



**E-CONSTRUCTION:
HOW TECHNOLOGY IS CHANGING
PROJECT DELIVERY**

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CEO, Co-Founder**

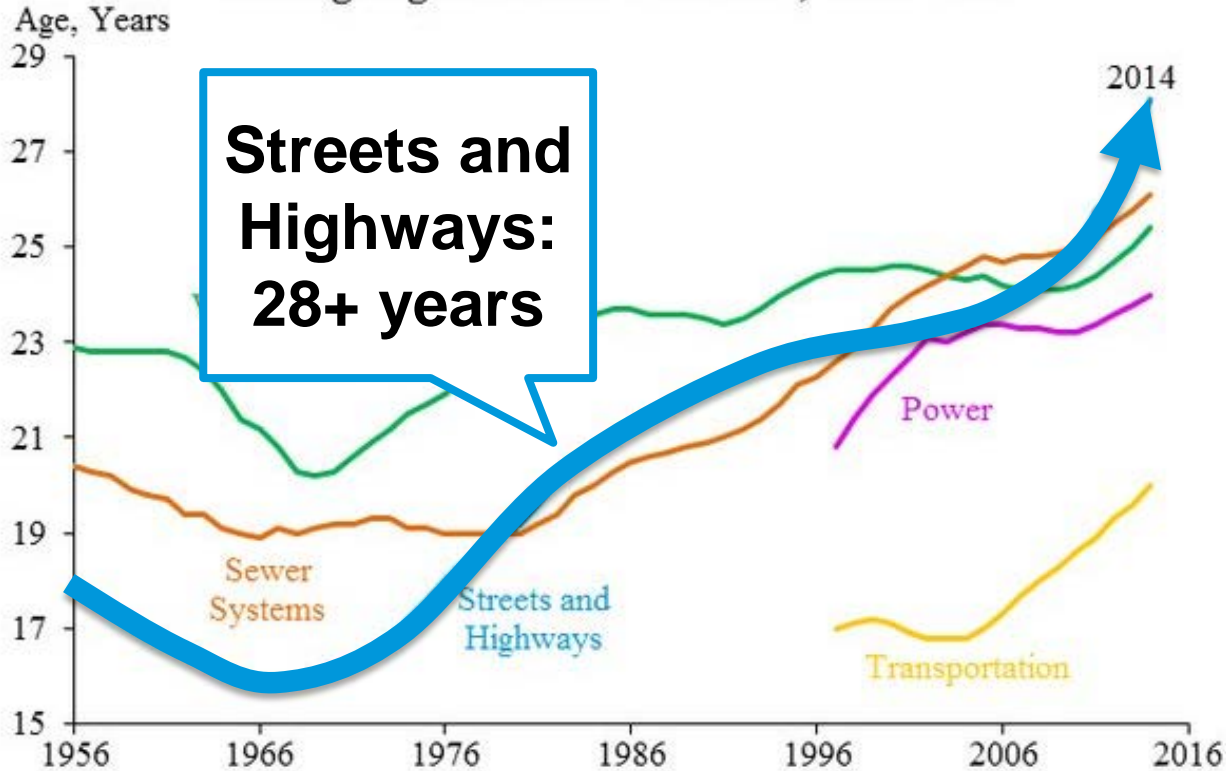


TRANSPORTATION INFRASTRUCTURE IS FUNDAMENTAL TO OUR WAY OF LIFE.

Why we do what we do...

Our infrastructure is aging...

Average Age of Public Structures, 1956–2014



Sources: Bureau of Economic Analysis, ASCE

AMERICA'S G.P.A. **D+** ESTIMATED INVESTMENT NEEDED BY 2020: **\$3.6 TRILLION**

INFRASTRUCTURE GRADES FOR 2013

ENERGY	D+	SCHOOLS	D	PUBLIC PARKS & RECREATION	C-
TRANSIT	D	ROADS	D	RAIL	C+
PORTS	C	INLAND WATERWAYS	D-	BRIDGES	C+
AVIATION	D	WASTEWATER	D	SOLID WASTE	B-
LEVEES	D-	HAZARDOUS WASTE	D	DRINKING WATER	D
DAMS	D				

A: EXCEPTIONAL, B: GOOD, C: MODERATE, D: POOR, F: FAILING
Each category was evaluated on the basis of capacity, condition, funding, future need, operation and maintenance, public safety, resilience, and innovation

MEGA TRENDS SHAPING THE FUTURE



Massive financing need

\$3.6 trillion of investment
needed by 2020

Aging Infrastructure

28+ average age of streets
and highways in U.S.

Bigger, more complex projects

2mi underground boring
Alaskan Way Viaduct

MEGA TRENDS SHAPING THE FUTURE



Sustainability Requirements

50% of solid waste in U.S. is produced by construction industry

Resource scarcity

No.1 consumer of global raw materials is the construction industry

Slow permit and approval process

\$1.2tn of infrastructure would be added by 2030 if all countries committed to specific time limits for approvals

