AWP: A CII & COAA Best Practice

CII Panel Discussion
Introductions

Wayne Crew, Director, CII

Bill O’Brien, Professor, The University of Texas at Austin

Jim Rammell, VP Construction Operations, Wood Group Mustang
Agenda

- CII Research & Best Practices
- AWP Concepts
- Evidence / Results
- AWP – The Research Journey
- Wrap Up / Q&A
Wayne Crew
CII History

- Organizational motivation was The Business Roundtable’s Construction Industry Cost Effectiveness (CICE) Project in 1982.
  - Create a construction research institute of leading companies to improve cost effectiveness and reduce fragmentation of the U.S. industry.
- Founded in 1983 by 28 organizations; now ~140.
- First structured owner-contractor-academic research collaboration for the constructed project.
CII’s Vision
CII envisions a construction industry that builds predictable value for society and stakeholders.

CII’s Mission
The mission of CII is to inspire Owners, Contractors/Suppliers and Academia to collaborate through research to produce best practices and implementation resources, creating innovative solutions that tangibly improve capital efficiency.
CII Research Team

Industry Input (Domain Expertise)

Outputs
- Industry
- RS & IR
- Conference

Academic Input (Process Expertise)

Academic Body of Knowledge
CII Best Practices 2014

Processes or methods that, when executed effectively, lead to enhanced project performance.

To qualify, a practice must be sufficiently proven through extensive industry use and/or validation.

- Front End Planning
- Alignment
- Constructability
- Lessons Learned
- Materials Management
- Team Building
- Planning for Start-up
- Partnering

- Quality Management
- Change Management
- Disputes Resolution
- Zero Accidents Techniques
- Implementation of Products
- Benchmarking & Metrics
- Project Risk Assessment
Depth & Breadth of CII Research

Front End Planning

Research History

- 6 continents
- 279 organizations
- 9 research teams
- 1,017 projects studied
- 21 years
- 4,000 years’ experience
- 40 countries
- 40,000 downloads
- 157 team members
- $88 B project value
Front End Planning Research
Cost & Benefits

Cost

2 to 5% of total installed cost

Savings

$3 to $10 payback per $ spent
6 to 25% cost savings
6 to 39% schedule reduction
AWP a CII – COAA Joint Initiative

• Both organizations saw opportunity to strengthen work packaging processes and tools to improve productivity throughout the entire project life cycle.

• Both provided funding, people, projects, and data.

• Worked with the end in mind – a North American “Standard” (Advanced Work Packaging) to be disseminated across the CII & COAA membership and the industry.
Research Overview

Phase I
2009-2011
Process

Definitions
Model Process
Checklists

Challenges

Phase II
2011-2013
Implementation

Contractual Requirements
Process Integration
Job Roles
Assessment Tools
Example

CII RT
COAA docs
Case Studies

CII & COAA RT
Workshops
Interviews & Surveys
Case Studies
Triangulation of Evidence

RT 319 Objective

1. Validate AWP Benefits
2. Identify AWP Maturity Levels

Case Studies
- Methods of AWP Implementation
- Benefits / Challenges / Lessons Learned
- 20 Case Studies

Survey
- Statistical Validation
- AWP and Project Predictability
- 92 Surveyed Managers

Expert Interviews
- Specific AWP Processes
- Feedback on Research Findings
- 22 Direct Interviews

Cross-Validated Results!
CII Best Practices 2014

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- Project Risk Assessment
- Advanced Work Packaging
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Bill O’Brien
What is Advanced Work Packaging?

*Work planning that emphasizes construction requirements*
AWP: So what’s really new?

• We **KNOW** Front End Planning helps projects
  – Statistics, logic, case examples

• AWP is the extension of FEP across the project lifecycle
  – People, processes, tools

• AWP promotes success at the work front
  – Provides pre-requisites for effective short-interval (field) planning

➢ AWP is a disciplined process to overcome problems resulting from a fragmented and specialized industry
  ➢ Two key ideas: (1) CWP/EWP definition; (2) Role of WorkFace Planners
CWP Plan

• A CWP Plan considers:
  – Construction constraints.
  – Trades being used.
  – Contracting plan.
  – Modules / separate CWP s for fabrication and installation.
  – Minimize interfaces to other CWP s.
  – Minimize schedule duration.
Inside the CWP

- All information required by Construction Contractor.
- Usually compiled by Construction Management (or the party responsible for managing subcontractors).
- Considers construction constraints, trades, contracting plan, module fabrication & installation, minimal interfaces with other CWPs, minimal duration.
EWP Plan

• A EWP Plan considers:
  – Availability of engineers and drafters.
  – Availability of design data.
  – Dates when needed by construction.
Inside the EWP

• All information required to be developed & transmitted from Engineering:
  – Scope of work, drawings and specifications, vendor data, line lists and equipment lists.

