Leadership
Research
Collaboration
Improvement

Celebrating 30 Years

2013 CII Annual Conference • July 29–31, Orlando, Florida

Construction Industry Institute
at The University of Texas at Austin
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Dear Colleagues and Guests,

Welcome to the CII Annual Conference in this, our 30th anniversary year. This is an exciting time for CII, and for all of us in this great industry. We are looking forward to a terrific conference here at the beautiful JW Marriott Grande Lakes Orlando, as we celebrate the owners, contractors, and academics that have done so much to make us the industry’s flagship research organization. Our conference theme, appropriately, includes the key tenants of our mission: **Celebrating 30 Years: Leadership. Research. Collaboration. Improvement.**

This week we will take a look back at our proud history, not just to remember our accomplishments, but also to motivate us for our next 30 years. Our conference agenda will bring forward recently completed work in many areas. Notably, CII research teams will report out on the following timely topics:

- construction productivity research
- workforce planning from design through site execution
- improving the prediction of project outcomes
- deploying best practices in unfamiliar countries
- strategies for HSE hazard recognition
- knowledge transfer from the near-retirement generation to the next generation.

Our 2013 keynote speakers will present their views of the market and our industry. These leaders—Jim Gallogly of LyondellBasell, John Engel of WESCO, Steve Knowles of the Wood Group Mustang, and Sara Johnson of IHS Global Insight, Inc.—will surely stimulate our thoughts and plans for the future. They will put three decades of CII research and member involvement in context and, importantly, present us with challenges for our work in the coming decades.

In addition to providing a forum for emerging research and expert wisdom, this conference affords us unparalleled opportunities to network and learn from our peers. I invite you to take advantage of the concentrated experience and energy of this yearly gathering. We will also honor the contributions of individuals and organizations that have given much to CII in the areas of academia, research, and implementation; most importantly, we will present our highest honor, the Carroll H. Dunn Award for lifetime achievement and contribution to CII.

Enjoy your time here in this beautiful setting.

Be safe and thank you for attending.

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**KEITH MANNING**  
*Annual Conference Chair*

**WAYNE CROW**  
*CII Director*
Conference Agenda

Monday Afternoon – July 29

1:30 – 4:00 pm  CII Next-Generation Leaders Forum  
(Sponsored by the Next-Generation Leaders Community of Practice)  
– Gaylen Paulson, Associate Dean and Director of Texas Executive Education – The University of Texas at Austin

4:30 – 6:30 p.m.  Get Acquainted with CII Orientation Reception  
(Sponsored by the Membership Committee)

7:00 – 10:00 p.m.  Family Welcome Mixer

Tuesday Morning – July 30

8:00 a.m.  Welcome from the Annual Conference Chair  
– Keith Manning, CII Annual Conference Chair

8:10 a.m.  CII Director’s Remarks and Keynote Introduction  
– Wayne Crew, Director – Construction Industry Institute

8:25 a.m.  Keynote Address: An Exploration and Production Revolution in the U.S. Fuels a Downstream Resurgence  
– James L. Gallogly, Chief Executive Officer – LyondellBasell

9:00 a.m.  Coffee Break  
Meet the VIPs – Jim Gallogly

9:30 a.m.  Youth Outreach Introduction  
– Keith Manning – Annual Conference Chair

9:35 a.m.  Youth Outreach: The Benefits of Being an ACE-sponsor Company: What’s in It for You?  
(ACE Mentor Program of America, Inc.)  
– Bryan Burke, Vice Chairman – ACE Mentoring Program of Frederick  
– Kristina Nguyen, Project Controls Engineer – Bechtel Power  
– Chris Putman, Plant Design Engineer – Bechtel Power  
– Carol A. Ritz, Quality Project Specialist – Bechtel Construction Operations, Inc.

9:55 a.m.  Plenary Presentations  
Advanced Work Packaging: Toolkit for Success  
(Research Team 272, WorkFace Planning, from Design through Site Execution)  
– Jim Rammell, Vice President, Corporate Construction Operations – Wood Group Mustang

CII’s 10-10 Performance Assessment Campaign  
(Performance Assessment Committee)  
– Micheal G. Elliott, Phillips 66

Advanced Practices for Field Automation  
(Fiatech)  
– Shanaya Averill, Global Product Manager for Construction – The Dow Chemical Company  
– Todd Sutton, Project Controls Manager – Zachry

ArcelorMittal Dofasco – Capital Process Case Study  
(ArcelorMittal Case Study)  
– George Atlija, Manager, Capital Project Controls – ArcelorMittal Dofasco, Inc.
Tuesday Morning – July 30 (continued)

10:35 a.m.  **Plenary Presentations (continued)**
            Improving Hazard Recognition in Construction
            *(Research Team 293, Strategies for HSE Hazard Recognition)*
            – Jim Duncan, HSE Director – Jacobs

10:45 a.m.  Coffee Break
            **Meet the VIPs** – ACE Mentor Program Students

11:00 a.m.  Concurrent Implementation Sessions

Tuesday Afternoon – July 30

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 Gilkey, Senior Vice President, Human Resources and Administration – Fluor Corporation

2:35 p.m.  **Keynote Address: Cigarettes for Six-year-olds?**
            – Steven R. Knowles, President – Wood Group Mustang

3:20 p.m.  **Plenary Presentations**
            Improving the Predictability of Project Outcomes
            *(Research Team 291, Improving the Accuracy of Project Outcome Predictions)*
            – Richard Sirven, Business Manager – ConocoPhillips

            **Nail a Speech – Launch a Career**
            *(Sponsored by the Professional Development Committee)*
            – Michael R. Peters, Director of Development & Training, Power Division – CB&I

            **An Update on the Next-Generation Leaders Program**
            *(Next-Generation Leaders Community of Practice)*
            – Lindsay Auble, Process Engineer – URS Corporation
            – Michael Bankes, Director I, Design Engineering – Fluor Corporation

            **Our Journey Way – Five-year Data-driven Learning – Sustain High Levels of ESH**
            *(SABIC Case Study)*
            – John Barry, Construction Leader, Cartagena, Spain – SABIC

            **Transferring Experiential Knowledge from the Near-retirement Generation to the Next Generation**
            *(Research Team 292, Knowledge Transfer from the Near-retirement Generation to the Next Generation)*
            – John R. McQuary, Vice President, Knowledge Management & Technology Strategies – Fluor Corporation

4:10 p.m.  Coffee Break
            **Meet the VIPs** – Steve Knowles

4:30 p.m.  **Concurrent Implementation Sessions**

5:30 p.m.  End of Day One
Tuesday Evening – July 30

6:00 p.m. Reception
7:00 p.m. **Award Recognition**
- Distinguished Service
- Outstanding Researcher
- Outstanding Implementer
- Outstanding Instructor
- Benchmarking Users
- Distinguished Professor
- Curriculum Partner Program

**Award Presentation**
- Richard L. Tucker Leadership & Service Award

8:00 p.m. Dinner Served
9:00 p.m. **Carroll H. Dunn Award of Excellence Presentation**
9:20 p.m. **Carroll H. Dunn and Richard L. Tucker Award Celebration**
* (dessert and coffee reception)

Wednesday Morning – July 31

8:00 a.m. **Keynote Address Introduction**
- Keith Manning, Annual Conference Chair

8:05 a.m. **Keynote Address: WESCO International, Inc.**
- John J. Engel, Chairman, President, and Chief Executive Officer – WESCO International, Inc.

8:50 a.m. Coffee Break
- *Meet the VIPs* – John Engel

9:10 a.m. **Tuesday Afternoon Implementation Sessions Repeated**
10:10 a.m. Intermission
10:20 a.m. **Youth Outreach Introduction**
- Keith Manning – Annual Conference Chair

10:25 a.m. **Youth Outreach: Workforce Ready – Preparing the Next Generation of Professionals**
(National Center for Construction Education and Research & SkillsUSA)
- Kaila O’Farrell, Senior – Plymouth South High School
- Holley Thomas, Certified Structural Welder – KBR –
- Ashley Webel, Certified Welding Inspector – RoMan Engineering Services

10:45 a.m. **Plenary Presentations**

**Construction Productivity Research Program**
(Research Team 252, Construction Productivity Research Program, Phase V)
- Warren G. Adamson, Field Operations Manager, Plant Services – S&B Engineers and Constructors, Ltd.
Wednesday Morning – July 31 (continued)

10:35 a.m. **Plenary Presentations** (continued)

**Deploying Best Practices in Unfamiliar Countries**  
(Research Team 294, Deploying Best Practices in Unfamiliar Countries)  
- James J. Sexton, Global Construction Manager – The Procter & Gamble Company

**Changing the Implementation Climate**  
(Implementation Strategy Committee)  
- Robert M. Patty, Executive Vice President, Operations – Lauren Engineers & Constructors, Inc.

**Maximizing the Value of CII within Your Organization**  
(DTE Energy Case Study)  
- Gino DePalma, Engineering Manager, Major Enterprise Projects – DTE Energy  
- Jason Schulist, Director, Major Enterprise Projects – DTE Energy  
- Michael Walters, DTE Energy

11:30 a.m. Lunch  
Meet the VIPs – NCCER & SkillsUSA Students

Wednesday Afternoon – July 31

12:30 p.m. Concurrent Implementation Sessions

1:30 p.m. Intermission

1:40 p.m. **Featured Speaker Introduction**  
- Keith Manning – Annual Conference Chair

1:45 p.m. **Featured Speaker: Ingenuity: The Journey to Extraordinary**  
- Joseph A. Ahearn, Vice Chairman – CH2M HILL  
(2012 Recipient of the Carroll H. Dunn Award of Excellence)

2:15 p.m. **Featured Speaker Introduction**  
- Keith Manning – Annual Conference Chair

2:20 p.m. **Featured Speaker: Regional Planning for Sustainability and Disaster Resilience**  
- E. Sarah Slaughter, President & Executive Director, Built Environment Coalition  
(Sponsored by the Academic Committee)

2:40 p.m. Coffee Break  
Meet the VIPs – Bud Ahearn and Sarah Slaughter

3:00 p.m. Implementation Sessions Repeated

4:00 p.m. Intermission

4:15 p.m. **Keynote Speaker Introduction**  
- Keith Manning – Annual Conference Chair

4:20 p.m. **Keynote Speaker: The World Economic Outlook: Brighter Days for Construction**  
- Sara Johnson, Senior Research Director, Global Economics – IHS Global Insight, Inc.
Wednesday Afternoon – July 31 (continued)

5:05 p.m.  **Video Presentation: Celebrating 30 Years: Leadership. Research. Collaboration. Improvement.**

5:15 p.m.  **Director’s Closing Remarks**
            – Wayne Crew, Director – Construction Industry Institute

5:25 p.m.  **Annual Conference Chair’s Closing Remarks**
            – Keith Manning, CII Annual Conference Chair

5:30 p.m.  **Meet the VIPs** – Sara Johnson

30th Anniversary Celebration Reception
            (champagne & coffee)

6:00 p.m.  End of Conference
Keynote Speaker

James L. Gallogly, Chief Executive Officer – LyondellBasell

James L. Gallogly is Chief Executive Officer of LyondellBasell, one of the world's largest refiners of olefins, polyolefins, and chemicals. With annual revenues of $45 billion, the company manufactures products at 58 sites in 18 countries, and supplies customers in more than 100 countries. Prior to joining LyondellBasell, Gallogly served as Executive Vice President of Exploration and Production for ConocoPhillips. He was named to that position in 2008, after having served as Executive Vice President of Refining, Marketing, and Transportation for ConocoPhillips since 2006. He joined Chevron Phillips Chemical as President and Chief Executive Officer in 2000. Previously, he had served Phillips Petroleum Company as Senior Vice President of Chemicals and Plastics, Vice President of Olefins and Polyolefins, and Vice President for North America production. Gallogly joined Phillips in 1980 and held various roles in exploration and production, legal, and finance.

Gallogly serves as Vice Chairman of the Board of the American Chemistry Council. He is also a member of the University of Oklahoma College of Engineering Board of Visitors, the University of Colorado Engineering Advisory Council and the University Cancer Foundation Board of Visitors at the University of Texas M.D. Anderson Cancer Center. Additionally, he serves on the Board of Directors and the Executive Committee of Junior Achievement of Southeast Texas. He is a member of the Colorado, Oklahoma, and Texas bar associations.

Gallogly received a B.A. from the University of Colorado in 1974, and a law degree from the University of Oklahoma in 1977. He also completed the Advanced Executive Program at the J. L. Kellogg Graduate School of Management at Northwestern University in 1998.

e-mail: mary.wix@lyondellbasell.com
An Exploration and Production Revolution in the U.S. Fuels a Downstream Resurgence

Keynote Address Slides

Notes

- Gas / NGL value chain
- Evolution of shale gas plays
- New investments in the chemical industry
- U.S. crude oil supply landscape

Gas/NGL Value Chain
An Exploration and Production Revolution in the U.S. Fuels a Downstream Resurgence

Shale Plays Being Developed in North America

Natural Gas NYMEX Price Breakevens by Play

Technology Advancement Has Driven Gas Supply Up...

Production has increased despite a reduction in rig count

Potential for further improvements as industry moves up the experience curve
Notes

An Exploration and Production Revolution in the U.S. Fuels a Downstream Resurgence

[Graph showing historical ethane production and inventory]

New Midstream Infrastructure bringing NGLs to Market

[Map showing new midstream infrastructure projects]

Ethane Production Capacity Expected to Exceed Demand

[Graph comparing U.S. ethane production and demand capacity]

Sources: IHS, EnergyEdge, and IES Consulting.
An Exploration and Production Revolution in the U.S. Fuels a Downstream Resurgence

Value Transitioning from Upstream to Downstream Chemicals

U.S. has Become a Low Cost Producer and Exporter

Notes

Cost of raw materials (ethane / propane) for U.S. chemical producers has decreased while product prices have increased with oil.

Source: Third party consultant, 2013 YTD or as of date.

Between 2005 - 2012, the U.S. transformed from one of the most expensive ethylene producers to the second cheapest producer.

Source: C&I Research LLC.
An Exploration and Production Revolution in the U.S. Fuels a Downstream Resurgence

Notes

Shale Gas Driving $25 Billion in New Ethylene Investments

<table>
<thead>
<tr>
<th>Year</th>
<th>Operator</th>
<th>Location</th>
<th>Comment</th>
<th>Capacity (Kt/year) (M lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>BASF/Texaco, Exxonmobil, LyondellBasell, Hess, Whirlpool, Williams</td>
<td>Expansion/Restart</td>
<td></td>
<td>617 1,800</td>
</tr>
<tr>
<td>2014</td>
<td>LyondellBasell, Ullahabad</td>
<td>Expansion/Restart</td>
<td></td>
<td>445 1,070</td>
</tr>
<tr>
<td>2015</td>
<td>Dow, LyondellBasell, Westlake</td>
<td>Expansion/Restart</td>
<td></td>
<td>810 1,700</td>
</tr>
<tr>
<td>2016</td>
<td>Shell</td>
<td>Nanchong, Sichuan, China</td>
<td></td>
<td>2,200</td>
</tr>
<tr>
<td>2017</td>
<td>CP Chem</td>
<td>Cedar Bayou, TX</td>
<td></td>
<td>5,510</td>
</tr>
<tr>
<td>2017</td>
<td>Dow</td>
<td>Freeport, TX</td>
<td></td>
<td>5,510</td>
</tr>
<tr>
<td>2017</td>
<td>ExxonMobil</td>
<td>Baytown, TX</td>
<td></td>
<td>5,510</td>
</tr>
<tr>
<td>2017</td>
<td>Formosa</td>
<td>Point Comfort, TX</td>
<td></td>
<td>2,786</td>
</tr>
<tr>
<td>2017</td>
<td>Sasol</td>
<td>Lake Charles, LA</td>
<td></td>
<td>3,010</td>
</tr>
<tr>
<td>2018</td>
<td>Occidental</td>
<td>Ingleside, TX</td>
<td></td>
<td>1,200</td>
</tr>
<tr>
<td>2019+</td>
<td>Shell and Others</td>
<td>Publicly Announced New Cracker Under Construction</td>
<td></td>
<td>TBD TBD</td>
</tr>
</tbody>
</table>

Source: Wood Mackenzie

New Propane to Propylene Dehydrogenation Units

<table>
<thead>
<tr>
<th>Year</th>
<th>Operator</th>
<th>Location</th>
<th>Comment</th>
<th>Capacity (Kt/year) (M lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>C3 Petrochemicals</td>
<td>Chocolate Bayou, TX</td>
<td></td>
<td>720 1,580</td>
</tr>
<tr>
<td>2017</td>
<td>Dow</td>
<td>Freeport, TX</td>
<td></td>
<td>2,010</td>
</tr>
<tr>
<td>2017</td>
<td>Enterprise</td>
<td>Mont Belvieu, TX</td>
<td></td>
<td>1,050</td>
</tr>
<tr>
<td>2017</td>
<td>Williams</td>
<td>Redwater, Alberta, Canada</td>
<td></td>
<td>500 1,100</td>
</tr>
<tr>
<td>2017</td>
<td>Formosa</td>
<td>Point Comfort, TX</td>
<td></td>
<td>800 1,760</td>
</tr>
<tr>
<td>2018+</td>
<td>Dow and Privatizations</td>
<td>Publicly Announced</td>
<td></td>
<td>TBD TBD</td>
</tr>
</tbody>
</table>

Source: Wood Mackenzie

Shift in ethylene cracker feedstocks drives new investment in on-purpose propylene production

New Methanol Units

<table>
<thead>
<tr>
<th>Year</th>
<th>Operator</th>
<th>Location</th>
<th>Comment</th>
<th>Capacity (Kt/year) (M lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>LyondellBasell (Leo-Cast)</td>
<td>Channelview, TX</td>
<td></td>
<td>680 1,722</td>
</tr>
<tr>
<td>2014</td>
<td>Methanex</td>
<td>Geismar, LA</td>
<td></td>
<td>2,060</td>
</tr>
<tr>
<td>2015</td>
<td>Celanese</td>
<td>Clear Lake, TX</td>
<td></td>
<td>2,870</td>
</tr>
<tr>
<td>2016+</td>
<td>Methanex</td>
<td>Publicly Announced/Under Construction</td>
<td></td>
<td>TBD TBD</td>
</tr>
</tbody>
</table>

Source: Rystad Energy

Low natural gas prices make U.S. methanol attractive again
An Exploration and Production Revolution in the U.S. Fuels a Downstream Resurgence

Notes

Unprecedented level of new ethylene capacity addition will challenge industry resources

Source: Wood Mackenzie

U.S. Crude Oil Supply Landscape Changing as Well

Domestic oil production expected to increase while more imports coming from Canada

Source: EIA

North America Crude Oil Pricing Dislocation

Changing oil supply and infrastructure bottlenecks are creating temporary regional market dislocations

Source: U.S. Energy Information Administration and Wood Mackenzie
Notes

Conclusions

- Positive outlook for long-term growth in U.S. natural gas and NGLs

- Shale gas value transitioning from upstream to downstream petrochemicals

- Exciting new possibilities and large capital projects for the U.S. petrochemical industry await

- Increased domestic crude oil production and Canadian oil imports coupled with regional market dislocation creates the need for additional infrastructure
The Benefits of Being an ACE-sponsor Company: *What’s in It for You?*

*Youth Outreach: ACE Mentor Program of America, Inc.*

Abstract

The purpose of this presentation is to demonstrate the tangible benefits of actively sponsoring the ACE Mentor Program. We know that building a strong pipeline of future workers is critical to sustaining the building industry. We also know that students have a great experience participating in outreach programs such as ACE. But, do you know about the many benefits that come from being a company that sponsors ACE?

This presentation will explore all of the benefits of ACE—for students, educational systems, industry trade associations, parents, colleges and universities, employees, and sponsoring companies that represent all aspects of the building industry. First, the ACE presenters will present their journeys from their initiation into the ACE Program to their employment in the industry. Then company executives will discuss how they and their companies have benefited from their ACE sponsorships. Ultimately, all of the presenters will address all the *What’s in it for me?* questions.

Featured Speakers

**Bryan Burke, Vice Chairman – ACE Mentoring Program of Frederick**

Bryan Burke, founder of Millennium Resource Engineering in Frederick, Maryland, has been an active mentor with the ACE Mentoring Program of Frederick for seven of its eight years. After his first year as a program mentor, he designed an advanced, technical program exclusively for returning second-year students. The combination of Burke’s curriculum and his mentoring has proven to be so effective that two Frederick teams have placed first in the ACE-CIRT National Design Competition. Because of the positive environment he creates, students often return for a third year, which challenges him to create even more advanced programs that build on their technical growth, leadership skills, and independent thinking. After students leave the ACE program, Burke continues to advise them as they pursue their careers and even as they become ACE mentors. In recognition of his dedication to the industry and to the program, ACE named his as one of its 2012 Exemplary Mentors.

Burke has helped establish other ACE teams in Frederick by encouraging mentors to branch out and lead new teams. He tirelessly promotes ACE in the business community and within the Frederick school system. He has become known as “Mr. ACE” in Frederick. Since the Frederick affiliate established its board of directors, he has served as an executive officer, acting as chair for two terms.

e-mail: bburke@mre-eng.com
Kristina T. Nguyen, Project Controls Engineer – Bechtel Power

Kristina Nguyen has been associated with the ACE Mentor Program since 2006 when she was a high school junior in Frederick, Maryland. As a senior, she was on the Frederick ACE team that won the ACE/CIRT National Design Competition. Because the winning project tackled a complex local transportation issue, I-270 traffic, the judges and the local community praised it for the thoroughness of its innovation, design, estimate, and presentation.

After graduating from high school, Nguyen attended the University of Maryland, College Park, earning a B.S. in 2013 civil engineering, with a focus on structural engineering and infrastructure, and an interest in project management. While in college, Nguyen interned with MRE for two summers, working on a variety of civil drawings, calculations, and permits. Currently an ACE mentor, she began mentoring while in college. In her four years as a mentor, she has worked exclusively with second-year ACE students on various projects. The most recent was for the Retrofit Design to Assist Aging in Place team, which was chosen as a 2012-2013 competition finalists.

Nguyen was hired by Bechtel in 2012, and started as a project controls engineer on a Southern Company nuclear plant project. The three main plants that she supports with estimate and schedule work are the Vogtle electric plant, the Farley nuclear plant, and the Hatch nuclear plant.

            e-mail: ktnguyen@bechtel.com

Chris S. Putman, Plant Design Engineer – Bechtel Power

Chris Putnam was a senior in high school in 2005, when the ACE Affiliate program was launched in Frederick, Maryland. At the time, he was already involved in architectural and design classes and Skills USA, so the new ACE program fit well with his career ambitions. While in ACE, he was a member of a team that designed an eco-friendly public park. Through his association with ACE and because of his strong CADD skills, he had the opportunity to work numerous times with Bechtel Power during his holiday and summer breaks.

After graduation, Putnam went on to attend the Pennsylvania State University and graduated with B.S. and M.S. degrees in architectural engineering, with a focus on mechanical systems. During summer internships at Bechtel, he worked on a variety of power plant project design teams. After graduating from Penn State, Bechtel hired him onto its Generation mPower Small Modular Reactor design team. In this role he develops detailed nuclear piping design, prepares power plant layout, creates engineering design studies, and coordinates work between different engineering disciplines.
Since joining Bechtel as a full-time employee, Putnam has also volunteered for two years as an ACE mentor, helping guide teams through two design projects, one for an eco-friendly “Smart Home” design project and one for a nuclear power plant.

*e-mail: csputman@bechtel.com*

**Carol A. Ritz,** Quality Project Specialist – Bechtel Construction Operations, Inc.

Carol Ritz has worked in many roles during her 34 years with Bechtel, mostly in the power business line and the corporate construction company. She has supported ACE Frederick since its inception in 2005. Carol assumed the reins for the program in 2007, when she established ACE Frederick’s not-for-profit status and Board of Directors. She served as the ACE Frederick Chair for several terms before passing the leadership on to Bryan Burke. The ACE Mentor Program of America recently honored her with its Exemplary Mentor award.

Ritz has also been active for many years in CII, starting with Research Team 230, which raised the Lessons Learned program to the status of a CII Best Practice. She then joined the Knowledge Management Committee (KMC) in support of maintaining the Institute’s vast knowledge base. Currently, she serves as the KMC Committee Co-Chair.

She has a B.S. and M.S. in business, with a focus on marketing and management. She is also a Certified Records and Information Manager and a Six Sigma Green Belt.

*e-mail: critz@bechtel.com*
The Benefits of Being an ACE-sponsor Company: What’s in It for You?

Featured Presentation Slides

The Benefits of Being an ACE-sponsor Company: What’s in it for you?

Presented by:
ACE Frederick, MD Affiliate

Agenda

- The effectiveness of the ACE program – Carol
- The ACE experience – Kristina
- The answer to the question – What’s in it for me? – Bryan

The Effectiveness of the ACE Program

Presented by:
Carol Ritz
Notes

The Benefits of Being an ACE-sponsor Company: What’s in It for You?

Launching Affiliates

- ACE Guidelines
- Ask for help
- Solicit co-workers
- Reach out to school
- Have fun!!

Changing Our Image

- Promote benefits of industry
- Show rewards
- Inspire students
- Being smart is cool!!

Flexible Program

- Adaptable to any situation
- Size
- Students
- Locations
- Content
The Benefits of Being an ACE-sponsor Company: What’s in It for You?

Notes

Making a Difference

- Company
- Community
- Student’s life
- Benefits are priceless!

The ACE Experience

Presented by:
Kristina Nguyen

The Decision To Apply

- First Hand guidance from professionals
- Confirm my interests
- Ability to learn and ask questions from those who have already gone through the process
The Benefits of Being an ACE-sponsor Company: What’s in It for You?

- Multiple fields within our industry
- Hands-on Experiences
  - Catapult, Bridge, Tower, Water Pipes
- Knowledge is Power

Notes

- First major public speaking event
- Reacting to a change in plans
- Pulling together as a team, despite the lack of resources

- 2007-2008 CIRT National Competition Finalist and Winner
- Multimodal transportation hub and an extension of a local existing metrorail line
- Sustainable and Environmentally Friendly Design
The Benefits of Being an ACE-sponsor Company: What’s in It for You?

Notes

- General Knowledge of Civil Engineering and an idea what work in the field/office would be like
- Competence in working within Group Projects
- Involvement in projects outside of school work
- Sharing my lessons learned

Lessons Learned & Value Added

- Knowledge of the industry
- Professional Networking
- Confirmation of pursuit into an ACE career
- Soft Skills (Leadership, Teamwork, Speaking, Perseverance, etc.)
- Pay it forward…

The Answer to the Question – What’s in it for me?

Presented by:
Bryan Burke
The Benefits of Being an ACE-sponsor Company: *What’s in It for You?*
The Benefits of Being an ACE-sponsor Company: What's in It for You?
Advanced Work Packaging: Toolkit for Success
Research Team 272, WorkFace Planning, from Design through Site Execution

Learning Objectives

- Learn what Advanced Work Packaging entails across the project life cycle.
- Become familiar with terms related to Advanced Work Packaging.
- Recognize the benefits of Advanced Work Packaging.
- Understand how to overcome barriers to implementing Advanced Work Packaging, focusing on tools for success.
- Examine how a sample project could implement Advanced Work Packaging processes, tools, and project controls.
- Get recommendations for action.

Plenary Session Abstract

Research Team 272—a joint effort of the Construction Owners Association of Alberta (COAA) and CII—will present its update of the model for Advanced Work Packaging (AWP), (formerly known as Enhanced Work Packaging), introducing tools to properly implement the practice and overcome barriers to success. A collection of planning techniques that can commence in the early phases of a project to improve field productivity at the workface, AWP leads to improved project productivity and predictability. In the past, many companies have realized significant cost and schedule benefits by simply concentrating on workface packaging programs during the construction phase. Advanced Work Packaging generates even greater benefits by incorporating work packaging into earlier project phases.

The presenter will outline the team’s best-practice model for an Advanced Work Packaging process that will be consistent across the project life cycle, from early planning efforts through field installation. This model is supported by interview research on a number of companies performing work packaging at various levels. The research shows that, although difficult to quantify, the benefits of work packaging are seen mainly in terms project productivity and predictability. In addition to providing these important benefits, work packaging—when used as a planning technique—can generate a number of ancillary benefits to safety and quality.

Implementation Session Abstract

The panelists will review the rationale for Advanced Work Packaging and discuss its benefits, define relevant terms (e.g., engineering work package, construction work package, and installation work package), recommend a work packaging process, and examine the organizational implications of implementation. They will also explain the new tools and processes they developed in this second stage of the team’s research, and show attendees how to use them effectively. Discussion topics will further include guidance on contracts, integration of AWP into standard procedures, AWP implementation in project controls, functional roles, and assessment tools to support implementation.
Plenary Session Presenter

**Jim Rammell**, Vice President, Corporate Construction Operations – Wood Group Mustang

As Vice President of Corporate Construction Operations for Wood Group Mustang, Jim Rammell provides comprehensive oversight of all construction management operations and facilities inspection activities. He joined Wood Group Mustang in 2008 with more than 20 years of experience in all phases of the project life cycle. Rammell also directs construction strategy development and implements construction execution approaches for Wood Group Mustang projects. His expertise in project management, scheduling, design coordination, and procurement enables him to reliably complete difficult projects, on schedule and on tight budgets. He is also in charge of recommending department tools, systems, and procedures to improve project execution efficiency, as well as employee development, staffing, and project support.

Rammell earned a B.S. in building construction from Virginia Tech in 1984, and an M.S. in management from Rensselaer Polytechnic Institute in 1995. He is a registered professional engineer in Virginia and North Carolina, a general contractor, an active CII research team co-chair, and teaches at the University of Houston.

*e-mail: jim.rammell@mustangeng.com*

Implementation Session Moderator

**Glen Warren**, Co-Chair, WorkFace Planning Committee – Construction Owners Association of Alberta (COAA)

In the course of a career that has spanned more than 40 years in the Canadian construction industry, Glen Warren has primarily worked in construction management in a variety of industry sectors, e.g., conventional oil and gas, oil sands extraction, pulp and paper, heavy civil construction, and infrastructure. His last post before his retirement was as Vice President–Major Projects for Ledcor Industrial Construction, where he had worked for the previous 17 years. Since his retirement, Warren has remained engaged in the industry by participating in the work of Workface Planning Committee of the Construction Owners Association of Alberta (COAA) to develop and disseminate best practices for improving project productivity. He is also active in the joint CII-COAA initiative to provide a North American standard for implementing advanced work packaging strategies during the entire project life cycle.

Warren is a registered professional engineer, and received his B.S. degree in mechanical engineering from the University of Alberta in 1968.

*e-mail: wrap@telus.net*
Panelists

Michael Bankes, Director I, Design Engineering – Fluor Corporation
  e-mail: michael.bankes@fluor.com

Keith B. Critzer, Advanced Engineering Associate – ExxonMobil Corporation
  e-mail: keith.b.critzer@exxonmobil.com

Kenneth Kohl, Program Manager/Constructability – General Electric Corporation
  e-mail: kenneth.kohl@ge.com

Jose LaRota, Project Engineering Supervisor – Southern Company
  e-mail: jlarota@southernco.com

William J. O’Brien, Associate Professor, Department of Civil Engineering –
  The University of Texas at Austin
  e-mail: wjob@mail.utexas.edu
Advanced Work Packaging: Toolkit for Success
Plenary Session Slides

Notes

Advanced Work Packaging:
Toolkit for Implementation Success
Jim Rammell, Wood Group Mustang
Research Team 272

RT 272, Advanced Work Packaging:
From Design through Workface Execution
Steve Autry, ConocoPhillips
Michael Bankes, Fluor
Jim Blevins, Pathfinder
Roy Burnette, CH2M HILL
Keith Critzer, ExxonMobil
Joel Gray, Corewax
Olfa Hamdi, The University of Texas at Austin
Ken Kohl, GE Power & Water
Jose LaRota, Southern Company
Fernanda Leite, The University of Texas at Austin

Robin Mikaelsson, Bentley Systems
Bill O’Brien, The University of Texas at Austin
Bryan Parsons, KBR
Sean Pellegrino, Chevron
Jim Rammell, Wood Group Mustang
Lloyd Rankin, Ascension Systems
Yogesh Srivastava, North West Redwater Partnership
Stan Stasek, DTE Energy
Jim Vicknair, WorleyParsons
Glen Warren, COAA

CII and COAA Joint Effort
Where We Left off . . .
Owner Case Study Example

- Improved safety performance
- Schedule Performance Index (SPI) improved by 25%
- Cost Performance Index (CPI) improved by 33%
- Reduced indirect costs
- Improved weld reject rates

Barriers to Implementation

- Contract
- People
- Process
- Culture
- Documentation (Templates)

Supporting Evidence

Interviews Representation – Firm Type
- Consulting: 11%
- Owner: 47%
- EPCM: 42%

Interviews Representation – Project Location
- Australia: 5%
- Canada: 47%
- USA: 48%

...and Surveys and Workshops
Notes

Where We Are . . .

RT 272 Contribution:
A Model for Advanced Work Packaging

- Contracts ➔ Requirements & Deliverables
- AWP Practice Model ➔ Flowcharts & Job Descriptions
- Tools ➔ Assessments & Templates
- Example ➔ Support

Contracts ➔ Requirements & Deliverables
Contracts team: two main focus areas

1. AWP Contracting Considerations
   - contract structure
   - compensation selection

2. Major Contractual Deliverables by Stage
   - summary table
   - responsibility by contract structure
Advanced Work Packaging (AWP) Implementation Considerations

- Contract Structure
  - FEED by Owner
  - FEED by Contractor

- Compensation Selection
  - Lump Sum/Fixed Price
  - Reimbursable Cost
Notes

Project Integration Flow Charts
Stages I, II, and III

Resources

Position Legend

Resources

Job Descriptions
Resources

Flow Chart Narrative

Tools and Templates

AWP Audit tool, Project Definition Assessment, EWP CWP Templates, Maturity Assessment

Contracts  Practice Model  Tools  Example

Construction Work Package (CWP) and Engineering Work Package (EWP) Templates

CWP and EWP work packages are the official information transfer vessels.
Notes

Example: Overall Project (ISBL)

Example: Construction Work Area (CWA)

Example: Engineering Work Package (EWP)
Develop IWPs

Start with CWP-EWP plan, then finalize CWP-EWP-IWP plan

<table>
<thead>
<tr>
<th>Dependencies</th>
<th>CWP</th>
<th>EWP</th>
<th>Procurements</th>
<th>IWP</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWP 104 - Mechanical Installation</td>
<td>EWP104-001 – Pump Procurement Specifications</td>
<td>PP104-0001E – Pump &amp; Motor</td>
<td>IMP104-C004 - Place Equipment Foundations</td>
<td></td>
</tr>
<tr>
<td>EWP104-002 – Equipment Setting Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EWP104-003 – Piping Design</td>
<td>PP104-0003P – Bulk Materials</td>
<td></td>
<td>IMP104-P001 - Install Piping &amp; Supports</td>
<td></td>
</tr>
</tbody>
</table>

Example: Installation Work Package (IWP)

Example: Integration of Project Controls
Advanced Work Packaging: Toolkit for Success

Notes

Schedule Based on CWP-EWP-IWP Plan

WORKFACE PLANNING OVERVIEW

THE FOREMAN’S DAY: SUMMARY
(COAA DATA)

+400% increase in Direct Supervision with WorkFace Planning

RT 272 Contribution:
A Model for Advanced Work Packaging

Productivity & Predictability
Safety, Quality, Alignment, Communication, Reduced Rework
Notes

Advanced Work Packaging: Toolkit for Success

Perceptions of WorkFace Planning: WorkFace Planning Perceived Advantages

Q11: Which area do you see as gaining the biggest benefit from WFP?