MEGA TRENDS SHAPING THE FUTURE

Resilience Challenges

3x as many disasters reported last year as in 1980

Talent and aging workforce leaving

50% of employees eligible for retirement by 2018



Managing Risk Through Asset Life



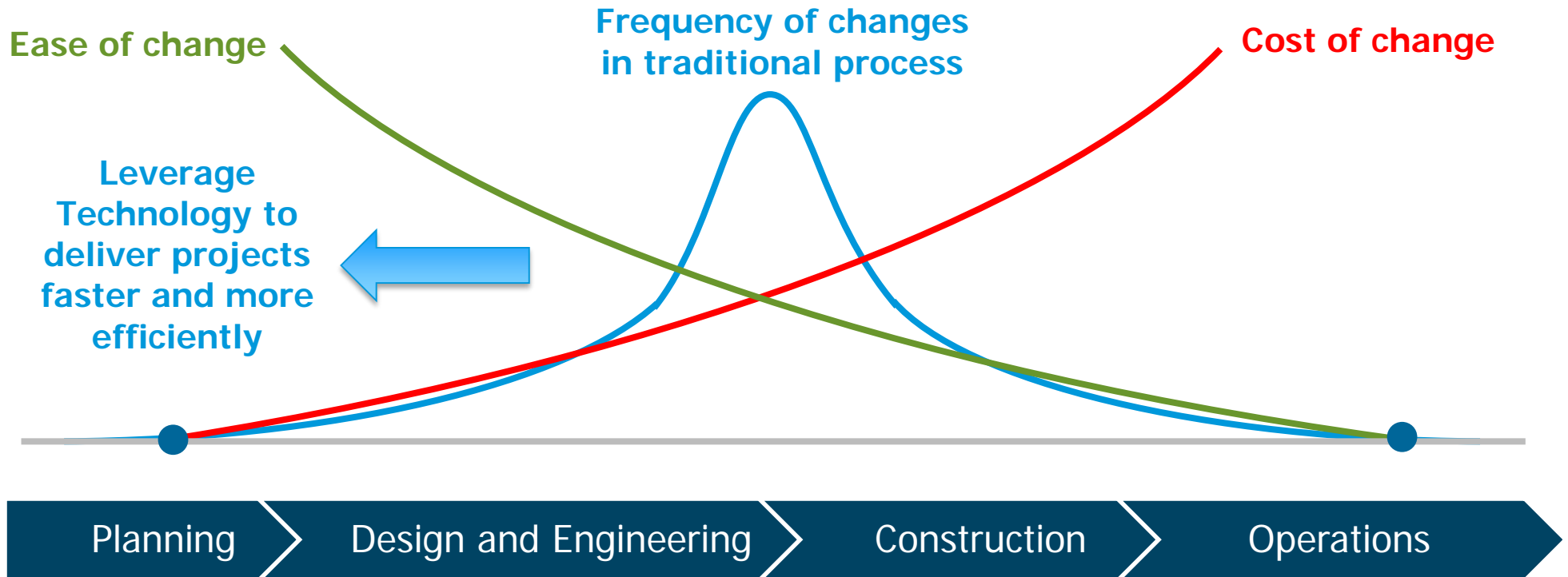
Planning

Design and Engineering

Construction

Operations

Managing Risk Through Asset Life (Time, Quality, Cost)



Source: Adapted from World Economic Forum; The Boston Consulting Group

OPPORTUNITIES TO EVOLVE

Mon: 98° - 79° P. CLDY 8 hrs
8/25 0800 - 5:00 pm Seq: 8

BASE: crew - Damiens

① supvr. ② skill ⑤ UNSKILL

Equip: ① Loader ① Track Hog

BASE CONSTRUCTIONS EXCAVATING TRENCHES
FOR 24" RCB PIPE FOR ADJOINING STORM
WATER INLETS, THAT ARE ALSO BEING
INSTALLED ALONG WBFR US-290
AT APPROX. STA. 1176+00 → 1177+00

Tues: 92° - 77° P. CLDY / Seq: 8 2 1/2 hrs

8/26: 08:00 → 5:00 pm GAS: 054469

BASE: Damiens crew

8/27 93° - 78° - P. CLDY
WED: 0800 - Seq: 8

BASE: chues crew

② skill ④ UNSKILL ① supvr.

Equip: ① Loader ① Track Hog

EXCAVATING SOIL FOR INSTALLATION
OF (36") RCB PIPE TO ADJOIN WITH
(5 X 5) STORM BOX LOCATED AT STA.
3143+50 FOR MH-1 TO 1-A15-1 16"
AND GROUTED PIPE AND BOXES

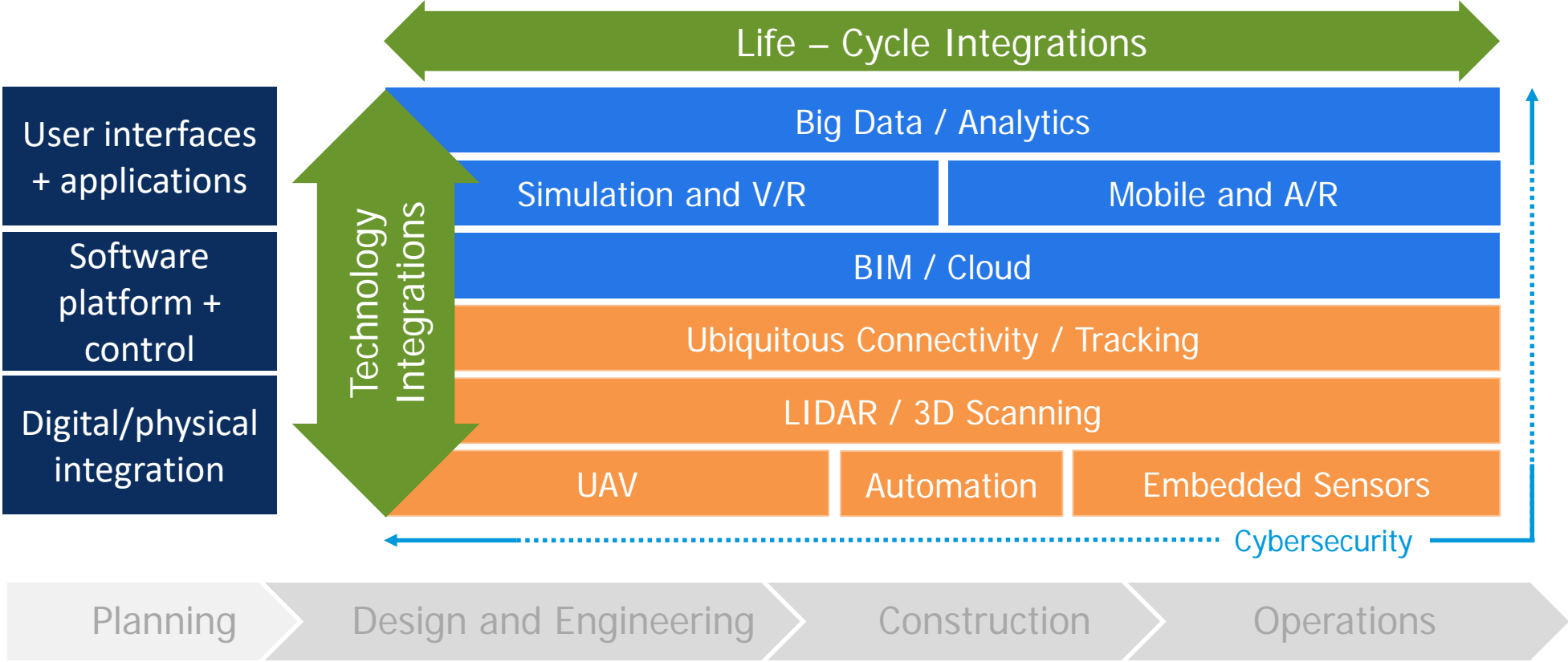
: SEE PLAN SHEET 1141:

BASE: EXCAVATING SOILS FOR INSTALLATION
OF (36") RCB PIPE TO ADJOIN WITH STORM
BOX (5 X 5) LOCATION AT WBFR US-290

OPPORTUNITY TO CONNECT SILOS



Core Enabling Technologies



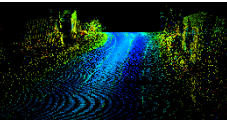
Sources: World Economic Forum; The Boston Consulting Group

