectural engineering, engineering management, and overall project execution. A charter member of CII’s Next-Generation Leaders Community of Practice, he has been involved in CII activities for over two and a half years.

Bankes has a B.S. and an M.S. in structural engineering, is a licensed professional engineer in the State of California, and has qualified for general building and engineering contractor licenses in several states, including California, Nevada, and Florida.

e-mail: michael.bankes@fluor.com
Panelists

Lindsay Auble, Process Engineer – URS Corporation
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Barry L. Christen, Director – URS Corporation
  e-mail: barry.christen@urs.com

Ryan M. Lisowski, Project Engineer – ConocoPhillips
  e-mail: ryan.m.lisowski@conocophillips.com

Steve Siceluff, Director, Summit Program – ConocoPhillips
  e-mail: steve.siceluff@conocophillips.com
Building Global Leadership: Engaging the Next Generation

Noé Hernandez, Burns & McDonnell
Co-Chair, CII Next-Generation Leaders

Things are changing!

The demographics and business environment are changing.

Since January, 2011 every day more than 10,000 Boomers reach the age of 65.

-Pew Research
The impending talent shortage is understood.

Attracting, recruiting, and retaining top quality leaders will continue to be an overwhelming problem.

- Deloitte Research 200-1

83% of workers feel their organization has a leadership vacuum.

- Workforce.com

- The DNA of Leadership, by Dr. Bill Badger

“We will build more things in the next 30 years, than we have built in the last 2000 years”

So what’s the challenge?

We are not adequately addressing the issue

“Current corporate leadership development programs are not capable of meeting the challenges ahead”

- Deloitte

Creating strategies to engage the younger generations requires a whole different approach-and strategy.

- Ivey Business Journal
Younger employees have different expectations than their predecessors.

- More open and accessible Management.
- Lateral movement and faster progression.
- Less emphasis on seniority and more on skills and competency.
- Good mentoring from supervisors and experts.

— CII Research Summary 200-1

44% of organizations have no knowledge transfer process in place. — Novations Group

So what can we do?

Focus on Engaging the Next Generation to develop Future Global Leaders

But how?

1. Embrace generational differences.
2. Engage immediately with onboarding.
4. Use the 70-20-10 development model.
5. Develop leadership and broad perspective.

How can CII help?
CII Next-Generation Leaders
Community of Practice

Our Mission:
Engage your Next Generation of Leaders
to become CII Ambassadors.

What’s the
Next Step?

Get engaged in our Session!

Ryan
Lincronski

Steve
Skellev

Lindsay
Auble

Barry
Chvistion

ConocoPhillips
Summit Program

URS
Mentoring Project

Moderator
Michael Bankes

FLUOR.
Building Global Leadership – Engaging the Next Generation

Implementation Session
CII Next-Generation Leaders Community of Practice

Given the opportunity, how would you change your company’s current talent development program?

Session Moderator

Michael Bankes, P.E.
- Fluor – Southern California
  Engineering Manager
- CII – Next-Gen Leaders COP
Learning Objectives

- The 70-20-10 model for adult development and its importance in fully engaging and developing the next generation of leaders
- The enhanced results when individuals are allowed to customize their development plans
- The value of Next Generation leaders being exposed to and involved in CII

The 70-20-10 Model for Adult Development

- 70% of development occurs in the course of your every day job
- 20% of development occurs through Individual Relationships and Feedback
- 10% of development occurs through Formal Training & Education

ConocoPhillips – Summit Program

Stephen Sceuluff
Director – Summit Program, ConocoPhillips

Ryan Lisowski
Project Engineer - Alternative Energy, ConocoPhillips
Notes

URS – Tailored Mentoring & Development

Barry Christen
Director – International Engineering, URS

Lindsay Auble
Process Engineer - Oil, Gas & Chemicals, URS

ConocoPhillips Summit Program

Ryan Lisowski and Stephen Siceluff,
ConocoPhillips

Steve Siceluff
Director, Summit Program

ConocoPhillips Project Development and Procurement
**What was our Challenge?**

Highly skilled, but aging, workforce and recognition of the coming gap in leadership capability, created Summit Program to:

- Recruit high performing engineering and construction graduates from U.S. and international universities
- Accelerate their development through intense formal training followed with planned work assignments, transferring knowledge from high-skilled workforce
- Reduce time required to transform entry-level employees into self-directed technical contributors on major projects in half (from 5+ years to 2-3 years)

---

**Summit: Phase 1**

3-month summer training:

- Learning about our industry, units and culture
- Deep dive into the processes and tools used to deliver major capital projects – aligned with many CII best practices
- hone communications and teamwork skills
- Practice new skills through project simulations
- Operational site tours to experience projects first-hand
- Develop professional networks through interface with company leaders and SMEs
- Mentoring and coaching to support development

---

**Summit: Phase 2**

Developmental assignments:

- Initial 9-month assignment on a project team
  - Apply skills learned during the summer session
  - Experience actual work of a project team
- 2-3 year project or operational assignment to grow project skills and gain experience
- Assignments can be domestic or international
- Skilled development (guides)
- Talent Management Teams oversee development beyond year 1.
Notes

Outcomes and Benefits

- Accelerated development of future leaders
- Summit Engineers begin delivering results during their developmental assignment
- Gaps between early and late career beginning to shrink
- Retention in our organization is strong – less than half other technical groups in COP
- Improved knowledge transfer through senior personnel serving as coaches/mentors and teachers
- Improved recruiting – attraction for top talent

Key Components of Early Years Programs

- Grounding: Industry, Company, culture, businesses/clients, include exposure to executives
- Processes, Tools, People – presentations and hands-on activities to learn how we get work done
- Networks: connect with Subject Matter Experts and develop connections with peers
- Guided development assignment for immediate application of knowledge and skills
My Experience

- **Where I Came From**
  - Experience, but not in the industry
  - 7 Years Military Experience
  - Aviation and Military Intelligence
  - 3 International Deployments, Multiple Projects

- **What Attracted Me to the Program**
  - Dedicated 12 months of training and development
  - Accelerated classroom training provided technical background, and personal network
  - Personal work experience on project with support of program (The 10 and 70)

What I Received

- **Walk Into First Role with Confidence**
  - Basis of Knowledge
  - Context (Industry, Company, Field)

- **Contributing Role on Multi-Billion Dollar Project….Not a new-hire position**

- **Opportunity to Demonstrate Skill Set**
  - Utilized tools, networks, relationships learned/built in Summit program
  - Afforded opportunity as small projects manager in Alternative Energy Group (first of a kind project)
How it Continues

- 12 Month Program Up Front, But Support and Networks are Career Long
  - Talent Management Teams
  - Internal Summit Networks, Knowledge Sharing
- Expectations for future success within organization
  - Leaders engage quicker and with much more confidence than normal new hires
  - Standard of excellence

Key Program Success Factors

- Management Commitment to Program
- Opportunity to Grow Professional Network
- Hands-On Exposure to relevant and important developmental experiences
- Combination of training and development assignments

What can NextGen Do?

- Encourage, mentor and facilitate new hires to:
  - Participate in as many networking opportunities and gain exposure to other areas in the company (learn the business and build networks)
  - Meet with subject matter experts. Plan field trips to give you hands-on exposure to the business
  - Utilize company training, libraries, mentoring program
  - Seek field assignments
A CII Development Project
Lindsay Auble and Barry Christen, URS

Introduction

- Specific, tailored development story
  - Mentoring? Project?
  - Opportunity to learn
  - Opportunity to contribute
- Utilizing CII as a development tool
- Tips and lessons learned

My Background

- Process Engineer
- 5+ years with URS
- Currently on field assignment

Development Objectives

- Expand/Refine engineering skills
- Master soft skills
- Understand our business
- Expand industry knowledge

Acquire the skills necessary to excel in near- and long-term leadership opportunities
Notes

CII – A Tool for Development

- NextGen Community of Practice
  - Virtual Monthly Meetings
  - Mentoring
- BOA member (mentor) – Barry Christen
  - Learning philosophy
- CII Improvement Project – A critical look at our CII membership
  - Are we getting the maximum benefit from our CII membership?
  - Is there anything we can do to improve the value?

Development Project

Maximizing the Value of our CII Membership

- How are we involved today?
- What are the constraints?
- What changes can we initiate to have the greatest impact?
- Implementing CII Findings/Best Practices
- Impact of URS Participation
- Engaging the URS Community

Development Project

Communication and Engagement Plan

- CII Leadership (URS BOA Members)
- URS RT/Committee/CoP Participants
- URS Employees
- Clients/Customers

Deliverables/Action Items:
- Alignment Meetings
- Pre/Post Conference Meetings
- Communication Campaign
How to Build a “Mentoring Project”

1. Determine where there is a current need or an opportunity for improvement
   - Meaningful and value-adding for your organization
2. Involve high potential talent as it fits within their development
   - Challenging but accomplishable
3. Develop the project
   - Make it a priority
   - Keep accountability on the mentee
   - Recognize progress
4. Incorporate mentoring into the process
Engaging the Next Generation

Michael Bankes, P.E., Fluor

Focus on Engaging the Next Generation to develop Future Global Leaders

1. Embrace generational differences
2. Engage immediately with onboarding
3. Keep engagement with mentoring
4. Use the 70-20-10 development model
5. Develop leadership and broad perspective

What’s the Next Step?

Next Generation Leaders Community of Practice

- NGL COP Objectives
  - Engage more young professionals in CII
  - Engage CII professionals with a passion for developing the Next Generation
  - Develop CII Ambassadors within the member companies
  - Facilitate an open forum for professional development discussions
Next Generation Leaders Community of Practice

NGL COP Activities

• Monthly Phone Meetings
  – CII Learning Topics
  – Individual development stories
  – Broadened exposure to the industry
• Annual Conference
  – Next Gen Leaders Forum
  – Plenary & Implementation Sessions
• More to come in the year ahead

Next Generation Leaders Community of Practice

NGL COP Participants

• Top performing NextGen professionals as
designated by their CII member companies

• CII Leaders and Academics willing to serve as
mentors or subject matter experts
Learning Objectives

- Learn how quick-connection systems are making steel and other materials faster and easier to install.
- Understand how the Contractors’ Workforce Development Assessment provides a smarter way to evaluate a contractor's training efforts.
- Preview the validation results of the Best Productivity Practice Implementation Index.
- Get a status update on the five-phase Construction Productivity Research Program.

Plenary Session Abstract

With its focus on the steel trades in this phase of the Construction Productivity Research Program, Research Team 252 continues its heavy lifting in the effort to improve construction productivity. Since the first phase of the program, the team has approached productivity from several angles, having discovered innovations that can maximize craft performance and reduce the number of work hours to complete one unit of work, having introduced processes that can increase the time spent on direct work and reduce the amount of rework, and analyzing benchmarking data to find the best practices that correlate with increased productivity.

In the current phase of the program, the team investigated the evolution of quick connections—with emphasis on their innovative use in steel construction. The speaker will discuss the productivity gains that are possible with quick-connect systems and will also unveil what the team considers a game changer on workforce development—the Contractors’ Workforce Development Assessment.

Implementation Session Abstract

In this session, the panel will present the results of the Construction Productivity Research Program's fourth phase. Research Team 252 will conduct an engaging session, providing a brief summary and update on the program's efforts to date and focusing on the Contractors' Workforce Development Assessment and quick-connection innovations. The panelists will also discuss the results of the team’s benchmarking and metrics data analyses on the best practices that most affect the construction productivity of steel trades. Attendees will also get an early look at the nearly complete validation of the Best Productivity Practice Implementation Index (BPPII).
Plenary Session Presenter

William R. Boyd, General Manager, Project Planning and Services – Southern Company

Bill Boyd has 26 years of power generation experience in maintenance, operations, and construction at Southern Company, one of the nation's largest electricity producers. His most recent experience includes leading major capital and retrofit construction projects for the company's Alabama region, and managing the Project and Planning Services group within the company's Engineering & Construction Services division. He is responsible for the project management office, project controls, constructability, start-up and commissioning, vendor quality, construction quality, and other project support functions.

Boyd holds a bachelor's degree in mechanical engineering from Auburn University. He has also completed the CII Executive Leadership Course from the McCombs School of Business at The University of Texas at Austin. He has been involved with CII for more than seven years, having served on two research teams.

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Implementation Session Moderator

Steve A. Toon, CE&T Productivity Engineer – Bechtel

Steven Toon leads the productivity engineering effort for Bechtel Construction Operations Incorporated, a part of the firm's Construction Engineering and Technologies group. He supports Bechtel's various business lines and projects by performing productivity studies, which include data collection, analysis, training, and interpretation. Toon has over 30 years of management, supervision, design, and construction engineering experience, in the areas of direct hire work, subcontracting, quality management, telecommunications, nuclear power, and the Department of Energy.

In 2010, he spoke on craft productivity at the Construction Business Forum, an event jointly sponsored by Engineering News-Record and the Construction Users Roundtable. He was also featured at the 2010 CII Annual Conference in Orlando, Florida. A member of the American Society for Quality, Toon holds a B.S. from California Polytechnic State University, San Luis Obispo, and an A.S. in agricultural engineering from Modesto Junior College.

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Panelists

Paul M. Goodrum, Professor, Department of Civil Engineering – University of Kentucky
  e-mail: pgoodrum@engr.uky.edu

Deborah Gustafson, Vice President – The Shaw Group Inc.
  e-mail: deborah.gustafson@shawgrp.com

Donald E. Whyte, President – National Center for Construction Education & Research (NCCER)
  e-mail: dwhyte@nccer.org
Construction Productivity: Faster, Smarter, Simpler

Plenary Session Slides

Notes

Construction Productivity: Faster, Smarter, Simpler

William R. Boyd, Southern Company
Construction Productivity Research Program

Program Objectives

• Improve direct work rates.
• Reduce the number of work hours required to complete a unit of work.
• Reduce rework.
Innovation:
Steel Quick Connection Systems

- Quick connection systems are bi-axial moment frame/space frame systems
- Features
  - faster erection
  - ease of installation
  - limited vertical bracing
  - similar benefits to modularization and prefabrication

Innovation:
Data Analysis – Unit Rate Comparisons

* Unit rate: erection unit rate only
Notes

Data Analysis:
Impact of Best Practices on Steel Productivity

<table>
<thead>
<tr>
<th>Practice</th>
<th>Improvement</th>
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<tbody>
<tr>
<td>Materials Management</td>
<td>32.3%</td>
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<tr>
<td>Constructability</td>
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<tr>
<td>Front End Planning</td>
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<tr>
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<tr>
<td>Safety</td>
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Bars represent productivity improvement between high versus low practice implementation.

