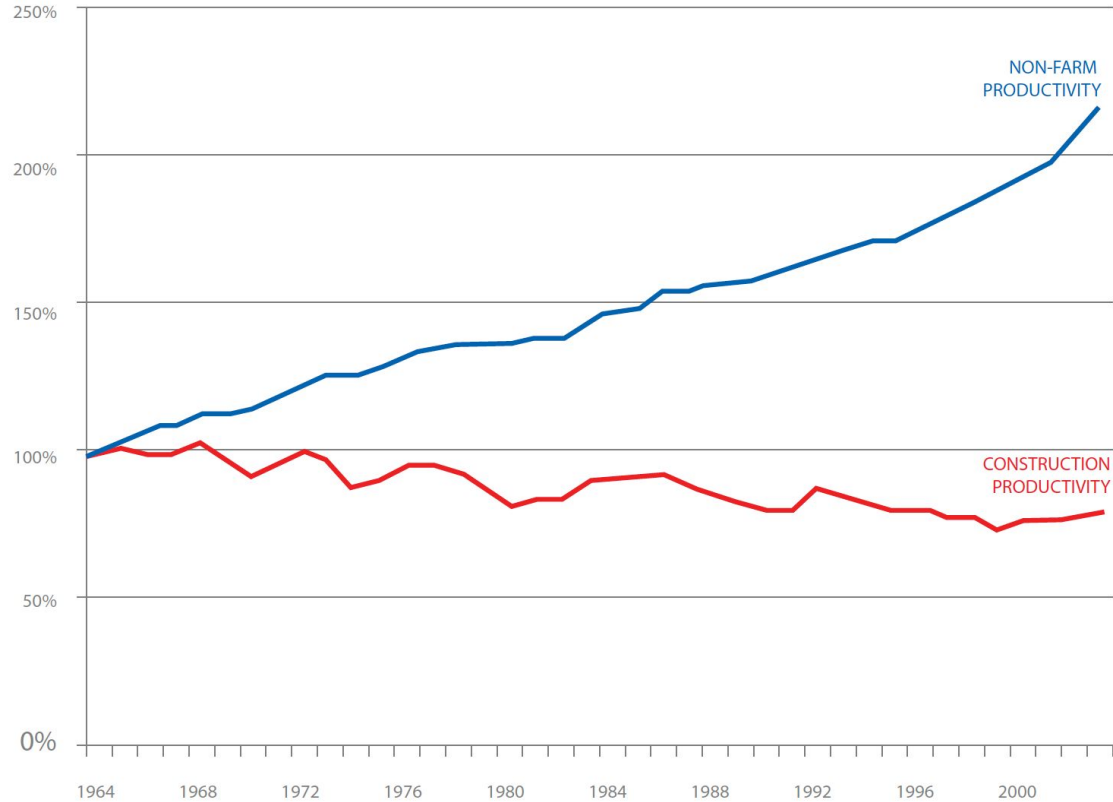


Not Everything is a Nail

Renée Cheng, FAIA
Dean, College of Built Environments
University of Washington

PRODUCTIVITY INDEX (1964-2003)

CONSTANT \$ OF CONTRACTS / WORKHOURS OF HOURLY WORKERS
SOURCES: US DEPT. OF COMMERCE, BUREAU OF LABOR STATISTICS



Paul M. Teicholz, CIFE

(December 13, 1999). Reverse Productivity Declines. *Engineering News-Record*. Retrieved from

<https://advance-lexis-com.offcampus.lib.washington.edu/api/document?collection=news&id=urn:contentItem:3Y44-T500-000K-J0TX-00000-00&context=1516831>.

The productivity opportunity in construction



Construction matters for the world economy

... but has a long record of poor productivity



Construction-related spending accounts for

13% of the world's GDP

...but the sector's annual productivity growth has only increased

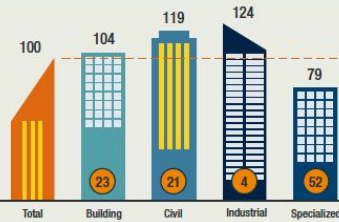
1% over the past 20 years

\$1.6 trillion of additional value added could be created through higher productivity, meeting half the world's infrastructure need

Construction is a sector of two halves

Fragmented specialized trades drag down the productivity of the sector as a whole

Construction productivity by subsector
Value added per employee, indexed total sector=100, 2013
● % of construction value added



Action in seven areas can boost sector productivity by

50–60%



- Reshape regulation
- Rewire contracts
- Rethink design
- Improve procurement and supply chain
- Improve onsite execution
- Infuse technology and innovation
- Reskill workers

5–10X productivity boost

possible for some parts of the industry by moving to a manufacturing-style production system



The productivity opportunity in construction



Construction matters for the world economy

... but has a long record of poor productivity



Construction-related spending accounts for

13% of the world's GDP

...but the sector's annual productivity growth has only increased

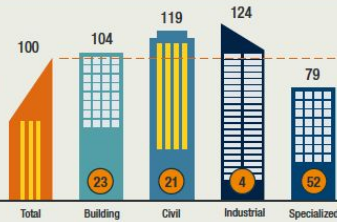
1% over the past 20 years

\$1.6 trillion of additional value added could be created through higher productivity, meeting half the world's infrastructure need

Construction is a sector of two halves

Fragmented specialized trades drag down the productivity of the sector as a whole

Construction productivity by subsector
Value added per employee, indexed total sector=100, 2013
● % of construction value added



Action in seven areas can boost sector productivity by 50–60%



- Reshape regulation
- Rewire contracts
- Rethink design
- Improve procurement and supply chain
- Improve onsite execution
- Infuse technology and innovation
- Reskill workers

5–10X productivity boost

possible for some parts of the industry by moving to a manufacturing-style production system



areas for architectural education requiring collaboration and intercultural skill

9 Augmented Reality Technologies for Architecture and Construction



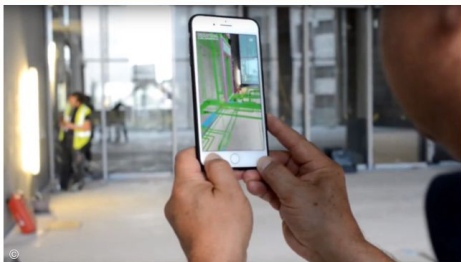
Save this article

Presented by Ducane



Part of ArchDaily's Topic:

WORK



Written by Eduardo Souza

April 14, 2019

<https://www.archdaily.com/914501/9-augmented-reality-technologies-for-architecture-and-construction>



Geometry Systems for AEC Generative Design: Codify Design Intent into the Machine

Lorenzo Villaggi explains how to formulate an AEC design problem through generative design and incorporate design intents as geometric systems (model parameterization) using Dynamo and Refinery.

Lorenzo Villaggi



Revit for Modular Design, Prefabrication, and Repetitive Layouts

Modular design and prefabrication are ideal for repetitive layouts in hospitals, schools, and hotels. Learn an interdisciplinary BIM workflow for the seamless design of modular components.

Bridget White, Kristoffer Tungland



How AI and Machine Learning Will Change the Way We Design

Generative design and machine learning can help architects design better and faster by solving complex problems and automating tedious tasks. Autodesk Principal Research Scientist Mehdi Nourbakhsh shares his perspective on what's possible.

Mehdi Nourbakhsh



Using Generative Design in Construction Applications

Generative design can optimize construction processes. Learn how to get started using current technologies, including Dynamo, and gain practical insight with case studies.

