How Big Data is Transforming the Construction Industry

About Speaker:

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One-Key & Construction Technology at Milwaukee Tool.

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What is Big Data?

- **Big Data:** A dataset that is too large, too fast, and too complex for ordinary computers to process

- Every day, humans create 2.5 exabytes (EB) of data, enough to fill 10 million Blu-Ray Discs

- Much of this value that lies in this data is left uncaptured due to:
  - High Volume
  - High Velocity
  - High Variety

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Stagnant Productivity Growth

- **The Construction Industry** has experienced flat growth over the past few decades

  - In contrast, manufacturing has seen a near doubling in productivity

- Failure to adopt technology that other industries leverage will further accentuate these issues

Overview of productivity improvement over time

Productivity (value added per worker), real, $ 2005

Manufacturing
Construction

$ thousand per worker

1.7x

Source: Expert interviews; IHS Global Insight (Belgium, France, Germany, Italy, Spain, United Kingdom, United States); World Input-Output Database

Source: McKinsey & Company
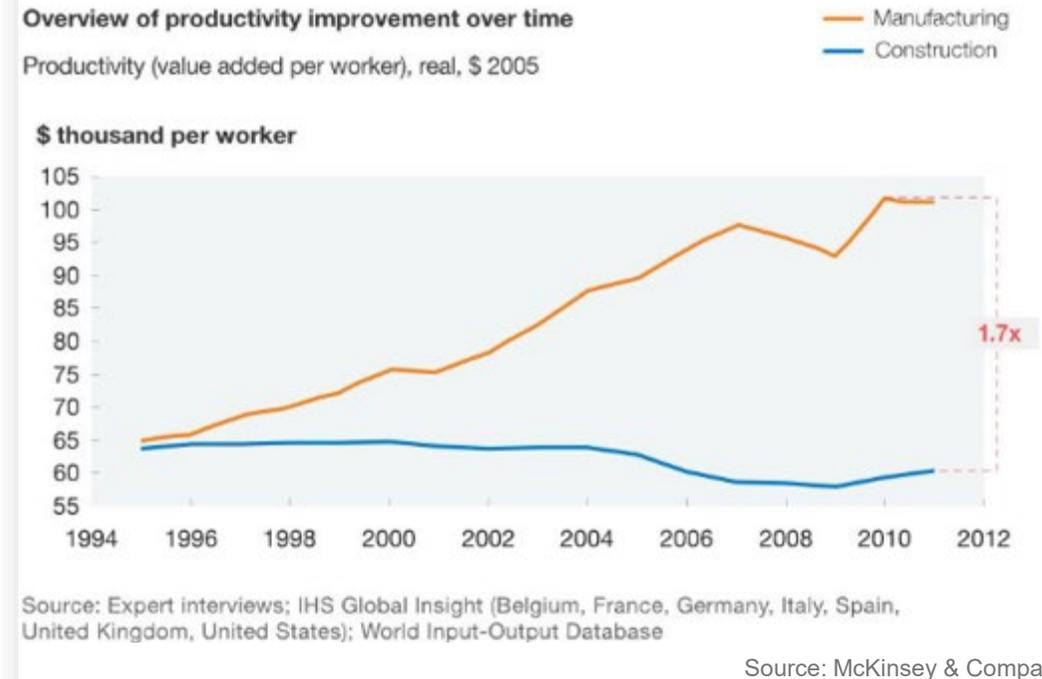
Other Industries Adopting Big Data

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Industry Use Case #1

Agriculture

- 47% of all farms use data software applications

- Total factory productivity and output have grown 250% since 1948.

