



Success Through Innovation and Technology



Operating System 2.0

Collaborating to Transform the Capital Projects Industry

Stephen P. Mulva, Ph.D.

Director, Construction Industry Institute (CII) The University of Texas at Austin

NWCCC Annual Conference

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Lynnwood, Washington

History of CII

- Founded in 1983 by 28 organizations; now 149
- Organized Research Unit (ORU) of the Cockrell School of Engineering (CSE) at the University of Texas at Austin (UT)
- First structured owner-contractor-academic research collaboration for the constructed project
- Merged Fiatech into CII as two technology-focused committees in January 2018



CII: Research and Development for Capital Projects

- History of Industry Best Practices Leadership
- Zero Accident Techniques, Constructability, PDRI, Advanced Work Packaging, Planning for Startup









CII Themes: Keys to Future Success

- Process (Innovation)
 - Near-term (industry sector)
 - Long-term (overarching R&D)
- People (Capacity Building)
 - Leadership and business acumen
 - Organizational behavior
- Technology (Enabled Transformation)
- (New) Business Model



EXECUTIVE LEADERSHIP PROGRAM

January 8 - 17, 2019 The University of Texas at Austin





go.cii.today/xlp



"This program is designed specifically for the engineering and construction industry, with a mix of leadership, strategy and business acumen topics to help your leaders excel."

- Tricia Thibodeaux, P.E., PMP, Fluor



The University of Texas at Austin Texas Executive Education McCombs School of Business



Get Engaged!

@ConstructionIndustryInstitute

Operating System 2.0 Defined

- OS2.0 is a new business and commercial model for the capital projects industry
 - "How can we use the capital project to enhance business outcomes?"
 - Owners: "How do we accelerate our organic growth by using our capital better?"
- OS2.0 will enhance the health and stability of the industry
 - Intelligent finance, accounting, tax, legal platform for a globally-distributed industry
 - Participating companies will leverage their own capital
- Key words: Distributed, Quick
 - Reverse the trends toward costly vertical integration (distributed risk, finance)
 - Create quick wins such as in leasing



Operating System 2.0 (OS2) will transform the global engineering and construction market in the way that facilities are conceived, evaluated, planned, delivered and operated (theories).

PrairieDog will implement the results of OS2 research & development through commercialization of innovative technology and services (platform).



TODAY Current Industry Status

T N R D B L

Industry Advancement?

- (CII) 94.5% of projects do not meet one or more of their business objectives.
- (CII) 70% of projects could not be completed within 10% of budgeted cost and schedule.
- (Bechtel) 98% of megaprojects experience overruns that average 80% over budget and 20 months late.
- (NTNU) Approximately 40% of the capital spending on any given project is "waste" due to non-value added transactional costs throughout the supply chain – contracts, risk, bonding, contingency, etc.
- (CII RT 191) Waste in Construction: 10% VA, 33% NVAR, 57% NVA (Waste)



2013

What We Do is Incredibly Valuable...

...however, the market doesn't value us.

Dow Jones Construction Index vs. DJIA (August 30, 2013 – August 30, 2018):



Why Fix Construction? Why Now?

- Need (Direct) Investment
- Make Industry Healthy Again (1.8%)
- Breakthrough vs. Continuous Improvement
 - Improve 2.5% per Year, but...
 - Industry Declines 3% per Year
- Mission of CII, CURT, EDRC, Others



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 <u>The Future?</u>

- 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)



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 vs. Idea to Launch (Edgett/Cooper)
- Open-source platform (IOS / Android)
- Operating System 2.0 encompasses
 17 Transformational Concepts
- Primarily a Financial and Interface model



Industry 4.0 (manufacturing)



TOMORROW Desired Future State of the Industry



"How can the project better enhance business value?"

"How can we make projects a preferred investment choice for the C-suite?"

"Can we eliminate significant transactional waste through better contracting & collaboration?"

"Can we procure materials and services based on ROI/ROCE instead of just initial cost?"

"Can we leverage advanced computing power to improve project outcomes?"

"Can we better take advantage of global trade & tax regulations?"

"Can leasing provide a better option for funding capital projects?"

"Can we improve the overall financial health of the industry?"