Data Analysis: Results by Phase

Phases:
- Phase I: Mechanical
- Phase II: Electrical
- Phase III: Concrete
- Phase IV: Steel

Innovation:
Contractors' Workforce Development Assessment (CWDA)

- Craft employee training is vital to the success of any construction or maintenance program.
- Owners should expect well-trained craft workers with the necessary skills to perform.
- CWDA objectively quantifies what traditionally has been a subjective analysis.
Innovation:
CWDA vs. Safety Performance

BPPII:
Overview
- BPPII Structure
  - 6 Categories
  - 18 Sections
  - 53 Elements
- Validation Results

Implementation Session
- Learn how quick connection systems are making materials faster and easier to install.
- See how the Contractor’s Workforce Development Assessment provides a smarter way to evaluate a contractor’s training efforts.
- Preview validation results of the BPPII.
Construction Productivity: Faster, Smarter, Simpler

Implementation Session Slides

Notes

Construction Productivity Research Program (RT-252)

Implementation Session

Implementation Panel

- Steve Toon (Moderator)
- Paul Goodrum
- Deborah Gustafson
- Don Whyte (NCCER)

Stages:

- Construction Productivity Program
- Quick Connections
- Benchmarking and Metrics
- Contractors’ Workforce Development Assessment
- Best Productivity Practice Implementation Index
Objective and Strategies

"Our primary objective is to significantly improve construction productivity by:

1. **Increasing the time spent on direct work** through activity analysis.
2. **Reducing the number of work hours to complete one unit of work** through innovations (e.g. tools and equipment, methods, materials, training, work processes, and the Best Productivity Practice Implementation Index); and
3. **Reducing the amount of rework.**

Objective and Strategies
Notes

Construction Productivity: Faster, Smarter, Simpler

Accomplishments to Date

CII RT-252 Members

- Warren Adamson - S&amp;B
- William Boyd (Co-Chair) - Southern Co.
- Carlos Caldás - U Texas-Austin
- Dan Christian (Co-Chair) - Victaulic
- Paul Goodrum - U of Kentucky
- Deborah Gustafson - The Shaw Group Inc
- Carl Haas - U of Waterloo
- Shannon Hopkins - Eastman Chemical
- Dan Leng - Faithful+Gould
- David MacNeil - Baker Concrete
- Tim Heath - URS
- David Butry, NIST/BFRL
- Robin Granger (Former Co-Chair) - Ontario Power Generation
- Thomas James - Zachry Construction
- Martin Katz - All Products and Chemical
- James Matteson - URS
- Mathew Parker – Praxair
- Paul Murray - SNC Lavalin
- Laerte Santos Gallardo - Petrobras
- Don Purtle, International Paper
- Mark Stofega – Fluor
- Bob Tait – Irving Oil Refining
- Carmen Holosta Cortes Tellos - Petrobras
- Steve Toon – Bed Tet
- Don Whyte - NCCER
- Chuck Richards - The Shaw Group Inc
- Randy Tomlinson - Dow Chemical
- John P. Trotter – AZCO Inc.
- Neal Zimmerman - Jacob
CII RT-252 Student Members

- Jung Yeol Kim - U Texas-Austin
- Elizabeth Klinckaid -
- Jiali Liu - U of Waterloo
- Yangwei Shan - U of Kentucky
- Ashley Suazo - U of Kentucky
- Di Zhang - U of Waterloo

- Gabe Dadi - U of Kentucky
- Chandra Foley - U of Kentucky
- Jie Gong - U Texas-Austin
- Chris Gourt - U of Waterloo
- William Hinkle - U of Kentucky
- Hassan Nasir - U of Waterloo
- Mahdi Safa - U of Waterloo
- Mark Smith - U of Kentucky
- Dong Zhai - U of Kentucky

Notes

QUICK CONNECTION SYSTEMS

Our Study of Quick Connection Systems

- Quick connect structural steel pipe supports
- Weld-less pipe Joining
- Innovative Scaffolding systems
- Modular Formwork
- **Steel quick connection systems**
Introduction to Quick Steel Connection Systems

- On-site welding and bolting consume considerable resources
- Evaluated innovative steel erecting methods
- ConX™ system was selected for analysis

Steel Quick Connection Systems

- Quick connections are an innovative structural steel building system
- Bi-axial moment frame/space frame systems.
- Features: faster erection, ease of installation, limited vertical bracing, and similar benefits to modularization and prefabrication

Process Comparison
Analysis of Projects that Used Steel Quick Connection Systems

<table>
<thead>
<tr>
<th>Project</th>
<th>Total SF</th>
<th>Steel Structure Contract Amount (Material + Labor)</th>
<th>Quantity (Ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>64,730</td>
<td>$1,283,000</td>
<td>471</td>
</tr>
<tr>
<td>Data Center</td>
<td>101,000</td>
<td>$2,160,000</td>
<td>682</td>
</tr>
<tr>
<td>General</td>
<td>152,000</td>
<td>$2,853,000</td>
<td>909</td>
</tr>
<tr>
<td>Military</td>
<td>145,600</td>
<td>$2,953,000</td>
<td>739</td>
</tr>
<tr>
<td>Residential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Density1</td>
<td>202,700</td>
<td>$3,774,274</td>
<td>1,226</td>
</tr>
<tr>
<td>High Density2</td>
<td>525,000</td>
<td>$9,460,000</td>
<td>2,887</td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training Tower</td>
<td>1,230</td>
<td>$46,000</td>
<td>12</td>
</tr>
<tr>
<td>Portable Tower</td>
<td>10,000</td>
<td>$420,652</td>
<td>140</td>
</tr>
<tr>
<td>Water Processing</td>
<td>N/A</td>
<td>N/A</td>
<td>485</td>
</tr>
</tbody>
</table>

Notes

Data Analysis – Cost Comparisons

* Cost: Fabrication and Erection Cost

Data Analysis – Unit Rate Comparisons

* Unit Rate: Erection Unit only
Notes

Case #1
Central California Pipe Rack Project

- Project Information
  - Light Industrial, Water Treatment, Grass Root

Pipe Rack

Unit Rate Comparison

![Graph showing unit rate comparison between conventional and SOC(S) methods.]

- Notes:
  1. Includes unloading, staging, installation, permanent connection.
  2. Correlated through field observations.

Case #2
Southern California Medical Office

- Project Information
  - Medical Office Building
  - 3 Stories, Grass Root

Unit Rate Comparison

![Graph showing unit rate comparison between conventional and SOC(S) methods.]

Cost Comparison

![Graph showing cost comparison between conventional and SOC(S) methods.]

- Notes:
  1. Includes unloading, staging, installation, permanent connection.
  2. Correlated through field observations.

Summary

- Conclusions
  - The use of SOC(S) can benefit project schedules, since the steel structures can be erected faster.
  - Safety performance can be improved by reduction of exposure to unsafe conditions.
  - The costs are similar.
    - The higher fabrication costs of a SOC(S) offset the savings from its better erection productivity.

- Limitations
  - Small number of fabricators.
  - Smaller tolerance for dimensional errors.
  - Less flexibility for design and construction changes.
  - Implemented on several commercial and residential projects but only on a small number of light industrial projects.
The “Model Project”

- Representative Commercial Project
  - 5-story office building
  - Total area of 152,000 sqft.
- Work hour requirements assigned to Steel
- Leverages relatively new product data standard for Steel design – CIMSteel Integration Standards (CIS/2)
- Utilizes Building Information Modeling to simulate productivity effects of utilizing steel quick connection systems on a project

Major Statistics about Quick Connection vs. Conventional Systems

<table>
<thead>
<tr>
<th>Conventional Systems</th>
<th>Quick Connection Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Work Packages</td>
<td>Work Package No.</td>
</tr>
<tr>
<td>1</td>
<td>1.29</td>
</tr>
<tr>
<td>2</td>
<td>1.29</td>
</tr>
<tr>
<td>3</td>
<td>1.29</td>
</tr>
<tr>
<td>4</td>
<td>1.29</td>
</tr>
<tr>
<td>5</td>
<td>1.29</td>
</tr>
<tr>
<td>6</td>
<td>1.29</td>
</tr>
<tr>
<td>7</td>
<td>1.29</td>
</tr>
<tr>
<td>8</td>
<td>1.29</td>
</tr>
<tr>
<td>9</td>
<td>1.29</td>
</tr>
<tr>
<td>10</td>
<td>1.29</td>
</tr>
<tr>
<td>Average</td>
<td>1.29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conventional</th>
<th>Quick Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnaround</td>
<td>650</td>
</tr>
<tr>
<td>Working Days</td>
<td>50</td>
</tr>
<tr>
<td>Work Hours</td>
<td>5,682</td>
</tr>
<tr>
<td>Labor Cost (Single Cost) ($/SFT, 2004)</td>
<td>276,353</td>
</tr>
</tbody>
</table>

4D Schedule Simulation of Quick Connection vs. Conventional Systems
Methodology and Procedure

- Labor Productivity = Work Hours
  Physical Output

- **Lower is Better**
- Productivity Normalization (1-10)
- Divide the practices into low and high level practice use groups
  - Low-level
    - (Practice Use Index < (Median - 5%))
  - High-level
    - (Practice Use Index > (Median + 5%))

**Normalized Steel Productivity between Low- and High Level Implementer by Practice**

*Note: All findings’ statistical significance beyond the 95% level.*
Notes

Confronting the Skilled Construction Workforce Shortage
2004 CURT Publication, Reprinted from 1997

Owners have promoted for more than 15 years!!

“Owners should require contractors to invest in training and maintain the skills of their workforce as a condition of employment.”

“Individual contractors must recognize the necessity and benefits of training their employees and be willing to invest in it...”

History & Evolution
Intent of the October 2006 Release:

- Owners regard craft employee training as important to project success
- Owners should expect contractor craft workers to be well trained & have the necessary skills to perform
- Provide a set of objective measures to quantify what traditionally has been a subjective analysis

- The effectiveness of craft employee training programs should be a key criterion in both the prequalification & the final selection of contractors, just as contractor safety, quality, & schedule are key selection criteria
Key Development Points

Contractors’ Workforce Development Assessment

- **Minimize subjectivity** to the extent possible
- **Weight questions** by importance & impact
- Make the tool labor posture neutral
- **Validate to metrics**
  - OSHA Incident Rates and Experience Modification Ratios
- **Use third party** to collect & audit information to achieve consistency and eliminate bias
- Final metric should be **easy to communicate & understand**

### Contractors’ Workforce Development Assessment: Methodology

1. Collect Survey Data
2. Develop Model Weights
3. Incorporate Weight into Tool
4. Validate Tool

### Survey

- **Purpose of Survey**: Ask respondents to indicate the importance of each question on the assessment on 1 to 5 scale:
  - 5: most important
  - 1: least important
- **113 responses to survey**
Notes

Top 5 “Important” Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Average Importance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does your organization have a formal policy for or commitment to providing a formal craft skills training program?</td>
<td>4.4</td>
</tr>
<tr>
<td>Does your employee training program address leadership training for frontline managers?</td>
<td>4.3</td>
</tr>
<tr>
<td>Does your organization currently have credentialed/certified craft employees?</td>
<td>4.2</td>
</tr>
<tr>
<td>Does your organization provide formal, documented top-down support for your craft training program?</td>
<td>4.0</td>
</tr>
<tr>
<td>Is your primary craft training program approved or recognized by a professional organization?</td>
<td>4.0</td>
</tr>
</tbody>
</table>

* Out of a 5-point scale

Two Phase Validation of the CWDA

- **Phase One**
  - Consistency of survey weighting between contractors, owners, and other workforce training stake holders (113 survey participants)

- **Phase Two**
  - Completion of CWDA by 25 contractors
  - CWDA vs. Workforce absenteeism rates
  - CWDA vs. Company safety performance

Phase I: Analyses of Average Importance among Different Groups

<table>
<thead>
<tr>
<th>Question (Element)</th>
<th>Overall Average</th>
<th>Owner Average ((n=33))</th>
<th>Contractor Average ((n=37))</th>
<th>Other Professional Average ((n=27))</th>
<th>F Value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does your organization have a formal policy for or commitment to providing a formal craft skills training program?</td>
<td>4.4</td>
<td>4.5</td>
<td>4.3</td>
<td>4.6</td>
<td>1.56</td>
<td>0.214</td>
</tr>
<tr>
<td>Does your employee training program address leadership training for frontline managers?</td>
<td>4.3</td>
<td>4.2</td>
<td>4.2</td>
<td>4.5</td>
<td>2.20</td>
<td>0.116</td>
</tr>
<tr>
<td>Does your organization currently have credentialed/certified craft employees?</td>
<td>4.2</td>
<td>4.1</td>
<td>4.3</td>
<td>4.3</td>
<td>0.444</td>
<td>0.643</td>
</tr>
<tr>
<td>Does your organization provide formal, documented top-down support for your craft training program?</td>
<td>4.0</td>
<td>4.0</td>
<td>3.9</td>
<td>4.2</td>
<td>0.621</td>
<td>0.540</td>
</tr>
<tr>
<td>Is your primary craft training program approved or recognized by a professional organization?</td>
<td>4.0</td>
<td>3.8</td>
<td>4.1</td>
<td>3.8</td>
<td>1.21</td>
<td>0.303</td>
</tr>
</tbody>
</table>
Contractor’s Workforce Development Assessment & Metric

User Friendly Format
Construction Productivity: Faster, Smarter, Simpler

Phase Two Validation Demographics

<table>
<thead>
<tr>
<th>Category</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Performing General Contractor</td>
<td>11</td>
</tr>
<tr>
<td>Self-Performing Sub-Contractor</td>
<td>7</td>
</tr>
<tr>
<td>Grand Total</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Curriculum</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>JTCC</td>
<td>5</td>
</tr>
<tr>
<td>NCCER</td>
<td>13</td>
</tr>
<tr>
<td>Grand Total</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (90-100%)</td>
<td>10</td>
</tr>
<tr>
<td>B (80-89%)</td>
<td>6</td>
</tr>
<tr>
<td>C (70-79%)</td>
<td>2</td>
</tr>
<tr>
<td>Grand Total (Avg. Score: 8)</td>
<td>18</td>
</tr>
</tbody>
</table>

Innovation:
CWDA vs. Safety Performance

<table>
<thead>
<tr>
<th>Rate</th>
<th>TIR (p-value = 0.06)</th>
<th>DART (p-value = 0.07)</th>
<th>EMR (p-value = 0.06)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=7</td>
<td>1.65</td>
<td>0.74</td>
<td>0.67</td>
</tr>
<tr>
<td>N=9</td>
<td>0.83</td>
<td>0.32</td>
<td>0.55</td>
</tr>
<tr>
<td>Better</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is a Better Skilled Work Force also More Productive?

A declining performance factor indicates productivity improvement

Productivity Performance Factor vs. Percentage of Certified PlusRSM Craft Workers
CII RT-231: Craft Training (2007)
R²=0.39
P-value = 0.478
P-value = 0.020

RSM Certified Plus is trademarked by NCCER
BPPII

- Best Productivity Practices Implementation Index (BPPII):
- BPPII Structure
  - 6 Categories
  - 18 Sections
  - 53 Elements

BPPII Dataset and Validation

- **Projects**: Total 35 Projects
- **Project Characteristics**:
  - Project Types: Mining, Chemical, Oil Refining, Natural Gas, and Power
  - Contract Types: Lump Sum and Cost Plus
  - Project Nature: Brownfield, Modernization, Greenfield
  - Project Scope: Construction and EPC
- **Validation**
  - Analyzing relationships between BPPII scores and construction productivity for different trades.
Notes

Validation Part - I

• Box Plot of BPPII and Unit Rates

Limitations of Using Unit Rates for BPPII Validation

• Unit rates vary significantly with projects' characteristics, such as type, size, and location.
• The amount of project data collected limited the possibility of analyzing groups of projects with similar characteristics.
• RT 252 is also using productivity factors (PFs) for BPPII validation. PFs are the ratios of estimated and actual productivities.

Validation Part - II

• BPPII vs Productivity Factors
  – Collected Productivity Factors

  \[
  \text{Productivity Factor} = \frac{\text{Estimated Productivity} \times \text{work hours/qty}}{\text{Actual Productivity} \times \text{work hours/qty}}
  \]
  – "Bigger Number is Better"
  – Conducted ANOVA with BPPII and Productivity Factors
BPPII vs Productivity Factors

- Box Plot of BPPII and PF

```
<table>
<thead>
<tr>
<th>BPPII</th>
<th>PF (High)</th>
<th>PF (Low)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 60.7%</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>&gt;= 67.1%</td>
<td>0.40</td>
<td>0.20</td>
</tr>
</tbody>
</table>
```

- ANOVA

```
<table>
<thead>
<tr>
<th>F-Ratio</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.72</td>
<td>0.04 (&lt; 0.05)</td>
</tr>
</tbody>
</table>
```

Path Forward

- Finalize BPPII Validation
- Develop the Implementation Resource

What is your take-away?

- New connection systems are revolutionizing assembly methods
- Projects with greater implementation of safety and materials management consistently have better productivity
- Productivity starts with a skilled worker
Keynote Address

Keynote Speaker: LTG Thomas P. Bostick, U.S. Army Corps of Engineers (invited)

Keynote Speaker

LTG Thomas P. Bostick, Chief of Engineers – U.S. Army Corps of Engineers

Lieutenant General Thomas P. Bostick has served extensively in both the United States and overseas. In Operation Iraqi Freedom, he served as an assistant division commander before commanding the USACE Gulf Region Division, where he managed $18 billion in reconstruction in Iraq. He held several staff leadership positions at the Pentagon from May 2001 to August 2002, and was involved in the U.S. response to the September 11 attacks and the initiation of operations in Afghanistan. A graduate of the U.S. Military Academy, he holds M.S. degrees in both civil and mechanical engineering from Stanford University.
The Importance of Leadership in Project and Program Management

Featured Speaker: Stephen T. Ayers, Architect of the Capitol
(2011 Recipient of the Carroll H. Dunn Award of Excellence)

Abstract

Good leaders can make the difference between an extraordinary project and one that struggles from the beginning. Is your company or organization simply good? After posing the question “How do you go from good to great?” at the beginning of the session, Ayers will explore leadership styles and theories, examine the characteristics of good leaders, offer leadership tips from his 16 years working for the U.S. Congress, and review the current state of leadership in the design and construction industry.

Featured Speaker

The Honorable Stephen T. Ayers, Architect of the Capitol

As Architect of the Capitol (AOC), Stephen Ayers is in charge of the maintenance and operation of the historic Capitol Building, caring for more than 460 acres of Capitol grounds, and operating and maintaining 17.4 million square feet of buildings. He is also responsible for works of art and all architectural elements within the Capitol complex. In addition to these duties, he serves as Acting Director of the U.S. Botanic Garden and the National Garden. He leads a team of 2,600 employees and, with the House and Senate Sergeant at Arms, he oversees over 2,000 employees at the United States Capitol Police.