Figure 1. Types of Data Collected by Farm Size (Acres)
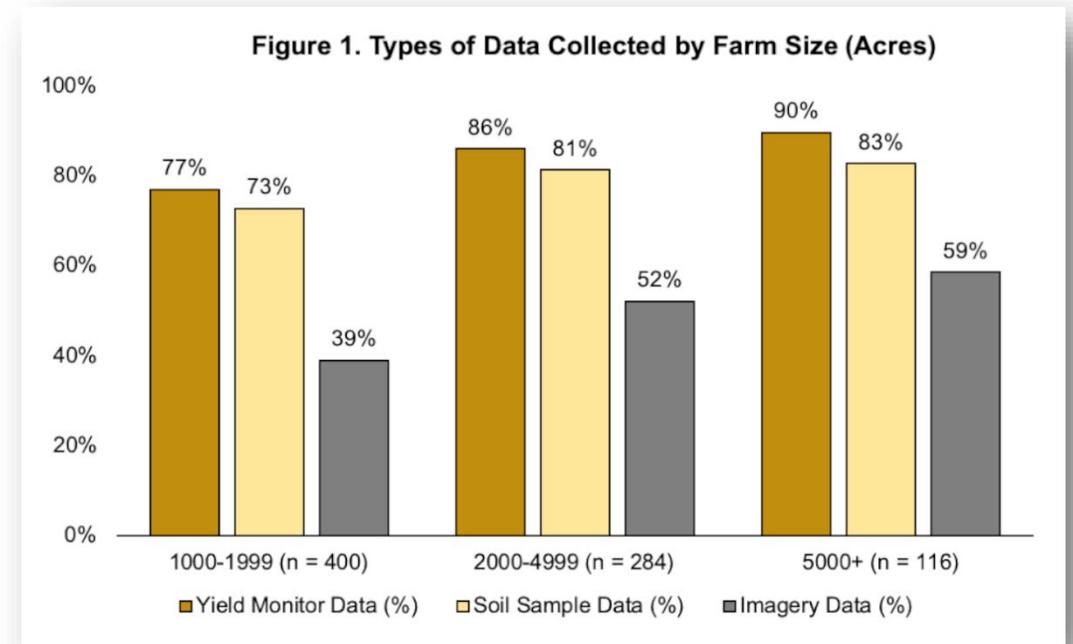
Source: Purdue University

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Industry Use Case #2

Entertainment

- 99% of executives in the entertainment industry use data software applications

- The entertainment industry is using Big Data to:

    - Maximize current market trends
    - Plan for future investments
    - Measure Performance
    - Understand patterns

Value of US Entertainment and Media Market (in billions of US dollars)

Year	Value
2011	496.39
2012	520.24
2013	545.19
2014	573.57
2015*	602.97
2016*	630.71
2017*	655.26
2018*	678.64
2019*	699.68
2020*	720.38

Source: Statista

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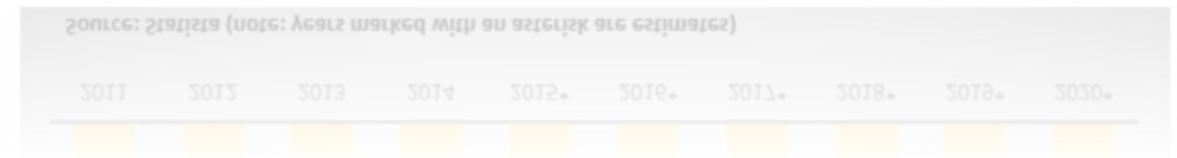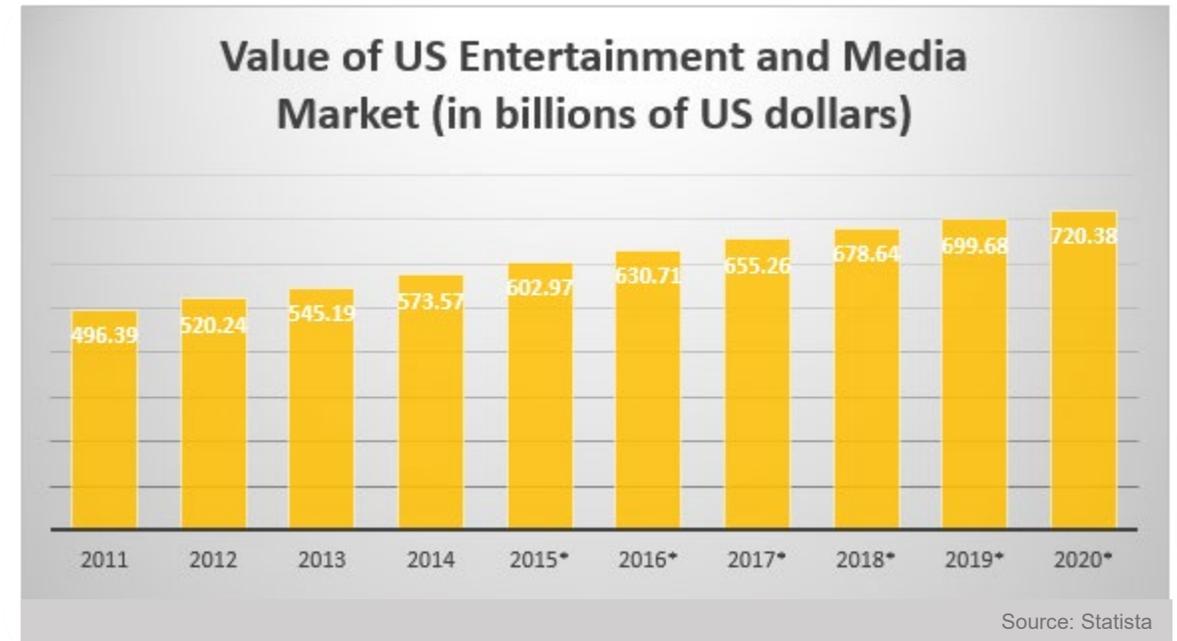
Healthcare

