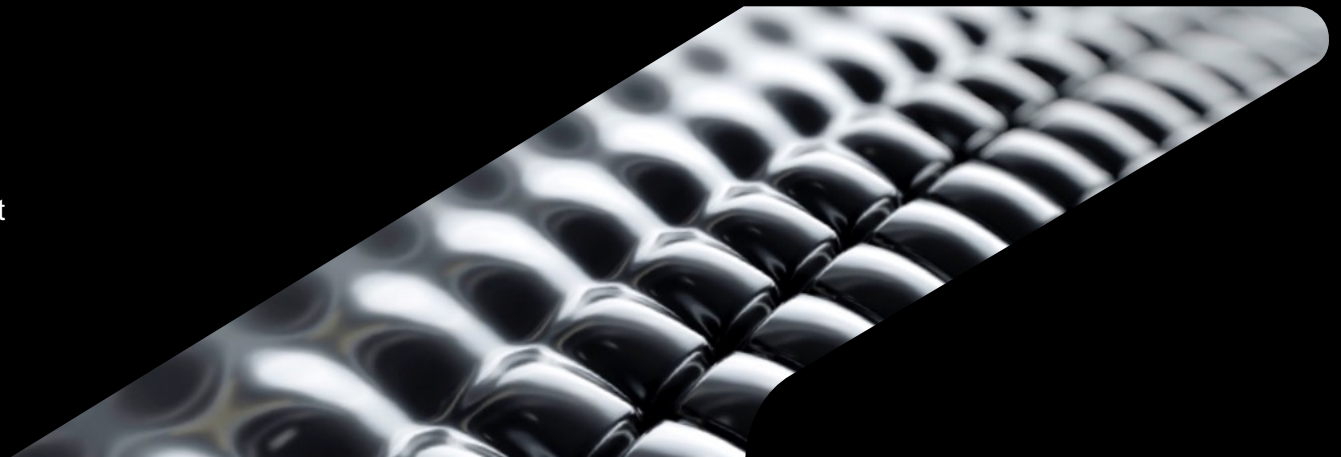
AUTODESK UNIVERSITY

From BIM to Construction Robotics and Beyond

Session CS501501



Alice Leung
Vice President, Platform and Product Strategy | Brick & Mortar Ventures |
linkedin.com/in/alice-leung/

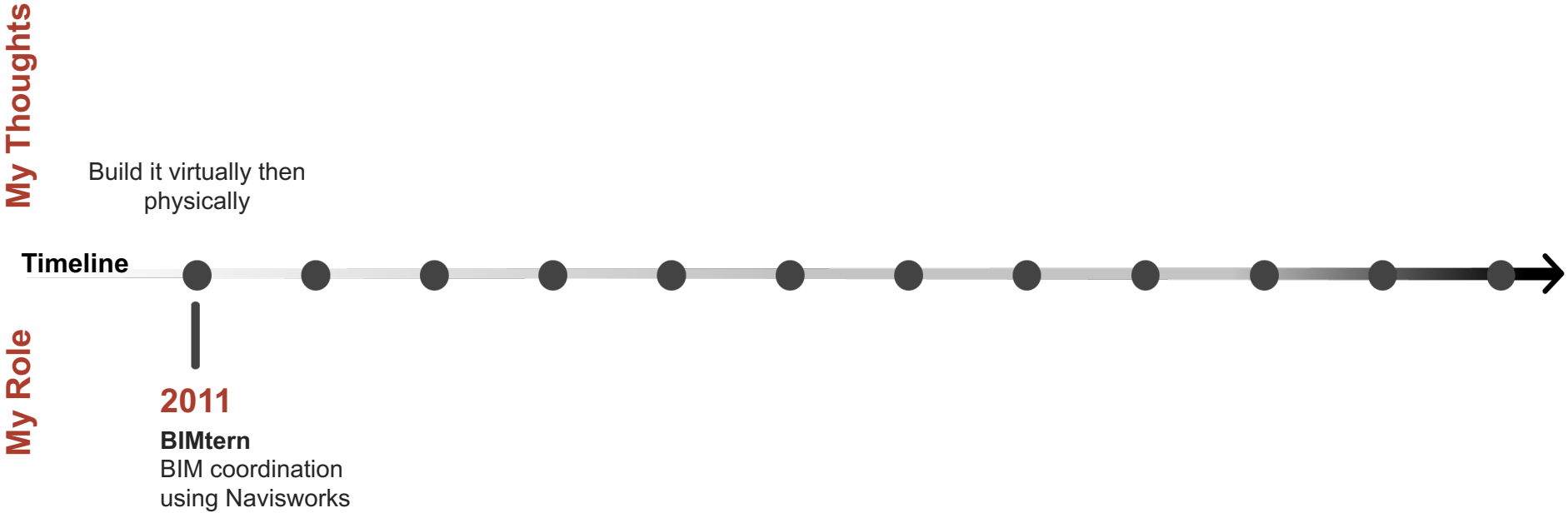
Outline

- My history with BIM / Introduction
- Value of BIM
- Challenges for BIM Adoption
- Bridging the Gap Between Digital and Physical
- Construction Robotics
- BIM + Robotics



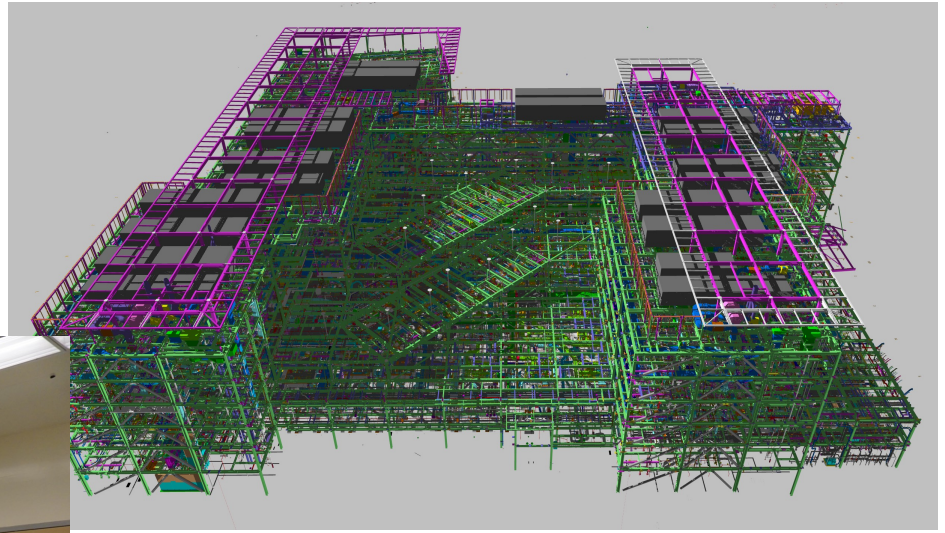
My brief history with BIM

I didn't exist during the BIM conceptualization.