Ayers completed his Bachelor of Science degree in Architecture at the University of Maryland and received his Masters of Science degree in Systems Management from the University of Southern California. He was later commissioned as an officer in the U.S. Air Force and assigned to Edwards Air Force Base. Serving first as a Staff Architect of his squadron, he quickly became Design Team Chief, progressed to the rank of Captain, and was awarded the Meritorious Service Medal.

At the end of five years of service, Ayers worked as an architect in the Washington, D.C., area until 1991, when he joined Voice of America (VOA) as a general engineer. In 1992, he was assigned to lead design and construction efforts at several VOA sites in Europe.Returning to the U.S. in 1997, he joined AOC as Assistant Superintendent for the Senate Office Buildings. In 1999, he was promoted to Deputy Superintendent. He was further promoted to Superintendent of Library Buildings and Grounds in 2002. In October 2005, Ayers became Acting Deputy Architect/Chief Operating Officer. In March 2006, he was selected as the organization’s Deputy Architect/Chief Operating Officer. In February 2007, he began serving as Acting Architect until his appointment as agency head in May 2010.

Ayers is a licensed architect in California, and an Accredited Professional in Leadership in Energy and Environment Design. He is a Fellow of the American Institute of Architects and a member of the National Historic Trust for Historic Preservation, the George Washington Chapter of Lambda Alpha International, Construction Users Roundtable, Construction Industry Institute, Washington Building Congress, and Construction Managers Association of America.

e-mail: sayers@aoc.gov
The Importance of Leadership in Project and Program Management
Abstract

Citing a recent Harvard study that found that career and technical education programs better prepare many students for the future than do traditional academics-only programs, the main speaker will argue that the country needs to re-focus its educational priorities to narrow the ever-widening skills gap we now face. He will argue that the solution to this national problem lies in our commitment to training, and in inspiring a new generation to build the future. He will then discuss the important work of the NCCER Build Your Future (byf.org) campaign, an initiative to guide America's youth and displaced workers toward opportunities for advanced education and training, and ultimately into long-term rewarding careers in construction.

This session will also feature testimonials from young craft professionals who have benefitted not only from secondary technical education, but also from the crucial connection between schools and industries that groups like NCCER and SkillsUSA have forged to ensure that America has a skilled workforce.

Featured Speakers

Karmen Ayres, Aberdeen High School Vice President – SkillsUSA

Karmen Ayres is a residential wiring and audio broadcasting graduate of Aberdeen High School. She has served as president, regional representative of SkillsUSA Washington State, and as president and secretary of her local chapter of the organization. She has competed in the SkillsUSA extemporaneous speaking championship at the state and national levels and was named soloist of the year of Washington's all-state band.

Melissa Rubly, Welder – Zachry

Melissa Rubly is a structural welder for Zachry Industrial at the BP Texas City Refinery, the third largest refinery in the United States and the eighth largest in the world. Originally from North Carolina, she graduated from Crosby High School in Crosby, Texas, where she first became passionate about working in the construction industry. After graduation, she joined the National Association of Women in Construction, which sponsored her attendance at its MAGIC camp, a week-long educational camp for young women who want to master the construction trades. At the conclusion of the program, she was able to demonstrate her skills to a variety of contractors, and Zachry offered to put her through its welding program to become a certified welder. After successfully completing her training, Rubly was selected as a competitor in the National Craft Championships in San Diego, CA, as a pipe welder. As a Zachry welder, she has been an ironworker and welder.
in almost every major unit in the BP refinery. Because her move directly from high school into the industry has led to so much success, she is committed to helping other interested young people get the training they need to begin their careers in construction.

**Ashley Webel**, Instructional Laboratory Assistant – Washtenaw Community College

After graduating from Lincoln Consolidated High School in Ypsilanti, Michigan, Ashley Webel attended Washtenaw Community College (WCC) and received an associate’s degree in applied science, with a focus on welding. While in the WCC welding program, she competed in the Skills USA Welding and Fabrication competition at the national level two years in a row. The WCC team won a silver medal in the first year of competition and took home a gold medal the following year. After graduation from WCC, Webel took a position in the training department at the Lincoln Electric Company (LECO). While at LECO, she was involved in many different educational projects for the welding and construction trades. This involvement in trades education included her participation on the national committee for the Skills USA Welding and Fabrication competition. She is now an instructional laboratory assistant at Washtenaw Community College, where she coaches welding and fabrication students for the national Skills USA competition. Because she is passionate about education in the welding and construction fields, she is also currently working towards an Education Vocational Technical Endorsement.

**Travis Weber**, Assistant Safety Director – LPR Construction

Travis Weber is Assistant Safety Director for LPR Construction, having started as an ironworker at the firm after his high school graduation in 2003. In 2005, he took a position as a site safety and training coordinator and worked on many large projects around the United States, including a chemical facility, a steel mill, and a retractable-roof baseball stadium. In 2011, he was promoted to his current position and currently works in the corporate office. He has found construction to be a very rewarding career path, both in terms of financial gain and personal satisfaction. He holds CHST and CSST designations and is currently enrolled at Trinidad State Junior College in pursuit of an associate’s degree in occupational safety and health.
Executive Summary

In this session, you will hear directly from four young people who have benefitted from non-traditional pathways to success, including career and technical education (CTE) programs and industry-funded apprenticeship training.

Travis Weber of LPR Construction, Ashley Webel of Washtenaw Community College, Karmen Ayres of SkillsUSA, and Melissa Rubly of Zachry Holdings, Inc., will all describe their experiences, when as high school students, they were considering their post-graduation lives. Their respective roads to success demonstrate that the solution to the ever-widening skills gap lies in our commitment to providing the next generation with alternative paths to prosperity and career satisfaction.

The Build Your Future campaign (www.byf.org) is on a mission to narrow the skills gap by guiding America’s youth and displaced workers into opportunities for advanced education and training for rewarding careers in construction. The goals of the campaign are the following:

- make career and technical education a priority in secondary schools
- change the public’s negative perception of the construction industry by promoting the wide range of professions available
- give aspiring craft professionals a pathway from ambition to training to job placement.

NCCER (www.nccer.org) is a not-for-profit educational foundation created to develop standardized construction and maintenance curricula and assessments. By developing training in over 60 craft areas, offering over 70 assessment exams, and providing 4,000 training locations, NCCER provides craft professionals the means to earn portable, industry-recognized credentials.

SkillsUSA (www.skillsusa.org) is a partnership of students, teachers, and industry leaders, working together to ensure that America has a skilled workforce. The SkillsUSA’s mission is to help its members become world-class workers, leaders, and responsible citizens. Serving more than 300,000 students and instructors annually, the organization has 13,000 school chapters in 54 state and territorial associations. More than 14,500 instructors and administrators are professional members of SkillsUSA.
Nearly half of what will be the built environment in 2030 doesn’t exist yet.

Brookings Institution Metropolitan Policy Program Report
We fail these young people not because we are indifferent, but because we have focused too exclusively on a few narrow pathways to success.

Pathways to Prosperity: Harvard Graduate School of Education
Cutting-edge CTE bears little relationship to the old vocational education programs that were often little more than dumping grounds for students who couldn’t cut it in college prep.

Pathways to Prosperity, Harvard Graduate School of Education
Economic prosperity and social cohesion depend on an appropriately skilled and employed workforce.

Pathways to Prosperity, Harvard Graduate School of Education
The U.S. now has the highest college dropout rate in the industrialized world.

Pathways to Prosperity, Harvard Graduate School of Education
Notes

Shortages of skilled workers will escalate as our industry recovers.
Learning Objectives

- Understand the history of front end planning research at CII over the past 21 years.
- Learn about the integrated, phase-gated planning process.
- Be aware of the various front end planning tools that CII has to offer.
- Demonstrate the value of using front end planning tools.
- Gain exposure to the new toolkit and implementation resources.

Plenary Session Abstract

The presenter will chronicle two decades of CII front end planning research (FEP) in three industry sectors, and will introduce Special Publication 268-3, *Adding Value through Front End Planning*—a resource that will help users integrate CII FEP tools on their projects. The speaker will also present an update of Implementation Resource 213-2, *Front End Planning Toolkit*, and discuss the phase-gated front end planning process and a variety of tools that add value to this process, including the Project Definition Rating Index (PDRI) tools and the *Front End Planning Toolkit*. He will address the unique planning issues that attend front end planning implementation, and give an overview of the critical front end planning success factors. The concluding discussion will focus on the integration of the FEP process and its associated tools.

Implementation Session Abstract

At the start of this session, the panelists will give a demonstration of the *Front End Planning Toolkit*, Version 3.0. They will also introduce Special Publication 268-3, *Adding Value through Front End Planning*. Written as both a summary document on CII front end planning research and as a guide to help individuals and companies perform better front end planning, this newest resource from RT 268 offers advice on developing and maintaining an effective FEP program. To round out the session, the panelists will follow this discussion with testimonials on successful implementation efforts within their organizations. Working in different industry sectors and speaking from varying levels of experience, each will describe the value gained from using the process and tools. The remainder of the session will be devoted to audience questions, shared experiences, and feedback on FEP implementation.
Plenary Session Presenter

G. Edward Gibson, Jr., Director, Professor, and Sunstate Endowed Chair in the School of Sustainable Engineering and the Built Environment – Arizona State University

Dr. Edd Gibson is the Director of the School of Sustainable Engineering and the Built Environment at Arizona State University (ASU). He is a professor and the Sunstate Endowed Chair in Construction Management and Engineering, and served as Programs Chair of the Del E. Webb School of Construction at ASU from 2009–2011. Prior to joining ASU, Gibson started the recently accredited construction engineering program at the University of Alabama, and before that, was a faculty member at The University of Texas at Austin for 15 years. In that capacity he headed the architectural engineering undergraduate program and the graduate construction engineering and project management program.

Originally from Alabama, his educational background includes a B.S. and a Ph.D. in civil engineering from Auburn University, and an MBA from the University of Dallas. Over the course of his career, he has been a principal investigator on over $9 million worth of funded research. His research and teaching interests include front end planning, organizational change, asset management, alternative dispute resolution, and risk management. He has received several awards for research excellence, having twice received the CII Outstanding Researcher award. He has been active on many national committees, including a National Research Council committee on project management practices at the U.S. Department of Energy. He is a member of the Architectural Engineering Institute and has also served as a Fulbright Senior Specialist. An elected member of the National Academy of Construction and a Fellow in the American Society of Civil Engineers, Gibson also has several years of industry experience and is a licensed professional engineer in Texas. Gibson has been involved with CII in several capacities since 1988.

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Implementation Session Moderator

Eskil E. Carlsson, Quality Director – CSA Group

Eskil Carlsson has worked on engineering projects across the United States, South America, Africa, Asia, and the Caribbean. With over 26 years of experience in the engineering and construction industry, he has held positions in quality and project controls, as well as in project and construction management. He has worked on many types of infrastructure projects, including tunnels, pipelines, roads, dams, and levees.

Carlsson is a civil engineer and holds a master’s degree in geotechnical engineering from the University of California at Berkeley. He has been involved with CII for the last nine years, having participated on three research teams. He is currently a member of the Implementation Strategy Committee (ISC), and is Vice Chairperson of the CII Front End Planning Community of Practice. He is also CSA Group’s Implementation Champion responsible for implementation of CII Best Practices.

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Panelists

Brian Foy, Associate – Burns & McDonnell

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Richard Gunn, Project Assessor – TransCanada

e-mail: richard_gunn@transcanada.com

Sandra MacGillivray, Vice President, Product Management – Coreworx

e-mail: smacgillivray@coreworxinc.com

Robert Mitrocsak, Jurisdiction Executive for Capitol Power Plant and Security Programs – Architect of the Capitol

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Richard Scott, Project QA/QC Manager – Kebabangan Petroleum Operating Company Sdn Bhd

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Adding Value through Front End Planning

G. Edward Gibson, Jr., Arizona State University

Integration of CII Front End Planning Products
Research Team

21 Years of Front End Planning (FEP) research

Behind the Numbers
CII Directors during the 21 years of front end planning research

Front end planning research teams

Front end planning team members

Front end planning graduate students
Notes

Our Generational Touch

Research Teams: 39, 113, 155, 181, 213, 242, 269

1940s 1991 2012 2050s

279 Organizations contributing to research

6 Continents where the tools are used

40 Countries where data collected
$88B
Total dollar value

1017
Projects researched

Adding Value

6 - 25%
Average cost savings through effective front end planning

6 - 39%
Average schedule savings through effective front end planning
Notes

1.5 - 5%
Average cost of effective front end planning depending on type and complexity (in relation to total project cost)

3 - 10:1
Average return through effective front end planning

Front End Planning Gated Process


7
Number of front end planning tools
A Suite of Management Tools Available

>40,000
Approximate number of front end planning product purchases and downloads

3
PDRI Tools
>4,000
Years of industry experience in the individuals involved in development of the three PDRIs

78%
Of you using at least one front end planning tool
2011 survey

96%
Of you finding value in CII front end planning tools
2011 Survey
Time and money
Lack of knowledge or understanding
We plan to real soon!
Alternate methods of planning employed
Difficult to use CII's tools
Lack of management commitment
Other existing processes in house
Lack of trained facilitators
People's unwillingness to plan

2

Resources we developed to help implement and strengthen your organization’s front end planning process

Integrating all tools
Adding Value through Front End Planning

Notes

They’re Using CII FEP Tools...Are You?

SNC-LAVALLIN
GS Engineering & Construction
Smithsonian Institution

Walbridge
hargrove

Jacobs
CoreWorx

DuPont
TransCanada

Ontario Power Generation

Research Team 268,
Integration of Front End Planning Products

Ken Bryson
Eskil E. Carlsson
Alfred Cypress
Don Cooley
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Sandra MacGillivray
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Richard Scott
Brian Werle
James B. Vicknair
Jim Vuongert

DHHS-CDC
CSA Group, Co-Chair
DHHS
CH2M Hill
Ford, Bacon, & Davis
Burns & McDonnell
Arizona State University
Tennessee Valley Authority
Fluor Corporation
CoreWorx, Inc.
Architect of the Capitol
Walbridge
BP, Co-Chair
ConocoPhillips
Jacobs

Students:
Roberta Boufield
Evan Bingham

Arizona State University
Arizona State University

Implementation Session Participants

Moderator:
Eskil Carlsson  CSA Group

Panelists:
Brian Foy  Burns & McDonnell
Sandra MacGillivray  CoreWorx, Inc.
Richard Scott  ConocoPhillips
Richard Gunn  TransCanada
Robert Mitrocsak  Architect of the Capitol
Adding Value through Front End Planning

Implementation Session Slides

Eskil Carlsson, CSA Group
Research Team 268
Integration of CII Front End Planning Products

Eskil Carlsson
Introduction

Facts By Numbers
6 continents
9 research teams
21 years
40 countries
157 team members
279 organizations
1,117 projects studied
4,000 years experience
40,000 downloads
$88 B project value

Findings By Numbers
Cost:
1-5% of TIC
$3-$10 payback per $ spent
6-25% cost savings
Schedule:
6-39% schedule reduction

Front End Planning: Global Input
Implementation Session Agenda

• Introduction
• Front End Planning Magazine Overview
• Front End Planning Toolkit V3.0 Demonstration
• Testimonials
  – TransCanada
  – ConocoPhillips
  – Architect of the Capitol
• Closing Thoughts
• Q&A

Research Team 268

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Dara Gooch
Alfred Cypress
John F. Shady
Brian Foy
G. Edward Gibson
David R. Halicks
Steve Laskowski
Sandra MacGillivray
Robert Mitrocsak

Scott Pendle
Tim Pederson
Richard Scott
Brett Welf
James E. Vicknair
Jin Young

Valbridge
EP, Co-Chair
ConocoPhillips
Jacobs
Vinley Parsont
Smithsonian Institution

Students:
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Evans Bingham
Arizona State University
Arizona State University

Panelists

• Brian Foy
• Sandra MacGillivray
• Richard Gunn
• Richard Scott
• Robert Mitrocsak
Panelists
- Brian Foy
- Sandra MacGillivray
- Richard Gunn
- Richard Scott
- Robert Mitrocsak

Notes

Introduction to CII’s Special Publication 268-3

1. Introduction
2. What Can Your Organization Gain from Front End Planning
3. Front End Planning Tools
4. How to Make it Work
5. Keeping to Momentum
6. Conclusions

A Cornerstone of CII Research
Adding Value through Front End Planning

Notes

The Proven Phase Gate Planning Process

Research Findings

Seven Front End Planning Tools
Adding Value through Front End Planning

Notes

Tips from Industry Experts

Guidance on Facilitating Best Practice

Myths and Misconceptions
Panelists

• Brian Foy
• Sandra MacGillivray  CORE WORX
• Richard Gunn
• Richard Scott
• Robert Mitrocsak

FRONT END PLANNING TOOLKIT V3.0

2012 Annual Conference • Baltimore
Building Global Leadership
Adding Value through Front End Planning

Notes

FRONT END PLANNING TOOLKIT V3.0
- align information and knowledge
- easily adopted by Owners and Contractors
- promote consistancy and excellence in planning

TARGET USERS WITHIN YOUR ORGANIZATION

Project Team Members
- primary resource and guide on front end planning
- ease of access to all information, tools, links, references, and deliverable lists that will assist its planning activities
Adding Value through Front End Planning
Adding Value through Front End Planning

Notes
Adding Value through Front End Planning

Notes
Adding Value through Front End Planning

Figure 5.1: IPRA Hierarchy

The IPRA consists of four main domains, each of which are divided into two categories:
- Domain 1: Geodiversity
  - Category A: Geology
  - Category B: Geography
- Domain 2: Infrastructure
  - Category A: Roads
  - Category B: Bridges
- Domain 3: Environment
  - Category A: Climate
  - Category B: Water
- Domain 4: Economics
  - Category A: Industry
  - Category B: Agriculture

Notes:

Front End Planning Table > Feasibility > PCRI 1

About the Task:
How to Use the Task
List of All Tasks
List of Outcomes
List of Resources
List of References
List of Terms

The PCRI is a high-level assessment of the project's feasibility, prior to Phase 1, and is used to make decisions on proceeding to the next phase. The assessment is typically held for projects in the initial stages of development. The PCRI includes four key components:
- Conceptual
- Detailed Scope
- Design
- Risk Assessment

1. Concept
   - Initial Phase
   - Generate Options
   - Filtering Options
   - Final Recommendation

2. Detailed Scope
   - Project Definition

3. Design
   - Risk Assessment

4. Risk Assessment
   - Evaluation

Typical PCRI scores at this assessment step will range from 500 to 1500.

