Project Partnering in the Digital Age

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Construction Progress Coalition (CPC) is a non-profit organization uniting Architecture, Engineering, and Construction (AEC) Professionals, Technology Solution Providers (TSPs), and their governing organizations (GOs) around a shared language to define project interoperability standards. Together, we are transforming the future of digital project delivery through a Common Data Exchange (CDX).
Agenda

• What is the Digital Age?
  • Shifting mindsets

• The Digital State of Construction
  • Shifting process standards

• Innovation in the Digital Age
  • Root Cause Analysis

• Change Management in the Digital Age
  • What’s in it for me?

• Partnering in the Digital Age
  • Continuous Improvement
What is “the Digital Age”? 
Shifting Mindsets
The Four Industrial Revolutions

First
Water and steam power is used to create mechanical production facilities.

Second
Electricity lets us create a division of labor and mass production.

Third
IT systems automate production lines further.

Fourth
IoT and cloud technology automate complex tasks.

1784: First mechanical loom
1800
1870: First assembly line
1900
1969: First programmable logic controller
2000

Today

81 HOURS!
71% of workers feel happy and productive in what they do, day in and day out, 40 hours a week, 220 days a year. Yet, there must be a smarter way of working, not just harder. I'm completely disengaged!
Hardware Consolidation

20 Years Later, All of These Fit in Your Pocket
The Digital Age is Now

My own theory is that we are in the middle of a dramatic and broad technological and economic shift in which software companies are poised to take over large swaths of the economy.

— Marc Andreessen

THE LARGEST COMPANIES BY MARKET CAP
The oil barons have been replaced by the whiz kids of Silicon Valley

THE LARGEST COMPANIES BY MARKET CAP
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Top 5 Publicly Traded Companies (by Market Cap)

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The Value of Integrated Data
The Digital State of Construction

Changing Process to Accommodate Technology
Productivity MUST Improve

Construction & Non-Farm Labor Productivity Index (1964-2003)

- Constant $ of contracts / workhours of hourly workers
- Sources: US Dept. of Commerce, Bureau of Labor Statistics

Since 1980, non-farm productivity has nearly doubled, whereas in construction:

- Manufacturing
- Construction

Igusa, France, Germany, Italy, Spain, United Kingdom, United States;
The Problem Lies Deeper than Tech

The Root Causes of Construction Productivity Stagnation

- Contractual Misunderstandings
- Missed Connections
- Inadequate Communication
- Insufficient Risk Management
- Limited Talent Management
- Poor Organization
- Poor Short-term Planning
- Flawed Performance Management
The Data is there to Prove it

### The Data is there to Prove it

#### Sector
- ICT
- Media
- Professional services
- Finance and insurance
- Wholesale trade
- Advanced manufacturing
- Oil and gas
- Utilities
- Chemicals and pharmaceuticals
- Basic goods manufacturing
- Mining
- Real estate
- Transportation and warehousing
- Education
- Retail trade
- Entertainment and recreation
- Personal and local services
- Government
- Healthcare
- Hospitality
- Construction
- Agriculture and hunting

#### Relatively low digitization

- Red Node: Individual company user
- Red Edge: Connection from internal user

#### Relatively high digitization

- Blue Node: Individual external user
- Blue Edge: Connection from external user

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1. Based on a set of metrics to assess digitization of assets (9 metrics), usage (11 metrics), and labor (8 metrics).
2. Information and communications technology.

Source: AppBrain; Bluewolf; Computer Economics; eMarketer; Gartner; IDC Research; LiveChat; US Bureau of Economic Analysis; US Bureau of Labor Statistics; US Census Bureau; McKinsey Global Institute analysis

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https://blog.box.com/mapping-the-information-economy-a-tale-of-five-industries
VC & Tech Start-ups Have Noticed

The AECO Software Landscape

$5.2 trillion
Global infrastructure spending
(Source: Oxford Economics)

$490 million
Total amount of venture funding
(Data provided by Crunchbase)

$5.3 billion
AECO estimated tech spending 2016
(Source: Oxford Economics)

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Innovation in the Digital Age

Root Cause Analysis
5 WHY’s – Poor As-Built Data
WHY #1 – Poor Data Handoffs

As-Built Input

Coordination Input

Design Input

Customer Input

Unreliable Data

Handover Data

Contract Risk Management

Assumptions & Miscommunication

Program
Design
Coordination
Construction
Operations
WHY #2 – Broken Process Standards

3D Model

2D Drawings

Designer

Detailer

Foreman

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WHY #3 – Contract Risk Management

3D Model

2D Drawings

Beware....
“Virtually everyone in the construction supply chain works on contracts where the incentive is to maximize their gain at the expense of others”

John Macomber, ASCE Report, 2003
“Follow the Money: What Really Drives Technology Innovation in Construction”
WHY #5 – Rationalization

Cognitive Dissonance
The mental discomfort experienced by a person who holds two or more contradictory beliefs, ideas, or values. This discomfort is triggered by a situation in which a person’s belief clashes with new evidence perceived by the person.
Do you trust in your data?
Change Management in the Digital Age

What’s in it for ME?
Change Management: The Old Way
Change Management: The New Way

Figure 1. What appears to be happening

- Mobile, sensors, AI, cognitive computing
- Access to technology by consumers globally
- Technology infiltrates home and political life

Figure 2. What is really happening

HR’s opportunity is to help close the gaps among technology, individuals, businesses, and society and governments.

