Don’t Get Left Behind

Future Trends and Emerging Technologies in Construction Technology

Jeff Sample

eSUB Construction Software

Defending Skilled Trades for 25 Years

Wendy Rogers

President / CEO, eSUB Construction Software

- 25+ years construction experience
- Passionate champion of the skilled trades
- Founded eSUB, a field-first, cloud-based platform
- Transforming the reactive claim process to proactive front-end documentation best practices

eSUB construction software


Freedom Tower- New York, NY


LAX- Los Angeles, CA


Kyle Field Renovation- College Station, TX

Facebook Campus- Menlo Park, CA


Madison Square Garden- New York, NY

NECA

American Subcontractors Association

The Associated General Contractors of America

Why

*The construction industry has to "build **1,000 buildings** a day for the next 31 years, so that **by 2050** we can accommodate the world's population of **10 billion people**." In total, McKinsey estimates that over **$57 trillion** will need to be spent by 2030 to finance this construction boom.*

Autodesk CEO Andrew Anagnost

Constructing the Foundation

- The Reality of DISRUPTION
- LEADERSHIP
- DATA THE DIGITAL CURRENCY
- THE PEOPLE

“Disruption is a business model change where segments of an industry cannot adapt.”

Brett Young

IN THE LAST 15 YEARS, 52% OF THE FORTUNE 500 COMPANIES HAVE DISAPPEARED

1955

Average life expectancy 75 years

vs.

2015

Average life expectancy 15 years


KODAK


BLOCKBUSTER


TOWER RECORDS
NO MUSIC, NO LIFE.


TOYS R US

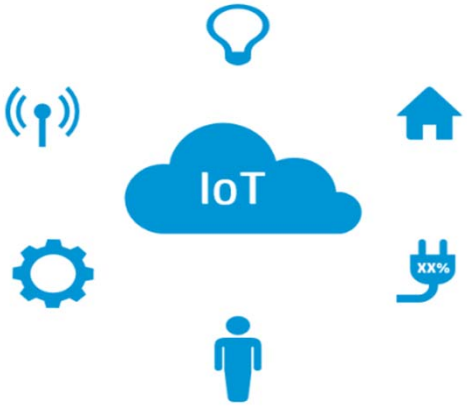

KATERRA


RAD
URBAN

Leadership

The digital currency of the future


BIM


IoT
XX%


VIRTUAL
DESIGN
AND
CONSTRUCTION
MANAGEMENT
ORDER
FACILITIES
CHANGE
RELEVANT
PROCESS
INTEGRATED
METHODS
THEORETICAL
PERFORMANCE
INTERACTIONS
ASPECT
USER
OPERATE
ORGANIZATION
QUANTITIES
OBJECTIVES
CONSTRUCT
LOGICALLY
PUBLIC