References:
- BNL, P21: Project Definition Rating Scale - Industrial Projects, Version 3.0
- BNL, P21: Project Definition Rating Scale - Existing Projects, Version 3.0
- BNL, P21: Project Definition Rating Scale - Infrastructure Projects, Version 3.0

First Selection Guide

When choosing a project, consider the following factors:
- Project type
- Location
- Availability of funds
- Environmental impact

The selection process involves evaluating the project's potential for sustainability, economic viability, and social benefit. The criteria for selection include:
- Feasibility
- Cost effectiveness
- Social impact

The selection process is iterative, with adjustments made based on feedback from stakeholders and changes in project parameters.

Figure 5.1. Incentives Non-Reliability Graph

Main characteristics of incentives:
- Building and infrastructure projects are connected in the graph:
  - The risks are identified and assessed using the appropriate PFI for the project.
Adding Value through Front End Planning

Notes

Planning Toolkit

Welcome to the Front End Planning Toolkit, Version 3

Click on a gate or phase to see details.

This HTML-based Toolkit is intended to assist with front end planning of all types of clients by owners, contractors, and consultants. Tools and techniques contained in this Toolkit include industrial, infrastructure, and building/housing projects. The processes considered here can

Front End Planning Toolkit > Feasibility > PDR 1

PDR 1

The PDR 1 Tool is a high-level assessment of the client's project. It's part of Phase 3, which sets out the decision criteria for proceeding to the next phase. This assessment is typically tailored towards a specific domain, whether it's commercial, industrial, or infrastructure. The PDR 1 should be conducted at the start of the project. The tool is tailored to industrial, building, or infrastructure projects. It supports the decision-making process by identifying potential risks and challenges.

References:
- R1-0.1.1: PDR - Project Definition Rating Index - Industrial Projects, Version 3.3
- R1-0.1.2: PDR - Project Definition Rating Index - Building Projects, Version 3.3
- R1-0.3.1: PDR - Project Definition Rating Index - Infrastructure Projects, Version 3.3
Notes

Adding Value through Front End Planning

Information Flow
Supporting this Phase

Does your project include a renovation or revamp option as an alternative?

Does your project include, or is it a part of, a

End Planning Toolkit > Concept > Conceptual Definition for Renovation and Revamping (R&R) Projects

Conceptual Definition for Renovation and Revamping (R&R) Projects

Renovation and revamping projects bring unique challenges and opportunities for project teams during Front End Planning. Critical Issues for the R&R Projects include:

- Finalizing Conceptual Design and Estimate
- Developing Renovation/Remodel Alternatives
- Conceptual Phase Report

Project personnel should be instructed in understanding the specific risks involved in each type of project.

See R&R-1, Front End Planning of Renovation and Remodel Projects for more details.
Adding Value through Front End Planning

Notes
Notes

Panelists

- Brian Foy
- Sandra MacGillivray
- Richard Gunn
- Richard Scott
- Robert Mitrocsak
Notes

TransCanada – Use of PDRI

- Over 45 PDRI reports prepared since February 2011.
- Reports used as input to Stage Gate decisions for capital projects.
- Infrastructure and Industrial PDRI reviews conducted.

Keys to Our Success

1) Creating a collaborative environment during assessments.
2) Facilitator research of project documents and familiarity with the PDRI elements.
3) Customizations of the PDRI elements with company and jurisdiction specific terminology and assigning disciplines to the elements.
4) Ensuring gatekeepers understand the results of the PDRI review.
5) Having upper management buy-in.
### Challenges - Continuous Improvement

- Interpretation of the rating scale has caused debate in some sessions. We are currently developing examples for element ratings.
- Have received feedback from energy generation projects that PDRI Industrial elements are more applicable to oil & gas.

### Results

- Excellent feedback from project managers
- Operations and construction groups enthusiastic
- Helps align project teams and project groups
- Excellent mechanism for communicating project management best practices

### Panelists

- Brian Foy
- Sandra MacGillivray
- Richard Gunn
- Richard Scott
- Robert Mitrocsak
Adding Value through Front End Planning

**Notes**

**ConocoPhillips’s Journey using CII tools**
- Embarked on Quality Improvement journey in 2007
- Used CII Processes as a starting point for FEL
- Participation in CII Research Teams key to improving
- Deployed PDRI on all our Major Capital Projects > $100M

**PDRI Facts**
- Currently using PDRI on 32 Major Capital Projects
- Used extensively in US and internationally

**PDRI Facts (Cont.)**
- PDRI re-named front end loading (FEL) Scorecard
- Used at end of FEL 2 and FEL 3
  - FEL 3 event pre-cursor to our Quantified Risk Assessment
- Provides extra layer of rigor; important when handling $15Bn annual project portfolios
- Use has improved performance on our Major Capital Projects
CII Front End Planning Benefits

- PDRI excellent scope definition tool
- CII Tools requires little customization
- Familiar to our contractors and partners
- Planned Design Review event prior to Financial commitment
- Facilitates understanding and alignment
- Helps assess Risks
- Great tools for monitoring progress

Panelists

- Brian Foy
- Sandra MacGillivray
- Richard Gunn
- Richard Scott
- Robert Mitrocsak

Architect of the Capitol

- Serve
- Preserve
- Inspire
Front End Planning: Serve, Preserve, Inspire

- Cannon House Office Building Renewal
  (Building PDRI)

- Campus Utilities Distribution
  (Infrastructure PDRI)

Front End Planning: Serve, Preserve, Inspire

- Refrigeration Plant Revitalization
  (Industrial PDRI)

- Co-Generation
  (Industrial PDRI)

Eskil Carlsson

Closing Thoughts
Front End Planning: Our Generational Touch

Research Teams - 39, 113, 156, 181, 213, 242, 288
(other: 221, 241)

1940 1991 2012 2060

G.I. Generation
Silent Generation
Baby Boomers
Generation X
Millennials (Gen Y)
Debt Generation

They're using CII FEP Tools… Are you?

Adding Value Through Front End Planning…
A perfect place to start

Where can you get these tools?
Adding Value through Front End Planning

Access your copy of:
- the interactive Toolkit
- special publication
- spreadsheets
- FEP resources
- RT 268 presentations

Access available until August 3, 2012

Questions?

THANK YOU!
Learning Objectives

• Understand basic concepts of life cycle assessment and carbon footprinting.
• Compare alternative products and designs for life cycle environmental impacts.
• Relate construction processes to sustainable development.

Plenary Session Abstract

After presenting the concepts of environmental life cycle assessment and carbon footprinting, the presenter will discuss the business uses of these approaches.

Implementation Session Abstract

The panelists in the implementation session will demonstrate the life cycle assessment and carbon footprinting tools presented in the plenary session, using input from audience members. In addition to determining what is analyzed by these tools, the attendees will have an opportunity to introduce themselves and describe their experiences with sustainability, life cycle assessment, and carbon footprinting.
Plenary Session Presenter

Chris T. Hendrickson, Duquesne Light Company Professor of Engineering – Carnegie Mellon University

Chris Hendrickson is the Duquesne Light Company Professor of Engineering at Carnegie Mellon University and Co-Director of the university’s Green Design Institute. His research, teaching, and consulting all focus on engineering planning and management, including design for the environment, project management, transportation systems, finance, and computer applications. His current research addresses life cycle assessment methods, assessment of alternative construction materials, economic and environmental implications of e-commerce, product takeback planning, and infrastructure for alternative fuels. He has co-authored three textbooks, two monographs, and many articles in the professional literature.

Hendrickson serves as Editor-in-Chief of the Journal of Transportation Engineering, and is a member of the National Academy of Engineering. He is also a Distinguished Member of the American Society of Civil Engineering, an emeritus Member of the Transportation Research Board, and a Fellow of the American Association for the Advancement of Science. His awards include the ASCE Turner Lecture Award, the Fenves Systems Research Award, the Frank M. Masters Transportation Engineering Award, the Outstanding Professor of the Year Award of the ASCE Pittsburgh Section, the ASCE Walter L. Huber Civil Engineering Research Award, the Benjamin Richard Teare Teaching Award, and a Rhodes scholarship.

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Implementation Session Moderator

Paul R. Bertram, Jr., Director, Environment & Sustainability – Kingspan Insulated Panels North American

Paul Bertram is a Fellow of the Construction Specifications Institute, an organization with a focus on climate change, Net Zero Energy strategies, and assessment of the environmental impacts of building products. His current work as Director, Environment & Sustainability for Kingspan Insulated Panels, includes the development of Envelope First energy efficiency strategies. Recent projects include energy modeling, first cost analysis, and integrated design through BIM technology. He is also responsible for coordinating the LCA/EPD development, improvement, and sustainable reporting on five of Kingspan's North American plants, having completed an ISO-compliant cradle-to-grave LCA. He is also part of the Kingspan team addressing the organization's mandate to have all facilities Net Zero Energy by 2020.

He represents Kingspan Insulated Panels at the U.S. Green Building Council, ASHRAE monitoring 189 and 90.1, ASTM E60 Sustainability, ICC, and the National Institute of Building Science, serving on its Building Enclosure Technology and Environment Council Board of Direction. He is also a member of the American Center for Life Cycle Assessment. Prior to joining Kingspan, Bertram led his Orlando-based design firm for 30 years, designing specification programs for various building product manufacturers. He began his career in design and development at Walt Disney World in Orlando, Florida.

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Environmental Life Cycle Assessment and Carbon Footprinting for Business

Plenary Session Slides

Notes

Environmental Life Cycle Assessment and Carbon Footprinting for Business
Chris Hendrickson
Carnegie Mellon University

In 1868, Pittsburgh was famously described as “Hell with the lid off.”
Today, as an early leader in green building, the city is a good case study on environmental progress.

Learning Objectives

- Understand basic concepts of life cycle assessment, carbon footprinting, and product environmental certification.
- Relate construction processes to sustainable development.
- Compare alternative products and designs for life cycle environmental impacts.
Sustainable Design

- Sustainability is the concept of meeting present needs without compromising the ability of future generations to meet their own needs.
  - Includes the informed selection of materials and products to reduce product-cycle environmental impacts, improve performance, and optimize occupant health and comfort.
  - Seeks to enhance and increase ecological, social, and economic values over time.

Source: AIA

Life cycle assessment is a tool to help improve decision-making

- Identifies bottlenecks.
- Informs consumers and stakeholders.
- Communicates regulations and standards.
- Generates procurement specifications.
- Compares products.
- Fosters research development and design.

Standards are beginning to require life cycle assessments for product certifications.

Life Cycle Assessment and Product Certification

- Market confusion: What is a green building product?
  - profusion of eco-labels worldwide
- Current focus: single-attribute environmental product reporting
  - recycled content or energy use
- Industry needs credible environmental reporting.
  - established multi-attribute and process assessment with “use-phase” and benefits
  - scientific, third-party verified, defensible methodology for environmental reporting
Product Life Cycle Stages

Cream, Sugar and... Bauxite? A Supply Chain Example

Cream, Sugar and... Bauxite?
Cream, Sugar and... Bauxite?

And we didn’t consider
• the three other simple components
• the specific impacts of each component
• the thousands of other un-followed branches

LCA Approaches and Data

• Process-based
  – Need to define multiple processes in the supply chain.
  – typical databases: Ecoinvent, Gabi, BEES (NIST)
  – detailed and tedious
• Economic input-output (EIO)
  – Uses national economic sectors and average emission/resource use.
  – typical database: www.eiolca.net
  – fast, cheap, but aggregate (~430 sectors in U.S. model)
• Hybrid of process-based and EIO
• Significant uncertainty exists for all approaches.

Life Cycle Assessment (LCA) and Carbon Footprinting (CF)

• LCA considers wide range of environmental impacts;
  CF only considers green house gas (GHG) emissions.
• LCA is cradle-to-grave; CF is often only company-specific or company plus supply chain (direct + indirect or cradle-to-gate).
• CF is a subset of LCA.
• Carbon emissions reporting is starting to appear worldwide.
Typical GHG Reporting Tiers

**Tier 1:** Direct GHG emissions (e.g., on-site combustion and company vehicles)

**Tier 2:** Purchased energy (e.g., electricity or steam)
  + direct emissions

**Tier 3:** Indirect (supply-chain) emissions
  - These tiers may or may not include non-CO₂ GHGs.
  - These tiers do not normally include the use phase of products.

Potential Uses of Tiers

**Tier 1:** Direct emission regulation
  (e.g., tax, cap-and-trade, or emissions limits)

**Tier 2:** Typical carbon footprint reporting

**Tier 3:** Improved supply chain management and analyzing impact of direct emissions regulation.

**Tier 4:** Green product design and informed consumer choice

Implementation Session

- Demonstration of useful takeaways
  - life cycle assessment tools
  - carbon footprinting tools
- Presentation of case studies
- Exchange of relevant experiences and plans
- “Where to go next” handout
Learning Objectives

- Learn how to create a collaborative platform for managing VIP implementation.
- Be able to increase the implementation rate of VIPS on capital projects.
- Know how to increase the perceived value and acceptance of the Planning for Start-up practice.
- Adopt methods for increasing project stakeholder’s engagement level on start-up planning.
- Find out how to realize a quicker return on investment.

Plenary Session Abstract

Successful implementation of Value Improving Practices (VIP) requires that stakeholders both perceive their value and commit to implementing them. Success also depends on using the proper tools and effectively scheduling and tracking each activity. To increase the rate, effectiveness, and consistency of VIP implementation—including the Planning for Start-up practice—Saudi Aramco developed the web-based Value Practices Management System (VPMS). The system maps the implementation schedule of VIP activities against project schedules. It also tracks project schedules and sends reminders to project teams as the due dates for each practice’s activities approach.

This presentation will demonstrate what led Saudi Aramco to develop the VPMS and how the new tool created a platform on which project stakeholders can interact and collaborate efficiently on the VIP implementation. The presenter will share information about system features, including dashboard functions that provide instant feedback on the project’s preparedness for start-up and on the status of each Planning for Start-up activity.