Dieter Vermeulen, Mostafa El Ayoubi

<https://www.autodesk.com/autodesk-university/>

CONSTRUCTION ► TECH TRENDS

How "The Internet of Things" Is Affecting the Construction Industry

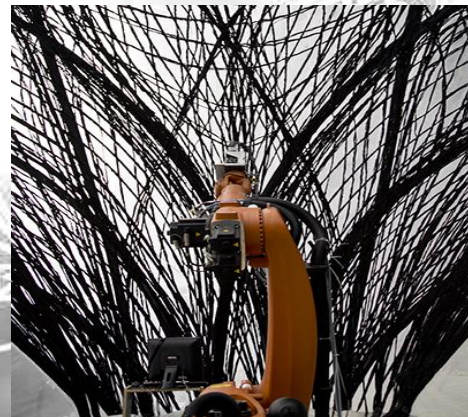
<https://www.thebalancesmb.com/how-internet-affects-the-construction-industry-845320>



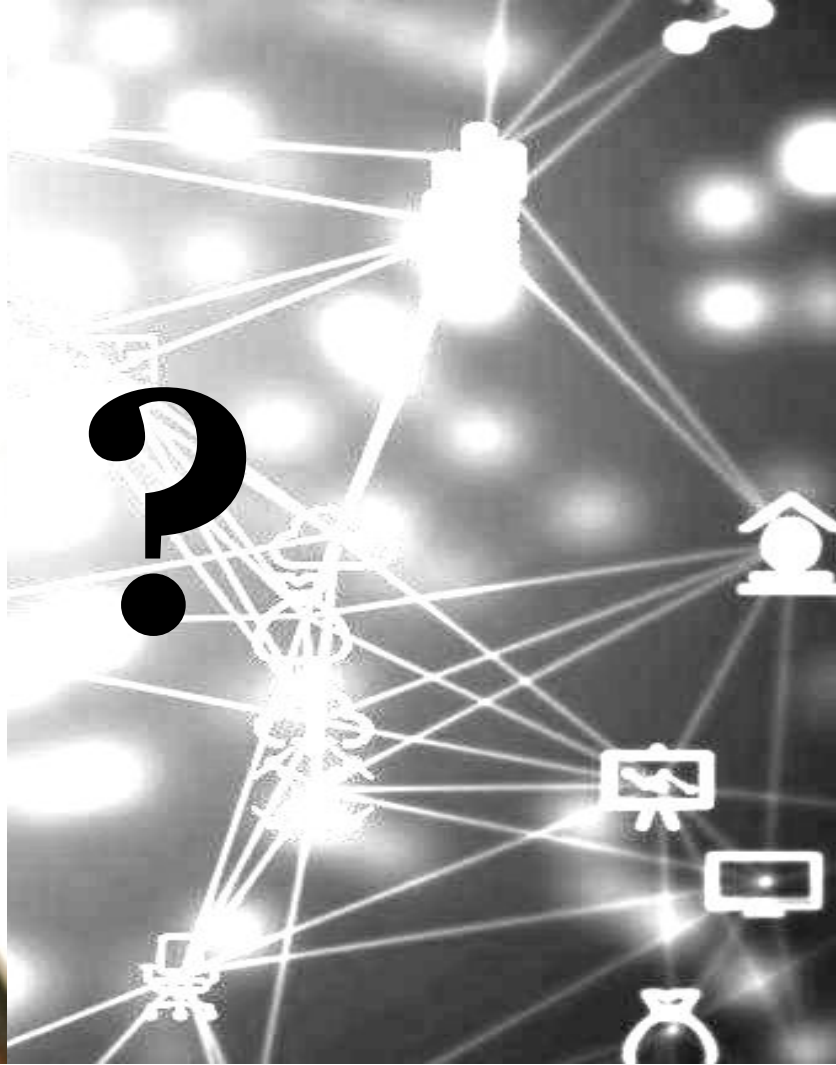
BY RACHEL BURGER | Updated June 17, 2019



<https://www.constructionblockchain.org>



ICD/ITKE ETH Pavilion 2014

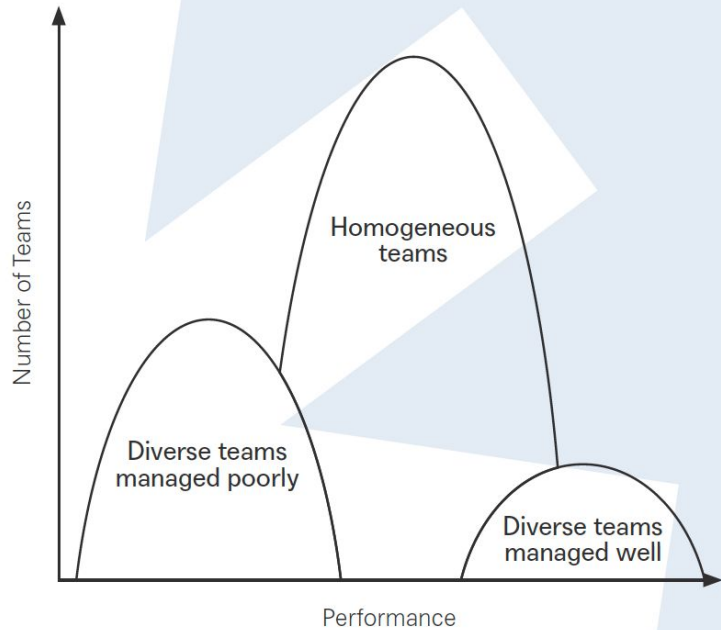


The whole is greater than the sum of its parts

- *meme attributed to Aristotle*

“To return to the difficulty which has been stated with respect both to definitions and to numbers, what is the cause of their unity? In the case of all things which have several parts and in which **the totality is not**, as it were, **a mere heap, but the whole is something besides the parts, there is a cause.**”

- *Aristotle, Metaphysics*



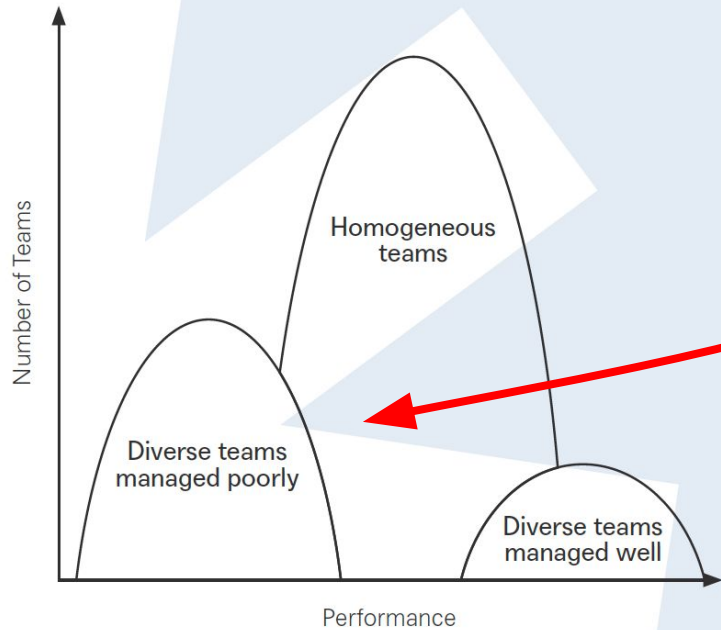
TEAM PERFORMANCE AND DIVERSITY

Research has shown that well-managed homogeneous teams outperform poorly-managed diverse teams while well-managed diverse teams outstrip all others.¹

Performance of homogeneous teams follows a typical bell curve

performance measured on creativity, ability to generate more and better alternatives, more and better criteria for evaluating alternatives

homogeneous defined as team members share same national identity



TEAM PERFORMANCE AND DIVERSITY

Research has shown that well-managed homogeneous teams outperform poorly-managed diverse teams while well-managed diverse teams outstrip all others.¹

Diverse teams follow a very different pattern

Conflict: the energy that could have been channeled into effective work was drained into negative stereotyping...the “team” destroyed value rather than creating it.

or

Mediocrity: by not allowing the differences to surface in any way, the teams suffered because they couldn't leverage them for innovation or performance advantages.