AR
VR
MR


API


big
data

BIM & VDC

CONCRETE FOUNDATION FOR THE TECHNOLOGY ECOSYSTEM

COMMUNICATION, COLLABORATION, & PLANNING

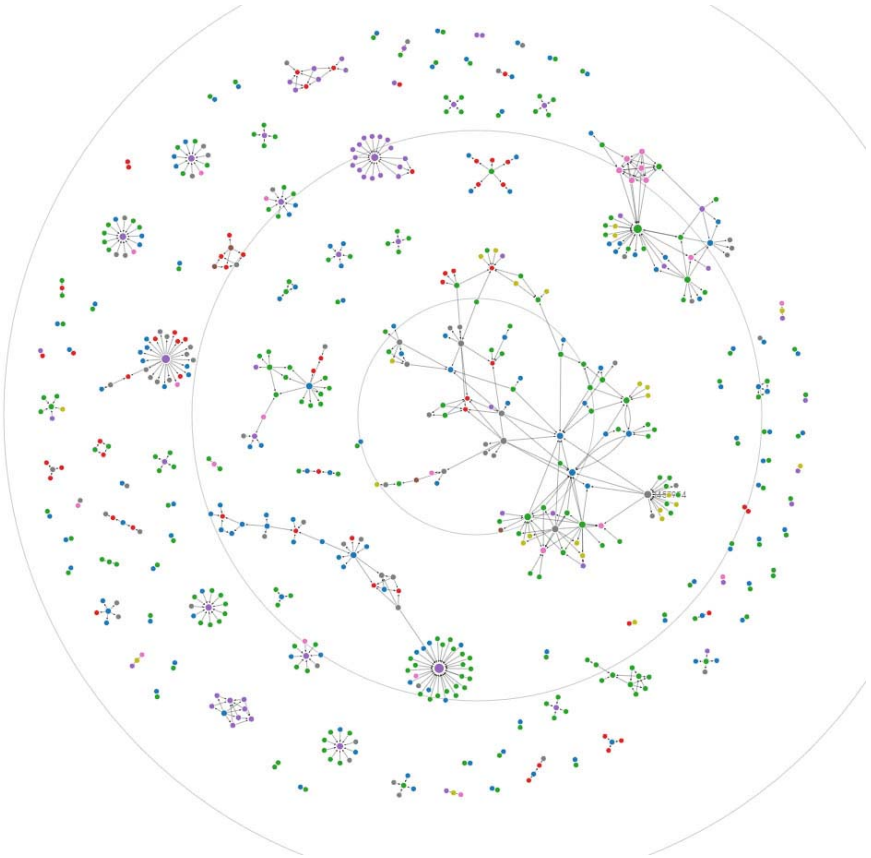
CONSTRUCT-ABLE BIM

PREFABRICATION AND MODULAR CONSTRUCTION

SAFETY

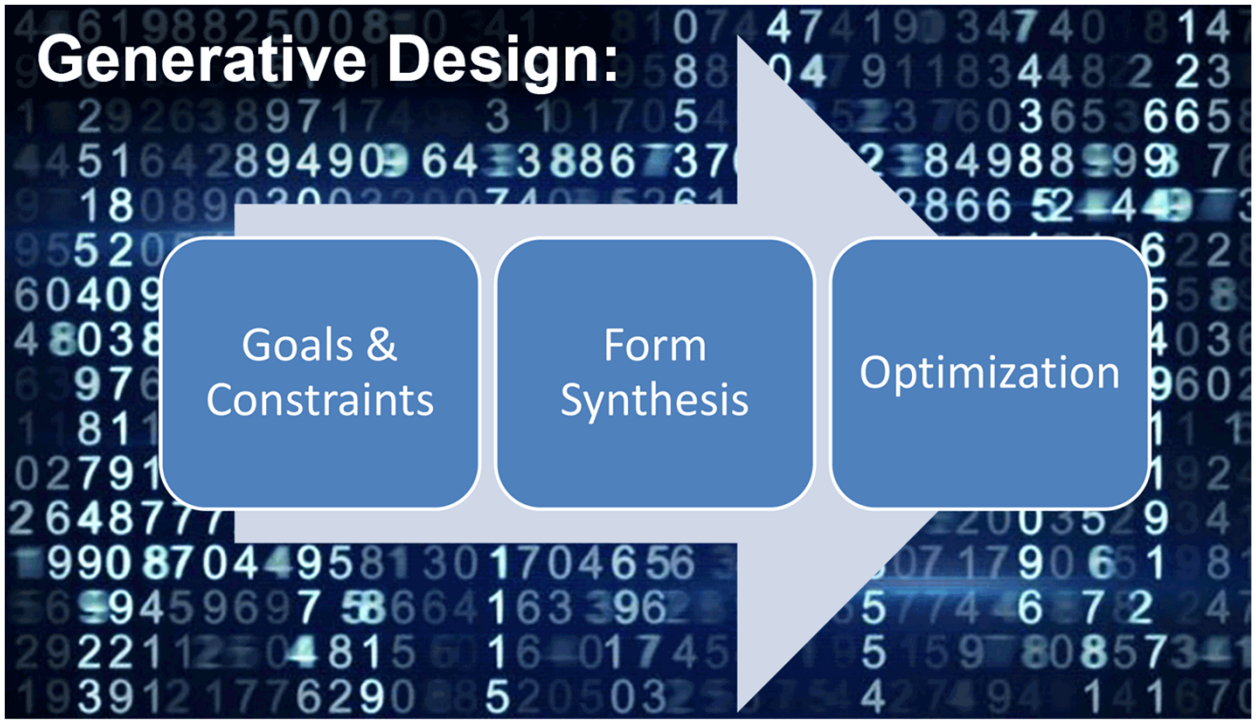
DESIGN CONSULTANT

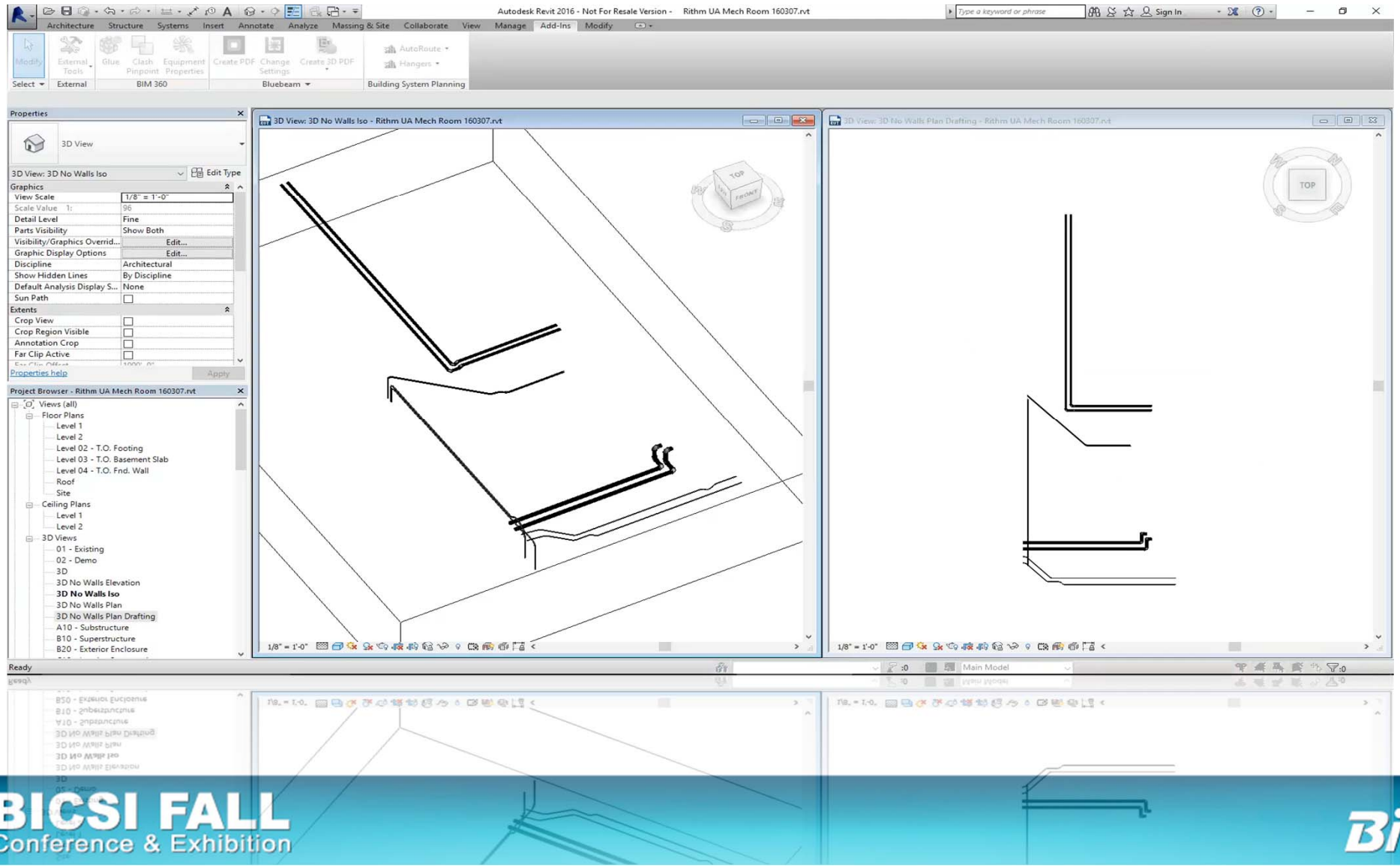
BIM



- Project virga – side by side images

Generative Design




Autodesk Revit 2016 - Not For Resale Version - Rithm UA Mech Room 160307.rvt
Architecture
Structure
Systems
Insert
Annotate
Analyze
Massing & Site
Collaborate
View
Manage
Add-Ins
Modify
Properties
3D View
3D View: 3D No Walls Iso
Edit Type
Graphics
View Scale
1/8" = 1'-0"
Scale Value 1:
96
Detail Level
Fine
Parts Visibility
Show Both
Visibility/Graphics Overrid...
Edit...
Graphic Display Options
Edit...
Discipline
Architectural
Show Hidden Lines
By Discipline
Default Analysis Display S...
None
Sun Path
Extents
Crop View
Crop Region Visible
Annotation Crop
Far Clip Active
Properties help
Apply
Project Browser - Rithm UA Mech Room 160307.rvt
Views (all)
Floor Plans
Level 1
Level 2
Level 02 - T.O. Footing
Level 03 - T.O. Basement Slab
Level 04 - T.O. Fnd. Wall
Roof
Site
Ceiling Plans
Level 1
Level 2
3D Views
01 - Existing
02 - Demo
3D
3D No Walls Elevation
3D No Walls Iso
3D No Walls Plan
3D No Walls Plan Drafting
A10 - Substructure
B10 - Superstructure
B20 - Exterior Enclosure
3D View: 3D No Walls Iso - Rithm UA Mech Room 160307.rvt
3D View: 3D No Walls Plan Drafting - Rithm UA Mech Room 160307.rvt
TOP
FRONT
1/8" = 1'-0"
Ready
Main Model

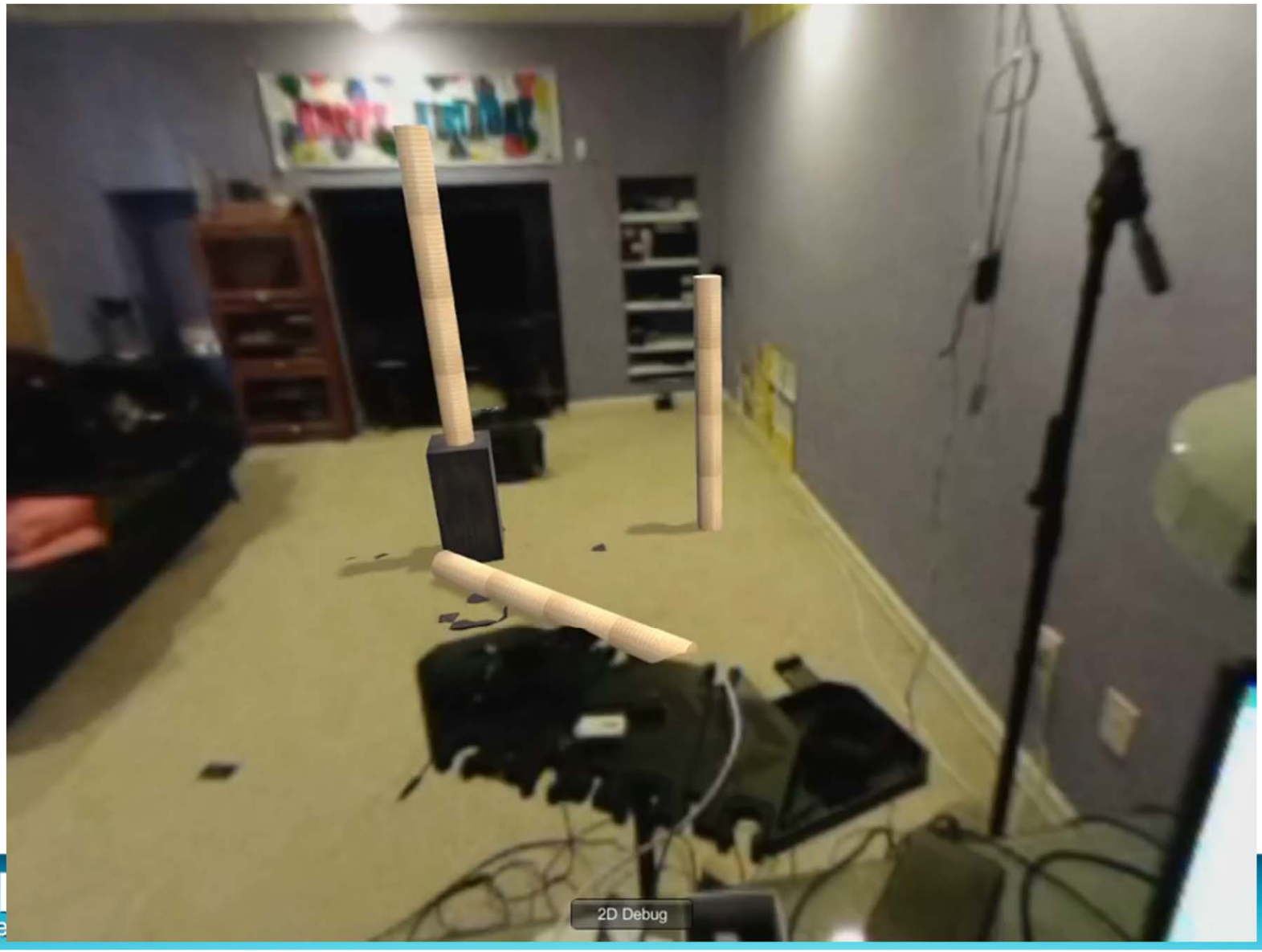
Virtual, Augmented, & Mixed Reality

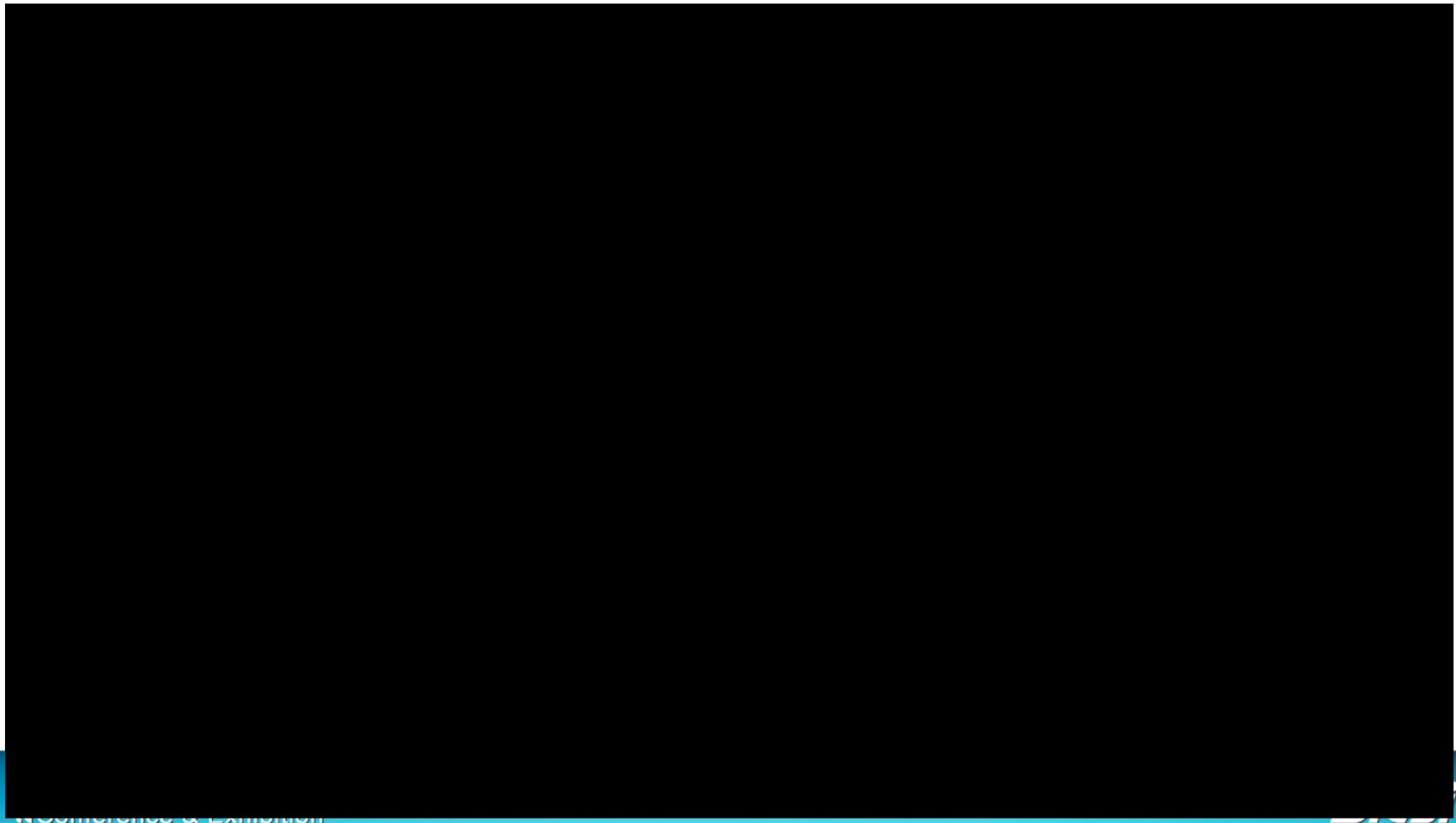
Virtual Reality Use Cases

- Design and Visualization of space
- 50% of people cannot visualize 2D plans in 3D without assistance
- More iteration in design translates to less rework in the field
- Less Man Hours = Safer Site
- HAPPY CUSTOMERS

- Training and Simulation
- Hours on the tools with less waste and risk to train
- Creates physical Muscle memory
- Simulate difficult or risky procedures
- Simulate Jobsite conditions and create collaboration with team members

