AUTODESK UNIVERSITY

Demain's Journey from Strategic Partnership to Commercial Entity

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Chief Executive Officer

Introduction

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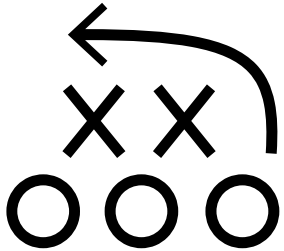
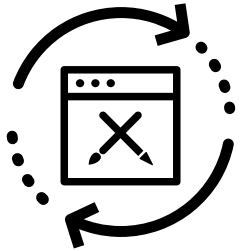
Demain

Learning Objectives

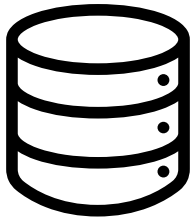
Learn about the industry problems that inspired the formation of Demain.



Learn the history of how Demain has evolved from a branded collaboration to an operating entity.



Learn about the challenges the consortium has had to overcome.



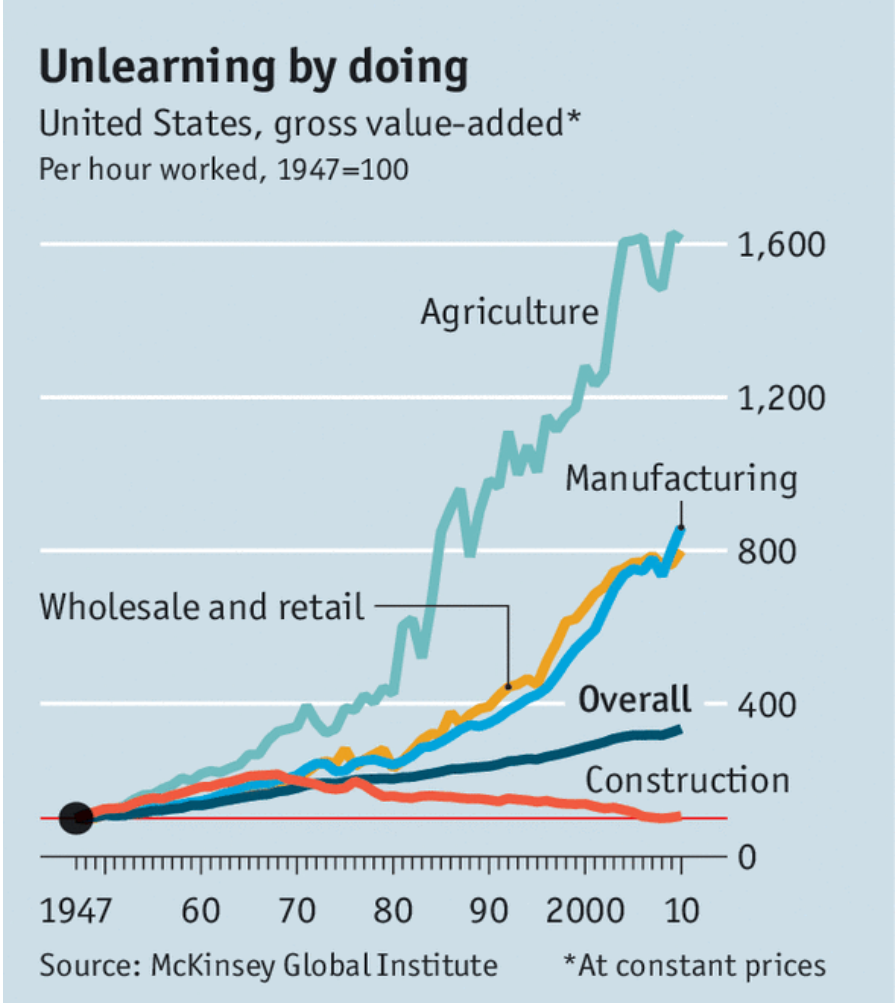
Discover new insights that will help you implement your own industrialized construction workflows.