Implementation Session Abstract

In this session, the case study team will provide an overview of Saudi Aramco’s web-based VPMS developed to improve the implementation rate, effectiveness, and consistency of Value Improving Practices on capital projects. The team will include a Planning for Start-up subject matter expert, as well as project management and plant operations personnel from an ongoing project that used the VPMS and Planning for Start-up automated tools. The team will also discuss how, with the current demographics of the project management workforce—especially with the increasing numbers of Generation Z workers in the workforce—leveraging today’s technology by deploying automated tools will improve the effectiveness and efficiency of Value Improving Practices implementation. It will also increase the perceived value of those practices. The panelists will conclude their presentation by highlighting the challenges and lessons learned in the development and rollout of the VPMS system. After the presentation, audience members will have the opportunity to share their insights and describe their successes at implementing best practices on capital projects.
Plenary Session Presenter

Abdirahman M. Abdi, Value Practices Engineer – Saudi Aramco

Abdirahman Abdi is an SME for Value Improving Practices for Saudi Aramco. Since 2008, he has been key to promoting the firm's CII Best Practice implementation on capital projects. In addition to developing the Value Practices Management System, he recently introduced a tool that guides project stakeholder through the start-up planning process.

Having graduated from the University of California at Berkeley with an MS degree in civil engineering, he is a registered professional engineer in the State of California. With more than 23 years of experience in construction engineering and project management, he holds Earned Value Professional and Planning and Scheduling Professional certifications from AACE-International, a Project Management Professional certificate from PMI, and the Associate Value Specialist credential from SAVE International.

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Implementation Session Moderator

Charles M. Green, Engineering Consultant – Aramco Services Company

Charlie Green is an Engineering Consultant at Aramco Services Company (ASC), where he has worked for over 28 years. Overall, he has more than 38 years of experience in the specification, evaluation, development, and testing of process control and data acquisition systems. At Aramco Services, these control systems have been integral to the firm's new facilities for oil & gas and chemical processing, as well as for its infrastructure projects. He has been active on the CII Benchmarking & Metrics Committee for 12 years, having served as the committee's Co-Chair. Green earned a bachelor's degree from Rice University.

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Panelists

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Ahmed M. Sharikh, Riyadh Refinery Representative – Saudi Aramco
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Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning

Plenary Session Slides

Notes

Managing a project is analogous to racing a boat
A winning team consistently implements best practices

• Plan carefully.
• Steer right.
• Secure resources needed for a strong start.
• Coordinate best practices implementation.
• Stay on course by minimizing changes.
• Strike optimal balance among competing objectives.
• Measure progress toward the objective.
• Follow through to the finish line.
• Cross the finish line before celebrating.

Leverage technology to gain a competitive edge.

We strived to find a consistently winning formula

• Adopted best practices from CII and others
• Created a dedicated best practices group
• Trained local contractors to supplement services
Some obstacles remained insurmountable

- Low rate of implementation
- Inefficient communication
- Large and complex capital program

Value Practices Management System (VPMS)

Leveraging technology to improve implementation of Value Improving Practices (VIPs) on projects

VPMS has dramatically increased VIP implementation rate

<table>
<thead>
<tr>
<th></th>
<th>Implementations</th>
<th>Planned</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Before VPMS</td>
</tr>
<tr>
<td>Value Improving Practices (2009-11)</td>
<td>150</td>
<td>40%</td>
<td>70%</td>
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<tr>
<td>Value Improving Practices (2012)</td>
<td>170</td>
<td>95%</td>
<td></td>
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<tr>
<td>Planning for Start-up (2009-11)</td>
<td>25</td>
<td>15%</td>
<td>40%</td>
</tr>
<tr>
<td>Planning for Start-up (2012)</td>
<td>28</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning

Notes

VPMS has produced many additional benefits

- Request for follow-up sessions
- Proponent participation
- Proactive engagement for start-up planning
- Improved relationships among project stakeholders
- Enhanced startup schedules

Come and join our implementation session

Learning Objectives

- Create collaborative environments.
- Increase VIP implementation.
- Increase VIPs’ perceived value.
- Increase project stakeholders’ engagement.

Learn and exchange implementation success stories

Moderator
- Charles M. Green
  Aramco Services Company

Panelists
- Fayzah A. Al-Habib
  Value Practices Division Head
- Abdirahman M. Abdi
  System Development Leader
- Ahmed Sharikh
  Owner Organization (System User)
- Shahzad Yazdani
  Project Management (System User)
Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning

Implementation Session Slides

Leveraging Technology to Improve Implementation of Value Improving Practices and Start-up Planning

Presented by:
Abdirahman M. Abdi
Ahmed Sharikh
Shahzad Yazdani,
Saudi Aramco

2012 Annual Conference • Baltimore
Building Global Leadership

Agenda

Saudi Aramco Team

- Moderator
  - Charles M. Green
    Aramco Services Company

- Panelist
  - Fayzah A. Al-Habib
    Value Practices Division Head
  - Abdirahman M. Abdi
    System Development Leader
  - Ahmed Sharikh
    Owner Organization (System User)
  - Shahzad Yazdani
    Project Management (System User)

We created a Value Practices Management System

Leveraging technology to improve implementation of Value Improving Practices (VIPS) on projects
What led Saudi Aramco to develop the VPMS?

- Low implementation rates of VIPs
- Untimely implementation of VIPs
- Lack of buy-in by key stakeholders
- Lack of consistency in implementations
- Reactive scheduling and weak control of VIPs
- Inefficient planning and communications

Process Overview – before the VPMS

Streamlined process – using the VPMS
Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning

Notes
Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning

Notes
Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning

Notes

Mapped PFSU activities against project schedules

- Customized PFSU Model
- Created collaborative platform
- Developed interactive tools and dashboards
Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning

**Value Practices Management System**

- Lessons Learned Knowledge Base
- Project Risk Management
- Internal Controls Excellence Tool
- Pitfall Prevention Tool
- Knowledge Exchange

**How long did it take us to develop VPMS?**

- Specification Development
- System Development
- Piloting
- Implementation Rollout
Notes

Benefits

*Multiple ways that we benefited from the VPMS!*

- **Improved communication**
  - Replaced hard copy distribution of information
  - Workflow based messaging
  - Action items
  - Customized information
  - Provided instant feedback

- **Created a platform for collaboration**
  - Online approvals
  - Online evaluation
  - Online report submittals
  - Instant access & control

- **Improved VIP implementation**
  - Brought efficiency in scheduling the sessions
  - Introduced effectiveness in implementation
  - Facilitated the increase of the number of practices per BI
  - Improved startup planning
  - Enabled consistency in implementations & effective monitoring

Agenda

**Saudi Aramco Team**

- **Moderator**
  - Charles M. Green
  - Aramco Services Company

- **Panelist**
  - Fayza A. Al-Halbi
  - Value Practices Division Head
  - Abdirahman M. Abd
  - System Development Leader
  - Ahmed Sharikh
  - Owner Organization (System User)
  - Shahzad Yarzadi
  - Project Management (System User)

Clean Transportation Fuels – Riyadh Refinery
Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning

### Transportation Fuels Specification

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Current Spec</th>
<th>Future Spec</th>
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</thead>
<tbody>
<tr>
<td>Sulfur (ppm)</td>
<td>1,000</td>
<td>10</td>
</tr>
<tr>
<td>Benzene (vol.%)</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>Aromatics (vol.%)</td>
<td>None</td>
<td>35</td>
</tr>
</tbody>
</table>

#### Diesel Quality Roadmap

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Current Spec</th>
<th>Future Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur (ppm)</td>
<td>500</td>
<td>10</td>
</tr>
<tr>
<td>T(90%), Deg max</td>
<td>None</td>
<td>350 Deg C</td>
</tr>
</tbody>
</table>

**Notes**
Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning

Challenges

- Complex Scope
- Coordinating Multiple Design Offices
- Alignment of Systems Outages and Coordination
- Timely Completion of Revamp Scope
- Complexity of Startup Sequence
- Criticality of the Riyadh Refinery

Agenda

Saudi Aramco Team

- Moderator
  - Charles M. Green
  - Aramco Services Company
- Panelist
  - Fayzah A. Al-Habib
    - Value Practices Division Head
  - Abdallah A. Al-Absi
    - System Development Leader
  - Ahmed Sharikh
    - Owner Organization (System User)
  - Shahzad Yazdani
    - Project Management (System User)

Overview of project Schedule and VIPs Conducted
Leveraging Technology to Improve the Implementation of Value Improving Practices (VIP) and Start-up Planning
Learning Objectives

- Learn how project teams can optimize modularization.
- Find out what industry organizations need to do to maximize their use of modularization.
- Hear how the modularization business case process and project execution planning can support higher levels of modularization at the project level.
- Discover how design standardization can amplify modularization benefits.
- Become familiar with the critical success factors, responsibilities, and implementation timing of modularization.

Plenary Session Abstract

This research addresses the ways that the industry at large, individual construction organizations, and specific project processes must change in order to achieve higher levels of modularization. The presenter will discuss highlights of five research product elements: 1) standard reference plant strategy; 2) business case process; 3) differences in execution planning; 4) critical success factors; and 5) ways to maximize modularization.

Implementation Session Abstract

The panelists will provide implementation details on the five research product elements introduced in the plenary session: 1) standard reference plant strategy; 2) business case process, 3) differences in execution planning; 4) critical success factors; and 5) ways to maximize modularization. These will include related learnings from a literature search and recently completed modularization case studies. Audience participation will include a question-and-answer session.
Plenary Session Presenter

**Fred Haney**, Senior Director – Fluor Corporation

Fred Haney is an executive director for Fluor Canada, with over 40 years of experience in the engineering and construction of facilities for the oil, gas, refinery, chemical, and mineral processing industries. His engineering background is in materials, corrosion, welding, and quality. He currently serves as Fluor’s corporate subject matter expert for modularization, consulting on several projects around the world. He is the champion of Fluor’s new execution methodology, 3rd-Gen Modular Execution℠. Before assuming his current post, his last position was as Manager of Project Engineering for Fluor Canada. He also worked as Engineering Manager for Sipchem's JAC project in Saudi Arabia and was assigned to OPTI Canada's Long Lake Heavy Oil Upgrader in Alberta. Other past positions include Construction Engineering Manager and Turnover Director for Suncor’s Project Millennium in Alberta, Piping/Pressure Vessels Engineering Manager and Quality Director for Fluor, Calgary Corporate. Haney is experienced in all project phases, from front end engineering to start-up. He has presented technical and management papers internationally at several conferences and symposiums. He earned his degree in engineering at Royal Roads in Victoria, Canada, in 1969.

*e-mail: fred.haney@fluor.com*
Implementation Session Moderator

Charlie Foster, Construction Manager, Engineering & Construction Services – Southern Company

Charlie Foster has worked for Southern Company since 1999. Specifically, Foster serves as Manager of E&CS support for Southern Nuclear’s Major Projects Group. In this role, he is responsible for planning and managing the implementation of a next-generation construction contracting strategy for existing facilities that incorporates top-quartile industry-wide best practices.

Foster has also served in various construction, retrofit, conceptual planning, and construction services roles. He has supported the development of the following E&CS publications: Project Controls Standards; Construction Roles and Responsibilities; and the Construction Field Manual. He has also developed and currently teaches two courses: Basic Concrete: Materials, Testing, Inspection, and Placement; and Self-consolidating Concrete for the Nuclear Industry.

Before joining Southern Company, Foster worked for KBR for 10 years and for Ford, Bacon & Davis for three years in the industrial sector. He also has other significant experience in the heavy-highway, marine, utility, and commercial sectors. He graduated from the University of Florida with a B.S. in building construction.

Panelists


Michael Kluck, Project Management, Engineering – KBR

Andre Kok, Programme Manager – Sasol Technology

William D. Meyer, Vice President – Foster Wheeler USA Corporation

James T. O’Connor, C. T. Wells Professor of Project Management – The University of Texas at Austin
Executive Summary

The industrial sector of the capital projects industry is clearly in need of additional guidance on when and how to exploit the benefits of modularization. Although, unlike the benefits of applying modularization on conventional stick-built projects, the benefits of taking a modular approach to industrial construction can vary in nature and be very significant, the industry has been slow to achieve high levels of modularization. Some would say that the industry has hit a ceiling in terms of the percentage of stick-built work hours being exported offsite. CII established Research Team (RT) 283 to investigate ways the industry might go beyond this apparent barrier to more robust modularization.

The research team formulated its essential question in the following way:

What changes or adaptations in traditional project work processes are required to create an optimal environment for broader and more effective use of modularization?

Focusing on the industrial sector of the capital projects industry, the team sought to compare an idealized all-modular work process with current, largely stick-built work processes, and to identify key high-value practices that are in need of change. The research methodology included a literature review, surveys, case studies, and external validation, among other features.

Findings from this research led to the development of five distinct solution elements:

- business case process
- execution plan differences
- critical success factors
- standardization strategy
- modularization maximization enablers.

Each element is significant in its own way and should play an important role in the achievement of higher levels of modularization. Thus, industry leaders and project managers should be attentive to each of these five different solution elements.

Regarding the first solution element, the modularization business case process should be applied at the earliest opportunity—starting as early as opportunity framing—and then analyzed in greater depth during assessment. For the industry to make real progress, project teams would be well served by considering the modular approach to be the default approach. Regarding the second solution element, the team found more than 100 differences between the ways modular projects and stick-built projects should be planned and executed, between how both types of projects should be organized by appropriate phase of implementation. Nearly half of these differences are applicable during the basic design phase. Regarding the third solution element, the team identified 21 high-impact critical success factors (CSFs). Owner responsibilities
for CSF achievement during the assessment and selection phases are especially significant, and the industry appears to be having difficulty achieving many of the CSFs. As described in the fourth solution element, the benefits of combining modularization with design standardization can exceed the additive sum, and, therefore, is deserving of special consideration. The team identified two basic approaches: 1) using standard modules and 2) using a modular standardized plant (MSP). The business case for standardization should recognize ten forms of economic advantages and three forms of economic disadvantages or tradeoffs. The team offers an eight-step process for anyone wanting to implement the MSP strategy, and present a case study to provide further insight into strategy implementation. Lastly, the team addresses industry-wide barriers that continue to challenge a broad-based application of modularization. Ten “maximization enablers” constitute the fifth solution element; the team identified these enablers to help organizations meet the industry-level challenges.
Modularization – How to Optimize? How to Maximize?

Plenary Session Slides

Notes

Modularization:
How to Optimize? How to Maximize?

Fred Haney, Fluor Corporation
Modularization Research Team

Case for Research … and Industry Action

Fact: Historical step-change productivity gains by manufacturing and ship-building

Case for Research … and Industry Action

Manufacturing has used modularization and standardization to drive these gains!

Why not similar gains in capital projects?

What must our industry do?
What must our companies do?
RT 283 Modularization

Jin Ouk Choi, UT Austin
Jack Counce, Technip
Denton Day, Emerson
Juergen Diekmann, Siemens
Charlie Foster, Southern Company
Fred Haney, Fluor Corporation
Tim Hettrick, Laiden Engineers
Michael Kluck, KBR
Andre Kok, Sasol
Kerim Koseoglu, Aramco Services
Stan Kukuika, Shaw Power

Bill Meyer, Foster Wheeler
Bill O’Brien, UT Austin
Jim O’Connor, UT Austin
Richard Shirley, McDermott
Steve Stark, Black & Veatch, Corp.
John van Beek, Shell

450+ years experience
170+ modular projects in last 5 years in 13 countries

Essential Question & RT Purpose

What changes or adaptations in traditional project work processes are required to create an optimum environment for broader and more effective use of modularization?

5 Solution Elements

[Diagram showing the relationship between B.U. Level, Project Level, and Industry Level, with critical success factors and maximization enablers highlighted.]
Modularization – How to Optimize? How to Maximize?

Notes

RT283 Methodology

1. Business Case
   - Define and scope project
   - Identify key stakeholders
   - Define project scope

2. Execution Plan
   - Develop execution plan
   - Identify resources
   - Establish timelines

3. Critical Success Factors
   - Identify critical success factors
   - Establish project objectives
   - Establish project milestones

4. Standardization Strategy
   - Establish standardization
   - Identify best practices
   - Establish governance

5. Case Studies
   - Analyze case studies
   - Identify lessons learned

6. Maximizer Enablers

Preparation
- Review literature
- Identify research questions
- Develop research design

Execution
- Collect data
- Analyze data
- Prepare report

Validation
- External review
- Finalize report

The Business Case Analysis Flow Chart

- Given: Identify & satisfy Owner objectives
- Focus: optimum level of WH to move offsite
- Iterative process: mix of data collection & analysis
Modularization – How to Optimize? How to Maximize?

**Differences in Execution Planning**

A. Selection  
B. Basic Design  
C. EPC

100+ Planning Differences

**21 Critical Success Factors**  
by IMPLEMENTATION LEADERSHIP/TIMING

- CSF by Responsible/Lead Party
  - Contractor 33%
  - Owner 57%
  - Vendors & Tech. 7%
  - Others 3%

- CSF by Project Phase
  - Opportunity 33%
  - Assessment 12%
  - Startup 5%
  - Execution 10%
  - Basic Design 23%

**21 Critical Success Factors FABRIC**

Modularization business case should recognize and incorporate its economic benefits from early project completion that result from modularization, and those resulting from minimal site presence and reduction of risk of schedule overrun.
Modularization – How to Optimize? How to Maximize?