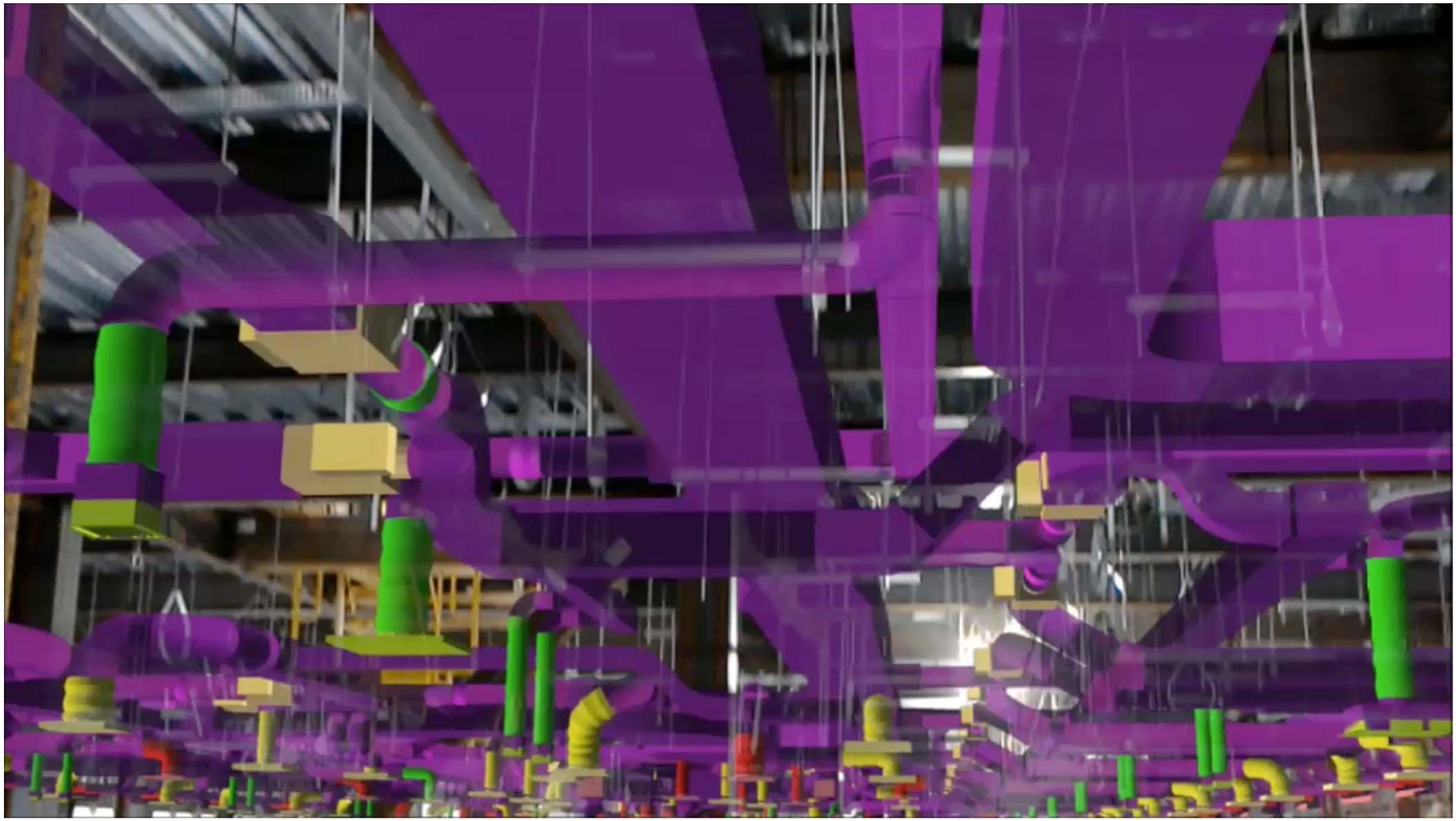

STEVEN HOLL
iris


2D Debug

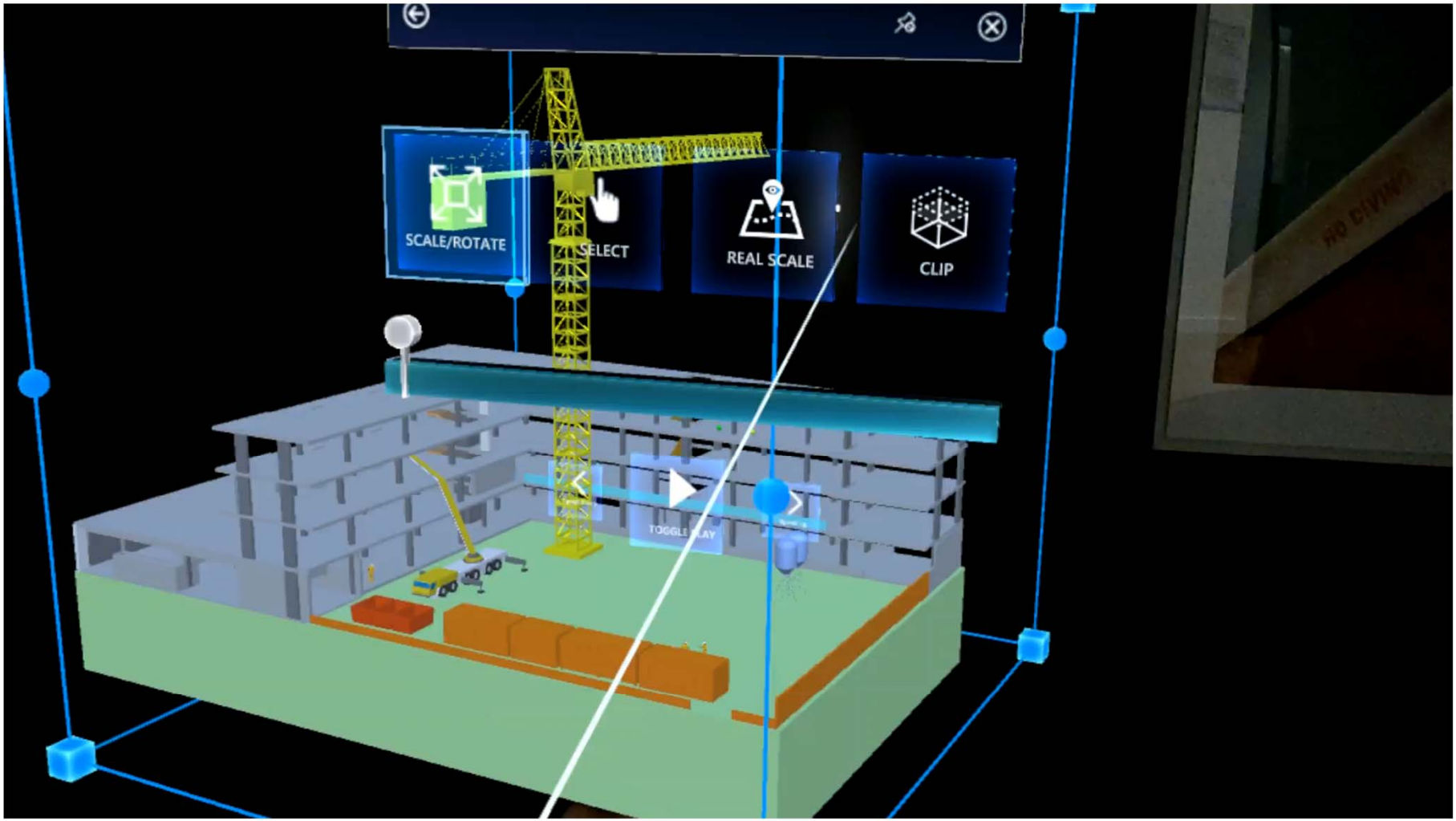


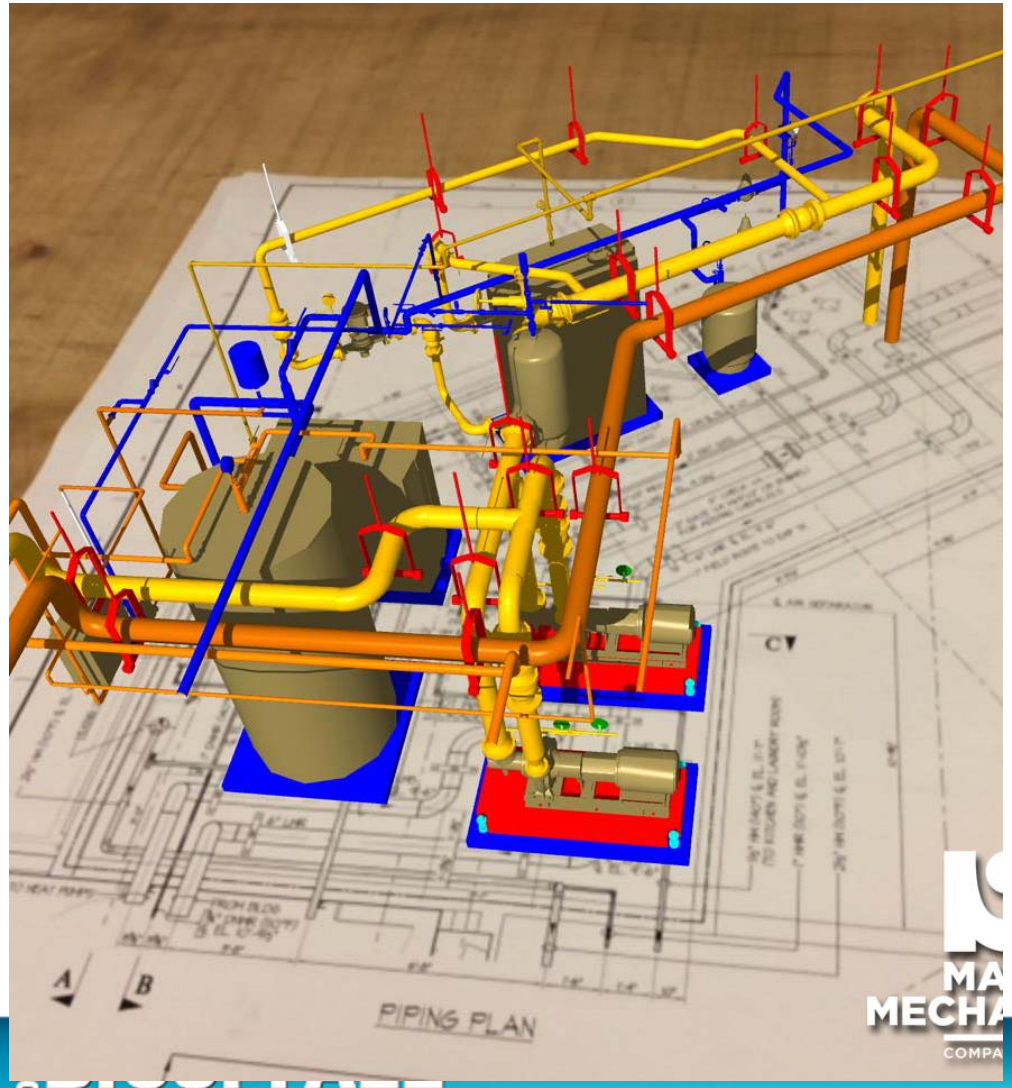
Augmented Reality Use Cases

- VERIFICATION
- DOCUMENTATION
- COLLABORATION
- VISUALIZATION




Greg Demchak
Technical Architect
Bentley Systems


SCALE/ROTATE
SELECT
REAL SCALE
CLIP

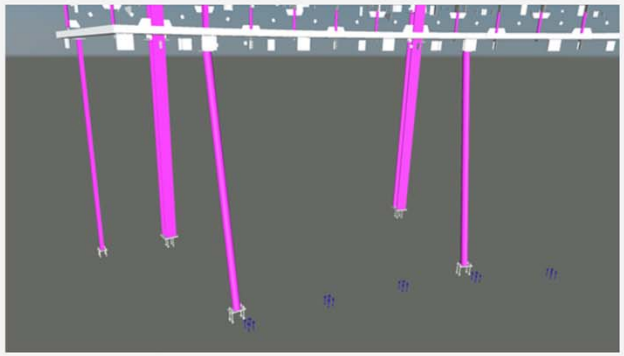

A
B
PIPING PLAN


MANN
MECHANICAL
COMPANY, INC.
MANHOLE
G8-5

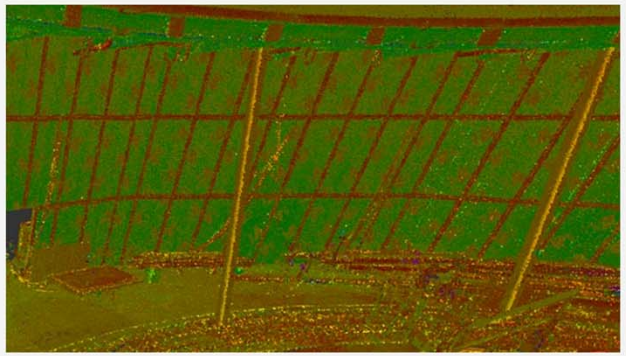

WM.T. SPAEDER
WM.T. SPAEDER
Since 1914

Reality Capture

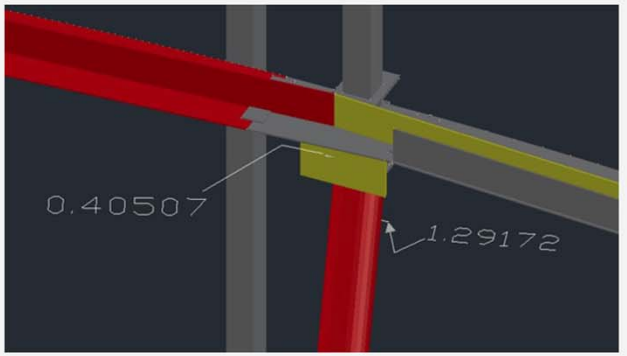
1. Upload Your Design File



2. Scan & Upload



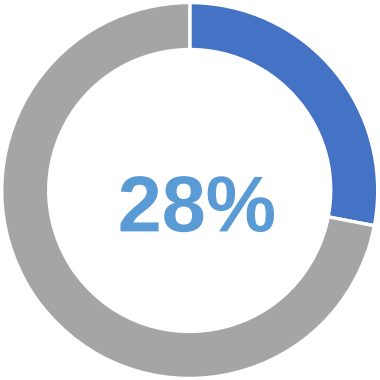
3. See The Result



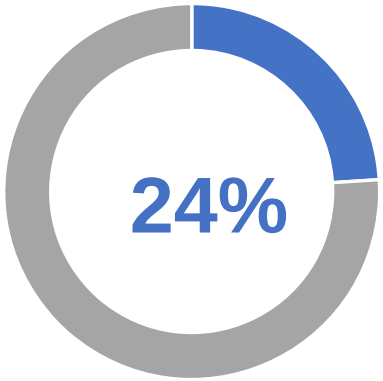
WHEN IT ALL COMES TOGETHER


Project
Edit
Share
2D
3D
Issue Tracker
Preferences