• Content will vary depending on Engineering's scope of work:
  – Is the Engineering Contractor also procuring materials?
  – Is Engineering developing the specifications or are they being provided?
  – Full EPC contract?
Inside the IWP

• All unique requirements to install a portion of work.
• Enough work for one “Shift”.
• Includes:
  - IWP Constraints.
  - Scope of Work.
  - Safety Requirements.
  - QA/QC Requirements.
  - Trade Coordination.
  - Material Take Offs & Locations.
  - Scaffold Requirements.
  - Model Shots, Drawings and All Other Necessary Engineering Information.
  - Any Other Information Required to Install the Work.
AWP – the Ultimate Payoff

• Brings Construction planning into the early phases of the project.

• Provides better visibility to the progress in a given portion of the project:
  – Highlights areas that are falling behind plan and allows more efficient recovery planning.
  – Allows flexibility in construction execution.

• Provides a mechanism to maximize supervision time and tool time in the field.
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- AWP – The Research Journey
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Bill O’Brien
AWP: Documented Benefits

- 25% productivity improvement
- 10% decrease in total installed cost
- Greater schedule & cost **predictability**
- Improved safety performance
- Improved quality & stakeholder alignment
- Improved contractor profitability
- *No silver bullet – achieving the benefits takes work!*
- *But no reason to wait…*

**My prediction: AWP will be a source of sustainable competitive advantage for a decade for early adopters**
Advanced Work Packaging (AWP) promises to usher in a new era of improved predictability, particularly in the areas of cost and schedule.... the added level of planning increases crew “uptime” and supervisor “onsite” time. The latter factor has been directly attributable to improved HSE and quality performance. In our company, safety is a core value. Any opportunity to reduce the frequency and/or severity of an injury or incident is sought after. Contractors that understand AWP and have developed robust AWP processes are more desirable for us to work with. In fact as we write new contracts, we are including language requiring the use of AWP.
Research Objective

RT 272 Deliverables

- **Contracts**
  - Requirements
  - Deliverables

- **Model**
  - Flowcharts
  - Job Description

- **Tools**
  - Assessments
  - Templates

- **Examples**
  - Support
  - Preliminary Evidence

Does AWP lead to performance improvement?
Show it!

RT 319 Objectives

1. Validate AWP Benefits
2. Identify AWP Maturity levels
Triangulation of Evidence

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Cross-Validated Results!
Case Studies

Objective: In-depth Results on AWP Benefits

- 20 case studies and 52 interviewees.
- Different industrial sectors and project sizes.
- Documented AWP benefits, challenges, and lessons learned.
Case Studies by Sector

- **Chemical**: 3 cases, 15%
- **Infrastructure**: 2 cases, 10%
- **Oil & Gas**: 10 cases, 50%
- **Power**: 5 cases, 25%

**N = 20**
Case Studies by Size*

- **Small**: 5\[25\%\]
- **Medium**: 2\[10\%\]
- **Large**: 7\[35\%\]
- **Mega**: 6\[30\%\]
- **Total**: 20

*Size (million USD):
- Small: < 5
- Medium: 5–50
- Large: 50–500
- Mega: > 500
Case Studies by Location

N = 20

US 12 60%
Canada 8 40%
[CAT EGO RY NA... ]
### Maturity Model

#### Level 2: AWP Effectiveness

AWP is seen as part of the business solution - being both an opportunity and a challenge.

Integration of AWP strategies are routinely developed and updated. These often seek to overcome integration and communication issues across project organizational units (silos). AWP is now included in all contracts.

Work processes and deliverables for individual business functions or departments are mostly well defined and standardized. Integration of these processes are still problematic across functional unit lines. Frustration will be experienced when some functions are progressing towards AWP implementation but are . . .

### Objectives:

1. Provide empirical evidence of the three stages.
2. Investigate the relationship between AWP maturity and project performance.
3. Deliver practical recommendations to obtain higher levels of AWP maturity.
Results:
- 60 ratings on 15 different projects.
- Independent ratings (RT319 experts).
- Two dimensions of analysis:

**AWP Maturity**
- A. Process Adherence
- B. Organizational Alignment
- C. Contract Integration

**Project Performance**
- A. Productivity
- B. Cost
- C. Safety
- D. Schedule
- E. Quality
- F. Predictability
(1) Recommendation in AWP Early Stages

- Set small project goals.
- Allocate adequate budgets.
- Identify key roles to drive AWP implementation.
- Perform intensive training.
## (1) Performance in AWP Early Stages