Value Creation: Differences are explicitly recognized and accepted, even nurtured, and their implications are incorporated into every facet of the group's processes.



The researchers also discovered which variables were *not* significantly connected with team effectiveness at Google:

- Colocation of teammates (sitting together in the same office)
- Consensus-driven decision making
- Extroversion of team members
- Individual performance of team members
- Workload size
- Seniority
- Team size
- Tenure

rework.with.google.com

Robert E. Levasseur (2017) People Skills: Building the Perfect Team—A Change Management Perspective.

INFORMS Journal on Applied Analytics 47(3):270-272. <https://doi.org/10.1287/inte.2017.0896>



shared belief held by members of a team that the team is safe for interpersonal risk taking

...an integrative perspective in which both team structures, such as context support and team leader coaching, and shared beliefs shape team outcomes.

-Amy Edmondson, 1999

TEAMS MATTER: LESSONS FROM ARRA

GSA REGION 5 AND THE AMERICAN RECOVERY AND REINVESTMENT ACT

RENEE CHENG, AIA, PROFESSOR, SCHOOL OF ARCHITECTURE UNIVERSITY OF MINNESOTA

PUBLISHED MAY 2016, SPONSORED BY GSA REGION 5 AND 4240 ARCHITECTURE

CONTEXT KEY INGREDIENTS OUTCOMES

Context							Key Ingredients																	Outcomes												
							Commercial				Leadership								Logistical & Process Tactics					Team Outcomes						Building Outcomes						
Project Size	Complexity and Risk	Logistical Complexity	Level of scope development at ARMA award	Frequency of scope refinement after ARMA award	Experience Level (Years in Career)	Experience Level (Familiarity)	Presence of shared savings (1-m, 2-yr)	Impact of savings and funding process	Impact of GSA funding decisions	Impact of ARMA visionary goals	GSA PM Leadership Capability	GSA Leadership Impact on goal achievement	GSA Regional Leadership Involvement	Accountability	Effective and healthy relationships	Continuity	Core team supported planning for complexity	Early process planning	Processes supported joint planning and decisions	Timely involvement of partners & stakeholders	Meeting Quality	Extend and Breadth of BIM Usage	Degree of Co-location	Trust and Respect	Aligned Goals	Effective Communication	Decisions Quality	Collaboration	Team Capability	BIM Impact	Design includes Innovative technology	Contribution to advancing sustainable technology	Impact of scope refinement	Cumulative ARMA Outlay Performance	Monthly ARMA Outlay Deadline Performance	Overall Project Success
1.00	3.88	2.2	1.38	2.88	4.00	1.67	3.00	3.45	3.82	3.91	4.30	3.83	3.48	2	4.11	1.00	4.14	3.00	2.86	2.63	4.19	3.50	2.00	3.88	3.31	3.86	4.08	4.15	4.00	3.86	4.00	3.00	3.38	3.00	3.60	4.34
5.00	4.19	3.00	1.15	3.63	4.00	2.37	3.00	3.02	3.87	4.18	4.30	3.84	3.16	1.95	3.93	3.80	4.06	2.88	2.82	2.72	3.96	3.96	5.00	3.8	3.49	2.69	3.84	4.58	4.31	3.88	5.00	1.94	3.94	5.00	4.20	4.24
2.00	3.90	2.60	3.60	3.10	2.00	1.94	1.00	-	3.69	3.68	4.34	3.85	2.50	1.94	4.29	4.00	4.29	2.86	2.86	2.49	4.13	3.2	3.00	2.71	3.70	3.00	4.05	3.92	4.43	2.42	-	3.00	3.17	2.00	3.10	4.71
1.00	3.76	2.60	2.50	2.89	4.00	2.55	3.86	3.42	3.33	3.58	4.14	3.70	2.89	1.89	4.17	1.00	4.13	2.89	2.89	2.66	4.24	2.57	2.00	2.78	3.67	2.67	4.11	4.17	4.26	2.40	2.00	2.00	3.89	1.00	2.80	4.27
5.00	3.87	3.00	1.57	2.67	4.00	3.24	1.17	4.40	3.50	3.47	4.01	3.79	3.26	1.89	3.86	3.50	4.22	2.67	3.00	3.70	3.61	2.10	4.00	2.78	3.56	2.67	3.99	3.98	4.00	1.87	4.00	3.00	3.44	2.00	2.70	4.34
1.00	3.54	1.00	1.40	3.21	3.00	3.31	1.00	-	3.32	3.58	3.81	3.71	3.11	1.87	3.86	2.90	3.90	2.65	2.78	2.61	3.74	3.25	3.00	2.64	3.30	2.71	3.46	3.64	3.96	2.88	1.00	1.75	2.95	3.00	3.10	3.96
3.00	3.92	-	3.80	2.75	5.00	3.77	1.00	-	3.47	3.94	3.76	3.60	2.67	6.00	3.95	-	3.75	2.50	2.40	2.26	3.60	-	4.00	2.46	3.00	2.50	3.29	3.85	4.20	-	2.00	3.00	3.50	3.00	2.80	4.01
1.00	4.45	-	1.00	3.88	1.00	2.02	3.67	3.00	3.01	3.53	3.96	3.76	3.16	1.88	3.50	-	3.33	2.43	2.29	2.29	3.79	3.00	3.00	2.55	3.07	2.00	3.66	3.81	3.14	1.92	1.00	1.71	2.00	4.00	3.50	3.42
2.00	4.13	-	2.11	3.45	3.00	2.23	3.89	3.31	2.93	3.32	3.34	3.24	3.32	6.00	3.47	-	3.18	2.73	2.33	2.33	3.25	2.81	4.00	2.35	3.10	2.36	2.86	3.23	3.33	3.22	1.00	1.82	2.33	3.00	2.40	3.88
6.00	4.38	3.80	3.48	3.59	3.00	2.77	1.08	3.00	2.94	3.31	3.36	3.51	3.15	1.87	3.40	4.20	3.27	2.30	2.27	2.28	3.48	2.75	5.00	2.24	2.89	2.30	2.98	3.16	3.10	2.46	1.0	1.93	2.40	2.00	2.90	3.61
2.00	4.16	4.00	3.31	3.78	2.00	1.82	1.50	2.81	2.23	2.76	2.38	2.58	3.04	1.80	2.67	5.80	2.38	1.69	1.67	1.72	2.92	-	2.00	1.76	2.20	1.67	2.33	2.40	1.79	-	1.00	1.43	1.39	1.00	2.80	2.39