Help
Brett S
ST
New
View
Camera

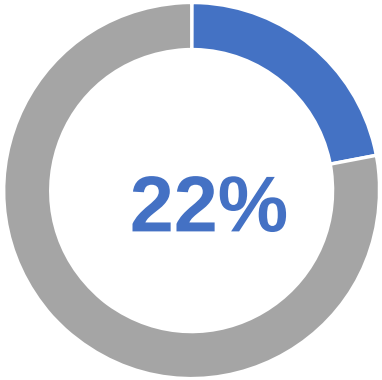
BIM is Still Not a Priority



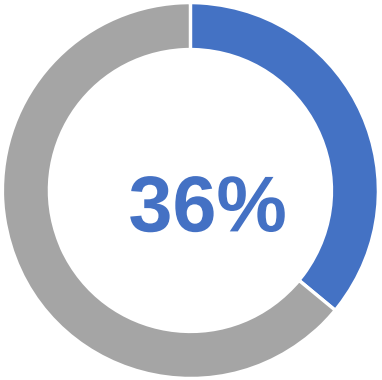
We do NOT bid on projects involving BIM



We have a BIM department

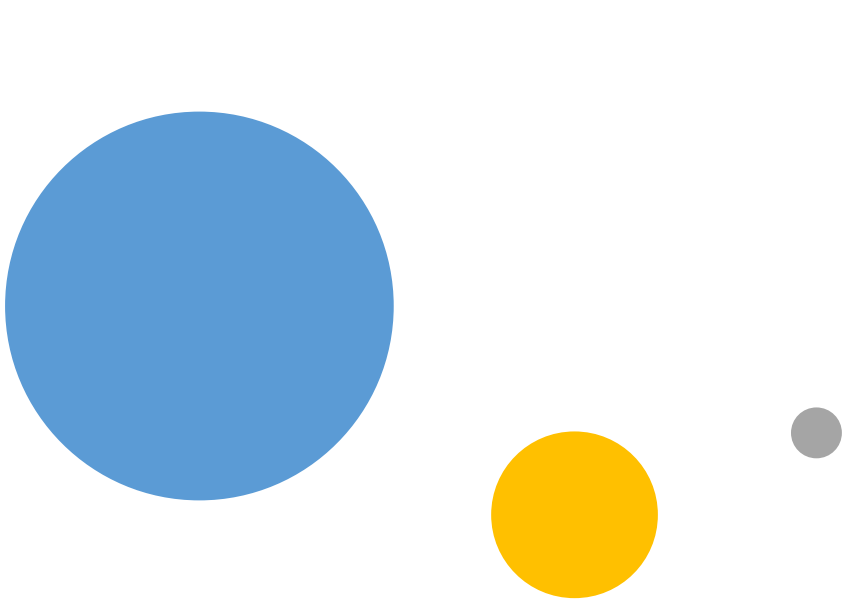


We have employees on staff that can work within BIM



Number of active projects that involve BIM

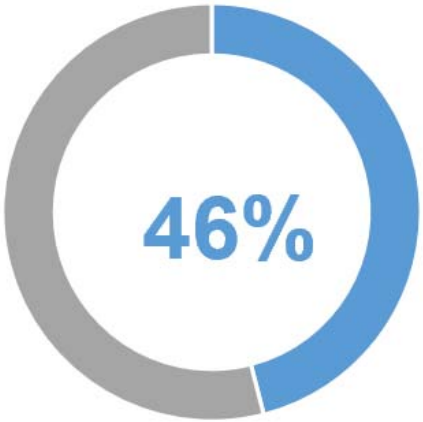
Source: 2018 JBKnowledge ConTech Report



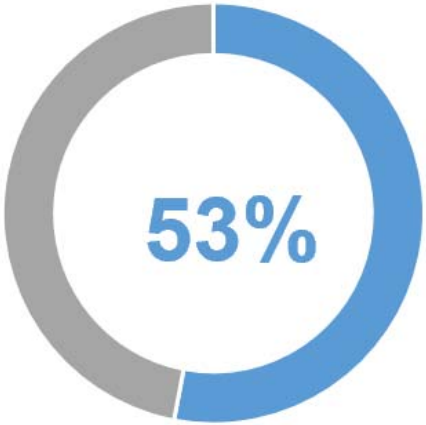
Evolving Applications

The first step to transforming your company

Manual Process Are Still Prevalent



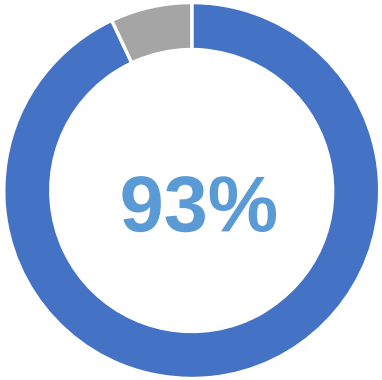
Nearly half of all contractors surveyed still process daily reports manually.



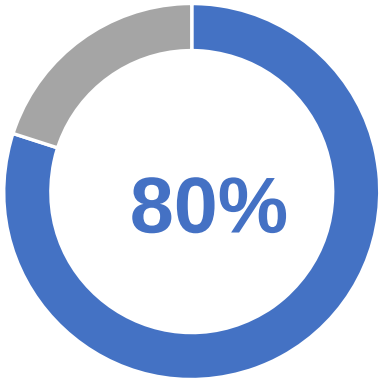
More than half of all contractors still process time cards manually