Implementation Panel

- **Moderator**: Glen Warren, COAA
- **Research Overview**: Bill O’Brien
- **Contract Requirements**: Keith Critzer
- **Swimlanes/Job Descriptions**: Ken Kohl
- **Tools**: Michael Bankes
- **Example**: Jose LaRota

Implementation Session Takeaways

- Better understanding of Advanced Work Packaging
- Overview of recommended process for work packaging, from planning through execution
- Tools to help ensure AWP success/implementations
- Example of how to implement and integrate AWP
- Handouts!
RT-272 Advanced Work Packaging: Ready for Implementation Toolkit for Success

CII and COAA Joint Initiative

CII Annual Conference Presentation
July 30th, 2013

Moderator – Glen Warren
Co-Chair COAA WFP Committee

RT 272, Advanced Work Packaging: From Design through Workface Execution

Steve Autry, ConocoPhillips
Michael Bankes, Fluor
Jim Blevins, Pathfinder
Roy Burnette, CH2M HILL
Keith Critzer, ExxonMobil
Joel Gray, Coreworx
Olfa Hamdi, The University of Texas at Austin
Ken Kohl, GE Power & Water
Jose LaRota, Southern Company
Fernanda Leite, The University of Texas at Austin
Robin Mikaelsson, Bentley Systems
Bill O’Brien, The University of Texas at Austin
Bryan Parsons, KBR
Sean Pellegrino, Chevron
Jim Rammell, Wood Group Mustang
Lloyd Rankin, Ascension Systems
Yogesh Srivastava, North West Redwater Partnership
Stan Stasek, DTE Energy
Jim Vicknair, WorleyParsons
Glen Warren, COAA

Agenda

- Who is COAA?
- How did we Arrive Here?
- What is Advanced Work Packaging?
- COAA – CII Joint Initiative
- Team Introduction
- Research Overview – Bill O’Brien – U of Texas
- AWP Practice Model – Ken Kohl – GE Power & Water
- Tools & Templates – Michael Bankes – Fluor
- Contract Guidelines – Keith Critzer – ExxonMobil
- Implementation Example – Jose LaRota – Southern Company
- Wrap-up
Who is COAA?

**Construction Owners Association of Alberta**
- Full Members - Owner Organizations
- Associate members – Contractors
- Volunteer committee members
- Annual conference to promote Best Practices

---

**WORKFACE PLANNING: OVERVIEW**

*HOW CREWS SPEND THEIR TIME*

**TRADITIONAL PROJECTS (COAA DATA)**

[Pie chart showing the percentage of time spent on various activities]

---

**WORKFACE PLANNING OVERVIEW**

*HOW CREWS SPEND THEIR TIME: SUMMARY (COAA DATA)*

- Traditional Projects:
  - 6.3 hours (63%)
  - Tool Time: 37%

- Projects using WFP:
  - 4.8 hours (46%)
  - Tool Time: 46%

[Note: +25% increase in tool-time with WorkFace Planning]
How did we arrive here?

What is Advanced Work Packaging?

The COAA – CII Joint Initiative

- Both organizations saw opportunity to strengthen work packaging processes and tools to improve productivity throughout the entire project life cycle.
- Both provided matching backing (funds) and resources (people).
- Worked with the end in mind – a “North American Standard” (Advanced Work Packaging) to be presented here at the CII Annual Conference as well as the COAA WFP Conference in Calgary, AB Sept. of 2013.
Team Introduction

RT 272 Team Advanced Work Packaging

Steve Astry, Canops/Philips
Michael Bankes, Fluor
Jim Blevins, Pathfinder
Roy Burnette, CH2MHill
Keith Critzer, ExxonMobil
Joel Gray, CoreVox
Ofisa Hamidi, The University of Texas at Austin
Ken Kohl, GE Power & Water
Jose LaRotta, Southern Company
Fernanda Leite, The University of Texas at Austin

Robin Mikaelsson, Bentley Systems Inc.
Bill O’Brien, The University of Texas at Austin
Bryan Parsons, KBR
Sean Pellegrino, Chevron
Jim Rammoll, Wood Group Mustang
Lloyd Rankin, Ascension Systems
Yogesh Silvastava, North West Redwater Partnership
Stan Stasek, DTE Energy
Jim Vicknair, WorleyParsons
Glen Warren, Retired – COAA Committee Co-chair

RESEARCH OVERVIEW

Bill O’Brien
The University of Texas at Austin

Research Overview

CII RT COAA docs Case Studies
Phase I 2009-2011 Process Definitions Model Process Checklists Challenges
CII & COAA RT Workshops Interviews & Surveys Case Studies
Phase II 2011-2013 Implementation Contractual Requirements Process Integration Job Roles Assessment Tools Example
Notes

Integrated Advanced Work Packaging

Key Terms:
- CWP - Construction Work Packages
- EWP - Engineering Work Packages
- IWP - Installation Work Packages

Findings: implementation challenges

- Change to volume deliverables
- Contracts
  - Lack of supporting language
  - Lack of clarity
  - Lack of support for integrated outcomes
- Construction Focused Engineering
  - Culture, processes not aligned
  - Lack of clear procedures
- Others
  - Owner commitment, ability to support Technology

AWP PRACTICE MODEL

Ken Kohl
GE Power & Water
Flow Charts Stage II  Detailed Engineering

Flow Charts Stage III  Construction Execution
TOOLS & TEMPLATES

Michael Bankes
Fluor
Notes

Prequalification

• Questions fundamental components of AWP

• Can be added to existing prequalification forms

• First step to gauge maturity and abilities

Advanced Work Packaging Maturity Model

• Two Pages
  – Maturity Model
  – Maturity Stages

• Subjective self evaluation

• Three Levels
  – AWP Early Stages
  – AWP Effectiveness
  – AWP Business Transformation

AWP Audit Tool

• Focused on AWP requirements of a project

• Intended to be used as a supplement to existing Audit processes

• Broken into stages
**Project Definition Assessment Tool**

- Aids in assessing readiness to begin an AWP Project
- Divided into the same project participants as the Integration Charts
- Similar Function to PDRI

**Construction & Engineering Work Package Templates**

- Outline of typical sections included in CWP's and EWP's
- Includes narrative explanations of the content and responsibilities

**CONTRACT REQUIREMENTS**

*Keith Critzer*
ExxonMobil Research and Engineering
Contracts team: 2 main focus areas

1. AWP Contracting Considerations
   - Contract structure
   - Compensation selection

2. Major Contractual Deliverables by Stage
   - Summary table
   - Responsibility by contract structure

AWP Implementation Considerations: Contract Structure & Compensation Selection

- FEED by Owner
- FEED by Contractor
- Lump Sum / Fixed Price
- Reimbursable Cost

Major AWP Contractual Deliverables by Stage & Contract Structure

<table>
<thead>
<tr>
<th>Deliverables</th>
<th>FEED by owner</th>
<th>EPC (Engineering)</th>
<th>EPC (Procurement)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessments</td>
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<td>AWP prequalification questionnaire</td>
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<tr>
<td>AWP selection criteria</td>
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<tr>
<td>Plan</td>
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</tr>
<tr>
<td>EPC Transaction Plan</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Contract</td>
<td></td>
<td></td>
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<tr>
<td>Engineering work plan</td>
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<td>1</td>
</tr>
<tr>
<td>Procurement work plan</td>
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<tr>
<td>Contract management</td>
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<tr>
<td>Change order management</td>
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<tr>
<td>Owner</td>
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<td></td>
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<tr>
<td>Procurement contractor</td>
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<tr>
<td>Construction</td>
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<tr>
<td>EPC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-P-C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Additional deliverables for AWP

<table>
<thead>
<tr>
<th>Progress</th>
<th>FEED by owner</th>
<th>EPC (Engineering)</th>
<th>EPC (Procurement)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>by AWP</td>
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</tr>
</tbody>
</table>

* Additional deliverables for AWP

- Owner
- EPC Contractor
- E-P-C Contractor
- EP-C Contractor

Advanced Work Packaging: Toolkit for Success
IMPLEMENTATION EXAMPLE

Jose LaRota
Southern Company

Implementation Example
• Now that you have all of the process pieces in place the natural questions are:
  – If I am part of the execution team – What does AWP look like?
  – Is this completely different than the way we do it today?
  – What will the “plan” look like?

Example

Overall Project (ISBL)
Notes

Construction Early Planning

- Start with
  - Making decisions about how we will perform the work
  - Identifying Constraints/Requirements
  - Communicate assumptions – Let the engineers know
- Then
  - Break the site down in self contained pieces - CWAs

CWP Boundary Definition

- Start with
  - Construction Plan
  - Communicate assumptions – Coordinate early with the engineers
- Then
  - Define CWP Plan

<table>
<thead>
<tr>
<th>CWA</th>
<th>CWP</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWPI01</td>
<td>Civil/Structural/Foundations</td>
</tr>
<tr>
<td>DWPI02</td>
<td>Civil/Structural/Foundations</td>
</tr>
<tr>
<td>DWPI03</td>
<td>Civil/Structural/Foundations</td>
</tr>
<tr>
<td>DWPI04</td>
<td>Mechanical/Plumbing Installation</td>
</tr>
<tr>
<td>DWPI05</td>
<td>Electrical</td>
</tr>
<tr>
<td>DWPI06</td>
<td>Instrumentation &amp; Control</td>
</tr>
<tr>
<td>DWPI07</td>
<td>B/C - EOC Configuration &amp; Installation</td>
</tr>
</tbody>
</table>

Additional Constraints Identified

- The total pumping system design needs to be released in phases, one of which is in the scope of this CWA
- The design must support hydro-testing of each individual release of the pumping system.
- The procurement plan needs to include purchase of additional valves to be able to isolate the piping in this scope of work for testing and commissioning.

• COMMUNICATE CONSTRAINTS
CWP / EWP Template

- CWP and EWP work packages are the official information transfer vessels.

Example

Construction Work Package (CWP)

EWP Boundary Definition

- Start with
  - Constraints
  - CWP Plan
  - Procurement plan
- Then
  - Define EWP Plan

<table>
<thead>
<tr>
<th>CWP Plan</th>
<th>Piping/Instrument</th>
<th>Piping/Procurement/Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>EWT5961M02</td>
<td>Piping/Instrument</td>
<td>Piping/Procurement/Specifications</td>
</tr>
<tr>
<td>EWT5961M02</td>
<td>Equipment Setting Plan</td>
<td>Piping/Procurement/Specifications</td>
</tr>
<tr>
<td>EWT5961M02</td>
<td>Piping/Design</td>
<td>Piping/Procurement/Specifications</td>
</tr>
<tr>
<td>EWT5961M02</td>
<td>Piping/Supports</td>
<td>Piping/Procurement/Specifications</td>
</tr>
</tbody>
</table>
Notes

From a System Engineering Perspective

<table>
<thead>
<tr>
<th>S001 RES System</th>
<th>CWP281 = Mechanical/Piping Installation</th>
<th>EWP305-M001 = Piping Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWP282 = Mechanical/Piping Installation</td>
<td>EWP303-M003 = Piping Design</td>
<td></td>
</tr>
<tr>
<td>CWP283 = Mechanical/Piping Installation</td>
<td>EWP305-M001 = Piping Design</td>
<td></td>
</tr>
<tr>
<td>CWP284 = Mechanical/Piping Installation</td>
<td>EWP304-M003 = Piping Design</td>
<td></td>
</tr>
</tbody>
</table>

Example

Engineering Work Package (EWP)

Develop IWP

- Start with
  - CWP-EWP Plan
- Then
- Finalize CWP-EWP-IWP Plan

<table>
<thead>
<tr>
<th>Dependencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWP284 = Mechanical Installation</td>
</tr>
<tr>
<td>EWP284-M003 = Pump Procurement Specifications</td>
</tr>
<tr>
<td>PP284-M003 = Pump &amp; Motor</td>
</tr>
<tr>
<td>EWP284-M003 = Equipment Installation Plan</td>
</tr>
<tr>
<td>PP284-M003 = Test Equipment Installation Plan</td>
</tr>
<tr>
<td>EWP284-M003 = Piping Design</td>
</tr>
<tr>
<td>PP284-M003 = Valve/Supports</td>
</tr>
</tbody>
</table>
Example

Installation Work Package (IWP)

Notes

Complete Plan Ready for Implementation

Example
Notes

Schedule Based on CWP-EWP-IWP Plan

Cost Structure

In Summary
  • Follow the boundaries definition
  • Record and communicate requirements
  • Use as basis for cost breakdown (for estimates and actuals) using packages
  • Use plan as basis for a complete schedule using packages
  • Execute
PRESENTATION WRAP UP

Glen Warren
Co-Chair COAA WFP Committee

WORKFACE PLANNING: OVERVIEW

A FOREMAN’S DAY:
TRADITIONAL PROJECTS
(COAA DATA)

- On-Site Travel: 30%
- Planning & Scheduling: 20%
- Direct Supervision: 15%
- Other: 35%

WORKFACE PLANNING OVERVIEW

THE FOREMAN’S DAY: SUMMARY
(COAA DATA)

- 8.5 hours: 85% (Traditional Projects)
- 6.5 hours: 65% (Projects Using WFP)

+400% increase in Direct Supervision with WorkFace Planning
Learning Objectives

- Learn how performance assessment information aids real-time decision-making.
- Discover how the measurement of inputs affects project performance outputs.
- Find out why many traditional industry benchmarks are no longer relevant.
- Learn how to participate in CII’s 10-10 Performance Assessment Campaign.

Plenary Session Presenter

Micheal G. Elliott, Manager of Project Services – Phillips 66

Micheal Elliott joined Phillips 66 in 1980 and has experience in management and engineering of both upstream and downstream projects. He has held various management positions, including international mega project management, operations, petroleum coke licensing, procurement, engineering and construction. He successfully managed a multi-billion dollar project in Venezuela, which won many awards including the 1999 Presidential Safety Award.

Elliott has served as executive assistant to the Vice President and Executive Vice President of worldwide refining, marketing, supply, and transportation. He currently represents Phillips 66 on the CII Board of Advisors. He has also served on various teams to improve performance of projects including co-authoring a design and construction manual. Elliott is experienced in all phases of projects from business development, through project completions to operations. He is bilingual, speaking Spanish and English.

Elliott is a licensed professional engineer. He earned a B.S. degree in engineering and an MBA with a financial focus.

e-mail: mike.elliott@p66.com
Implementation Session Moderator

Noé H. Saénz, Manager of International Business Development, Process & Industrial – Burns & McDonnell

As Manager of International Business Development for Burns & McDonnell’s Process & Industrial division, Noé H. 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, Saénz 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 Performance Assessment Committee and is a founding co-chair of the Next-Generation Leaders Community of Practice. Saénz 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.

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Panelists

Micheal G. Elliott, Manager of Project Services – Phillips 66

e-mail: mike.elliott@p66.com

Stephen P. Mulva, Associate Director – Construction Industry Institute

e-mail: smulva@cii.utexas.edu

Bruce A. Strupp, CPE Engineering/Design Technology Director – CH2M HILL

e-mail: bruce.strupp@ch2m.com
CII’s 10-10 Performance Assessment Campaign

Plenary Session Slides

CII’s 10-10 Performance Assessment Campaign

Mike Elliott, Phillips 66
CII Performance Assessment Committee

CII Performance Assessment Committee

James Blaschke, ConocoPhillips
Robert Chapman, NIST
Guadalupe Chiriboga, Jacobs
Russell Cusimano, ePM
Charles Green, Aramco Services
Kay Harlow, Southern Company
Tom Isbell, Alstom Power
Emmanuel Jimenez, Abbott
Noah Kahn, Kaiser Permanente
Mark LaClair, Waibridge

Kevin Miller, Black and Veatch
James O’Connor, Univ. of Texas
Randall Park, Zachary Holdings
David Perkins, Invista
Oscar Rodriguez, URS Corporation
Jason Rose, CBI
Bruce Strupp, CH2M Hill

* Noé Sáenz, Burns & McDonnell
* Paul Woldy, Chevron

* Committee Co-Chairs

CII’s Legacy of Improvement (TRIR Rates)
CII's 10-10 Performance Assessment Campaign

Notes

Phases of a project
1. Front End Engineering and Design
2. Engineering
3. Procurement
4. Construction
5. Start-up/Commissioning

WARMUP QUESTION:

What is your level of experience planning and executing capital projects?

(or, can you use a clicker?)

A. Somewhat Experienced
B. Quite Experienced
C. Very Experienced
D. Extremely Experienced

Experience is what you get when you didn’t get what you wanted.

— Randy Pausch
QUESTION 2:

Which factor most influences an owner’s project NPV?

A. Contract Type  
B. Working Relationships  
C. Front End Planning  
D. Planning for Startup

This is a CII Initiative

This is not a new self-assessment tool rather it is the 3 leg of the process:

1. Develop your project, your self, your system  
2. Evaluate your progress  
3. Compare yourself to others

When you don’t know where the bar should be, you’re only going to do a disservice by putting it anywhere.

― Andries van Dam
10-10 Outcome Metrics

Whenever an individual or a business decides that success has been attained, progress stops.

— Thomas J. Watson

Attend Our Implementation Session!

Moderator
Noé Sáenz, Burns & McDonnell

Panel
Stephen Mulva, CII
Mike Elliott, Phillips 66
Bruce Strupp, CH2M Hill
It isn’t what we know that gives us trouble, it’s what we know that ain’t so

— Will Rogers
CII’s 10-10 Performance Assessment Campaign

Implementation Session Slides

Notes

CII’s 10-10 Performance Assessment Campaign Implementation Session

CII Performance Assessment Committee

2013 Annual Conference
July 29-31, Nashville

CII Performance Assessment Committee

James Blaschke, ConocoPhillips
Robert Chapman, NIST
Guadalupe Chiriboga, Jacobs
Russell Cusimano, ePM
Charles Green, Aramco Services
Kay Harlow, Southern Company
Tom Isbell, Alstom Power
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Mark LaClair, Weirbridge

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James O’Connor, Univ. of Texas
Randall Park, Zachry Holdings
David Perkins, Invisia
Oscar Rodriguez, URS Corporation
Jason Ross, CBAI
Bruce Strupp, CH2M Hill

* Noé Sáenz, Burns & McDonnell
* Paul Woldy, Chevron

* Committee Co-Chairs

Agenda

Moderator
Noé Sáenz, Burns & McDonnell

Panel
Stephen Mulva, CII
Mike Elliott, Phillips 66
Bruce Strupp, CH2M Hill
Motivation

- Senior Management Disconnect
- Need for Actionable Information
- Measures Roll Up, Down

CII’s 10-10 Performance Assessment Campaign

CII 10-10 Program
$/BOED, $/GSF, Capacity Efficiency, Quality, Design Efficiency, Leading, HR

CII General Program
Budget Factor, Change Cost Growth, WH/LF Piping, Project TRIR, etc.

CII’s Legacy of Improvement

The Knowledge Leader for Project Success
Owners • Contractors • Academics

Theory
Stephen Mulva, CII
CII's 10-10 Performance Assessment Campaign

Notes

21st Century Project Context

“Old School” Project Management

Phase-Gate Based Project Management

The “Hidden” Projects

8-11% Variation

“Drunkard’s Walk” (Markov Chain)

What is the Probability of Success (?)

Project Health Indicators (RT 220)
“Famous” Construction Quotes

“Construction would be easy, if it weren’t for all the people involved”

— Ted VanWyck

“When we pay for benchmarking, we typically tend to find the data being asked”

— Sanat Doshi
CII's 10-10 Performance Assessment Campaign

Notes

Application
Mike Elliott, Phillips 66

10-10 Questionnaires
- Practice-Based
  - Yes/No
  - 5-point scales (strongly agree → strongly disagree)
- Phase-Based
  - Help for current projects
  - Answered as project nears phase completion
- Quantitative, yet simple to answer
- Research-based, empirically tested
- Paper-Based (2013-2014)
- Examples...

FEP Questionnaire
The interfaces between project stakeholders were well-managed.

A. Strongly Agree
B. Agree
C. Neutral
D. Disagree
E. Strongly Disagree

Input Metrics: Organizing, Leading
## Engineering Questionnaire

The equipment procurement and vendor schedules were a significant challenge or problem for this project.

- A. Strongly Agree
- B. Agree
- C. Neutral
- D. Disagree
- E. Strongly Disagree

Input Metrics: Planning, Controlling, Partnering & Supply Chain Management

## Procurement Questionnaire

Preferred suppliers were used effectively to streamline the procurement process.

- A. Strongly Agree
- B. Agree
- C. Neutral
- D. Disagree
- E. Strongly Disagree

Input Metrics: Planning, Controlling, Quality, and Partnering & Supply Chain Management (SCM)

## Construction Questionnaire

The availability and competency of craft labor was adequate.

- A. Strongly Agree
- B. Agree
- C. Neutral
- D. Disagree
- E. Strongly Disagree

Input Metrics: Planning, Controlling, Quality, HR and Safety
Notes

Start-Up / Commissioning Questionnaire

The project experienced an excessive number of project management team personnel changes

A. Strongly Agree
B. Agree
C. Neutral
D. Disagree
E. Strongly Disagree

Input Metrics: Organizing, Leading, and Human Resources (HR)

Start-Up and Commissioning Questionnaire

• Which of the following statements characterize the decisions made by the manager(s) of this project? (please check all that apply)
  – Considered final and not revisited
  – Collaborative and inclusive
  – Made at the lowest appropriate level in the organization
  – Communicated promptly to the team
  – Made in a timely and effective manner
  – Consistent with the delegation of authority

• Input Measure: Leading

Results

Bruce Strupp, CH2M Hill
CII’s 10-10 Performance Assessment Campaign

10-10 Program Metrics

Questions

10 Input Measures
- Planning
- Controlling
- Design Efficiency
- Human Resources

10 Outcomes
- Proj. Sch. Efficiency
- Capacity Efficiency
- Proj. Cost Efficiency
- Burn Rate

Measures
- $/Ton/Day
- $/Bcid
- $/SSF

Implementation
CII General Program
CII Industry-Specific Metrics Programs

Notes

10-10 Outcome Metrics

10-10 Input Metrics

- Simple
- Motivating
- Insightful
CII’s 10-10 Performance Assessment Campaign

Notes

10-10 Integration, Diagnostics
- Phase-Based, Sector-Based, Attribute-Based

10-10 Program Integration
Member Imperatives
- 10-10 Program

Knowledge Base

Campaign
Noë Sáenz, Burns & McDonnell

2013 Annual Conference
Celebrating 30 Years
Leadership, Research, Collaboration, Improvement
10-10 Program Campaign

- August 2013 – April 2014
  - Data Collection (~1,200 Phase-Projects)
  - Personnel (Benchmarking Associates, NextGen Leaders)
  - 10-10 Automation
- July 21-23, 2014 CII Annual Conference
- 2014 and Beyond
  - Company-level dashboard
  - Self-help vs. facilitated evaluation and implementation
- It starts NOW!

Questions?

Moderator
Noé Sáenz, Burns & McDonnell

Panel
Stephen Mulva, CII
Mike Elliott, Phillips 66
Bruce Strupp, CH2M Hill
Learning Objectives

- Be aware of productivity and efficiency advances in automated field services.
- See highlights of the Fiatech Real-time Field Reporting Project.
- Hear an update on the Fiatech Augmented Reality Project.
- Learn about 14 additional initiatives from Fiatech, the Fiatech-COMIT partnership, and the Fiatech Mobile IT Community of Interest.
- Understand industry application and business value.

Plenary Session Abstract

Fiatech is driving increased productivity and efficiency in capital project delivery and management, through advancement of field automation. This presentation will highlight 16 projects completed by Fiatech, the Fiatech–COMIT partnership, and Fiatech Mobile IT Community of Interest. Focusing on tools, technology systems, and processes that have demonstrated productivity and efficiency benefits for delivery of field services, the speakers will introduce several new devices. These will include “ruggedized” units that are field-ready under restricted and varying conditions, and capable of providing real-time data-capture and data sharing.

The presentation will also introduce Fiatech’s mobile IT initiatives and activities, and provide overall recommendations for implementing technological advances in the automation of field services. To give an example of such advances, the presenters will discuss a demonstration project, highlighting the tools evaluated and the productivity and efficiency benefits achieved.

Implementation Session Abstract

Members of the implementation session panel will present project examples of advanced automation practices for field services, reviewing the revaluation process, the project experience, and the measured and forecasted productivity and efficiency benefits for each project. Theses highlighted projects include Fiatech’s Real-time Field Reporting Tool Assessment and its trial of Augmented Reality Tools on construction projects. Additionally, the panelists will discuss the advancements being developed through the Fiatech-COMIT partnership and with the Mobile IT Community of Interest, which includes the BIM for Mobility initiative. Finally, the panel will describe projects that Fiatech members of the Mobile IT Community of Interest are undertaking, with an emphasis on the tools implemented and the productivity and efficiency benefits gained; these projects include Enterprise i-Phones, aMobile Solutions Expertise Center, 3D Model tools for the iPad, a Mobile IT–pen-based timesheet solution, and pipeline management on handheld devices.
Plenary Session Presenters

Shanaya G. Averill, Global Product Manager for Construction – The Dow Chemical Company

In her 16 years at Dow, Shanaya Averill has held roles as a process engineer, improvement engineer, run plant engineer, six sigma engineer, and Zyqad subject matter expert. In her current role, she and her team are responsible for providing best in-class tools, training, support, and expertise for Dow Chemical’s global construction management organization. She earned a B.S. in chemical engineering from The University of Texas at Austin.

e-mail: sgaverill@dow.com

Todd Sutton, Project Controls Manager – Zachry

Todd Sutton has worked for more than 25 years in the construction industry, specializing in project management. His project experience is spread across several markets, including civil infrastructure, commercial, governmental, and industrial, on projects ranging in size and scope from $2M to $900M. He has helped various business units implement technologies or construction methods to improve project execution. Currently involved in Fiatech’s study on real-time field reporting with smart devices on construction jobsites, Sutton is also a Co-Roadmap Champion for Fiatech’s Technology Roadmap Element 4 – Intelligent and Automated Construction Job Site.

e-mail: todd.sutton@zachrycorp.com

Implementation Session Moderator

Ray Topping, Director – Fiatech

Ray Topping is Director of Fiatech, where he leads strategic direction and manages operations. Previously an executive leader for more than 20 years at CH2M HILL, he was involved in numerous senior leadership roles. His work includes director of the firm’s engineering design group for global delivery. He also served in a leadership role for CH2M HILL’s work on the 2012 London Olympics. Other major assignments for the firm include program director for the $23 billion Masdar City development in Abu Dhabi and senior adviser on the Panama Canal Expansion Program. Topping holds bachelor’s and master’s degrees from Auburn University and is a registered professional engineer.

e-mail: topping@fiatech.org
Panelists

Shanaya Averill, Global Product Manager for Construction – The Dow Chemical Company
  e-mail: sgaverill@dow.com

Todd Sutton, Project Controls Manager – Zachry
  e-mail: todd.sutton@zachrycorp.com
Advanced Practices for Field Automation

Plenary Session Slides

Notes

Advancing Automation of Field Services

Shanaya Averill, Dow Chemical
Todd Sutton, Zachry
Fiatech

2013 Annual Conference
Celebrating 30 Years

Change is Moving at a Rapid Pace
For Automation of Field Services

- Tools
- Processes
- Systems
- People
- BYOD
- Social Networks
- Solution Sharing

Fiatech

Some sectors are positioned for greater gains from the use of big data

Historical productivity growth in the United States, 2000–08

1 See appendix for detailed definitions and metrics used for value potential index.
How do you Best Implement Technology that Increases Productivity & Efficiency?

Fiatech Recommended Approaches
- Personal investigation and company networking/sharing
- Participating in Industry Organizations
- Partnerships, shared development
- Demonstration Projects & Lessons Learned
- Encourage new technologies and emphasize business value
- Visible company leadership & communications
- Recognition & reward for benefits

Notes

Delivering Productivity and Efficiency Improvements
Advancing Technology & Innovative Practices

Projects - develop, demonstrate and deploy

Networking, Collaboration and Partnerships

Technology Exchange, Events, Outreach & Webinars

Awards & Recognitions
Notes

**Field Automation is Rapidly Increasing**

How Many WiFi Connected Devices were in service in 2012 Globally (not exclusive to capital facilities)?

- A. 500 Million
- B. 2 Billion
- C. 10 Billion
- D. 20 Billion

Source: ARD

---

**Dow Chemical – Field Computers**

**Problem:** Construction Personnel were spending excessive time finding and accessing information they needed while in the field.

**Opportunity:** Construction personnel & leadership were eager to enhance and streamline their jobs to create value for the businesses resulting in:
- Increased productivity
- Increased safety performance
- Reduced cost
- Reduced cycle time

**Objective statement:** Provide Construction Personnel with a mobile computer and real-time connectivity while in the field.

---

**Dow Chemical – Field Computers**

**Evaluation and Selection**

**Process followed:**
1) Focus Groups
2) Researched industry solutions & conducted tests
3) Selected unit
4) Worked with corporate IS organization to gain buy in
5) Piloted 22 units globally
6) Rolled out ~150 units globally for Construction
7) Leveraging out to other functions
Dow Chemical - Field Computers

- Hardware Selected
  - Panasonic Toughbook CF-19
    - Fully Rugged
    - Convertible Laptop
    - Hazardous Classification: UL1604 Class 1 Div 2
    - Real-time connectivity via internal gobi chip
    - Screen can be easily viewed outdoors

- Providing Significant Benefit and Cost Savings
  - $1.8 MM/yr saved
  - based on survey of time savings of ~150 Construction Personnel

Panasonic Toughbook & ToughPad

Current unit

Possible Future unit

Screen rotates so it can also be used in tablet mode

Panasonic ToughPad Windows 8

Field Automation Projects and Advancements
Increasing Productivity and Efficiency

Fiatech’s Project
- Real Time Field Reporting Project
- Augmented Reality Project
- RFID Access Control Systems, Case Study
- Enhancing Productivity through Materials Management

- Projects with our partner COMIT
  - Mobile IT Community of Interest
  - BIM for Mobility
  - Solution Directory
**Field Automation Projects and Advancements**

**Increasing Productivity and Efficiency**

**Dow Chemical Implementation of**
- Panasonic Toughbooks – as presented
- Enterprise I-Phones
- Field Cameras
- Mobile Solutions Expertise Center

**Zachry Implementation of**
- 3D Model tools for the iPad
- 123 PUNCH list Process

**CCC Implementation of**
- Mobile IT – pen based timesheet solution
- Pipeline management on hand held devices – Australia
- 3D models for AWP

---

**Mobile Apps**

How Many Mobile Apps were available at the end of 2012?

**Number of Mobile Apps Available From 2008 - 2013**

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apps</td>
<td>200</td>
<td>2,000</td>
<td>5,000</td>
<td>10,000</td>
<td>15,000</td>
<td>20,000</td>
</tr>
</tbody>
</table>

**Source:** Mobilewave

A. 100,000  
B. 500,000  
C. 1.0 Million  
D. 1.5 Million

---

**Come to our Implementation Session and Increase Your Productivity**

- Example – Dow’s implementation of toughbooks providing approximately $2 Million per year of cost savings
- Highlights for 15 more Field Automation Projects & Initiatives
- Includes demonstration projects, industry surveys, case studies, tools demonstrations, and lessons learned
- Emphasis on industry implementation and business value

**Moderator**
Ray Topping, Fiatech

**Panel**
Shanaya Averill, Dow Chemical  
Todd Sutton, Zachry
Advanced Practices for Field Automation

Implementation Session Slides

Advanced Practices for Field Automation
Implementation Session

Fiatech
Ray Topping, Fiatech Director
Shanaya Averill, Dow Chemical
Todd Sutton, Zachry

2013 Annual Conference Celebrating 30 Years Leadership, Research, Collaboration, Improvement

Tablets are a Strong Driver in Advancing Field Automation

How much, what percent, of the combined PC and Tablet sales in 2012 was sales of Tablets?

A. 50%
B. 75%
C. 80%
D. 90%

Field Automation Projects and Advancements Increasing Productivity and Efficiency

- Fiatech Projects
- Projects with our partner COMIT
- Dow Chemical Advancements
- Zachry Advancements
- CCC Advancements
Field Automation Projects and Advancements
Increasing Productivity and Efficiency

Fiatech’s Project
– Real Time Field Reporting Project
– Augmented Reality Project
– RFID Access Control Systems, Case Study
– Enhancing Productivity through Materials Management

• Projects with our partner COMIT
  – Mobile IT Community of Interest
  – BIM for Mobility
  – Solution Directory

Real Time Field Reporting Using Smart Devices

Real Time Field Reporting Using Smart Devices
Project Participants
### Progress and Delivered Results

**Real Time Field Reporting Using Smart Devices**

- User acceptance survey May – June 2011
- Field Pilot Studies July 2011
- Analyzed data and Prepared initial report
- Document case studies from Field Pilot Studies - February 2012
- Compiled list of available Smart Devices with comparison of features

---

#### Smart Device Comparison Chart

<table>
<thead>
<tr>
<th>Feature</th>
<th>Device A</th>
<th>Device B</th>
<th>Device C</th>
<th>Device D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Form Factor</strong> – Tablet or Handheld</td>
<td>Tablet</td>
<td>Tablet</td>
<td>Tablet</td>
<td>Handheld</td>
</tr>
<tr>
<td><strong>Screen</strong></td>
<td>HD</td>
<td>HD</td>
<td>HD</td>
<td>HD</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>Small</td>
<td>Medium</td>
<td>Large</td>
<td>Large</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Touchscreen</td>
<td>Touchscreen</td>
<td>Touchscreen</td>
<td>Pen Stylus</td>
</tr>
<tr>
<td><strong>Interface</strong></td>
<td>USB</td>
<td>Bluetooth</td>
<td>WiFi</td>
<td>Bluetooth</td>
</tr>
<tr>
<td><strong>Sunlight</strong></td>
<td>Resistant</td>
<td>Resistant</td>
<td>Resistant</td>
<td>Resistant</td>
</tr>
<tr>
<td><strong>Durability</strong></td>
<td>Waterproof</td>
<td>Shockproof</td>
<td>Fireproof</td>
<td>Fireproof</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>3G</td>
<td>4G</td>
<td>5G</td>
<td>5G</td>
</tr>
<tr>
<td><strong>Battery</strong></td>
<td>8 hours</td>
<td>10 hours</td>
<td>12 hours</td>
<td>14 hours</td>
</tr>
</tbody>
</table>

---

#### Smart Device Comparison Chart

- **Security**
  - Physical
  - Remote Wipe
  - Electronic
- **Interfaces and Sensors**
  - Camera
  - RFID Reader
  - Barcode Scanner
- **GPS**
- **Power**
  - Charging Time
  - Battery Usage Time
Notes

Smart Device Comparison Chart

- Form Factor – Tablet or Handheld
- Screen
- Durability
- Communication
- Security
- Interfaces and Sensors
- Power

Productivity and Efficiency Benefits for Real Time Field Reporting Using Smart Devices

- Enhances field and office communication - speed and understanding/clarity
- Streamlines data collection processes – more efficient, saves time
- Allows real-time access to most up to date information in the field – improving productivity
- Eliminates need for paper-based communication systems - reduces errors
- Significantly reduces time required to sync written field comments and digital data.
- Reduction in errors & missing data transfer
- Results in significant time & cost savings

Advancing Asset Knowledge Through the Use of Augmented Reality Technologies

Augmented Reality presents a view of a physical, real-world environment augmented by computer-generated input

- Project Objective: demonstrate innovative technology
- Three proof-of-concept trials and test beds that evaluated the application of this technology for the construction industry
Augmented Reality – Benefits Realised to Date

- Improves Tracking and Determining Logical Placement of Onsite Materials
- Tracking of Personnel
- Verification of Progress & Schedule Look-ahead
- Safety Measures:
  - Simulates Site Walkthroughs to Support Safety Training
  - Provides Simulation Training for Operators
- Improves Design Techniques (Ex. Visually Anticipating Signal Sites in lieu of Field Testing for rail companies - London rail case)

What are the Operational Efficiency and Carbon Footprint rates?