- GIS software to create visual data to plan for the building of hospitals

- Track the spread of chronic disease like COVID-19

- Public health data & records

- Intervene & mitigate negative health trends
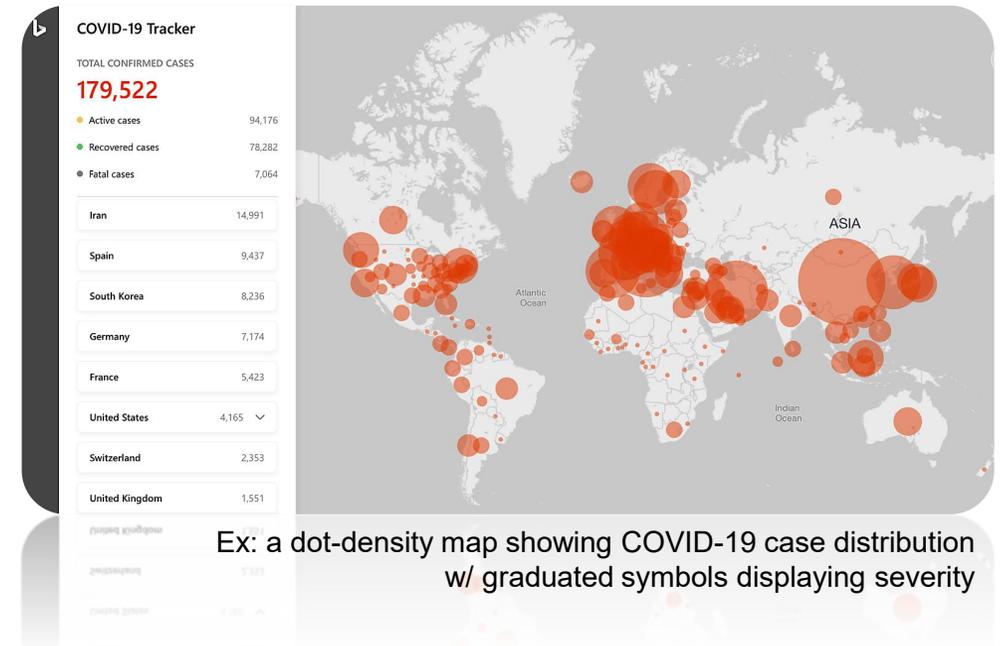
COVID-19 Tracker

TOTAL CONFIRMED CASES
179,522

● Active cases	94,176
● Recovered cases	78,282
● Fatal cases	7,064
Iran	14,991
Spain	9,437
South Korea	8,236
Germany	7,174
France	5,423
United States	4,165 ⌄
Switzerland	2,353
United Kingdom	1,551

ASIA

Atlantic Ocean

Indian Ocean

Ex: a dot-density map showing COVID-19 case distribution w/ graduated symbols displaying severity