Source: 2018 JBKnowledge ConTech Report

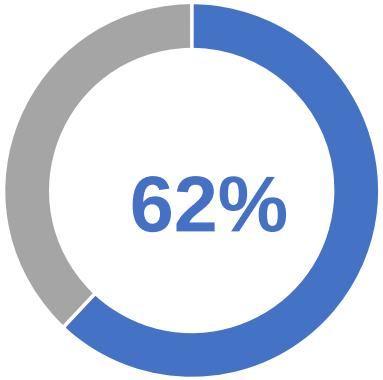
Mobile devices used daily



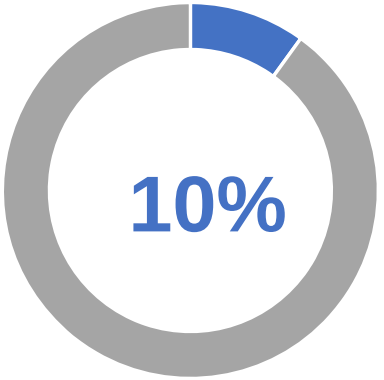
Smartphone



Laptop



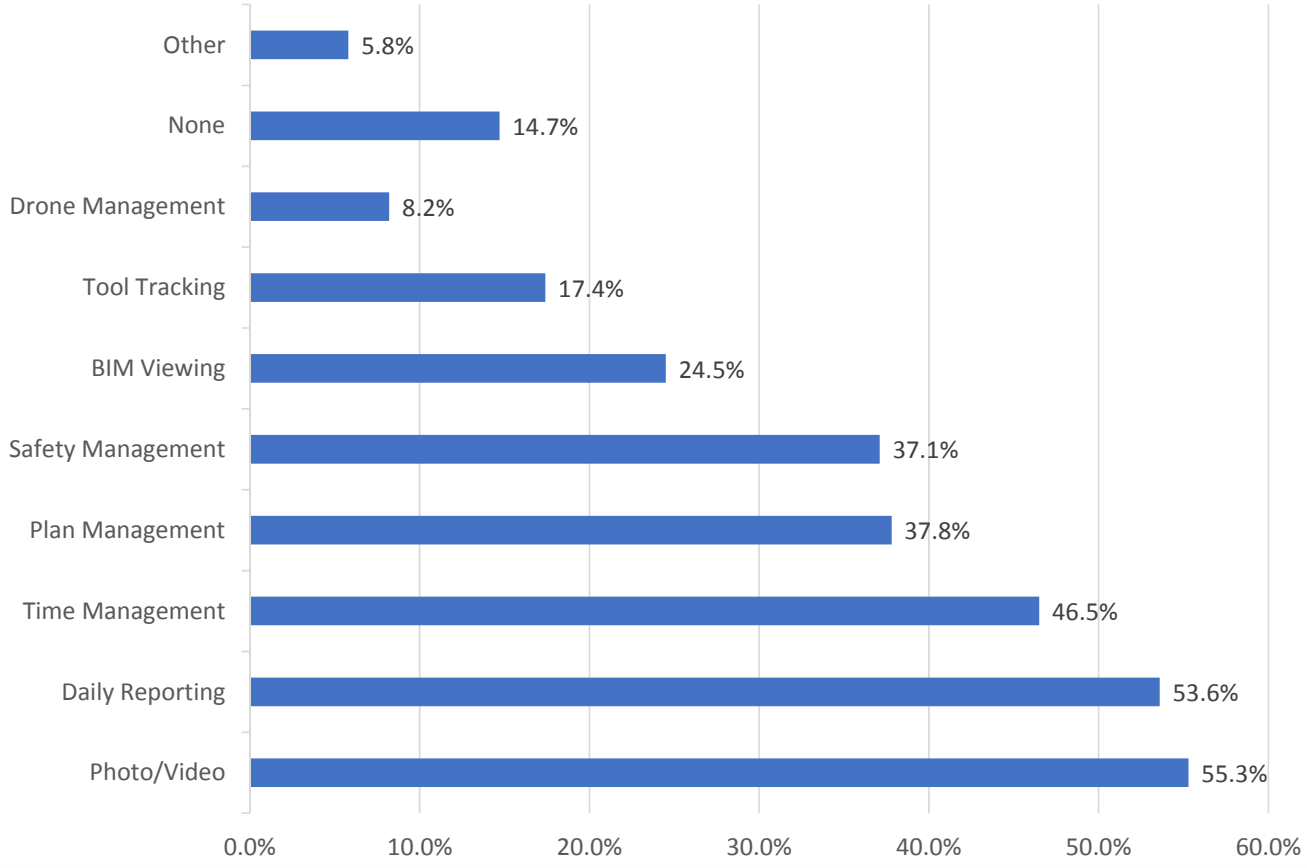
Tablet



Smartwatch

Source: 2018 JBKnowledge ConTech Report

Workflows using mobile apps



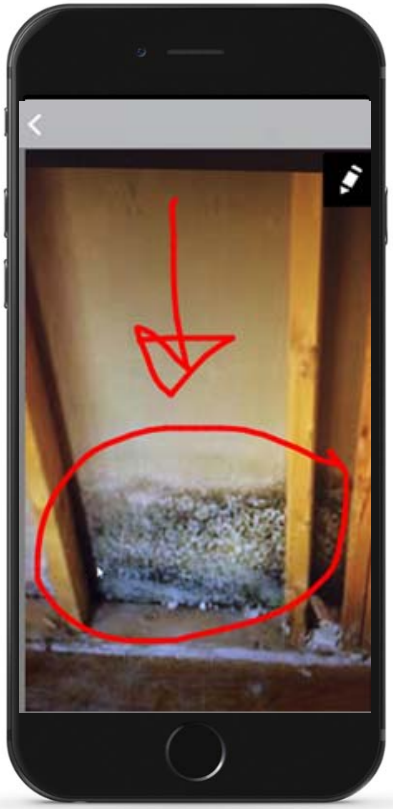
Source: 2018 JBKnowledge ConTech Report

THEN

NOW

THEN

NOW



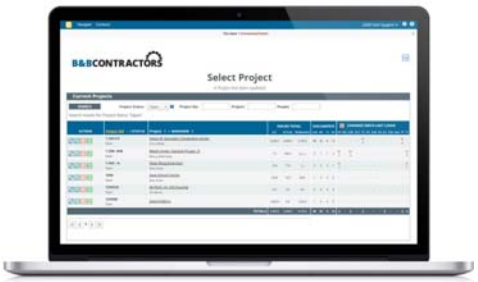
THEN

NOW

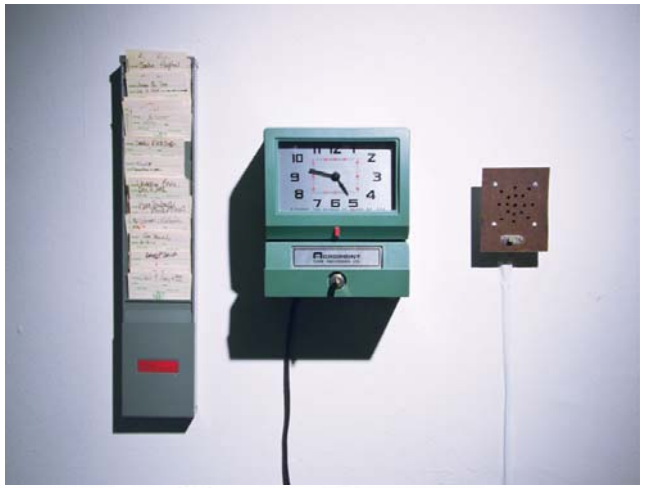
THEN

NOW


Daily Report 01 - 9/13/2016
Comments
Crews
Subcontractors
Equipment
Materials
Attach Field Notes
SAMSUNG
Projects
PRJ001 - Qualcomm Stadium
PRJ002 - San Diego Zoo
PRJ042 - Shapery Towers
PRJ202 - Rubio's Fish Tacos #17
1455-Retail - Ocean Beach Lifeguard Station
PRJ901 - San Onofre Cooling Tower 3
09-34 - Titanium Mine
a2 - Wendy's High School Test
Seb-001 - Sebastian's Sky Tower
1457 - Skyview Towers


B&BCONTRACTORS
Select Project

THEN



Name: Jane Doe | Employee ID Number: 1234 | Week Ending: 04/05/09

DAILY TIME RECORD

XXX XXXX XXX

KELLY | Region: WEST

	START TIME HR	START TIME MIN	LUNCH OUT HR	LUNCH OUT MIN	LUNCH IN HR	LUNCH IN MIN	LUNCH OUT HR	LUNCH OUT MIN	LUNCH IN HR	LUNCH IN MIN	FINISH TIME HR	FINISH TIME MIN	DAILY TOTAL HRS	DAILY TOTAL MINS
MON	7	56	12	19	1	19					5	06	8	.25
TUE	7	58	11	57	12	57					5	02	8	00
WED	7	55	12	03	1	05					5	03	8	00
THU	7	59	12	37	1	38					5	02	8	00
FRI	8	00	12	03	1	03					4	45	7	.75
SAT														
SUN														

Current Reference/Order Information: 1620 A 0001 (Branch No. / Letter / Reference/Order No.)

Company Name / Information: ABC Company

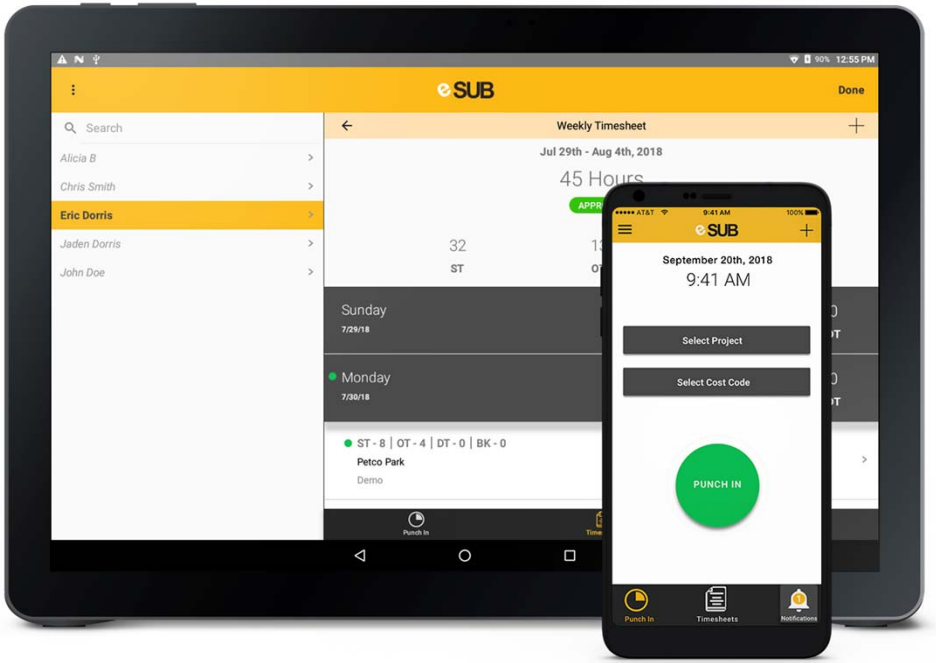
Customer Verification and Signature: I certify that the hours are correct and have read and agree to the "Terms of Service" on the back of this time card. X Bob Smith

Round daily hours to nearest 15 minutes (ex. 0,15,30,45) before summing column

Employee Signature: X Jane Doe | Total Time: 40

TOTAL TIME SUMMARY: Straight Time 40:00 | Overtime | Double Time

NOW



THEN

NOW

OHIO DEPARTMENT OF TRANSPORTATION
CONCRETE INSPECTORS DAILY REPORT

TE-45 — REVISED 1992

SAMPLE ID	TYPE OF INSPECTION	ID#	MATERIAL CODE	CLASS OF CONCRETE	DATE MADE
666774-01	CTL	C273076	21527	HP4	05/29/02

P/S CODE	CONCRETE PRODUCER	REPRESENTS QUANTITY	PERSONNEL ID	DATE SHIPPED
03517-03	Tri-Son Concrete #2 Plant - Bellaire	240 C.Y.	XXX-YY-ZZZZ	06/03/02

ASSIGN TO: PROJECT NO. 533-01 — PROJECT INDICATOR: PROJECT ✓ P.O.

ITEM CODE	REF. NUMBER	QUANTITY
511	41	240

Use TE-45 SUPP if there are not enough spaces in step ❶

WEATHER	
AMBIENT TEMP.	78-84
CONCRETE TEMP.	80
HUMIDITY	44 %
WIND SPEED	2 mph
EVAPORATION RATE	0.04 - 0.06

PLACEMENT LOCATION: Bridge No. BEL-7-2.15 Deck, Phase 1 of 2, SB Side. Starting North side moving South w/ Pump.