Introduction

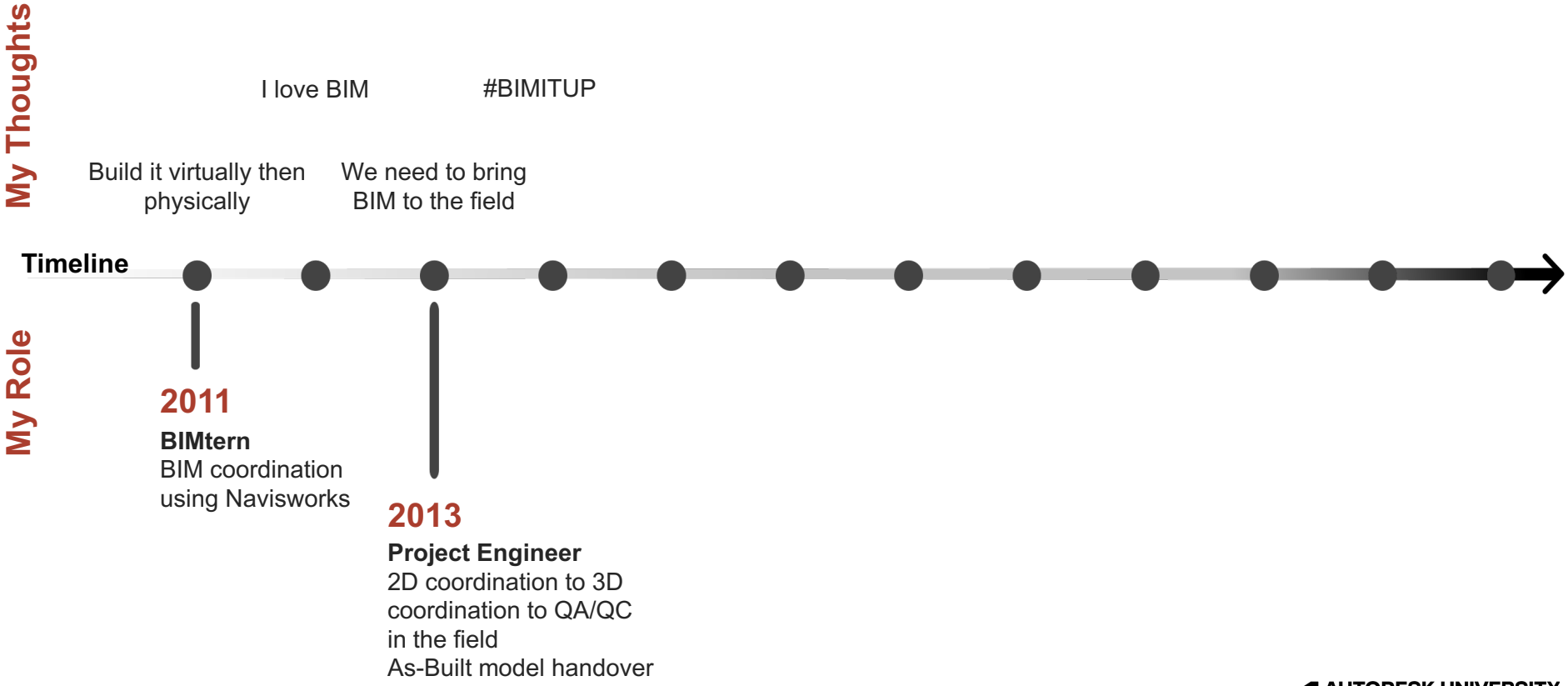
2011, 2012: BIMtern at DPR Construction





My brief history with BIM

I didn't exist during the BIM conceptualization.



Introduction

2013 – 2015: UCSF Medical Center at Mission Bay (DPR Construction)