Notes

Modularization CSF FREQUENCY STAIRWAY

Very Rare
#1. Owner Delay Avoidance
#3. Escalator for Optimization
#10. Transport Delay Avoidance

Rare
#6. Owner’s Planning Resources & Processes
#7. Contractor Leadership
#8. Investment in Studies
#9. Vendor Involvement
#12. Management of Execution Risks

Occasional
#13. Contingency throughout Project Phases

Frequent
#14. Preliminary Module Definitions
#15. Contingency throughout Project Phases

Medium
#1. Module Fabrication Capability
#2. Module Site Site Transport Capabilities

Low
#3. Preliminary Module Definitions

Integrating Standardization with Modularization

Degree of Standardized Design

High

Medium

Low

Power Plant

Degree Modular

High

Medium

Low
Modularization – How to Optimize? How to Maximize?

Integrating Standardization with Modularization

Modularization *Maximization Enablers*  
How to gain *real step-change* in the industry?  
How to achieve gains as in manufacturing & ship-building?

*2 examples*, from among 10

- Engineering schools should establish & promote a new design process paradigm
- The industry needs a different approach to scoping & configuring equipment to make it more modularization-friendly

Notes
## 5 Solution Elements: Overview

<table>
<thead>
<tr>
<th>Solution Element</th>
<th>Breadth</th>
<th>Project Phases</th>
<th>Primary Audience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Case Process</td>
<td>Project Level</td>
<td>Assessment through Basic Design</td>
<td>Project Leaders</td>
</tr>
<tr>
<td>Execution Plan Differences</td>
<td>Project Level</td>
<td>Selection, Basic Design, &amp; EPC</td>
<td>Project Managers</td>
</tr>
<tr>
<td>Critical Success Factors</td>
<td>Project Level</td>
<td>All</td>
<td>Project Team</td>
</tr>
<tr>
<td>Standardization Strategy</td>
<td>Business Unit Level</td>
<td>Opportunity Financing or Earlier</td>
<td>Business Strategists</td>
</tr>
<tr>
<td>Modularization Maximization Enablers</td>
<td>Industry Level</td>
<td>Opportunity Financing or Earlier</td>
<td>Industry Leaders</td>
</tr>
</tbody>
</table>

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## Come to our Implementation Session

**Moderator**
Charlie Foster, Southern Co.

**Panel**
Bill Meyer, Foster Wheeler
Michael Kluck, KBR
Andre Kok, Sasol
Juergen Diekmann, Siemens
Jim O’Connor, UT-Austin
Modularization – How to Optimize? How to Maximize?

Implementation Session Slides

Industrial Modularization:

How to Optimize? How to Maximize?

RT 283 Modularization

Welcome to our Implementation Session

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5 Solution Elements: Overview

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<td>Industry Leaders</td>
</tr>
</tbody>
</table>
Modularization – How to Optimize? How to Maximize?

Modularization:
How to Optimize? How to Maximize?

Critical Success Factors

Maximization Enablers

Developing the Business Case for Optimum Modularization

Module Yard Hrs | Site Hrs

Optimum Manhours to Move Offsite

Project Total Installed Cost ($)

0% % Manhours moved Offsite 100%
Modularization – How to Optimize? How to Maximize?

Business Case Decision Process

Site Survey – Site Specific Restrictions & Opportunities

- Site access restrictions can limit size of modules that can be delivered to site

Business Case Decision Process

Site Survey – Site Specific Restrictions & Opportunities

- Logistics are project specific
  - Some sites have their own port
  ...

Business Case Decision Process

Site Survey – Site Specific Restrictions & Opportunities

- Logistics are project specific
  - Some sites have their own port
  ... others are road access only
Modularization – How to Optimize? How to Maximize?

Notes

**Business Case Decision Process**

- **Site Survey** includes:
  - Labor
  - Weather impacts
  - Logistics
  - Environmental impact
  - Safety
  - Permit issues
  - Etc.

- **Module Yard Survey** includes:
  - Labor
  - Productivity, cost, flexible workforce, skills, experience etc

- **Module Yard Survey** includes:
  - Labor
  - Yard capabilities
  - Covered fabrication, assembly area, loadout capabilities, management skills and experience, procurement capability, drafting capability, quality systems, safety records etc
Modularization – How to Optimize? How to Maximize?

---

**Notes**

**Module Yard Survey:** includes
- Labor
- Yard capabilities
- Size of client management team required

---

**Module Yard Survey:** includes
- Labor
- Yard capabilities
- Size of client management team required
- Shipping type and distances to site
- Weather
- Political factors
- Etc

---

**Business Case Decision Process**

**Cost Benefits**

**Marginal Cost of Site Construction:**

Defined as cost saved for each direct site man-hour of work removed from site

**Marginal Cost of Module Yard Construction:**

Defined as cost added for each direct yard man-hour of work added to the module yard
Modularization – How to Optimize? How to Maximize?

### Business Case Decision Process

#### Cost Benefits

**Economic Productivity Factor – Gulf Coast yard example**

<table>
<thead>
<tr>
<th></th>
<th>Construction Site</th>
<th>Module Yard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labor Productivity</strong></td>
<td>2.20</td>
<td>1.20</td>
</tr>
<tr>
<td><strong>Marginal Cost of Construction / mh</strong></td>
<td>$125.00</td>
<td>$55.00</td>
</tr>
<tr>
<td><strong>Relative Manhour Cost c/w Gulf Coast</strong></td>
<td>$275.00</td>
<td>$86.00</td>
</tr>
<tr>
<td><strong>Economic Productivity Ratio</strong></td>
<td>4.17 : 1</td>
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</tr>
</tbody>
</table>

### Business Case Decision Process

#### Modular versus Stick built Cost Differentials

**COST DRIVEN MODULAR PROJECT**

**Diagram:**

- Modular versus Stick built costs
- Installation cost a
- Shipping cost b
- Canal trenching cost c
- Foundation cost d
- Steel cost e
- Engineering cost f
- Compress cost g
- Other cost

### Business Case Decision Process

**Flowchart:**

- **Start**
- **Client’s Objectives and Evaluation Criteria**
- **Site Survey**
- **Modular Yard Survey**
- **Compare With**
- **End**

**Decision Points:**

- Yes: **Design schedule for site tasks & materials**
- No: **Stick build the project**

**Design Process:**

- **Yes:**
  - **Yes:**
  - **Yes:**
  - **Yes:**
  - **Comparison:**
  - **End**

- **No:**
  - **No:**
  - **No:**
  - **No:**
  - **End**
### Business Case Decision Process

**Driver Evaluation with Respect to Client’s Evaluation Criteria**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Execution Options</th>
<th>Clients Evaluation Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>✓ ✓ ✓</td>
<td>1</td>
</tr>
<tr>
<td>Quality</td>
<td>✓ ✓ ✓</td>
<td>2</td>
</tr>
<tr>
<td>Cost</td>
<td>$50-40 mil</td>
<td>4</td>
</tr>
<tr>
<td>Benefit to local community</td>
<td>✓ ✓ ✓</td>
<td>3</td>
</tr>
<tr>
<td>Etc</td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

Each ✓ for local community benefit valued at $5mil

---

**Business Case Decision Process**

1. **Start**
2. **Decisively Fattier?**
   - Yes
     - **Stick build the project**
   - No
     - **Design schedules for stock base & member**
      - Site Survey
      - Site specific relocations & opportunities

3. **Evaluate Clients’ Concerns**
4. **Develop scope of execution**
5. **Compare with Client’s Objectives and Evaluation Criteria**
Modularization – How to Optimize? How to Maximize?

Notes

Business Case Decision Process

Type of plant
Scale of plant
Will impact possible module sizes

Business Case Decision Process

Type of plant
Scale of plant
Will impact possible module sizes

Business Case Decision Process

Type of plant
Scale of plant
As well as logistics constraints and economic considerations

As well as logistics constraints and economic considerations
Modularization – How to Optimize? How to Maximize?

**Business Case Decision Process**

- **Stick build the project**
- **Modularize the project**

- **Develop schedules for stick build & modular**
- **Site survey & site-specific constraints & opportunities**
- **Model Test Survey & Process & cost units for modular**
- **Modularization Decision**
- **Develop scope of modularization**
- **Develop size of modular**

**Optimum Manhours to Move Offsite**

Graph:
- T/C \(\$\)
- Optimum manhours to move offsite

- NPV \(\$\)
- Optimum manhours to move offsite
Modularization – How to Optimize? How to Maximize?

Notes

Optimum Manhours to Move Offsite

Modularization: How to Optimize? How to Maximize?
Differences in Execution Planning

A. Plans for Selection (pre-Feed)
   - Project Objectives
   - Organization & Staffing
   - MSSO & Social Impacts
   - Craft Labor Relations
   - Contract Strategy
   - Procurement Strategy and Owner-Furnished Equipment
   - Planning & Cost Estimating
   - Transport Route Study & Planning
   - Risk Management

21 Topics
107 Plan Differences
40% of Differences
Further detailed discussion

B. Plans for Basic Design (FEED)
   - Stakeholder Alignment and Reframing
   - Modularization Scoping, Layout Process, & Plot Plan
   - Fabricators, Contractors, & Subcontractors
   - Methods, Heavy Lifts, & Construction Facilities
   - Procurement, Vendor Data, & Expediting
   - Basic Design Standards, Models, & Deliverables
   - Modularization Business Case
     Validation/Refinement
     Scope Freeze & Change Management

C. Plans for EPC
   - Project Controls & Site Management
   - Quality Assurance/Quality Control
   - Detailed Design Deliverables
   - System Testing, Commissioning, & Startup

Notes

General

- Relevant for Project Selection Phase (pre-Feed) forward

- EP Project Assumptions (two)
  - Two cycles completed thru Module Business Case
  - Critical Success Factors (CSF) – identified and assessed

- Overlap (BC / EP / CSF)
  - EP differences – global in nature / impact different areas
    - Ex: Logistics / Procurement
  - Difficult to completely silo / segment

Selection Phase Differences

- Organization & Staffing
  - Evaluate Level of Module “expertise” in organization
  - Set up Module Coordinator
    - Empowered champion of modularization
    - Integrate this group into organization

- Contract Strategy
  - Higher level of pre-project funding required
  - Different contract strategies needed
    - Earlier / Incentivized / Risk sharing
    - Performance incentives
Notes

Selection Phase Differences (cont.)

- Planning & Cost Estimating
  - Module fab yard delays magnify Project impact
  - Delivery & setting sequence critical
    - Installation windows (access) critical at Site
    - Commissioning / unit start up

- Transport Planning
  - Route study required EARLY
    - Initially identify max shipping envelope (Assessment Phase)
    - Later refine to max module size
    - Define transport equipment options
    - Permitting issues / Route conditions / Public impact / etc.
    - Engr. studies – Accelerations / Shipping restraint / Weight report – C of G

Basic Design Differences

- Stakeholder Alignment
  - Start of Basic Design
    - Firstline leadership buy - in
    - Review / validate module business case with stakeholders
  - Start of EPC
    - Align new members of design team
    - Ensure Mgmt / Engr. / Proc. / Const. are internally aligned

- Module Scoping / Layout / Plot Plan
  - Start with blank paper / do not “box” stick build design
  - Iterative process
  - Consider transport economics / O & M input / interconnects
  - Constructability / Site sequencing / Logistics / Start-up needs

Basic Design Differences (cont.)

- Scope Freeze & Change Mgmt.
  - Stop “tweaking” early
    - Impacts Module fab yard – materials / sequence / schedule
    - Expensive – yard delays / incomplete shipments
  - No – change mindset
    - Commitment required – Owner down to all Project disciplines
    - Strict Mgmt. of Change enforcement
EPC Differences

- Project Controls & Site Mgmt.
  - Track materials by module
  - Understand customs requirements of fab yard
  - Ship module 100% complete
- QA / QC
  - Design / control module interfaces
    - Dimensional control / fab tolerances
    - Site installation techniques / flexibility
- System Testing, Comm., & Start-up
  - Pre-shipment testing & Owner sign off
  - Handover documentation

21 Critical Success Factors \textit{FABRIC}
Notes

21 Critical Success Factors FABRIC

INVESTMENT IN STUDIES
Owner should be willing to invest in early studies into modularization opportunities in order to capture full benefits.

PRELIMINARY MODULE DEFINITION
Front-end planners and designers need to know how to effectively define scope of modules in a timely fashion.

OWNER- FURNISHED/LONG LEAD EQUIPMENT
Specification
Owner-furnished and long-lead equipment (DFE) specifications and delivery lead times should support a modular approach.
Modularization – How to Optimize? How to Maximize?

Notes

Modularization CSF FREQUENCY STAIRWAY

Frequent

1. Project team
2. Preliminary Module Definition
3. Customer/Client Involvement

Rare

4. Owner’s Planning Resources & Processes
5. Contractor Leadership
6. Cost Estimating
7. Field Site Experience
8. Management of Execution Risks
9. Owner Delay Avoidance
10. Data for Optimization
11. Transport Delay Avoidance

Very Rare

12. Investment in Studies
13. Vendor Involvement

CSFs & Enablers

Critical Success Factors

#0. PRELIMINARY MODULE DEFINITION

- Front-end planners and designers need to know how to effectively define scope of modules in a timely fashion.

- Optimum Timing
  - Starting in Basic Design

- Lead Party
  - Owner or Contractor

Enablers

- Refine plot plan and general arrangement drawings with input from the heavy lift transport and construction team, as well as the fabricator. Seek to optimize the modules based on these discussions.

- Optimize man-hour density of modules without impacting operability/maintainability. Conduct a man-hours density check.

- Avoid modules too small with too many interfaces.

- More...

CSFs & Enablers

Critical Success Factors

#11. MODULE FABRICATOR CAPABILITY

- Available, well-equipped module fabricators have adequate craft skills in high-quality, tight-tolerance modular fabrication.

- Optimum Timing
  - Starting in Basic Design

- Lead Party
  - Owner and Contractor(s)

Enablers

- Starting in the Selection phase, Owners/Contractors should conduct timely screening studies and pre-qualifications of candidate fabrication shops to ensure that project needs are matched with capable Fabricator(s).

- Ensure that fabrication facilities and adjacent transport infrastructure are adequate or can be upgraded in a timely fashion while remaining cost-competitive.

- More.
Modularization: How to Optimize? How to Maximize?

Notes

Integrating Standardization with Modularization

Key Research Findings:

- 2 alternative strategies
- 10 benefit types vs. 3 disbenefits
- Work process for implementation
- Power Generation application case study

Integrating Standardization with Modularization
Modularization – How to Optimize? How to Maximize?

Notes

Standardization Benefits & Tradeoffs Scale

10 Benefits (Mostly Variable Cost Savings)
- Design Only Once and Build It Multiple Times
- Design & Procure in Advance to Respond to Schedule Needs
- Accelerated Parallel Engineering for Site Adaptation
- Learning Curve in Fabrication
  - Volume Discount in Procurement
  - Construction Materials Management Cost Savings
- Learning Curve in Module Installation/Sheet Construction
- Learning Curve in Commissioning/Start-up (Planning & Execution)
- Learning Curve in Operations & Maintenance
- OEM Materials Management Cost Savings

3 Tradeoffs
- Cost of Assessing the Market and Establishing Scope (F)
- Cost of Establishing the Design Standard (F)
- Sacrificed Benefits from Conventional Customization (V)

Economics of Modular Standardized Plant vs. Stick Built

Cost vs. Qtn of Units

Economics of Modular Standardized Plant vs. Stick Built

Cost Savings from Modularization vs. Qtn of Units
Modularization – How to Optimize? How to Maximize?

8 MSP Implementation Steps

1. Assess the market & establish objectives and an implementation plan.
2. Create the standard design(s) for the targeted plant type(s).
3. Create the modular standard design(s).
4. Iterate with Steps 2 and 3 as needed.
5. Firm up agreements with vendor(s)/packager(s) and further involve them in refinements of the modular standard design.
6. Implement execution of the modular standard plant for each client.
7. Assess and benchmark KPIs on the effectiveness of the modular standard plant effort.
8. Learn from modular standard plant projects and update/modify the standard design(s) only after thorough analysis and with confident justifications.