- Action: Digging, Location: X, Y, Z
- Resource: Excavator, CAT, 320e
- Workers too close to the Equipment?
- Crew balance chart?
- Occupational Health of the workers?

World Trade Center Construction Site – NYC, 2011

Provided by Mari Golparvar-Fard, Ph.D.
University of Illinois at Urbana-Champaign

Progress Monitoring Based on BIM and Site Imagery

- 3D BIM
  - AIA 200-2008 BIM Protocol
  - Binding e.g., in Wisconsin
- Time-Lapsed Photos
  - Single viewpoint
  - Dependent information
- Daily Construction Photos
  - Easy and Cheap to collect
  - Shows progress from different viewpoints

Provided by Mari Golparvar-Fard, Ph.D.
University of Illinois at Urbana-Champaign
Visualization of Construction Progress Monitoring

Detection of progress deviation
I. Superimpose as-planned model and extract relevant image parts
II. Analyze progress
III. Visualize progress deviations

Traffic-Light Color Coding Metaphor

- Ahead of Schedule
- On Schedule
- Behind Schedule

e.g., Color presentation of progress deviations

Augmented Reality – Future Potential Benefits

Construction
- Confirm Installation Locations
- Locate Construction and Project Component Details
- Locate Installation Instructions and Guidance Notes
- Interface and Clashing Issues
- Address Public Inquires and Planning

Operation and Maintenance
- Availability of Asset Data
- Integrating Operational and Maintenance Manuals
- Visual Illustration of Maintenance Activities
RFID Access Control International Case Study
Project Description

Two case studies demonstrate needs and benefits of an access control solution for construction sites to meet project management and client requirements for reliable control of personnel access.

RFID Access Control - Benefits and Opportunities

- Improvements in tracking and controlling attendance and access to project sites through the use of RFID technology.
- Ensure valid and accurate work hours of each employee registered in the project’s timekeeping software system.
- Improved security measures.
- Reduced time spent monitoring project site access.
- Reduced labour queues at site gates.
- Increased available productive work hours.
- Labour hours easily calculated.

The Big Question – How Much Did it Save?

- Greater return on productive work hours
  - Saving approximately $6500/month

- Accurately Calculated Work Hours
  - Savings Approximately $19,500/month

- RFID – Active Reader Total Savings
  - Savings Approximately $26,000/month
Notes

How many separate documents (e.g. drawings, contracts, plans, purchase orders, RFIs, schedules, etc.) does a typical $100 million building project generate?

A. 60,000  
B. 110,000  
C. 160,000  
D. 210,000

Field Automation Projects and Advancements  
Increasing Productivity and Efficiency

Fiatech’s Project
– Real Time Field Reporting Project  
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– Enhancing Productivity through Materials Management

• Projects with our partner COMIT  
  – Mobile IT Community of Interest  
  – BIM for Mobility  
  – Solution Directory

Mobile IT Community of Interest

• Joint Initiative of Fiatech and COMIT, UK based group for Construction Opportunities for Mobile IT  
• Collaborate & leverage Mobile IT advanced practices  
• Share successful Mobile IT solutions including hardware, software, implementation experience and lessons learned  
• Advance capital projects industry implementation of Mobile IT  
• Demonstrable business value and ROI  
• Examples of Project sharing in this presentation from COMIT, CCC, Dow Chemical and Zachry
BIM for Mobility

- Collaborative working group for Information mobility development for the construction industry.
- Provide direct link between data sharing and elements of technology at site including as built info, mobility and modelling 3D, 4D and beyond
- Gathering of best practice information

Primary Focus

- Achieve cross industry technology adoption
- Facilitate industry wide processes improvement and investment in innovation
- Promote efficiencies and deliver savings

Key Participants, BIM for Mobility

Specific technologies

- Redlining pen and tablet pc – as built data capture
- Augmented reality
- Real time field analysis and reporting
- Document retrieval and form completion
- 3D and 4D modelling software

Benefits from BIM for Mobility

- Reduced design rework
- Reduced construction rework
- Reduced downtime
- Up to date information sharing
- Fewer inputting errors
- Empowered and informed workforce
- Improved planning technique
- More timely and accurate commercial valuation
- Faster throughput of application invoicing
- Less queries arising
- Reduced risk
- Increased margins
- Happy Clients
Notes

Field Automation Projects and Advancements
Increasing Productivity and Efficiency

- Dow Chemical Implementation of
  - Panasonic Toughbooks – plenary session
  - Enterprise i-Phones
  - Field Cameras
  - Mobile Solutions Expertize Center
- Zachry Implementation of
  - 3D Model tools for the iPad
  - 123 PUNCH list Process
- CCC Implementation of
  - Mobile IT – pen based timesheet solution,
  - Pipeline management on hand held devices –
    Australia
  - 3D Models for AWP

Dow Chemical – Enterprise Phones

Problem: Wanted faster more portable access to Dow email & calendar

Opportunity: Construction personnel & leadership were eager to enhance and streamline their jobs to create value for the businesses resulting in:
  - Increased productivity
  - Increased safety performance
  - Reduced cost
  - Reduced cycle time

Objective statement: Provide Construction Personnel with an Enterprise Phone.

Evaluation and Selection

Process followed:
1. Facilitated focus groups
2. Evaluated & compared Dow approved industry solutions
3. Worked with corporate IS organization to gain buy in
4. Conducted a pilot of 8 units
5. Rolled out ~65 units domestically for Construction
6. Implementation outside of US
Dow Chemical – Enterprise iPhones

Hardware Selected
• Apple iPhone 4 with OtterBox Cases
  – Deployed ~65 Enterprise iPhones for Construction Managers
  – Allow for real-time access to corporate:
    • E-mail
    • Calendar
    • Tasks
    • Dow’s Global Address Book
    • Intranet access
    • SharePoint access
    • Instant Messaging (coming soon)
    • Included a wireless hotspot

Providing Significant Benefit and Cost Savings
• Estimated savings of over $1 MM/yr based on 65 people
  saving 1 hr/day

Enterprise iPhones
Many other beneficial iPhone apps exist to assist in the field:
• Weather
• View attachments & pdf’s
• Google Earth
• Maps
• Camera
• Video Recording
• Facetime/Skype – Video Conferencing
• Compass
• Unit Converter
• Flashlight
• Voice Memos
• Calculator
• Bar Code Scanner
• World Clock
• Alarms
• Check flight status
• etc.

Dow Chemical – Field Cameras

Problem: Construction Personnel need to take many pictures in the field during the construction phase. It is very time consuming to then download them and find ways to share them with the necessary people.

Opportunity: Construction personnel & leadership are eager to enhance and streamline their jobs to create value for the businesses resulting in:
• Increased productivity
• Increased safety performance
• Reduced cost
• Reduced cycle time

Objective Statement: Provide Construction Personnel with an automated method for taking & downloading photographs of the jobsite at a regular timed interval on a daily basis. A 3rd party hosted website should then allow anyone with permission to view the photographs.
Dow Chemical – Field Cameras

Process followed:
1. Searched the web to understand the best vendors & their solutions
2. Evaluated & compared each solution
3. Consulted with our Dow IS architect
4. Selected a vendor
5. Conducted a Risk Assessment with Dow’s corporate IS organization
6. Find a project to conduct a pilot on
7. Finalize a global standard process for future projects
8. Leverage cameras & solution to other projects as the need arises

Notes

Vendor Selected – EarthCam

• Highlights of the solution
  – Expanded visibility of construction progress
  – Past & present pictures available anytime for anyone with access
  – Security
    • Robust user management controls = Low risk
  – Shorten communication time
    • Photos can be viewed from desk & potential safety issues identified & communicated via phone
  – Numerous options
    • Variety of customization options
    • Customer can be hands on or hands off with solution
  – Value/ROI created: TBD

Dow Chemical – Field Cameras

Vendor – EarthCam
Notes
ArcelorMittal Dofasco – Capital Process Case Study

Case Study: ArcelorMittal

Learning Objectives

- Understand how a company-wide capex process increases the likelihood of successful investments.
- Learn how ArcelorMittal approach implements a company-wide capex process across its Flat Carbon Americas program.
- Know how to deploy a joint project manager-manufacturing process manager model for capex development and implementation.
- Be aware of how integrating engineering, maintenance, and operating resources into a team enables safer, faster, and more sustainable start-ups.
- Realize that project processes deliver value for projects on emergency, fast-track, and conventional timelines.

Plenary Session Abstract

Soon after the 2006 merger of Mittal Steel and Arcelor, the newly formed ArcelorMittal combined its technology and procurement departments to introduce a new company framework called the Capital Investment Projects Methodology (CIPM). Since its introduction, CIPM has provided a consistent, centralized guideline for the effective and efficient delivery of increasingly challenging capital projects. The success of this new methodology is largely due to its dual assignment of responsibility to the project manager and the manufacturing process manager; in this session, the speaker will introduce CIPM and briefly discuss this unique structure for project leadership. The presenter will also explain how the CIPM guideline has been enhanced since its introduction, and how it has led to the delivery of a sustainable training program across ArcelorMittal Flat Carbon Americas.

Implementation Session Abstract

This session will discuss ArcelorMittal’s Capital Investment Projects Methodology (CIPM), a guideline that—by establishing a common approach and leveraging benchmarks—drives efficient and profitable project delivery. The panelists will show how this methodology promotes robust planning early in the project lifecycle, when the ability to influence positive change is relatively high and the cost of making such changes is relatively low. The presenters will also explain how CIPM provides a consistent framework for project reviews and authorization, and meets corporate approvals.

The panelists will relate the CIPM structure to ArcelorMittal’s belief that, to ensure successful investment, organizations must wholly engage their functions and resources; these include operations, maintenance, process technology, engineering, purchasing, and finances. The panel will explain how this total engagement is made possible by the CIPM’s establishment of shared responsibilities between the project manager and manufacturing process manager.
The session will also focus on how—to overcome the barriers to instituting a company-wide project management system, particularly after a merger—ArcelorMittal contracted with The University of Texas at Austin to quickly develop the CIPM training program, adapting CII Best Practices and other industry best practices. The speakers will highlight several high-value best practices and give details on the implementation planning and rollout of the CIPM program in the company’s operations in Mexico, Canada, Brazil, and the United States. The session will close with a discussion of the challenges of introducing CIPM across North and South America.

**Plenary Session Presenter**

**George Atlija**, Manager, Capital Project Controls – ArcelorMittal Dofasco, Inc.

George Atlija has been with ArcelorMittal Dofasco for 27 years, and currently serves as Manager of Capital Project Controls for ArcelorMittal Dofasco, at the company’s Hamilton, Ontario, operations. Atlija has over 25 years of project management experience, having managed capital projects in a variety of ArcelorMittal’s manufacturing business areas. In his present role with the firm, he is responsible for providing value-added services as the process owner of the Capital Investment Projects Methodology (CIPM). CIPM is a formalized approach to delivering engineering and construction projects across all of ArcelorMittal’s operations. Atlija provides CIPM training and mentoring to internal and external project team members, offering them guidance as they develop and integrate project controls. He also works with the company’s capital planning manager, project teams, and purchasing and financial personnel to routinely review, strategize, and modify capex portfolio spending for planned and approved projects. Atlija is also currently serving as Chair of the Project and Construction Management Technology Committee for the Association for Iron and Steel Technology. He graduated with a B.S. degree in mechanical engineering from McMaster University in Canada, and is a registered professional engineer in the Province of Ontario.

*e-mail: george.atlija@arcelormittal.com*

**Implementation Session Moderator**

**George Atlija**, Manager, Capital Project Controls – ArcelorMittal Dofasco, Inc.

*e-mail: george.atlija@arcelormittal.com*

**Panelists**

Douglas K. Eastman, General Manager, Engineering & Maintenance Technology – ArcelorMittal

*e-mail: doug.k.eastman@arcelormittal.com*

Thomas W. Szkut, Senior Project Manager – ArcelorMittal Dofasco, Inc.

*e-mail: tom.szkut@arcelormittal.com*
ArcelorMittal Dofasco – Capital Process Case Study

Plenary Session Slides

ArcelorMittal Dofasco
Capital Process Case Study

George Attila
ArcelorMittal Dofasco

2013 Annual Conference
July 20-22 - Ontario

ArcelorMittal Group Structure

The Challenges That We Faced ...

ArcelorMittal New Global Company:
• Operations in 20 Countries
• Various Capex Models
• Diverse Capabilities

Project Results Inconsistent:
• Fail to Plan is a Plan to Fail
• Scope Creep into Scope LEAP
• Cost and Schedule Overruns

Our Response
Best Practices
CIPM
Notes

What is CIPM

- Consistent centralized process for the development and implementation of Capital Investments

<table>
<thead>
<tr>
<th>Capital Investment Projects Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>Investment Development</td>
</tr>
<tr>
<td>Funding Approval</td>
</tr>
</tbody>
</table>

Launching CIPM

How do you roll out CIPM across four countries with different languages, cultures, and degrees of capex experience?

CII implementation Planning Model: Steps to Success

Implementation Challenges: Multi-sites and Countries

- Limited Time
- Should CII be brought to bear?
- Why CII? Best Practices developed from leading-edge research that directly improves project performance
ArcelorMittal – Capital Process Case Study

- The implementation of a central capital process in a newly merged heavy industrial corporate environment
- The three areas of the Capital Investment Project methodology:
  - development and unique aspects
  - approach used to implement
  - lessons learned and results

Come to our Implementation Session

Moderator

George Atlija, Manager, Capital Project Controls
Engineering and Maintenance Technology
ArcelorMittal Dofasco

Panel

Doug Eastman, General Manager
Engineering and Maintenance Technology
ArcelorMittal Dofasco

Tom Szkut, Senior Corporate Project Manager
ArcelorMittal Flat Carbon Americas
ArcelorMittal Dofasco – Capital Process Case Study

Implementation Session Slides

Notes

ArcelorMittal Dofasco
Capital Process Case Study

George Attija, Manager, Capital Project Controls
Engineering and Maintenance Technology
ArcelorMittal Dofasco

2013 Annual Conference
July 20-23 • Orlando
Celebrating 30 Years
Leadership, Research, Collaboration, Improvement

ArcelorMittal – Capital Process Case Study

• The implementation of a central capital process in a newly merged heavy industrial corporate environment

• The three areas of the Capital Investment Project Methodology:
  – development and unique aspects
  – approach used to implement
  – lessons learned and results

Implementation Panel

Moderator:
George Attija, Manager, Capital Project Controls
Engineering and Maintenance Technology
ArcelorMittal Dofasco

Panel:
Doug Eastman, General Manager
Engineering and Maintenance Technology
ArcelorMittal Dofasco

Tom Szkut, Senior Corporate Project Manager
ArcelorMittal Flat Carbon Americas
Agenda

- George Atlija
  - ArcelorMittal Dofasco Background
  - Case for Action
  - ArcelorMittal Response
  - What is Capital Investment Projects Methodology
- Tom Szukut:
  - How Capital Investment Projects Methodology training was launched
- Doug Eastman:
  - How the Process was made more Practical
  - Results from several ArcelorMittal Dofasco projects

ArcelorMittal Group Structure

Background

- Through the use of the latest technology Dofasco was consistently profitable
Notes

Background

- In 2006 Dofasco was acquired by Arcelor
- In 2007, Mittal Steel and Arcelor merged,
- Now different countries, cultures and capex models with different contracting styles

ArcelorMittal Response

- Capital Investment Projects Methodology framework combined with best practises
- Develop and deliver a sustainable, adult learner training program
- Provide a centralized guideline for:
  - Project selection
  - Project development
  - Implementation

Why Implement CIPM?

- Better portfolio management
- Better assessment of investment opportunities
- Better alternative selection leading to better technical solutions
- More consistent preparation of investment files and supporting information
What is CIPM

- Consistent centralized process for Capex development and implementation

<table>
<thead>
<tr>
<th>CIPM Training</th>
<th>Project Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>File Development</td>
<td>Implementation</td>
</tr>
<tr>
<td>Common 80%</td>
<td>40 – 50% Equipment</td>
</tr>
<tr>
<td>Site Specific 20%</td>
<td>60 – 50% E&amp;C</td>
</tr>
</tbody>
</table>

CIPM Improves the Likelihood of Successful Investments

- Enables selection of the right projects
- Drives proper implementation of projects chosen, increasing likelihood of high returns
CIPM Improves the Likelihood of Successful Projects

- Engagement of all parts of the organization including operations, maintenance, process technology, engineering, purchasing and financial resources
- Right Project
- Right People
- Right Scope
- Right Schedule
- Right Price

One Key Aspect of CIPM

- Dual leadership roles shared between project manager and manufacturing process manager

Efficient relationship between both partners is a KEY factor of success

Organization Chart – Investment Development
What does the Manufacturing Process Manager Do?

- Defines the industrial objective
- Creating an interface between the project and the Operations and Maintenance departments
- Providing the voice of Manufacturing during the design and engineering phase
- Looks for decreasing the operational cost and increasing profits.
- Validates the functional description.

What does the Manufacturing Process Manager Do?

- Interface between the operational department and build-up of the “Plant Assigned” Teams
- Ensures Operational and Maintenance readiness to operate and maintain the new facility prior to start up
- Ensures training is provided to the maintenance and operational personnel for a successful start up
What does the Project Manager Do?

- Determine alternate technical solutions
- Define engineering team roles and responsibilities
- Manage the technical interface with the suppliers.
- Manage schedule and budget
- Is in charge of the design, manufacturing, installation and cold commissioning
- Support the Manufacturing Process Manager during hot commissioning and ramp up phases

Launching CIPM

How do you roll out Capital Investment Projects Methodology across four countries with different languages, cultures, with diverse capex experience?

CII Implementation Planning Model: Steps to Success

Launching CIPM

Change Audit reinforced the need for employee educational opportunities:

- Mexico
- Brazil
- Canada
- USA
CIPM Training: Multi-sites and Countries

- Needed professional adult education
- Selected the Center for Lifelong Engineering Education at The University of Texas at Austin
- Combined best practices from University of Texas, ArcelorMittal, and CII
- Why CII? Best Practices developed from leading-edge research that directly improves project performance.

Who - Will be Trained?

People from:
- Engineering
- Operations Technology
- Maintenance
- Purchasing
- Marketing
- Capital Controls
- Financial

How - Training Methods

- Combination of Lecture (60%) and Case Studies (40%)
- Groups of 4-5 people, maximum 5 groups per session
- Supported by participating Flat Carbon America subject matter experts with peer review conducted on all material
Notes

Growing CIPM

- Peer Reviews by Flat Carbon America subject matter experts

Initial Pilots May to June 2012

<table>
<thead>
<tr>
<th>Segment</th>
<th>Initiating (Leadership)</th>
<th>Growing (Practitioners)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>UT</td>
<td>UT</td>
</tr>
<tr>
<td>Canada</td>
<td>UT</td>
<td>Train the Trainer</td>
</tr>
<tr>
<td>Brazil</td>
<td>UT</td>
<td>Train the Trainer</td>
</tr>
<tr>
<td>USA</td>
<td>UT</td>
<td>Train the Trainer</td>
</tr>
</tbody>
</table>

Initiating CIPM

- First graduating class in Mexico

How to make CIPM more Practical

- Flexibility is key, the 7 stage rigorous process is designed for conventional timeline projects.
- Mature heavy manufacturing industries need to be adaptable when business drivers demand:
  - Emergency responses to major sentinel events
  - Fast Track approaches to pursue market opportunities
  - Conventional track to maximize likelihood of success
  - Start then Stop and Start
How to make CIPM more Practical

- To help project teams develop Investment Files and right size front end planning that will result in projects being delivered on time, on budget and to expectations
- To ensure “fit for purpose” during the front end planning phase with the right balance between risk and resources

Formal planning sessions to streamline front end planning

How to make CIPM more Practical

Discuss the following to characterize complexity:

**Organization**
- Assumptions
- Constraints

**Project**
- Feasibility
- Timeline
- Manufacturing Process Technology
- Equipment, Buildings, Material Handling & Infrastructure
- Sourcing
- Implementation & Manufacturing Risk

How to make CIPM more Practical

<table>
<thead>
<tr>
<th>Relative Complexity</th>
<th>Gate Approval</th>
<th>% Number of Projects</th>
<th>% Portfolio Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>4</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>Medium</td>
<td>3 &amp; 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>2, 3 &amp; 4</td>
<td>20</td>
<td>80</td>
</tr>
</tbody>
</table>

Most projects will require only Gate 4 approval
Few projects require all gates approval
How to make CIPM more Practical

Examples of possible Investment File requirements and follow ups:

- Steering Committee formation
- Asset Risk Management review
- Environmental Permits Checks
- Business Case Review
- Benchmarking
- Resourcing – Team Members
- Central Technology Office - Technical Validations
- Range Estimating – Cost
- Specific Health & Safety Plan
- Commissioning Plan
- Construction Readiness Review
- Project Definition Rating Index
- Quality Management
- Alignment Thermometer
- ArcelorMittal Global Sourcing
- Risk Assessment - FMEA, HAZOP

Project Results

- ArcelorMittal Dofasco projects
  - Pulverized Coal Injection Plant
  - Annealing Improvement Program
  - No. 3 Blast Furnace Restart

- From Fastrack to Conventional CIPM approach

Project Results – ArcelorMittal Dofasco

- Pulverized Coal Injection Plant

OEM Benchmark

Minimized Process
160 kg/ton
To
140 kg/ton

Minimize Building

Assume procurement of process equipment

(Bar charts and graphs showing process improvements and stages of implementation.)
Project Results – ArcelorMittal Dofasco

• Annealing Improvement Program

Project Results – ArcelorMittal Dofasco

• No. 3 Blast Furnace Restart

Project Portfolio Results

• ArcelorMittal Dofasco historical data used for portfolio analysis

• 290 “small and medium” projects with a capex spend of $850M carried out between the 2006 to 2012

• Investment File Target vs. Actual Results:
  – Project Safety
  – Project Scope
  – Project Schedule
  – Project Budget
  – Project Benefit
Notes

### Project Portfolio Results

<table>
<thead>
<tr>
<th>Area</th>
<th>Data</th>
</tr>
</thead>
</table>
| Scope   | 90% of the scope achieved  
92% of all projects were completed to at least  
95% of the scope |
| Schedule| 94% of the projects were completed no more than 10% over the original schedule  
Note: 10% late = 5 weeks on 1 year project |

### Project Portfolio Results

<table>
<thead>
<tr>
<th>Area</th>
<th>Data</th>
</tr>
</thead>
</table>
| Budget | 90% of the projects were completed no more than 10% over the budget  
85% of all projects were completed within +/- 10% of the budget |
| Benefit| 97% of the projects achieved at least 90% of the benefits             |

**Overall Capital Budget Performance**  
Budget vs. Actual difference < 0.5%

### Common Causes of Problems Encountered

- Inadequate understanding of:  
  - Manufacturing process / constraints  
  - Risk management tactics when implementing new technology  
  - Scope resulting in poor design development  
  - Impact to existing operations when integrating new equipment with existing equipment  
  - Interferences and constraints with existing facilities when adding new equipment
- Inappropriate vendor/equipment selection
Summary

• To improve the likelihood of successful investments:
  – First priority is selecting the Right business case
  – Second priority is selecting the Right project and technology
  – Third priority – Do It Well – with Effective start ups
  – Company process with checks and balances
• Dual leadership roles shared between project manager and manufacturing process manager
• Process practical relative to Engineering and Construction operating model and project environment

Q & A

1. Why have 2 people (dual) lead the project?
2. How do you deal with conflict between the PM and MPM?
3. What are the steering committee, sponsor and client roles?
4. Why train the trainer?
5. How much detail came with the CIPM framework that was introduced following the AM acquisition?

What does the Project Buyer Do?

• Manages globally supplied process equipment purchases
• Looks for synergies with the central corporate procurement department
• Defines the purchasing strategy
• Considers low cost country sourcing options
• Leverages purchasing power
Notes

What does the Client Do?

• Prioritizes project selection
• Provides high level justification for project
• Provides input to the Industrial and approves Industrial Objective
• Verify project deliverables for each stage
• Facilitate and support identification of resources
• Review project status periodically

What does the Sponsor Do?

• Senior Management representative
• Prioritizes project selection
• Owns Accountability for project success and Approves the Investment File
• Leads Steering Committee (large projects)
• Removes barriers
• Verify project deliverables for each stage and review project status periodically

What does the Steering Committee Do?

• Project strategy identification/definition
• Help remove barriers
• Facilitate / support team resources, as needed
• Review project status periodically
• Verify project deliverables for each stage
Learning Objectives

• Understand that current hazard recognition is poor.

• Recognize that hazard recognition is fundamental to effective safety management.

• Be aware of three new strategies that dramatically increase hazard recognition skills.

• Learn why augmented reality is the future of safety training.

• See how field testing (experiments) can be done for safety.

Plenary Session Abstract

Hazard recognition is an important workplace skill, and many safety processes (e.g., pre-job safety analysis and safety observations) rely on it for effective workplace hazard identification and mitigation. Yet, as the work of RT 293 shows, hazard recognition among construction workers is relatively poor, with workers only able to identify fewer than half the jobsite hazards that they encounter. The presenter will first give an overview of three hazard recognition improvement strategies that the research team researched, developed, and field-tested at six different project sites. He will then present the team’s finding that the ability of work crews to identify hazards can be significantly improved through the use of these simple techniques.

Implementation Session Abstract

The panel in this session will review the RT 293 methodology for selecting and developing the hazard recognition improvement strategies it tested in this research. The panelists will highlight the field testing results and then demonstrate each strategy.
Plenary Session Presenter

James Duncan, HSE Director – Jacobs

Jim Duncan is a corporate HSE director for Jacobs Engineering and has worked in various engineering, project management, operations management, and safety roles for Jacobs during his 25 years with the company. In his current role, Jim leads many facets of the Jacobs safety program, which includes developing and sustaining the HSE Management System, providing specialty HSE support to projects globally, and providing construction safety leadership and training support to a major client. Duncan earned a B.S. in mechanical engineering from Tennessee Technological University in 1981. He is a Registered Professional Engineer in Tennessee, and is a Certified Safety Professional. He also holds a Project Management Professional certification from the Project Management Institute, and is a Certified Reliability and Maintainability Professional.

e-mail: jim.duncan@jacobs.com

Implementation Session Moderator

James Duncan, HSE Director – Jacobs

Panelists

Alex Albert, Graduate Research Assistant – University of Colorado
  e-mail: alex.albert@colorado.edu

Darrell W. Dumas, Senior Safety Consultant – ConocoPhillips
  e-mail: darrell.w.dumas@conocophillips.com

Heriberto Feliciano, Senior Construction Manager – Zachry
  e-mail: hfeliciano21@yahoo.com

Matthew Hallowell, Assistant Professor and Bevers Faculty Fellow – University of Colorado
  e-mail: matthew.hallowell@colorado.edu

Brian M. Kleiner, Professor and Director – Virginia Tech
  e-mail: bkleiner@vt.edu
Improving Hazard Recognition in Construction

Plenary Session Slides

Strategies for HSE Hazard Recognition

Jim Duncan, Jacobs
Research Team 293

Research Team 293, Strategies for HSE Hazard Recognition

Carlos Adams, Chevron
Alex Albert, University of Colorado
John Barry, SABIC
Cecil W. Chapman, Jr., Shaw Group
Ao Chen, Virginia Tech
Earl Collins, CH2M HILL
Danny T. Deighton, Eli Lilly and Company, Vice Chair
Kelly Doughty, Chevron
Cristiano Duarte, Petrobras

Darrell W. Dumas, ConocoPhillips
James Duncan, Jacobs, Chair
Heriberto Feliciano, Zachry
Matthew Hallowell, University of Colorado
Brian M. Kleiner, Virginia Tech
Michael D. Newkirk, Fluor
Esua Perez, Chevron
Robert Rubsam, Bilfinger
Industrial Services

Why is hazard recognition important..?

Jobsite Safety Assessment (JSA)
Safety Audits
Worker Observation

As we will show, workers are only able to recognize 45% of workplace hazards.
“Which practices, techniques, and processes are effective for establishing and improving hazard recognition in the construction industry?”

Overview of research methodology

- **Exploratory Phase**: Develop strategy and field testing protocol
- **Development Phase**: Experimental field testing of developed strategy on active work crew
- **Field Testing**: Analysis of field data and reporting of field testing experience
Training Strategy: SAVES

Improving Hazard Recognition in Construction

Notes
Notes

Planning Strategy: SMQM

Execution Strategy: HIT Board

Meaningful Research with High Industry Impact

- Researched, developed, and empirically tested three innovative strategies for hazard recognition.
- All three strategies led to significant, measurable improvements.
- Conducted rigorous safety field tests
  - 100 participants from eight craft disciplines
  - 100 days of field tests
  - six sites in five different states
**Bottom line...**

- On average workers are only able to identify 45% of hazards that they will encounter during a work-day.

- We have researched, innovated, and tested three strategies that can improve hazard recognition by from 45% to 73% with more than 99% confidence.

---

**Come to our Implementation Session**

**Moderator**

Jim Duncan, Jacobs

**Panel**

Alex Albert, University of Colorado - Boulder  
Darrell Dumas, ConocoPhillips  
Heriberto Feliciano, Zachry Industrial Inc.  
Matthew Hallowell, University of Colorado - Boulder  
Brian Kleiner, Virginia Tech
Improving Hazard Recognition in Construction

Implementation Session Slides

Notes

Strategies for HSE Hazard Recognition
Research Team 293

2013 Annual Conference
Celebrating 30 Years
Leadership. Research. Collaboration. Improvement

RT 293 Team

Jim Duncan, Jacobs
Darrell Dumas, ConocoPhillips
Heriberto Feliciano, Zachry Industrial Inc.
Michael Neuhart, Place
Matt Hallowell, University of Colorado
Brian Kline, Virginia Tech
Cecil Chapman, CH2M
Bob Dobson, Hilgart Industrial Services Inc.
Cristiano Davide, Petronas
Anita Gara, Virginia Tech
Art Albert, CU Boulder

RT 293 Panelists

- Jim Duncan, Jacobs
- Dr. Matt Hallowell, University of Colorado - Boulder
- Dr. Brian Klener, Virginia Tech
- Darrell Dumas, ConocoPhillips
- Heriberto Feliciano, Zachry Industrial Inc.
Essential Research Question

“Which practices, techniques, and processes are effective for establishing and improving hazard recognition in the construction industry?”

Hazard Recognition Test

Why is hazard recognition important...?

High injury rates in the construction industry are partly due to workers’ inability to recognize hazards.
### We Struggle with Hazard Recognition

- On average workers are only able to identify 45% of hazards that they will encounter during a work-day.

- Why?
  - Lack of training
  - Lack of experience
  - Lack of communication
  - Changes in task/conditions
  - Inattentiveness
  - Cognitive limitations
  - Others?

### Overview of Research Method

**CII RT293**

- **Overview of research method**
  - Identify innovative and effective hazard recognition strategies
  - Experimental field testing of developed strategy on active work crew

- **Phases**
  - **Exploratory Phase**
  - **Development Phase**
  - **Field Testing**
  - **Analysis and Reporting**

- Develop strategy and field testing protocol
- Analysis of field data and reporting of field testing experience
Comprehensive survey of existing methods

- Past Research in Construction
- Past research military, aviation, mining, etc.
- Survey of CII companies
- Research team brainstorming “out of the box”

Over 100 strategies identified

Prioritizing Hazard Recognition strategies

- Goal: Identify the three most promising strategies that may transform construction hazard recognition

- Criteria:
  1. Active
  2. Testable
  3. Minimizes disruption
  4. Easily implemented
  5. Ease of workforce training
  6. Scalable and adaptable
  7. Promotes scenario building
  8. Worker participation
  9. Transformative potential
Notes

Prioritizing using Nominal Group Technique

- Each strategy was rated on 1-10 scale after 3 rounds of discussion
- Professional meeting facilitator
- Grouputer

Subcommittee Development of 3 Strategies

1. Training: System for Augmented Virtuality Environment Safety (SAVES)
   - BIM model, >500 photographs, identified hazards
2. Planning: Safety Meeting Quality Measurement (SMQM)
   - Rubric content developed w/group brainstorming
3. Execution at worksite: Hazard Identification and Transmission Board (HIT Board)
   - Full-scale prototype built by team and vendor

Energy Mnemonics for “Situational Awareness” within the Environment

- A condition or action that has the potential for an unplanned release of, or unwanted contact with, an energy source that may result in harm or injury to people, property, or the environment.
System for Augmented Virtuality Environment Safety (SAVES)

CII RT293

Learning Objectives

• What is SAVES?

• Implementation Process

• Benefits

What is SAVES: “System for Augmented Virtuality Environment Safety”

SAVES is a team training simulation that makes learning to identify potential hazards in construction fun, while being in a safe environment.
What is SAVES?

1. No observable issue
2. Potential hazard/poor practice
3. Immediate action required to prevent or treat

<table>
<thead>
<tr>
<th>Energy/Severity</th>
<th>1 (Green)</th>
<th>2 (Yellow)</th>
<th>3 (Red)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Biological</td>
<td>A-1</td>
<td>A-2</td>
<td>A-3</td>
</tr>
<tr>
<td>B Chemical</td>
<td>B-1</td>
<td>B-2</td>
<td>B-3</td>
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<tr>
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<tr>
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<tr>
<td>J Temperature</td>
<td>J-1</td>
<td>J-2</td>
<td>J-3</td>
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</tbody>
</table>

SAVES is a team training game that makes learning to identify potential hazards in construction fun, while being in a safe environment.

- Human factors engineering
  - BIM Selection
  - Conceptual Design
  - Search tasks
  - Decision tasks
  - Hierarchy of controls
  - Feedback schemes
  - Avatar requirements
  - Interface design
  - PPE
  - Photo integration
  - Training scenarios

- Programming
  - Physical design and rendering
  - ZBrush
  - JDSMax
  - Photoshop
  - MAYA
  - Sketchup 7.0
  - UnrealScript
  - C++ KISMET

Implementation Process

1. Hazard Identification Training
2. SAVES Training
3. Cross-based Training
Notes

Benefits

- BIM Integration
- Team building and Interaction
- Communication
- Evaluation
- Gen Y desire for interactive training
- Combines identification with action

"I have not come across many other training programs that could engage workers for more than an hour like this tool does."