Outside the Industry vs Inside the Industry

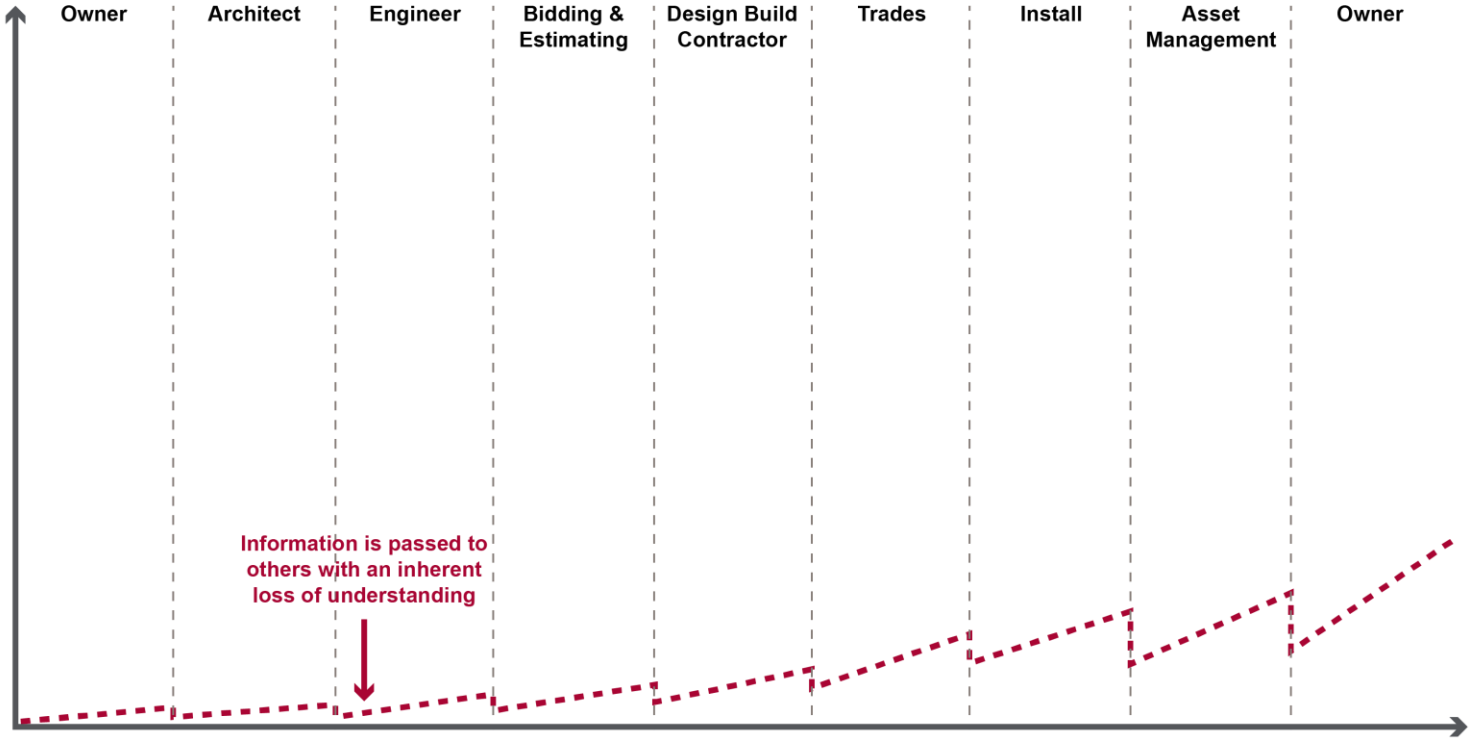
- How do you copy an address on your phone from one app to another?
- Would you send a car down a manufacturing assembly line twice?

Industry Productivity

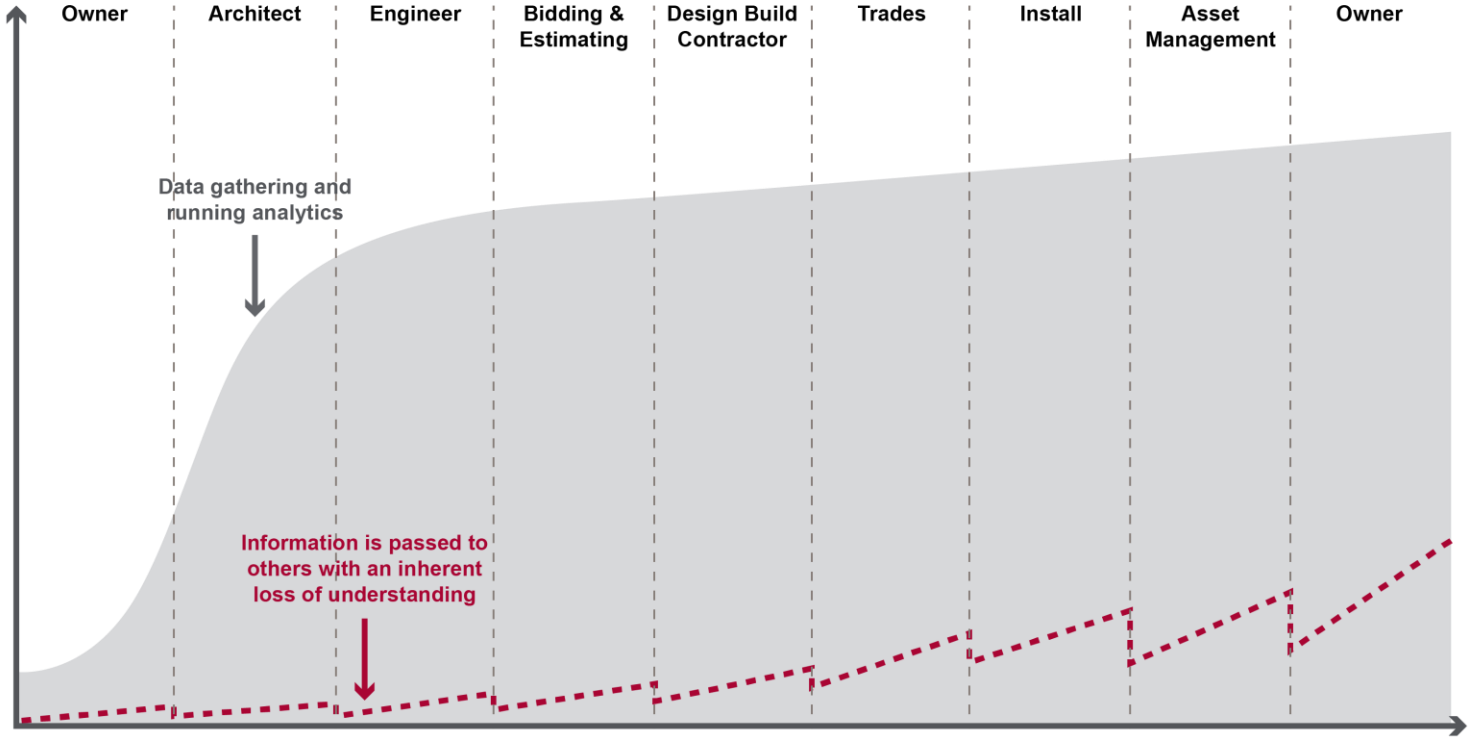
- Most industries have seen significant growth in productivity
- Productivity in construction has actually decreased over time