Opportunities Enabled By Digital

User interfaces
+ applications

Software
platform +
control

Digital/physical
integration



Data-driven
construction
planning and lean
execution

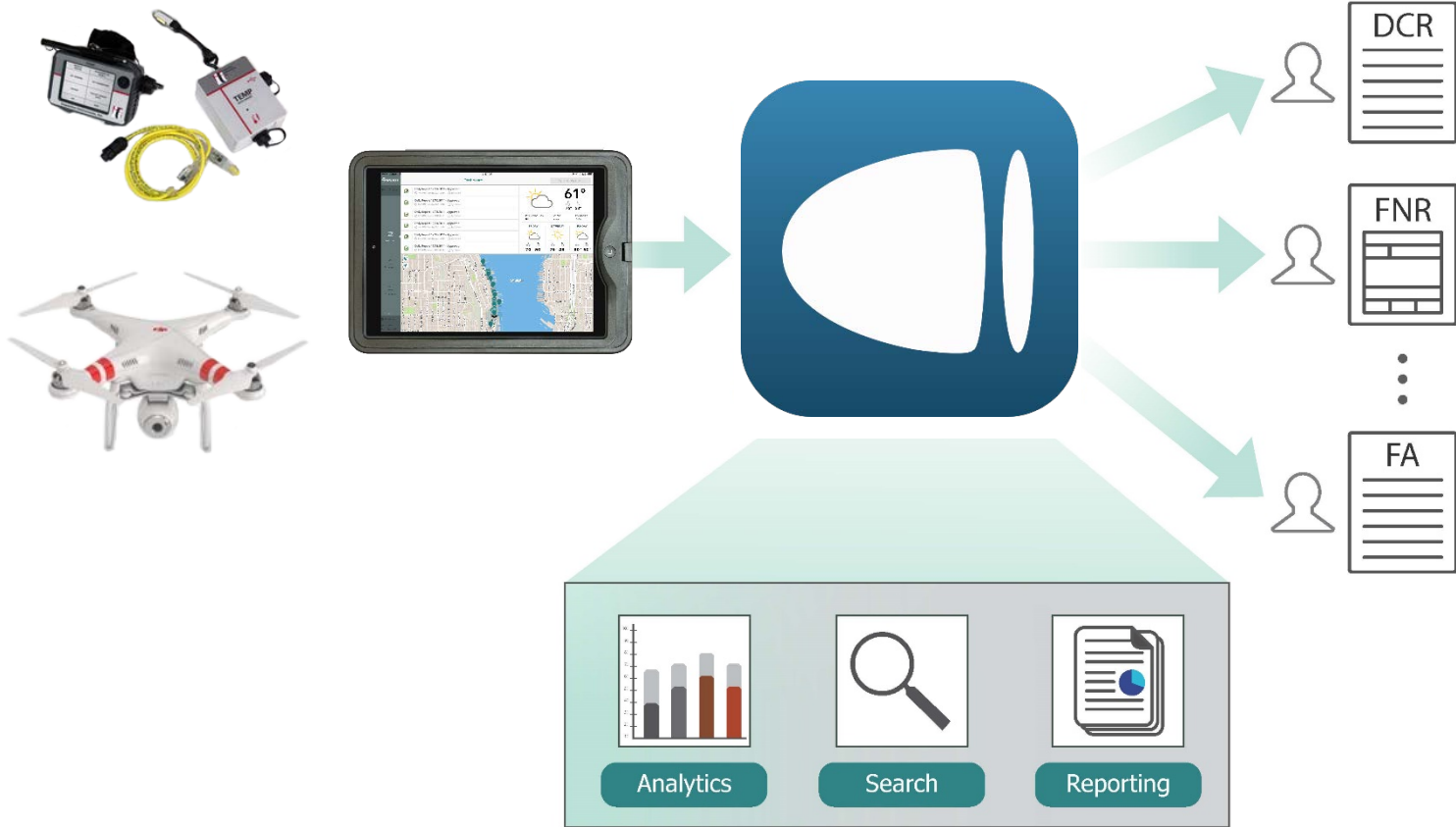
New fabrication
methods

Automated
and autonomous
construction

Rigorous construction
monitoring and
surveillance

Real-time data sharing, integration, and coordination across stakeholders

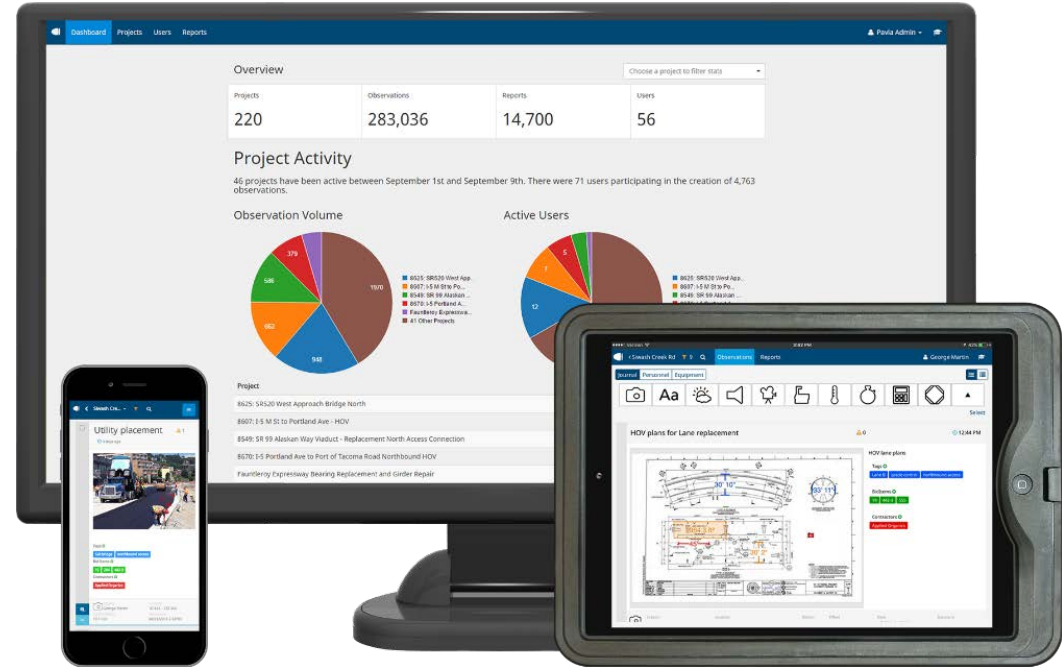
Collect Data Once, Use Many Times





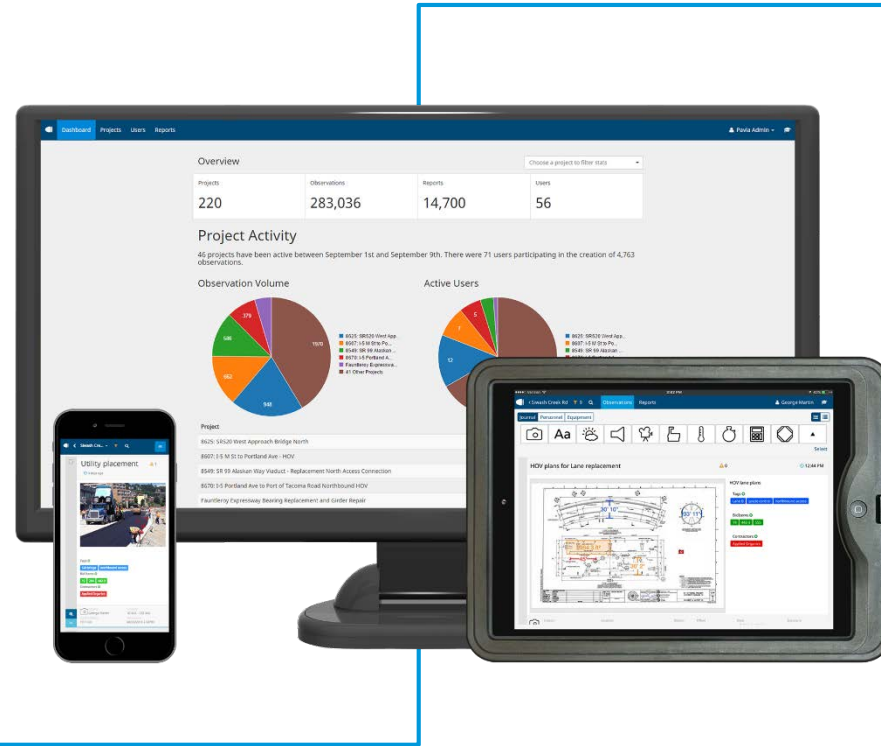
A mobile first, purpose-built platform to reduce project delivery risk.

