



# Accelerating Port Construction with Digital Project Delivery

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Transforming the Way the World Works

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# Agenda

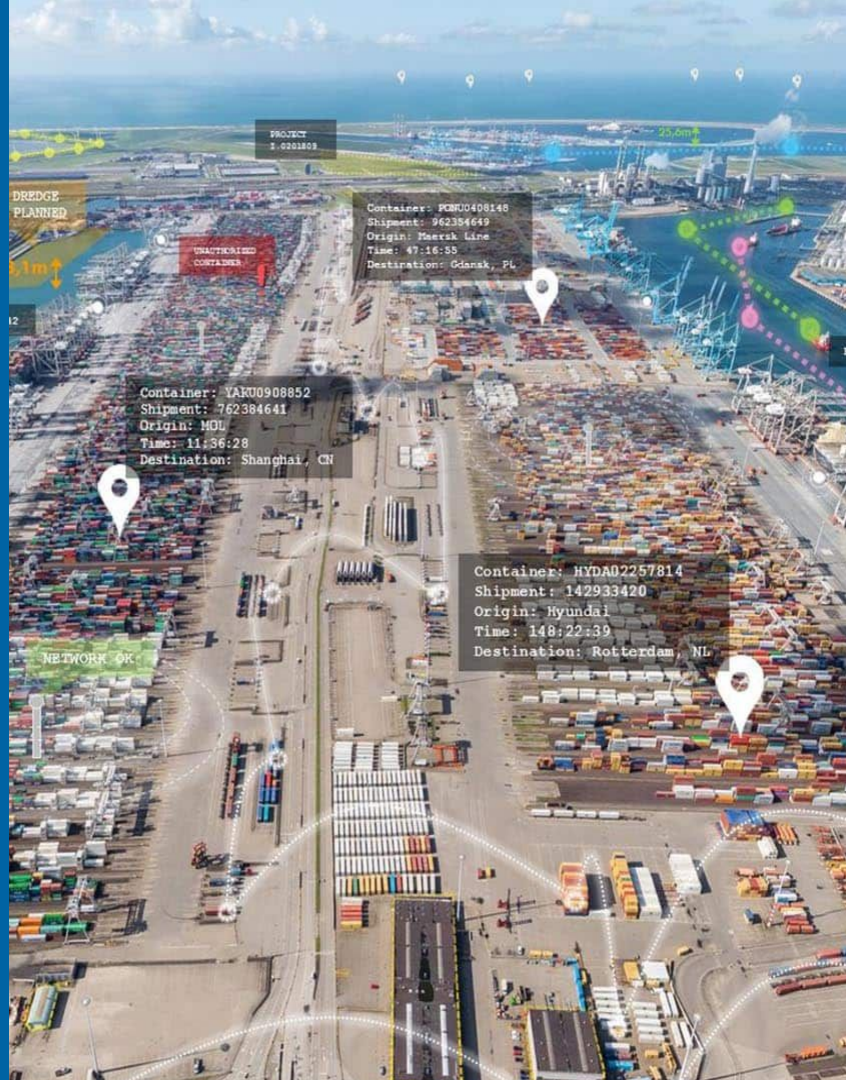
**01** Today's Infrastructure Landscape

**02** Digital Transformation

**03** Connected Construction

**04** Success Stories

**05** Funding Opportunities



# About Trimble

TRANSFORMING THE WAY THE WORLD WORKS

## Innovation



**Founded in 1978 currently in  
S&P 500: TRMB**

\$3.27B revenue in 2019

40+ years of technology innovation with  
2,000 patents and **14% yearly revenue  
re-invested in R&D**

11,500 employees in 34 countries

## Market Leaders



Trimble solutions manage  
>\$400B in **construction**

>70% of top 100 **geospatial** companies  
use Trimble

>2M **transportation** assets managed  
with Trimble Solutions

Overseeing 155M  
acres of **agriculture**

## ESG



Trimble solutions estimated to deliver  
millions of metric tons of **avoided  
greenhouse gas emissions** annually

Top **10 of companies for diversity and  
gender** scores (comparably)