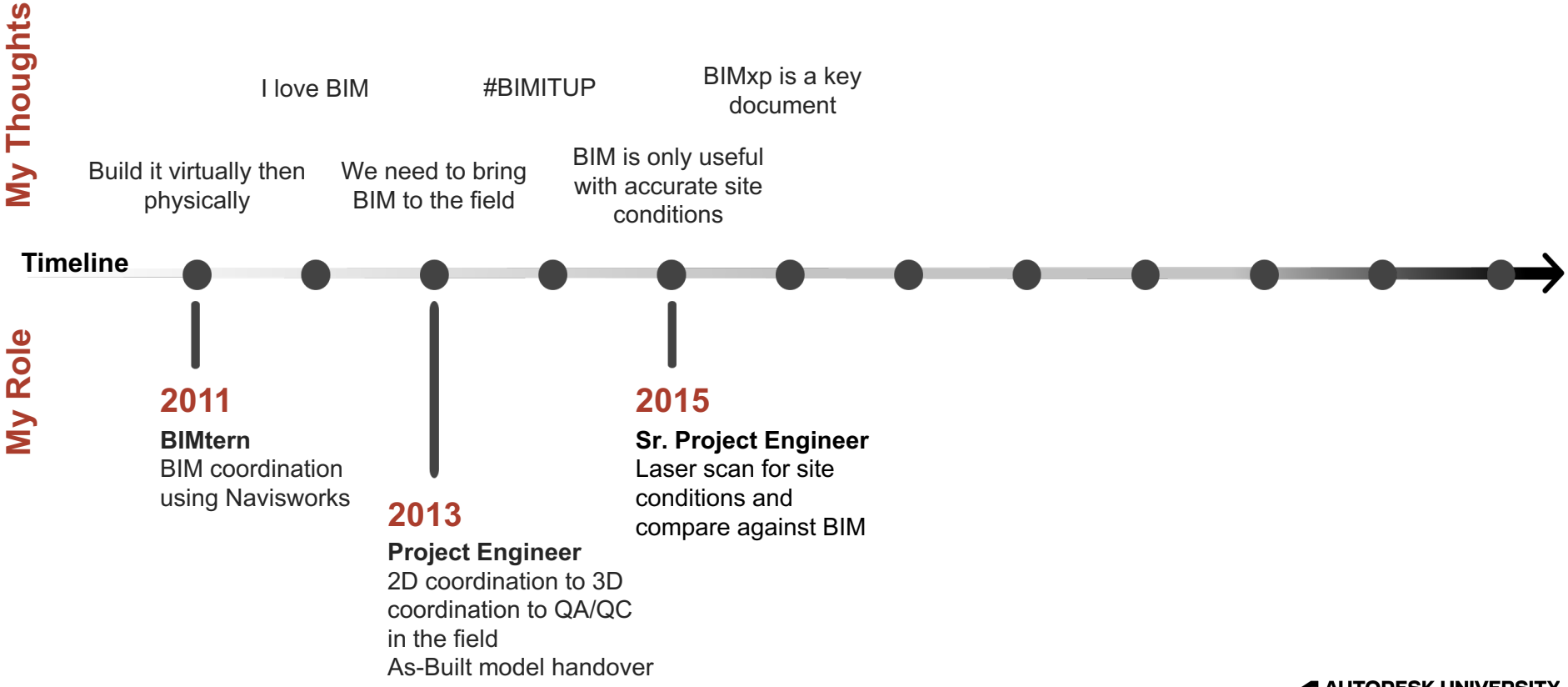






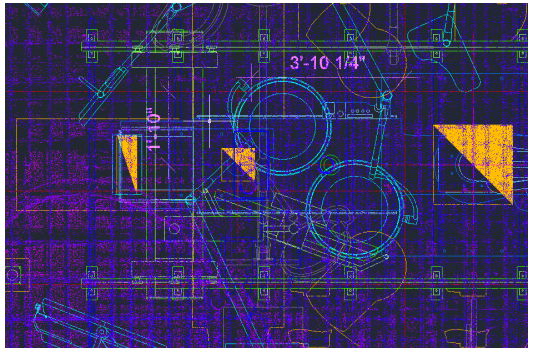
My brief history with BIM

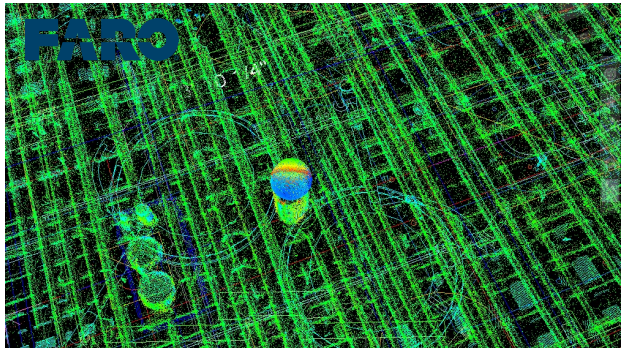
I didn't exist during the BIM conceptualization.



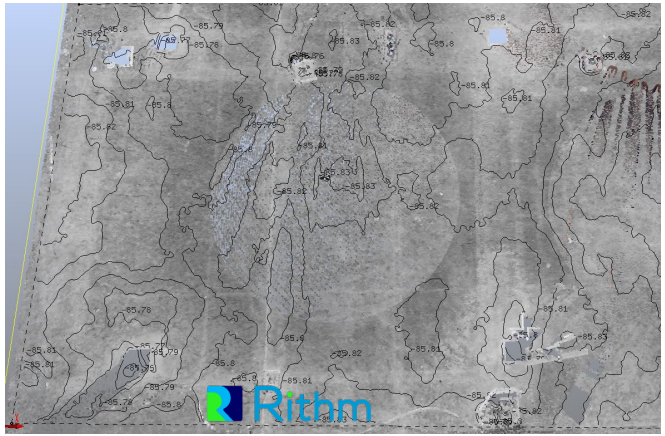
Introduction

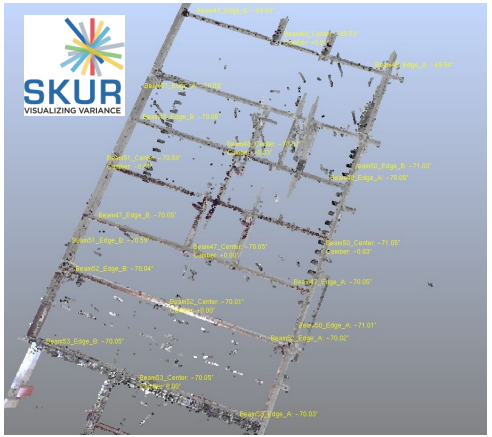
2015 – 2016: Lucile Packard Children's Hospital, Stanford (DPR Construction)





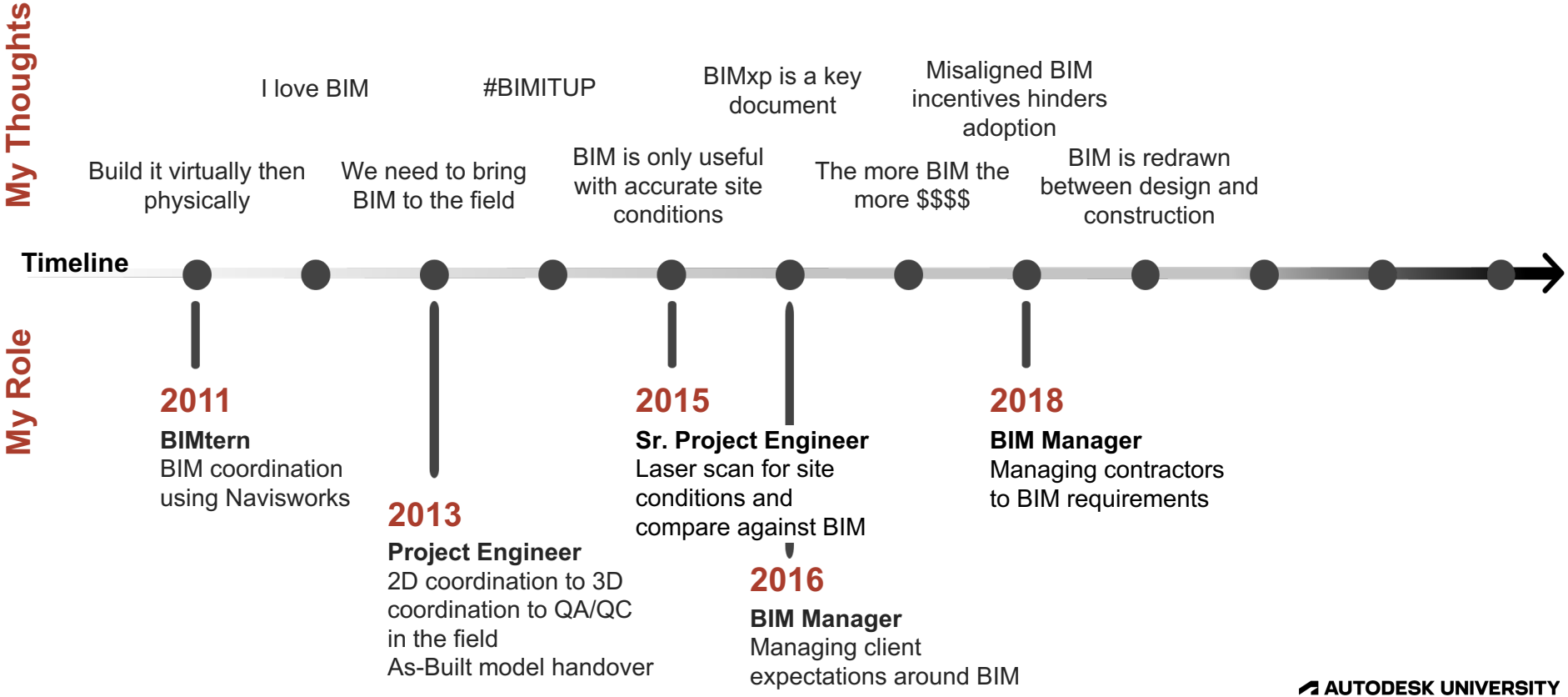






My brief history with BIM

I didn't exist during the BIM conceptualization.