- ✓ Simplified project inspection
- ✓ Real-time communication
- ✓ Automated reporting
- ✓ Digitized workflows
- ✓ Information flow for collaboration



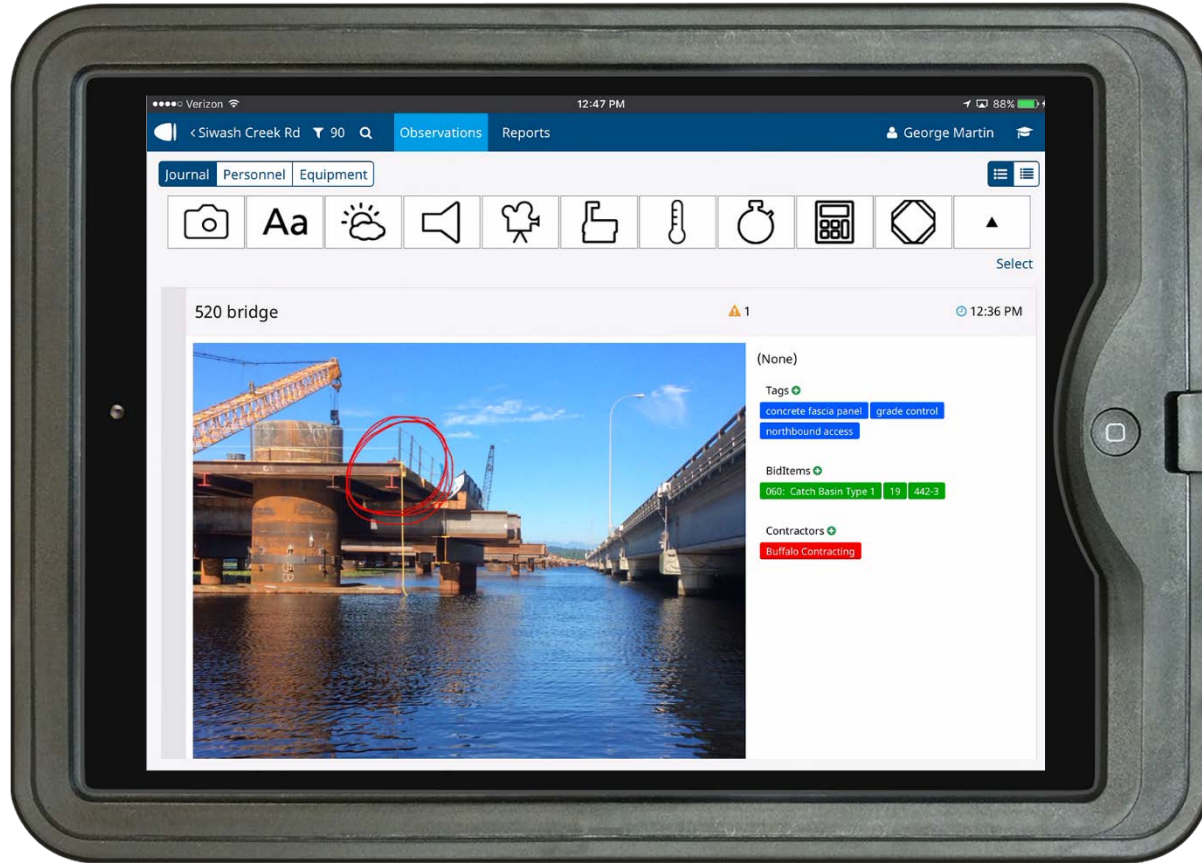
Real-Time Communication Among Stakeholders