Named **Top 50 ESG Best ESG Company**  
by Investor's Business Daily

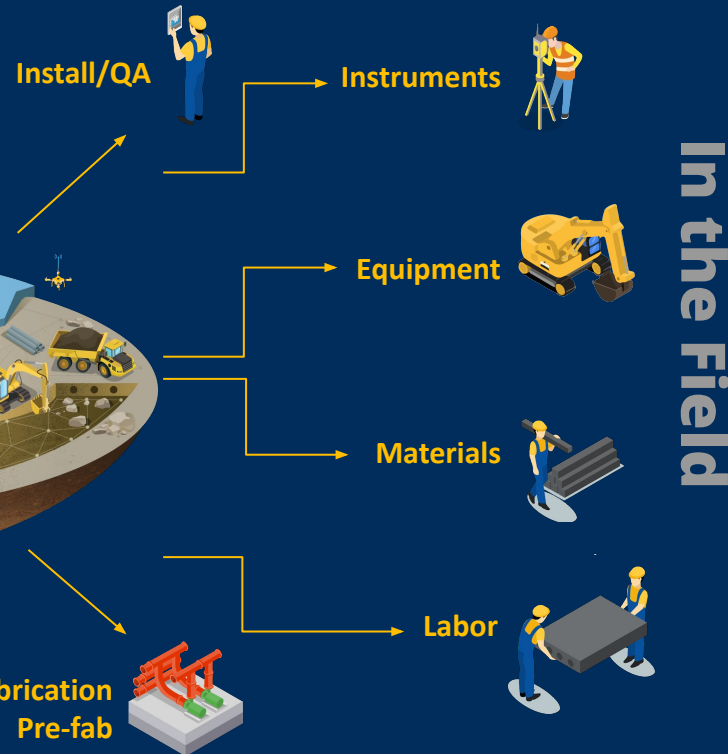
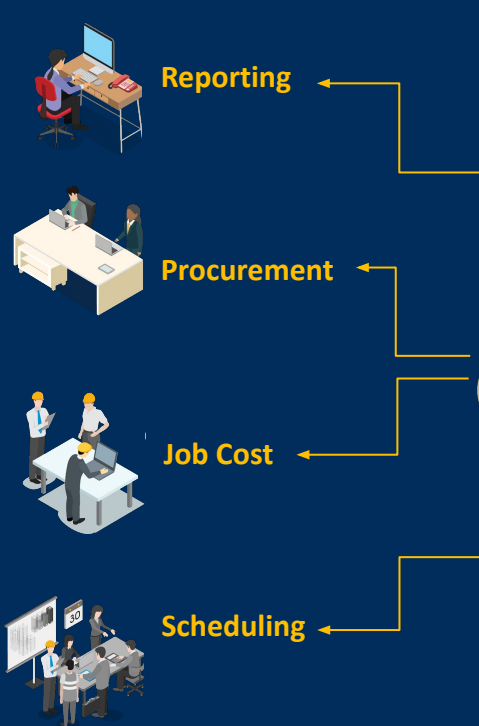
**WSJ's Management Top 250**





# Connected Construction: System-Wide Productivity

In the Office



In the Field



**Fabricatable Design & Detailing**



**Project Docs & Contracts**



**Prod Schedule, Work Order Mgmt**



**Financial: AR, AP Management**

# Leading Inhibitors To Performance

## Trapped Data

Vital Construction Data  
Trapped “On Premises” or  
“On Paper”

## Apps Don't Connect

“Bring Your Own” Application  
Create Silos That Don't  
Connect

## Office Disconnected From Field

Inability To Connect The  
Office & The Field

## Lack of Transparency

Lack of Transparency To A/E  
& Contractor Progress

## Project Surprises

Project Surprises That  
Become Irrecoverable

## Passive Data Ownership

Opportunity For Owners To  
Require Digital Twin, Cost  
Control & Asset Data



# Corpus Christi Pipeline Explosion

**The risk is too great to maintain the status quo**

CORPUS CHRISTI, Texas (AP) — Inadequate communication, planning, and risk management by a dredge operator likely led to the cutting of a liquefied propane pipeline and an explosion that killed five people at a Texas port last year, the National Transportation Safety Board concluded Tuesday.

The explosion happened Aug. 21, 2020, in the Corpus Christi Ship Channel when the dredging vessel Waymon L Boyd's rotating cutter head cut the 16-inch pipeline owned by Enterprise Products. That released a geyser of propane that quickly exploded, enveloping the Waymon L Boyd in flames.

Of the 18 crew members employed by the dredge owner Orion Marine Group, three aboard the Waymon L Boyd and one aboard an adjacent anchor barge were killed. Six other crew members aboard the dredge were injured, one of whom later died.