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Change Management: Technology

Impact-Likelihood Matrix of New Technologies

- Extremely Likely
  - Integrated BIM
  - Real-time Mobile Collaboration
  - Prefabricated Building Components
- Somewhat Likely
  - Drones
  - Augmented Reality
  - Advanced Building Materials
- Some Impact
  - Big Data Analytics
  - Advanced Project Planning Tools
  - New Active Materials
- Extremely High Impact
  - Contour Crafting of Buildings
  - 3D Printing of Components
  - Self-healing Materials

LEGEND:
- Green: Transformative
- Blue: Breakthrough
- Purple: Disruptive

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78% of Millennials say access to technology they like makes them more effective at work.

80% of execs agree that knowledge-sharing across roles is crucial for growth. Only 25% claim their organization is effective at this.

66% of workforce are Gen Xers and Boomers. By 2020, they’ll represent only 54%.

From “Millennials, Tech, and the Changing AEC Workforce” www.StrXur.com
FORMAL COMMUNICATION (Solid Line)
Indicates formal lines of communication defined by contract (direct relationship (green) or indirect relationship (orange))

INFORMAL COMMUNICATION (Dashed Line)
Indicates informal lines of communication at the workforce level that are contractually incentivized relationship (green) or pose contract risk (red)
“the only way any kind of early contractor involvement type of approach works is if there’s true collaboration and a level of trust built between the parties, the owner, architect and contractor. IDc represent new contracting approach for VA; does not fit existing procedures which is complicated by VA culture that does not encourage or it [not] comfortable with new approached” – Construction Manager, VA Replacement Hospital
Partnering in the Digital Age

Continuous Improvement, Measurable Results
Digital Transformation is Hard

"Of the $1.3 trillion that was spent on DT last year, it was estimated that $900 billion went to waste."

Source: John Kotter International

https://hbr.org/2019/03/digital-transformation-is-not-about-technology
Learn from the 30% that Survived

Source: John Kotter International
Integrate People

Cooperation

Collaboration

The Project Owner/Operator

What is desirable to users?

The AEC Professional

INNOVATION

What is possible with technology?

What is viable in the marketplace?

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Integrate Technology

Physical Bigroom (Jobsite Office)

Virtual Bigroom (Bluebeam Studio)

Figure 23: Co-location Trailer Layout (Temecula Valley)
Align Stakeholder Perspectives

Different Perspectives. Same Mission.

TRANSPARENCY & ACCOUNTABILITY
Align Workflow Standards

**CDX-002 Submittal Review**
Supporting

**HOW MIGHT WE** streamline the **PREPARATION, REVIEW, and RELEASE** of fabrication **SUBMITTAL** packages

**IN WAYS THAT** leverage **CLOUD COLLABORATION** and **OPEN API** capabilities

**SO THAT** design and construction stakeholders can **CUSTOMIZE** project specifications to balance their need for **EFFICIENCY** and **QUALITY**

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**CURRENT STATE #SHARED PAINS**

- Items vs Packages
- What inherent metadata exists?
- Review process is not in parallel
- Where are release packages stored? Who is notified?
- Turnaround varies — 2 days to 3 weeks!

**IDEAL STATE POTENTIAL**

- General Contractor
  - Package Submittal
  - Send to Reviewer
- Architect
  - Receive Submittal
  - Send to Engineer
- Engineer
  - Review & Stamp
  - Return to IPI
- Shop Detailer
  - Submit Design
- Shop Fabricator
  - Begin Fabrication

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Respect the Conditions of Satisfaction

**Figure 3: Determining Project Viability (Ballard & Morris, 2011)**

http://www.iglc.net/Papers/Details/1193
Respect the Boundary of Realization

"Tell me how I am measured, and I will tell you how I behave"

- Eli Goldratt

Respect the Role of Technology

Data Verification & Quality Control

Project Metrics Dashboard

"Tell me how I am measured, and I will tell you how I behave"

- Eli Goldratt
Are You Ready? Questions....?

WE'RE HIRING A DIRECTOR OF CHANGE MANAGEMENT TO HELP EMPLOYEES EMBRACE STRATEGIC CHANGES.

OR WE COULD COME UP WITH STRATEGIES THAT MAKE SENSE. THEN EMPLOYEES WOULD EMBRACE CHANGE.

THAT SOUNDS HARDER.

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