CAUSAL FACTORS



PROJECT SUCCESS

TRUST & RESPECT

ALIGNED GOALS

ACCOUNTABILITY

Context							Key Ingredients																	Outcomes												
							Commercial			Leadership														Logistical & Process Tactics									Team Outcomes		Process Outcomes	
Project Size	Complexity and Risk	Logistical Complexity	Level of scope development at ARMA award	Frequency of scope refinement after ARMA award	Experience Level (Years in Career)	Experience Level (Familiarity)	Presence of shared savings (1-m, 2-yr)	Impact of savings and funding process	Impact of GSA funding decisions	Impact of ARMA visionary goals	GSA PM Leadership Capability	GSA Leadership Impact on goal achievement	GSA Regional Leadership Involvement	Accountability	Continuity	Core team supported planning for complexity	Early process planning	Processes supported joint planning and decisions	Timely involvement of partners & stakeholders	Meeting Quality	Extend and Broaden BIM Usage	Degree of Co-location	Trust and Respect	Aligned Goals	Effective Collaboration	Decisions Quality	Collaboration	Team Capability	BIM Impact	Design includes Innovative Technology	Contribution to advancing sustainable technology	Impact of scope refinement	Cumulative ARMA Outlay Performance	Monthly ARMA Outlay Deadline Performance	Overall Project Success	
1.00	3.88	2.2	1.38	2.88	4.00	1.67	3.00	3.45	3.82	3.91	4.30	1.83	3.4	3.2	3.7	1.00	4.14	3.00	2.86	2.63	4.19	3.50	2.0	3.88	3.71	3.6	4.08	4.75	4.00	3.86	4.00	3.00	3.38	3.00	3.6	4.34
5.00	4.19	3.00	1.15	3.63	4.00	2.37	3.00	3.02	3.87	4.18	4.30	3.84	3.16	1.95	3.13	2.80	4.06	2.88	2.82	2.72	3.96	3.96	5.0	3.8	3.49	69	3.84	4.58	4.31	3.88	5.00	1.94	3.94	5.00	4.2	4.24
2.00	3.90	2.60	3.60	3.10	2.00	1.94	1.00	-	3.69	3.68	4.34	1.85	2.50	1.94	2.79	4.00	4.29	2.86	2.86	2.49	4.13	3.2	3.0	2.71	1.70	80	4.05	3.92	4.43	2.42	-	2.00	3.17	2.00	3.1	4.71
1.00	3.76	2.60	2.50	2.89	4.00	2.55	1.86	3.42	3.33	3.58	4.14	3.70	2.8	1.89	2.7	1.00	4.13	2.89	2.89	2.66	4.24	2.57	2.0	2.78	3.67	67	4.11	4.17	4.28	2.40	2.00	2.00	3.89	1.00	2.8	4.27
5.00	3.87	3.00	1.57	2.67	4.00	3.24	1.17	4.40	3.50	3.47	4.01	3.79	3.21	1.89	3.16	3.50	4.22	2.67	3.00	2.70	3.61	2.10	4.5	2.78	3.56	67	3.99	3.98	4.00	1.87	4.00	3.00	3.44	2.00	2.7	4.34
1.00	3.54	1.00	1.40	3.21	3.00	3.31	1.00	-	3.32	3.58	3.81	3.71	3.11	1.87	3.16	2.90	3.90	2.65	2.78	2.61	3.74	3.25	3.0	2.64	3.30	71	3.46	3.64	3.96	2.88	1.00	1.75	2.95	3.00	3.1	3.96
3.00	3.92	-	3.80	2.75	5.00	3.77	1.00	-	3.47	3.94	3.76	3.60	2.6	3.00	3.15	-	3.75	2.50	2.40	2.26	3.60	-	4.5	2.46	3.00	50	3.29	3.85	4.20	-	2.00	3.00	3.50	3.00	2.8	4.01
1.00	4.45	-	1.00	3.88	1.00	2.02	1.67	3.00	3.01	3.53	3.96	3.76	3.1	1.88	3.10	-	3.33	2.43	2.29	2.29	3.79	3.00	3.0	2.55	3.07	60	3.66	3.81	3.14	1.92	1.00	1.71	2.00	4.00	3.5	3.42
2.00	4.13	-	2.11	3.45	3.00	2.23	1.89	3.31	2.93	3.32	3.34	3.24	3.3	3.00	3.17	-	3.18	2.73	2.33	2.33	3.25	2.81	4.5	2.35	3.10	36	2.86	3.23	3.33	3.22	1.00	1.82	2.33	3.00	2.4	3.88
4.00	4.38	3.80	3.48	3.59	3.00	2.77	1.08	3.00	2.94	3.31	3.36	3.51	3.15	1.87	3.10	4.20	3.27	2.30	2.27	2.28	3.48	2.75	5.0	2.24	2.89	30	2.98	3.16	3.10	2.46	1.0	1.93	2.40	2.00	2.9	3.61
2.00	4.16	4.00	3.31	3.78	2.00	1.82	1.50	2.81	2.23	2.76	2.38	2.58	3.0	1.80	2.27	5.80	2.38	1.69	1.67	1.72	2.92	-	2.0	1.76	2.20	57	2.33	2.40	1.79	-	1.00	1.43	1.39	1.00	2.8	2.39

Cheng et al., Teams M

NON-FACTORS

USE OF BIM

CO-LOCATION

SHARED SAVINGS

Context							Key Ingredients															Logistical & Process Tactics			Outcomes											
							Commercial		Leadership																Team Outcomes					Building Outcomes						
Project Size	Complexity and Risk	Logistical Complexity	Level of scope development at ARMA award	Frequency of scope refinement after ARMA award	Experience Level (Years in Career)	Existence Level (if available)	Presence of shared savings (1=not, 2=y)	Impact of shared savings on business case	Impact of GSA funding decisions	Impact of ARMA visionary goals	GSA PM Leadership Capability	GSA Leadership Impact on goal achievement	GSA Regional Leadership Involvement	Accountability	Effective and healthy relationships	Continuity	Core team supported planning for complexity	Early process planning	Processes supported joint planning and decisions	Timely involvement of partners & stakeholders	Meeting Quality	Extend and breadth of BIM usage	Degree of Co-location	Aligned Goals	Effective Communication	Decisions Quality	Collaboration	Team Capability	BIM Impact	Design includes Innovative Technology	Contribution to advancing sustainable technology	Impact of scope refinement	Cumulative ARMA Outlay Performance	Monthly ARMA Outlay Deadline Performance	Overall Project Success	
1.00	3.88	2.2	1.38	2.88	4.00	1.0	3.00	3.00	3.82	3.91	4.30	3.83	3.48	3.00	4.11	3.00	4.14	3.00	2.86	2.63	79	3.50	2.00	3.80	3.31	3.86	4.08	4.35	4.00	3.86	4.00	3.00	3.38	3.00	3.60	4.34
5.00	4.19	3.00	1.15	3.63	4.00	2.0	3.00	3.00	3.87	4.18	4.30	3.84	3.16	3.95	3.93	3.80	4.06	2.88	2.82	2.72	96	3.96	5.00	3.80	3.49	2.69	3.84	4.58	4.31	3.88	5.00	1.94	3.94	5.00	4.20	4.24
2.00	3.90	2.60	3.60	3.10	2.00	1.0	1.00	-	3.69	3.68	4.34	3.85	2.50	3.94	4.29	4.00	4.29	2.86	2.86	2.49	73	3.2	3.00	2.00	3.70	3.00	4.05	3.92	4.43	2.42	-	3.00	3.17	2.00	3.10	4.71
1.00	3.76	2.60	2.50	2.89	4.00	2.0	3.86	3.00	3.33	3.58	4.14	3.70	2.89	3.89	4.17	3.00	4.13	2.89	2.89	2.66	24	2.57	2.00	2.80	3.67	2.67	4.11	4.17	4.26	2.40	2.00	2.00	3.89	1.00	2.80	4.27
5.00	3.87	3.00	1.57	2.67	4.00	2.0	1.17	4.00	3.50	3.47	4.01	3.79	3.26	3.86	3.50	4.22	2.67	3.00	3.70	61	2.10	4.00	2.80	3.36	2.67	3.99	3.98	4.00	1.87	4.00	3.00	3.44	2.00	2.70	4.34	
1.00	3.54	1.00	1.40	3.21	3.00	2.0	1.00	-	3.32	3.58	3.81	3.71	3.11	3.87	3.86	3.90	3.90	2.65	2.78	2.61	74	3.25	3.00	2.40	3.30	2.71	3.46	3.64	3.96	2.88	1.00	1.75	2.95	3.00	3.10	3.96
3.00	3.92	-	3.80	2.75	5.00	2.0	1.00	-	3.47	3.94	3.76	3.60	2.67	4.00	3.95	-	3.75	2.50	2.40	2.16	60	-	4.00	2.60	3.00	2.50	3.29	3.85	4.20	-	2.00	3.00	3.50	3.00	2.80	4.01
1.00	4.45	-	1.00	3.88	1.00	2.0	1.67	3.00	3.01	3.53	3.96	3.76	3.16	3.88	3.50	-	3.33	2.43	2.29	2.29	79	3.00	3.00	2.50	3.07	2.00	3.66	3.81	3.14	1.92	1.00	1.71	2.00	4.00	3.50	3.42
2.00	4.13	-	2.11	3.45	3.00	2.0	1.89	3.00	2.93	3.32	3.34	3.24	3.32	4.00	3.47	-	3.18	2.73	2.33	2.33	25	2.81	4.00	2.50	3.10	2.36	2.86	3.23	3.33	3.22	1.00	1.82	2.33	3.00	2.40	3.88
4.00	4.38	3.80	3.48	3.59	3.00	2.0	1.08	3.00	2.94	3.31	3.36	3.51	3.15	3.87	3.40	4.20	3.27	2.30	2.27	2.28	48	2.75	5.00	2.40	2.89	2.30	2.98	3.16	3.10	2.46	1.0	1.93	2.40	2.00	2.90	3.61
2.00	4.16	4.00	3.31	3.78	2.00	1.0	1.50	2.00	2.23	2.76	2.38	2.58	3.04	1.80	2.67	5.80	2.38	1.69	1.67	1.72	92	-	2.00	1.50	2.20	1.67	2.33	2.40	1.79	-	1.00	1.43	1.39	1.00	2.80	2.39