The Waymon L Boyd was a total loss valued at almost \$9.5 million, while the explosion caused more than \$2 million in damage to the Enterprise Products pipeline.

<https://www.mbtmaq.com/home/news/21940388/ntsb-poor-planning-led-to-deadly-texas-pipeline-bias>



# The Transformation Formula

Bridge the gap between design, construction & operations like never before

## Transparency



**One Single source of truth**

Built around a structured database federating all stakeholders inputs for each project phase, tracking design variation, physical progress and enabling the handover of a digital twin of the project

+

## Performance



**Graphical display of comprehensive data**

Reducing the overall lifecycle costs, the amount of deviation between design and construction, empowering the decision making through a data driven process

+

## Predictability



**Workflow consistency for repeatable success**

Consistency across design and construction workflows leading to cycle time reduction and process improvement

=

## Control



**A confident delivery process**

Improved control over their assets enabled by digital transformation of their organization.





# **Connected Construction**

How to Deliver On The Vision



# Owner Requirements

The Digital Transformation Platform for Capital Improvement Programs

Lifecycle Phase:

**Design**

**Build**

**Operate**

App Category:

**Design  
Collaboration  
& Authoring**

**Project &  
Program  
Management**

**Asset  
Management &  
Maintenance**

Capabilities:

- 3D Model Collaboration
- Integrated Design Process
- Open Data Environment

- Bidding & Procurement
- Contract Management
- Cost & Change Mgmt

- Asset Management
- Work Order Management
- Permitting



# Design Phase Capabilities

## Model Sharing & Tracking

Shareable model for core project data that needs to be aligned, up-to-date, and accessible by all stakeholders.

## Integrated Work Processes

Track or clarify issues in the model by providing notifications and alerts to anyone on the team.

## Informational Views

Get all the information you need with multiple ways to view your model, from 3D views to long and cross-section views.

## Open Environment Interaction

BIM software connectors and standard file formats provide a software agnostic approach to data flow.

## Quantity Takeoff

Generate quantities from the complete model. Quantity takeoff can be extracted, independent of what tool was used to create the data.

## Intelligent Data

Data organized and identified by object-oriented coordinated geometry. Objects are aligned and have a linear position with an XYZ coordinate position.



# Build Phase Capabilities

## Cost Management

Program-level job cost management tracking commitments through actual cost for accurate forecasts.

## Schedule Management

Planning, scheduling and resource management integrated with Microsoft Project & Primavera P6

## Contract Management

Contract management including change management.

## Funding Tracking

Multiple funds tracking and management to ensure compliance with funding governance & reporting.

## File Management

Central repository and auditable document management of all construction files.

## Bid & Award

Complete bidding system from estimate to award with bid tabulation, award and DBE tracking.



# Operate Phase Capabilities

## Work Management

Create and track maintenance activities such as preventive work, reactive work, tests, or inspections.

## Emergency Management

Re-prioritize field work, monitor an ever-changing situation, and streamline reporting for post-event recovery.

## Facility Management

Configurable workflows help you engage management, staff, and residents in the care and maintenance of your facilities.

## Permits & Licensing

Connect assigned work, permits and licensing to GIS data to create greater efficiencies and communications.

## Inspections

Connect valuable inspection data to operational activities across the organization

## Zoning

Align daily work with long-term master plans. Improve public access to valuable community data.





# What Makes Us Different

1

**Centralize Data Between Stakeholders, Across Phases**

*Common Data Environment*

2

**Bridge The Gap Between Design, Construction & Ops**

*Connecting The Office And The Field*

3

**Data & Analytics (AI/ML)**

*Value of Data To Predict Outcomes*





# Why Owners, Designers and Contractors are adopting Digital Project Delivery?

## Risk Reduction and Shared Savings

### The Project

Last year, this Norway PPP project opened the 17 mile long national road 3/25 Løten-Elverum after 26 months of construction.

Total estimated cost of \$657M USD, including operation and maintenance.