Inspectors Field Staff

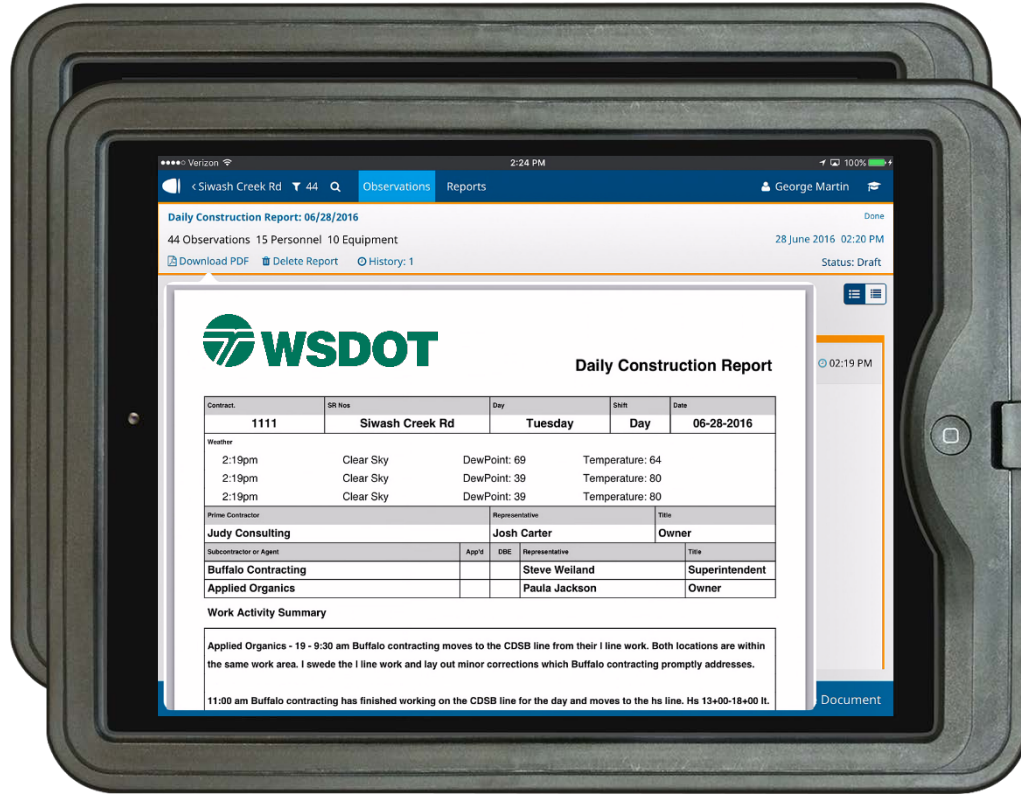


**Design Engineers
Project Engineers
Resident Engineers
Office Personnel**

Simplify Data Collection

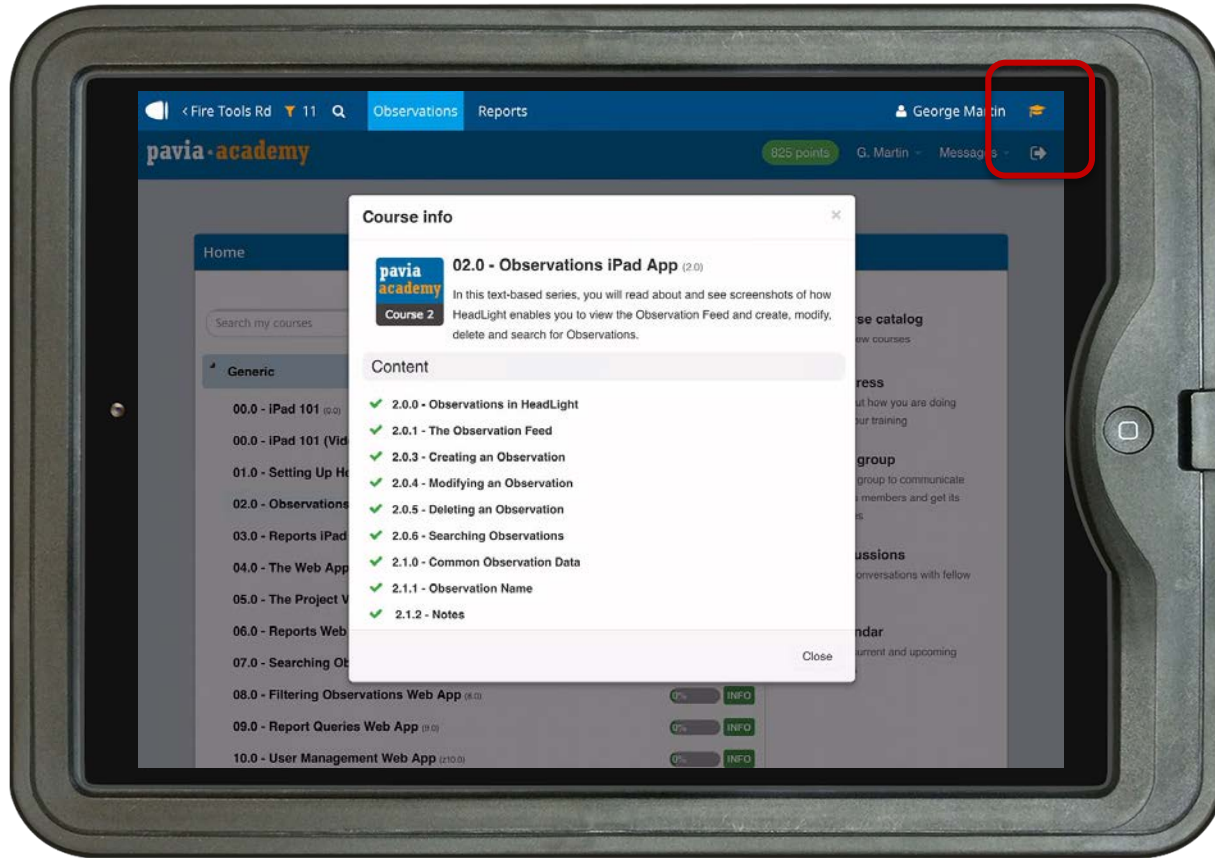


Automate Reporting and Enhance Workflows

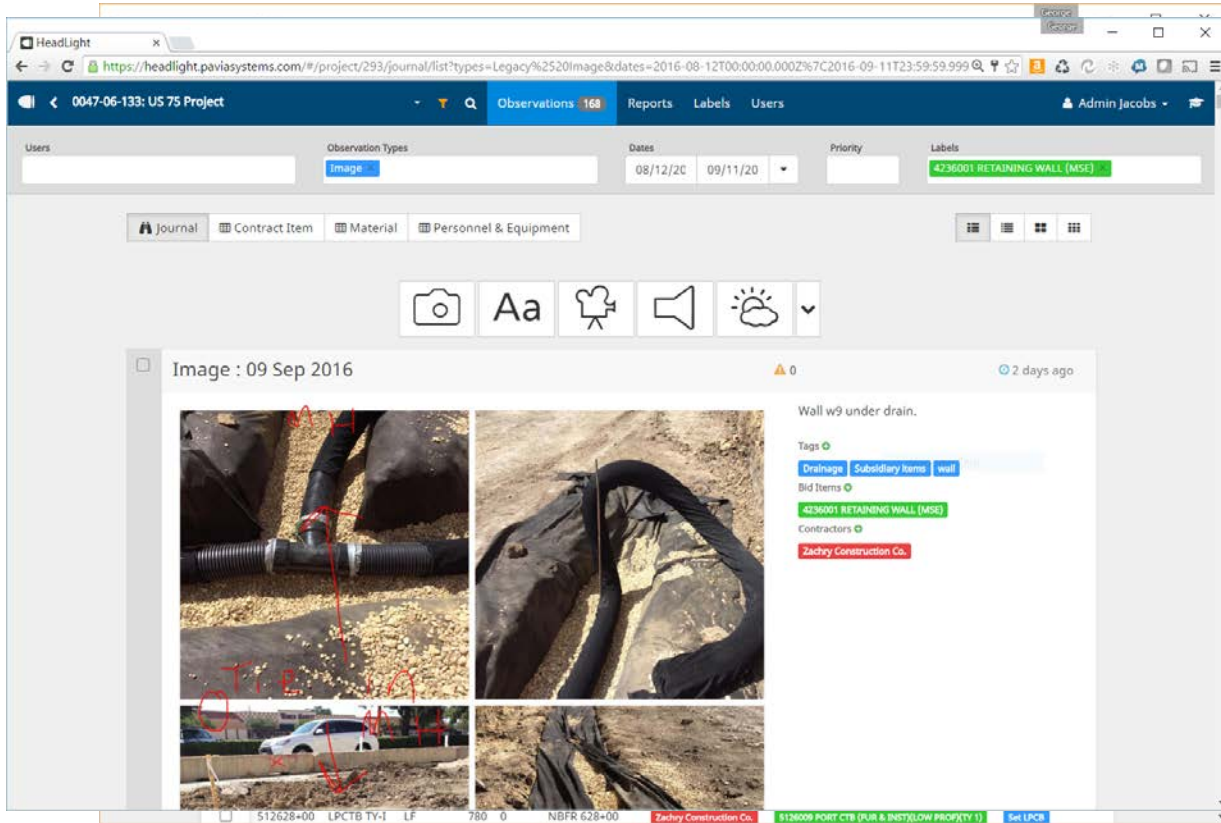


Final Records System

Improve Project Understanding



Collaboratively Track and Manage Issues



Discover Trends and Identify Potential Issues

Observation Types: Observation Types, Dates: 08/13/16, 08/13/16, Priority: High, Labels: High

Start/Stop Work : 31 Aug 2016

- 100 Full Depth Milling - 3'10"
- 100 Crack/Filling, Route & Seal
- 110 Adjust Manhole/Inlet
- 100 Traffic Control - Above Red Lamp
- 100 Provide Performance & Paynor
- 20: Partial Depth Milling - 3'24"
- 30: HMA CL2 Asphalt Base 3.758 PG54-

Image : 07 Sep 2016

Salatin Pkwy / Campbell Rd

Storm drain LWS observed before it had and got too high to enter it. Also to the right of the storm drain is a hole in the drainage. This hole is the root to be removed before finishing the site.