Project 13 (ICE UK)

- Not concerned with project scope
- Totally concerned with returns
- Entities:
 - Investor
 - Owner
 - Advisor
 - Integrator
 - Supplier





OS2's "Big Ideas"





Research & Development Thrust Areas

	Research & Development Thrust Area	Priority	Finance	Technolog y	Process	People
1	Leasing Model	1	×			
2	Equity Participation in Asset Development	1	 Image: A second s			
3	Depreciation / Tax Advantages	1	 Image: A second s			
4	New Accounting Methods	1	×			
5	Cloud-Enabled Thin Platform	2		4		
6	Optimal / Real-time Partner Selection	2		4		
7	Risk, Insurance, Surety, Bonding	3			×	
8	Supply Chain Rationalization	3			4	
9	Sourcing Globally / Buying / Transfer Pricing	3			1	
10	Contract Simplification	3			4	
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15	Agile Planning & Generative Design	6			1 - C	
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Flexible Approach to Capital Markets and Investment

Leasing Model

- Financial markets prefer to spread risk by making many small loans
- Initial capital requirements
 vs. over time
- Commercial finance vs. investment banking
- Equity participation (improve quality, ROI)



Leasing Primer

- Improves the health of the industry (grows supplier, provider assets)
- Up to 85% reduction in owner's capital requirements
- Borrowing rates of 4.5%, not 11.8%

	Analogy	Balance Sheet	Ownership	Bargain Purchase Option?	Term	NPV	Risks	Accounting	Тах
Capital Lease	Loan	On	Transfer to Lessee	Yes	75+% of Life	>90% of Value	Transfer to Lessee	Lease is an Asset	Lessee Depreciates
Operating Lease	Renting	Off*	Retained by Lessor	No	<75% of Life	<90% of Value	Retained by Lessor	Payments in Operating Expenses	Lessor Depreciates

*FASB Lease Accounting Standard ASC 842 (January 2019)

(Operating leases going onto balance sheet) (Sale-leaseback considerations changing significantly)



Flexible Approach to Capital Markets and Investment

- Can we better align market analyses and production projections for a new asset with its development and operation?
 - Build more facilities, each with less capacity and continually re-analyze those decisions in real-time?
 - Initial build = ~40% of forecast capacity
- Take advantage of tax laws, tariffs, domiciles, and depreciation
- Lifecycle Asset Class (MACRS)



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Cloud-Enabled, Thin Platform



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

(Open Source, Cloud-Enabled Thin Platform)

Commercial Finance Integrator (IT) Tax

Month State Cost (4% Transactional Cost)

Optimal, Real-Time Selection and Integration

- Pockets of innovation today, but most proprietary and sector-specific
 - There is no *business platform* for the industry
- Use the project to improve business performance (ROI / ROCE)
- Unleash data from being controlled by the "project team"
 - Dramatic ↑ in information flow and awareness
 - Vastly speed up the project
 - Better, faster decision-making
 - PrairieDog will be the *Selector* and *Integrator*
- Mine data to enhance business knowledge & profitability
- Open API philosophy





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Risk, Insurance, Surety and Bonding



- Lack of trust = protectionist schemes
 - Unfair allocation of risk is common
 - Can we engineer trust back into the system?
- Duplicative insurance (400% excess insurance is common)
- Entire cost centers may be unnecessary



Supply Chain Rationalization



- Historical reasons for the industry's current (massive) purchasing and distribution networks (and inventories)
- Modern economy enables factory-direct sourcing
- Need to rationalize supply chain against an objective function that looks at life cycle value contribution (ROI/ROCE), not just initial cost
- Enabling technologies:
 - Logistics software, Blockchain, cognitive computing



Contracts and Commercial Management

- Relational contracting (not roll-up, M&A)
- New industry compensation models (hour-based billing, ROI/ROCE)
- Global sourcing and transfer pricing
 - Elimination of RFPs and POs
 - Cognitive computing
- Two contracts for a project?
 - Investors and providers
 - C/R and LS = transactional costs



Supplier-Led Design

- B787 Development Cost: From \$10B to \$6B (-40%)
- B787 Development Time: From 6 Years to 4 Years (-33%)



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Workforce of the Future

- Effective leadership (financial, decision-making)
- Organizational engineering (project team dynamics)
- Communications and information flow
- Recruitment, retention, training
- Human / technology / digital interface
- 1/6th workers at site (shift workers to manufacturing setting)





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Owner Transformation

Use the project to enhance business value.

- Better 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 a preferred choice of the C-suite.