Company Safety Trainer

"After the training, the site evaluation process during permit release were more detailed and specific."

Safety Representative
Notes

Safety Meeting
Quality Measurement Tool (SMQM Tool)

Improving the Quality of the Pre-Job Safety Meeting

Pre-Job Safety Meetings

What Can We Do To Improve?
Define for the Supervisor...

“What a good pre-job safety meeting looks like”

SMQM Tool

Continuous Improvement Loop
SMQM Tool
Hazard Identification & Mitigation
Basic Steps
Identify the Job
Discuss Location
Supervisor Leadership
Crew Participation
Documentation
Evaluate
Job Changes

SMQM Tool Exercise

Discussion Location
Please make your selection...
1. Green (Mature)
2. Yellow (Less Mature)
3. Orange (Least Mature)
Supervisor Leadership

Please make your selection...
1. Green (Mature)
2. Yellow (Less Mature)
3. Orange (Least Mature)

Crew Participation

Please make your selection...
1. Green (Mature)
2. Yellow (Less Mature)
3. Orange (Least Mature)

Benefits

- Economical
- Adaptable
- Minimal Training Time
- Improves Communication...
  - Which improves Hazard Recognition

Implementation Aids:
- Training Presentation
- Supervisor Pocket Card
Notes

Safety Execution at The Workface Using The Hazard Identification and Transmission Board (HIT)

CII RT293

Learning Objectives

• What is HIT?

• Implementation Process

• Benefits

What is HIT?

Hazard Identification and Transmission Board
**Implementation Process**

- Identify the task
- Tools and Environment
- Hazard identification & Mitigation
- Permits and JSA
- Discussion Location
- Supervisor and Crew actions

**Notes**

**Benefits**
Notes

Benefits
- Provide clear visual information about the hazards
- Allows workers to assess and adjust their plan
- Increases the overall awareness
- Serves as a platform for workers-management interaction
- Directly involved workers with the safety planning

Field Testing
Many research projects stop there but....
How do we know these strategies really work?

Hypothesis: Each strategy causes a measurable improvement in hazard recognition skill
A new experimental method: Multiple Baseline testing

Multiple Baseline Testing Approach

Hazard recognition skill

Hazard recognition pre-test with photos
Improving Hazard Recognition in Construction

**Multiple Baseline Testing Approach**

Hazard recognition skill (HRS index) = 
# hazards identified before work begins
Total # hazards encountered during work

**Notes**
Multiple Baseline Testing Approach

For each strategy:
- 2 projects
- 3 crews per project
- At least 16 work periods

At least 2 members of the management team and one researcher
Multiple Baseline Testing Approach

- Choose appropriate mathematical model
  - Has a change in performance occurred?
  - Is the change likely to have occurred due to the intervention?
  - Is the change statistically significant?

Training: SAVES Case 1 Results

Training: SAVES Case 2 Results
Improving Hazard Recognition in Construction

Notes

Planning: SMQM Case 3 Results
Multiple baseline testing results

Planning: SMQM Case 4 Results
Multiple baseline testing results

Execution: HIT Case 5 Results
Multiple baseline testing results
Hazard Recognition Improvement Strategies

- We have researched, innovated, and tested three strategies that can improve hazard recognition by at least 28% with more than 99% confidence.

  SAVES – a training strategy

  SMQM – a planning strategy

  HIT – a worksite strategy

Closing

- Researched, developed, and empirically tested three innovative strategies for hazard recognition

- All three strategies led to significant, measurable improvements

- Conducted rigorous safety field tests
  - 100 participants from 8 craft disciplines
  - 100 days of field tests
  - 6 sites in 5 different states
Keynote Speaker

Steven R. Knowles, President – Wood Group Mustang

Steve Knowles has over 26 years of broad experience managing and executing all phases of domestic and international oil and gas projects. Knowles joined Mustang in 1990 and, prior to becoming president in 2006, he served in various roles, including Chief Operating Officer, Upstream Business Unit Manager, Project Engineering Department Manager, Project Manager, and Project Engineer. In these positions, he provided engineering, design, and project management services for global clients.

Knowles has oversight of more than 7,000 Mustangers and is in charge of operations in Mustang’s three regions and five business units: offshore; onshore; process plants and industrial; pipeline; and automation and control. Under Knowles’ leadership, Mustang performs worldwide project management, engineering, procurement, and construction services from offices in the United States, Latin America, United Kingdom, India, Malaysia, United Arab Emirates, Angola, and Saudi Arabia. He also serves on Wood Group’s Executive Committee.

Mustang is consistently ranked as one of the best places to work in the Houston area, and ranked ninth in the 2012 Houston Chronicle Top Workplaces. His leadership and vision have been instrumental to the ongoing success of Mustanger mentoring and development, and to Mustang’s globalization initiatives, corporate standards development, and implementation.

Before joining Mustang, Knowles worked for Saudi Aramco in Dhahran, supervising offshore platform design, fabrication, and installation. He also served as a project manager with IPC Malaysia LTD for the offshore PM3 development, while residing in Kuala Lumpur. Knowles was also a project engineer with Chevron U.S.A. in its Lafayette, Louisiana office.

Knowles holds a B.S. degree in Mechanical Engineering from Texas A&M University and is a registered professional engineer in Texas. He is a graduate of Harvard University’s Executive Management Program and has passed the Project Management Professional test. Knowles has been a guest speaker at several industry and civic conferences, notably having delivered keynote speeches at the 2010 Offshore Technology Conference and the Rice Global Forum.

Born in Denver, Colorado, Knowles demonstrates Mustang’s core values not only in business, but in his personal life. A devoted husband to his wife of 27 years, Vicki, and father of three grown children, Steve is an active member of his community. Knowles is part of three generations of Eagle Scouts (his father, son, and two brothers are also Eagles), the highest honor awarded by the Boy Scouts of America. He serves on the Board of Directors of the Sam Houston Area Council, the nation’s largest Scout council. His other hobbies include running, cycling, golf, and backpacking.

e-mail: steve.knowles@mustangeng.com
Keynote Cigarettes for Six-year-olds?
Improving the Predictability of Project Outcomes

Research Team 291, Improving the Accuracy of Project Outcome Predictions

Learning Objectives

- Grasp the criticality of early and accurate project outcome predictability
- Learn to utilize and implement the RT 291 Four-casting model of predictability practices.
- Understand the value of a project’s Predictability Index score.
- Use practical examples to gain mastery of the Predictability Index tool.
- Recognize the major influence of human behavior on predictability.
- Hear details about the meaningful benefits RT 291 members gained by implementing the team’s recommendations and tools.

Plenary Session Abstract

As most industry practitioners know, using any process to predict project outcomes accurately—especially final cost and schedule—is fraught with challenges. To address this persistent inaccuracy of prediction, CII chartered Research Team 291 was chartered to examine existing processes and develop a more accurate prediction model. The team’s research revealed distinct and identifiable process differences between effective and ineffective project forecasters. These differences can be broadly summarized into four categories: 1) human behavior and organizational culture; 2) project characteristics; 3) forecasting practices; and 4) management processes. Of these, human behavior and organizational culture was the category statistically shown to have the greatest positive influence on the accuracy and timeliness of cost and schedule predictions.

While project teams cannot eliminate surprises (or all bad news), they can and should mitigate the effects of such surprises with early recognition and communication of the issues, transparent and candid reporting, and a full appreciation of the drivers that influence forecasting effectiveness. In this session, the presenter will highlight the team’s findings and introduce its “Four-casting Model,” a new implementation tool for improving a project team’s approach to generating early and accurate predictions.

Implementation Session Abstract

This session will discuss the objectives, research methods, and principal findings from the RT 291 investigation into processes to improve the accuracy of cost and schedule project outcome predictions. The panelists will explain the “Predictability Index,” which assesses not only the accuracy, but also the timeliness of a project’s outcome predictions. They will present and discuss the team’s Four-casting model, which is designed to provide implementation guidance to project teams seeking more reliable predictions. The panel will also introduce its new assessment tool, demonstrating how it allows project teams to evaluate their progress in implementing the research recommendations. The session will feature practical, real-world examples to highlight the research findings and to demonstrate the utility of the tools.
Plenary Session Presenter

Rick Sirven, Business Manager – ConocoPhillips

Rick Sirven is currently the Business System and Process Development Manager for the Asia Pacific LNG Project, a joint venture operated by ConocoPhillips. During his 29 years with ConocoPhillips, Sirven has held various leadership positions in both project services management and finance in various subsidiaries around the world, including in Ecuador, Venezuela, Norway, Saudi Arabia, Abu Dhabi, and currently in Brisbane, Australia.

Prior to his current position, Sirven was responsible for the development of project services standards and assurance for ConocoPhillips’ major capital projects. He holds a B.S. degree from the University of Louisiana and an MBA from Louisiana Tech University. He is a Certified Public Accountant and a Certified Internal Auditor. With CII, Sirven chairs Research Team 291, Improving the Predictability of Project Outcomes.

e-mail: rick.sirven@originenergy.com.au
First Implementation Session Moderator

**John J. Greco**, Lead Project Engineer – Air Products and Chemicals, Inc.

John Greco is a Project Manager at Air Products and Chemicals, Inc. (APCI), responsible for the execution of capital projects to support the company’s Tonnage Gases, Equipment and Energy business, the number one supplier of hydrogen to refiners globally. During his 17-year tenure with APCI, Greco has managed projects involving process equipment manufacturing and industrial facility construction for hydrogen and CO production, natural gas liquefaction, helium purification, and ethylene recovery in such diverse geographies as Japan, China, United Kingdom, Sweden, and Thailand. In the mid-2000’s, he spent four years in Alberta, Canada, managing the construction of APCI’s first two hydrogen production facilities in that region.

Prior to joining APCI, Greco worked at Mobil Oil Corporation as a facilities engineer providing technical support for capital projects and operating facilities worldwide. He holds B.S. and M.S. degrees from Lehigh University. He is a Co-Chair for Research Team 291, Improving the Predictability of Project Outcomes, and he looks forward to contributing to other CII research programs in the future.

*e-mail: grecojj@airproducts.com*

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First Implementation Session Panelists

W. Edward Back, Director, Construction Engineering Management Program – University of Alabama

*e-mail: eback@eng.ua.edu*

Kay Harlow, Benchmarking & Metrics Manager – Southern Company

*e-mail: kharlow@southernco.com*

Micki Kohn, Senior Construction Manager – Hargrove Engineers + Constructors

*e-mail: mkohn@hargrove-epc.com*

Brian Kong, Senior Project Manager – U.S. Department of Energy

*e-mail: brian.kong@hq.doe.gov*

Patrick Sweeney, Vice President, Project Support – SNC-Lavalin Engineers and Constructors

*e-mail: patrick.sweeney@snclavalin.com*

Douglas E. Weaver, Senior Project Manager – Walbridge

*e-mail: dweaver@walbridge.com*
Second Implementation Session Moderator

Robert Mozzi, Manager, Innovative Plastics Manufacturing, Capital Programs – SABIC - Saudi Basic Industries Corporation

Bob Mozzi is currently responsible for project delivery system improvement initiatives within SABIC’s Innovative Plastics strategic business unit, and facility operations management at their world headquarters in Pittsfield, Massachusetts. After joining the plastics business in 1996, he held positions as Indirect Services and Distribution Sourcing Leader, Total Cost-Out Process Black Belt, Site Project Manager, and Program Manager P&E.

Mozzi holds a B.A. degree in Economics from Cortland State University and a Project Management Professional certification. He began his career with the General Electric Company (GE) in 1986, holding various positions within their Corporate Financial Services Operation and Power Systems business. While with GE, he graduated from their Corporate Financial Management Program and received his Six Sigma Black Belt Certification.

Mozzi is involved with CII as a Board of Advisor Alternate and Benchmarking Manager.

e-mail: robert.mozzi@sabic-ip.com

Second Implementation Session Panelists

Glen Cullop, Engineering/R&D – Eastman Chemical Company
e-mail: gccullop@eastman.com

Russell T. Cusimano, Principal and Practice Leader – eProject Management, LLC
e-mail: rcusimano@epm.cc

David Grau, Assistant Professor – Arizona State University
e-mail: david.grau@asu.edu

Doug Helmann, Sustainability Program Manager – Architect of the Capitol
e-mail: dhelmann@aoc.gov

Oscar D. Rodriguez, Senior Director of Project Controls – URS Corporation
e-mail: oscar.rodriguez@urs.com

William A. Taylor, Head of Planning & Scheduling – Alstom Power
e-mail: william.a.taylor@power.alstom.com
Let's begin with an informal survey...

- Have you struggled or been challenged to predict accurate project outcomes early in the execution process?

- Have you been surprised with last minute supplements?

- How many of you see value in knowing final project outcomes early in project execution?

The industry must address its inability to consistently make early and accurate project outcome predictions.
Improving the Predictability of Project Outcomes

Notes

Sound Familiar?

- Forecasting seems to start only after significant project completion.
- Negative trends and events remain hidden or unreported.
- Late and undesirable cost and schedule "surprises" appear frequently.

The dreaded "Hockey Stick"

Improving predictability provides time for corrective actions . . .

. . . and adds significant value.
The goal of this research was to develop practices, recommendations, and tools that will assist project teams to accurately and timely predict project outcomes.
Improving the Predictability of Project Outcomes

Methodology

- Data Collection
  - 135 projects, with forecast and change logs

- Statistical Analysis
  - Compared Good to Very Poor project predictors
  - Change drivers

- Tool Development
  - Implementation model
  - Assessment and benchmarking tools

Predictability Index (PI)

Project B is a better predictor than Project A.

Cost Predictability

Very Poor Predictors (4th Q) Practices and Behaviors

Good Predictors (1st Q) Practices and Behaviors

Schedule Predictability
Notes

Significant Findings

- There are execution differences between Good Predictor (1st Q) and Very Poor Predictor (4th Q) Projects

- We identified over 40 distinct practices of influence, many of which statistically correlated with predictability.

- We determined the change reasons that most influence predictability, examining both their frequency and severity.
Notes

Improving the Predictability of Project Outcomes

Four-Casting Model

Research Deliverables

1. Statistically correlated findings
   - Frequency and severity of change reasons

2. Practices to improve predictability for both cost and schedule
   - Change reasons impacting predictability

3. Insights from high-performing teams
   - De-rippers and mitigation actions
   - Assessment & benchmarking tools
Assessment Tools

1. *Four-Casting* Assessment Tool to evaluate project predictability practices

2. Predictability Index for benchmarking predictability performance

Key Insights

- A project team cannot eliminate surprises, but their early recognition can mitigate their negative effects.

- Early predictability has significant influence on project value.

Key Insights (continued)

- Many external project factors—in terms of quantity or magnitude—can be effectively managed with the right people, processes, and behaviors.

- Predictability performance should be benchmarked.
## RT 291 Recommendations

- Apply the predictability model.
- Use the *Four*-Casting Assessment and Predictability Index tools.

Join the 1st Quartile!

## Implementation Session Takeaways

- Meet research team members and hear the RT 291 story.
- Learn how to use the *Four*-Casting predictability model and tools.
- Discover how much value early predictability can add to your project.

## Come to our Implementation Sessions

<table>
<thead>
<tr>
<th>Session 1 Moderator</th>
<th>Session 2 Moderator</th>
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<tr>
<td>John Greco, Air Products and Chemicals Inc.</td>
<td>Robert Mozzi, Manager, Saudi Basic Industries</td>
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### Session 1 Panel

- Edward Back, The University of Alabama
- Kay Hartlow, Southern Company
- Micki Kohn, Hargrove Engineers + Constructors
- Brian Kong, U.S. Department of Energy
- Patrick Sweeney, SNC-Lavalin Constructors, Inc.
- Douglas E. Weaver, Walbridge

### Session 2 Panel

- Glen Cullop, Eastman Chemical Company
- Russell T. Cusimano, ePM
- David Grau, Arizona State University
- Doug Helmman, Architect of the Capitol
- Oscar Rodriguez, URS Corporation
- William A. Taylor, Alistom Power
The Essential Question:

How do we improve the timeliness and accuracy of the predicted project outcomes between project authorization and project completion?

Real World Project Uncertainties

- Design Errors and Omissions
- Execution Changes
- Escalation
- Permitting Issues
- Geopolitical Impacts
- Currency Exchange Rates
- Productivity
- Scope Changes
- Material Availability

RT291 Implementation Session Agenda

- Purpose and Objectives
- Methodology and Data Collection
- Statistical Analysis
- Tools Development and Demo’s
- Testimonials
Improving the Predictability of Project Outcomes

Project Performance Measures

Traditional Project Closing Report

III. COST & SCHEDULE PERFORMANCE

| Budget: $27.2MM | Original Schedule: 18.5 mos |
| Current Forecast: $16.8MM | Actual Schedule: 19.0 mos |
| Variance ($) | Variance (weeks): 7 weeks |

“Improving Predictability”

Improving the Predictability of Project Outcomes

Research Team 291

Project Predictability – New Approach

Project B is a better predictor than Project A.
The Value of Improved Predictability

- What if project teams were more reliable with their project outcome predictions? Reputation and credibility would be enhanced.
- What if project teams identified issues earlier and recognized potential impacts on project outcomes? Project execution strategy adjustments could be made proactively to mitigate negative impacts.
- What if project teams provided more timely and accurate forecasting of cash flow requirements? Organizations could make better informed investment decisions and improve ROI.

Four-Casting Model

Panel – A

- John Greco - Moderator
  Air Products and Chemicals
- Kay Harlow
  Southern Company
- Micki Kohn
  Hargrove Engineers + Constructors
- Brian Kong
  U.S. Department of Energy
- Patrick Sweeney
  SNC Lavallin Constructors, Inc.
- Doug Weaver
  Walbridge
Notes

Panel – B

- Bob Mozzi - Moderator
  Saudi Basic Industries Corp.
- Oscar Rodriguez
  URS Corporation
- Russ Cusimano
  eProject Management
- Glen Cullop
  Eastman Chemical Company
- Doug Helmann
  Architect of the Capitol
- Bill Taylor
  Alstom Power

Purpose and Objectives

“Improving Predictability”

How is RT-291 different from other CII RTs?

- We wanted to find a better way to predict outcomes early in the project
- Past CII research focused on quantitative forecasting methods
- We knew that there had to be other project practices that influence project predictability
- We approached the research with a comprehensive management perspective *instead of* quantitative prediction aspects alone
Our Purpose

- Improve the reliability of project cost and schedule forecasts
- “Crack the code” to improve timely and accurate incremental predictions of project outcomes

Our Objectives

- Identify and analyze underlying practices that impact the accuracy of project outcome predictions
- Propose practices for the improvement of accuracy of predicted project outcomes
- Evaluate whether forecasting practices should change based on the stage of completion during project execution

Our Objectives (cont.)

- Explain how forecasting practices should be applied to cost and schedule measures of project performance
- Develop high value tools and/or recommended Practices that can be widely adopted and implemented by CII member companies
Improving the Predictability of Project Outcomes

Notes

Methodology and Data Collection

"Improving Predictability"

Research Methodology

Step 1
Identification and Classification of: 1) Factors of Influence on Predictability; and, 2) Change Reasons for Cost and Schedule Deviations
- Literature Review
- CI & Technical Journals
- Research Charrette
- 16 Subject Matter Experts
- Change Classification Schema
- 11 CSI Companies

Step 2
Conceptualization of a Reliable, yet Practical Predictability Measure – the Predictability Index (PI)
- Literature Review
- CI & Technical Journals
- Research Charrette
- 16 Subject Matter Experts
- External Validation Workshop
- 13 Subject Matter Experts

Step 3
Impact Assessment of Influencing Factors on Predictability
- Correlation Analysis
- External Workshop
- Online Survey
- Historical Data on 135 Projects
- 15 Subject Matter Experts

Step 4
Impact Assessment of Change Reasons on Predictability and Deviations
- Statistical Analysis
- External Workshop
- Historical Data on 135 Projects
- 12 Subject Matter Experts
Data Collection
- 135 Project Submissions
- Total Installed Cost over $28.8 billion
- Over 90% completed in last 5 years
- Two thirds of projects reported cost and/or schedule overruns at completion
- Projects reflected both ends of the performance spectrum

Proportion of Owner and Contractor Projects

Sector Affiliation
- Both (3%)
- Private (52%)
- Public (45%)
Improving the Predictability of Project Outcomes

Notes

Projects by Industry Sector

Respondent Organizations by Role / Function

Total Installed Cost ($MM)
Improving the Predictability of Project Outcomes

### Project Delivery Type

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<th>Project Type</th>
<th>Percentage</th>
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<tr>
<td>Partial Procurement</td>
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<tr>
<td>Fast Track</td>
<td>35%</td>
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<tr>
<td>Design/Bid (6FCT)</td>
<td>75%</td>
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<tr>
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<td>Testing</td>
<td>27%</td>
</tr>
<tr>
<td>Change/Rule</td>
<td>26%</td>
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<tr>
<td>Other (9%)</td>
<td>7%</td>
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### Statistical Analysis

“Improving Predictability”

### Statistical Analysis

- 135 retrospective project data with forecast & change logs for cost and schedule
- Compared **Good** (1st Q) predictor versus **Very Poor** (4th Q) predictor projects
- Identified 43 practices that influenced predictability, 25 of them with statistically significant correlation
- Identified 36 change reasons that impact predictability
Improving the Predictability of Project Outcomes

**Notes**

**Four-Casting Model**

**Practices of Influence**

**Do you Know the Answer? (i)**

What change reason has a low frequency of occurrence but has a high impact on predictability?

A. Cost estimating

B. Constructability

C. Project team integration

D. Standard, regulatory, and legal requirements
Improving the Predictability of Project Outcomes

Do you Know the Answer? (ii)
Which of the following change reasons has the most impact on the ability to predict project outcomes?

A. Work planning & execution
B. Engineering design
C. Control functions
D. Scope changes

Do you Know the Answer? (iii)
Which of the four practices listed below has the most influence on predictability?

A. Change management
B. Team alignment
C. Market volatility, escalation, and location influences
D. Completeness of input data and information for forecasting

Do you Know the Answer? (iv)
True or False? Third party financing has a positive impact on predictability.

A. True
B. False
Do you Know the Answer? (v)
How does the centralization of the project controls function impact predictability?

A. Negative impact
B. Positive impact
C. None of the above

Do you Know the Answer? (vi)
How does a non-risk based contingency management process impact predictability? Select all that apply.

A. Delayed identification of actual project outcomes
B. Likely no negative impact
C. Enables the maintenance of a constant forecast
D. Late disclosure of underlying trends

Do you Know the Answer? (vii)
Indicate which of the statements below are true with respect to reporting and forecasting? Select all that apply.

A. They are fundamental but distinct core project control functions
B. Reporting is performed at discrete time intervals.
C. Forecasting should be regarded as a continuous effort
Tool Development, Demonstration and Testimonials

"Improving Predictability"

Notes

Two Different but Complementary Tools

1. **Four-Casting Assessment**
   - Continuous evaluation of project predictability practices
   - Project team member input
   - Highlights practices that need attention

2. **Predictability Index (PI)**
   - Benchmarking predictability performance
   - Quantitative and objective measure
   - Timeliness and accuracy of cost and schedule forecasts

When to Use...

- **Four-Casting Tool** for *Continuous* assessment during execution
- **Predictability Index (PI) Tool** at project completion
Improving the Predictability of Project Outcomes

Notes

**Four-Casting Assessment Tool**

Assessment of severity or negative impact of 85 elements on predictability

**Four-Casting Assessment Tool Results**

**Four-Casting Model and Assessment Tool**

- Contractual incentives
- Third party finance
- Project delivery method
Improving the Predictability of Project Outcomes

Using the Model

Every sub-category in the Four-Casting model provides

Key Take Away
Insights from Research
De-railers
Mitigation Actions

Notes

Live demo

“Improving Predictability”

Testimonial – Overoptimism vs. Externally Facilitated Assessment

- Before – Internal assessment by project team

- After – Externally facilitated assessment
Notes

Value Added

- Identify predictability issues early in the project
- Address predictability practices that require attention
- Gain confidence in forecasting cost & schedule accuracies

Predictability Index Tool

- Quantitative assessment of accuracy and timeliness of cost and schedule forecasts
- At project completion

\[
\text{Predictability Index} = \text{Cost Predictability (CP)} \times \text{Schedule Predictability (SP)}
\]

How to Use the Predictability Index Tool

- Introduce cost forecast log
- Introduce schedule forecast log

<table>
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<th>Forecasted Total</th>
<th>Actual Total</th>
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<td>1500</td>
<td>Poor</td>
</tr>
<tr>
<td>12</td>
<td>1600</td>
<td>1600</td>
<td>Poor</td>
</tr>
</tbody>
</table>
Reading the Predictability Index

- \( P_i < 8 \) – Good predictor (1st Quartile)
- \( 8 < P_i < 18 \) – Medium predictor (2nd Quartile)
- \( 18 < P_i < 32 \) – Poor predictor (3rd Quartile)
- \( P_i > 32 \) – Very poor predictor (4th Quartile)

Testimonial - Predictability Index Applications

- Benchmark metric within and across other CII companies
- Predictability assessment at project level
- Predictability assessment at organization level
- Evaluate qualification of project teams, business units, and contractors
- Incentivize project team performance

Testimonial – Identification of Predictability Trends and Underlying Issues
**Testimonial - Predictability Index**

**Performance Over Time**

- Ongoing predictability improvement process
- Portfolio of projects: organization, business unit, industry sector, etc.
- Expected declining PI values over time

![Graph showing predictability index over time](image)

(*) Ongoing evaluation, sample data

---

**Testimonial – Misuse of Contingency**

- Lack of predictability often identified for projects that constantly reported no change in forecast after 30% to 40% execution
- Problems were mostly associated with misuse of contingency and lack of transparency
- Mandatory execution review policy for projects with no change in forecast after 40% execution

![Graph showing percent complete vs. deviation](image)

---

**Testimonial - Benchmarking Project Characteristics**

- Benchmarking of project metrics such as location, size, sector, business unit, delivery method, etc...
- Identification of projects with recurrent predictability issues
- Assessment of practices that require attention

![Graph showing predictability index for different locations](image)

(*) Ongoing evaluation, sample data
Research Strengths

- Rigor and process discipline followed
- Robust data set, statistically supported findings
- Transform your organizations and project teams
- Improve project outcomes and add value

RT-291 Product Summary

- 291-1 Research Summary: Improving the Predictability of Project Outcomes
- 291-2 IR: Four-Casting for Early Predictability
- 291-3 IR: The Predictability Index - Benchmarking Project Outcome Predictions
- 291-4 IR: Barriers to Success – Change Reasons that Hinder Project Predictability
- Tool: RT291 Four-Casting Assessment Tool
- Tool: RT291 Predictability Index Tool
Learning Objectives

- Understand how giving an engaging speech or presentation can promote your career.
- Learn the critical elements of effectively constructing and delivering a speech or presentation in any environment.

Plenary Session Abstract

To celebrate CII's 30th anniversary, the Professional Development Committee is proud to give members an opportunity to focus on their personal growth and development. To prepare attendees for learning how to make effective presentations, the presenter will give examples of the all-too-familiar elements of bad presentations.

Implementation Session Abstract

When preparing a speech or presentation, speakers often focus solely on the subject of the talk. They often forget that a presentation conveys information about them as much as it does about the topic. Those in technical fields are even more prone to ignoring how they are perceived during a presentation. Certainly, as one moves up in his or her career, the importance of a well organized and engaging speech increases. In fact, leaving a positive impression can actually help launch a career—no matter at what stage.

The speaker, who began his career as an engineer and progressed into the executive ranks, demonstrates that anyone—even construction professionals!—can create and deliver an effective speech or presentation. Using humor, anecdotes, and real-world examples, he will help participants think about how they can create memorable speeches that engage listeners and reflect positively on them.

Plenary Session Presenter

Michael R. Peters, Director of Development & Training, Power Division – CB&I

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. The training programs he develops support a broad array of industries and markets. Currently he manages international training and development programs spanning 20 countries.

e-mail: michael.r.peters@cbi.com
Implementation Session Moderator

David Beckmann, Senior Vice President, Marketing (retired) – Emerson Process Management

Dave Beckmann began his 36-year-long first career as an application engineer for Siemens. He progressed into sales management, general management, and, eventually, became General Manager for Honeywell Europe. Later, at Emerson Process Management, he served as Vice President of Marketing for Fisher Controls, and then as Senior Vice President for Systems and Solutions. Upon retirement, Beckmann began his second career as a pastor for the First Presbyterian Church in Marshalltown, Iowa. Not long after becoming a pastor, he also embarked on a career as a motivational speaker and a consultant for the process industry.

Beckmann has been a featured speaker at events hosted by several companies, including Chevron, Fluor, and Statoil; he has spoken at industry forums such as the EPC Forum in Seoul, Korea, and at internationally recognized universities such as the INSEAD Business School in Paris, McNeese University in Baton Rouge, and the Johannesburg Technical Institute in South Africa. He earned a B.S. degree in electrical engineering from LeTourneau University, an Executive MBA from Harvard Business School, and a Master of Divinity from Trinity Evangelical Divinity School.

e-mail: dave.beckmann@emerson.com
Nail a Speech – Launch a Career

Plenary Session Slides

Learning Objectives

• Understand how giving an engaging speech or presentation can promote your career.

• Learn the critical elements of effectively constructing and delivering a speech or presentation in any environment.

Professional Development Committee

Dale Allen, Shell
Nuria Ayala, CII
James Chiarello, Pathfinder
Erika Corbelli, CII
Mike Davidson, Ontario Power
Manuel Garcia, CII
Dr. David Grau, Arizona State U
Dorothy Hellberg, Emerson Process Management
Tracee Herring, Dow Chemical
Gary Landrum, URS
Sue Maden, Burns & McDonnell
Mark Miklusacak, Kvaerner
Dr. T. Kirk Morrow, S&B
Michael Peters, CII
Catherine Polito, U of Texas
Dr. Paul Resta, U of Texas
Lori Stevens, Matrik Service Co.
Janet True, Fluor
Dianne Underwood, ConocoPhillips
Roger Walters, Chevron
Notes

Most Speeches Are Terrible

Poorly Delivered Speeches Can Kill A Career

“As soon as you move one step up from the bottom, your effectiveness depends on your ability to reach others through the spoken and written word”

Peter Drucker

Why are so many presentations so bad?
Notes

Death By PowerPoint

Our Goal For This Short Course...

To make you insanely great in front of any audience
Join the PDC in the Implementation Session

*Nail A Speech – Launch A Career*

Dave Beckmann
Emerson Process Management
Nail a Speech – Launch a Career

Implementation Session Slides

Nail a Speech – Launch a Career

David Beckmann, Emerson Process Management
Professional Development Committee

2013 Annual Conference
July 29-31, Orlando
Celebrating 30 Years
Leadership. Research. Collaboration. Improvement

Speeches Are Important

Most Speeches Are Terrible
Death By PowerPoint

Typical Corporate Presentation

Nail a Speech – Launch a Career

Poorly Delivered Speeches Kill Careers

“As soon as you move one step up from the bottom, your effectiveness depends on your ability to reach others through the spoken and written word”

Peter Drucker
Up In Smoke

How can you keep your speech from crashing and burning?

Our Goal For This Short Course...

To make you insanely great in front of any audience

Let’s Analyze The Speech By Steven Johnson

• He starts with an illustration
  – It is simple
  – It is memorable
  – It captures the audience
• He makes three points
  – The Liquid Network
  – The Slow Hunch
  – Connecting vs Protecting
• He concludes by coming back to the opening illustration
Notes

Delivering An Insanely Great Speech

- **The Look** - Understand how your audience processes information
- **The Book** - Construction and delivery of a Great Speech
- **The Hook** - Getting a commitment

Think Like An Engineer - Feel Like An Artist

The Look

Your opening should compel your audience to open their eyes and take a look at your thoughts
Let Story Be Your Guide

- Nothing is more compelling than a story
- Great speakers build their presentations around stories
  - They introduce a common enemy (The antagonist)
  - They reveal the conquering hero

Fact Based Presentations Are Dead

- So states the July/August edition of HBR
- People process information differently today than in the past
- Fact based speeches are guaranteed to fail

Information Is Free

- If all you are communicating is information, you are in trouble
- Those who built their livelihood on the dissemination of information are doomed to failure
Notes

Presentations Are About Action

- They are not about data dumps
- What we are communicating is a call for a decision
- When it comes to presenting, almost all of our instincts are wrong

The key to effective communications is understanding how the audience processes verbal communications

Delivering An Insanely Great Speech

- The Look - Understand how your audience processes information
- The Book - Construction and delivery of a Great Speech
- The Hook - Getting a commitment

Speech Construction

- Introduction
  - Title
  - Antagonist
  - Passion Statement
- Message
  - Three Points
  - Illustrations
  - Product Demo
- Conclusion
  - Slay The Antagonist
  - Ask for the Order
The Title

- Selecting the right title will draw your audience in
- Make it descriptive yet intriguing
- It should be easy to remember and pronounce

Introducing The Antagonist

- In every classic story, the hero fights the villain
- In his book “Buyology,” Martin Lindstrom equates Apple’s message with the same powerful ideas that propel widespread religions - both appeal to a common vision and a specific enemy
- Having an identifiable enemy stirs our emotions and gives us a unified cause

The Antagonist – Who’s The Enemy Here?
Some People Should Be Barred From Shopping At Home Depot

Most Professions Require Certification

A doctor must be Board Certified

An engineer must pass the PE Exam

A lawyer must pass the Bar Exam

But, No Such Certification Required For The Weekend Repair Genius
The Test Should Focus On Three Areas

- Electrical
- Plumbing
- Structural

Conclusion...

For The Safety Of Us All...

The Passion Statement

Transition

The Passion Statement has two objectives:

1. To transition the listener from your introduction to your premise
2. To show that you are 100% committed to your idea
Your Passion Statement Shows Your Belief

“We choose to go to the moon”

Building Your Message

Research and write the script 15 hrs.

Sketch the Slides 5 hrs.

Build your slides 10 hrs.

Organize Your Thoughts

“A speech is a carefully designed journey to a clearly defined destination”

Tim Pollard
Connecting The Dots

- The mind tries to make sense of what it sees and hears
- If it is confused, it shuts down
- And... it never remembers a list

People Remember Stories

People Are Wired To Remember 3 Things

- They must be short and memorable
- They show how we must change to meet the challenge
- The points supply an answer to the antagonist dilemma

To PowerPoint Or Not To PowerPoint

Bad PowerPoint Presentations
Cost $252 Million Per Day
In Wasted Time
THE WALL STREET JOURNAL.
Pay Attention to Audience Attention Span

- The average human cannot concentrate on a single subject for more than 10 minutes
- In order to keep attention, you will need to spiff up your presentation

Your Job: Train Your Maintenance Staff

- Objective: Remove a “Take-Off Valve” to clear a choke
  - The 10 inch valve isolating it from the reactor loop is a rack and pinion actuator with air to open and air to close
  - The reactor loop is a polyethylene line and is under full operational pressure
- How will you keep your maintenance techs from falling asleep while you review this procedure?