Typ: Paving Complete
Location: 38.24652211, -84.8285444

Image: 10 Aug 2016
Enter Ring Road from Children's to Outer Ring Road.

Daily Construction Report

Contract	Est No.	Date	Week	Day	Year
490027		Wednesday	Day	08-31-2016	

Weather Summary:

Time	Weather	Humidity	Temperature
7:12am	Clear Sky	90	71
10:36am	Clear Sky	74	80

Personnel:

Name	Role
Rick Dean	Superintendent

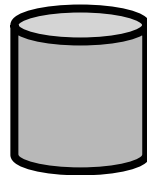
Summary:

- 100 HMA CL2 Asphalt Surf 6.380 PG54-22A1-00: HMA CL2 Asphalt Surf 6.380 PG54-22 - Mill road to front of Victoria's Secret, inner ring road under parking deck and additional patch
- at = 111.79 tons surface
- deck = 88.83 tons surface
- Cheesecake to go parking patch = 2 tons surface
- Daily total = 193.79 tons surface

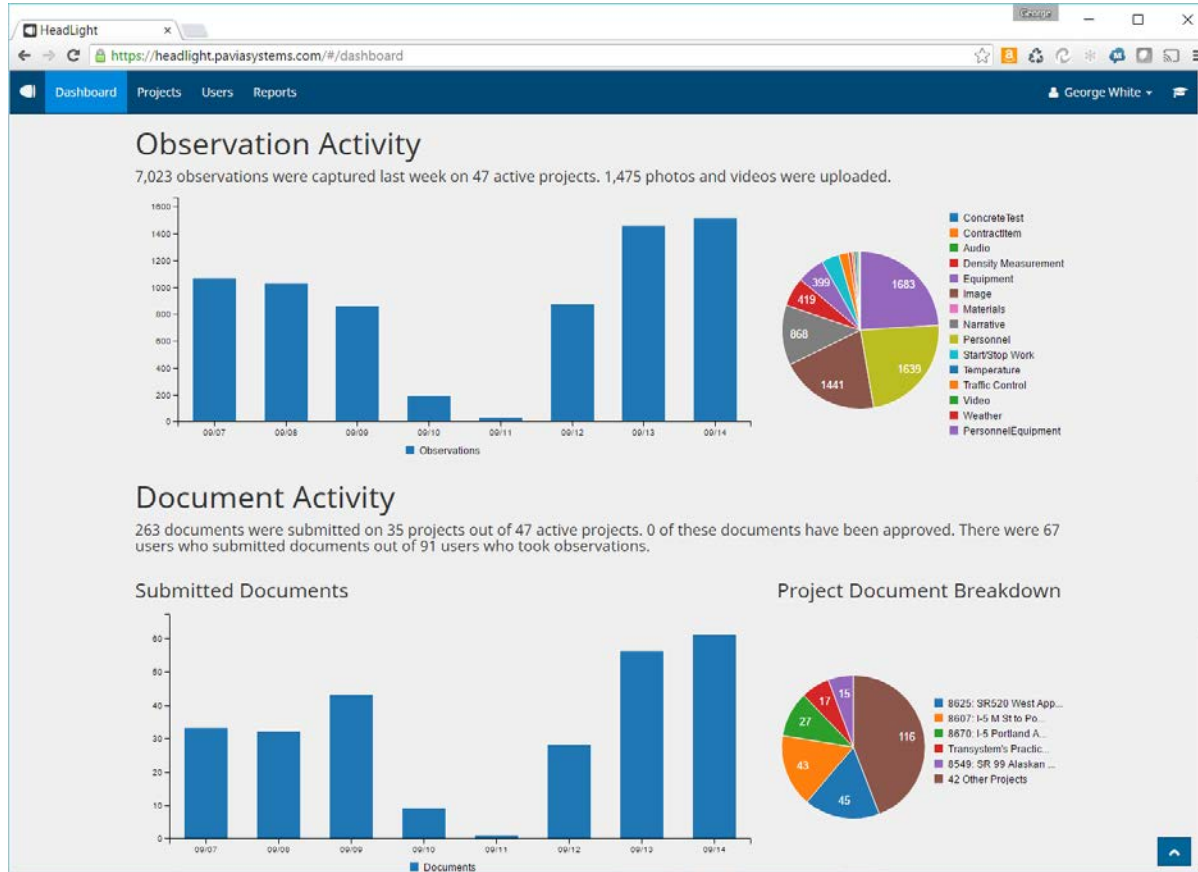
Contractor's Equipment

Contractor	ID	Description	Count	Start	End	Days	Start	End
Louisville Paving & Concret.	Roller Small	Walker Newcom Rd 12	1	2	2	0	0	0
Louisville Paving & Concret.	Roller Med	Car C3636	1	2	2	0	0	
Louisville Paving & Concret.	Roller Large	Car C3634	1	3	0	0	1	
Louisville Paving & Concret.	Paver	Cat Ag 1000a	1	3	0	0	1	
Louisville Paving & Concret.	Broom	Superior Broom 800lb	1	3	0	0	0	
Louisville Paving & Concret.	Pump Truck	Hino Road Truck	4	3	0	0	0	
Louisville Paving & Concret.	Pickup	F150 Pickup Truck	2	1	3	0	0	
Louisville Paving & Concret.	Task Buggy	Landby 1200	1	1	0	3	0	
Louisville Paving & Concret.	Pickup Truck	F350 Pickup Truck	3	1	3	0	0	