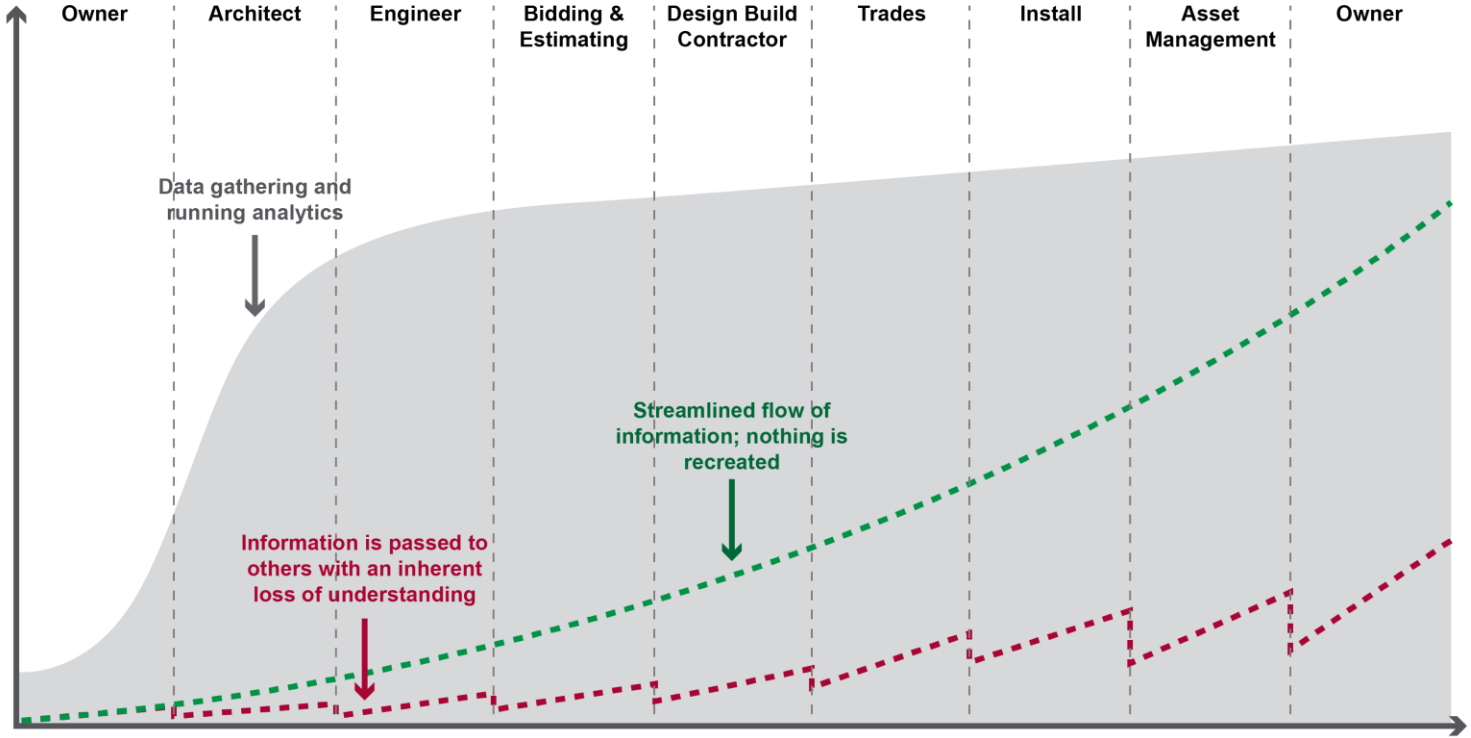
The Costs of Communication



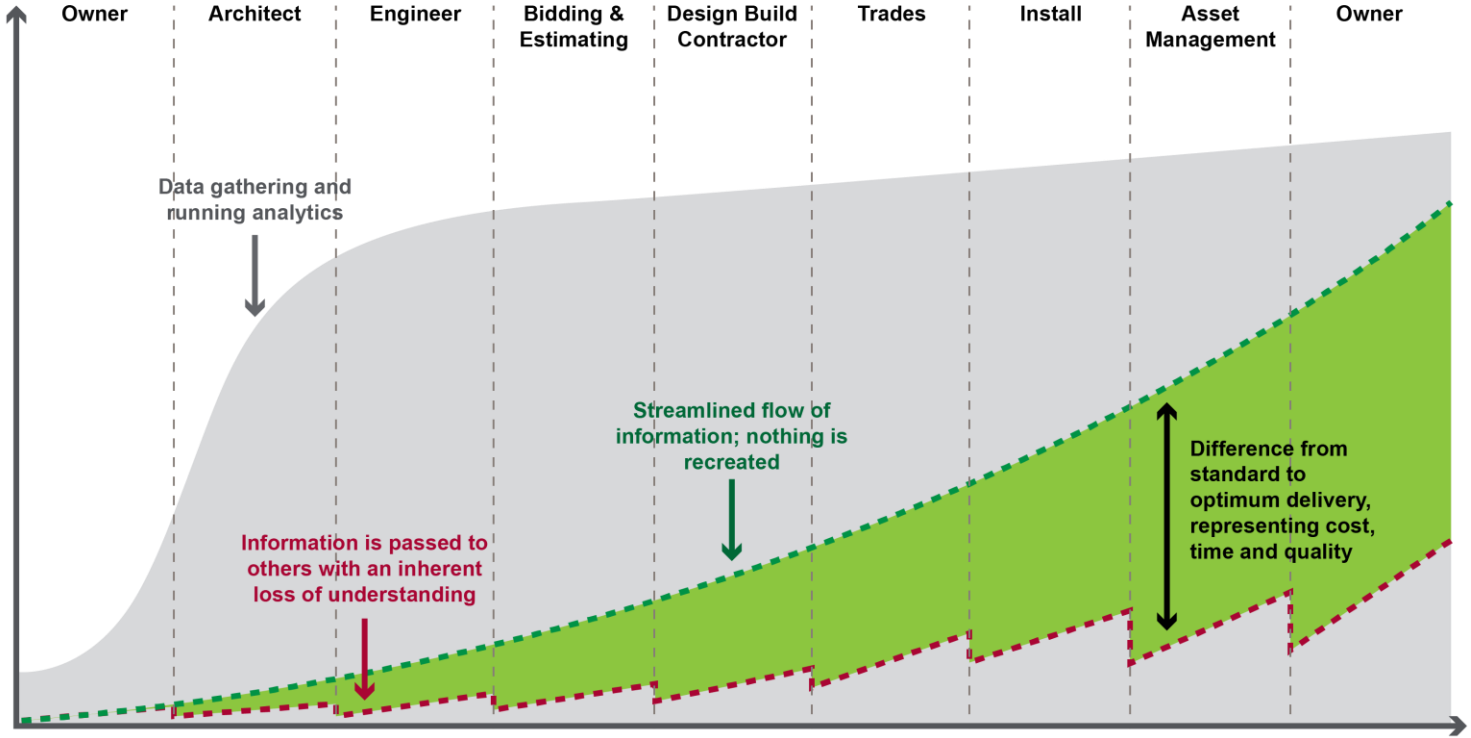
The Opportunity for Data



The Opportunity for Data



The Opportunity for Data

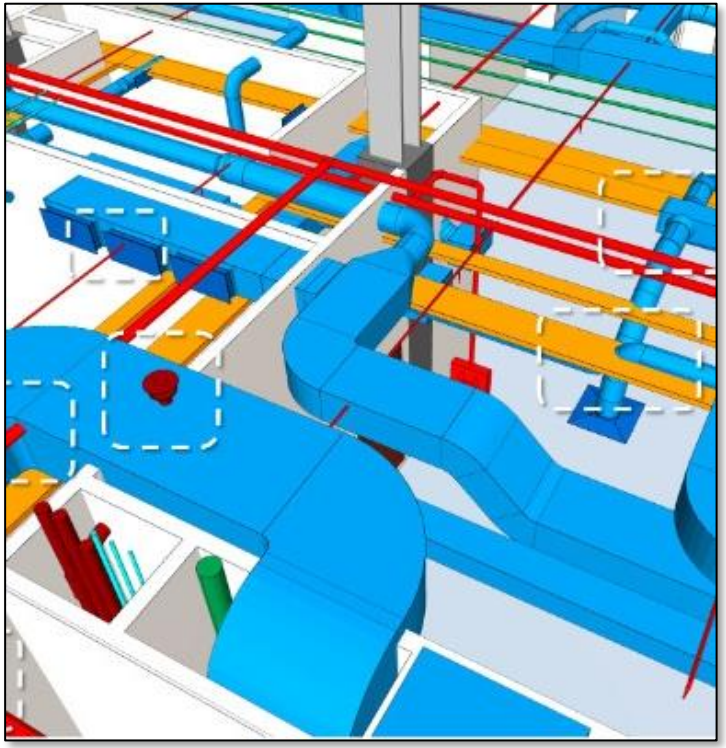


How Do Contractors View Design Professionals?

- Necessary evil
- Arrogant/Disconnected
- Incomplete drawing packages
- Uncoordinated deliverables
- Poor communication

How Do Trade Firms View Each Other?

- Conflicting priorities
- Competing for time and space
- Require constant coordination
- Incomplete modeling
- Poor communication