Grab Their Emotions, Then Apply

- Use real life examples of what can go wrong if the procedure is not done properly
- Engage your staff in the discovery of what could have been done differently
- Establish a checklist with your team to ensure safe maintenance practices
Notes

Illustrations

Let me illustrate by telling you a story...

Testimonials / Financial Benefits

Use Videos

- Use Firefox downloader to download Flash
- Use a converter such as iSoft Converter to change the format into WMV
- Use Microsoft Moviemaker or Apple iMovie to trim and clip the videos
- Keep the videos short
A Video Illustrating Your Point

The Delivery

The polish that will make you insanely great

Watch What You Say...
Notes

How Should You Dress?

Delivering An Insanely Great Speech

- **The Look** - Understand how your audience processes information
- **The Book** - Construction and delivery of a Great Speech
- **The Hook** - Getting a commitment

Conclusion

Slay the dragon

Ask for the order
Your Conclusion

Bring them back to the beginning

Nail a Speech - Launch a Career

If Nailing A Speech Could Save A Kingdom...

Nail A Speech
And
Launch Your Career
An Update on the Next-Generation Leaders Program

Next-Generation Leaders Community of Practice

Learning Objectives

- Gain a better understanding of how the Next-Generation Leaders COP (NGLCOP) develops its members, contributes to CII and member organizations, and influences the capital projects industry.
- Hear an update on the NGLCOP’s accomplishments from the past year.
- Look into the future of the NGLCOP for 2013 and beyond.

Plenary Session Abstract

Having experienced a tremendous increase in membership and participation since its first significant appearance at the 2012 CII Annual Conference in Baltimore, the CII Next-Generation Leaders Community of Practice (NGLCOP) is building an active community of early-career talent and experienced advisors. Together, they are focused on developing NGLCOP members, positively influencing CII and its member organizations, and making a positive impact on the capital projects industry. In this presentation, the COP co-chairs will describe the community’s current structure and activity, its accomplishments to date, and the engaging initiatives it leaders have planned for the upcoming year. They will also explain the personal networking and development opportunities available to NGLCOP members, as well as the broader benefits that engagement with this community will have for CII and CII member companies.
Plenary Session Presenters

**Lindsay Auble**, Senior Process Engineer – URS Corporation

Lindsay Auble’s project experience has ranged from technology evaluation and early design development through detailed design and installation. She is currently on a field assignment at the BP Husky Refinery in Toledo, Ohio, supporting a pressure safety valve revalidation project. In her current project role, Auble is managing functional interfaces and coordinating a project quality and productivity improvement initiative.

Since 2007, Lindsay has participated on the URS Project Services Strategic Planning Team, supporting the development and implementation of the organization’s strategic direction. She is currently working on an action to improve the engagement and development of early career talent.

Auble graduated from the Colorado School of Mines with B.S. degrees in chemical engineering and economics. A registered professional engineer in Colorado, she has been involved in CII for two years and currently serves as co-chair of the Next-Generation Leaders Community of Practice.

*e-mail: lindsay.auoble@urs.com*

**Michael Bankes**, Director I, Design Engineering – Fluor Corporation

Michael Bankes has over 18 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. A charter member of CII’s Next-Generation Leaders Community of Practice, he has been involved in CII activities for over three and a half years.

Bankes has B.S. and M.S. degrees 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*
An Update on the Next-Generation Leaders Program

Plenary Session Slides

CII Next-Generation Leaders

ENGAGE • DEVELOP • INFLUENCE • LEAD

Developing Our Members

COP Co-Chairs: Michael Bankes, Fluor, Lindsay Auble, URS

Academic Administrator: Dr. Fernanda Leite, UT Austin

Ex-Officio & Community Advisor: Kim Allen, CII

Team Leaders:
- Daniel Gary, CCC Group, Inc.
- Ronak Patel, Coreworx, Inc.
- Stacey Gibson, Burns & McDonnell
- Obi Ogbazi, Hargrove Engineers & Constructors

COP Membership: 66 members, 135% Growth
Notes

Developing Our Members

Knowledge & Leadership Development
- Value of CII
- CII’s publications and resources
- Broadened opportunities for networking and exposure within the industry
- Support for those who take on bigger roles in CII

Interacting with Our Members

Benefiting CII Member Organizations
- Creating CII ambassadors
- Transferring knowledge
- Developing leadership cost-effectively
  - eMeetings
  - online communication

Influencing CII

- Sounding board for Executive Committee, Board of Advisors, and Annual Conference Committee
- Research support
  - Participation on research teams
  - Review of RT 292 knowledge-transfer tool
- Committee participation
Influencing CII

NextGen Leaders Forum at the Annual Conference
Creative Solutions to Complex Problems
– Gaylen Paulson, The University of Texas at Austin

Leading the Industry

• Next-Gen positioned within CII to provide input on a broad range of topics.
• Next-Gen focus distinctive among professional associations.
• Next-Gen leaders affecting the present and future of our industry.

Community Activities and a Look into the Future

Lindsay Auble, URS
CII Next-Generation Leaders Community of Practice
An Update on the Next-Generation Leaders Program

Notes

Positioned for Growth

- Community Teams
  - Administrative
  - Social Networking
  - Leadership Development
    - Knowledge Sharing
    - Events Planning
    - Communications & Membership
  - 10-10 Project Support

Utilizing CII Resources

- Active membership engagement
- Enhanced opportunity for member development
- Streamlined introduction to CII

Supporting CII Strategic Efforts

- Develop our members through active, hands-on project involvement
- Support member organization involvement with Next-Gen participation
- Improve CII’s benchmarking program and connect member organizations to CII practices and tools

Partnering with the 10-10 Project

- Advance the industry’s benchmarking capability
Join the Next-Generation!

<table>
<thead>
<tr>
<th>Next-Generation</th>
<th>Advisors</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Leadership-bound</td>
<td>– Industry/CII experience</td>
</tr>
<tr>
<td>– Ready to make a difference</td>
<td>– Passion for mentoring</td>
</tr>
<tr>
<td></td>
<td>and development</td>
</tr>
</tbody>
</table>

Interested?

- Look for one of us wearing the NGLCOP button.
- Find the information card in your conference handouts.
- Visit the CII Community of Practice webpage.
- Stop by the COP display area.

ENGAGE • DEVELOP • INFLUENCE • LEAD
An Update on the Next-Generation Leaders Program
Learning Objectives

- Be inspired to take action in construction safety.
- Know how to integrate innovative construction safety methods.
- Be able to unify a project team to develop and implement specific safety solutions.
- See how data-driven learning drives implementation of preemptive safety actions.
- Recognize that learning is energizing and fun!

Plenary Session Abstract

Every jobsite has a unique safety culture that is particular to the local environment. This session will describe the safety environment in Cartagena, Spain, both inside and outside the SABIC facility fence line there. It will also discuss the process SABIC follows to clarify key safety factors and to unify the entire team: supervisors, contractors, and EHS personnel. The presenter will show how the company engages non-safety personnel on site and explain how they then use their experience to take the lead in identifying and implementing preemptive safety solutions. He will further demonstrate how team participation creates higher levels of learning through group interaction. To conclude, he will focus on the way that data-driven approaches enrich team engagement—creating excitement and fun—and how such approaches create novel solutions and increase the project team’s professional learning.

Implementation Session Abstract

Can you identify key safety predictors that will signal which projects will be successful prior to the mobilization of workers? If you talk with workers who have had accidents and near misses, can you identify tendencies or groups of factors that could lead to preemptive solutions?

This session will provide a learning experience for participants in which they will be challenged to reflect on what is most critical to clarifying project safety issues and unifying the project workforce.

The panelists will explain the SABIC data collection process, including its correlation analysis of “Good” versus “Opportunity” projects. They will also discuss onsite surprises they have encountered, and the novel solutions they implemented during three facility shutdowns. The SABIC panel will also share what was learned, what was implemented, and why it was implemented.

Finally, in light of these examples, participants will be challenged to reflect on three improvements that each of them can make to improve EHS.
Plenary Session Presenter

John A. Barry, Construction Leader – SABIC

As Construction Leader and Gatekeeper for small project approval at the Sabic-IP plastics site in Cartagena, Spain, John Barry works with project leaders and contractors to enhance productivity, quality, schedule, and safety. Barry has lived and worked on projects in four continents: Africa, Asia, Europe, and North America. Through his 35-year career, he has worked as a laborer, construction engineer, construction supervisor, design engineer, and project leader on projects ranging from $5M to >$1MMM. Barry has worked for SABIC-IP, GE Plastics for 25 years, and before joining SABIC, he worked for 10 years with KBR. He earned a B.S. in civil engineering from Rose-Hulman in 1978, and a Krannert Executive MBA from Purdue University in 1995.

Barry is an active member of CII Research Team 293, Hazard Recognition, and participates in the CII Safety Community of Practice (SCOP).

e-mail: johnsr.barry@sabic-ip.com

Implementation Session Moderator

John Barry, Construction Leader, Cartagena, Spain – SABIC

e-mail: johnsr.barry@sabic-ip.com

Panelists

Cecil W. Chapman, EHS Director – CB&I

e-mail: cecil.chapman@cbi.com

Matthew Hallowell, Assistant Professor and Bevers Faculty Fellow – University of Colorado

e-mail: matthew.hallowell@colorado.edu
Our Journey Way – Five-year Data-driven Learning – Sustain High Levels of EHS

*Plenary Session Slides*

**Way**
Our Journey:
Five-year Data-driven Learning
Sustain High Levels of EHS

John Barry, SABIC-IP

---

SABIC-IP Cartagena, Spain – Engineering Team

---

**Is safety important?**

A. Yes
B. No
Why is safety important?

A. Boss tells me so and he’s watching.
B. Zero accidents means more bid opportunities.
C. Everyone goes home to family each day.

How important is safety?

A. Not important
B. Important
C. Very important

If safety is so important...

What are you doing to improve it?
Learning Objectives

- Be inspired to take action in construction safety.
- Know how to integrate innovative construction safety methods.
- Be able to unify a project team to develop and implement specific safety solutions.
- See how data-driven learning drives implementation of preemptive safety actions.
- Recognize that learning is energizing and fun!

Part of Our “Way”

- Construction team performs projects within an existing plastics plant.
  - 250,000 to 900,000 workhours per year with more than 14 contractors
- Each year our expectation is zero OSHA recordable incidents.
- Our team has achieved zero OSHA recordable incidents in seven of the last 11 years.

Charles Darwin

- Five-year sea voyage around the world
- Five weeks in Galapagos Archipelago
Notes

25 years after his journey, Darwin publishes his theory of natural selection.

Our “Island” – SABIC-IP in Cartagena, Spain

CII, its Safety COP, conferences, and digital communications enable us to share and learn globally.
Notes

Our “Island” – SABIC-IP in Cartagena, Spain

1993
$2.5 billion
$25-50 million annually in projects
Contractor workforce 150–300

Shutdown workforce surge 450–800

“Our Way” – Process

Engage employees with the wisdom and knowledge gained through experience.

- Ask for help; protect.
- Ask why.
- Ask a BIG question.
- Challenge.
- Study (e.g., collection data and analyze).
- Seek consensus.
- Execute.
- Check/rechallenge.
Our Journey Way – Five-year Data-driven Learning – Sustain High Levels of EHS

Notes

Why do we do it that way?

Σωκράτης
(Socrates)

Why do we do it that way?

Knowles’ Andragogy

Know the reason.
Use our experience.
Be engaged in decisions.
Demonstrate immediate relevance.
Stay problem-centered.
Generate internal motivation.

Why do we do it that way?

Knowledge through Experience

700 persons x 25 year average experience = 17,500 years of experience

With everyone’s experience here... imagine our total years of experience

Together we have more knowledge than any one person.

Robert Greenleaf
Why do we do it that way?

Start with why!

Simon Sinek

Action learning requires a question!
Learning = Programming + Question

Reg Revans

Why do we do it that way?
Cone of Learning
(Edgar Dale)

After two weeks we tend to remember

<table>
<thead>
<tr>
<th>Nature of Involvement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>50%</td>
</tr>
<tr>
<td>Verbal Receiving</td>
<td>20%</td>
</tr>
<tr>
<td>Looking at Pictures</td>
<td>30%</td>
</tr>
<tr>
<td>Visual Receiving</td>
<td>50%</td>
</tr>
<tr>
<td>Participating in a Discussion</td>
<td>10%</td>
</tr>
<tr>
<td>Receiving, Participating</td>
<td>10%</td>
</tr>
<tr>
<td>Doing</td>
<td>50%</td>
</tr>
</tbody>
</table>

Why do we do it that way?

Safety Program

<table>
<thead>
<tr>
<th>Safety System</th>
<th>Safety Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspections and audits</td>
<td>Thoughts and actions</td>
</tr>
<tr>
<td>Training to increase safety knowledge</td>
<td>Influence values</td>
</tr>
</tbody>
</table>
Why do we do it that way?

Clarity, Unity, and Agility
Based on “Strategic Speed”

What Is Different in Our “Way”

- Data drives OUR initiatives/actions.
- Achieving team alignment – EHS and supervisors
  - safety and non-safety departments
    - weekly joint meetings
    - equal voice to all (no backseat drivers).
- Non-safety department personnel also take lead roles.
  - Safety technicians cannot do it all by themselves.
  - Supervisors must be leaders.
  - Workers respond to supervisors more than safety technicians.

Implementation Session

- Share our findings and implementations from two data-driven processes inspired by the following questions:
  1. Can you predict positive results prior to mobilizing workers?
  2. Can studying trends in accidents and near misses lead to preemptive solutions eliminating accidents?
- Share a glimpse of where we are going.
- Hand-outs.
How Data Change Everything

We love to collect data

- Guarantee surprises
- Prompt new discussion
- Necessitate new learning
- Provide unique solutions
- Generate turnkey learning
- Are fun!

Data-driven Learning Culture

- We are a team with extensive hands-on experience and a drive for improvement.
- We believe no matter how much or how little experience you have, you can learn and improve each day.
- We believe by learning and improving we change those around us and help change the world.
- Would you like to join us?
Our Journey Way – Five-year Data-driven Learning – Sustain High Levels of EHS

Implementation Session Slides

Notes

Our Journey Way
5 Year Data Driven Learning
Sustain High Levels of EHS

John Barry, Sabic-IP

2013 Annual Conference
July 20-23, Orlando
Celebrating 30 Years
Leadership. Research. Collaboration. Improvement

Sabic-IP Cartagena, Spain - Engineering Team

Panelists:

Cecil W Chapman Jr. CSP
HSE
CB&I Power Group

Matthew R. Hallowell, Ph.D.
Beavers Endowed Faculty Fellow and Assistant Professor
Dept. of Civl, Environmental, and Architectural Engineering
University of Colorado at Boulder
Implementation Session

- Share our findings and implementations from two data-driven processes inspired by the following questions:
  1. Can you predict positive results prior to mobilizing workers?
  2. Can studying trends in accidents and near misses lead to preemptive solutions eliminating accidents?
- Share a glimpse of where we are going.

If safety is so important...

What are you doing to improve it?

Learning Objectives/Goal

- Inspire audience to action in Construction Safety.
- Introduce a new innovative method of approaching construction safety.
- Unify this team (supervisors/contractors/EHS/owners) to uncover specific solutions you will implement.
- See how data-driven learning drives implementation of preemptive safety actions.
- Experience the energy and fun in learning!!!
“Our Way” – Process

Engage employees with the wisdom and knowledge gained through experience.

- Ask for help; protect.
- Ask why.
- Ask a BIG question.
- Challenge.
- Study (e.g., collection data and analyze).
- Seek consensus.
- Execute.
- Check/rechallenge.

Good vs. Opportunity

Predicting Positive Results prior to mobilizing?

1. Evaluate Opportunity Projects
   - 12 Factors
   - 16 Projects

Good vs. Opportunity Projects

- 12 Factors
- 16 Projects

Is there a way to predict successful projects prior to mobilizing the workers?

Good vs. Opportunity Projects

- 12 Factors
- 16 Projects

SUPERVISORES DE CONTRUCCION
DEPARTAMENTO DE PROYECTOS DE OBRA VIVA
What is the key factor?

A. Workers with experience  
B. Foreman with experience  
C. # of men in the crew  
D. Scope of work  
E. Weather

Is there a way to predict successful projects prior to mobilizing the workers?

1) Foreman with Experience at Sabic site
2) Crew Size & % Crew with experience at Sabic site

Solutions:
1. Site experienced foreman & workers.
2. Supervisors develop foreman training.
3. Supervisors trained 60+ general foreman, foreman & safety technicians.
4. Supervisors train all newly arriving foreman.
Our Journey Way – Five-year Data-driven Learning – Sustain High Levels of EHS

Notes

Good vs. Opportunity
Predicting Positive Results prior to mobilizing?

1. Identify Opportunities
2. Position of Factors Trends
3. TAPs

The next shutdown, we maximized foreman and workers with experience at our site…

What will the data show as the next opportunity?

Good vs. Opportunity Projects
25 Factors
40 PCs

What is the key factor?

A. Planning
B. Foreman with experience at our site
C. Follow the Rules
D. Complexity of work
E. Known contractor
Our Journey Way – Five-year Data-driven Learning – Sustain High Levels of EHS

Predictor of Positive Results 3

Follow the Rules

Sample of what we have learned...

Can you create an environment where people have the habit of following the rules?

1. Contractors perform inspection with Site Construction Leader.
2. Follow-up summary of performance distributed.

CII Active Leading Indicator prior to 2012 conference...
Our Journey Way – Five-year Data-driven Learning – Sustain High Levels of EHS

Notes

Good vs. Opportunity

Predicting Positive Results prior to mobilizing?

Good vs. Opportunity Projects
43 Factors
26 POs

The next shutdown, we maximized foreman and workers with experience at our site AND concentrated on following the rules...

What will the data show as the next opportunity?

SAMPLE OF DATA COLLECTION SHEET

<table>
<thead>
<tr>
<th>Contractor Projects</th>
<th>Supervisor</th>
<th>Date</th>
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<tbody>
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- Foreman had previous small jobs
- More than 3 months ago

- 2 days prior to shutdown
- 4 days prior to shutdown
- 6 days prior to shutdown
- 8 days prior to shutdown
- 10 days prior to shutdown
- 12 days prior to shutdown

- Knowledge of data in 1 Beat
- Knowledge of data in 2 Beat

- Less than 1 week
- 1 week
- 2 weeks
- 3 weeks
- 4 weeks
- 5 weeks
- 6 weeks

- Available
- Not available

- Good vs. Opportunity Projects
- 43 Factors
- 26 POs

- Cartage TEAM developed and measured.
What is the key factor?

A. Planning  
B. Foreman with experience in Sabic  
C. Communication  
D. Follow the Rules  
E. Experienced worker  
F. Situation awareness

Predictor Results

<table>
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<tr>
<th>Correlation</th>
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<tr>
<td>Communication</td>
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**Communication, Situation Awareness & Behavior of Foreman**

How do we assure new contractors communicate, situation awareness foreman behavior and teamwork prior to work starting?

Results similar 2003
"Safety at the Sharp End" - Rhonda Flin & Crew
Resource Management in Aviation
Good vs. Opportunity Concept

- **Clarifies** most important factor.
- **Unifies** team around improvement opportunity...
  - Creates opportunities for team to find unique solutions for selective **preemptive strikes**.
- Each site is distinct, key factors may be different.
  - Data from Good vs. Opportunity Concept allows you to locate the key factor for each site.

**HOW DOES THIS CONCEPT MESH WITH RECENT CII RESEARCH?**

**QUESTIONS PRIOR TO MOVING TO NEXT CONCEPT?**
CATEGORIZING ACCIDENTS

Are there trends in existing accidents and/or near misses that could enable preemptive actions?

CATEGORIZING ACCIDENTS

24 months accidents & near misses + 90 questions + Worker’s Voice =

Are there trends in existing accidents and/or near misses that could enable preemptive actions?
Which category do you think had higher number of incidents from data at our site?

A. Emotional distraction
B. Heroic Acts
C. Failure in Fundamentals - Bad habit
D. Failure in Fundamentals – Inexperience
E. Victim
F. Organizational Accidents
Notes

Our Journey Way – Five-year Data-driven Learning – Sustain High Levels of EHS

Which category do you think had highest potential consequences of the incidents from the at our site?

A. Organizational Accidents
B. No Foreman
C. Emotional distraction
D. Heroic Acts
E. Failure in Fundamentals - Bad habit
F. Failure in Fundamentals - Inexperience
G. Victim

Potential Consequences
WHAT ARE THE TWO TYPES OF ACCIDENTS?

Two Types of Accidents
Individual Accidents & Organizational Accidents

1. Example Individual Accident: Person trips and falls and breaks hand.
2. Example of an Organizational Accident:

The Reason Model
and Accident Causal Chain

Swiss-Cheese Model -
James Reason

Organizational Incidents in Construction

1) Communication
2) Schedule
3) Permits
4) Presence of Ops
5) Lock-out Tag-out or Special Risk Analysis
6) Awareness of Risks
7) Shutdown
Our Journey: Way – Five-year Data-driven Learning – Sustain High Levels of EHS

Notes

SO WHAT???

Implemented Solutions

Errors

- Emotional Distractions
  - Create positive climate
  - Engage personnel to observe and help others

- Heroic Acts, Cultural
  - Embrace innovation to identify culture, expectations
  - Rotate/revise with employee who took risk of potentially high severity

- Failure in fundamentals
  - Need to address fundamentals for each major task
  - Observation

Does not know or understand
  - Need to determine next step or list of fundamentals

Personal

Team Imposed

Organizational Accidents

Victim: Unforeseeable and/or Unknown

Study each per incident to be implemented next
Categorizing Accidents Concept

- Clarifies why, potential frequency & potential severity consequences.
- Unifies team to find solutions.
- Creates opportunities to implement preemptive solutions.
- Categorizing Accidents Concept appear to be Universal.

What is New or Different

- Non-safety department personnel taking initiative, learning and leading continuous learning and improvement in safety, working with the safety department.
- Two unique data driven learning concepts: Good vs. Opportunity & Categorizing Accidents
  - Goodness: clarity, unity, and driven: safety initiatives (learning, studies, inspections), contract analogies, learning culture.
  - Opportunity: new lines of thinking, new questions, which drives new solutions.
  - Creates change from passive to proactive to preemptive stance, data driven, actions.
  - Extra and studies have broken multiple paradigms.
  - Good works are the most important.
  - Contract is shaped for safety.
  - Workers can change the emotional comfort of safety personnel.
  - People cannot change.
  - Communication can not be measured nor improved.
  - Only individual as a unit exist in construction (organizational accidents).
- Participation and engagement
  - Participation of contract workers, general foreman, EHS department and all site supervisors in weekly EHS meetings.
  - Supervisors with autonomy to challenge others for non-compliance and/or better way.
  - Workers wants to work with us, are proud of their accomplishments, not being.
  - Site director tells contractors: “You have valuable experience. Use your experience to stop any unsafe acts or requests.” Experience is valued.
  - 50+ concepts and initiatives developed and led by non-safety personnel.
  - Asking B50 questions and continuous learning.
  - Workers thank you for what you are doing.
  - People are energized with direct learning.
How data changes everything...

Love to collect data because

- Always a surprise
- New discussions
- New learning
- Unique solutions
- Turnkey learning
- Fun!!!

Initiation of next study...

Where are we going?

Continue the learning journey (Engaging those with wisdom and knowledge through experience): asking, helping, protecting, challenging, collecting and studying data, consensus, execute & check/rechallenge...

Join us in the journey to help in the evolution...

What more can you and your team do?

1.

2.

3.

Your email: johnallenberry@gmail.com
Our Journey Way – Five-year Data-driven Learning – Sustain High Levels of EHS

1. Write your 3 actions. NOW!
2. Fill-in your email address.
3. Communicate your 3 action items with your neighbor.
4. Pass your sheet into the center aisle.
5. John will email you 45-60 days from now asking for your self-evaluated performance.
6. Return John’s email advising 0, 1, 2 or 3 action items taken.

What more can you and your team do?

1. 
2. 
3. 

Your email: _________________________________

Reference team: joh寰hen@yahoo.com

If you want to grow people, have them come to their own insights. - David Rock

Questions and/or Feedback?

Hope you have new perspectives and ideas and you are inspired to take action

Look forward to the 45-60 day feedback results

Have fun!!!
Learning Objectives

- Understand the magnitude of the knowledge loss potential in the capital projects industry and the associated risks.
- Appreciate the unique, dynamic and intangible nature of individual experiential knowledge.
- Introduce experiential knowledge retention management as a long-term, proactive, corporate initiative.
- Describe techniques for identifying and assessing individual experiential knowledge loss from a corporate perspective.
- Present the Experiential Knowledge Retention Model.

Plenary Session Abstract

The plenary presentation will highlight the risks associated with experiential knowledge loss, the prevalence of the problem within the industry, and will introduce the Experiential Knowledge Retention Management Model as a means for mitigating these risks. This model is structured around 10 steps. Key research findings will also be presented.

Implementation Session Abstract

The implementation session will be a mix of a teaching session and interactive teaching aided by the use of electronic polling and videos. The presentation will introduce elements of IR 292-2, Experiential Knowledge Retention Management Model, in detail; specifically, those pieces which research shows most companies lack when trying to address this problem. The session will conclude with a Q&A session to a panel of team members.
Plenary Session Presenter

John R. McQuary, Vice President, Knowledge Management & Technology Strategies – Fluor Corporation

John McQuary has been with Fluor for over 29 years. As the leader of the Knowledge Management Team, he has led the Fluor KM program from initial concept to cross-industry recognition for Fluor as a leader in the field of knowledge management. External recognition has included nine Most Admired Knowledge Enterprise (MAKE) awards and recognition by the American Productivity and Quality Center (APQC) three times for excellence in creating communities of practice, knowledge retention and transfer, and sustaining communities.

In addition to his Fluor responsibilities, McQuary sits on the Fiatech Board of Directors. He is frequently invited to be a keynote speaker at various knowledge management and technology conferences. His education includes a degree in mechanical engineering from the University of Arkansas, and leadership studies at the Thunderbird Graduate School of International Management and the University of South Carolina.

e-mail: john.mcquary@fluor.com

Implementation Session Moderator

Mark R. Fox, Training Coordinator/Instructor – ConocoPhillips Projects College

As a member of ConocoPhillips’ centralized projects organization, Mark Fox delivers onsite training and provides facilitation and course content development services in several areas: project controls, project management, personal development, and leadership. Prior to joining ConocoPhillips, he worked at a large international EPC contractor, holding positions in project engineering, civil/structural engineering, and quality management. Mark has 25 years of experience associated with oil and gas, petrochemical, refining, and production facilities projects. He is a registered Professional Engineer in Colorado and Texas, and has received certification as a Project Management Professional.

e-mail: mark.r.fox@conocophillips.com
Panelists

Carlos H. Caldas, Associate Professor – The University of Texas at Austin
e-mail: caldas@mail.utexas.edu

Antonio Carlos De Lemos Oliveira, Petrobras
e-mail: acarloslemos@petrobras.com.br

Jeffrey Joyce, Project Manager, Energy Business – Air Products & Chemicals, Inc.
e-mail: joycejr@airproducts.com

John R. McQuary, Vice President, Knowledge Management & Technology Strategies – Fluor
e-mail: john.mcquary@fluor.com
Transferring Experiential Knowledge from the Near-retirement Generation to the Next Generation

Plenary Session Slides

Research Team 292

Ted Andrus, Day & Zimmermann
Carlos Caldas, UT Austin
Dennis Chastain, Mustang
Jason Crain, Hargrove
Richard Elkington, UT Austin
Mark Fox, ConocoPhillips
Melvyn Hizon, BP
John Hope, Bateman
Jeff Joyce, Air Products (Vice-Chair)

Kevin Kaczmarczyk, OPG
Jung Yeol Kim, UT Austin
Fernanda Lino, Petrobras
John McQuary, Fluor (Chair)
James O’Connor, UT Austin
Antonio Oliveira, Petrobras
Kevin Porter, Lauren
Larry Stevens, Alstom Power
Robert Tabor, URS

Research Objective

Provide the capital projects industry with definitive recommendations, guidelines, and tools to effectively transfer the experiential knowledge of its near-retirement employees to remaining and new employees.
Research Objective

- Deliver techniques to measure an organization’s knowledge loss risk.
- Define methods to effectively transfer knowledge.
- Understand the barriers and implementation success factors.
Notes

Key Findings

• Effectively retaining an organization’s experiential knowledge requires a managed program.

• Benefits include the following:
  – maintaining operational efficiency
  – reducing the occurrence of critical errors
  – encouraging innovation
  – enabling the pursuit of growth strategies.

• Transfer of experiential knowledge is more important than ever, as the number of baby boomers at retirement age increases daily.

Experiential Knowledge Retention Management Model

March 2013

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</table>
Transferring Experiential Knowledge from the Near-retirement Generation to the Next Generation

Implementation Session Slides

Why Are We Here?

The capital projects industry is experiencing a dramatic increase in the rate of experienced people leaving the workforce.

Why Are We Here?

Simply maintaining headcount will not maintain collective knowledge and too many mentors are leaving too quickly.
**What Needs To Be Done?**

We recommend shifting focus from *people replacement* to *knowledge retention*. This creates an opportunity for companies to maintain their competitiveness.

**RT-292 Products**

Guidelines and tools for the capital projects industry to *effectively transfer the experiential knowledge* of its employees nearing retirement to the people who remain on the job or are new to the industry.

- Experiential Knowledge Retention Management Model
- Research Summary
- Research Report

**WHAT TO EXPECT DURING THE PRESENTATION**

- The story of EPC, Inc. will link to our product
- Audience survey questions
- Take-away summary for each section
- Panel session with Q&A after the presentation
Transferring Experiential Knowledge from the Near-retirement Generation to the Next Generation

Presentation Handout

Notes

Experiential Knowledge Retention Management Model

<table>
<thead>
<tr>
<th>Organization</th>
<th>SMA</th>
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Which is the top superhero?

A. Superman
B. Batman
C. Spiderman
D. Wonder Woman
E. Ironman
Let’s recall the EPC, Inc. CEO discussion with his client

How concerned are you about losing an expert in your organization with critical knowledge?

A. Moderate concern
B. High concern
C. Extreme concern

WHAT IS EXPERIENTIAL KNOWLEDGE?
### Which of these best represents Experiential Knowledge?

A. Design manuals  
B. International Building Code  
C. Expert solution to a challenging problem  
D. Lesson learned report

### The Value of Experiential Knowledge
Transferring Experiential Knowledge from the Near-retirement Generation to the Next Generation

Notes

The Value of Experiential Knowledge

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<td>KNOWING WHERE TO PUT THE X</td>
<td>$9,999.00</td>
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<tr>
<td>TOTAL</td>
<td>$10,000.00</td>
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Some 100 years later this would equate to getting an invoice for $335,000!

What Does Experiential Knowledge Mean to You?

*RT-292 has defined Experiential Knowledge as that knowledge which constitutes the insight, wisdom, and good judgment gained through experience; is often characterized as “know-how;” and is developed more through ‘doing’ than other forms of learning.*

HOW IS KNOWLEDGE TRANSFERRED?
Transferring Experiential Knowledge from the Near-retirement Generation to the Next Generation

How does your organization currently address knowledge transfer?

A. We don’t
B. Unplanned or informal (on your own)
C. Conventional training focused on explicit knowledge
D. A formal program that addresses both experiential & explicit knowledge
E. I don’t know

How many knowledge transfer strategies is your organization currently using?

A. None
B. 1 to 5
C. 5 to 10
D. More than 10

Knowledge Transfer Strategies

<table>
<thead>
<tr>
<th>KTS Index</th>
<th>KTS Name</th>
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<tr>
<td>KTS-01</td>
<td>Lessons Learned &amp; Best Practices</td>
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<td>KTS-02</td>
<td>Community of Practice</td>
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<td>Facilitated Masters Classes</td>
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<td>Lunchtime Seminar</td>
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<td>Narrative Database/Storytelling</td>
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<td>KTS-06</td>
<td>Standardized College Program/course</td>
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<td>KTS-07</td>
<td>IT Collaboration/Communication</td>
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<td>Outsourcing/Acquisition</td>
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<td>KTS-09</td>
<td>Desk Side Review</td>
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<td>Job Shadow</td>
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<td>KTS-11</td>
<td>Mentoring/Coaching</td>
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<td>KTS-12</td>
<td>Simulations</td>
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<td>KTS-13</td>
<td>Job Rotation</td>
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<td>KTS-14</td>
<td>Attend Meetings as an Observer/Learner</td>
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<td>KTS-15</td>
<td>Grooming Assignment</td>
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<td>KTS-16</td>
<td>Keep Retired Connected</td>
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</table>
Meanwhile at EPC, Inc.
Jeff wants to know which transfer strategy is best

KEY TAKE-AWAYS

- Wide variety of available options
- Don’t start by selecting a transfer strategy
  - Start by understanding the problem

Experiential Knowledge Retention Management Model
I plan to retire in ____ years.

A. Less than 3  
B. 4 to 6  
C. 7 to 10  
D. More than 10  
E. None of your business

Have you shared your potential retirement timeframe with your organization?

A. Yes  
B. No

Meanwhile at EPC, Inc.
Kevin has started analyzing the company's situation
Notes

**Experiential Knowledge Retention Management Model**

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**STEP TWO TAKE AWAYS**

- Organizational demographics
- Subject Matter Area identification & structure
- Identification of projected at-risk knowledge departure

**Does your company know which Subject Matter Areas are at risk?**

A. Yes
B. No
Meanwhile at EPC, Inc.
They are prioritizing
whose knowledge is critical
and at risk of departure

What We’ve Covered

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STEP FOUR
TAKE-AWAYS

- Before looking at the what, we need to look at the who
- Some SMA knowledge is more critical than others
- Tool helps identify priorities
  - Priority = departure risk x criticality
For each specific knowledge transfer case, do you have any corporate guidance on how to select the best strategy?

A. Yes
B. No
C. Don’t know

Meanwhile at EPC, Inc.
The potential transfer environments are analyzed in order to select the best strategy.

---

**Moving from Assessment to Planning**

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Transferring Experiential Knowledge from the Near-retirement Generation to the Next Generation

**STEPS FIVE & SIX TAKE-AWAYS**

- Analyze the transfer environment
- Tool outputs top 5 transfer strategies
- Narrow down to select best case
  - Consider other qualitative factors

**Final Steps to the Process**

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Meanwhile at EPC, Inc.
They’re experiencing a successful end result
Notes

Research Products

- IR 292-2
  - Experiential Knowledge Retention Management Model: Provide guidance on the implementation of effective knowledge retention programs
  - Knowledge Criticality Assessment Tool
  - Knowledge Transfer Characterization Tool
- Research Summary
- Research Report

RT 292

Ted Andrus, Day & Zimmerman
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Richard Eikington, UT Austin
Mark Fox, ConocoPhillips
Melvyn Hizon, BP
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John McQuary, Fluor (Chair)
James O'Connor, UT Austin
Antonio Oliveira, Petrobras
Kevin Porter, Lauren
Larry Stevens, Alstom Power
Robert Tabor, URS
WESCO International, Inc.

Keynote Address: John J. Engel, WESCO International, Inc.