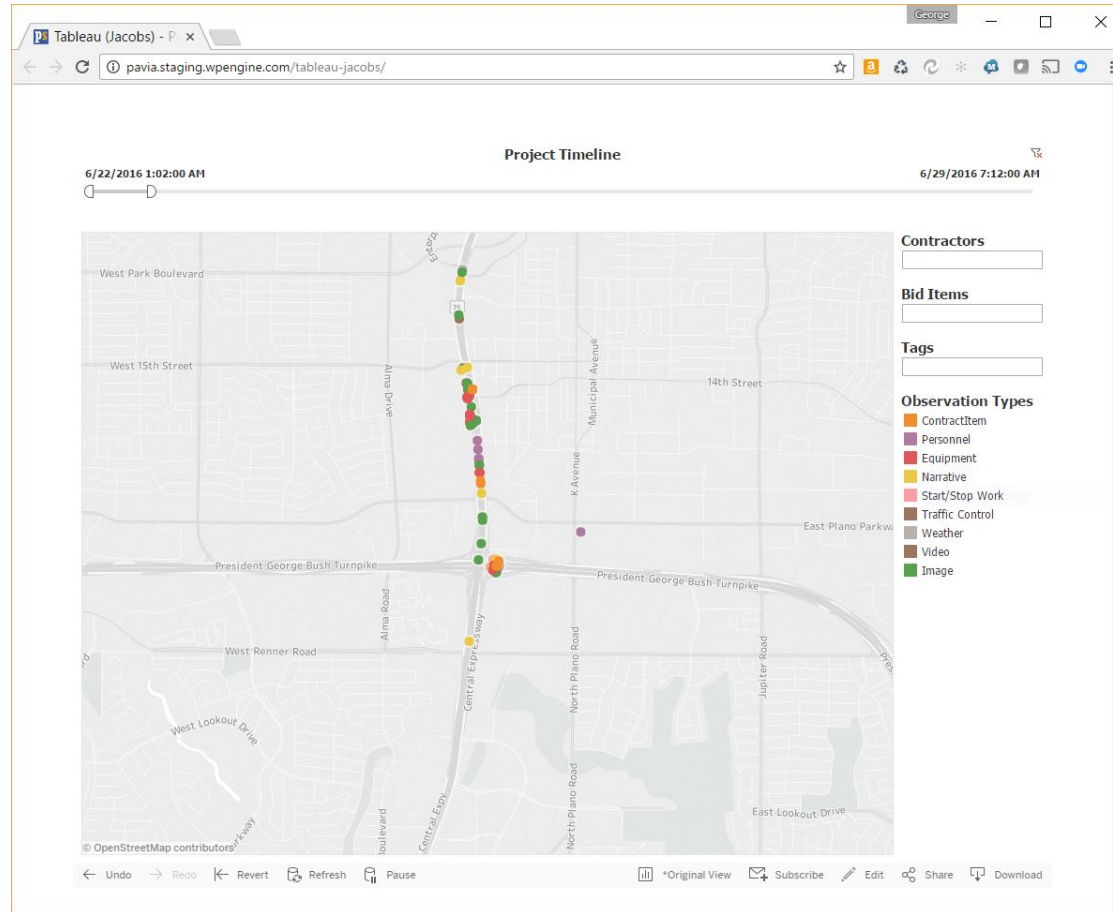
Turning Data Into Information



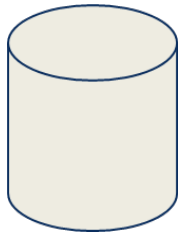
Improve Project Intelligence



And turn into Asset Intelligence

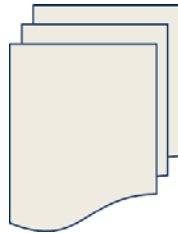


Information Enabled By Digital



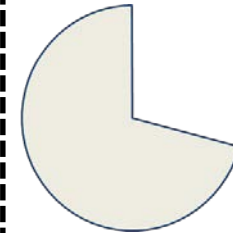
Communication

- Warehousing Collected Data
- Real-Time Access
- Communication\Collaboration



Information

- Claims Abatement
- Risk Reporting
- Owner\Contractor Reporting



Insights

- Past Performance Analytics
- Real-time Data Analysis

Benefits To Be Realized

Office building



Highway



Power plant



Impact on life cycle cost (%)	-15%	-16%	-12%
• Design and engineering	±0%	±0%	-5%
• Construction	-12%	-19%	-14%
• Operations	-18%	-10%	-10%
Impact on construction time (%)	-30%	-23%	-15%

Benefits To Be Realized

Highway



Impact on life cycle cost (%)

-16%

• Design and engineering

±0%

• Construction

-19%

\$24.1 Billion Annually

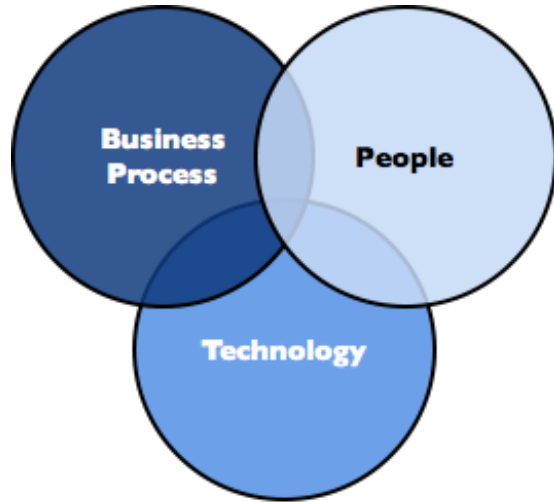
• Operations

-10%

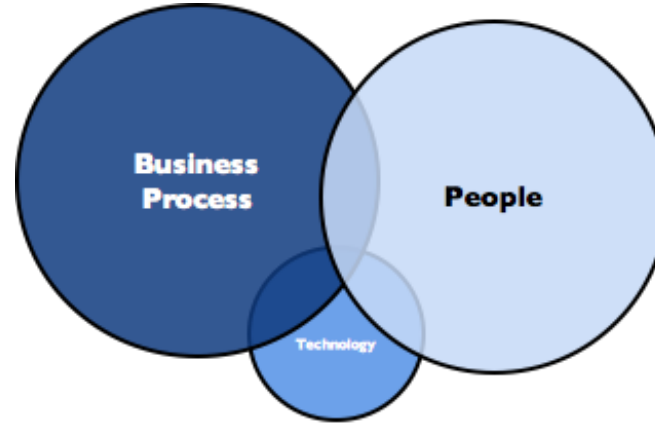
Impact on construction time (%)