DE | MA | IN

= DESIGN | = MANUFACTURING | = INSTALLATION

DPMG Corporation
Design · Process · Management

REXMOORE

CONSTRUCTION INNOVATIONS

KLH ENGINEERS

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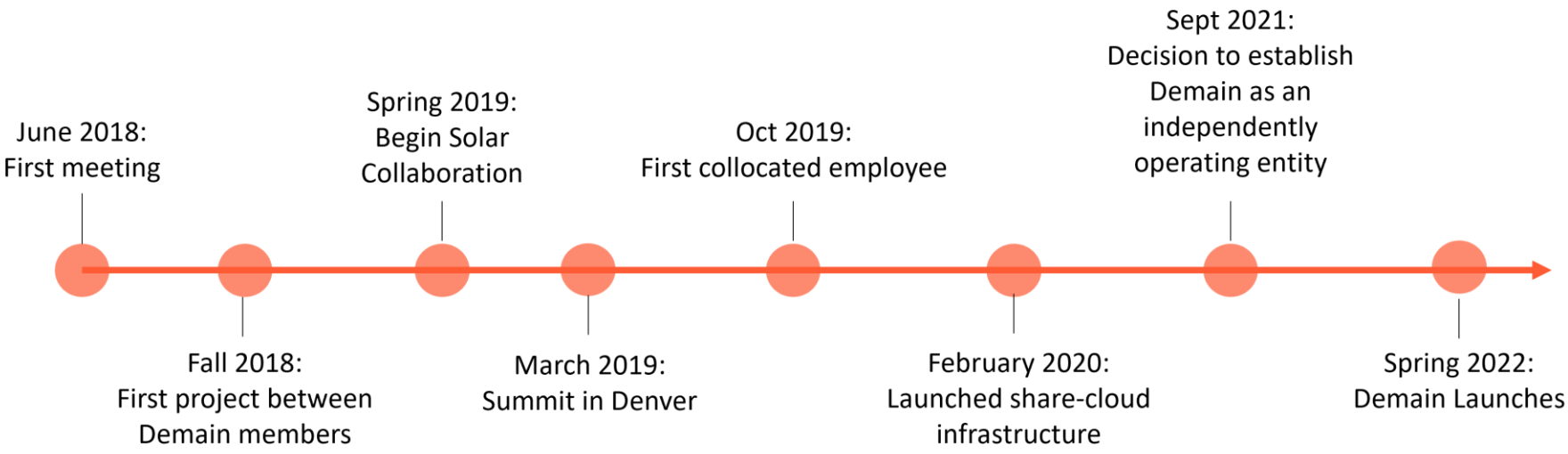
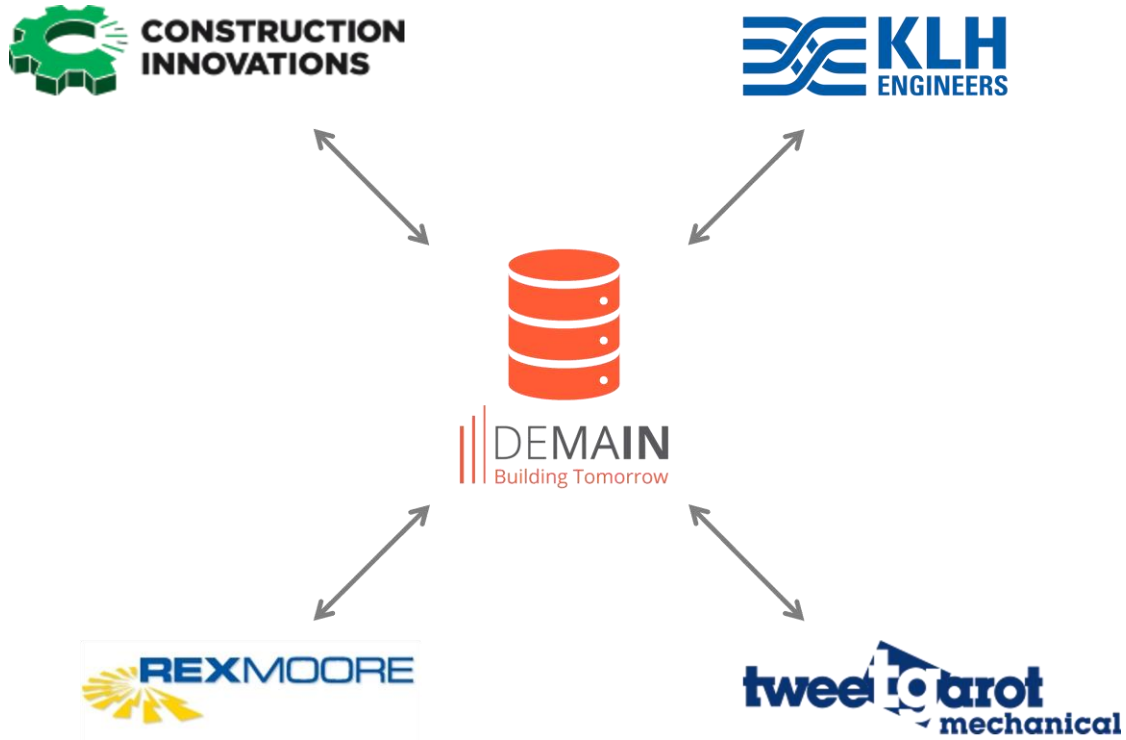
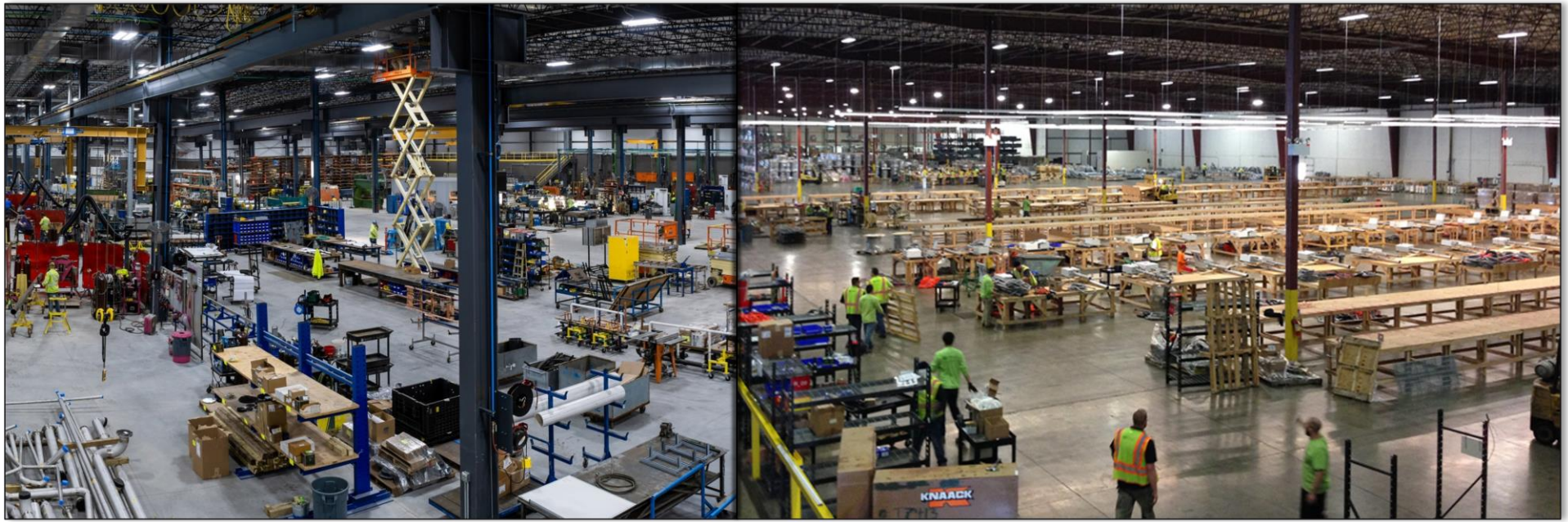
Demain Timeline