Cheng et al., Teams M...

MOTIVATION AND MEANS: How and Why IPD and Lean Lead to Success

Research Report
November, 2016

University of Minnesota in collaboration with University of Washington, University of British Columbia, Scan Consulting
Sponsored by Integrated Project Delivery Alliance (IPDA) & Lean Construction Institute (LCI)



Our conclusion is that **IPD** sets the terms and provides the **motivation** for collaboration; **Lean** provides the **means** for teams to optimize their performance and achieve project goals.



- Industry adoption of Lean tools and processes is uneven and weighted towards construction over design.

- Teams with more Lean were:
 - more likely to have slightly more positive team and building outcomes.
 - rate their projects as less complex.

This may be perception, since Lean tools and processes can make tasks clear and straightforward.

	Lean Tools and Processes					
	Lean Team Formation		Goals	Workplace and Meeting	Cost and Decision	Project Management
	Team Formation	Team Development				
Akron	●	●	●	●	●	●
Autodesk	○	○	○	●	●	○
Mosaic	●	●	●	●	●	●
Quail Run	●	●	●	●	●	●
Rocky Mountain	●	●	●	●	●	●
St. Anthony	●	●	●	●	●	●
Sutter Los Gatos	●	●	●	●	●	●
Sutter Sunnyvale	●	○	●	●	●	●
T. Rowe Price	●	●	●	●	●	●
Wekiva Springs	●	●	●	●	●	●

● Done well, used often, helpful to the team
 ● Done, but only somewhat helpful or mixed comments about its effectiveness
 ○ Did it, but it was not seen as particularly effective by most of the team
 ■ Did not have it

New Hypothesis:

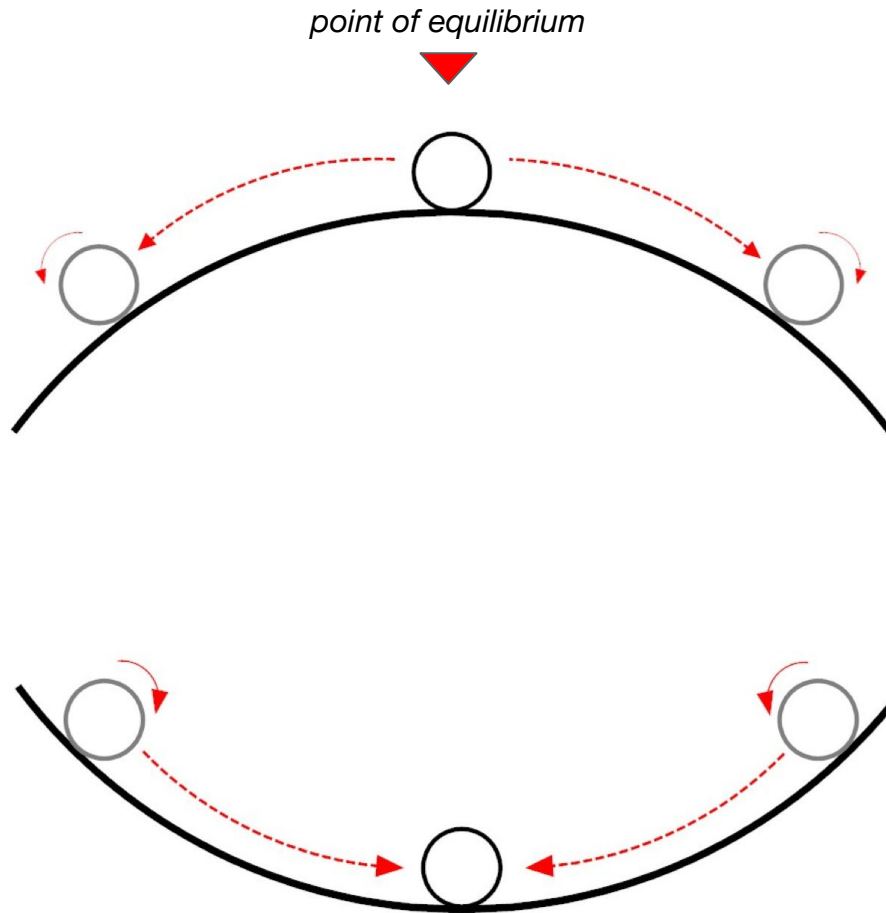
Lean tools and processes **BUILD** and **RELY UPON**

- Trust
- Communication
- Accountability
- Psychological Safety

Lean and IPD teams discuss intention and differences in agendas, priorities and practices – assume not every firm or individual is the same, but goals are shared.