New Sources of Capital

- Owners do three things:
 - Idea
 - Capital (can come from anywhere)
 - Operations (can be contracted)
- Crowdsourcing capital?
- Listing projects on stock exchange?
- Leverage capital from supply community (facilitated by leasing)
- New credit options for suppliers



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Generative Design & Miniaturization

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





Production Economics

- Modular Chemical Process Intensification (MCPI) can drastically reduce per unit cost
 - Microwaves
 - Combined reaction and separation
- Scale-up by "numbering up" through economics of mass production of modules



New Production Methods

- New Management Science (AGILE planning, lean, project controls, estimating, etc.)
- Modeling and simulation (Lego path of construction)
- Modular, Miniature (no STO – CAPEX / OPEX)
- Economies of scale and repetition
- Computer-aided, factorybased production





Technology and Systems

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



Multi-functional & Disposable Equipment (Biotechnology Manufacturing)



RESULTS Expected Impact

Owner's Total Cost of Ownership (TCO) Impact

- 35% cost reduction
- 50% cycle time reduction
- 60% better ROCE
- 250% more projects

Plus...

 300% more profit for OS2 providers



Companies & Consortiums Interested / Supporting OS2

OS2 Consortiums

OS2 Companies

1	ABC	1	Air Products & O
2	AGC	2	Alberici
3	AIA	3	Andeavor
4	BRE	4	Autodesk
5	CII	5	Baker Concrete
6	COAA	6	Barton Malow
7	CPF	7	BASF
8	CURT	8	Bechtel
9	ECI / CE (EU)	9	Bentley
10	ECITB (UK)	10	BHP
11	EDRC (RSK)	11	Black & Veatch
12	IMPACT	12	BMW Construct
13	LCI	13	BP
14	NAC	14	Brasfield & Gorr
15	NCCER	15	Brick & Mortar \
16	PPI	16	Burns & McDon
17	Project Norway	17	Cenovus
18	RAPID (DoE/AIChE)	18	Concord Techno
		19	Day and Zimme
		20	Dow
		21	Duke Energy
		22	DuPont
		23	Enbridge
		24	ExxonMobil

Chemicals	25	General Electric
	26	General Motors
	27	Gray Construction
	28	Fluor
1	29	Hargrove
	30	Haskell
	31	Hatch
	32	Hexagon
	33	Honeywell
	34	IBM
	35	Intelliwave
ors	36	Jacobs
	37	Kajima
rie	38	KBR
Ventures	39	Kiewit
nell	40	LyondellBasell
	41	Mammoet Cana
ologies	42	Matrix Service C
rman	43	McKinsey
	44	Metrolinx
	45	MetroPower
	46	Milestone Capit
	47	Mitsubishi Heav
	48	Odebrecht

49	Oneok
50	Owens Corning
51	Petronas
52	Pillsbury Law
53	Procter & Gamble
54	Pioneer
55	Praxair
56	PTAG
57	Rockefeller Group
58	Roeslein
59	Rosendin Electric
60	SABIC
61	Saudi Aramco
62	Shell
63	Skanska
64	Southern Company
65	Suncor
66	Stevens Engineering
67	Taft Stettinius & Hollister
68	Tecnimont SpA
69	United Rentals
70	Victaulic
71	WorleyParsons
72	Zurich
	49 50 51 52 53 56 57 58 59 60 61 62 63 64 65 66 67 68 970 71 72



"By the industry, for the industry"

Cll's Engagement in OS2.0



Operating System 2.0 – A Declaration of Commitment

The leaders of the built environment recognize a need to revolutionize the way our industry delivers capital projects and programs. As the custodians of society's infrastructure, we have a responsibility to drive massive improvements in cost, schedule, quality, and safety performance which support the needs of our citizens. This must be done in way that creates value rather than erodes it.

Our choice is simple: achieve these results in a way that delivers greater value, or face value migration from external forces. To thrive in a dynamic and changing world, our industry must be more adaptable, agile, and responsive to the complex challenges it faces.

We declare these beliefs and intentions:

- We will reduce the organizational layers and information gaps between the end user and those delivering the asset.
- We will deploy new financial vehicles to maximize financial and societal benefit.
- We will focus on the total cost of facility ownership.
- We will embrace true collaboration with better risk management that builds trust.
- We will value the innovation, creativity, and inventiveness of people to meet the challenges in our built environment.

We, the undersigned, firmly stand by this declaration and are committed to lead and bring about this change in our industry through Operating System 2.0 (dba PrairieDog).

Further, the undersigned organizations intend to support these goals and bring them to fruition by investing in PrairieDog Venture Partners directly or by contributing to the related Industrial Affiliate Program (IAP) research at the University of Texas at Austin. Call to Action (Get Involved)!

Questions?

Stephen Mulva, Ph.D. Director, CII smulva@cii.utexas.edu (512) 232-3013