<table>
<thead>
<tr>
<th>Performance Dimension</th>
<th>Maturity Stage</th>
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(2) Recommendation in AWP Effectiveness

- Set ambitious project goals.
- Prioritize incremental improvement projects.
- Watch out for complacency.
- Attain to AWP guidelines.
## (2) Performance in AWP Effectiveness

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<tr>
<td><strong>Schedule</strong></td>
<td>Project experienced minor delays</td>
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<td>Project slightly ahead of schedule during execution</td>
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<tr>
<td><strong>Predictability</strong></td>
<td>Significant deviation from baseline estimates</td>
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<td>Minor changes to execution schedule</td>
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<tr>
<td><strong>Quality</strong></td>
<td>Rework in line with previous quality performance</td>
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![Performance Break-Out Diagram](image)
(3) Recommendation in AWP Biz. Transformation

- Continue investing in AWP implementation.
- Increase the flexibility of project managers to evolve/adapt AWP processes.
- Export the project as “world-class” benchmark.
### (3) Performance in AWP Business Transformation

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3 – AWP Business Transformation:

- Around 25% improvement
- TIC 10% below estimates
- 0 lost-time accident (TRIR improves with sporadic first-aids / near misses)
- Project slightly ahead of schedule during execution
- Execution schedule to plan
- Rework substantially below company’s average + substantial reduction in RFIs
Project Performance with AWP

<table>
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Performance Break-Out

- Productivity
- Cost
- Safety
- Schedule
- Predictability
- Quality
Managerial Implications

- Set ambitious project goals
- Prioritize incremental improvement projects
- Watch out for complacency
- Attain to AWP guidelines

- Set achievable project goals
- Allocate adequate budget during planning
- Identify key roles to drive AWP implementation
- Perform intensive training for all key participants

- Continue investing in AWP implementation
- Increase the flexibility of project managers to evolve/adapt AWP processes
- Export the project as “world-class” benchmark
CII Publications: RT-272 & 319

Volume I: Recommended Process
Volume II: Implementation Guidance
Volume III: Case Studies and Expert Interviews
RS-319-1
AWP World-Wide Adoption
Resources

CII Volumes
RT 272 + RT 319

CII Community of Practice
Virtual Meetings

Education
Conferences and Training
Agenda

- CII Research & Best Practices
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Jim Rammell
A Long Research Journey!

RT 272 Phase I Process (2009-2011)

RT 272 Phase II Implementation (2011-2013)

RT 319 Validation (2014-2015)

Steve Autry, ConocoPhillips
Michael Bankes, Fluor
Jim Blevins, Pathfinder
Roy Burnette, CH2M Hill
John Hyland, Lauren Engineers & Constructors
Mark Hunter, Bechtel
Robin Mikaelsson, Bentley Systems
Fernanda Leite, The University of Texas at Austin
Brendan Lynam, Kvaerner

Richard Buxo, SNC-Lavalin
Joel Gray, Coreworx
Kenneth Rota, Southern Company
Doug House, Zachry Industrial Inc.
Mark Hunter, Bechtel
Lauren Engineers & Constructors
Olfa Hamdi, The University of Texas at Austin
Bryan Parsons, KBR
Bill O’Brien, The University of Texas at Austin
Jim Rammell, Wood Group Mustang
Jim Vicknair, WorleyParsons

Sarah Meeks, The University of Texas at Austin
Robin Mikaelsson, Bentley Systems
Bill O’Brien, The University of Texas at Austin
Bryan Parsons, KBR
Bill O’Brien, Wood Group Mustang
Jean Stasek, DTE Energy
Jim Rammell, Wood Group Mustang

Fernanda Leite, The University of Texas at Austin
Brendan Lynam, Kvaerner

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Stan Stasek, DTE Energy

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Sarah Meeks, The University of Texas at Austin
Bill O’Brien, The University of Texas at Austin

Jim Rammell, Wood Group Mustang
Jim Vicknair, WorleyParsons
Glen Warren, Retired – COAA
CII AWP Community of Practice

- Established to Support the AWP User Community
- Hosts monthly meetings with insightful productivity topics
- Less than 1 year old, already grown to over ~30 members
• Record one actionable idea for your company
• Discuss: What questions do you have about AWP? What are the implementation challenges you foresee?
Break Out Session

Moderator

- Jim Rammell, Wood Group Mustang

AWP Research Overview

- William O’Brien, The University of Texas at Austin

Contractor & Owner Stories

- William O’Brien, The University of Texas at Austin
- Jim Rammell, Wood Group Mustang

Resources

- Jim Rammell, Wood Group Mustang

Q&A
Break Out Session Takeaways

• Overview of Advanced Work Packaging
• Research methodology
• Owner and contractor implementations
• Resources