Shared Cloud Infrastructure

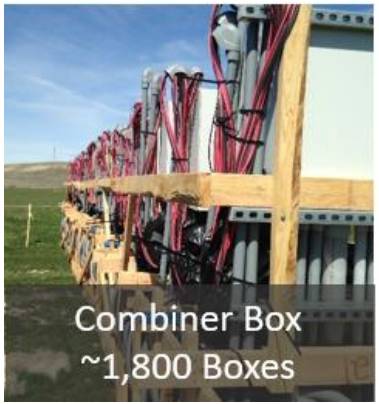


Manufactured Project Delivery



Data-Driven Manufacturing

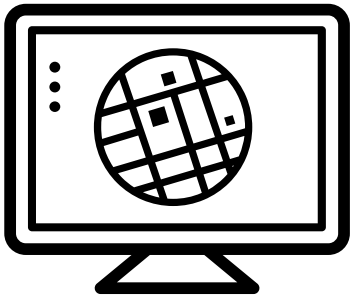
- Opportunities
  - String wire harnesses
  - Feeder harnesses
  - Combiner box assemblies
  - Loose material kitting
- Benefits
  - Factory inspection/testing
  - Just-in-time shipping
  - Predictable cost
  - Consistent quality



Data-Driven Manufacturing

- Typical BOM
  - Fuses ~40,000
  - ZipRingTM ~800,000
  - Zip Ties ~150,000
  - Wire Management Hangers ~750,000
  - Ground Jumper Wires ~10,000
  - Splitters ~25,000
  - Over 200,000 individual wires!

Data-Driven Manufacturing



Preliminary design provided in AutoCAD (2D)

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Design Criteria Based on Manufacturing Standards

- Row/module settings
- String wiring design
- Hardware requirements

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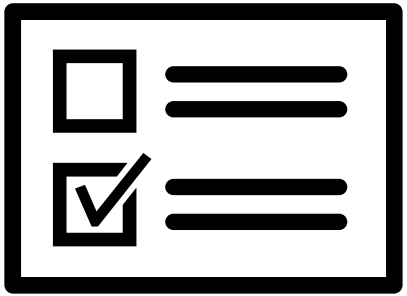
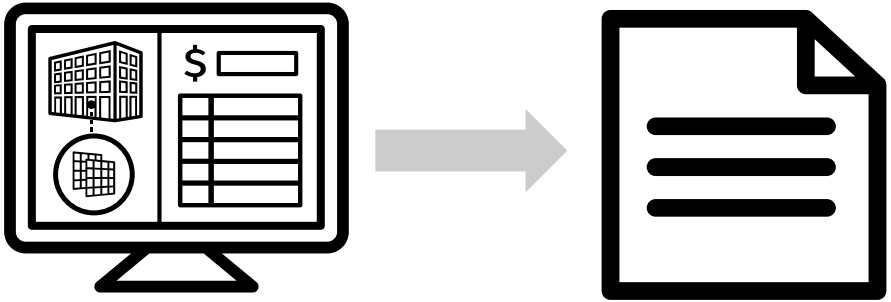
Detailed design translated into Revit (3D)

