OPERATING SYSTEM 2.0

We *Must* Change and We *Can* Change!

Peter Dumont, P.E.
Vice President, nVent
President, Construction Users Roundtable (CURT)

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Industry Advancement?

- Today’s projects are unsustainable (5.4% success rate)
- We can do much better (with a new operating system)
Why Fix Construction?  Why Now?

- $10T industry globally ($14T by 2025)
- 13% of world’s GDP
- Economic loss of $1.63 Trillion/year in construction sector globally
  - $580B in North America
Low Profitability. High Risk.

- Seven Fortune 500 E&C companies (1.8% net profit on $77B revenue)
  - 310% profits made on 40% of projects
  - Extensive M&A to buy backlog (classic downward demand spiral)
- Living off “wrong side of the dollar”
  - 90 day terms
  - Inflationary spiral
- C-suite views projects as too risky
  - M&A, share repurchase
  - Project departments as profit centers?
What We Do is Incredibly Valuable…

…however, the market doesn’t value us.

Dow Jones Construction Index vs. DJIA (May 2013 – May 2018):

Dow Jones U.S. Heavy Construction Index

-7.6%

Dow Jones Industrial Average

+60.3%
Outsiders in an Industry with Grocery Store Margins

- June 16, 2017
- Amazon acquires Whole Foods
- Are we next?
The Outsiders Are Here

- Elon Musk’s Hyperloop
- TBM 14x faster, 10x cheaper
- Ability to raise capital

**Tunneling R&D.** In the United States, there is virtually no investment in tunneling Research and Development (and in many other forms of construction). Thus, the construction industry is one of the only sectors in our economy that has not improved its productivity in the last 50 years.
**BEST Practices?**

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.

**Predictable & Consistent → Inefficient**

- Advanced Work Packaging
- Alignment
- Benchmarking & Metrics
- Change Management
- Constructability
- Disputes Resolution
- Front End Planning
- Implementation of CII Research
- Lessons Learned

- Materials Management
- Quality Management
- Owners Safety Blueprint (OSB)
- Partnering
- Planning for Modularization
- Planning for Start-up
- Project Risk Assessment
- Team Building
- Zero Accidents Techniques (ZAT)
We Need a New Business Model

• The capital projects industry is not economically viable for many sectors
  ✓ “Our (industry’s) house is on fire”
    - Brendan Bechtel
  ✓ Stage Gate (OS1) obsolete?

• Sweeping change is required
• Open-source platform – (IOS / Android)
• Operating System 2.0 encompasses 16 Transformational Concepts
• Primarily a Financial and Interface model

Industry 4.0 (manufacturing)
7 Focus Areas for Research and Product Development

- Corporate Governance
- Commercial Model
- Project / Asset Design
- Production Methods
- Technology & Systems
- Human Resources
- New Business Platform
Element 1 – (Corporate) Governance

- The “changing face” of the owner
  - Construction not core competency for most
  - Emerging, non-traditional owners
  - Capital can come from anywhere

- Align Enterprise, Program, Project (change, risk)

- Corporate (business strategy, long-range planning, capital budgeting, finance, commercial, legal, accounting, government relations, investor relations, tax, regulatory, and operations)

- CAPEX and OPEX (integration)

- Make projects preferred choice of C-suite

“How can the project be used to enhance business value?”
Element 2 – Commercial Model

- Relational contracting (not roll-up)
- New industry compensation models (hour-based billing)
- Holonic projects / creative tension (reduction in transactional costs)
- LEASE vs. buy
- Economics of Bundling
  ✓ Bigger Bundles = Bigger Economic Advantage

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Element 3 – Design

- Modularization AND Miniaturization
- Preassemblies (mass customization)
- Design reuse and improvement
- Supplier-led design
- Digital twin designs
- Process Intensification (PI)

\[
\text{Cost of Facility A} = \text{Cost of Facility B} \times \left( \frac{\text{Capacity of Facility A}}{\text{Capacity of Facility B}} \right)^{0.6} \\
= \$2 \text{ Billion} \times \left( \frac{300,000 \text{ BOED}}{150,000 \text{ BOED}} \right)^{0.6} \\
= \$3.03 \text{ Billion}
\]
Supplier-Led Design

- **B787 Development Cost:** From $10B to $6B (-40%)
- **B787 Development Time:** From 6 Years to 4 Years (-33%)
Element 4 – Production Methods