Introduction

2016 – 2018: Data Centers in Singapore (DPR Construction)







Back to America

Introduction

2018 – 2019: UCSF Block 23A

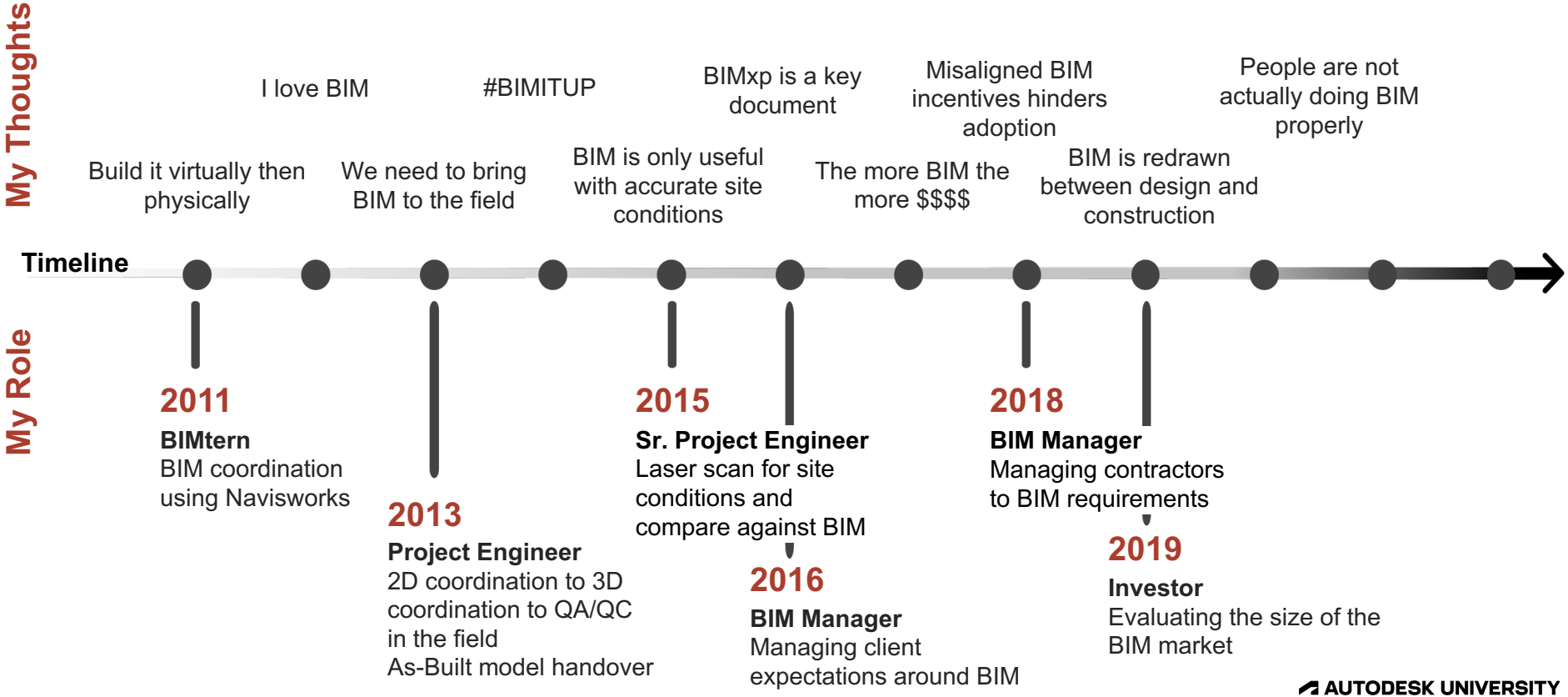






My brief history with BIM

I didn't exist during the BIM conceptualization.



Introduction

2019 – Current: Brick & Mortar Ventures



Darren Bechtel
Managing Director



Curtis Rodgers
Partner



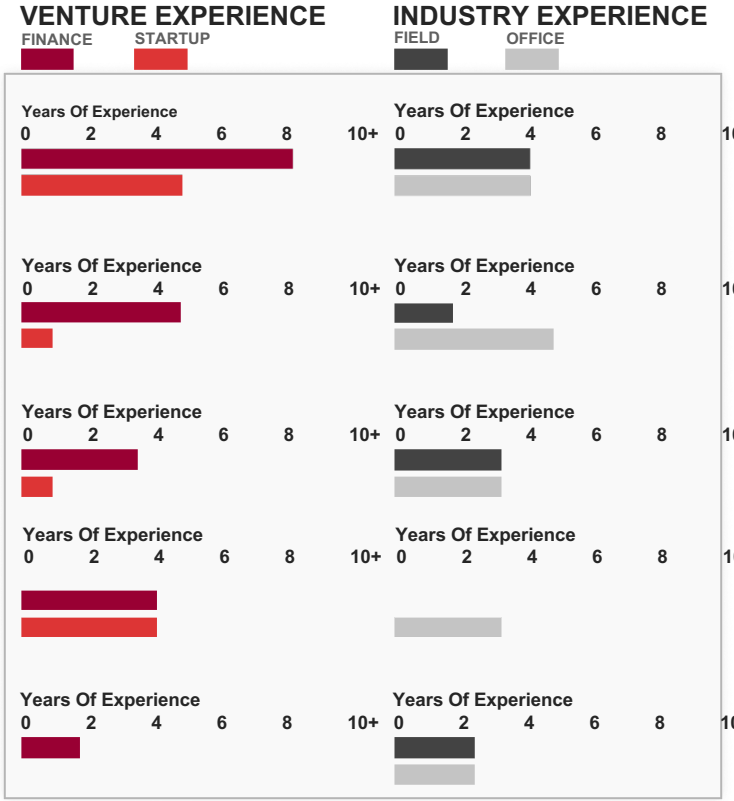
Kaustubh Pandya
Partner



Austin Yount
Principal



Alice Leung
Vice President



ASSOCIATIONS

BECHTEL
Stanford University + Stanford Graduate School of Business
SOUTH PARK VENTURES