Use tools to intentionally build equitable culture on your team:

- Team performance metrics such as plan percent complete
- Communication protocols such as A3
- Decision protocols such as CBA
- Attitude of continuous improvement and project first priorities
- Benefits from challenging concepts such as last responsible moment



Conceptual Model

→ forces acting upon project & team

- - - contract "gravitational assist"

○ project

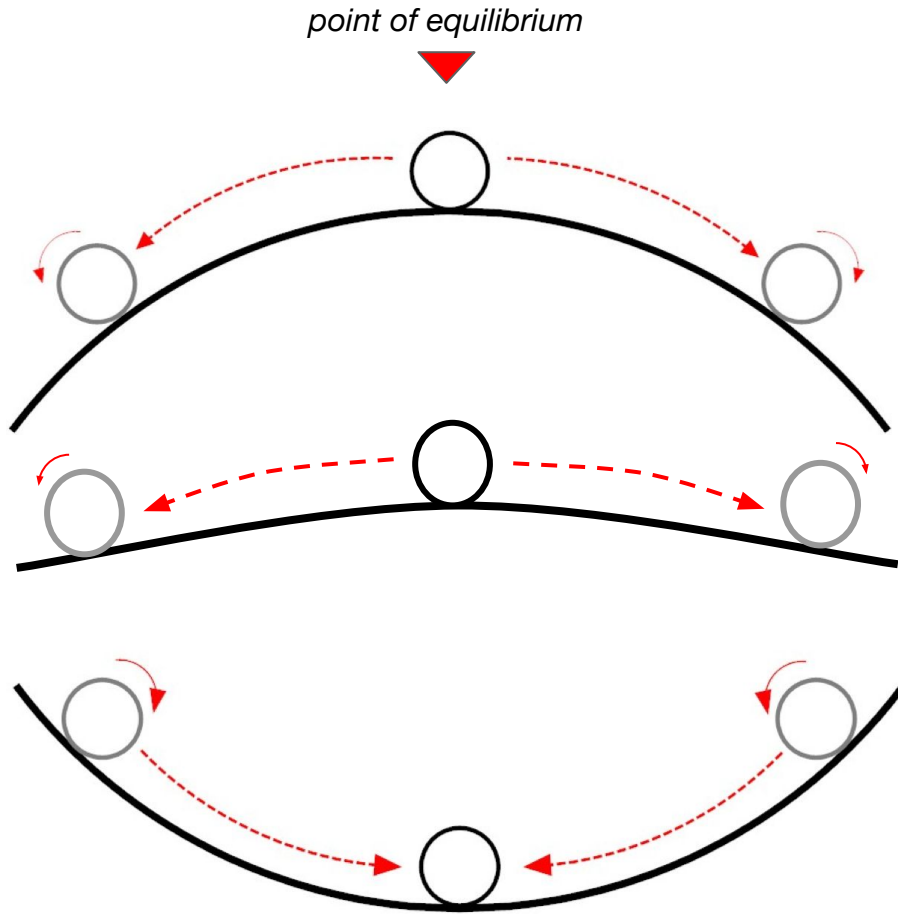
Design Bid Build,
CM@Risk, Design Build

Integrated Project Delivery (IPD)

Self-Centering System



Conceptual Model (adapted)



Design Bid Build

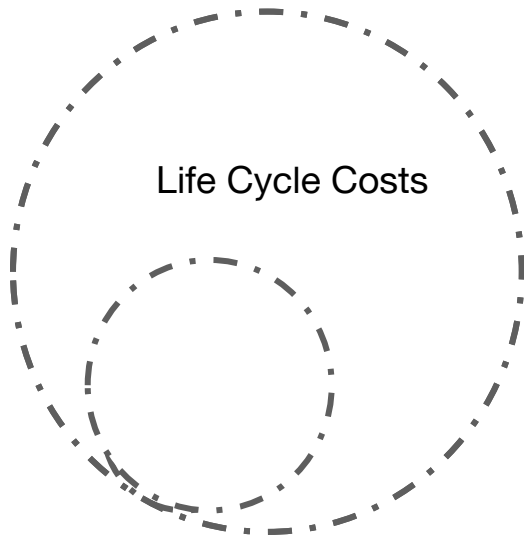
CM@Risk, Design Build,
(maybe) IPD-ish (if nothing goes wrong)

Integrated Project Delivery (IPD)

Renée Cheng adapted from
Howard Ashcraft, 2019

Proportional way to consider the value proposition in the built environment







Value to society, region, neighborhood

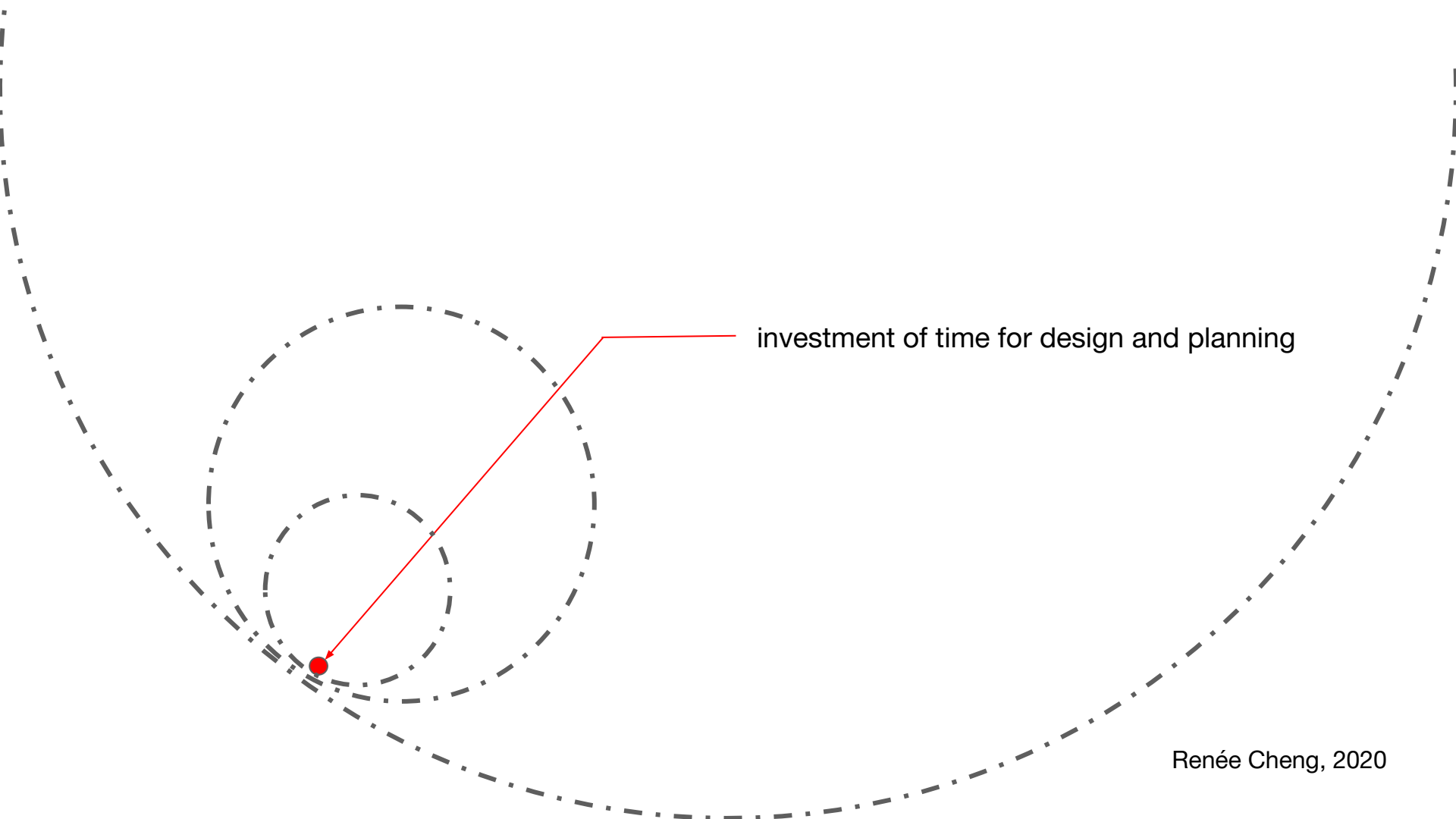
Equity, health, engagement

Value to building owner

Cost of personnel development, recruitment, retention

Savings to healthcare expenditures

Building builds positive brand



investment of time for design and planning



Tree cover may improve academic performance. This study of 624 Illinois public high schools showed that tree cover density within a 1-mile radius of schools was positively associated with better ACT scores and...