Utilized digital and connected construction technologies including survey, Tekla design, Quadri, machine control, augmented reality, and construction management software

### Value Proposition

The road opened three months ahead of schedule with \$167M USD in shared savings

- 25% cost savings
- 10% time savings
- 25% reduction in CO2 emissions



# Outcomes

Digital project delivery providing tangible, real world outcomes

Customer:



App Category:

DESIGN COLLABORATION

PROJECT MANAGEMENT

ASSET MANAGEMENT

Trimble Solution:



Lifecycle Benefits:

#### BIM Utilization & Integration:

- 40 iterative designs
- 4D model created with schedule
- 5D model created with cost

#### Cost & Schedule Savings:

- +\$10M budget reduction
- Utility relocation 6 months early

#### Scalable Collaboration:

- CIP grew from \$200M to \$1.4B
- Coordination of 1200+ firms
- Management of 500+ contracts

#### Process Optimization:

- Digitized institutional processes
- Created visibility & accountability
- Decreased payment cycle time

#### Digitization:

- Paperless public reporting
- Digital work order management
- Real Time monitoring

#### Some other benefit:

- 250% work order improvement
- Increased operational awareness





**\$547M**  
Capital Improvement  
Program

# A Connected Vision

## Project Management and Asset Management

The City of Raleigh is the capital of North Carolina with a population of just over 470,000. They have been utilizing Cityworks for over 10 years and e-Builder Enterprise for over 3 years.

- Leverages e-Builder to manage contracts, payments, submittals, communications, inspections and RFI's.
- Uses Cityworks in order to track maintenance of existing infrastructure (e.g. water, sewer, stormwater mains, building facilities)
- Integrating workflows so that completed project information automatically updates the maintenance platform and identified maintenance issues can automatically escalate to a created construction project.



[Watch Raleigh Webinar](#)





# AAPA Urges Congress to Pass Sustained Infrastructure Investment

America's seaports are doing their part, investing \$31 billion in port-side infrastructure, but it's not enough. The U.S. needs major, long-term, infrastructure investment to keep American trade and commerce competitive and on the move.

FY21

FY22

NORMAL APPROPRIATION + IJA SUPPLEMENT PER YEAR FY22-26

Funding from the Infrastructure Investment & Jobs Act boosts critical investment every year, for 5 years.

\$230 million

\$300 million

\$450 million

**Port Infrastructure Development Program (PIDP) - \$2.25B TOTAL**  
Port equipment and facilities improvements.

\$3.75 billion

\$2.75 billion

\$540 million

**Army Corps of Engineers Coastal Navigation Program - \$2.7B TOTAL**  
Dredge and maintain federal coastal navigation channels.

\$2 billion

\$2.2 billion

\$3.14 billion

**Rebuilding American Infrastructure with Sustainability and Equity (RAISE ) & Infrastructure for Rebuilding America (INFRA) - \$15.7B TOTAL**  
Nationally significant transportation projects including roads, bridges and rail.

\$375 million

\$500 million

\$1 billion

**Consolidated Rail Infrastructure and Safety Improvements (CRISI) - \$5B TOTAL**  
Rail-focused infrastructure and intermodal port projects.

\$10.5 million

\$14.8 million

\$5 million

**America's Marine Highways - \$25M TOTAL**  
Promote sea freight transportation.

**NEWLY FUNDED FOR 2022!**

\$50 million

**Port Truck Idling Program - \$250M TOTAL**  
Reduce truck emissions at ports.

\$10 million

**Electric or Low-Emitting Ferry Program - \$50M TOTAL**  
Purchase of electric or near-zero emissions passenger ferries

# Thank You

## A Partner You Can Trust

For Questions or Feedback  
please contact:

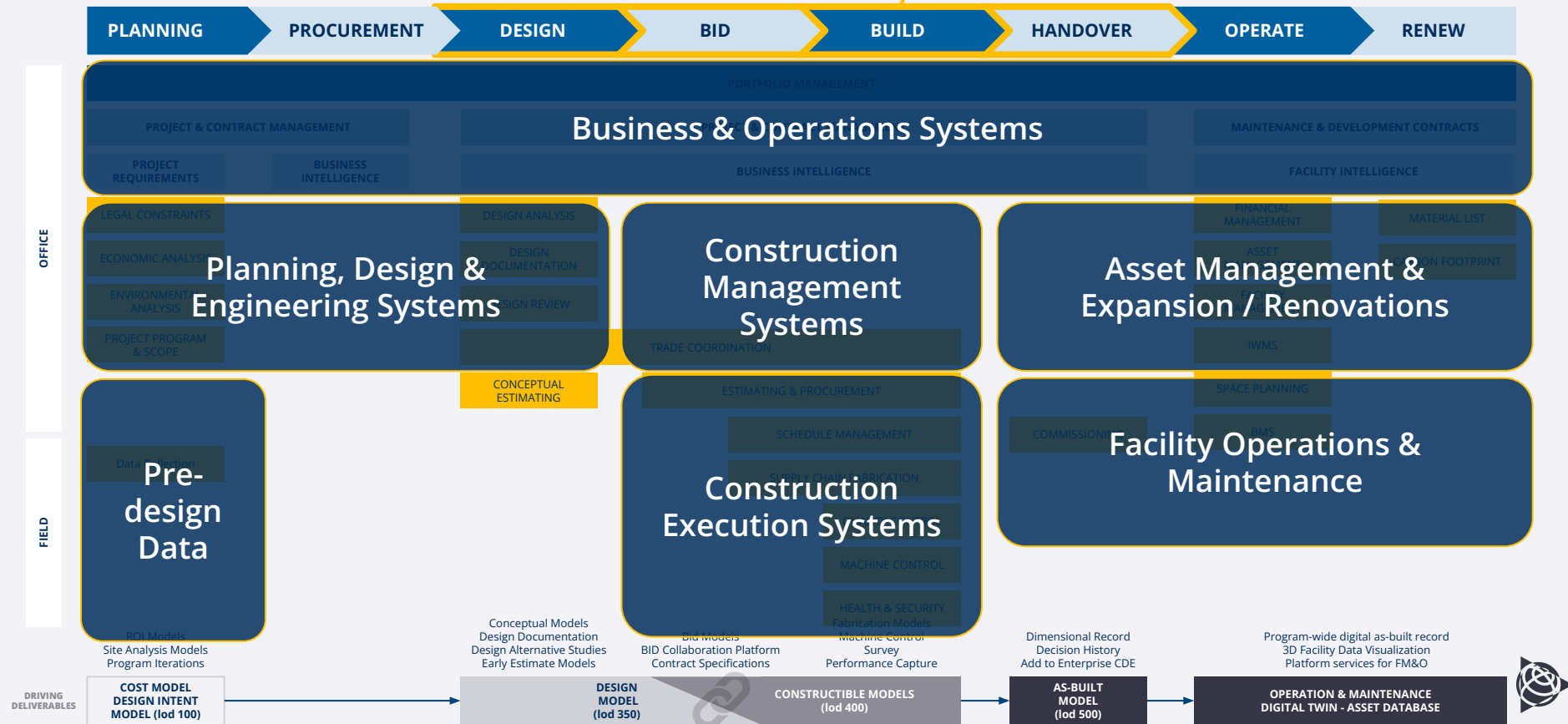
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# Technology Ecosystem

Hand-off between design and construction is where most breakdowns occur.





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PLANNING

PROCUREMENT

DESIGN

BID

BUILD

HANDOVER

OPERATE

RENEW

## Business & Operations Systems

CDE & DOCUMENT MANAGEMENT



Trimble Connect



ProjectSight



Quadri

FINANCE, PM & ERP



VIEWPOINT

## Planning, Design & Engineering Systems

PLANNING & CONCEPTUAL DESIGN



Trimble Quantm

CONTRACT DOCUMENTS & DETAIL DESIGN



Quadri

## Construction Management Systems

ESTIMATING & PROCUREMENT



Quest

SCHEDULING & PRODUCTIVITY



## Asset Management & Facility Maintenance

ASSET MANAGEMENT



Quadri

Cityworks  
Empowering GIS



AgileAssets

## Pre-Design Data

SURVEY & AERIAL DATA



ROI Models  
Site Analysis Models  
Program Iterations

COST MODEL  
DESIGN INTENT  
MODEL (Iod 100)

CONCEPTUAL  
ESTIMATING

## Construction Execution Systems

SURVEY & LAYOUT



BID Models  
BID Collaboration Platform  
Contract Specifications

DESIGN  
MODEL  
(Iod 350)

IoT, ROBOTICS &  
MACHINE CONTROL



Machine Control  
Survey  
Performance Capture

CONSTRUCTIBLE MODELS  
(Iod 400)

COMMISSIONING

SPACE PLANNING

BMS

Dimensional Record  
Decision History  
Add to Enterprise CDE

AS-BUILT  
MODEL  
(Iod 500)

Program-wide digital as-built record  
3D Facility Data Visualization  
Platform services for FM&O

OPERATION & MAINTENANCE  
DIGITAL TWIN - ASSET DATABASE



OFFICE

FIELD

DRIVING  
DELIVERABLES