Kiewit
PlanGrid
McCARTHY

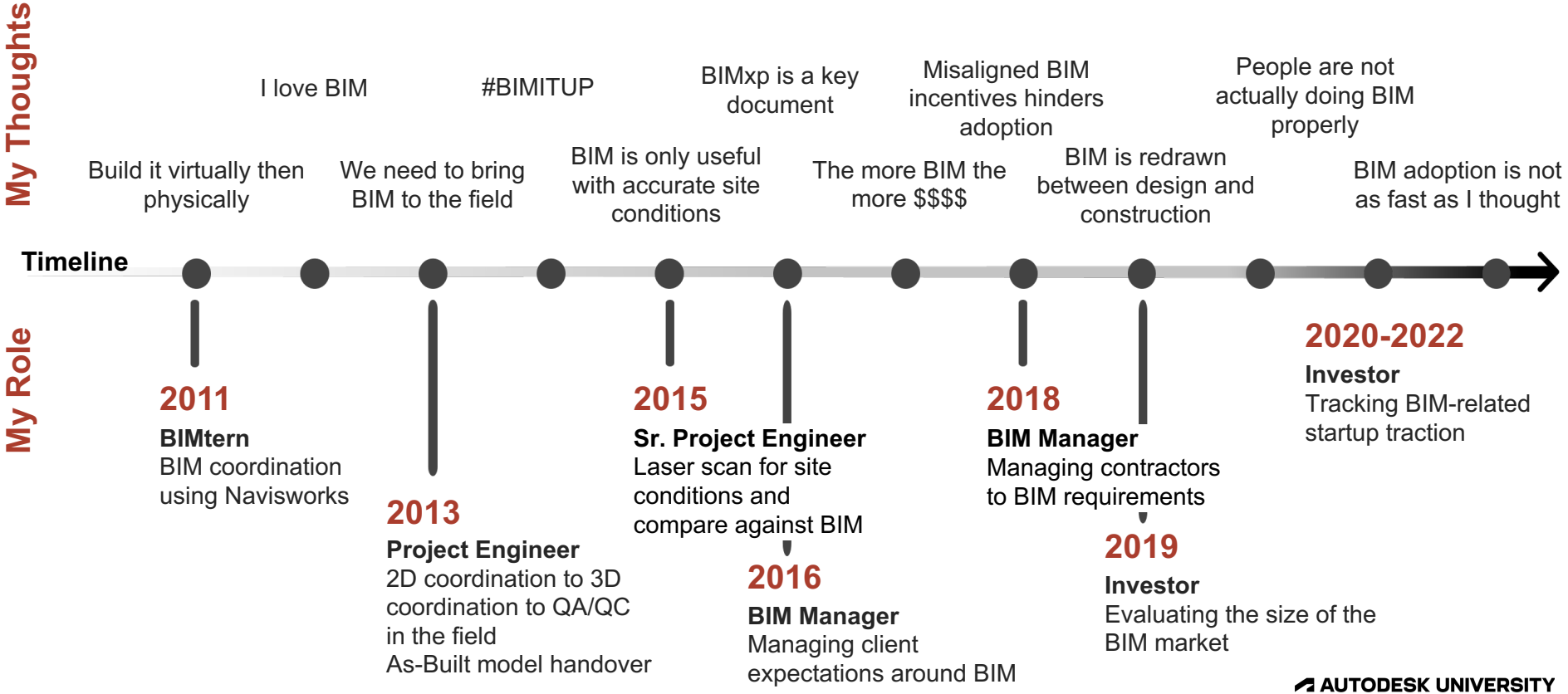
MIT Management Sloan School
McKinsey & Company
Kiewit

Stanford University
MONTGOMERY & CO
ENJOY

DPR CONSTRUCTION
BROWN

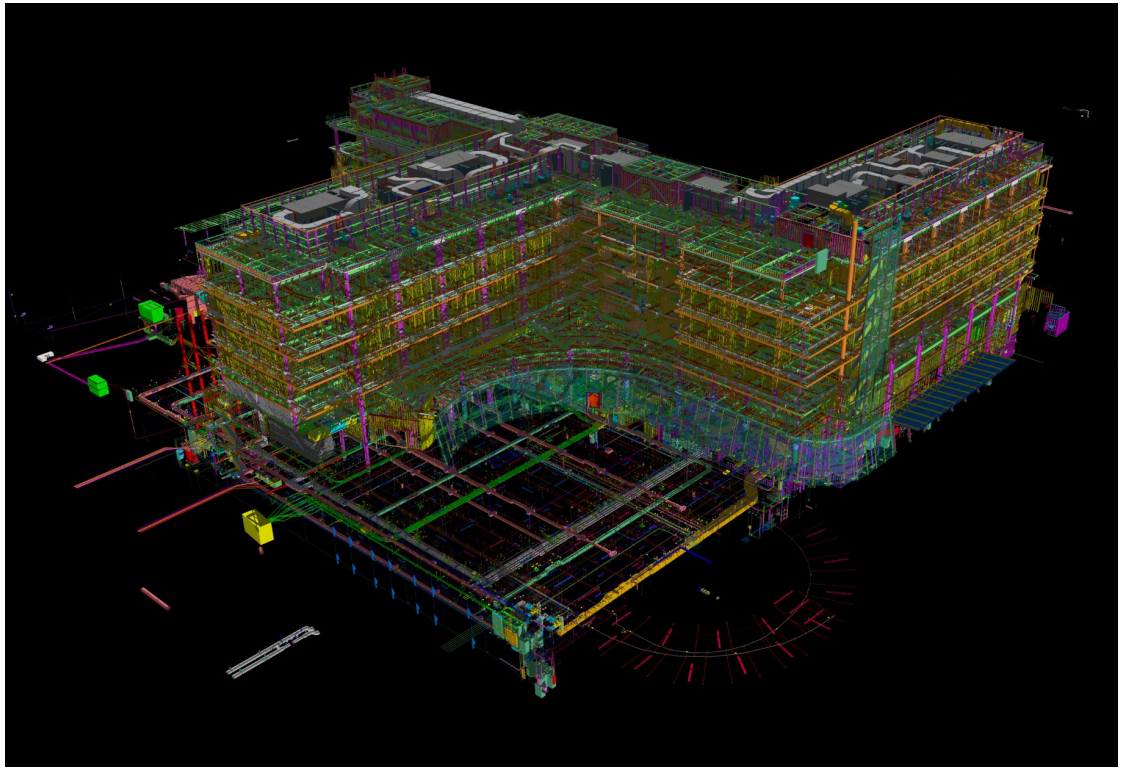
My brief history with BIM

I didn't exist during the BIM conceptualization.



The Value of BIM (Perfect Scenario)

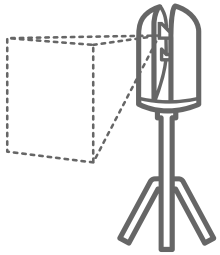
- Reduced RFI's
- Reduced Rework
- Prefabrication
- Simulation, Path of Travel
- Early Estimates
- BIM for FM
- List goes on…



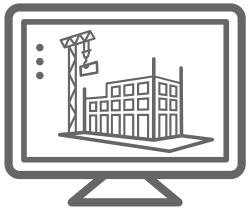
Challenges for BIM Adoption



Most construction contracts do not align incentives for BIM adoption



Complex digital to physical to digital feedback loop. Getting information out and back (As-builts)



Tools are difficult to learn and hard to use.