YIELD - CONSISTENCY - TEST SPECIMENS

❶ TIME	CONCRETE TEMP (°F)	STATION	UNIT WT (lbs/ft³)	BATCH SIZE (yd³)	TOTAL BATCH WEIGHT (lbs)	YIELD (ft³)	SLUMP (in)	AIR (%)	BEAMS AGE	BEAMS STRENGTH	CYLINDERS SPECIMEN NUMBERS	
5:45	80	BEL-7-2.15	140.50	8	30,100	26.78	5.0	8.4				
6:02	80	"	140.37	8	30,050	26.76	6.25	7.7			9	9A
6:26	81	"	140.22	8	30,040	26.78	6.75	7.2				
6:45	80	"	139.78	8	30,070	26.89	6.5	7.2				
7:05	79	"	139.67	8	30,070	26.91	6.5	7.1			10	10A
7:20	78	"	139.52	8	30,070	26.94	7.0	7.0	√5	760		

AGGREGATE MOISTURES

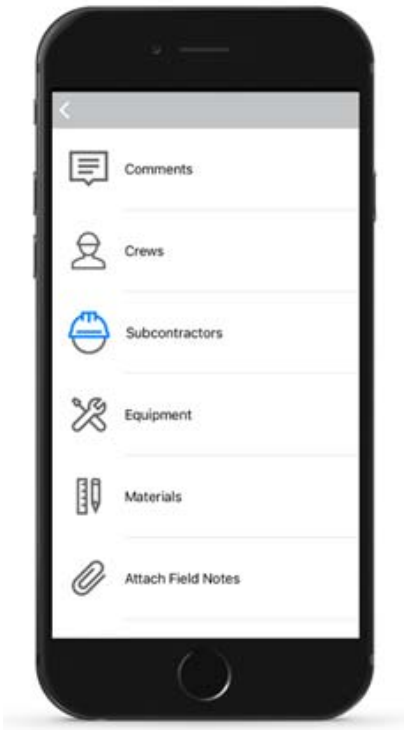
❷	MATERIAL	F.A.	C.A.#1	C.A.#2
A	TARE WEIGHT OF PAN	309 gm	322 gm	297 gm
B	WET AGGREGATE + PAN WT	1877	1946	1932
C	B - A = WET AGGREGATE WT	1568	1624	1635
D	DRY AGGREGATE + PAN WT	1807	1912	1901
E	D - A = DRY AGGREGATE WT	1498	1590	1604
F	C - E = WEIGHT OF WATER	70	34	31
G	(F ÷ E) x 100 = % MOISTURE	4.67%	2.14%	1.93%

ADMIXTURES

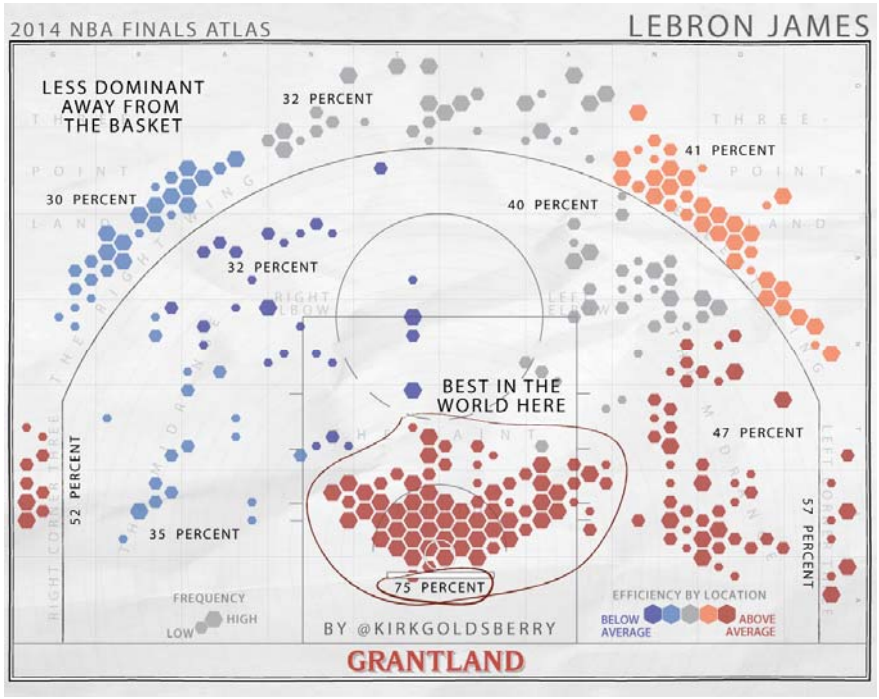
TYPE	BRAND	DOSE /yd³
AIR ENTRAINING	MB AE 90	902
WATER REDUCING (A)		
SET RETARDING (B)	Pozzolith 80	12.0#
ACCEL. (C or E)		
WR / SR (D)		
HR WR (F or G)	Rheobuild 1000	5502
OTHER		

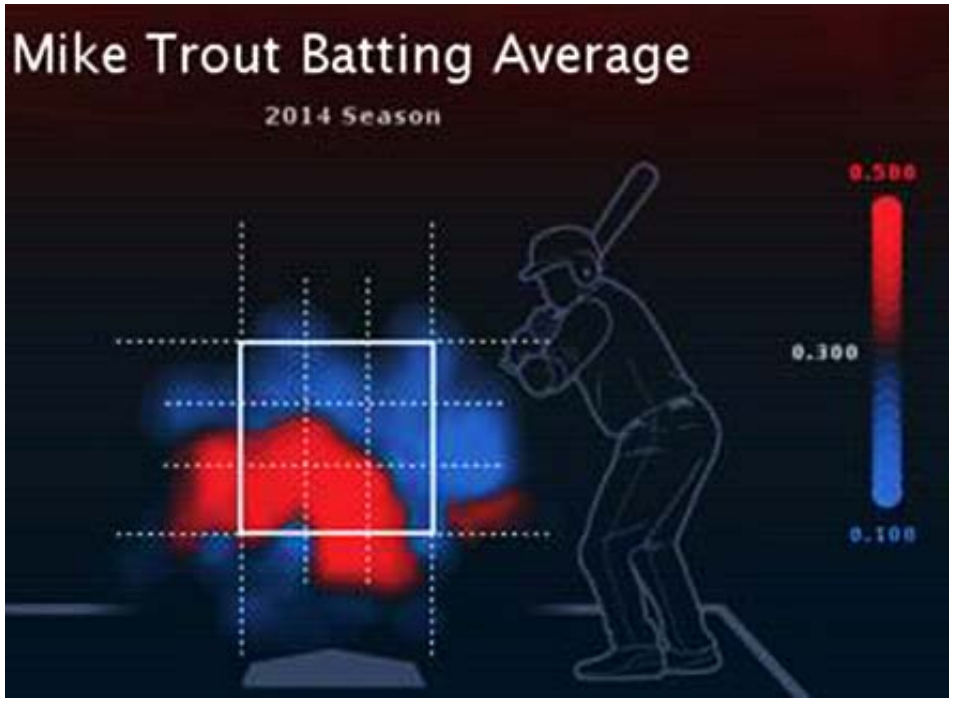
The aggregate design weights in the Construction and Materials Specification manual have changed from DRY to SSD. The actual weights have not changed, therefore it is necessary to use the Bulk Specific SSD specific gravities when adjusting the weights from the ones specified in the design.

When adjusting aggregate weights for moisture, the calculation consists of first taking the aggregate back to dry condition then up to the actual moisture condition. This is done by dividing the SSD design weight by the absorption factor and multiplying by the moisture factor as shown in the AGGREGATE QUANTITIES FOR 1 yd³ BATCH WITH CORRECTION FOR MOISTURE table.



It’s All About the Data





Two Types of Data

Unstructured Data

2-d Plans

Tasks

PDF documents

Emails

Photos/videos

Most data is unstructured

Structured Data

Numbers / Dates / Strings

Time / Hours / Days

Costs

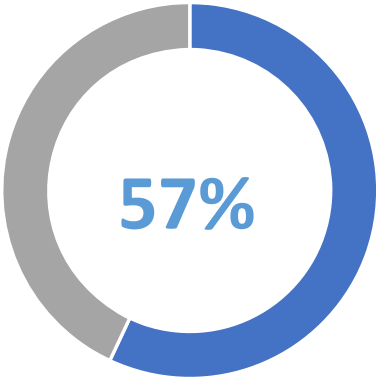
Production

Highly Organized

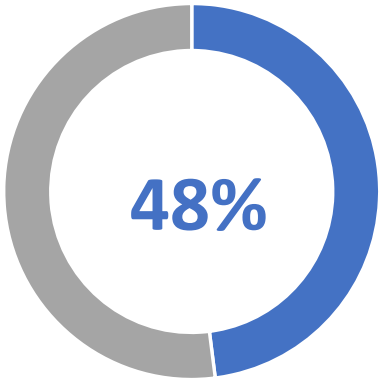
Relational Databases

Input, Search, and Manipulate Data

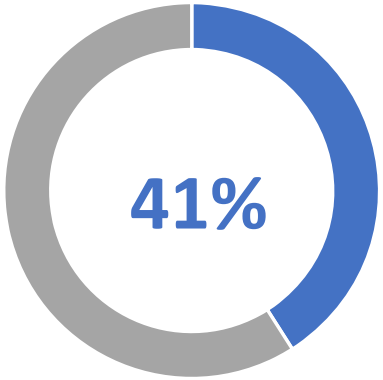
Benefits of Structured Data



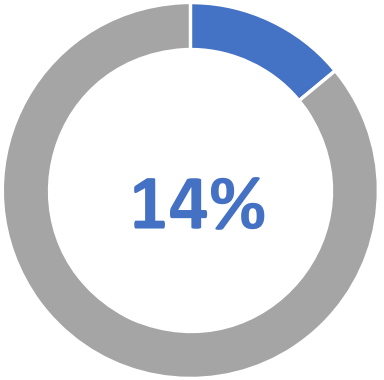
Want **consistent, up-to-date** project and financial information



Want to be **warned** when specific situations occur



Want **forecasting**, allowing them to prepare for best and worst case building events



Want **online analytics** to see precisely which factors are affecting profitability and by how much.

Companies with the Right Data will see $430B in Productivity Gains by 2020

Source: Sage Construction Survey

Your Company Letterhead

Daily Report

PRJ001 — Jefferson High School (Sample Project)

From
Justin Wetherby
eSUB Inc.
5703 Oberlin Drive
San Diego, CA 92121
Phone No: 800-493-3782
Justinw@esub.com

Daily Report No: PRJ001-34
Date: 2/8/2019
Weather: Sunshine
Temp: 59°F
Wind: Light Breeze
Total Workers: 2

Crew

Cost Code	Employee / Labor Class	Work Type	Hours 1x	1.5x	Lost	Units	Comments
300—Site Work	Collins, Mark — EMP005 / Apprentice	Base Contract	8	0	1	0	mud on jobsite
300—Site Work	Lewis, Matt — EMP004 / Apprentice	Base Contract	8	0	1	0	mud on jobsite
		TOTAL:	16	0	2	0	

Subcontractors Usage

Subcontractor	Workers	Comments

Equipment Usage

Code	Equipment	Notes	Hours
24	Pipe Threaders - Electric	-	8

Materials

Materials	Quantity	Notes
DS14 - 08-0104-20 - 1 1/4" Tek Screws	12 *per EACH*	

Submitted By:
Micheal Jordon

Dated: 2/8/2019

Hours Lost Summary

Cost Code Summary | Equipment Usage Summary | Cost Summary

From Date:
Through Date:

QUERY DATA

	Labor Class	Notes/Comments		Hours Lost
	Laborer	Work cancelled due to rain. Unsafe working conditions. All workers sent home with 3 hours show up time.		3.0
	Apprentice	Basic Electrical Material		2.0
	Laborer	Work cancelled due to rain. Unsafe working conditions. All workers sent home with 3 hours show up time.		3.0
	Apprentice	test		3.0
	Apprentice	test edit		3.0
	Apprentice	test		3.0
	Apprentice	test edit		3.0
	Apprentice	mud on jobsite		2.0
	Foreman	Locked out of Site		4.0
	Apprentice	ot150her trade in the way		2.0
	Apprentice	outside delay		2.0
				30.0