Modular Standardized Power Plant
Case Study

- **Company:** Siemens
- **Reference Plant technical scope and targeted market:** Worldwide Gas- and Oil-Fired Power Plant
- **Scope exclusions to standard design:** Scope outside the Power Block, e.g. water intake structure, fuel oil storage and unloading, and water pre-treatment system.
- **Type of modules:** Gas turbine auxiliary systems (fuel gas, control and lube oil, fuel oil system); Steam turbine auxiliary systems (lube and control oil, drain system); Generator auxiliary system (cooling system, hydrogen system, seal system); Heat recovery steam generator; Water cooling equipment; Compressed air system; Power control center; Electrical distribution and control system; Main steam and water systems; and Boiler feed water pump island.
Modularization – How to Optimize? How to Maximize?

Notes

Advantages & Disadvantages for Modular Standardized Power Plant

<table>
<thead>
<tr>
<th>ECONOMIC IMPACT</th>
<th>Significance of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE OF ADVANTAGE</td>
<td>Low</td>
</tr>
<tr>
<td>DESIGN &amp; PRODUCE ONCE AND REUSE MULTIPLE TIMES</td>
<td>✓</td>
</tr>
<tr>
<td>DESIGN &amp; PRODUCE IN ADVANCE / RESPOND TO SCHEDULE NEEDS</td>
<td>✓</td>
</tr>
<tr>
<td>ACCELERATED PARALLEL ENGINEERING FOR SITE ADAPTATION</td>
<td>✓</td>
</tr>
<tr>
<td>LEARNING CURVE IN FABRICATION</td>
<td>✓</td>
</tr>
<tr>
<td>VOLUME DISCOUNTS IN PROCUREMENT</td>
<td>✓</td>
</tr>
<tr>
<td>CONSTRUCTION MATERIALS MANAGEMENT COST SAVINGS</td>
<td>✓</td>
</tr>
<tr>
<td>LEARNING CURVE IN MODULE INSTALLATION/SITE CONSTRUCTION</td>
<td>✓</td>
</tr>
<tr>
<td>LEARNING CURVE IN COMMISSIONING/STARTUP (PLANNING &amp; EXECUTION)</td>
<td>✓</td>
</tr>
<tr>
<td>LEARNING CURVE IN OPERATIONS &amp; MAINTENANCE</td>
<td>✓</td>
</tr>
<tr>
<td>O&amp;M MATERIALS MANAGEMENT COST SAVINGS</td>
<td>✓</td>
</tr>
<tr>
<td>TYPE OF DISADVANTAGE</td>
<td>Cost of Assessing the Market and Establishing Scope</td>
</tr>
<tr>
<td></td>
<td>Cost of Establishing the Design Standard</td>
</tr>
<tr>
<td></td>
<td>Sacrificed Benefits from Conventional Customization</td>
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</tbody>
</table>

Standard Power Generation Plant Case Study Learnings

- Developing an MSP design requires **time, money, and resources**. Plan on assigning your **best design resources** to MSP development. Close interaction with **major equipment vendors** is an absolute must.

- **Changes in conventional engineering** are required for the MSP approach. Design **objectives must be altered** from the traditional way of executing engineering. Design engineers need to thoroughly **understand** the range of variable values to be accommodated through design, and that subsequent design variation accommodations must be thoroughly scrutinized and controlled.

- Plan on conducting an **early meeting to discuss** the customer’s specification and advantages from the MSP approach.

Modularization:

How to Optimize? How to Maximize?
10 Modularization Maximization Enablers

1. Expand comfort zones
2. Different paradigm of what’s needed & how to accomplish it
3. Greater multi-disciplinary collaboration
4. Modified design process in engineering schools
5. Capture data for optimization studies

Modularization Maximization Enablers
6. Denser, more complete modules
7. Equipment scoping/configurations
8. More off-shelf modular components
9. Improved transport infrastructure
10. Advanced technologies
Lessons-Learned from Case Studies

<table>
<thead>
<tr>
<th>Examples of Lessons Learned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Front-End Planning</strong></td>
</tr>
<tr>
<td>- Teams consist of all required disciplines early on, including engineering, purchasing, and transportation.</td>
</tr>
<tr>
<td>- Clearly set transportation limits and scope limits.</td>
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<tr>
<td>- Promote vendor involvement in design and installation.</td>
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<tr>
<td>- Confirm fabrication yard adequacy early.</td>
</tr>
<tr>
<td><strong>Engineering</strong></td>
</tr>
<tr>
<td>- Promote reusability and selection of common materials.</td>
</tr>
<tr>
<td>- In-house fabrication should be avoided.</td>
</tr>
<tr>
<td><strong>Contracts &amp; Procurement</strong></td>
</tr>
<tr>
<td>- Integrate vendors early on in design of modules to ensure technical feasibility.</td>
</tr>
<tr>
<td><strong>Module Fabrication</strong></td>
</tr>
<tr>
<td>- Get alignment with the site.</td>
</tr>
<tr>
<td><strong>Module Transportation</strong></td>
</tr>
<tr>
<td>- Early transportation studies result in clear definition of transportation limits.</td>
</tr>
<tr>
<td><strong>Module Site Installation</strong></td>
</tr>
<tr>
<td>- Early involvement of Contractor with module Fabricator/Installer.</td>
</tr>
<tr>
<td>- Clear in site layout and execution.</td>
</tr>
<tr>
<td><strong>Staffing</strong></td>
</tr>
<tr>
<td>- All involved parties from Engr., oversite, installation, contractor involved with conceptualization.</td>
</tr>
</tbody>
</table>
Learning Objectives

• Understand different cultural learning styles.

• Recognize the challenges of implementing U.S.-based training in another country or region.

• Appreciate the importance of training to project execution and start-ups in foreign countries.

• Learn how companies modify their teaching approaches to ensure audience comprehension and understanding.

• Hear how companies are using CII training materials and best practices to develop their global workforce.

Plenary Session Abstract

As the industry expands globally and the workforce diversifies, companies increasingly face the challenge of defining, developing, and deploying training to employees in foreign countries. "Made in America" training is not always appropriate for training individuals with different cultural learning backgrounds. The speaker will show how companies are modifying their traditional U.S.-based training programs to meet the needs of local workers in other regions of the world. With an increasing number of large capital projects in foreign countries, companies are recognizing the importance of developing new and effective training that can be implemented on an international scale.

Implementation Session Abstract

This session’s panelists—learning leaders from the Shaw Group, Dow Chemical, and Procter & Gamble—will emphasize the importance of an educated workforce in any location, using the It’s a Small World theme. After the moderator opens with an overview of cultural learning differences, the panelist from Procter & Gamble will show how the company performs language translations, conducts verbal training, and adapts knowledge-checks and visual examples to reach workers in countries with low literacy rates. He will also stress the importance of ensuring that training tracks with the availability of local construction tools and equipment. Lastly, he will recommend the firm’s practice of grounding case studies in local cultural contexts, and its use of virtual/web based training in areas that lack the necessary training skills and capability. The Dow Chemical representative will show how the company is delivering traditional classroom courses in virtual training sessions to accommodate all geographies. She will explain how Dow engages students through learning exercises adapted to their respective cultures, and how the firm has translated non-engineering courses into 12 local languages for broader coverage. The last panelist to speak will describe the new teaching practices the Shaw Group uses with employees at two large nuclear plants projects in China. He will also talk about how the learning styles of workers differ by locale, and how Shaw instills safety and best construction practices in laborers’ work habits in areas where such work processes have traditionally been less important.
Plenary Session Presenter

**Michael R. Peters**, Director of Learning & Development – Shaw Power Group

Michael Peters has extensive experience evaluating enterprise training needs, aligning training strategies with business performance goals, recommending and executing training/development plans, and establishing comprehensive employee development programs. His expertise is in the following areas: training and development; program development/management; group facilitation; online training; strategic planning; customer service; goal setting; curriculum design; and course delivery. The training programs he develops and manages support a broad array of industries and markets. His current client portfolio includes Exxon, Conoco/Phillips, Xerox, General Motors, the U.S. Department of Energy, and the U.S. Department of Defense. At present, he manages international training and development programs in 20 countries. An expert group facilitator, Mike provides both technical and relationship-based training program development and delivery. He holds a B.A. in communications from Drury College.

*e-mail: michael.r.peters@shawgrp.com*

Implementation Session Moderator

**Dianne Underwood**, Training Supervisor, Quality & Management Systems, Project Development & Procurement – ConocoPhillips

Dianne Underwood has over 20 years of experience, managing and implementing large multi-media, multi-discipline engineering and environmental projects. She currently manages the training and development function within ConocoPhillips' capital projects organization. In this capacity, she oversees learning programs designed to expand the skills and capabilities of engineers, project managers, cost management personnel, and others involved in capital project delivery.

Before assuming her current role at the firm, Dianne served as Site Manager on a portfolio of environmental projects that consisted of complex remediation projects and multi-party Superfund sites. Before joining ConocoPhillips, she was a principal engineer with Law Engineering & Environmental Services, Inc., where she managed and executed environmental and design projects.

Underwood holds an M.S. degree in chemical engineering from Louisiana State University and a B.S. degree in the subject from the University of Arkansas. She is registered as a professional engineer in the state of Georgia.

*e-mail: f.dianne.underwood@conocophillips.com*
Panelists

Richard E. Bilotto, Global Construction Process Owner – The Procter & Gamble Company
  e-mail: bilotto.re@pg.com

Tracee Herring, Engineering Solutions Global Learning Leader – The Dow Chemical Company
  e-mail: therring@dow.com

Stefan James, SmartPlant Materials Business Analyst – The Shaw Group Inc.
  e-mail: stefan.james@shawgrp.com
Globalization is not a phenomenon. It is not just some passing trend. Today it is an overarching international system shaping the domestic politics and foreign relations of virtually every country, and we need to understand it as such.

— Thomas Friedman in his book The Lexus and the Olive Tree
Why this is important to CII members

In the engineering and construction industry, discussions of globalization have centered largely on three main topics:

1. Outsourcing services from offshore providers
2. The increasing project scope of global projects
3. Increased global competition

Source: CII RS 263-1

Another thing to consider . . .

- The current estimated value of the global construction market is $7.5 trillion.
- That value is expected to jump to $12.7 trillion (in 2008 dollars) by 2020.

Source: Oxford Economics

The Three R’s for Economic Success in the 21st Century

Retention
Recruitment
Retraining

Source: Dr. Thomas Stimson
Lead Economist, State of Minnesota
Notes

It is still about people . . .

- They must be trained.
- Knowledge must be transferred.
- Skills must be increased.

World labor force growth is slowing . . .

![Projected Change in Working Age Population (15-64)]

Source: U.S. Census Bureau

So, you can imagine the challenges . . .

U.S. classes

International classes
Let's take a little test . . .

- Imagine you are a trainer.
- You are conducting a class.

What does this mean?

- U.S. = A-OK
- Japan = Money
- France = “Zero” or worthless
- Brazil = Go $%&* yourself

What does this mean?

- U.S. = Good job
- India = Wishing all the best
- France = One
The Cultural Dimensions of Global Learning

Notes

The Professional Development Committee & CII are here to help.

CII Products

IR 263-2 Globalizing Self-assessment Tool (G-SAT) User’s Guide

RR 263-11 Globalization: Building a Successful Global Engineering and Construction Company

IR 181-2 International Project Risk Assessment (IPRA)

Our Implementation Session

- Share experiences.
- Discuss Dow’s delivery of traditional classroom courses in virtual training sessions to accommodate all geographies.
- Learn how Dow has adapted learning exercises to engage student participation, based on local culture.
- Hear lessons learned.

Dow Chemical Company
Our Implementation Session

- Learn how P&G adapted its training approach.
- See how P&G developed culturally attuned case studies.
- Explore virtual/web-based training.

Notes

Our Implementation Session

- Share experiences of project training in Shanghai.
- Learn how to customize content for better training.
- Hear about cultural challenges on Shaw projects.
- Take away lessons learned.

Agenda

- Presentations
- Panel discussion
- Q&A
- Conclusion
Notes

Our panel

Moderator
Dianne Underwood  Training Supervisor, ConocoPhillips

Panelists
Stefan James  SmartPlant Materials Business Analyst, Shaw Group, Inc.
Tracee Herring  Engineering Solutions Global Learning Leader, Dow Chemical Company
Rick Bilotto  Global Construction Process Owner, Procter & Gamble

What does this mean?

U.S. = ??
Singapore = ??
Japan = ??

Come to our implementation session to find out

It's a small world after all
The Cultural Dimensions of Global Learning

Implementation Session Slides

Agenda

- Introductions
- The Realities
- The Challenges
- Panel Discussion
- Q&A
- Conclusion

Our Panelists:

Rick Bilotto
Procter & Gamble

Tracee Herring
The Dow Chemical Company

Stefan James
Shaw Group, Inc.
Notes

The Realities of Globalization

- Increased project complexity
- More competition
- Service outsourcing
- Estimated 70% increase in construction spending by 2020
- Success = Retention, Recruitment, Retraining

Remember – it’s about People...

- They have to be trained
- Knowledge has to be transferred
- Skills have to be increased

Global Learning: The Challenges

- Language barriers
- Learning preferences
- Locally accepted behaviors
- Distance learning
- Increased demand on training resources
Rick Bilotto, Procter & Gamble

How has P&G adapted construction training to a global audience? How do you engage and impact local workers in the field?
Effective Training Approach

Plan – Best Practices, Standard Global Approach and Training

Do – Implement methods to connect to construction resources of different cultures and with different language skills

Check/Act – On the job practice, coaching and feedback to continuously improve

Best Practices – Standard Global Approach

P&G has been adapting CII Best Practices into Global Standard Project Procedures & Expectations for years.

These Best Practices have reinforced standard training packages across all global regions.

Training methods include:
- Classroom instruction
- Web-based
- Virtual training

Connecting to the Construction Resources

PROBLEM:

Many hurdles have to be crossed to reach the training audience:
- Language barriers
- Limited reading skills
- Limited equipment resources
- Limited training resource capability where needed
Connecting to the Construction Resources

SOLUTION:

- Training material translated into the target language
- Visual cues (Dos and Don'ts) paired with verbal knowledge checks
- Culturally relevant case studies
- Class engagement through small groups

Connecting to the Construction Resources

SOLUTION:

- Adjustment of training material to the availability of Construction tools and equipment.
- Use of web-based or virtual training.
  __ Centro
  __ WebEx

Practicing & Coaching

Supervised hands-on experience for the new employee ensures:

- Comprehension
- Quality assurance
- Safety assurance

Behavior based feedback from supervisory personnel allow the opportunity to improve their skills.
Summary

- People want to learn.
- As Trainers, we have to make connections & build understanding.
- Training methods can change. High expectations and best practices don’t.
- Cultural change takes time. Changing behavior comes before changing beliefs.

Tracee Herring, The Dow Chemical Company

What are some of the best practices Dow has identified in training a global and culturally diverse workforce?

Best Practices for Training a Global Workforce

Tracee Herring, The Dow Chemical Company
Engineering Solutions Global Learning
Objective

To share some of Dow’s best practices for addressing the challenges of attracting, retaining, and growing the knowledge base of a workforce that is
• cross-cultural
• multi-generational
• globally dispersed

Engineering Solutions @ Dow

Dow’s global provider of engineering, process technology and construction expertise.

Challenge

• In 2011, Dow Engineering Solutions Learning recorded close to 50,000 training completions of our classes in 38 countries.
• Demand is increasing
• A traditional training approach simply won’t work.
• So what do we do?
Notes

Best Practice #1 - Know Your Learners

- Where are they located?
- What are their roles?
- What’s their education level?
- How old/young are they?
- What languages do they speak?
- What gender are they?
- What are their cultural norms?

Example Demographics Analysis

Best Practice #2 - Create Good Content

- Repurpose traditional ILT into 2-3 hour learning segments; include interactive exercises.
- Remove local examples / vernacular from all global training
- Repurpose “death by power point” training into true self-directed training
Best Practice #3 - Make Learning Accessible

- Implement a good enterprise-wide Learning Management System
- Create and Assign Global Role-based / Technology-based curricula
- Offer multiple delivery methods for learning
  - Traditional brick-and-mortar classroom
  - Virtual classroom
  - Self-directed
  - “Express” Learning sessions (90 minutes)

Best Practice #4 - Teach in Their Language

- Dow core languages
  - English, German, Spanish, Dutch, Portuguese, Simplified Chinese, French, Thai, Italian, Korean, Japanese, Traditional Chinese
- Additional for Global Process Safety courses
  - Indonesian (Bahasa), Greek, Hungarian, Polish, Russian, Swedish, Vietnamese, South Sotho (for South Africa)
- Global pool of technical subject matter experts who check technical integrity of the translations
- Certify a global pool of instructors

Best Practice #5 – Honor Recruitment Promises

- Discipline-specific orientation program
- Peer Coaching
- Technical Coaching
- Talent Development Programs
Best Practice #6: Create Purposeful Retention Programs

Multi-level Talent Development Programs – Example: 3-5 Year Engineers

– Leaders nominate multi-culture, high potentials from all geographies (~300)
– Bring together for a 2 week face-to-face event / 3-4 times per year / exciting global location
– Senior Leaders from all geographies / cultures are present

Community Service project to build cultural ties

Conclusion

• Adopt a No-Learner-Left-Behind philosophy
• Take the time to understand and respond to who your learners are (age, gender, ethnicity, location are all key factors)
• Be flexible, practical and realistic
  – Academic approaches to learning have to be adjusted to the reality of the situation
• Be patient and lead by example
• Continuously Improve

Stefan James, Shaw Group, Inc.