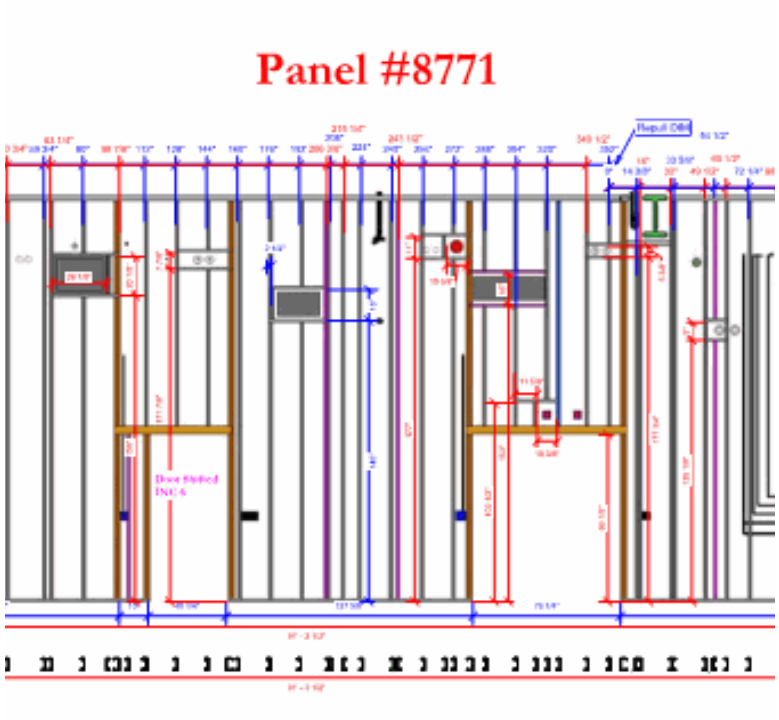


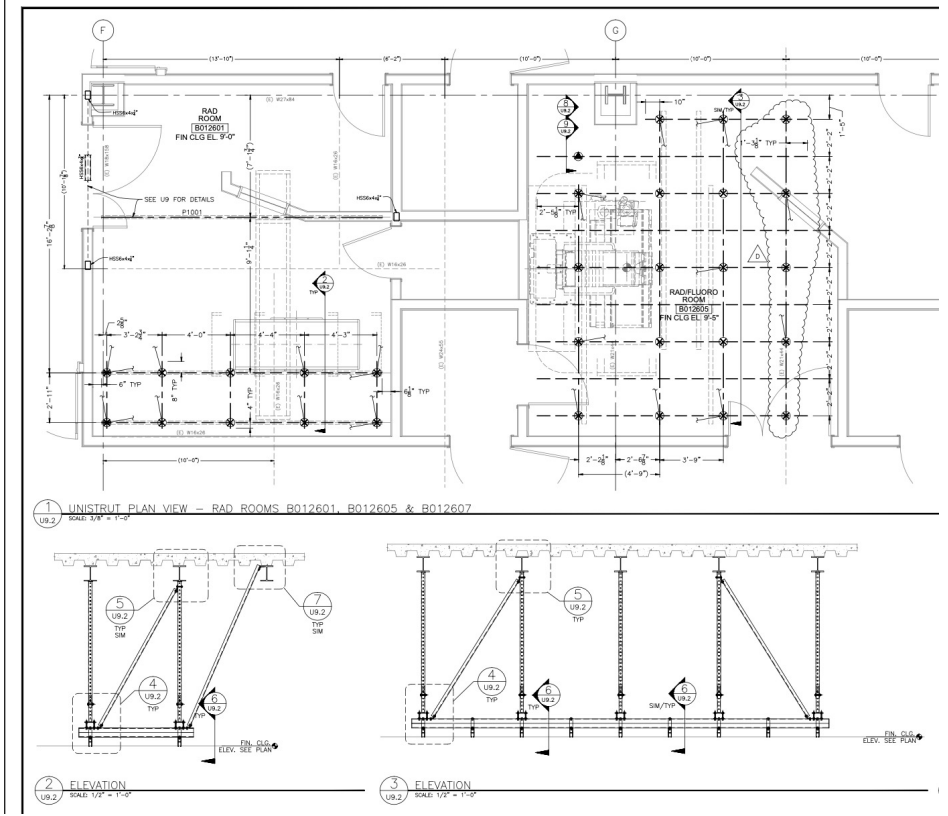
Lack of interoperability of data

BIM never makes it to site.