Li, Dongying, Yen-Cheng Chiang, Huiyan Sang, and William C. Sullivan. "Beyond the School Grounds: Links between Density of Tree Cover in School Surroundings and High School Academic Performance." *Urban Forestry & Urban Greening* 38 (2019): 42-53. <https://doi.org/10.1016/j.ufug.2018.11.001>

TOPICS

EDUCATIONAL VALUE, TREES, LEARNING LANDSCAPES

SHARE THIS



Researchers studying a Toronto pilot project found that installing a bike lane and removing 136 on-street parking spaces improved the business environment for establishments along the corridor. The number of...

Arancibia, Daniel, Steven Farber, Beth Savan, Yvonne Verlinden, Nancy Smith Lea, Jeff Allen, and Lee Vernich. "Measuring the Local Economic Impacts of Replacing On-Street Parking With Bike Lanes." *Journal of the American Planning Association* 85, no. 4 (2019): 463-81. <https://doi.org/10.1080/01944363.2019.1638816>

<https://www.landscapeperformance.org>

A scoping review of the impact on children of the built environment design characteristics of healing spaces

2020

HERD: Health Environments Research & Design Journal
Journal Article

Pages in press

Author(s): Gaminiesfahani, H., Lozanovska, M., Tucker, R.

[SOURCE LINK](#)

[SAVE](#)

Effects of birthing room design on maternal and neonate outcomes: A systematic review

2020

HERD: Health Environments Research & Design Journal
Journal Article

Pages in press

Author(s): Nilsson, C., Wijk, H., Höglund, L., Sjöblom, H., Hessman, E., Berg, M.

[SOURCE LINK](#)

[SAVE](#)

<https://www.healthdesign.org/research-services/pebble-project>

Green office environments linked with higher cognitive function scores



For immediate release: October 26, 2015

Boston, MA – People who work in well-ventilated offices with below-average levels of indoor pollutants and carbon dioxide (CO₂) have significantly higher cognitive functioning scores—in crucial areas such as responding to a crisis or developing strategy—than those who work in offices with typical levels, according to a new study from the Harvard T.H. Chan School of Public Health’s [Center for Health and the Global Environment](#), [SUNY Upstate Medical University](#), and [Syracuse University](#).

The researchers looked at people’s experiences in “green” vs. “non-green” buildings in a double-blind study, in which both the participants and the analysts were blinded to test conditions to avoid biased results.



Researchers controlled indoor environmental quality from a space underneath the testing environment to simulate conventional and green building conditions.

<https://www.hsph.harvard.edu/news/press-releases/green-office-environments-linked-with-higher-cognitive-function-scores/>

KieranTimberlake

See all ›
5 Citations

See all ›
52 References

See all ›
4 Figures



Green Roofs Over Time: A Spatially Explicit Method for Studying Green Roof Vegetative Dynamics and Performance

Article (PDF Available) · August 2014 · with 391 Reads ⓘ

 [Cite this publication](#)



Max R. Piana

18.02 · University of Massachusetts Amherst/U.S. Forest S...



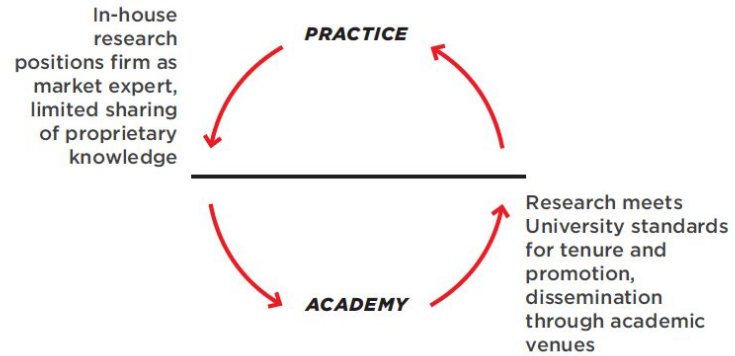
Stephanie Carlisle

17.81 · University of Pennsylvania

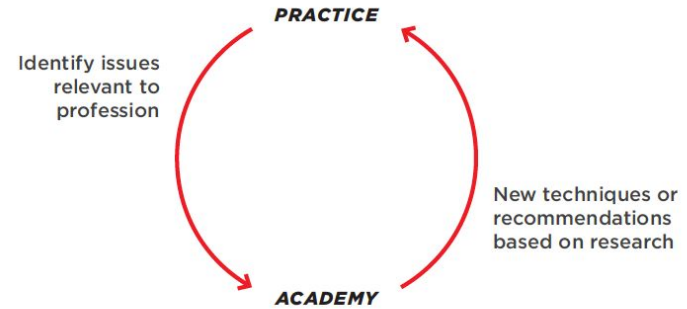


KNOWLEDGE LOOP

BROKEN KNOWLEDGE LOOP



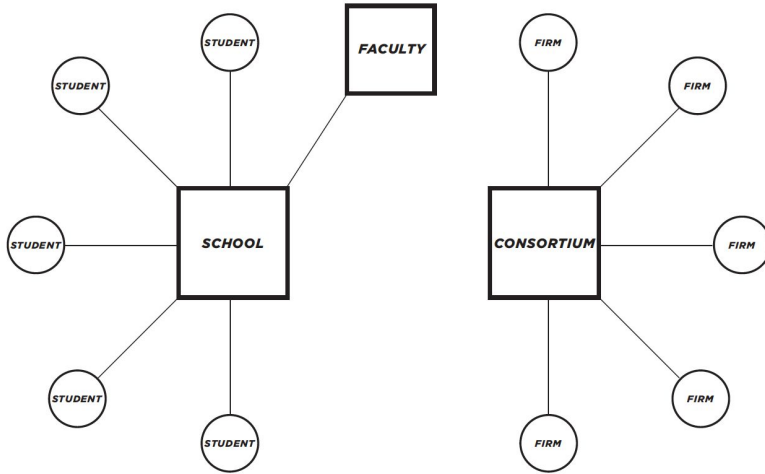
COMPLETED KNOWLEDGE LOOP



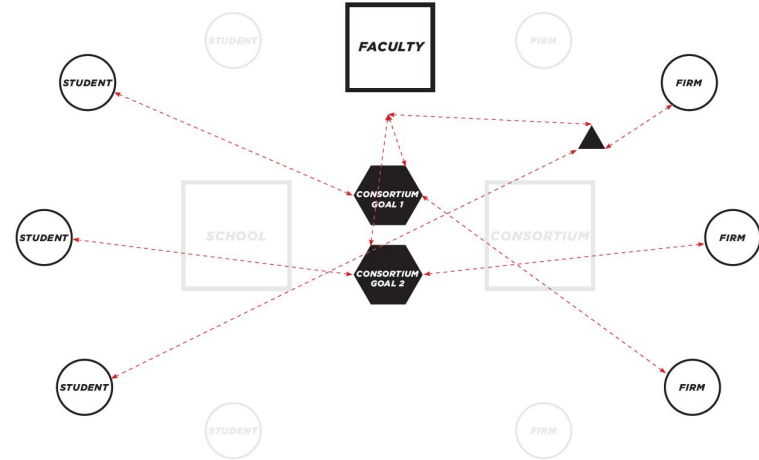
Model of Applied Research Consortium under development at UW CBE

multi-disciplinary expansion of architecture research program originally developed by Renee Cheng at University of Minnesota