Data-Driven Manufacturing



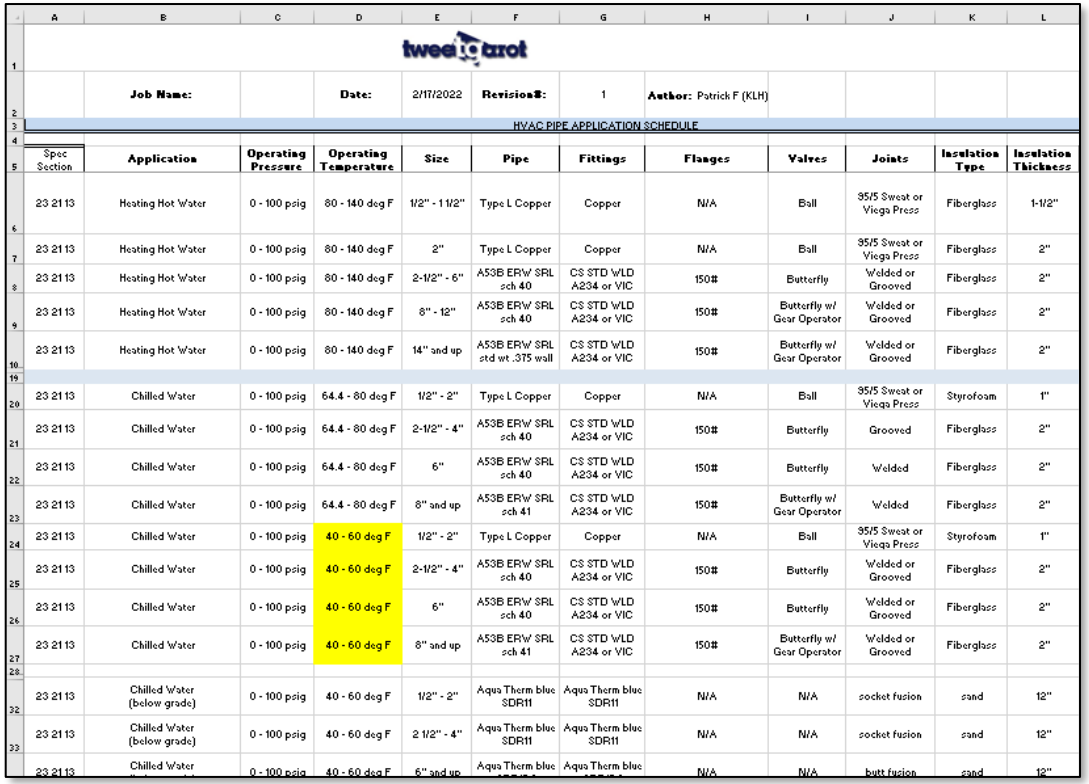
Design Validation and Optimization



Development through the Revit API can analyze the model providing full bills of material, aiding the manufacturing process

Setting the Stage

- Pre-project Collaboration
  - Align on pipe/duct application schedule
  - Clear definition on:
    - Materials, valves, hangers, and insulation
    - Dictate the fabrication part availability



tweetatzot

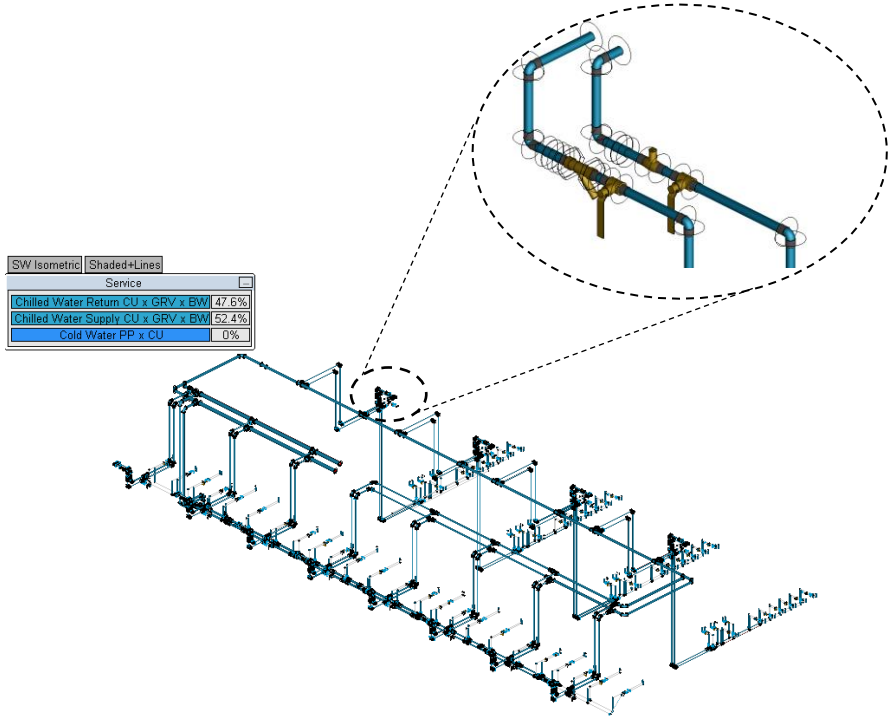
Job Name: **Date:** 2/17/2022 **Revision#:** 1 **Author:** Patrick F (KLH)