Equipment Usage Summary

Cost Code Summary | Hours Lost Summary | Cost Summary

	Asset	Acquired	Divested		Hours Used
	rented	1/9/2012			10
	rented	1/9/2012			16
	rented	1/9/2012			30
					56

Material Item Summary

Purchase Date Status: Complete
Item Number: all
Balance: all

QUERY DATA

	Total Ordered	Quantity Ordered	Quantity Received	Ord/Rec Balance	Quantity Used
	$2,040.00	50.00	50.00	0.00	0.000
	$0.00	0.00	0.00	0.00	1.000
	$0.00	0.00	0.00	0.00	106.000
	$1,280.00	1.00	1.00	0.00	0.000
	$1,000.00	100.00	100.00	0.00	0.000
	$250.00	50.00	50.00	0.00	0.000
	$4,570.00	201.000	201.000	0.000	107.000

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Structured Data and Labor Efficiency

Budgeted Hours

Actual Hours

% Hours Used

% Complete

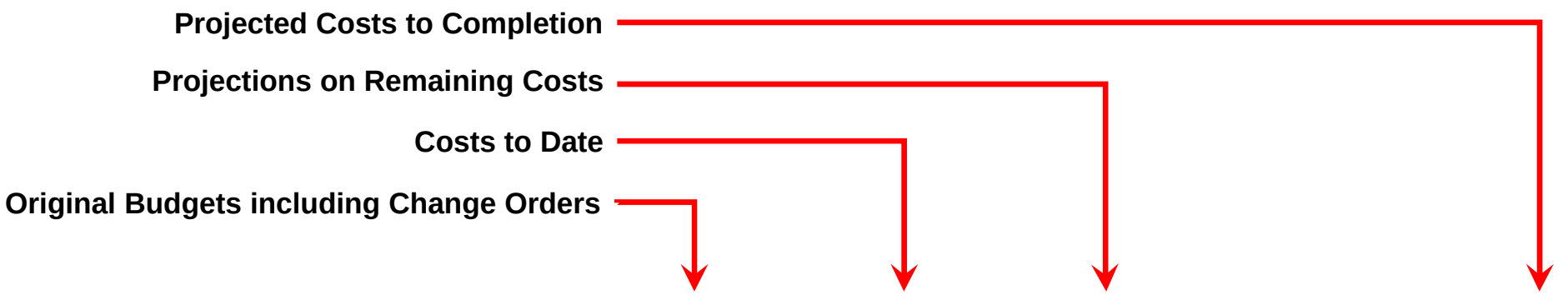
Projected Completion

% of Efficiency

Percent Of Efficiency

Cost Code	Cost Code Description	Est Cost	Act Cost	Orig Budgeted Hours	COR Budgeted Hours	Total Budgeted Hours	Used Hours	% Used Hours	Rem Hours	% Complete	Proj Used Hours	Proj Rem Hours	% Of Eff
01-120	Rough- Branch	$160,000.00	$48,000.00	2,000.00	0.00	**2,000.00**	800.00	40.0%	**1,200.00**	30%	2,666.67	1,866.67	**75.0%**
01-130	Rough- Feeder	$64,000.00	$16,320.00	800.00	0.00	**800.00**	288.00	36.0%	**512.00**	40%	720.00	432.00	**111.1%**
01-230	Wire Pull- Feeder	$15,000.00	$0.00	200.00	0.00	**200.00**	0.00	0.0%	**200.00**	0%	200.00	200.00	**0.0%**
01-330	Distribution	$22,500.00	$0.00	300.00	0.00	**300.00**	0.00	0.0%	**300.00**	0%	300.00	300.00	**0.0%**
	Totals	**$261,500.00**	**$64,320.00**	**3,300.00**	**0.00**	**3,300.00**	**1,088.00**	**33.0%**	**2,212.00**	**28.0%**	**3,886.67**	**2,798.67**	**84.0%**

Structured Data and Labor Efficiency



Item	Original Contract Budget	Change Orders	Revised Contract Budget	Actual Costs Through 4/23/2018	Projected Additional Cost/Rev	Total Actual & Projected Costs	Variance From Estimate
Labor Hours	7,500.00	0.00	7,500.00	0.00	7,500.00	7,500.00	0.00
Labor Rate/Hour	100.00	0.00	100.00	0.00	0.00	94.67	0.00
Labor Costs	750,000.00	0.00	750,000.00	710,000.00	0.00	710,000.00	40,000.00
Equipment Costs	15,000.00	0.00	15,000.00	17,000.00	1,500.00	18,500.00	-3,500.00
Material Costs	397,500.00	0.00	397,500.00	321,000.00	35,000.00	356,000.00	41,500.00
Subcontractor Costs	25,000.00	0.00	25,000.00	15,000.00	10,000.00	25,000.00	0.00
Overhead Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Job Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Job Costs	1,187,500.00	0.00	1,187,500.00	1,063,000.00	46,500.00	1,109,500.00	78,000.00
Earned Revenue	1,250,000.00	0.00	1,250,000.00	1,116,150.00	133,850.00	1,250,000.00	0.00
Gross Margin - $	62,500.00	0.00	62,500.00	53,150.00	87,350.00	140,500.00	78,000.00
Gross Margin - %	5.00%	0.00%	5.00%	4.76%	65.26%	11.24%	6.24%

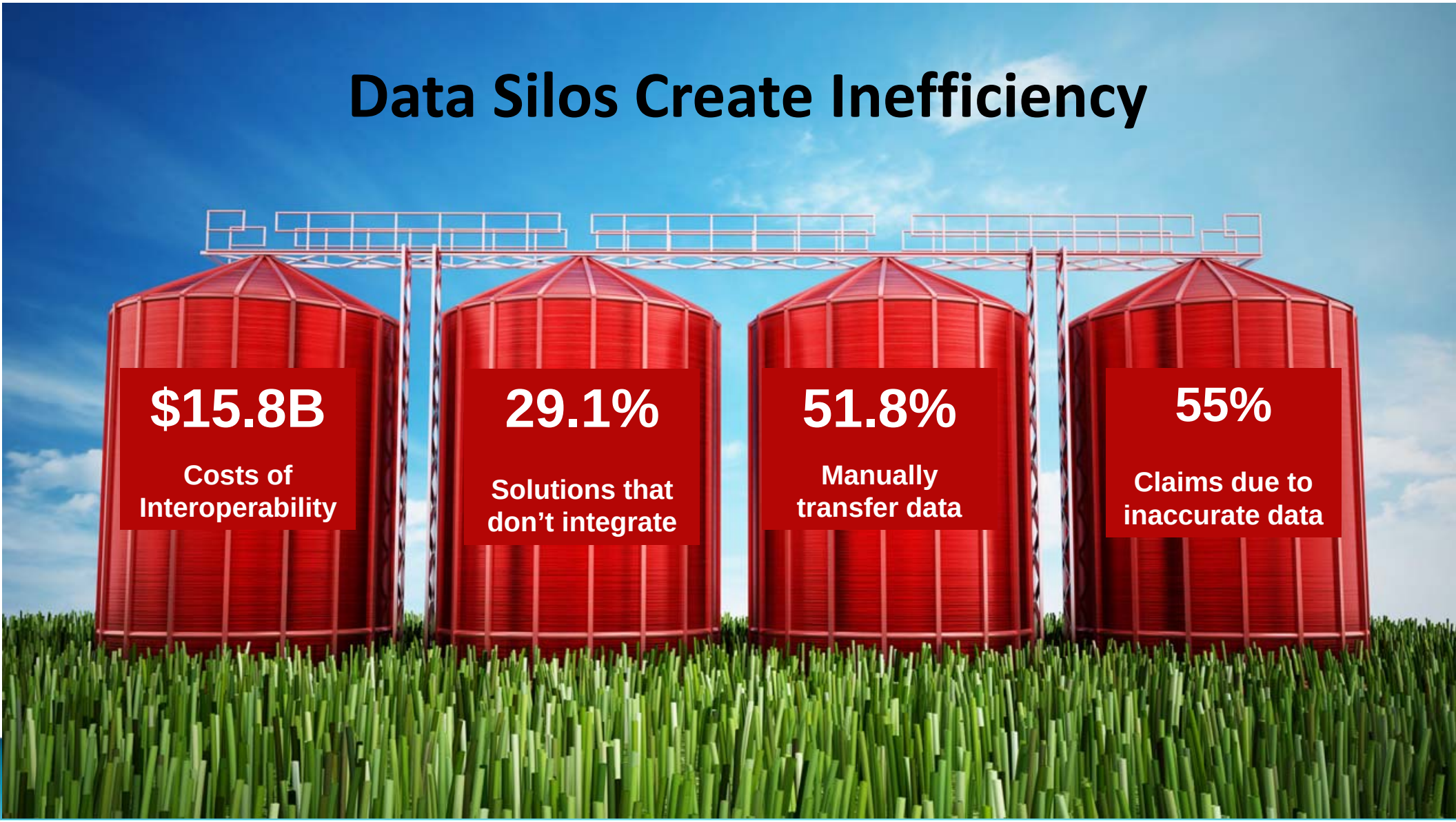
Structured Data and Logs

Request For Information Log — Excel® | Print | Print Multiple

SEARCH | RFI Number: | RFI Subject or Answer To Clarification: | Status: All

ACTION	RFI Number	GC/CM No	GC File No	Owner No	RFI Date	Return By	Date RFI Returned	Status
		RFI Subject						
		Answer To Clarification						
	54				2/20/2018	2/28/2018	4 Days Left	Pending Pending
		Flood damage to main electrical room						
	53				2/12/2018	2/17/2018	7 Days Late	Pending Pending
		Need clarification regarding Switchboard AA metering						
	52				2/8/2018	2/13/2018	11 Days Late	Pending Pending
		Clarification of Exit light in rm 101						
	51				1/30/2018	2/4/2018	20 Days Late	Pending Pending
		Damage to equipment						