Keynote Speaker

John J. Engel, Chairman, President, and Chief Executive Officer – WESCO International, Inc.

John J. Engel was appointed Chairman of the Board of Directors of WESCO International, Inc. in May 2011, and has been President and Chief Executive Officer since September 2009. Prior to these appointments, Engel served as WESCO’s Senior Vice President and Chief Operating Officer from 2004 to September 2009. Before joining WESCO, Engel served as Senior Vice President and General Manager of Gateway, Inc. from 2003 to 2004; Executive Vice President and Senior Vice President of Perkin Elmer, Inc. from 1999 to 2002; and Vice President and General Manager of AlliedSignal from 1994 to 1999. He also held various engineering, manufacturing, and general management positions at General Electric from 1985 to 1994.

Engel serves as a Director of United States Steel Corporation. He is also a member of the Business Roundtable and the Business Council, and serves as a member of the Board of Directors of both the National Association of Manufacturers and the Allegheny Conference. In addition, he is Vice Chairman of the Board of Directors of the Electrical Safety Foundation International. Engel holds a B.S. degree in mechanical engineering from Villanova University and earned an MBA from the University of Rochester.

e-mail: kwickwire@wesco.com
WESCO International, Inc.

Keynote Address Slides

Notes

WESCO International

WESCO is a leading provider of electrical, industrial, and communications MRO and OEM products, construction materials, and advanced supply chain management and logistics services.

VISION

Global Leader of Supply Chain Solutions that consistently delivers Superior Customer Value and Shareholder Returns

Known for the best customer service and the best people

VALUE PROPOSITION

Providing customers the products and supply chain services they need for MRO, OEM, and Capital Projects

...an industry leader

Global Footprint

Headquartered in Pittsburgh, PA | 9,000+ employees | 475+ locations in 18 countries

...supports expanding with customers around the world
Global Reach

...delivering solutions far beyond our physical locations

Profile

Markets & Customers
...serving over 65,000 customers

- Industrial: 12%
- Non-Residential: 36%
- Residential: 45%
- Other: 12%

Products & Services
...partnering with 15,000 suppliers

- General Supplies: 25%
- Data & Broadband Communications: 20%
- Wire, Cable & conduit: 15%
- Distribution Equipment: 19%
- Lighting & Controls: 11%
- Controls & Motors: 11%

Geography
...over 4 million different products shipped annually

- U.S.: 79%
- Canada: 5%
- Mexico: 15%

Sales
1994: $1.6B at LBO
2003: $5.3B
2012: $6.6B

...portfolio diversified and strengthened over last decade

Market Leadership

We serve more than 65,000 customers, including an impressive array of Fortune 1000 companies across the industrial, construction, utility, and C&I (commercial, institutional, and government) end markets.

BOEING
ExxonMobil
OXY
Chevron

FLUOR
INTERNATIONAL PAPER

Eaton
CARGILL
Honeywell
P&G
Dow

Northrop Grumman
Tyson
United States Steel Corporation

...demonstrated by blue chip customer base
Notes

One WESCO Product and Services Portfolio

- Automation and Control
- Broadband Communications
- Data Communications
- Electrical
- Electromechanical
- Electronics
- Industrial MRO and consumables
- LEAN and Supply Chain Management Services
- Lighting
- Network and Physical Security
- OEM
- Safety
- Solar
- Utility
- Wind
- Wire and Cable

...comprehensive supply chain solutions for our customers

A pick-up in US real GDP growth in 2014 will help to lower the unemployment rate

Global Accounts Value Proposition

Standardizing products, pricing, terms, and service across multiple customer facilities

Industrial & Electrical Distribution  Direct Material Solutions  Global Capital Project Management  Integrated Supply

...address key customer needs and applications
Integrated Supply Capabilities

Customer Savings Opportunities

- 15% Lower material prices
- Productivity improvements
- Spending controls and reduced consumption
- Less waste
- Lower labor costs
- Less working capital
- Optimized inventory
- Increased efficiencies
- Reduced system investments

...provide turnkey supply chain outsourcing for our customers

Utility

Utility Power Chain segments addressable by WESCO

- Generation
- Transmission
- Substation
- Distribution

Core Sales Growth versus Prior Year

<table>
<thead>
<tr>
<th>FY 2011</th>
<th>FY 2012</th>
<th>Q1 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0%</td>
<td>10.5%</td>
<td>17.4%</td>
</tr>
</tbody>
</table>

Note: Includes completions during the prior year's revenue.

Over $115B annual spend in U.S., and Canada
12-15% is addressable by WESCO

...attractive growth prospects

Communications and Security

$20 Billion Addressable Market

- Data Centers
- Critical Access
- Critical Life
- Critical Security

Strategic Initiatives

1. End-user Specification Selling
2. Global Accounts and Service Excellence
3. Inside and Outside Facility Solutions
4. Product Line Expansion
5. Acquisition Strategy

U.S. Data Center Construction ($B)

<table>
<thead>
<tr>
<th>2010</th>
<th>2015</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: E-Weekly, U.S. Data Center Services, March 2011

Global Security Market ($B)

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>11</td>
<td>12</td>
<td>13</td>
<td>15</td>
<td>18</td>
<td>25</td>
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</tbody>
</table>

Source: IMI Markets

...attractive growth prospects over long term
Notes

Construction

Architects Billing Index (ABI)

Capital Projects Group
EPCs and Large Contractors

Global Accounts
End Users, EPCs, and Contractors

Branches
Local Contractors

...attractive growth prospects for non-residential in near- to mid-term

Capital Projects Group

<table>
<thead>
<tr>
<th>Contract Awarded</th>
<th>Alignment Session</th>
<th>Construction</th>
<th>Operations</th>
<th>Strategic Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Safety</td>
<td>• Resource</td>
<td>• Manage transition</td>
<td>• Lessons learned</td>
<td></td>
</tr>
<tr>
<td>• Cool and schedule</td>
<td>requirements</td>
<td>from construction to</td>
<td>from warehouse set up</td>
<td></td>
</tr>
<tr>
<td>• Project risk</td>
<td>• Standardization</td>
<td>operations</td>
<td>• Inventory management</td>
<td></td>
</tr>
<tr>
<td>• Project</td>
<td>• Maximize craft</td>
<td>solutions (WMS,</td>
<td>• Metrics and results</td>
<td></td>
</tr>
<tr>
<td>organization</td>
<td>productivity</td>
<td>integrated Supply, etc.)</td>
<td>• Benchmarking</td>
<td></td>
</tr>
<tr>
<td>• Identify key</td>
<td>• Leverage spend</td>
<td>• Leverage capital</td>
<td>• Global best practices</td>
<td></td>
</tr>
<tr>
<td>capital metrics</td>
<td>• Minimize surplus</td>
<td>projects spend for</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Benchmarking</td>
<td>• Prepare for transition</td>
<td>KRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Identify key</td>
<td>to operations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>executive sponsors</td>
<td></td>
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</tbody>
</table>

...supporting the entire project lifecycle

Capital Project Management

WESCO RPM Software

- Invested in tools to support the construction industry
Construction Success Stories

Major Oil Company:
Re refinery Expansion

- $3.9B TV. 2 year project
- WESCO sales: $35M
- 3,000 craft / 200 electrical at peak
- 4,000 item project catalog
- $4M in dedicated inventory
- Four on-site trailers
- Over 30,000 pick tickets
- RPM project management

Utility Company:
Cogeneration Facility

- $3.0B TV. 2.5 year project
- WESCO sales: $45M
- Eight EPCs
- 3,500 craft / 1,200 E&I at peak
- 3,000 line items shipped
- 10 WESCO employees on-site
- RPM project management

...project and supply chain management for our customers

Notes

Supplier Engagement Best Practices

1. Strategic alignment between customer and suppliers
2. Commitment to a win-win value proposition
   - Agreements that work
   - Clearly defined metrics
   - Transparency
3. Commitment to continuous improvement
   - Executive sponsorship
   - Organizational design that creates ownership
4. Leverage WESCO’s scale and multiple product and service platforms
5. Adapt to rapidly changing market conditions

...partnership, transparency, and win-win value proposition

LEAN Journey

- Initiated in 2003
- Centralized LEAN team with additional field resources
- 6,000+ Kaizen events
- Enterprise-wide application and results
  - Focus on sales, operations and transactional processes
  - Industry-leading value creation program for customers
- LEAN leadership, culture and certification programs
- A distinct, competitive differentiator

...a continuous improvement culture founded on LEAN
Notes

LEAN Construction Solutions

Construction
- Job Trailers
- New Construction
- Lighting
- Power Distribution
- Services
- Prefabricated Systems

e-Business
- eCommerce Transaction Services
- Online Procurement

Green and Sustainability
- Sustainability Planning

Production Support
- Cable Management
- Kitting

Safety and Security
- Arc Flash Training and Review
- Lockout/Tagout
- Spill and Leak Remediation Assessment

Supply Chain Optimization
- LEAN Inventory
- Vendor Managed Inventory (VMI)

...serving the construction market for over 90 years

Cumulative Acquisitions Since 2010

Acquisition Strategy Framework

Markets & Customers

Geographies

Core Products & Suppliers

Acquisition Priorities
- Consistent with WESCO strategy
- Rate of return greater than WESCO
- Risk-adjusted average cost of capital
- Accretive in first year of operation
- Margins higher than WESCO

Acquired Sales (in $ millions)

<table>
<thead>
<tr>
<th>Acquired Sales</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>PepsiCom</td>
<td>325</td>
<td>400</td>
<td>1,500</td>
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</tr>
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</table>

...driving strategic growth and shareholder value

EECOL Business Profile

57 locations in Canada

20 locations in South America

...EECOL is a transformational acquisition
Recent Accomplishments

WESCO International, Inc.

Notes

Total Shareholder Return

Partner with WESCO

- Industry leader with deep domain expertise in electrical, industrial, construction, and utility
- Proven business model and well positioned in large, fragmented markets
- Broad product and service portfolio
- Extensive global supply chain capability
- Operational excellence culture founded on LEAN
- Proven acquirer and integrator in a consolidating industry
- Blue chip customer and supplier base
- Focused on improving the efficiency and effectiveness of our customer supply chains

...strong company with proven and effective supply chain solutions
Abstract

Meaningful collaboration between industry leaders and vocational educators is the key to preparing students for the careers of the 21st century. Programs that provide leadership training and professional development are also essential to helping today’s students gain a realistic understanding of workplace expectations develop professionalism. In this session, you will hear the first-hand perspectives of young people, explaining what has worked for them and how programs can evolve to create even better educational outcomes and industry benefits.

In this unique moderated discussion, the presenters will address best practices for improving communication between educators and industry, and discuss the importance of using established CTE programs, first to identify and nurture high achievers and, then, to direct them as young craft professionals into the industry, where they can fill the current skills gap.

NCCER’s Build Your Future campaign (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, and leading them to long-term, rewarding careers in construction. SkillsUSA is a partnership of students, teachers and industry leaders working together to ensure that America has a skilled workforce.

Featured Speakers

Kaila O’Farrell, Senior – Plymouth South High School

Kaila O’Farrell is a senior in the electrical program at Plymouth South High School in Plymouth, Massachusetts. Although a non-traditional student, she has excelled not only vocationally—having earned the Massachusetts Outstanding Vocational Technical student award—but also academically. Indeed, in every high school term to date, she has maintained an A average, having accrued a 3.7 GPA. O’Farrell has displayed a commitment to student leadership by serving at all levels of SkillsUSA, from the local to national. Now a national officer, her service has allowed her to advocate for career and technical education, at a variety of business, industry, and educational venues. Also, since she joined SkillsUSA four years ago, she has attended various leadership training events and conferences, and has helped students and teachers improve professional and employability skills. In addition to student leadership, she has been committed to community service, having been awarded the President’s Volunteer Service award twice for contributing more than 300 hours of service to the people of Plymouth. Upon graduation from high school, O’Farrell will pursue a degree in political science or communications.
Holley Thomas, Certified Structural Welder – KBR

Holley Thomas became interested in welding in 2007, while earning a degree in robotics from Central Alabama Community College. A native of Alex City, Alabama, she was recruited by KBR, where she received mentoring and subsequent training. Holley is the first woman welder to have taken top honors in welding in the 60-year history of the Associated Builders and Contractors National Craft Championships. Since this historic achievement, Thomas has dedicated herself to continued education in the field, training others, and the recruitment of women for non-traditional industry roles.

e-mail: holleyt8@gmail.com

Ashley Webel, Certified Welding Inspector – RoMan Engineering Services

Ashley has extensive experience in applied welding and works mainly for RoMan Engineering Services in arc welding education and qualification. In addition to being a Certified Welding Inspector (CWI), Ashley’s qualifications include an associate’s degree in applied science from Washtenaw Community College, with a focus on welding. She also has a comprehensive background in welder education and instruction, experience she drew upon at both the Lincoln Electric Company and Washtenaw Community College. Webel is a past competitor on the Skills USA Welding and Fabrication Team competition, having earned two national medals. She is also a member of the American Welding Society, previously serving as Vice-Chair for the Cleveland section and presently serving on the executive board of the Detroit section.

e-mail: awebel@romaneng.com
Learning Objectives

- Provide an overview of the Construction Productivity Research Program and its findings.
- Present the Best Productivity Practices Implementation Index (BPPII) – Industrial Projects/Infrastructure Projects.
- Learn where to find BPPII, where BPPII fits, and how to use it.
- Understand how to interpret results to improve productivity.
- Learn about other productivity improvement tools through the use of the Construction Productivity Handbook.

Plenary Session Abstract

RT 252’s six-year research program has identified practices and innovations that can maximize construction productivity performance by increasing the time spent on direct work, reducing the number of work hours to complete each unit of work, and reducing the amount of rework. In this last phase of the program, the highlights are the final implementation resources developed by the team. This session will introduce the Construction Productivity Handbook and the Best Productivity Practice Implementation Index, tools that synthesize what has been learned over the course of the program and set the stage for construction productivity improvements.

Implementation Session Abstract

This session will present the results of the final phase of the Construction Productivity Research Program. RT 252 members will provide a brief summary of the team’s effort, mainly focusing on the Best Productivity Practice Implementation Index (BPPII). The audience will learn how to use the BPPII and how to interpret its results in order to improve construction productivity on their projects. Also, the panel will present the Construction Productivity Handbook, a comprehensive productivity improvement guide.
Plenary Session Presenter

Warren G. Adamson, Field Operations Manager, Plant Services – S&B Engineers and Constructors, Ltd.

As Field Operations Manager for S&B Plant Services, Ltd., Warren Adamson has operational responsibilities for small capital construction, supplemental maintenance, turnaround services, logistics services, technical services, and contract management for petroleum, chemical, and power industry facilities. His duties include safety and health, proposal preparation, operations, employee relations, and client satisfaction. A graduate of Texas A&M University with a B.S. in building construction, Warren has more than 30 years of experience in the industrial construction and services environment. He has acquired detailed expertise in engineering management, procurement, subcontract management, large and small capital construction, and maintenance operations. He also served for more than 24 years as an Air Force civil engineering officer, on active duty and in the reserves. He has been an active participant in CII initiatives since 2007, and is currently working on construction productivity with Research Team 252.

   e-mail: wgadamson@sbec.com

Implementation Session Moderator

Daniel D. Christian, Director, Power Market Sales Europe, Middle East, and India – Victaulic

Dan Christian has worked for 32 years for Victaulic, a world leader in piping solutions based in Easton, Pennsylvania. He is a member of both ASME B31-1 and ASME B31-3, and serves as the chairman of ASME B31-9. He holds a B.S. in Mechanical Engineering/Mechanical Contracting from Kean University and an M.S./MBA in Industrial Technology from Montclair University.

   e-mail: dchristian@victaulic.com
Panelists

Carlos H. Caldas, Associate Professor – The University of Texas at Austin
e-mail: caldas@mail.utexas.edu

Laerte Santos Galhardo, Project Manager – Petroleo Brasileiro S/A - Petrobras
e-mail: lsg@petrobras.com.br

Tim Heath, Project Director – URS Corporation
e-mail: tim.heath@urs.com

G. Mark Stofega, Jr., Director II, Construction Support – Fluor Enterprise, Inc.
e-mail: mark.stofega@fluor.com

Bob Tait, Construction Manager – Irving Oil
e-mail: bob.tait@irvingoil.com

Steve A. Toon, CE&T Productivity Engineer – Bechtel
e-mail: satoon@bechtel.com
Construction Productivity Research Program

Plenary Session Slides

Notes

CII labor costs incurred to this point of the presentation

$1,444,444

Best Productivity Practices Implementation Index
Industrial Projects

“Ninety percent of people want to work, but there are so many roadblocks.”

– Craft Professional, Eastern Canada
What Is the Industrial BPPII?

A tool for measuring and implementing practices to improve construction productivity on industrial projects.

Notes

Construction Productivity Research Program

BPPII – Industrial Projects

Excel Tool – Input

Higher Industrial BPPII Scores Led to Better Productivity

Statistical Validation (greater than 95%)

Productivity Performance Factor = \frac{\text{estimated hours/output}}{\text{actual hours/output}}

28% better
Notes

CII labor costs incurred to this point of the presentation $106,092

Best Productivity Practices Implementation Index
Infrastructure Projects

“We have a one-lane bridge going to the laydown yard; every day there’s a giant traffic jam.”

– Craft Professional, United States

What is the Infrastructure BPPII?

- Same structure and methodology as BPPII – Industrial
- Different elements
- Different weights

Materials Management
Construction Machinery and Equipment Logistics
Execution Approach
Human Resource Management
Construction Methods
Environment, Safety, and Health
Higher Infrastructure BPPII Scores Led to Better Productivity

Statistical Validation (greater than 99%)

Productivity Performance Factor = \frac{\text{(estimated hours/output)}}{\text{(actual hours/output)}}

Notes

CII labor costs incurred to this point of the presentation

$1,314,936

The Construction Productivity Handbook

“When I've got work, I like to take pride in it. I want to get it done.”

– Craft Professional, United States
Notes

About the Construction Productivity Handbook

- Presents critical research findings on construction productivity.

- Synthesizes the team’s work over the past six years into one coherent resource.

Use of the Construction Productivity Handbook

- As a productivity improvement guide for industry professionals

- As a quick reference guide for productivity experts

- For the education of the next generation through university courses

Using our productivity tools, you could save a substantial portion of your labor costs.

$164,556
Implementation Session

- Learn where to find the BPPII tools.
- Understand how the BPPII tools fit into project planning.
- Know how to use both BPPII tools.
- Interpret BPPII results to improve productivity.
- Discover other productivity improvement tools featured in the Productivity Handbook.
Notes

RT 252 Craft Productivity Research Program
Implementation Session

Agenda

• Introductions
• Best Productivity Practices Implementation Index for Industrial Projects (BPPII – Industrial)
• Best Productivity Practices Implementation Index for Infrastructure Projects (BPPII – Infrastructure)
• Construction Productivity Handbook
• Conclusions and Lessons Learned
• Q&A

Moderator & Panelists

Moderator:
• Dan Christian, Victaulic – SLIDES 1 TO 9, 39, AND 40

Implementation Session Panel:
• Tim Heath, URS – SLIDES 10, 12, AND 14
• Laerte Galhardo, Petrobras – SLIDES 11, 13, AND 15
• Steve Toon, Bechtel – SLIDES 16, 18, AND 20
• Mark Stofega, Fluor – SLIDES 17, 19, AND 21
• Carlos Caldas, UT-Austin – SLIDES 22 (BPPII TOOL DEMO) AND 23
• Bob Tait, Irving Oil – SLIDES 24 TO 38
RT 252 Members

- Warren Adamson: S&B
- William Boyd: U of Colorado
- Carlos Calles: U Texas Austin
- Dan Christian: U of Nebraska
- Paul Goodhart: U of Colorado
- Deborah Gustafson: CB&I
- Carl Haa: U of Waterloo
- Shannon Hopkins: Eastman Chemical
- Thomas James: Zachry Construction
- Martin Katz: Air Products and Chemical, Inc.
- Chuck Richards: CB&I
- David Baby: NIST/BPRL
- Tim Healy: URS
- Laerte Santos Galindo: Petrobras
- Mark Stokey: Fluor
- Bob Tait: Irving Oil Refining
- Carmen Heloisa Cortes Telles: Petrobras
- Steve Toon: Bechtel
- Robin Gutterman: Ontario Power Generation
- James Matteson: URS
- Randy Tomlinson: Dow Chemical
- John P. Trotter: AZCO Inc.
- Neal Zimmerman: Jacobs
- Dan Punte: International Paper
- David MacNeil: Baker Concrete
- Mathew Parker: Praxair
- Paul Murray: SNC Lavalin
- Dan Leng: Faithful+Gould

RT 252 Student Members

- Jung Yeol Kim: U Texas Austin
- Jial Liu: U of Waterloo
- Yongwei Shan: U of Kentucky
- Di Zhang: U of Waterloo
- Ashley Suzuo: U of Kentucky
- William Hinkle: U of Kentucky
- Mark Smith: U of Kentucky
- Chandara Foley: U of Kentucky
- Gabe Dadi: U of Kentucky
- Dong Zhan: U of Kentucky
- Jie Gong: U Texas Austin
- Mahdi Sadi: U of Waterloo
- Chris Gossett: U of Waterloo
- Hassan Naseh: U of Waterloo

The Knowledge Leader for Project Success
Owners • Contractors • Academics

BPPII – Industrial Projects

2013 Annual Conference
July 29-31 - Orlando
Celebrating 30 Years
BPPII – Industrial Projects

- Method and metric for measuring the implementation level of practices that have the potential to improve craft productivity in industrial projects.

BPPII and Other CII Indexes

- PDRi measures the level of project scope definition during Front End Planning (FEP).
- PHI assesses leading indicators of project performance during the Execution phase.
- BPPII supplement these indexes:
  - It evaluates practice implementation levels with a focus on construction productivity. BPPII should be used at the end of the FEP phase and the beginning of the Execution phase to support the preparation of the Project Execution Plan.

BPPII – Industrial Projects: Structure

- 6 Categories
- 18 Sections
- 53 Elements

- Materials Management
- Equipment Logistics
- Craft Information Systems
- Human Resources Management
- Construction Methods
- Environmental Safety and Health
Materials Management

"I waited for one month for a jamb clamp once"

"Good planning... plan ahead... look ahead!"

"They’re bringing up truckloads of spool pieces and it would take them four hours to find four spool pieces"

"When they’re planning these jobs I don’t think there looking at them because they’re all wrong"

---

Equipment Logistics

"We’re always running around looking for tools. We spend a lot of time doing that"

"Plan ahead for needs, scaffolds or man lifts"

"Looking for innovative equipment in the market to improve labor productivity"

"Explosion proof cords, can’t get‘em, have to steal from other jobs"

"When you are spending 10 minutes looking for tools and it takes five full time... to do the job, you got a lot of"

"We choose our tails for tools"

"We need to find a way to encourage contractors to looking for innovations to improve their processes"
Notes

**Equipment Logistics**

<table>
<thead>
<tr>
<th>Section</th>
<th>Planning and Implementation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Site Tool Management</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>2.A.1. Site tool and consumables management strategy</td>
<td></td>
</tr>
<tr>
<td>2.A.2. Tool tracking systems</td>
<td></td>
</tr>
<tr>
<td>2.A.3. On-Site tool maintenance</td>
<td></td>
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<tr>
<td>2.A.4. Control system for tool delays</td>
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<tr>
<td>B. Machinery Availability</td>
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<tr>
<td>2.B.1. Construction machinery productivity analysis</td>
<td></td>
</tr>
<tr>
<td>2.B.2. Equipment maintenance</td>
<td></td>
</tr>
</tbody>
</table>

**Craft Information Systems**

"The key is working together as a team and having a good plan"

"The best jobs are always the best planned jobs"

"We’d get in at 5:30 in the morning and not start work sometimes till 9:00 just because we’d have to wait for on the permit office"

"Better communication between crafts"

"Planning ahead on activities to be done with other crafts, to make sure timing is ok and areas available"

"Detailed analysis of the project with focus on constructability"
Human Resources

“Productivity’s going to be bad if they have bad morale

“Training should be an early, not once on site

“We don’t have enough people trained

“When I’ve got work, I like to take pride in it. I want to get it done

“Supervisors need to solicit craftsman opinions on assigned tasks

“What is it that you guys like best about your job?
- The satisfaction of doing the job
- It’s nice to know you built something
- The work you do that day, you can look back and see it. You’re not in a suburb

<table>
<thead>
<tr>
<th>IV - HUMAN RESOURCE MANAGEMENT</th>
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<tbody>
<tr>
<td>Section</td>
<td>0 1 2 3 4 5</td>
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<tr>
<td>A. Training and Development</td>
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<td>4.5.1. Trades technical training</td>
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<td>4.5.2. Career development</td>
<td></td>
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<tr>
<td>B. Behavior</td>
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<tr>
<td>4.6.1. Nonfinancial Incentive Programs</td>
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<tr>
<td>4.6.2. Financial Incentive Programs</td>
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<td>4.6.3. Social Activities</td>
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<td>C. Organizational Structure</td>
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<tr>
<td>4.7.1. Boundaries of Organization Structure</td>
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<tr>
<td>4.7.2. Clear Delegation of Responsibility</td>
<td></td>
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<tr>
<td>D. Employment</td>
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<tr>
<td>4.8.1. Retention Plan For Experienced Personnel</td>
<td></td>
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<tr>
<td>4.8.2. Exit Interview</td>
<td></td>
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</tbody>
</table>

Construction Methods

“Better coordination between Construction and Engineering

“Blinds are on the other side of the refinery from the shop

“Preparing an extensive scaffolding planning

“Certification does not equal skill or qualification

“Every piece of pipe has a different number of the same piping run. Line numbers change from print to print

“Computer access to electronic models, drawings and specifications

“We have a one lane bridge coming in. Everyday it’s like a giant traffic jam”
Notes

Construction Methods

<table>
<thead>
<tr>
<th>Section</th>
<th>Planning and Implementation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td></td>
</tr>
<tr>
<td>A.A.1. Integrated Schedule</td>
<td></td>
</tr>
<tr>
<td>A.A.2. Work Schedule Strategies</td>
<td></td>
</tr>
<tr>
<td>A.A.3. Schedule Execution and Management</td>
<td></td>
</tr>
<tr>
<td>B. Start-Up, Commissioning, and Turnover Plan</td>
<td></td>
</tr>
<tr>
<td>B.B.1. Planning for Start-Up</td>
<td></td>
</tr>
<tr>
<td>B.B.2. Testing Procedures</td>
<td></td>
</tr>
<tr>
<td>B.B.3. System Turnover Procedure</td>
<td></td>
</tr>
<tr>
<td>C. New Product Investigation</td>
<td></td>
</tr>
<tr>
<td>C.C.1. New equipment investigation</td>
<td></td>
</tr>
<tr>
<td>C.C.2. New information system investigation</td>
<td></td>
</tr>
<tr>
<td>C.C.3. New materials technologies investigation</td>
<td></td>
</tr>
<tr>
<td>D. Site Layout Plan</td>
<td></td>
</tr>
<tr>
<td>D.D.1. Dynamic site layout plan</td>
<td></td>
</tr>
<tr>
<td>D.D.2. Site safety plan</td>
<td></td>
</tr>
<tr>
<td>D.D.3. Equipment positioning strategy</td>
<td></td>
</tr>
</tbody>
</table>

Environmental Safety and Health

“All workforces shall be conscious that healthy and safety of workers the basic conditions to the success of any project and activity”

“Safety guys are always around.”

“Smaller groups give better feedback and everyone has a better attention span.”

“Management should be more active in smaller safety groups to help ID problems and educate personnel.”

“Supervisors need to continually remind employees of their previous training and needed.”

Environmental Safety and Health

<table>
<thead>
<tr>
<th>Section</th>
<th>Planning and Implementation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td></td>
</tr>
<tr>
<td>A.A.1. Zero Accident Techniques</td>
<td></td>
</tr>
<tr>
<td>A.A.2. Task Safety Analysis</td>
<td></td>
</tr>
<tr>
<td>A.A.3. Identification of Potential Hazards</td>
<td></td>
</tr>
<tr>
<td>A.A.4. Housekeeping</td>
<td></td>
</tr>
<tr>
<td>A.A.5. System task hazard planning</td>
<td></td>
</tr>
<tr>
<td>B. Substance Abuse Programs</td>
<td></td>
</tr>
<tr>
<td>B.B.1. Substance Abuse Programs</td>
<td></td>
</tr>
<tr>
<td>C. Safety Training and Orientation</td>
<td></td>
</tr>
<tr>
<td>C.C.1. OSHA Compliance Training</td>
<td></td>
</tr>
<tr>
<td>C.C.2. Toolbox safety meetings</td>
<td></td>
</tr>
</tbody>
</table>
BPPII – Industrial Projects

Validation

- **Average Performance Factor**
  - Better
  - Low BPPII (<61%)
  - High BPPII (>67%)

- **Statistical Analysis**
  - $n = 23$
  - $p$-value = 0.0414 (<0.05)

BPPII – Infrastructure Projects

- Method and metric for measuring the implementation level of practices that have the potential to improve craft productivity in infrastructure projects
Notes

BPPII – Infrastructure Projects: Structure

- 6 Categories
- 20 Sections
- 61 Elements

BPPII – Infrastructure Projects

Excel Tool

BPPII – Infrastructure Projects

Validation

Average Performance Factor

Low BPPII (<45%)

High BPPII (>54%)

n = 20
p-value = 0.001 (<0.05)
Overview

- Comprehensive compendium of construction productivity knowledge that utilizes research findings from 159 research efforts.
- This handbook draws from both CII and non-CII efforts that address:
  - Productivity measures
  - Factors (e.g., weather and overtime) that affect productivity
  - Techniques to reduce construction rework
  - Workforce development strategies; and field analyses techniques.

Objectives and Strategies

This handbook is largely based on the premise that improving construction productivity occurs among three approaches:

- Increasing the percentage of time spent by craft professionals on direct work,
- Reducing the number of work hours required to complete one unit of work, and
- Reducing the amount of rework that occurs on projects.
How to Use It

- **Productivity experts**
  - Can use its details, list of tables and figures, and the index to quickly find information for their productivity improvement programs.

- **Industry practitioners** (Site managers, supervisors, & field engineers)
  - As a guide to improve the productivity of their projects
  - As a tool for training new employees

- **Students and teachers**
  - As a textbook for courses that address construction productivity
  - It contains relevant materials from the vast volumes of research and knowledge about construction productivity originating from CII and non-CII sources

Organization of the Handbook

- Introduction
- Construction Productivity Definitions and Measurements
- Factors That Adversely Affected Productivity
- The Best Productivity Practice Implementation Index
- Leveraging Technology to Improve Construction Productivity
- Wreck Reduction
- Craft Workers and Construction Productivity
- Techniques of Productivity Analysis
- Lean Construction, Continuous Improvement, and Productivity
- The Search for Consistent Measures of Construction Productivity

Highlights
Highlights

Conclusions & Lessons Learned

- Analysis of BM&M data revealed that projects with higher levels of implementation of some CII “best practices” had better productivity performance.
  - Safety; Materials Management; Systems Integration and Automation; Team Building; Front End Planning; and Constructability
- Several innovations were found to have impacts on labor productivity of up to 50% with equal or better overall cost impact than conventional alternatives.
  - Quick connect systems for piping, formwork, and structural steel
  - Self-consolidating concrete
  - Advanced scaffolding and formwork systems

Conclusions & Lessons Learned

- Direct work rates could be improved on average by about 15% with the use of activity analysis processes and tools.
- Improvements in productivity requires a qualified workforce.
- Your ability to improve the productivity of your project is limited only by your willingness to implement the changes that are required by the BPPII analysis.
- Rework is still not being measured accurately, and we made very limited progress in reducing this productivity killer.
Notes

Conclusions & Lessons Learned

- Consistent and relentless implementation of best productivity practices would be a breakthrough and an innovation in itself.
- Measuring productivity is not much easier, because cost accounts are not defined or used consistently, progress information is difficult to collect, and projects vary wildly in their natures, environments and sets of stakeholders.
- Productivity improvement is a journey, not a destination. It is a result of continuous improvement involving many interconnected processes, tools, systems, cultures and people.
Learning Objectives

- Learn how to identify your gaps in knowledge about deploying best practices in unfamiliar countries.
- Use the International Readiness Passport tool to determine your readiness to estimate and bid in unfamiliar countries.
- Find out which strategies you need to mitigate identified gaps in your readiness to deploy best practices in unfamiliar countries.
- Know how to prepare execution plans that reduce your risk exposure in unfamiliar countries.
- Be able to better achieve cost, schedule, quality, and safety objectives when deploying best practices in unfamiliar countries.

Plenary Session Abstract

This session will open with a discussion of the RT 294 finding that companies are often not ready to deploy best practices abroad in nine critical areas: 1) business customs; 2) social and cultural considerations; 3) regulations; 4) geography and logistics; 5) market and political conditions; 6) safety and security; 7) human resources and workforce issues; 8) legal and contractual concerns; and 9) communications. Next, by giving examples of how an organization can be unprepared in each of these areas, the presenter will explain how, just as a person cannot travel abroad without a passport, the same is true with best practices; an organization cannot confidently deploy best practices abroad without an RT 294 International Readiness Passport. The presentation will emphasize how a lack of readiness in any or all of the critical areas decreases company confidence and performance during deployment of best practices abroad. Such weak deployment negatively affects a company’s ability to meet cost, quality, schedule, and safety objectives.

The speaker will provide an overview of the RT 294 International Readiness Passport metric, process, and tool, detailing its development and validation. The presentation will focus particularly on how the International Readiness Passport will enable CII member companies to go abroad with a better understanding of the potential obstacles to best practice deployment, and a menu of measures to mitigate the impact of those obstacles.

Implementation Session Abstract

This session will be presented in four parts: 1) Introduction (the essential question investigated and how the team approached the research); 2) Validation and Case Study (how the team validated the International Readiness Passport metric, process, and tool); 3) Demonstration of the International Readiness Passport Metric, Process, and Tool; and 4) Question & Answer Session. The panel will distribute a small passport-like pamphlet that will describe how to use the International Readiness Passport metric, process, and tool. The pamphlet will include a USB drive containing the International Readiness Passport tool.
Plenary Session Presenter

James J. Sexton, Global Construction Manager – The Procter & Gamble Company

Jim Sexton has over 35 years of construction and engineering management experience, including assignments in project controls, cost engineering, field engineering, project management, and safety management. He joined Procter & Gamble (P&G) in March 1991 and has worked in four business units supporting 16 global brands. During his tenure at P&G, he has managed close to $1 billion of capital projects in 20 countries.

Sexton earned a B.S. degree in industrial management from the University of Cincinnati, and an MBA degree in finance from Xavier University in Cincinnati, Ohio. Prior to joining P&G, his career included working with engineering, construction, and steel companies. He has earned the P&G Leadership and Mastery Award, Capital Management—one of only 43 in P&G—and has been recognized as an Expert Construction Manager, the highest construction level at P&G. Jim has also achieved Advanced Capital Project Manager and Capital Systems Manager designations.