What impact did local culture play in the implementation of training in China? How did Shaw adjust its approach?
Life is like a box of Chocolates.....

Stefan James, Shaw Group, Inc

China AP1000 Nuclear Power

- Two Site locations – Sanmen and Haiyang
- Both locations have the capacity for 6 units
- Shaw/Westinghouse engaged in the first 2 units at each Site.
- Shanghai local office – JPMO (Joint Procurement Management Office)

Initial Plan - Training

- Provide user training 2-4hrs depending on SPM Module (SmartPlant Materials)
- Agenda supplied to Managers, request users
- Power Point training
- Documentation Handouts to be supplied
The Cultural Dimensions of Global Learning

Notes

The First Bite of Training in China

- Over 50 attended
- Arrived throughout the first hour
- Side conversations
- Loss of attendance
- No translation
- Cell phone disturbance

Cultural / Challenges

- Lateness
- Face
- Cell Phones
- Loud
- Participation

- Sleep
- Leave course to train at desk
- View
- Personal Challenges

Environment Adjustments

- Make training hands on – request room to be installed with computers.
- Reduced the class size to no. of PC’s (6)
- Allowed a sign-in grace time before training.
- Request cells be put to vibrate, and calls to taken outside of class
- One to One personal time scheduled a day after training.
- Included translation
- Short quiz
- Local Support Web page
Modified Training Methods

It's a small world: This Song is known for being catchy because of its simple words and repetition.

- Simplify
- Involvement
- Repetition

These are a few key ingredients to successful training.

Simplify: How?

Simple words and short sentences are powerful tools of communication, especially for 2nd languages. Even when you deal with deep material, simplicity of style can help make it easier to understand.

How can simplicity be achieved?

- Do not overwhelm your audience with unnecessary details.
- Explain Unfamiliar Terms. Do not overestimate the knowledge of your audience, but do not underestimate their intelligence.
- Provide Needed Explanation. To make a matter clear to your audience, more may be needed than the correct definition of a certain term.

Involvement: Why?

- Students stay interested and learn more from the class when instructors use many different techniques to involve them in the learning process.

Adapted with permission from the University of Nebraska.

HOW TO DO IT
- Examples and stories.
- Questions.
- Visualizations.
- Mini Activities.
- Props.
Notes

Repetition: When?

EFFECTIVE teaching includes the use of repetition. When an important point is stated more than once, those in attendance are more likely to remember it. If the idea is restated in a slightly different way, they may even be able to understand it more clearly.

Your objective is not merely to present information. You want the audience to understand it, to remember it, and to apply it. To achieve that, make good use of repetition.

WHEN TO DO IT
Immediately after stating an important point or after fully developing a main idea.
At the conclusion of your conversation or your training.
When you discern that your listeners are finding it difficult to grasp some key point.

"Ya Never Know what ya gonna get."

At all times:
- Smile
- Comment
- Be friendly and approachable
- Patient.

S.I.R
- But keep it Simple, Involve the class, and be Repetitive, thus making your teaching effective.

Knowledge Leader

Our Core Processes
- CI is organized into committees representing four knowledge processes:
  - Knowledge Creation
  - Knowledge Distribution
  - Knowledge Utilization
  - Knowledge Conservation

Knowledge Creation
- CI conducts workshops, seminars, and customer conferences. This includes the distribution of materials, which are sent to customers for use in their work environment.

Knowledge Distribution
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Knowledge Management
- CI conducts workshops, seminars, and customer conferences. This includes the distribution of materials, which are sent to customers for use in their work environment.

Announcements and Upcoming Events
- Come to Aasted for Spring Benchmarking Associates Training:
  - April 26-27
  - Contact: Benchmarking @ CI

- Register for the Spring Performance Improvement Workshop:
  - April 28-29
  - Contact: Benchmarking @ CI

- The next CI will be held March 26-28 in Greensboro, NC. Register today for savings and special offers.

- Spring 2003 Board of Directors Meeting:
  - Location: CI Headquarters

- For information on current benchmarks, contact Benchmarking @ CI.
And now we'd like to hear from you... Questions?

What does this mean?

- **U.S.** = Come here
- **Singapore** = Death
- **Japan** = Just ruined your end of class evaluation
The Cultural Dimensions of Global Learning
What’s Ahead for the U.S. Economy and Construction

Keynote Address: Mark Vitner, Wells Fargo Securities, LLC

Keynote Speaker

Mark Vitner, Managing Director & Senior Economist – Wells Fargo Securities, LLC

As Managing Director, Senior Economist for Wells Fargo Securities, Mark Vitner is responsible for tracking U.S. and regional economic trends. He also writes for the company’s Monthly Economic Outlook and its Weekly Economic & Financial Commentary. The firm also relies on him to provide regular updates on the housing markets, commercial real estate, regional economies, and inflation. Mark’s commentary has been featured in the New York Times, Wall Street Journal, Bloomberg, and many other publications. Before joining Wells Fargo, he worked for many years as an economist at Wachovia and Barnett Banks.

Mark is a member of the National Association of Business Economists and co-founded its Charlotte chapter. He serves as a distinguished lecturer and practitioner at the University of Georgia. He is also a member of the American Economic Association, the American Real Estate and Urban Economics Association, and the Charlotte Chapter of the Association for Corporate Growth.

He currently chairs the economic advisory committee for the Bond Dealers of America, and serves as the chief economist for the North Carolina Certified Commercial Investment Member Institute. He is a member of the Blue Chip Economic forecasting panel and was recently named one of the 2009 North Carolina Power Players by Business Leader magazine. He also currently serves on the Joint Advisory Board of Economists for the Commonwealth of Virginia.

Mark earned his B.B.A. in economics from the University of Georgia, an MBA from the University of North Florida, and has completed further graduate work in economics at the University of Florida. He also completed the National Association of Business Economics Advanced Training in Economics program at Carnegie Mellon University.

e-mail: mark.vitner@wellsfargo.com
What's Ahead for the U.S. Economy and Construction
Appendices
ACE architecture, construction, engineering
ANSI American National Standards Institute
AOC Architect of the Capitol
BM&M Benchmarking & Metrics
BMM Benchmarking & Metrics
BOA Board of Advisors
BP CII Best Practice
BPPII Best Productivity Practice Implementation Index
BRAC Base Realignment and Closure Act
CF carbon footprinting
CCM Certified Construction Manager
CM&SP Construction Management and Supervisory Personnel
CMAA Construction Management Association of America
CMCI Construction Manager Certification Institute
CMIT Construction Manager in Training
COP CII Community of Practice
CSF critical success factors
CTE career and technical education
CTSO career and technical student organization
CWDA Construction Workforce Development Assessment
DART Days Away, Restricted, or Transferred rate
ECI Early Contractor Involvement
ECI European Construction Institute
EIO Economic input-output
ENR Engineering News-Record
EP execution planning
ERI Experience Reference Index
FEP front end planning
GHG green house gas
IC implementation champion
IDCC indirect construction costs
IR implementation resource
ISC Implementation Strategy Committee
KMC Knowledge Management Committee
LCA life cycle assessment
LWCIR Lost Workday Case Incidence Rate
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<tr>
<th>Acronym</th>
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<tr>
<td>MCEQ</td>
<td>major construction equipment</td>
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<td>NCCER</td>
<td>National Center for Construction Education and Research</td>
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<td>NCE</td>
<td>NGA Campus East</td>
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<td>NGA</td>
<td>National Geospatial-Intelligence Agency</td>
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<td>PAESMEM</td>
<td>Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring</td>
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<td>Project from Hell (card game)</td>
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<td>Performance Improvement Workshop</td>
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<td>U.S. Army Corps of Engineers</td>
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<td>VIP</td>
<td>value improving practice</td>
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<td>VPMS</td>
<td>Value Practices Management System</td>
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<td>work breakdown structure</td>
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<td>XLP</td>
<td>Executive Leadership Program</td>
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Next-Generation Leadership Forum

Guest Speaker

Cam Marston, Founder & President, Generational Insight

Cam Marston is an expert on the impact of generational characteristics and differences on the workplace and the marketplace. As an author, columnist, blogger, and lecturer, he explores the ways generational demographics are changing the landscape of business. For over 15 years, his firm, Generational Insights, has provided research and consulting services on generational issues to hundreds of companies and professional groups. In his publications and presentations, Marston describes and analyzes the major generations now active in the workplace, explaining how their generational characteristics and differences affect every aspect of business, including recruiting and retention, management and motivation, and sales and marketing.

His work has been covered by the Wall Street Journal, The Economist, the Chicago Tribune, BusinessWeek, Fortune, Money, and Forbes, and he has appeared on Good Morning America and programs on the BBC. He writes a monthly column for Business Alabama and InvestmentNews, and has been a featured columnist in Agent’s Sales Journal, PROFIT Magazine, and Multi-Housing News, among others. His blog tracks the latest changes and developments in generational issues and demographics.

As a consultant, Marston has advised the leaders of major corporations, including American Express, Fidelity, Merrill Lynch, Kellogg, Coca-Cola, Macy’s, Warner Brothers, ESPN, Qualcomm, RE/MAX and Eli Lilly. He has also consulted for the U.S. Department of Agriculture, the Internal Revenue Service, and the U.S. Army, as well as for major professional associations such as the American Bankers Association and the Million Dollar Roundtable. In addition to his work as an author and consultant, Marston is an instructor at Belmont University. He holds a B.A. from Tulane University.

e-mail: cam@generationalinsight.com
How to Achieve Success in Your Workplace: 
An MBA of a Different Sort

Overview
This two-hour session will give attendees insights into a typical workplace run by a senior level executive and what he or she expects from up-and-coming employees regarding teamwork, leadership and accountability, communication, and adding value to the workplace. The session will also provide tactics for the next generation of leaders that will help them quickly establish themselves as contributors to company goals and, ultimately, position themselves for future leadership opportunities.

Outline

I. Introduction, Set-up, and Overview of Agenda
   A. Why this subject, why this audience, and why right now?
   B. Apprentice to Master – historical models & why now it’s different.
   C. Today’s methodology.

II. The Senior Generations
   A. Baby Boomers & Matures – characteristics
   B. How they developed leadership traits
   C. What their mentors taught them
   D. Open Question: What else did today’s leadership generations have at their disposal that we don’t have today? How might this impact your development?

III. The Generation Gap
   A. Generation X & the Millennials (aka Gen Y) – characteristics
   B. How might they see you? Are there behaviors you or your peers do to deserve this view? (Positive and negative behaviors.)
   C. From the innocent incompetent to the knowledgeable incompetent – moving from “I’m unaware of what I don’t know” to “I know what I need to learn.”
   D. Finding a mentor.

IV. Succession Planning
   A. The nine-box chart – working toward the top right quadrant.
   B. Appealing for assistance as the mentee.
   C. Making mistakes – some but not too many and very few repeated mistakes.
   D. Open Question: What caveats have you been given as a mentee? Or “I’ll be your mentor if you promise you’ll...”
V. Table Exercises

A. The Knowledgeable Incompetent –
   1. Create a list of the five things you think you need to know about your workplace that your mentor/supervisor can help you with.
   2. Create a plan for approaching the person who can teach you this.
   3. Create a plan for utilizing this new knowledge ASAP to provide new value to your workplace.
   4. Discuss two of these items with your table group and ask for their feedback.

B. Pitfalls to Avoid – Seek the counsel of the collected wisdom of your table to discuss mentor/mentee relationships that have failed and what caused them to fail.
   1. Create a list of what caused them to fail.
   2. Seek trends in the failures – communication? Lack of effort from one party or another? Too aggressive?
   3. Create a trajectory of a mentor relationship, ID'ing likely pitfalls along the way and a termination point for the relationship so that the relationship leaves both parties pleased and satisfied?

VI. Summary & Take Aways

A. Open Question: Please tell the group one thing that surprised you about what you learned today.

B. Open Question: What is the first thing you’ll now do differently when you get back to your workplace?
1. Policy Analysis in Complex Infrastructure Systems under Deep Uncertainty
   Ali Mostafavi, Dr. Dulcy Abraham, Purdue University

   The overarching objective of this research was to create and evaluate a new paradigm for micro-simulation and ex-ante analysis, and to develop policies related to infrastructure renewal under uncertain conditions. The created framework was applied and tested in the context of assessing financing policies for infrastructure renewal.

2. A Decision Support System for Investments in Infrastructure Maintenance/Rehabilitation/Replacement
   Farrukh Arif, Dr. Mehmet Emre Bayraktar, Florida International University

   The goal of this project was to develop an integrated, multi-objective decision support system for portfolio investment decisions. This system evaluates the trade-offs of such decisions under budget constraints.

3. Benchmarking Integrated Project Delivery (IPD) Performance
   Mounir El Asmar, Dr. Awad Hanna, University of Wisconsin-Madison

   This study compares the performance of IPD projects to that of projects delivered with design-bid-build, design-build, and construction management at-risk methods. The two specific objectives for this research include evaluating IPD performance across several metrics, and combining all independently studied performance metrics in order to create a new metric for overall project performance.

4. Creating Global, Multi-lateral, Knowledge-Sharing Communities of Practice
   John Wanberg, Dr. Amy Javernick-Will, Dr. Paul Chinowsky, University of Colorado at Boulder; Dr. John Taylor, Virginia Polytechnic Institute & State University

   This project aimed to determine the impact of geographic location, discipline, business practice, generation, and grade level on KSC in a COP, and to understand how and why boundary type influences the mechanics and dynamics of knowledge exchange. Future objectives will determine how and why boundary-spanning connections are made, the directional flow of knowledge within networks, and how and why directional flow of knowledge exists.

5. Site Utilization Planning using CONSITEPLAN
   Karthick Alagarsamy, Dr. Abhijeet Deshpande, Auburn University

   One of the two main objectives of this research was to develop a user-friendly, multi-objective site utilization planning tool that creates plans based on user and project requirements. The other main objective was to provide an alternative to the commonly used distance measurement algorithms (Euclidean and Manhattan) used in optimization.

Chris Stoppel, Dr. Fernanda Leite, The University of Texas at Austin

The two main objectives of this study were 1) to identify relevant variables for predicting a new building’s energy use using real-world data, and 2) to develop a process by which buildings similar to the one proposed can be identified and pooled together for subsequent predictive analysis.

7. A Decision Support System for Roadway Asset Management (DRAM)

Omidreza Shoghli, Dr. Jesus de la Garza, Virginia Polytechnic Institute & State University

The main objective of this research was to develop a decision support system for selecting and prioritizing necessary actions for maintenance, rehabilitation, and repair of multiple asset items to enable roadways to function within an acceptable level of service, safety, and quality while considering budget constraints.

8. Life-Cycle Carbon Emission Assessment for Construction

Xiaoyu Liu, Shu-Chien Hsu, Dr. Qingbin Cui, University of Maryland, College Park

The intention of this study was to develop an advanced LCA tool for quantifying carbon dioxide emissions from projects, especially highway construction. By expanding system boundaries, standardizing the functional unit, and optimizing information requisition, our tool will help advance the state of project-specific LCA science and lead to more comprehensive and credible LCA tools for use by construction professionals.

9. A Framework for Portfolio Project Management in Transit Projects

Ye Zhang, Dr. Ali Touran, Northeastern University

One of the main goals of this research was to develop a tool to improve the management experience of Portfolio Project Management (PPM) for project schedule and cost on transit projects. Another goal was to develop an effective strategy for contingency planning and expenditures.

10. Multiple-sensor Data Fusion for Automatic Assessment of the Safety and Productivity Performance of Construction Workers

Umberto C. Gatti, Dr. Giovanni Migliaccio, Dr. Susan Bogus, and Dr. Suzanne Schneider, University of Washington; Tao Cheng and Dr. Jochen Teizer, Georgia Institute of Technology

This research project addressed issues such as the construction industry’s perspective on the use of physiological monitoring devices, their validity in monitoring subjects during dynamic construction activities, and analysis of the relationship between physical strain and productivity.
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U.S. General Services Administration
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