Data Silos Create Inefficiency



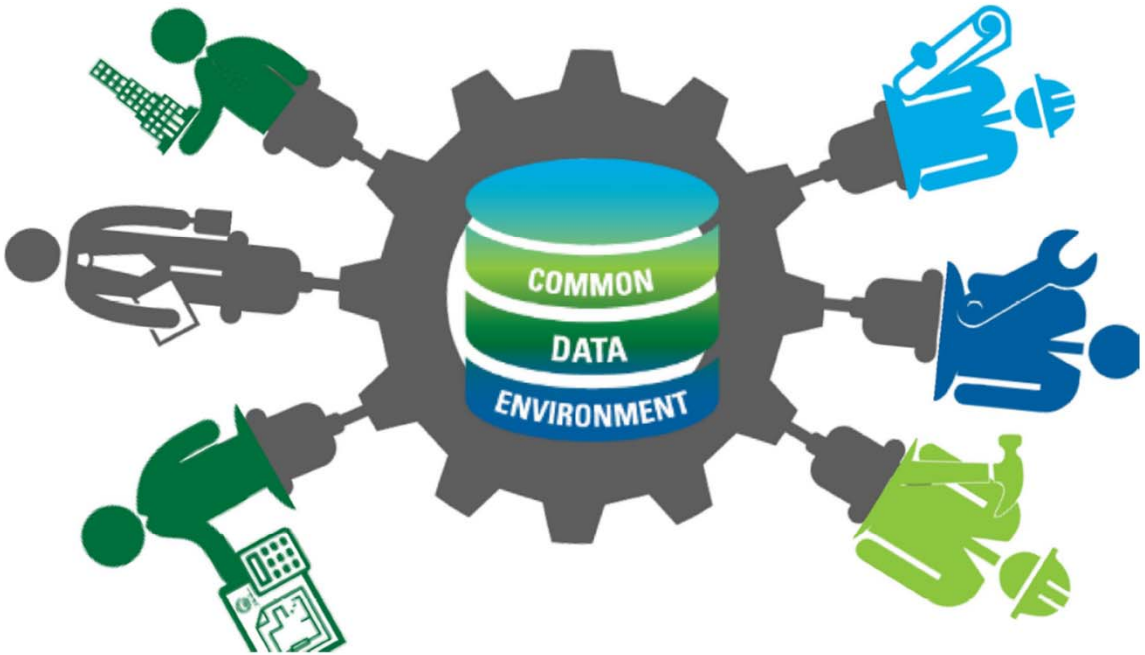
Data Integrations

Current State

Linear Integration

Source: Construction Progress Coalition

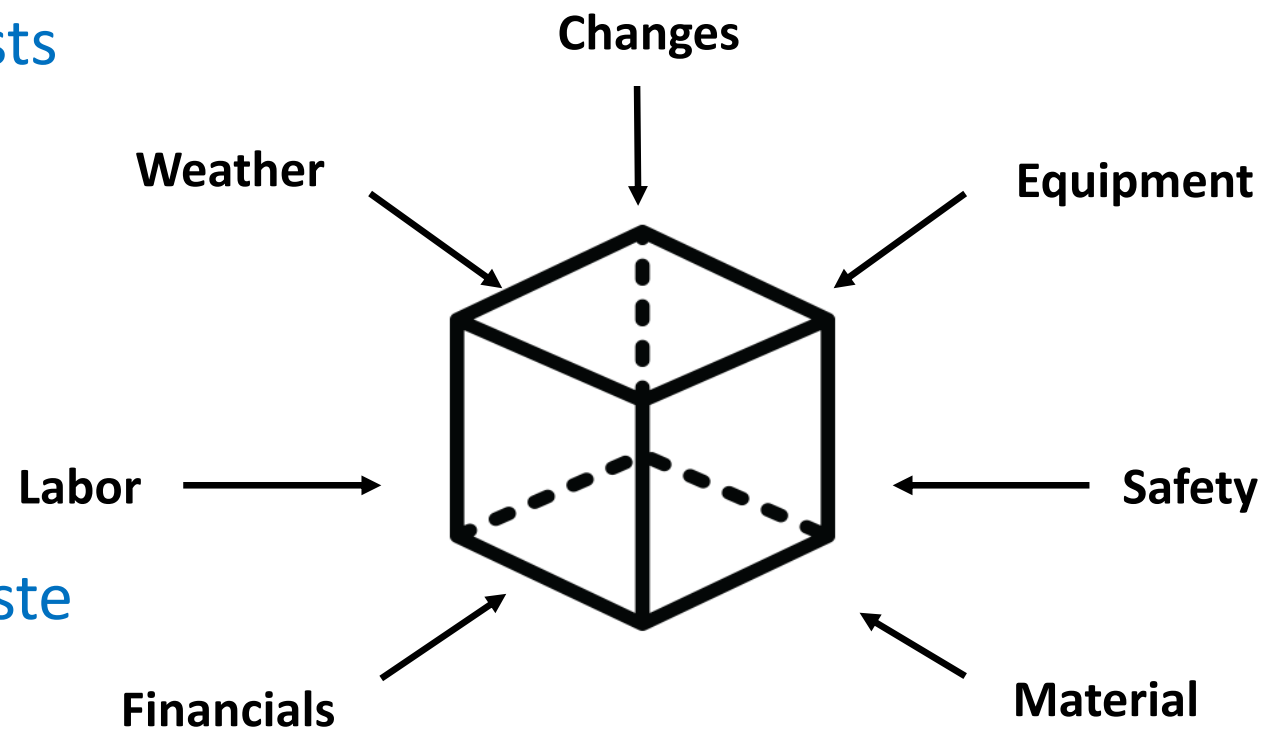
Future State
Common Data Environment



Source: Construction Progress Coalition

Real-time, data-driven predictive modeling

Reduce costs by 18%



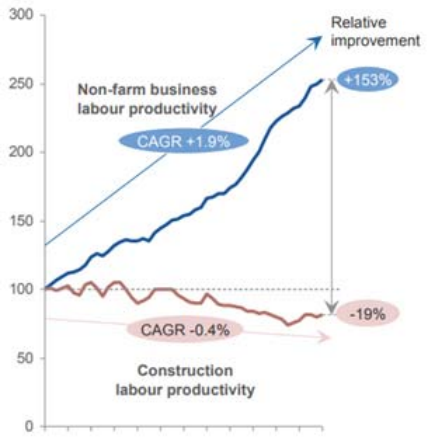
Cut projected completion by 12 weeks

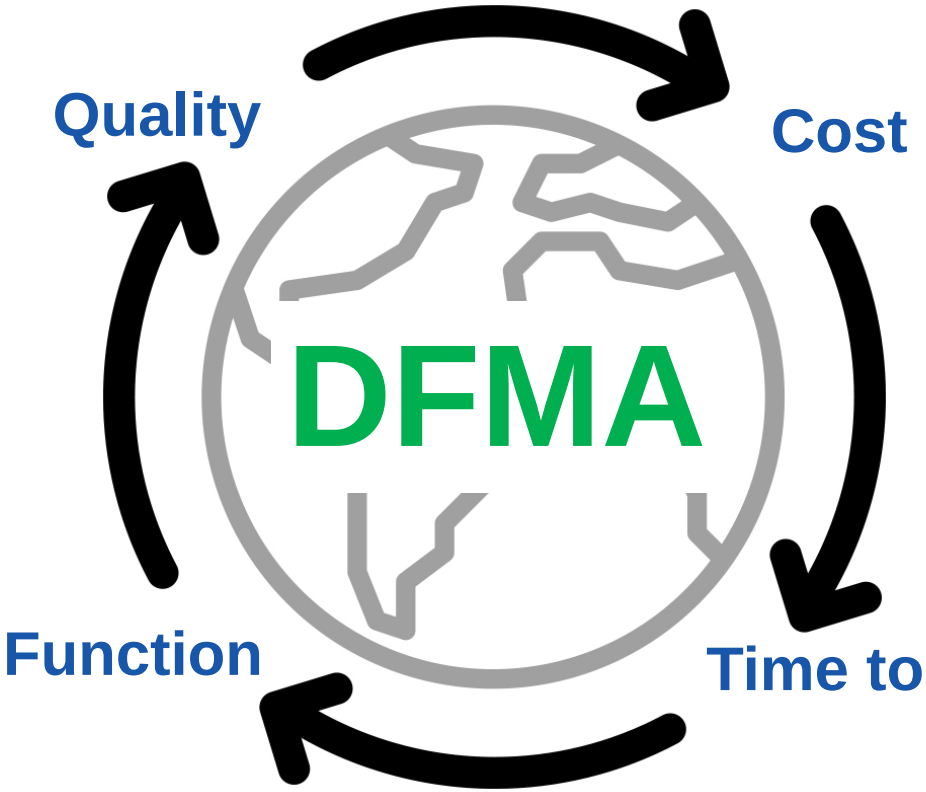
Reduce Waste

Break down silos

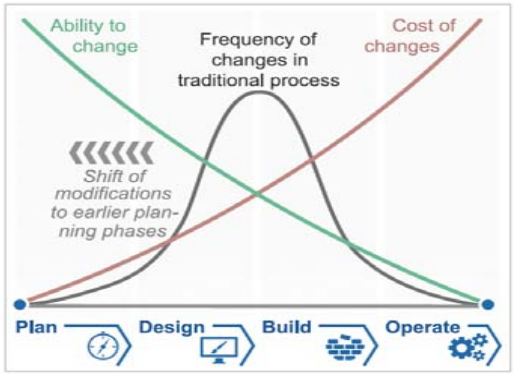
ILD-Convergence of Forces for The Perfect Storm

Declining Labor Productivity





Cost of Changes



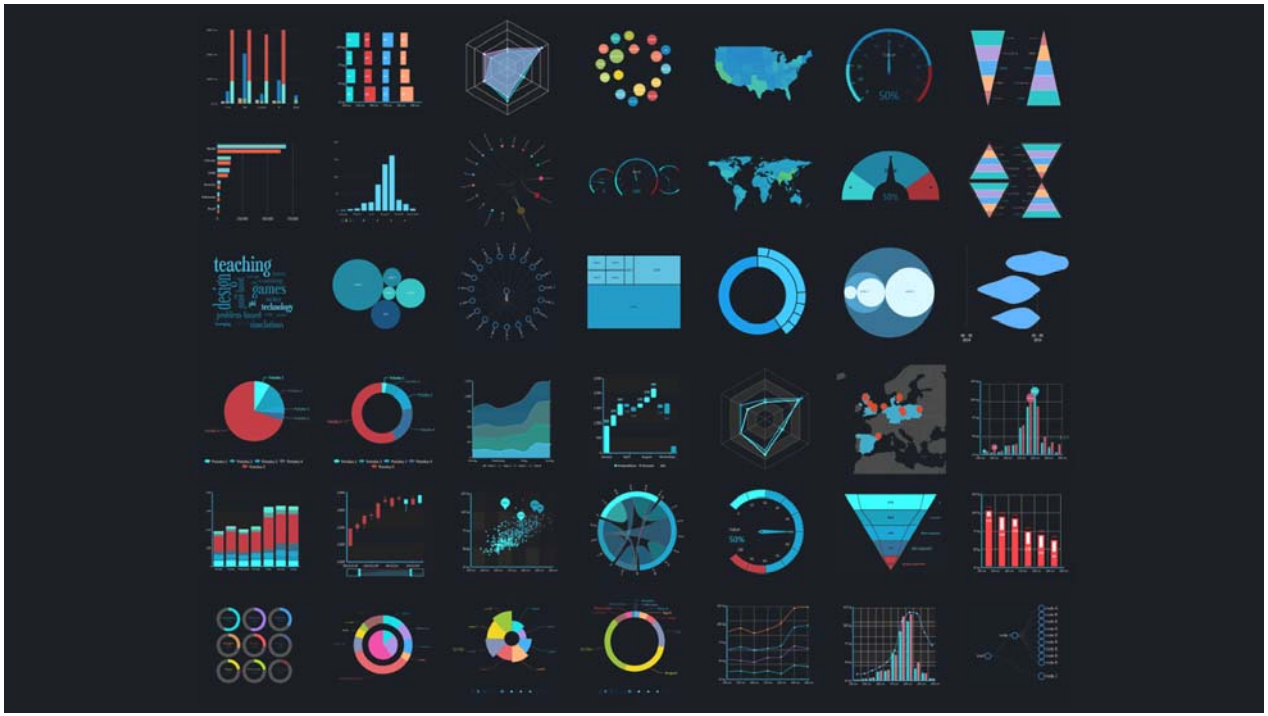
Constructability Experts

Integrated labor delivery

Aligning Owners / Architects / Engineers / GCs / Skilled Trades

Labor Begins at Design

Big data
bigger opportunities



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