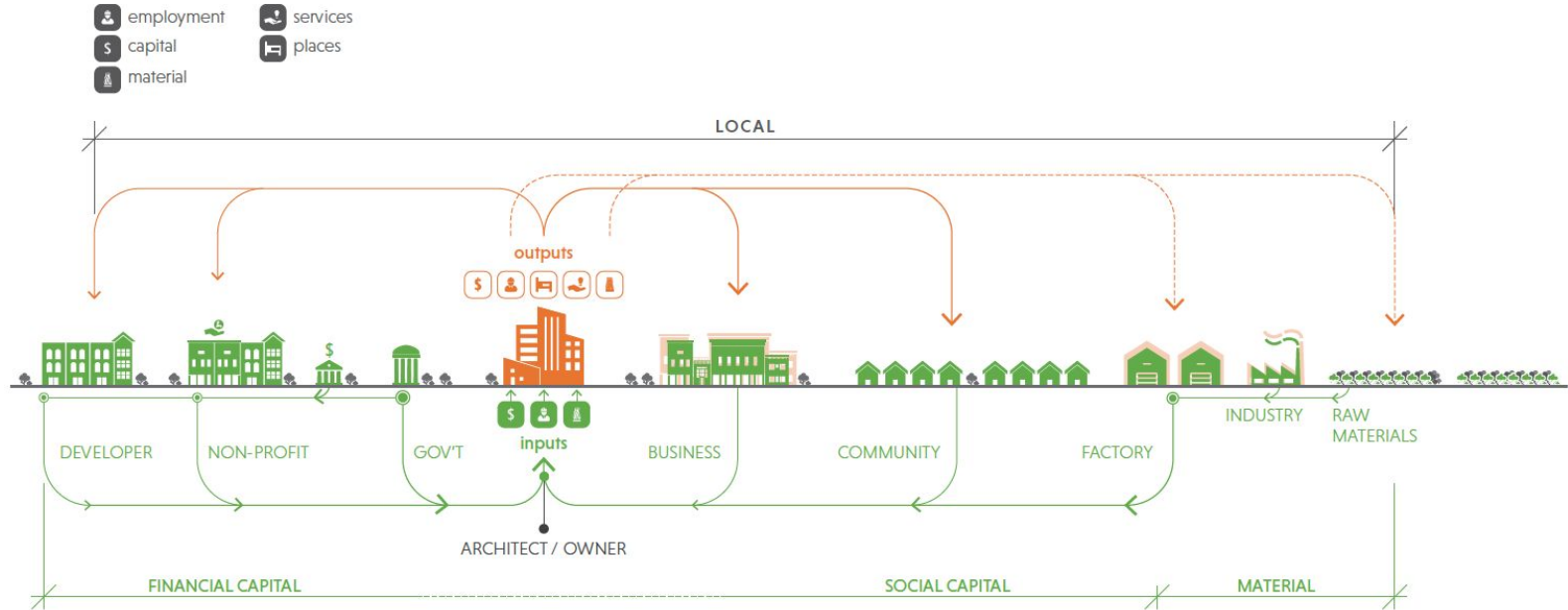
INDIVIDUALS AND ORGANIZATIONS



RESEARCH GOALS



LOCAL ECONOMY MODEL



Guides for Equitable Practice

Guides for understanding and building equity
in the architecture profession

FIRST EDITION
PART I - RELEASED NOVEMBER, 2018
PART II - RELEASED JUNE, 2019




AIA

W








The University of Washington for the American
Institute of Architects Equity and the Future of
Architecture Committee



[Architects](#)
[Career](#)
[Advocacy](#)
[Events](#)
[Topics](#)
[Practice](#)
[About AIA](#)
[Contracts](#)

[Join AIA](#)
[Login](#)

Guides for Equitable Practice









Increasingly, architects will be called to lead efforts in finding solutions to many of our society's most pressing issues. To meet these challenges, as well as the unknown ones ahead, we must have the talent, passion, and creativity of a diverse cohort of students, professionals, and leaders.

The *Guides for Equitable Practice*, done in partnership with the University of Washington and the University of Minnesota, and the American Institute of Architects' Equity and the Future of Architecture Committee (EQFA), are a vital part of AIA's long-term commitment to lead efforts that ensure the profession of architecture is as diverse as the nation we serve.

These guides will help you make the business and professional case for ensuring that your organization meets the career development, professional environment, and cultural awareness expectations of current and future employees and clients.

Each chapter includes real-world-derived best practices, relevant research, and other tools to help you address a variety of employment and personnel issues about equity, diversity, and inclusion. Each guide begins with a baseline explanation of its topic, conveying the knowledge and language required to have meaningful conversations with individuals at any level of your firm. The user-friendly layout and short, consumable sections are designed so you can find the content you need easily and quickly.

Equity, Diversity, and Inclusion

We are actively engaged in furthering and supporting multiple initiatives and goals that value EDI for people of all backgrounds.

[Learn more >](#)

Questions regarding the Guides for Equitable Practice?

[Contact us >](#)



Introduction

The guides make the moral, business, ethical, and societal cases for equitable practice in architecture.



Intercultural Competence

As architecture becomes more diverse, bias and intercultural competence—the ability to function effectively across cultures—have



FIRM MANAGEMENT

Workplace Culture

Workplaces are becoming more complex—with new environments, increases in diversity, and shifting



Compensation

Architecture's compensation issues arise from inequitable opportunities, valuation of work, and pay practices.



Recruitment and Retention

Attracting and retaining talent is vital for every firm and the profession as a whole.



Negotiation

This guide outlines skills architects can develop to act inclusively and equitably during negotiations.



Mentorship and Sponsorship

Mentorship and sponsorship can prove crucial to individuals' careers, and they can help make workplaces



Advancing Careers

This guide details the importance of approaching career advancement as a shared responsibility between employee and employer.



Engaging Community

Because the majority of architects' work affects communities, respectfully engaging with them and adopting solutions created in



Measuring Progress

True support of equity, diversity, and inclusion (EDI)

<http://aia.org/equityguides>



Office: Gould Hall
[Research Website](#)
[Curriculum Vitae](#) [pdf]

Renée Cheng

Dean

Renée Cheng joined the College of Built Environments as dean on January 1, 2019. Dean Cheng comes from the University of Minnesota where she was a professor, associate dean of research, head of the school of architecture, and directed an innovative graduate program linking research with practice and licensure. Prior to UMN, she taught at the University of Michigan and the University of Arizona. She is a graduate of Harvard's Graduate School of Design and Harvard College.

A licensed architect, her professional experience includes work for Pei, Cobb, Freed and Partners and Richard Meier and Partners before founding Cheng-Olson Design. Dean Cheng has been honored twice as one of the top 25 most admired design educators in the United States by DesignIntelligence. She has received numerous honors and awards including the 2017 Lean Construction Institute Faculty Award and was named to the American Institute of Architecture's College of Fellows in 2017.

Cheng is a leader in the American Institute of Architects (AIA) and advocates for equity in the field of architecture and in the practices related to the built environment. Recently, Cheng led the research effort for the AIA guides for equitable practice in the workplace. Cheng has pioneered research surrounding the intersection of design and emerging technologies, including work on industry adoption of Integrated Project Delivery, Building Information Modeling and Lean.

be.washington.edu/people/renee-cheng/

CONTACT THE DEAN

Brittany Faulkner

Assistant to the Dean

☎ 206-221-3451

✉ bfaulk@uw.edu

DEAN'S DIALOGUE SITE

ENGAGE IN THE DISCUSSION >

FROM THE DEAN'S DESK



Archinect Deans List: Renée Cheng on How Comprehensive Design Can Engender Inclusivity

AIA releases new chapters of "Guides for Equitable Practice"



Building equity: A talk with Renée Cheng, new dean of the UW College of Built Environments