For CII, Sexton currently co-chairs Research Team 294, Deploying Best Practices in Unfamiliar Countries. Previously he was a member of Research Team 263 on Globalization. He served as Chairperson for the 2011 Construction Users Round Table annual meeting and has been certified a Project Management Professional by the Project Management Institute.

e-mail: sexton.jj@pg.com

Implementation Session Moderator

Mahmoud Khoncarly, Manager of Discipline Engineering and Functional Lead for Architecture, Civil, and Structural Engineering, Energy and Construction Division – URS Corporation

Mahmoud “Mike” Khoncarly is currently the URS Energy and Construction Division Manager of Discipline Engineering and functional lead for architectural, civil, and structural (ACS) engineering. He champions the strategic direction of the disciplines, and is responsible for process and tools. He has more than 26 years of experience in the project management, design, and design supervision of multi-discipline, multi-million dollar national and international projects in a range of industries, including infrastructure, manufacturing, defense, nuclear power, and chemical/processing. Currently, he is leading seismic analysis for the combined operating license applications of two US-based utilities. Past projects have included managing the engineering efforts on projects in Russia, Eastern Europe, Central Asia; among these are Chernobyl Shelter Project,
the SS-24 Dismantlement and Elimination Project, the Chemical Weapons Demilitarization projects, the Weapon of Mass Destruction-Proliferation Prevention Initiative, and the Uzbekistan Nuclear Detection Portal Monitoring project. Khoncarly was also the prime interface with the Defense Threat Reduction Agency (DTRA) Project Officer in the U.S., and acted as the corporate liaison between the international project offices and U.S.-based clients.

He has served as president and board member of the American Society of Civil Engineers–Cleveland Section, as well as The Society of American Military Engineers–Cleveland Post. Khoncarly was named the 2008 Outstanding Civil Engineer of the Year by the American Society of Civil Engineers (ASCE)–Cleveland Section. He earned his B.S. and M.S. in civil engineering from The University of Texas at Arlington, and his Ph.D. in structural engineering from Case Western Reserve University. He is also a registered professional engineer in Ohio, Washington, Maryland, Virginia, North Carolina, South Carolina, Oklahoma, Arizona, Illinois, Florida, Missouri, Texas, Louisiana, California, and Alaska.

e-mail: mike.khoncarly@urs.com

Panelists

David Campbell, Manager of Projects – Air Products and Chemicals, Inc.
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Deron Cowan, Global Construction Tech Center Lead – Zurich
e-mail: deron.cowan@zurichna.com

Jesús M. de la Garza, Vecellio Professor – Virginia Tech
e-mail: chema@vt.edu

Carlos Mallol, Senior Vice President – CSA Group
e-mail: cmallol@csagroup.com

Renée Perry, Director, Strategic Sourcing – Fluor Corporation
e-mail: renee.perry@fluor.com
Deploying Best Practices in Unfamiliar Countries

**Plenary Session Slides**

Notes

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**Deploying Best Practices in Unfamiliar Countries**

Jim Sexton, Procter & Gamble
Research Team 294

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**Essential Question**

How do we systematically deploy best practices to achieve successful project results in areas of the world where we have no previous professional or cultural experience?

---

**Essential Question**

Do you have a passport for your best practices?
Categories of Issues

- Communications
- Geography & Logistics
- Market & Political Conditions
- Safety & Security
- Social & Cultural
- Business Customs
- HR & Workforce
- Legal & Contracts
- Regulations

How Do You Get a Passport for Your Best Practices?

The International Readiness Passport

Launch Page  Readiness Check  Process Generator  Report
Notes

What Are the Benefits?

- Better assessment of readiness to work in unfamiliar countries
- Improved identification of risks and practical solutions to mitigate those risks
- A rational and validated approach to applying this knowledge on your projects
- Global tool, including companies for which the US, Mexico, and Canada are unfamiliar

Research Team 294 Roster

- Phil Barth
  U.S. Department of State
- William Brittman
  Abbott
- David Campbell
  Air Products and Chemicals, Inc.
- George Chronis
  SNC-Lavalin (Pty) Ltd.
- Deron Cowan
  Zurich
- Jesús M. de la Garza
  Virginia Tech
- Timothy Horner
  Faithful+Gould
- Sara Horsey
  Virginia Tech
- Alexandre Ioakimidis
  ABB
- Mahmoud Khoncarly
  URS Corporation
- Carlos Mallo
  CSA Group
- Sean Musick
  Wood Group Mustang
- Renee Perry
  Fluor Corporation
- James Sexton
  The Procter & Gamble Company
- John Taylor
  Virginia Tech
- Laura Vaughn
  Chevron
- Willis Weatherford
  Siemens Energy, Inc.

Research Team 294 Experience

- Core research team’s international experience
- Additional participation of more than 50 experts
Come to our Implementation Session

Moderator
Mahmoud Khoncarly, URS

Panel
Dave Campbell, Air Products
Deron Cowan, Zurich
Jesús M. de la Garza, Virginia Tech
Carlos Mallol, CSA Group
Reneé Perry, Fluor

With all due respect to our friends at Disney...

... perhaps it's NOT such a small world after all.
Notes

Deploying Best Practices in Unfamiliar Countries
*Implementation Session Slides*

2013 Annual Conference
Celebrating 30 Years

**Research Team 294 Roster**

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  AIL Power Inc.
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  CSA Group
- Sean Musick
  Wood Group Mustang
- Renee Perry
  Fuer Corporation
- James J. Sexton
  The Procter & Gamble Company
- John E. Taylor
  Virginia Tech
- Laura Vaughn
  Chevron
- Will Weatherford
  Siemens Energy, Inc.

**RT294 Research Team Roster**
AGENDA

1. RT 294 Essential Question
2. Overview of International Readiness Passport
3. Research Methodology
4. Hands-on Demo of International Readiness Passport
5. Q&A

RT 294 Essential Question

How do we systematically deploy Best Practices to achieve successful project results in areas of the world where we have little or no previous professional or cultural experience?
Deploying Best Practices in Unfamiliar Countries

Notes

RT 294 Essential Question

In other words...

DO YOUR BEST PRACTICES HAVE A PASSPORT?

Are You Ready?

Ready to meet the challenges and opportunities working in unfamiliar countries

What can the tool do for you?

The International Readiness Passport will:
1. Identify and categorize the readiness
2. Measure the impact
3. Provide you with mitigation strategies as potential solutions
Notes

**RT 294 Implementation Resource**

- Launch Page
- Readiness Check
- Process Generator
- Report

**Research Methodology: The Metric**

- Delphi Study
  - 4 round Delphi Study
  - 62 issues accepted
- Categorization
  - 62 issues classified into 9 Categories
- Analytical Hierarchy Process
  - Weighting of the 9 Categories
  - Weightings of the 62 issues within the 9 Categories

**Delphi Experts Have:**

- More than **10 years** of experience managing projects or programs;
- More than **5 years** of that experience managing international projects or programs;
- Experience working internationally (in country) for more than **1 year**;
- Experience working in **3 or more countries**; and
- Experience with **3 or more** of the five phases of a project lifecycle.
### Delphi Process to Identify Issues

1. According to your experience, this can be an **important** issue to be addressed when attempting to deploy a best practice in an unfamiliar country.

2. This issue is **unique** to deploying best practices in unfamiliar countries (i.e., it is not a common deployment issue in the United States).

### Delphi Issue Selection Criteria

<table>
<thead>
<tr>
<th>Question</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Differing personal values, ethics, and lifestyle.</td>
<td>5.238</td>
<td>5</td>
<td>5</td>
<td>0.726</td>
</tr>
<tr>
<td>2. Different methods for communication (for example, verbal, written, body language).</td>
<td>5.119</td>
<td>5</td>
<td>5</td>
<td>1.017</td>
</tr>
</tbody>
</table>

### Analytic Hierarchy Process

Identifies weights of Categories & Issues

![Analytic Hierarchy Process Diagram]
Deploying Best Practices in Unfamiliar Countries

Notes

Analytic Hierarchy Process
Relative Importance Weights

<table>
<thead>
<tr>
<th>Category</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Customs</td>
<td>8.6%</td>
</tr>
<tr>
<td>Social and Cultural</td>
<td>10.8%</td>
</tr>
<tr>
<td>Regulations</td>
<td>9.3%</td>
</tr>
<tr>
<td>Market and Political Conditions</td>
<td>16.3%</td>
</tr>
<tr>
<td>Geography and Logistics</td>
<td>5.0%</td>
</tr>
<tr>
<td>Legal and Contracts</td>
<td>10.0%</td>
</tr>
<tr>
<td>Human Resources and Workforce</td>
<td>9.1%</td>
</tr>
<tr>
<td>Safety and Security</td>
<td>21.7%</td>
</tr>
<tr>
<td>Communications</td>
<td>9.7%</td>
</tr>
</tbody>
</table>

Safety and Security

<table>
<thead>
<tr>
<th>Issue</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differing safety culture and practices by labor force</td>
<td>22%</td>
</tr>
<tr>
<td>Differing needs for jobsite security</td>
<td>13%</td>
</tr>
<tr>
<td>Different availability and requirements for worker health and safety, such as predominant diseases, food and clean water access, and healthcare</td>
<td>20%</td>
</tr>
<tr>
<td>Different security procedures for travel and living</td>
<td>18%</td>
</tr>
<tr>
<td>Differing procedures for reacting to an emergency</td>
<td>27%</td>
</tr>
</tbody>
</table>

Uniqueness Weightings: Delphi

- “This issue is UNIQUE to deploying best practices in unfamiliar countries (i.e., it is not a common deployment issue in the United States).”

<table>
<thead>
<tr>
<th>Safety and Security</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differing safety culture and practices by labor force</td>
<td>0.539</td>
</tr>
<tr>
<td>Differing needs for jobsite security</td>
<td>0.517</td>
</tr>
<tr>
<td>Different availability and requirements for worker health and safety, such as predominant diseases, food and clean water access, and healthcare</td>
<td>0.420</td>
</tr>
<tr>
<td>Different security procedures for travel and living</td>
<td>0.420</td>
</tr>
<tr>
<td>Differing procedures for reacting to an emergency</td>
<td>0.393</td>
</tr>
</tbody>
</table>

Category Readiness Level Calculations

\[
\sum_{\text{All Issues}} \text{RL} \times \text{IW} \times \text{UM} \times \text{CC} = \text{Within Category Readiness Score}
\]

Overall Readiness Score Calculation

\[
\sum_{\text{All Issues}} \sum_{\text{All Categories}} \text{RL} \times \text{IW} \times \text{UM} \times \text{CC} \times \text{CW} = \text{Overall Readiness Score}
\]

IW = Issue Weight
RL = Readiness Level
UM = Uniqueness Modifier
CC = 10pt Scale Conversion Constant
CW = Category Weight
Research Methodology: The Mitigating Process

How do we overcome the weaknesses for each of the identified issues?

- Identify your company’s domestic norms and policies relating to the category and constituting issues
- Identify the norms and policies for the category and constituting lessons in the unfamiliar country

Checklist of items to assess readiness for each issue

- Do gaps exist?
  - Yes
    - Mitigate gaps
  - No
    - Move forward

Strategies to mitigate identified gaps in readiness

External Validation

<table>
<thead>
<tr>
<th>Feature</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usefulness</td>
<td>3.87</td>
</tr>
<tr>
<td>Relevancy</td>
<td>3.87</td>
</tr>
<tr>
<td>Practicality</td>
<td>3.30</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>3.40</td>
</tr>
</tbody>
</table>

1 = Strongly Disagree  4 = Strongly Agree

The Scenario

- Maracaibo, Venezuela
- Owner - PVDSA
- Refinery Expansion
### Tool Demo

![](passport.png)

### AWP Audit Tool
- Focused on AWP requirements of a project
- Intended to be used as a supplement to existing Audit processes
- Broken into stages

### Different levels of surveillance required for activities of the workforce

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring of communication activities</td>
<td>Develop a communication policy and training for employee Conduct via the employee handbook. (1)</td>
</tr>
<tr>
<td>2. Are there consistent approaches to monitoring</td>
<td>Conduct a gap analysis on equivalency of laws and standards regarding the approach to surveillance. For example, the Electronic Communications Privacy Act 1986 (CA 1986), or the Privacy and Personal Information Protection Act of Australia – NSW, etc. (2)</td>
</tr>
<tr>
<td>3. Employee perception of surveillance approaches and its effect</td>
<td>Seek authorization from local law enforcement agencies, as required (e.g., National Data Protection Authority – Portugal). (3)</td>
</tr>
<tr>
<td>4. Is there an understanding of the use of preferred technologies</td>
<td>Measure employee satisfaction and perception of personal and effectual anonymity, and include the connection to data security and competitiveness in the marketplace by individual responsibility to corporate IP, by allowing employees to use technology that they prefer, as long as it is in compliance with company’s policies, there can be a gain in employee satisfaction and an increase in the ability to attract and retain employees. (4)</td>
</tr>
</tbody>
</table>
## Different technical capability of locally available engineering workforce

<table>
<thead>
<tr>
<th>Have you considered the following items regarding your readiness?</th>
<th>If you have not considered the item, then the following mitigation strategies should be taken into account:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship with local universities</td>
<td>Create relationships with local universities to understand the expertise and knowledge to be gained in a knowledge transfer program. More people. (2)</td>
</tr>
<tr>
<td>Relationship with professional associations</td>
<td>Establish relationships with professional organizations that can assist in the identification of qualified personnel. (3)</td>
</tr>
<tr>
<td>Does your company have relationships with</td>
<td>Identify local agents that can facilitate the entry of the new specialty and licensing requirements. (6)</td>
</tr>
<tr>
<td>Relationship agencies that</td>
<td>Utilize a local recruitment agency if available, for office staff recruitment. The Embassies or other companies may also offer resources. (8)</td>
</tr>
<tr>
<td>Regulate professions</td>
<td>Utilize existing satellite resources to establish a connection with experts that have already worked in the host country. In some instances, work is compensated and need to be adjusted to a level that is more aligned to local conditions. (1)</td>
</tr>
<tr>
<td>Recruitment agency</td>
<td>Develop a training program to facilitate the transfer of knowledge and training of local, training efforts are very important. The benefit of knowledge transfer from experts to the local workforce is highly recommended. Invest in implementing best practices, process models, and case studies. Select a local leader that has been following other operations in the company’s home country. This next topic can be an excellent tool. (6)</td>
</tr>
<tr>
<td>Know means of recruiting personnel</td>
<td>Develop a research and recognition program aligned with the local norms to recognize the performance of local workers. (7)</td>
</tr>
</tbody>
</table>

### International Readiness Passport Tool Deployment

- Project Execution Planning
- Users and Participants
- Role of Facilitators
- Internal comparison against Readiness Level

### RT 294 Implementation Resource

- Launch Page
- Readiness Check
- Process Generator
- Report
Now You Are Ready!!!
Do Your Best Practices Have a Passport?
Changing the Implementation Climate
Implementation Strategy Committee

Learning Objectives

- Understand how corporate commitment enables implementation of CII research and drives performance at CII owner and contractor member organizations.
- Preview what CII and Implementation Strategy Committee (ISC) research on corporate commitment is revealing.
- Recognize that sustained corporate commitment is essential to the CII Implementation Model.

Abstract

Currently, the implementation climate provides for sub-optimal implementation of performance improvement principles. How can we change this paradigm? Do you have the corporate commitment to build a culture of executive ownership of outcome? How can we apply lessons learned by the CII community in other critical efforts to achieve sustained improvement in safety, quality, schedule, and cost performance?

The plenary session will lay the groundwork for a lively discussion by a panel of senior professionals at the implementation session. The panelists will explain what corporate commitment means to their individual companies’ efforts at long-term continuous performance improvement and corporate sustainability. Attendees will see how, even in highly competitive environments, corporate commitment enables implementation of CII research and drives performance at CII owner and contractor member organizations. In particular, the panel will explore how Lauren E&C recognizes opportunities to improve value delivery to clients beyond industry expectations—with mutual benefit—by addressing four key elements of leadership behaviors: organizational trustworthiness, transparency, accountability, and unity. There will also be an opportunity to preview the latest ISC research findings. Attendees will exchange perspectives with the panelists and come away armed with key resources for their implementation journey.

Plenary Session Presenter

Robert M. Patty, Executive Vice President, Operations – Lauren Engineers & Constructors, Inc.

Robert Patty joined Lauren Engineers in 2011 and currently serves as the firm’s Executive Vice President of Corporate Operations. He is responsible for safety, project controls, quality management, and promotion of lean-principle-driven rapid continuous improvement, and is a member of Lauren’s Executive Committee.

Patty has more than 30 years of industry experience and has been a constructability/lean consultant for PetroCanada, Saudi Aramco, and BP, most recently having served as KBR’s constructability technology
chief and lean program manager worldwide. He has personally led implementations on major capital projects in the United States, Canada, Venezuela, and Nigeria. In *The End of Project Overruns: Lean and Beyond for Engineering, Procurement and Construction*—his rapid improvement handbook for EPC—he focuses on benefits, principles, and methods for leading corporate-wide implementations of lean EPC. The book discusses the level of performance that clients must ask for and expect, and how the joint efforts of the customer and the EPC Contractor can deliver that performance.

A practicing structural engineer, construction project manager, and company partner when he began implementing lean principles, his first-hand experience of their profound results and his recognition of their potential motivated him to pursue a Ph.D. in civil engineering from Purdue University. Before pursuing his doctorate, Patty received an MBA and a B.S. in Civil Engineering from Colorado State University.

*e-mail: bob.patty@laurenec.com*

**Implementation Session Moderator**

**William C. Beck**, Vice President, Integrated Quality Services Global – WorleyParsons

Bill Beck has worked for WorleyParsons and its legacy companies for nearly 30 years. He has served in numerous capacities, including Procurement Management, Director of Safety, Project Management, Business Development, and Materials Management Services. He currently manages the Global Quality Management Group including Corporate Audit, Supplier Quality Project Services, and Construction Quality. He is responsible for Business Processes, Project Improvement, Company Certifications and Registrations, and Quality Services, a business unit which provides a range of quality services for external clients.

Beck has been an active participant with CII since 1989. His past participation includes the International Standards Research Team, Lesson Learned Research Team, Work Breakdown Structure Team, and Implementation Champions. He currently is a Co-Chair of the Implementation Strategy Committee and a Board of Advisors Alternate for WorleyParsons. In 2011, CII recognized him as the Outstanding Implementer.

*e-mail: william.beck@worleyparsons.com*
Panelists

Richard E. Bilotto, Global Construction Process Owner/Welding & Materials Engineering Section Head, CEBS – Procter & Gamble
  e-mail: bilotto.re@pg.com

Paul S. Chinowsky, Director, Mortenson Center in Engineering for Developing Communities – University of Colorado at Boulder
  e-mail: paul.chinowsky@colorado.edu

Robert M. Patty, Executive Vice President, Operations – Lauren Engineers & Constructors, Inc.
  e-mail: bob.patty@laurenec.com
Changing the Implementation Climate

Bob Patty, Lauren Engineers & Constructors, Inc.
CII Implementation Strategy Committee

The Implementation Climate

73% of CII Board Members consider that implementation efforts are minimally to somewhat effective.

73% of CII Implementation Champions agree.

Ref: 05244-1a The Role of Executive Support in Implementation Champions Success, p16.
Changing the Implementation Climate

The CII Implementation Model

Corporate Commitment
  Corporate Implementation Champion
    Self Audit
      Implementation Plan and Goals
        Product Champions/Review Boards
          Products Training
            Product Implementation
              Measures Results
                Celebrate Success
                  CII Products  CII Support  Benefit/Cost Data

Our Focus

• How are your executives going to steer improvements in implementation of CII Research?

• How do you build a culture of executive ownership of outcome?

Analogy with Safety

Like the step-change in safety
The Faster Learning Organization

- Companies that engage their executives to improve faster and earlier than competitors create the opportunity to dominate their industry.

- Clients will say, “Somebody has figured this out; and we’re going to hire them.”

What Does Effective Implementation Look Like?

- Measurable results

- CII Performance Assessment can help here...

Is that enough?

- You need prompt course corrections.
Changing the Implementation Climate

**The CII Implementation Model Can Help**

- Celebrate Success
- Measure Results
- Product Implementation
- Products Training
- Product Champions/Review Boards
- Implementation Plan and Goals
- Self Audit
- Corporate Implementation Champion
- Corporate Commitment

CII Products  CII Support  Benefit/Cost Data

**What Implementation Climate Should Executives Nurture to Support Implementation?**

- At Lauren we have focused on 4 leadership principles for implementation
  - Trustworthiness
  - Transparency
  - Accountability
  - Unity

Rapid and continuous improvement is essential for corporate survival.

Effective implementation of CII Research can get you there.

Reliable client bottom-line improvement is where we want to go.

The market demands it.
Changing the Implementation Climate

Notes

Implementation Session Learning Objectives

- Understand how corporate commitment enables implementation of CII Research & drives performance at CII Owner & Contractor member organizations.

- Preview what CII/ISC corporate commitment research is revealing.

- Recognize that sustained corporate commitment is essential to the CII Implementation Model.

P&G

LAUREN

WorleyParsons

resources & energy
Changing the Implementation Climate

Notes

Implementation Strategy Committee (ISC)

Come to Our Implementation Session

Moderator

Bill Beck, WorleyParsons

Panel

Rick Bilotto, The Procter & Gamble Company

Bob Patty, Lauren Engineers & Constructors, Inc.

Paul Chinowsky, University of Colorado at Boulder
Changing the Implementation Climate

CII Implementation Strategy Committee

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Ref: R0246-1 The Role of Executive Support in Implementation Champion Success, p16.
Changing the Implementation Climate

Bill Beck
WorleyParsons

- Growth of organization
- CEOC
- Global Leaders for each process
  - Globally supported Initiatives
  - Best Practices (CII and others)
  - Key Performance Indicators

Implementation Strategy Committee (ISC)

The CII Implementation Model

- Celebrate Success
- Measure Results
- Product Implementation
- Products Training
- Product Champions/Review Boards
- Implementation Plan and Goals
- Self Audit
- Corporate Implementation Champions
- Corporate Commitment

CII Products
CII Support
Benefit/Cost Data
Changing the Implementation Climate

Notes

Implementation Session Team
Moderator
Bill Beck, WorleyParsons
Panel
Rick Bilotto, The Procter & Gamble Company
Bob Patty, Lauren Engineers & Constructors, Inc.
Paul Chinowsky, University of Colorado at Boulder

Implementation Session Learning Objectives
• Understand how corporate commitment enables implementation of CII Research & drives performance at CII
  Owner & Contractor member organizations.

• Preview what CI/ISC corporate commitment research is revealing.

• Recognize that sustained corporate commitment is essential to the CII Implementation Model.

Rick Bilotto
Global Construction Process Owner
The Procter & Gamble Company

• Why is this topic relevant to P&G?

• Corporate commitment is required to drive performance and ensure successful project delivery.

• How is this Corporate Commitment demonstrated?
  • Leadership by example
  • Drive timely decision making
  • Drive accountability while creating transparency
Leadership by Example

- Corporate Leaders have had the P&G field experience needed to understand project execution.
- Corporate Leaders
  - Communicate clear expectations
  - Visit and tour project sites
  - Get involved with site audits
  - Provide first hand feedback

Drive Timely Decision Making

- Business Reality
  - Our consumer products business is volatile
    - Market needs and volume forecast change frequently
    - High probability for business changes on projects
- Project Reality
  - Project managers drive timely decision making through the direction and support of Corporate Leaders.

Drive Accountability through Transparency

- Clear accountability is driven throughout the organization from top down.
  - Every individual has an approved work plan that ties work to corporate business drivers.
- Clear roles are defined by the project team
  - Project teams develop and define responsibilities for each team member.
Drive Accountability through Transparency

- Transparency in communication from Corporate Leaders
  - On business need changes
  - Through reinforcement of project expectations and recognition of results.
- Transparency is key with Engineering and Construction supplier partnerships
  - Top to top meetings
  - Solid communication plans and feedback process

Bob Patty
Lauren Engineers & Constructors, Inc.

What Implementation Climate Should Executives Nurture to Support Implementation?

- At Lauren we have focused on 4 leadership principles for implementation
  - Trustworthiness
  - Transparency
  - Accountability
  - Unity

Trustworthiness

- Does ultrahigh organizational trustworthiness really exist?
- By what measures?
- What does it look like?
- What would be the quantified market impacts?
How Do You Address Trustworthiness?

- Owners
- Contractors
- Implementation Champions

Individual to Organizational Integrity

- How do leaders of organizations that create and sustain market dominance transform high individual trustworthiness and integrity of their people into organizational trustworthiness?

Behavior, Interfaces, Systems

With executive leadership we are
- Exploring root causes
- Creating the necessary human behaviors, systems and interfaces to create and sustain:
  - ultrahigh organizational trustworthiness in the face of human nature.
Changing the Implementation Climate

Notes

Answers That Require Serious Consideration

- How do you engage people’s minds and hearts?
- How do you improve work process and culture in full recognition of human nature?
- How do you reverse the usual consequences of admitting a need to improve?
- How do you enhance project fitness with improved relationships of trust?

Organizational Transparency

Working definition:

- An individual and business system state where all who need to know can
  - see performance as it happens
  - verify it against commitment to standards
  - and perceive immediately what to do

Transparency Facilitates Partnership with Clients Through

- A genuine stake in each other’s success
- Joint responsibility for risk
- Performance visibility
- Aligned improvement
- Benefit sharing throughout the project
Accountability to Excel

This requires adherence to standards without compromise.

Accountable for Transparency of Projected Outcomes

- No one can withhold information.
- No one can skirt real accountability.
- Make it clear that adherence to standards is not negotiable.

Methods to Improve Accountability

- Create a culture Making and Keeping Commitments.
- Create a performance risk catching net.
- Learn and apply human factors.
- Push mutual accountability to lowest level.
- Empower project managers.
- Proactively fill necessary functions not performed by owner personnel.
Unity – Alignment for Performance Excellence

- Most of industry’s best managers & teams already exhibit many advanced leadership skills including significant unified decision making.

- Build Unity by resisting any cynicism, resignation or cordial hypocrisy
  - Those behaviors eat away at our efforts for performance improvement.

Encourage Straight Talk

- Talk straight with necessary confidences

Unity – A Powerful Tool for Aligned Performance Excellence

- The choice is not between top down or bottom up - the best leadership is achieved through unity.

- There is an absolute need for humility (sober minded).
  - Putting others first and not thinking more highly of self than ought to think.

- The results of unity will baffle competitors.
  - The minds and hearts will have been won.
  - Team will be engaged in a common goal pursued on a steeper and better path.
Vital Executive Role

The sustainable rapid improvement miracle:
- Leaving competitors flatfooted and unable to follow, lies not in the organization & systems alone but in the people’s hearts.
- Trustworthiness, Transparency, Accountability and Unity magnify their power individually and enable management to better direct and sustains efforts collectively.

Notes

Rapid and continuous improvement is essential for corporate survival.

Effective implementation of CII Research can get you there.

Reliable client bottom-line improvement is where we want to go.

The market demands it.

Paul Chinowsky
University of Colorado at Boulder
- Prior research focusing on role of leadership and management in successful implementation and innovation
- Visible leadership support is the first requirement for successful implementation
  – Creation of culture to facilitate implementation
  – Appropriate resources to support new ideas
  – Appropriate risk perspective
  – How to move from Vision to Action is last barrier
Changing the Implementation Climate

Notes

Implementation Difficulty

Implementation Barriers

almost identical barriers identified by new and by experienced implementers

Bridging the Gap

• Most successful – Engaged leaders in organization.
• Less Successful – Ones that require change in behavior
• Key Leadership Roles
  – Show the necessity of change.
  – Communication- assign “go-to” person to aid process.
  – Focus on impact on organization.
Changing the Implementation Climate

The CII Implementation Model

- CII Products
- CII Support
- Benefit/Cost Data

What Lessons Have You Learned?
- Owners?
- Contractors?
- Implementation Champions?
- Academics?
Key Implementation Guidance

Implementation Model + Knowledge
Structure Guide, IR166-2

CII Best Practices Guide, Version 4,
IR166-3

Implementation Planning Model: Steps to Success, IR246-2, version 1.2

Implementation Assistant
(Found at CII Website)

Implementation Toolbox
(Found at CII Website)

Key Implementation Guidance (continued)

The Role of Executive Support in Implementation Champion Success,
RS246-1a

Support for the Implementation Champion:
The Experience Reference Index,
IR246-3

Support for the Implementation Champion:
The Experience Reference Index,
RS246-1b
Performance Improvement Workshop
October 22–24, 2013

Focused on:
- CII Product Implementation
- Best Practices
- New Practices
- Case Studies
- Networking

Houston, Texas

Pre-purchase option!

A Useful Resource Referenced Today

Did we meet our presentation goals?
- Do you understand how corporate commitment can enable implementation of CII Research & drive performance?
- Do you have an appreciation for the direction of CII/ISC corporate commitment research?
- Do you better understand the role of sustained corporate commitment within the CII Implementation Model.
Changing the Implementation Climate
Maximizing the Value of CII within Your Organization

Case Study: DTE Energy

Learning Objectives

- Understand how to maximize the benefits of effectively implementing CII knowledge and processes.
- See how DTE Energy has focused its CII implementation on breadth and depth.
- Know how to achieve quick wins by implementing CII best practices.

Plenary Session Abstract

Since joining CII two years ago, DTE Energy has implemented three best practices, joined four research teams, and participated in benchmarking events, communities of practice, Board of Advisor meetings, PIWs, and annual conferences. The company has done all this with fewer than 200 project management professionals. What's the secret? This presentation will provide a short history of DTE's participation in CII, describing the breadth and depth of its implementation of CII resources, its focus on priorities, and the results.

Implementation Session Abstract

In the implementation session, the case study team will begin with an overview of the methods, structure, and strategic focus of DTE Energy’s Major Enterprise Projects (MEP) organization by its creator. Next, DTE Energy’s CII Implementation Champion will describe the implementation strategy that combined a breadth of implementation with a depth of focus. Finally, two process owners will describe their approaches to implementing best practices within the organization. In conclusion, MEP’s will link its CII implementation to its continuous improvement efforts and results. After these presentations, audience members will have the opportunity to ask questions and share their own implementation insights.
Plenary Session Presenters

Gino DePalma, Manager, Major Enterprise Projects – DTE Energy

Gino DePalma has served as Manager of Discipline Engineering in Major Enterprise Projects (MEP) at DTE Energy since 2006. While in this role, he has worked with the unit’s project engineering, project management, construction management, and project controls groups, using the PM Solutions’ Project Management Maturity Model to develop and implement a majority of the firm’s project management processes.

DePalma started with DTE Energy in 1979 after graduating with a B.S. in electrical engineering from Lawrence Technological University. Until 1981, he worked as an electrical engineer in the electrical system of the Process Control Computer Division. He was then transferred to the DTE Energy Fermi 2 Nuclear Power Plant, where he stayed for nearly 25 years. During final plant construction, he served as a test engineer in instrumentation and controls start-up and in start-up and commissioning. When the plant became commercially operational in 1988, his role shifted to that of nuclear engineering supervisor in system engineering and plant support engineering—a position he held until moving to MEP. While working within these DTE engineering organizations at the Fermi 2 plant, DePalma actively led process development and improvement programs.

E-mail: depalmag@dteenergy.com

Jason Schulist, Director, Major Enterprise Projects – DTE Energy

Jason Schulist serves as Director, Project Management, Engineering and Construction, Major Enterprise Projects at DTE Energy, having previously led the firm’s Program Office, Major Enterprise Projects. As Director of Continuous Improvement, Schulist led the effort to save DTE Energy over $700 million, while building CI capability in its employees. Prior to joining DTE Energy in 2004, he led a small retail assembly company for two years and, before that, worked at General Motors for 13 years in strategy, business development, and lean manufacturing.

Schulist earned a B.S in electrical engineering from Marquette University, an M.S. in electrical engineering, and an MBA from the Massachusetts Institute of Technology (MIT) as part of the institution’s Leaders for Global Operations program. He is a certified Lean Six Sigma Black Belt and a certified Project Management Professional (PMP) and serves on the boards of several organizations, including the Greening of Detroit, Recovery Park, the Michigan Lean Consortium, the Construction Industry Institute (CII), Oakland University’s Systems Engineering Department, and the University of Michigan’s Tishman Construction Management...
Maximizing the Value of CII within Your Organization

Program. He is past Chairman and co-founder of the Michigan Lean Consortium, and a co-creator of DTE’s Sustainable Lean Sigma discipline. He has also served on the boards of Menlo Labs and the Society for Organizational Learning.

e-mail: schulistj@dteenergy.com

Michael Walters, Cost Engineer – DTE Energy

Michael Walters is a cost engineer working for the controllers group within DTE’s Major Enterprise Projects (MEP) unit. He started at DTE 18 years ago, working in the gas accounting group, before leaving the firm briefly to take a position as a controller for a small construction management firm. He returned to DTE in 1999, where he has worked for various groups with the controllers organization, before joining MEP in 2011.

Michael has a B.A. in accounting from the University of Detroit, and an MBA in Marketing, also from the University of Detroit.

e-mail: waltersma@dteenergy.com

Implementation Session Moderator

Ron A. May, Senior Vice President – DTE Energy

Ron A. May is Senior Vice President at DTE Energy, a Detroit-based energy company with operating units that include an electric utility serving 2.1 million customers in Southeastern Michigan, and a natural gas utility serving 1.2 million customers across the state. May is responsible for major generation construction and environmental projects at DTE Energy’s power plants, the company’s new nuclear power plant development project, FERMI 2 modifications, development of renewable, metering and distribution assets, along with strategic facilities and service projects. He previously served as Senior Vice President of DTE2, an enterprise resource planning project, and as Senior Vice President of Energy Distribution. He has also held a variety of nuclear leadership positions at DTE Energy. Prior to joining the company, May was Vice President at Project Management Associates, a project controls consulting business. Earlier in his career, he held leadership positions at Townsend and Bottum, Inc., a heavy utility construction business.