- Management Science (agile, lean, project controls, estimating, etc.)
- Modeling and simulation (Lego path of construction)
- Supply chain and logistics
- Lifecycle (5, 7, 10 years) – Asset Class (MACRS)
- Financial metrics (ROCE, NPV, etc.) - jettison EVMS
- Modular, Miniature (no STO – CAPEX / OPEX)
Element 5 – Technology and Systems

- Digital mapping, GPS, BIM, collaboration/ connectivity
- Integrated transaction platform (cognitive computing)
- Data-centric IoT (lifecycle monitoring, inventory tracking, etc.)
- Multi-functional equipment, disposable (recyclable)
- Automation and robotics
Element 6 – Human Resources

• **Effective leadership** (financial, decision-making)
• Organizational engineering (project team dynamics)
• Communications and information
• Recruitment, retention, training
• Human / technology interface
• 1/6th workers at site

SAM Bricklaying Robot (Construction Robotics)
Element 7 – Cloud-Enabled, Thin Platform

(40% Transactional Cost)

- Banks
- Owners
- EPC / CM
- Labor
- Subcontractors
- Vendors / Suppliers
- Distributors
- Manufacturers
- Raw Materials Companies

VS.

Capital Markets
(Owners, Private Equity, Bonds, MLP’s, Syndicates)

(Open Source, Cloud-Enabled Thin Platform)

- Commercial Finance
- Integrator (IT)
- Tax

- CM
- Labor
- licensors
- Engineering
- Regulators
- Manufacturers
- Raw Materials Cos.
- Contractors
- Large Risk Mgmt.
- Logistics
- MRO

(4% Transactional Cost)
Optimal, Real-Time Partner Selection

• Industry is fragmented and highly specialized
  ✓ Many companies on any given project (1-to-$1M factor)
  ✓ Suboptimal partner selection is frequent cause of failure
  ✓ Highly dysfunctional purchasing practices are common

• Some innovations exist, but most proprietary & specific
  ✓ We need a common business platform for construction

• Need the right “objective function” in selecting partners

• Buy based on maximizing ROI / ROCE
  ✓ Availability, track record, product efficiency, location, initial price, reliability, etc.

• Leverage cognitive computing
  ✓ Analyze millions of configurations in minutes
Why?
When We Get This Right....
…Owner’s Total Cost of Ownership (TCO) Impact

- 35% cost reduction
- 50% cycle time reduction
- 60% better ROCE
- 250% more projects
- 300% more profit for OS2 providers
Win-Win-Win for Engineers, Contractors & Suppliers

- Cash flow leveling (Wall Street loves predictability)
- Ride out market’s peaks and valleys
• Sanctioned March 2018
  ✓ R&D JV company established
  ✓ Branding / marketing
  ✓ Investor prospectus
  ✓ Company visits underway
• Round 1 fundraising campaign is underway
• R&D launch Fall 2018*
• Future incubator for new businesses

* Assuming first round investment targets are met
Who’s Interested in Operating System 2.0?

✓ CURT Board approved
✓ CII Board approved

!
A level of energy and excitement not seen in decades

“By the industry, for the industry”

OS2.0 Consortia
1. ABC
2. AGC
3. AIA
4. CII
5. COAA
6. CPF
7. CURT
8. ECI / CE (EU)
9. ECITB (UK)
10. EDRC (RSK)
11. LCI
12. NAC
13. NCCER
14. PPI
15. Project Norway
16. RAPID (DOE/AIChE)

OS2.0 Companies
1. Air Products & Chemicals
2. Alberici
3. Andeavor
4. Autodesk
5. Barton Malow
6. BASF
7. Bechtel
8. Bentley
9. Black & Veatch
10. Burns & McDonnell
11. BMW Constructors
12. Concord Technologies
13. Day and Zimmerman
14. Dow
15. DuPont
16. ExxonMobil
17. General Electric
18. General Motors
19. Gray Construction
20. Hargrove
21. Haskell
22. Hatch
23. Hexagon
24. Honeywell
25. IBM
26. Jacobs
27. Kajima
28. Kiewit
29. LyondellBasell
30. Matrix Service Co.
31. McKinsey
32. Metrolinx
33. Oneok
34. Petronas
35. Procter & Gamble
36. Pioneer
37. Praxair / Linde
38. PTAG
39. Rockefeller Group
40. Roeslein
41. Rosendin Electric
42. SABIC
43. Saudi Aramco
44. Shell
45. Skanska
46. Southern Company
47. Stevens Engineering
48. Tecnimonst SpA
49. Victaulic
50. Zurich
“It’s unbelievable how much you don’t know about the game you’ve been playing all your life.”

- Mickey Mantle