HVAC PIPE APPLICATION SCHEDULE

Spec Section	Application	Operating Pressure	Operating Temperature	Size	Pipe	Fittings	Flanges	Valves	Joints	Insulation Type	Insulation Thickness
23 21 13	Heating Hot Water	0 - 100 psig	80 - 140 deg F	1/2" - 1 1/2"	Type L Copper	Copper	N/A	Ball	95/5 Sweat or Viega Press	Fiberglass	1-1/2"
23 21 13	Heating Hot Water	0 - 100 psig	80 - 140 deg F	2"	Type L Copper	Copper	N/A	Ball	95/5 Sweat or Viega Press	Fiberglass	2"
23 21 13	Heating Hot Water	0 - 100 psig	80 - 140 deg F	2-1/2" - 6"	A53B ERW SRL sch 40	CS STD WLD A234 or VIC	150#	Butterfly	Welded or Grooved	Fiberglass	2"
23 21 13	Heating Hot Water	0 - 100 psig	80 - 140 deg F	8" - 12"	A53B ERW SRL sch 40	CS STD WLD A234 or VIC	150#	Butterfly w/ Gear Operator	Welded or Grooved	Fiberglass	2"
23 21 13	Heating Hot Water	0 - 100 psig	80 - 140 deg F	14" and up	A53B ERW SRL std wt .375 wall	CS STD WLD A234 or VIC	150#	Butterfly w/ Gear Operator	Welded or Grooved	Fiberglass	2"
23 21 13	Chilled Water	0 - 100 psig	64.4 - 80 deg F	1/2" - 2"	Type L Copper	Copper	N/A	Ball	95/5 Sweat or Viega Press	Styrofoam	1"
23 21 13	Chilled Water	0 - 100 psig	64.4 - 80 deg F	2-1/2" - 4"	A53B ERW SRL sch 40	CS STD WLD A234 or VIC	150#	Butterfly	Grooved	Fiberglass	2"
23 21 13	Chilled Water	0 - 100 psig	64.4 - 80 deg F	6"	A53B ERW SRL sch 40	CS STD WLD A234 or VIC	150#	Butterfly	Welded	Fiberglass	2"
23 21 13	Chilled Water	0 - 100 psig	64.4 - 80 deg F	8" and up	A53B ERW SRL sch 41	CS STD WLD A234 or VIC	150#	Butterfly w/ Gear Operator	Welded	Fiberglass	2"
23 21 13	Chilled Water	0 - 100 psig	40 - 60 deg F	1/2" - 2"	Type L Copper	Copper	N/A	Ball	95/5 Sweat or Viega Press	Styrofoam	1"
23 21 13	Chilled Water	0 - 100 psig	40 - 60 deg F	2-1/2" - 4"	A53B ERW SRL sch 40	CS STD WLD A234 or VIC	150#	Butterfly	Welded or Grooved	Fiberglass	2"
23 21 13	Chilled Water	0 - 100 psig	40 - 60 deg F	6"	A53B ERW SRL sch 40	CS STD WLD A234 or VIC	150#	Butterfly	Welded or Grooved	Fiberglass	2"
23 21 13	Chilled Water	0 - 100 psig	40 - 60 deg F	8" and up	A53B ERW SRL sch 41	CS STD WLD A234 or VIC	150#	Butterfly w/ Gear Operator	Welded or Grooved	Fiberglass	2"
23 21 13	Chilled Water (below grade)	0 - 100 psig	40 - 60 deg F	1/2" - 2"	Aqua Therm blue SDR11	Aqua Therm blue SDR11	N/A	N/A	socket fusion	sand	12"
23 21 13	Chilled Water (below grade)	0 - 100 psig	40 - 60 deg F	2 1/2" - 4"	Aqua Therm blue SDR11	Aqua Therm blue SDR11	N/A	N/A	socket fusion	sand	12"
23 21 13	Chilled Water	0 - 100 psig	40 - 60 deg F	6" and up	Aqua Therm blue	Aqua Therm blue	N/A	N/A	butt fusion	sand	12"

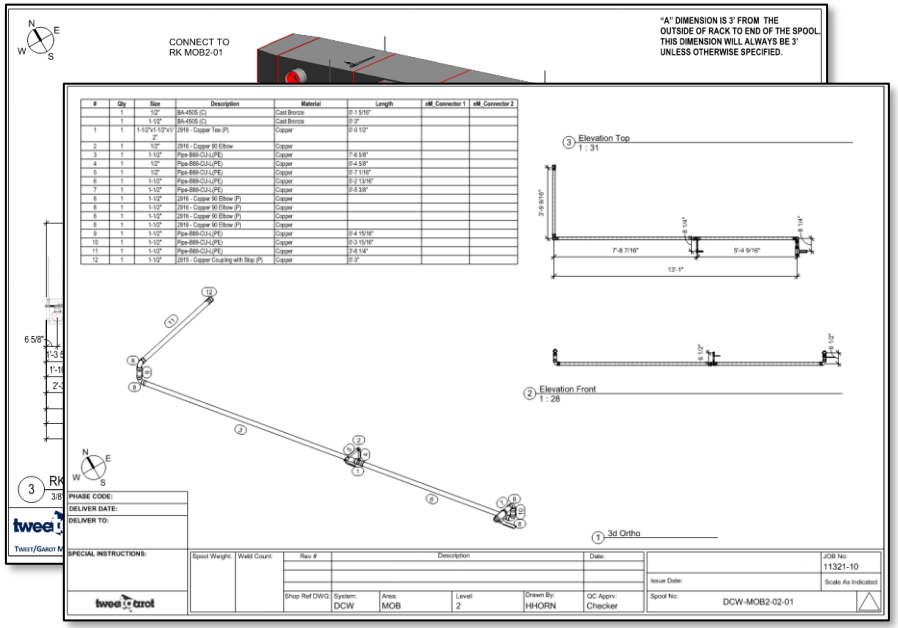
Integrated Delivery

- Opportunities
  - Shop standards drive modeling
  - Prefabrication library is uploaded to support engineer drafting
  - Costing database is linked into model
- Benefits
  - Engineered model is constructible
  - Eliminate manual take-off
  - Supports manufactured deployment



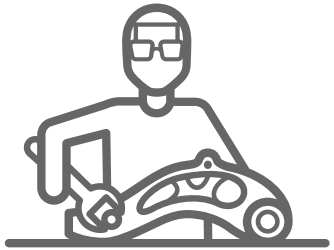
Data-Driven Prefabrication

- Opportunities
  - Pipe Spools
  - Duct Spools
  - Multi-trade racking
  - Loose material kitting
- Benefits
  - Factory inspection and testing
  - Unique identification and sequencing
  - Just-in-time shipping
  - Elevation specific details for hanger fabrication
  - Model data exports to shop fabrication equipment



Key Takeaways

Data is the common language



Inform design with manufacturing and field standards

Engage!