Getting BIM out to Site

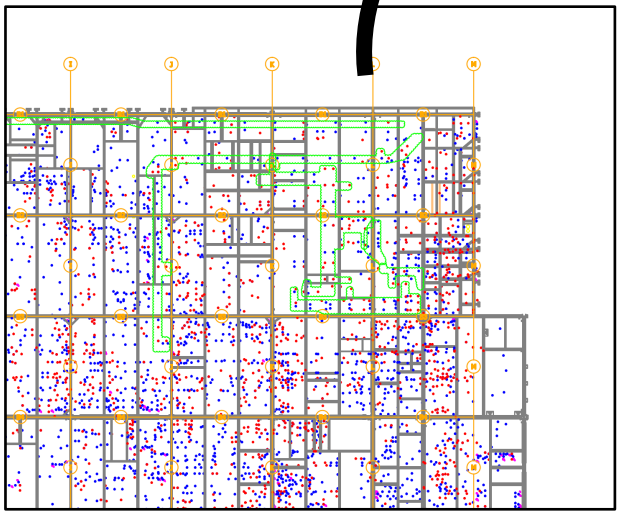
Layout Based on Coordinated Models





Getting BIM out to Site

Use Robotic Total Stations



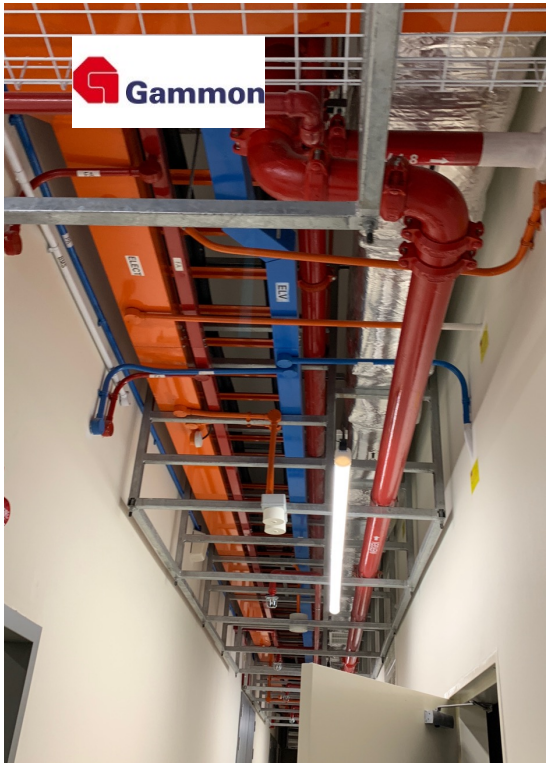




Getting BIM out to Site

Prefabricate from BIM



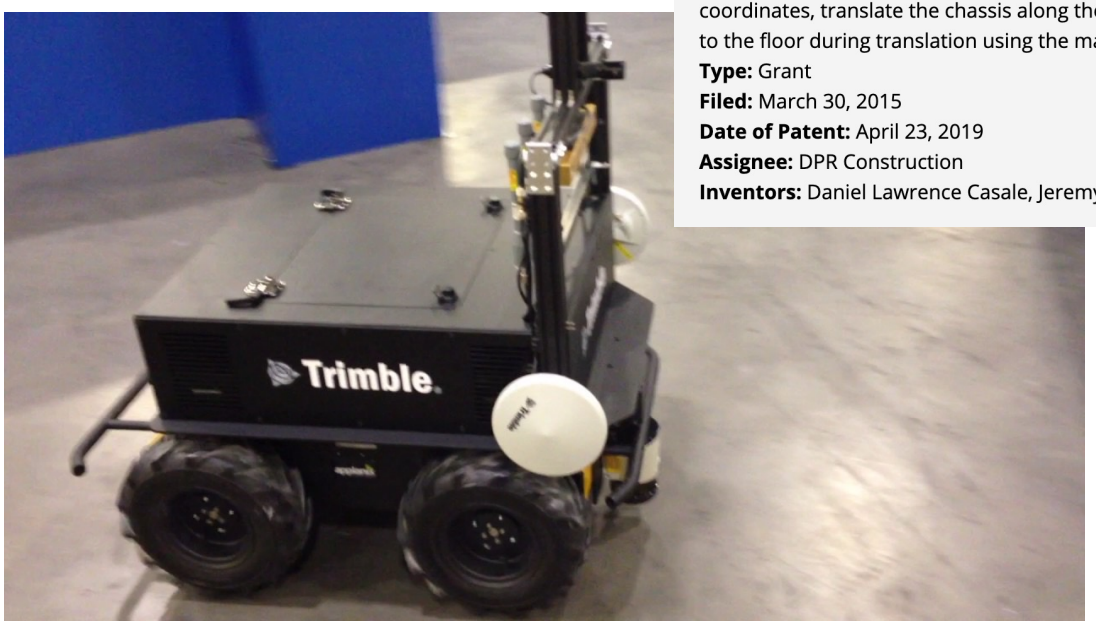




But why is it still so hard?

Enter… Layout Robots

DPR Construction’s LayBot



Automated construction scribing devices and methods of use
Patent number: 10268202
Abstract: Construction design layout devices and systems are provided herein. An example device includes a chassis configured to translate along a floor, an optical prism mounted to the chassis that reflects signals from a base station, a marking assembly mounted to the chassis, the marking assembly having at least a marking device that physically marks the floor, and a controller configured to receive construction instructions comprising floor markings defined by floor coordinates, translate the chassis along the floor in alignment with the floor coordinates, and transfer the floor markings to the floor during translation using the marking assembly.
Type: Grant
Filed: March 30, 2015
Date of Patent: April 23, 2019
Assignee: DPR Construction
Inventors: Daniel Lawrence Casale, Jeremy Bartle

Construction Robotics - Challenges

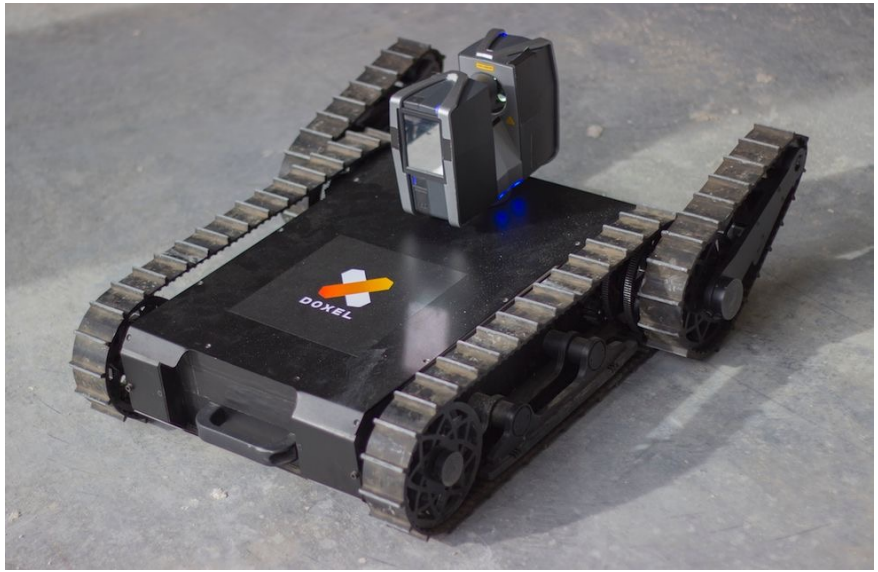


- Localization is hard to solve with robotics, no accurate BIM
- Hardware needs to be ruggedized for site conditions
- Ever changing site conditions (snow, rain, heat, etc.)

Early Construction Robotics

Reality Capture + Robotics





Reality Capture + Robotics





BIM could have helped.

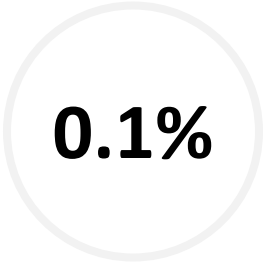
We need to walk the dog.





Construction Robotics: Why now?

The time is right for construction robotics.