May earned a B.S. degree in civil engineering at the University of Michigan, and completed the Advanced Management Program at Harvard University. Additionally, he completed graduate coursework at Eastern Michigan University, Youngstown State University, and The Pennsylvania State University. May is a member of the American Association of Cost Engineers, American Society of Civil Engineers, American Nuclear Society, and the Engineering Society of Detroit. He is also a certified Lean Six Sigma Black Belt and holds a Michigan real estate license.
Maximizing the Value of CII within Your Organization

May serves as the chairman of the Oakland University School of Engineering and Computer Science Advisory Council, and is the past chairman of the Michigan Roundtable for Diversity and Inclusion. He also sits on the board of directors of numerous educational and civic organizations, including University of Michigan Engineering Advisory Council, Arab Community Center for Economic and Social Services, Think Detroit PAL, and the United Way. He is a former board member of the Warren Conner Development Coalition, Crossroads for Youth, the United Negro College Fund and Leadership Oakland. May received the Diversity Champion awards from the DTE Energy African American Action Association, Birmingham-Bloomfield Diversity Task Force, and the Detroit Chapter of the Association of Asian Pacific Americans

   e-mail: mayr@dteenergy.com

Panelists

Patricia Anthony, Manager, Safety & Continuous Improvement, Major Enterprise Projects – DTE Energy
   e-mail: anthonyp@dteenergy.com

Richard D. Carrithers, Jr., Manager, Project Management, Major Enterprise Projects – DTE Energy
   e-mail: carrithersr@dteenergy.com

Gino DePalma, Engineering Manager, Major Enterprise Projects – DTE Energy
   e-mail: depalmag@dteenergy.com
Maximizing the Value of CII within Your Organization

Plenary Session Slides

Maximizing the Value of CII within your organization

DTE Energy
Major Enterprise Projects

Who we are

• DTE Energy
  – Diversified energy company
  – Founded in 1903
  – Largest electric utility in Michigan
  – Stock recently reached a 52 week high of over $73
  – DTE Electric
    • Serves 2.1 million customers in Michigan.
      – Use coal, nuclear, natural gas, hydroelectric and renewable sources

DTE Energy - Major Enterprise Projects (MEP)

• Ron May, Sr. VP –
  Major Enterprise Projects
• Jason Schulist, Director –
  Project Management,
  Engineering & Construction
• Richard Carrithers, Manager –
  Project Management
• Gino DePalma, Manager –
  Discipline Engineering (previous CII implementation champion)
• Patricia Anthony, Manager –
  Safety & CI (CII implementation champion)
Maximizing the Value of CII within Your Organization

Notes

**Major Enterprise Projects (MEP)**

- **Organization within DTE Electric**
  - Considered an Enterprise Asset
- **Formed in 2006**
  - Manage projects of strategic importance
    - Investment is significant (generally $5M or greater)
    - One year or more from planning to execution
    - Investment is incremental (generally a new asset)
    - New capacity, capability, or technology
    - "Owner/Client" mindset, separate from day-to-day, routine operations
- **Joined CII in May 2011**

---

**MEP Case for Change (Why We Were Created)**

- Various DTE Energy business units were implementing capital projects within their own units
  - Inconsistent approach to implementation
  - Lessons learned not captured, shared and incorporated into processes
  - Projects approached as a "Brand New" experience

---

**Major Enterprise Projects Structure**

- Nuclear Projects Platform
- Environmental, Fossil & Facilities Platform
- Distribution Technology & Renewables Platform
- Nuclear Development and IT Platform
- Gas Platform
- Program Office Center of Excellence
- Quality Management Center of Excellence
- Engineering & Project Management Center of Excellence
Maximizing the Value of CII within Your Organization

**Objectives**

Case study of DTE Energy’s rapid engagement in CII

- Strategy for first time implementation
  - Determining where to start
  - Determining what to do
- Coupling with Continuous Improvement and Project Management Maturity
- Results

**DTE Energy Key Corporate Priority**

**CLEAR GROWTH & VALUE CREATION STRATEGY**

Develop and execute a growth strategy that achieves superior returns in all business segments.

- Execute our portfolio of investments
- Materially expand our business and investments
- Multi-year investment pipeline
- Effective communication

**DTE Energy Key Corporate Priority**

**DISTINCTIVE CI CAPABILITY**

Accelerate our journey to becoming the best-operated energy company in North America.

- Improve Continuous Improvement Maturity
- Continuously improve key processes and front-line involvement
- Capability of leaders to coach Continuous Improvement application and develop their teams
- Defined by “Best Operated” Scorecard
- Advance deployment of key metrics
Lesson #1: Broad Scope of Engagement in CII – “Swarm” the Opportunity

Active MEP Participation in CII

- Board of Advisors (BOA)
- Communities of Practice (COP)
- Benchmarking

Lesson #1: Broad Scope of Engagement in CII – “Swarm” the Opportunity

Active MEP Participation in CII

- Attend CII Meeting and workshops including
  - Annual conference
  - Benchmarking meetings
  - BOA meetings
  - Performance Improvement Workshops
- Join Research Teams

Lesson #2: Extent of Our CII Implementation Strategy – Go Deep and Extract Value

- Review CII Best Practices and select initial focus
  - Gated process for projects
  - Front end planning
  - Constructability
  - Zero accident techniques
Lesson #2: Extent of Our CII Implementation Strategy – Go Deep and Extract Value

- Develop processes which align to CII best practices
- Implement processes with an eye to continuous improvement

Lesson #3: Commit to Improving the Industry:

Example: Participation in ongoing research
- Quantitative Measurement of PM Competencies (RT-306)
  - Constantly improving PM performance
    (U of Wisconsin)


Summary

- DTE Energy maximized the value of their CII membership by:
  - Broad scope of engagement in CII activities
  - Applying CII best practices and other lessons learned to develop processes
  - Using a Continuous Improvement approach
- This approach has successfully enabled rapid process deployment and organizational growth.
Results

• Using CII best practices, MEP has moved from early adoption to a level of excellence in a short period of time.
  – MEP selected as Best Practices Partner for Project Management Organizations by the American Productivity and Quality Center (APQC) Dec. 2012
  – Project Management Maturity Model rating of 4.4 on a scale of 5.0 Dec. 2012
• First organization in the energy industry to be certified Project Management Maturity Model Level 4
Maximizing the Value of CII within Your Organization

Implementation Session Slides

Maximizing the Value of CII within your organization

DTE Energy
Major Enterprise Projects

Who we are

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  – Founded in 1903
  – Largest electric utility in Michigan
  – Stock price valuation $65
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    • Investment is incremental (generally a new asset)
    • New capacity, capability, or technology
    • "Owner/Client" mindset /separate from day-to-day/routine operations
• Joined CII in May of 2011
Maximizing the Value of CII within Your Organization

MEP Mission

Become the best manager of strategic initiatives and projects in Michigan and the Utility Industry in an ever improving environment.

Major Enterprise Projects
(Why We Were Created)

- Various DTE Energy business units were implementing capital projects within their own units
  - Inconsistent approach to implementation
- Lessons learned not captured, shared and incorporated into processes
- Projects approached as a “Brand New” experience

Major Enterprise Projects Structure

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- Distribution Technology & Renewables Platform
- Nuclear Development Platform
- Gas Platform
- Program Office Center of Excellence
- Quality Management Center of Excellence
- Engineering & Project Management Center of Excellence
Maximizing the Value of CII within Your Organization

DTE Energy - Major Enterprise Projects (MEP)

- Ron May, Sr. VP – Major Enterprise Projects
- Rick Carrithers, Manager – Center of Excellence
- Gino DePalma, Manager – Engineering (previous CII Implementation Champion)
- Patricia Anthony, Manager – Safety & Continuous Improvement (CII Implementation Champion)

Objectives
Case study of DTE Energy’s rapid engagement in CII

- Strategy for first time implementation
  - Determining where to start
  - Determining what to do
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- Results

DTE Energy Key Corporate Priorities

- CLEAR GROWTH & VALUE CREATION STRATEGY
  Develop and execute a growth strategy that achieves superior returns in all business segments.

- DISTINCTIVE CI CAPABILITY
  Accelerate our journey to becoming the best-operated energy company in North America.
Lesson #1: Broad Scope of Engagement in CII – “Swarm” the Opportunity

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Lesson #1: Broad Scope of Engagement in CII – “Swarm” the Opportunity

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- Attend CII Meeting and workshops including
  - Annual conference
  - Benchmarking meetings
  - BOA meetings
  - Performance Improvement Workshops
- Join Research Teams

Lesson #2: Extent of Our CII Implementation Strategy – Go Deep and Extract Value

- Use CII Implementation Tools
  1) Get a CII Mentor
  2) “CII Implementation Assistant”
  3) “CII Best Practice Guide:
     - Improving Project Performance”
     - Assessment
Lesson #2: Extent of Our CII Implementation Strategy – Go Deep and Extract Value

4) Develop your initial focus
   - Gated Process
   - Front-End Planning
   - Constructability
   - Zero-Accident Techniques

Lesson #2: Extent of Our CII Implementation Strategy – Go Deep and Extract Value

- Develop processes which align to CII best practices
- Implement processes with an eye to continuous improvement
- Develop an action plan based on a gap analysis with CII Best practices

Change management critical in implementing new CII best practices

- Gated Process Implementation
  - Lesson learned: case for change- needed a manager role for change management
  - get the engagement / insure the alignment
  - understand roles/ responsibilities
  - Insure proper level of training
Maximizing the Value of CII within Your Organization

Notes

Get connected with CII and CII companies to learn Best Practices
• Ontario Power- Implement the appropriate level of process rigor based on the specific project risk factors.
• Continuously improve processes using proven best practices

Set up the proper level of project embedded tests
• Hitting the rumble strip = scope/schedule & budget for projects
• Set pre-specified deliverables by phase
• Processes are predictable and consistently used
• Provides confidence and control

We follow the CII phased project approach
• Broke out startup & commissioning
• Drive front end planning
• Pre-specified deliverables by phase
• Maximize capital dollars
Maximizing the Value of CII within Your Organization

**Need organizational commitment**

- Senior VP Ron May
  Executive leader
  Support - PMP
- Get involved in CII
  Research teams
  - I am involved in RT-306
  - DTE involved in 5 research teams

**Organizational Commitment**

- Why is this important to DTE Energy?
  - Impact of research and improving the industry
  - Collaboration with other owners, academia and contractors
  - Develop great networks and friends
  - Employee engagement
    - Help drive best practice in organization

**Extent – Best Practice Implementation**

- Goal: Develop a fully mature Front-End Planning process by the end of 2013
  - Benchmarked CII member companies recommended by CII
  - Participate in FEP Community of Practice
  - Action plan included in our 2013 Business plan
Notes

Maximizing the Value of CII within Your Organization

Extent - Best Practice Implementation

Front-End Planning Process (RS268-1)

• Front-End Planning - largest impact on optimizing project performance.
  – High usage saves an average of 8% spend

21

Extent - Best Practice Implementation

• Constructability (RS3-1)
  – Benchmarked CII research and 10 companies (including those recommended by CII)
• Key Parameters for Success
  – Defined processes
    • Constructability review
    • Lessons learned database
  – Ensure sustainability
    • Embedded in the gated process
    • Checklist driven

22

Extent - Best Practice Implementation

Safety (RS32-1)

• Use of CII Zero Accident Techniques and benchmarking another organization with similar gaps resolved
  – Develop pre-specified safety processes
  – Develop/refine key metrics (leading and lagging) to improve understanding of safety performance

23
Lesson #3: Commit to Improving the Industry:

Example Participation in ongoing research

- Quantitative Measurement of PM Competencies (RT-306)
  - Constantly improving PM performance
    (U of Wisconsin)

Notes

Proven success

Key Learnings

- Commit to Improve the Industry – Our Industry!
- Get Involved!
  - Our industry needs your support!

- Keep an Open Mind
  - You may discover an improvement area that you were not looking for initially
  - Share your good practices with others
Maximizing the Value of CII within Your Organization

Notes

Key Learnings

• Organization aligned and engaged in Continuous Improvement
• Admit that your processes can be improved
• Learn from industry best practices
• Challenge the organization!

Summary

• DTE Energy maximized the value of their CII membership by:
  – Broad scope of engagement in CII activities
  – Applying CII best practices and other lessons learned to develop processes
  – Using a Continuous Improvement approach
• This approach has successfully enabled rapid process deployment and organizational growth.
Ingenuity: The Journey to Extraordinary

Featured Speaker: Joseph A. Ahearn, CH2M HILL
(2012 Recipient of the Carroll H. Dunn Award of Excellence)

Featured Speaker

Joseph A. Ahearn, Vice Chairman – CH2M HILL

Bud Ahearn pursued his first career in the U.S. Air Force, rising to the rank of Major General during years devoted to space and nuclear missile program management, construction program management, special operations, and directing all financial programs for Air Force Civil Engineering. He commanded a combat engineering squadron during the Vietnam War, and he retired as The Air Force Civil Engineer.

In civilian life, Ahearn worked at CH2M HILL, advancing through many positions and holding firmwide responsibilities for strategic planning, governmental affairs, strategic communications, and leadership development. Ultimately, he became the company’s Vice Chairman of the Board.

In semi-retirement since 2011, he divides his time between consulting with CH2M HILL and serving as an active member of the National Academy of Engineers, the National Academy of Construction, the American Society of Civil Engineers, and the Society of American Military Engineers. He helped found Engineers Without Borders USA, a not-for-profit service organization that provides sustainable infrastructure systems and services in the developing world.

Ahearn holds a B.S. degree in civil engineering from Notre Dame and a master’s degree in public policy and engineering management from Syracuse University. In 2012, CII honored him with its highest honor, the Carroll H. Dunn Award of Excellence.

e-mail: budahearn1@comcast.net
Abstract

Regional planning for sustainability and disaster resilience can improve performance of critical infrastructure systems and buildings, under both normal and extreme conditions. Over the last 10 years, communities across the United States and around the world have seen increasing rates of extreme weather events, along with significantly higher damage costs. This presentation introduces a systemic framework for regional planning that proactively responds to this new reality, with examples for the Finger Lakes region of New York. It will show how targeted interventions implementing regenerated natural systems can simultaneously improve resilience to disasters and enhance economic opportunity and quality of life. As this model is more widely adopted, companies and organizations will play a key role in its success, by contributing their expertise to regional planning, coordinating with local communities, and advancing the state of knowledge and practice.

Featured Speaker

E. Sarah Slaughter, President & Executive Director, Built Environment Coalition

Dr. Sarah Slaughter is President and founder of the Built Environment Coalition. Previously, she was the Associate Director for Buildings and Infrastructure in the MIT Energy Initiative (MITEI), coordinating research across MIT focused on improving the built environment, and led the development of a program to improve the built environment and economic development across New England that involved over 120 companies, nonprofit organizations, and local and state government agencies. Before her work with MITEI, she was co-founder and head of the Sustainability Initiative in the MIT Sloan School of Management, focusing on strategies for sustainable organizations and communities.

Slaughter was founder and CEO of MOCA Systems, Inc., a construction program management company based on the construction simulation software system created by her MIT research. She has also been a professor in the Department of Civil and Environmental Engineering at MIT, focusing on innovations for the built environment, and a professor of Civil and Environmental Engineering at Lehigh University, conducting research in the NSF Center for Advanced Technology for Large Structural Systems (ATLSS).

Slaughter’s current research focuses on innovations for sustainable and disaster-resilient infrastructure and the built environment. She is a member of the National Academies National Research Council (NRC) Board on Infrastructure and the Constructed Environment, the National Academies DOD Standing Committee on Materials, Manufacturing, and Infrastructure, the NRC Committee on Federal High Performance Green Buildings, and is a National Academy Associate. She also serves on the Massachusetts Sustainable Water Management Advisory Board, the
Sustainability Committee in the International Facilities Management Association, and several national advisory committees and editorial boards of professional publications. She currently serves on the Board of Directors for Retroficiency, Inc., ERG, Inc., and the Charles River Watershed Association.

Slaughter has published over 50 articles and books, and is a recognized expert in the field of sustainable facility assets, and in innovations in the built environment. She received her S.B., S.M., and Ph.D. from the Massachusetts Institute of Technology.

*e-mail: sarah@builtenvironmentcoalition.org*
Regional Planning for Sustainability and Disaster Resilience

Dr. Sarah Slaughter, Built Environment Coalition

Sustainable Critical Infrastructure Systems

Recommendations:
- Focus on Essential Services
- Work Collaboratively across Region
- Use Interdependencies among Critical Systems
- Develop Performance Measures

Critical Community/Regional Assets

- Critical Infrastructure Systems
  - Water and Wastewater
  - Solid Waste
  - Energy
  - Communications
  - Transportation
- Critical Built Facilities
  - Emergency Response (Police, Fire, EMT)
  - Hospitals and Medical Care
  - Schools
  - Production Facilities

NRC Report, 2009 – co-sponsored by CII

NYT, June 14, 2009
Notes

Objectives

- Enhance the Health, Safety, and Well-being of Individuals and Their Communities.
  - **Sustainability** – Improve Economic Opportunity, Social Justice, and Environmental Regeneration
  - **Disaster-resiliency** – Improve Ability to Rapidly Re-establish Critical Functions after an Extreme Event

Sustainability ↔ Disaster Resiliency

Trends in Disaster Incidence

Federal Disaster Declarations

Source: FEMA
EPA Critical Drinking Water Contaminants in Surface and Groundwaters

Framework for Regional Planning for Sustainability and Disaster Resilience

- Characterize Critical Community Assets
- Assess Vulnerabilities of Assets to Extreme Conditions
- Identify Intervention Points and Solution Sets
- Implement using Rapid Prototypes, Monitoring, and Refinement of Potential Solutions
Notes

Characterization of Risk – Current Resources

- Business Continuity Planning
- State and Local Hazard Mitigation Plans
- Federal Agency Climate Adaptation Plans 2013
- USDOT, USEPA - Analysis of Vulnerability of Assets from Climate Change Impacts

Vulnerabilities of Critical Assets to Extreme Conditions: Multi-Hazard

- Proximity
- Interdependencies

Intervention Points and Solution Sets

- Interdependencies Among Critical Infrastructure Systems
- Opportunities to Provide Benefits Under Normal and Extreme Conditions
Call to Action For CII Members

- Plan and Invest for Resilience In Each Major Facility
  - System Interdependence
  - Range of Benefits
- Contribute Expertise in Community and Regional Planning
- Re-assess Vulnerabilities Over Time
- Contribute to Advancement of Knowledge and Practice

Opportunities

- Improve Quality of Life Under Normal and Extreme Conditions
- Develop and Grow Regional Resources
- Invest in Pre-emptive Programs – and Avoid Expensive Rebuilding After Disasters

Notes
The World Economic Outlook: Brighter Days for Construction

Keynote Address: Sara Johnson, IHS Global Insight, Inc.

Keynote Speaker

Sara Johnson, Senior Research Director of Global Economics – IHS Global Insight, Inc.

In her role as Senior Research Director of Global Economics, Sara Johnson helps clients assess worldwide business and financial opportunities and risks. IHS Global Insight provides economic forecasts and analyses of over 200 countries. Johnson co-authors the Global Executive Summary, manages the Executive Strategy Council, and presents the IHS economic outlook to international conferences. She was previously North American Research Director and Chief Regional Economist with Standard & Poor’s DRI, a predecessor of IHS Global Insight.

Johnson holds a B.A. in economics and mathematics from Wellesley College and an M.A. in economics from Harvard University, with concentrations in finance and macroeconomic theory. A member of The Boston Economic Club and American Economic Association, she is also a director of the NABE Foundation and a former director of the National Association for Business Economics.

e-mail: sara.johnson@globalinsight.com
A subpar global economic expansion

- Sluggish global growth is a legacy of the 2008-09 financial crisis.
- Unwinding expansionary fiscal and monetary policies is difficult.
- Housing and consumer market recoveries will drive US growth.
- The Eurozone’s long recession will soon end.
- Emerging markets will post solid—not spectacular—growth rates.
- China’s growth is wavering as financial risks surface.

After stalling in 2013, global economic growth will gradually strengthen in 2014-15

(Percent change)
The World Economic Outlook: Brighter Days for Construction

Notes

Asia-Pacific will lead regions in real GDP growth

(Annual percent change)

NAFTA Other Western Emerging Middle East Europe N. Africa Sub-Saharan Africa Japan Other Asia-Pacific

2012 2013 2014 2015 2016-20

Industrial materials prices have retreated

(IHS Global Insight indexes, 2002:1=1)


All materials Chemicals Nonferrous metals

Consumer price inflation varies by region

(Annual percent change)

NAFTA Other Western Emerging Middle East Europe N. Africa Sub-Saharan Africa Japan Other Asia-Pacific

2012 2013 2014 2015 2016-20

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Notes

Private-sector dynamism will carry the US economy through fiscal policy headwinds

Positive Forces
- Employment growth
- Rising asset prices
- Housing market rebound
- Energy boom

Negative Forces
- Tax increases
- Federal budget sequestration
- Government regulations
- High debt burdens

A pick-up in US real GDP growth in 2014 will help to lower the unemployment rate

The unemployment rate will hit the Federal Reserve’s 6.5% threshold in mid-2015.

A recovery in US household formation will support a resurgence in homebuilding in 2013-15
The World Economic Outlook: Brighter Days for Construction

Notes

US business fixed investment growth reflects caution

Real private US investment in industrial structures is led by energy projects

North American business cycles are synchronized
South America: Varied investment climates

- Most countries have sound macroeconomic fundamentals, improving debt profiles, substantial foreign-exchange reserves, and stable financial systems.
- High commodity prices and rising exports to Asia have supported growth.
- Long-term prospects are bright for countries with sound policy frameworks and inflows of foreign investment, including Brazil, Chile, Colombia, and Peru.
- Policy mismanagement and resource nationalism will restrain growth potential in Venezuela, Argentina, Ecuador, and Bolivia.
- Venezuela’s outlook is uncertain after Nicolas Maduro’s narrow victory in the presidential election; high inflation, crime, corruption, and shortages persist.
- South America’s long-term challenges include inadequate infrastructure, restrictive business environments, and income inequality.

Real GDP growth in South America

The Eurozone economy will stabilize

- Actions by the European Central Bank (ECB) have bolstered financial markets, but significant growth is not yet in sight.
- Fiscal and trade balances are improving.
- Several North European economies (Germany, Sweden, Norway) are expanding.
- Contraction in the southern periphery will extend through mid-2014, partly because of tough austerity programs, tight credit, and a strong euro.
- Greece is expected to stay in the Eurozone, but will need further debt relief.
- Necessary structural reforms to improve competitiveness on the periphery will gradually produce long-term benefits.
The Eurozone’s debt crisis is aggravated by links between banks, governments, and the economy.

**Strategies**
- Fiscal tightening
- Market reforms
- Liquidity provision
- Bank recapitalization
- Sovereign debt relief
- Integrated bank regulation

Ten-year government bond yields reflect changing risks.

Recent growth in Western Europe’s major economies reflects a North-South divide.
Notes

Emerging Europe is vulnerable to Eurozone problems

- The Eurozone’s sovereign-debt problems continue to affect the region through exports, bank solvency risks, and credit availability.
- The Czech Republic, Hungary, and Slovenia are among the hardest hit.
- In Poland, growth momentum has been dampened by the Eurozone stagnation, a slowdown in construction, and fiscal tightening.
- Social unrest has rattled financial markets in Turkey, threatening an otherwise favorable economic outlook.
- A weak investment climate and sluggish exports are restraining Russia’s growth.
- Ukraine’s economy is struggling with a huge current account deficit.

Real GDP growth in Emerging Europe

Asia-Pacific will continue to lead global growth

- The ASEAN region remains strong, underpinned by the strength of domestic demand in Indonesia, Thailand, Malaysia, and the Philippines.
- Japan’s aggressive policies will help to generate modest growth in 2013-15.
- Liberalization of foreign direct investment, diminishing inflation, and monetary easing will help to revive growth in India.
- Indonesia continues to deliver 6% real GDP growth, led by 10% annual increases in fixed investment.
- The medium-term outlook for consumer spending is bright, thanks to robust income growth, appreciating currencies, and deepening financial markets.
- Asia’s emerging markets will continue to increase infrastructure investments.
Notes

China’s economic growth disappoints

- Despite a surge in credit issuance, China’s economy decelerated in early 2013.
- Exports and fixed investment are undergoing a period of consolidation.
- Property markets have heated up, particularly along the coast, prompting policy-tightening measures that will restrain prices and slow construction activity.
- The new government’s policy agenda emphasizes the new urbanization drive and consolidation of sectors that are energy-intensive or have excess capacity.
- Rising debt of local governments, banking-sector leverage, and loss of momentum on reforms are longer-term risks.
- China’s export-oriented growth model has reached its limits; to sustain growth, China will need to cultivate domestic demand and move up the value chain.

China’s economic growth is downshifting
Notes

China’s structural challenges and long-run policy choices

Industrialization

Urbanization

Consumption upgrade

Demographic dividend

Globalization

Reforms

The Middle East and North Africa

• The region is searching for stability and recovery from Arab Spring revolutions.

• Egypt, Tunisia, and Yemen have struggled through their political transitions.

• Libya has benefited from the oil industry’s fast rebound but faces the challenges of rebuilding infrastructure and institutions amid precarious security conditions.

• Syria’s ongoing civil war and Iran’s standoff with the West over its nuclear program are causing deepening recessions in those countries.

• The oil-exporting countries of the Gulf Cooperation Council will see slower economic growth as crude oil prices and exports decline in 2013-14.

• Addressing job creation and competitiveness will be critical to regional stability over the medium term.

Real GDP growth in the Middle East

(Annual percent change)

2012 2013 2014 2015 2016-20

Saudi Arabia Iran UAE Israel Iraq Kuwait

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Sub-Saharan Africa is one of the fastest-growing regions

- Commodity export revenues continue to drive the region’s growth.
- To an increasing but inadequate extent, expanding domestic markets, income gains, and regional integration will support 5% growth in Sub-Saharan Africa.
- Macroeconomic management is improving substantially, poverty is declining, and foreign direct investment is rising.
- The region’s consumer price inflation (6.3% in 2013) remains relatively high.
- Poor infrastructure (especially power generation), political instability, and corruption remain obstacles to economic development.
- South Africa also faces difficulties with labor unrest and labor-market rigidities.

Angola and Nigeria will lead real GDP growth in Africa

Bottom line: A soft global economic expansion

- The US expansion will continue at a modest pace, sparked by a housing market recovery and an energy boom, but restrained by fiscal tightening.
- The Eurozone will struggle with weak growth and sovereign debt problems, but risks of a major financial crisis have diminished substantially.
- In China, bubbles in property markets and shadow finance could lead to credit tightening, restraining growth.
- Asia will lead global growth, while Latin America and Africa will do relatively well by historical standards.
- Geopolitics and policy mistakes are the main sources of risk.
The World Economic Outlook: Brighter Days for Construction

Notes

Construction spending is rising in most countries

Total Construction Spending Growth 2012-17
(2005 USD, CAGR)

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Appendices
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<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ABI</td>
<td>Architects Billing Index</td>
</tr>
<tr>
<td>ACE</td>
<td>architecture, construction, engineering</td>
</tr>
<tr>
<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
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<td>AWP</td>
<td>advanced work planning</td>
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<tr>
<td>BIM</td>
<td>building information modeling</td>
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<tr>
<td>BM&amp;M</td>
<td>Benchmarking &amp; Metrics (now Performance Assessment)</td>
</tr>
<tr>
<td>BMM</td>
<td>Benchmarking &amp; Metrics (now Performance Assessment)</td>
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<td>BOA</td>
<td>Board of Advisors</td>
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<td>BP</td>
<td>Best Practice</td>
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<td>BPPII</td>
<td>Best Productivity Practice Implementation Index</td>
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<tr>
<td>BYOD</td>
<td>bring your own device</td>
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<td>CAGR</td>
<td>Compound Annual Growth Rate</td>
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<td>CF</td>
<td>carbon footprinting</td>
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<td>CIRT</td>
<td>Construction Industry Round Table</td>
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<td>CM&amp;SP</td>
<td>Construction Management and Supervisory Personnel</td>
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<td>CMAA</td>
<td>Construction Management Association of America</td>
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<td>COAA</td>
<td>Constructions Owners Association of Alberta</td>
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<td>COMIT</td>
<td>Construction Opportunities in Mobile IT</td>
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<td>COP</td>
<td>Community of Practice</td>
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<td>CSF</td>
<td>critical success factors</td>
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<td>CTE</td>
<td>career and technical education</td>
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<td>CTSO</td>
<td>career and technical student organization</td>
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<tr>
<td>CWDA</td>
<td>Construction Workforce Development Assessment</td>
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<tr>
<td>DART</td>
<td>Days Away, Restricted, or Transferred rate</td>
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<tr>
<td>ECI</td>
<td>European Construction Institute</td>
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<td>ENR</td>
<td>Engineering News-Record</td>
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<td>EP</td>
<td>execution planning</td>
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<td>ERI</td>
<td>Experience Reference Index</td>
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<tr>
<td>FEED</td>
<td>Front End Engineering Design</td>
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<td>FEP</td>
<td>front end planning</td>
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<td>GHG</td>
<td>greenhouse gas</td>
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<tr>
<td>HIT</td>
<td>Hazard Identification and Transmission</td>
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<td>IC</td>
<td>implementation champion</td>
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<tr>
<td>IR</td>
<td>implementation resource</td>
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<tr>
<td>IRP</td>
<td>International Readiness Passport</td>
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<tr>
<td>ISBL</td>
<td>inside battery limits</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>ISC</td>
<td>Implementation Strategy Committee</td>
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<td>KM</td>
<td>knowledge management</td>
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<td>KMC</td>
<td>Knowledge Management Committee</td>
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<td>NGL</td>
<td>natural gas liquids</td>
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<tr>
<td>LWCIR</td>
<td>Lost Workday Case Incidence Rate</td>
</tr>
<tr>
<td>MRO</td>
<td>maintenance, repair, and operations</td>
</tr>
<tr>
<td>NCCER</td>
<td>National Center for Construction Education and Research</td>
</tr>
<tr>
<td>NGA</td>
<td>National Geospatial-Intelligence Agency</td>
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<td>NGLCOP</td>
<td>Next-Generation Leaders Community of Practice</td>
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<tr>
<td>NPV</td>
<td>net present value</td>
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<td>PAC</td>
<td>Performance Assessment Committee</td>
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<tr>
<td>PAS</td>
<td>Performance Assessment System</td>
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<td>PDC</td>
<td>Professional Development Committee</td>
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<td>PDRI</td>
<td>Project Definition Rating Index</td>
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<tr>
<td>PFSU</td>
<td>planning for start-up</td>
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<td>PIW</td>
<td>Performance Improvement Workshop</td>
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<tr>
<td>PM</td>
<td>project manager</td>
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<tr>
<td>PPE</td>
<td>personal protective equipment</td>
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<tr>
<td>RIR</td>
<td>Recordable Incidence Rate</td>
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<tr>
<td>RR</td>
<td>research report</td>
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<tr>
<td>RS</td>
<td>research summary</td>
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<tr>
<td>RT</td>
<td>research team</td>
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<tr>
<td>SAVES</td>
<td>System for Augmented Virtuality Environment Safety</td>
</tr>
<tr>
<td>SMA</td>
<td>subject matter area</td>
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<tr>
<td>SME</td>
<td>subject matter expert</td>
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<tr>
<td>SMQM</td>
<td>Safety Meeting Quality Metric</td>
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<tr>
<td>TRIR</td>
<td>Total Recordable Incidence Rate</td>
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<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers</td>
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<tr>
<td>WBS</td>
<td>work breakdown structure</td>
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<tr>
<td>XC</td>
<td>Executive Committee</td>
</tr>
<tr>
<td>XLP</td>
<td>Executive Leadership Program</td>
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</tbody>
</table>
Effective leaders are tasked with bringing fresh ideas to their organizations. In order to accomplish this, we must 1. Identify new ideas and opportunities, and 2. Effectively communicate those ideas to key people in the organization. In this interactive session, we will explore potential ways to achieve these two objectives, and examine some inherent hindrances to success. Along the way, you’ll gain several new insights to help move your ideas (and your career) to the next level!

**Key Questions/Objectives:**

- Where do creative ideas come from?
- How do we better tap into hidden and novel opportunities?
- What kinds of barriers might we expect when attempting to sell our ideas internally?
- How can we overcome these obstacles in order to meet our objectives?

**Guest Speaker**

**Gaylen Paulson**, Associate Dean and Director of Texas Executive Education – The University of Texas at Austin

Dr. Paulson’s research and teaching are focused on the strategic aspects of interacting with people, including negotiation, conflict management, persuasion, and interpersonal communication. The recipient of numerous teaching awards, Dr. Paulson was most recently named to the “Faculty Honor Roll” by the UT MBA students and “Outstanding Faculty” by the Engineering Management Executive Master’s program.

*e-mail: gaylen.paulson@mccombs.utexas.edu*
1. A Novel Approach for Automated Generation of Knowledge-Based Construction Simulation Models  
   Reza Akhavian, Dr. Amir H. Behzadan – University of Central Florida

2. A Strategy for Mitigating Material Price Risk  
   Rebecca McDonald, Dr. W. Edward Back – University of Alabama

3. An Advanced Construction Supply Nexus Model (ACSNM)  
   Mahdi Safa, Dr. Carl Haas – University of Waterloo

   Jongwei Shan, Dr. Paul Goodrum – University of Colorado–Boulder

5. Analysis of Shifting Dynamics in the Global Construction Marketplace  
   Joshua Zilke, Dr. John Taylor – Virginia Tech

   Mohsen Shahandashti, Dr. Baabak Ashuri – Georgia Institute of Technology

7. Mining Clash Data: Evaluation and Improvement of BIM-based MEP Design Coordination  
   Li Wang, Dr. Fernanda Leite – The University of Texas at Austin

8. Mobile 3D Mapping of Large Infrastructure Projects Using Unmanned Aerial Vehicle (UAV) Systems  
   Eric Marks, Dr. Jochen Teizer – Georgia Institute of Technology; Sebastian Siebert, Dr. Yelda Turkan – Iowa State University

9. A Selecting the Most Suitable Project Delivery System for Capital Projects  
   Zorana Popic, Dr. Osama Moselhi – Concordia University

10. The Owner’s Guide to Maximizing Success on Projects  
   Bryan Franz, Behzad Esmaeili, Dr. Robert Leicht, Dr. John Messner – The Pennsylvania State University; Dr. Keith Molenaar, University of Colorado–Boulder
CII Member Organizations

Owners
Abbott
Air Products and Chemicals
Ameren Corporation
American Transmission Company
Anheuser-Busch InBev
Aramco Services Company
ArcelorMittal
Architect of the Capitol
BP America
Barrick Gold Corporation
CITGO Petroleum Corporation
Cameco Corporation
Cargill
Chevron
ConocoPhillips
Consolidated Edison Company of New York
DTE Energy
The Dow Chemical Company
DuPont
Eastman Chemical Company
Ecopetrol
Eskom Holdings
ExxonMobil Corporation
General Electric Company
General Motors Corporation
GlaxoSmithKline
Global Infrastructure Partners
Huntsman Corporation
International Paper
Irving Oil Limited
Kaiser Permanente
Koch Industries
Eli Lilly and Company
Linde North America
LyondellBasell
Marathon Petroleum Corporation
National Aeronautics & Space Administration
NOVA Chemicals Corporation
Occidental Petroleum Corporation
Ontario Power Generation
Petroleo Brasileiro S/A - Petrobras
Petroleos Mexicanos
Phillips 66
Praxair
The Procter & Gamble Company
SABIC - Saudi Basic Industries Corporation
Sasol Technology
Shell Global Solutions US
Smithsonian Institution
Southern Company
Statoil ASA
SunCoke Energy
TNK-BP
Teck Resources Limited
Tennessee Valley Authority
TransCanada Corporation
U.S. Army Corps of Engineers
U.S. Department of Commerce/NIST/Engineering Laboratory
U.S. Department of Defense/Tricare Management Activity
U.S. Department of Energy
U.S. Department of Health & Human Services
U.S. Department of State
U.S. Department of Veterans Affairs
Vale
The Williams Companies
# CII Member Organizations

## Contractors

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<thead>
<tr>
<th>AMEC</th>
<th>KBR</th>
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<tr>
<td>AZCO</td>
<td>Kvaerner North American Construction</td>
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<td>Alstom Power</td>
<td>Lauren Engineers &amp; Constructors</td>
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<td>Audubon Engineering Company</td>
<td>Matrix Service Company</td>
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<td>Baker Concrete Construction</td>
<td>McCarthy Building Companies</td>
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<td>Barton Malow Company</td>
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