-23%

Innovation Requires Change



Perception



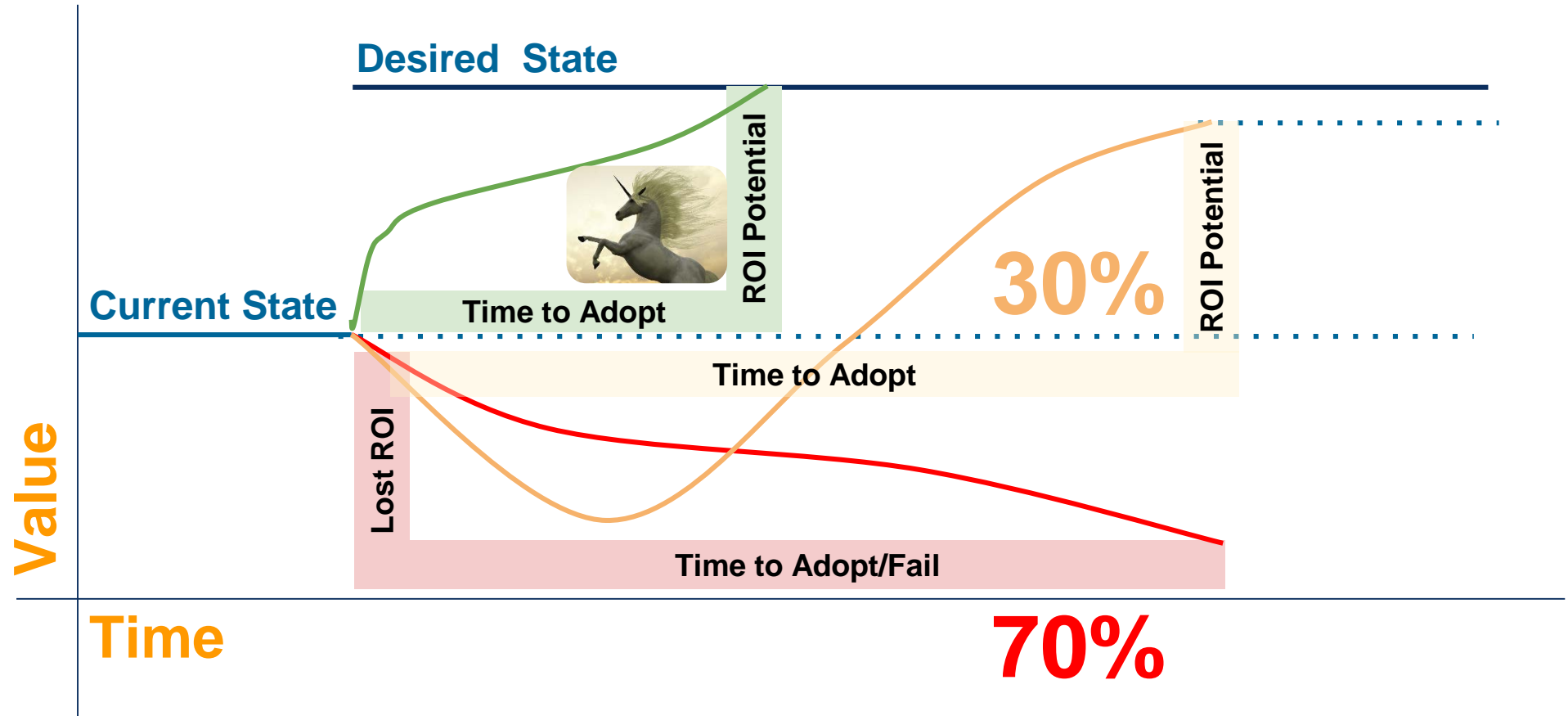
Reality

Most companies find the biggest innovation challenge is executing change to their people and processes.

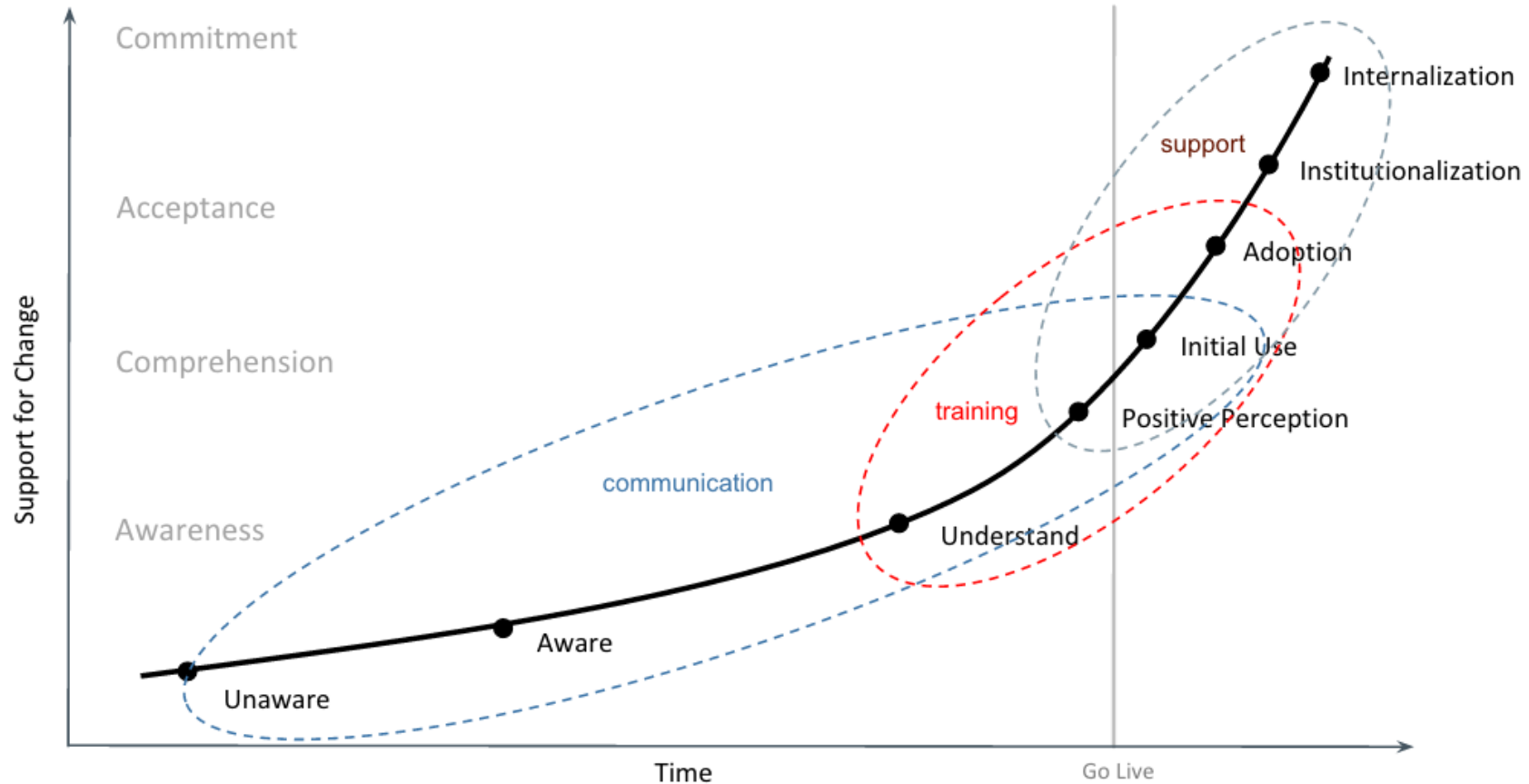
Why Is Change Difficult?



Expectations vs. Reality



Managing Change: Shifting Focus of Activities





7 Critical Success Factors

1. Vision, value, and success metrics
2. Strong sponsorship (HQ and region-level)
3. Energy level
4. Thoughtful deployment
(planning, communication, training, and support)
5. Peer ambassadors
6. Feedback and responsiveness
7. Continuous improvement

Become a ~~Technology Evangelist~~ Pragmatist

- Drive your workflows to digital at point of collection
- Identify business impact and choose open platforms
- Partner with technology providers that understand change management

CHALLENGE THE STATUS QUO



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