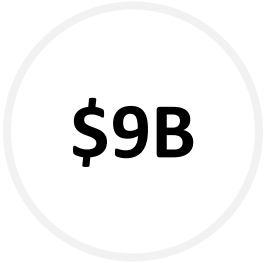
LiDAR Cost

The cost of LiDAR dropped from $75k in 2015 to $100



Labor Shortage

Unfilled positions in October 2021



Venture Funding

Projected venture funding for construction tech



Outside Talent

Construction robotics startups not founded by construction professionals*

Sources: https://www.forbes.com/sites/enriquedans/2020/09/11/the-incredible-shrinking-lidar/?sh=69cc3dc757d6
https://www.mckinsey.com/business-functions/operations/our-insights/bridging-the-labor-mismatch-in-us-construction
https://constructionphysics.substack.com/p/a-brief-history-of-construction-startups
*based on the construction robotics startups in the Brick & Mortar Ventures deal flow

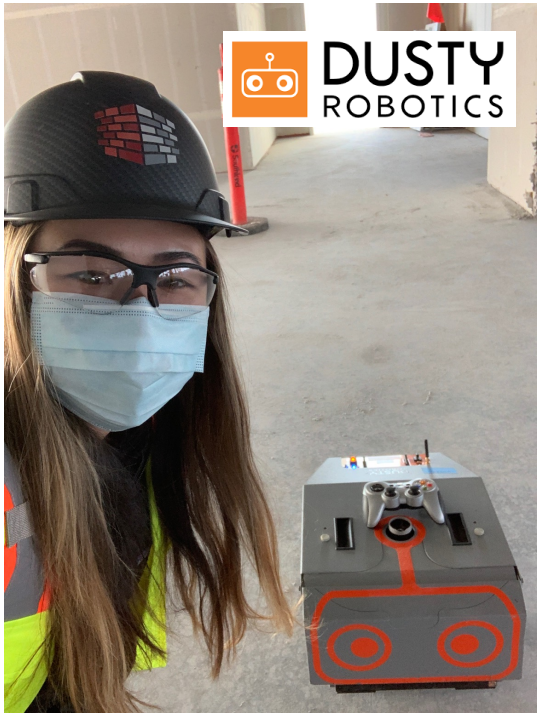
Current Construction Robotics

Scope: Layout









Current Construction Robotics

Scope: Layout [Rugged Robotics]



Other Construction Robotics

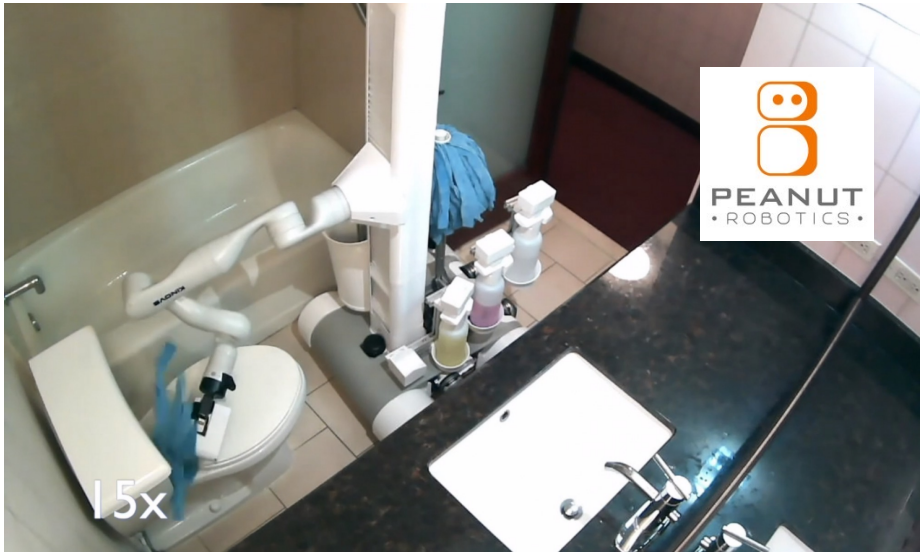
Current Construction Robotics

Scope: Earth Moving [SafeAI]



Current Construction Robotics

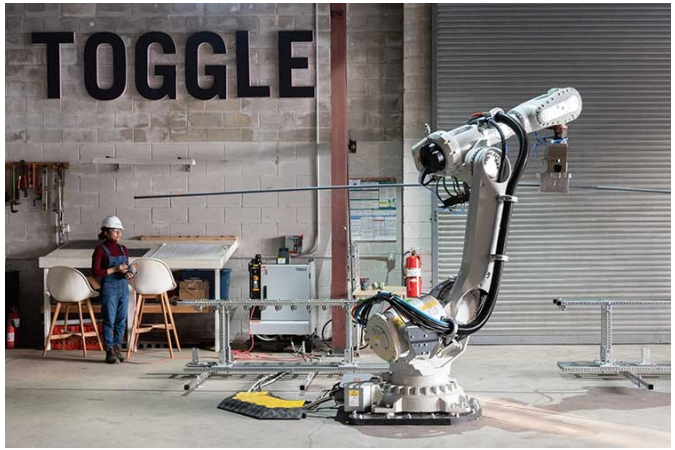
Scope: Cleaning





Current Construction Robotics

Scope: Rebar







Current Construction Robotics

Scope: Rebar [Advanced Construction Robotics – TyBot]



Current Construction Robotics

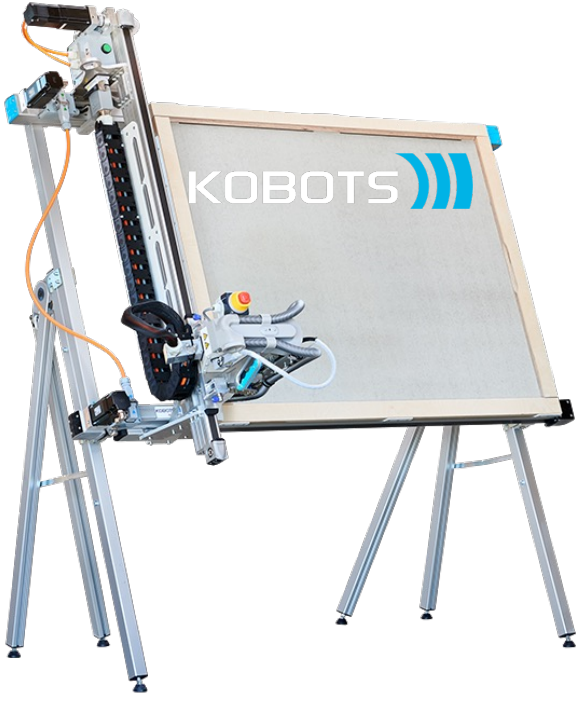
Scope: Exterior Skin





Current Construction Robotics

Scope: Drywall



CANVAS





okibo

Current Construction Robotics

Scope: Drywall [Canvas]



BIM + Robotics

What can we unlock with BIM + Robotics?



On-Site Manufacturing

- Coordinated BIM and fleet management tools (like Formant) will give robotics better understanding of interaction with other scopes/robots
- Accurate BIM makes it easier for robots to navigate



‘Dark Site’

- A coordinated BIM + schedule (4D BIM) may eliminate the need for humans on site.
- Robots can work 24/7 (except during maintenance)



Data/Actuals

- Robots have a lot of sensors and a lot of the data they are collecting can easily be fed back into BIM
- The link between digital and physical can provide accurate progress on site
- Link to payments, quality, risk

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Thank You!

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linkedin.com/in/alice-leung

https://loveconstructiontech.substack.com/