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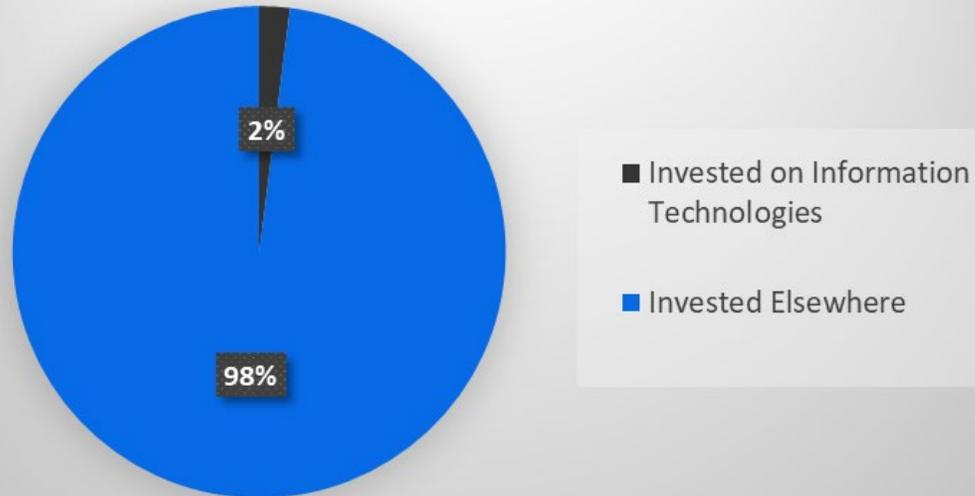
Key Questions:

1. **Why Doesn`t the Construction Industry Leverage Data Efficiently?**

2. **What are the Risks of Not Utilizing Construction Data?**

3. **What are the Opportunities of Utilizing Construction Data?**

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Construction`s Big Data Problem

Why Doesn't the Construction Industry Leverage Data Efficiently?

1. Lack of tools and knowledge

2. Uncertainty of end goal

3. Lack of Integration(s)

An Aging Workforce is not an issue unique to the construction industry
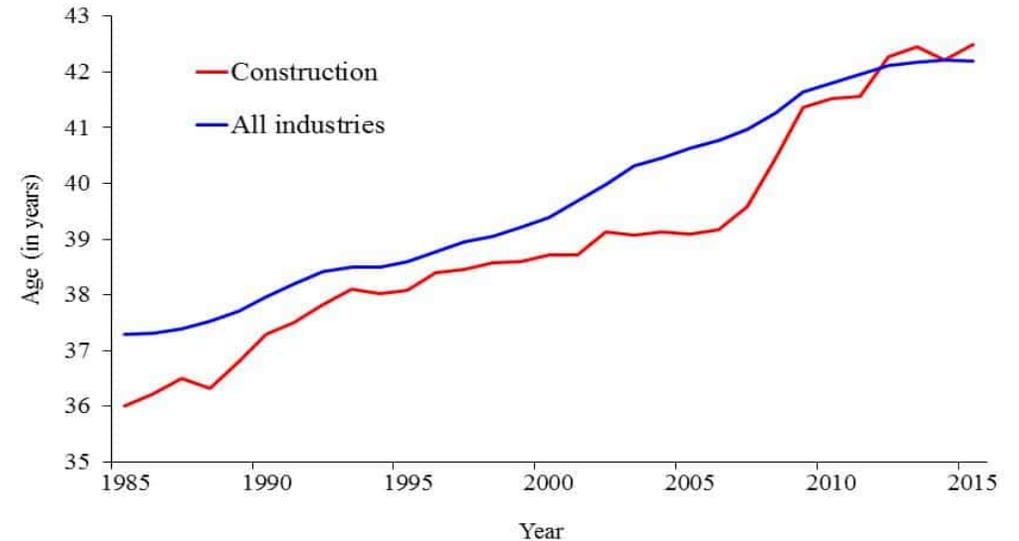

Average age of workers, construction versus all industries.
Source: The Center for Construction

Construction`s Big Data Problem

Risks of Not Utilizing Construction Data

1. Lose out on market & sales opportunities

2. Don`t mitigate safety risks

3. Fail to identify employee productivity and general patterns

Data Utilization Rate by Construction Professionals

4%

Construction Managers use only 4% of available data

96%

■ Data Utilized ■ Data Wasted

Source: The Center for Construction

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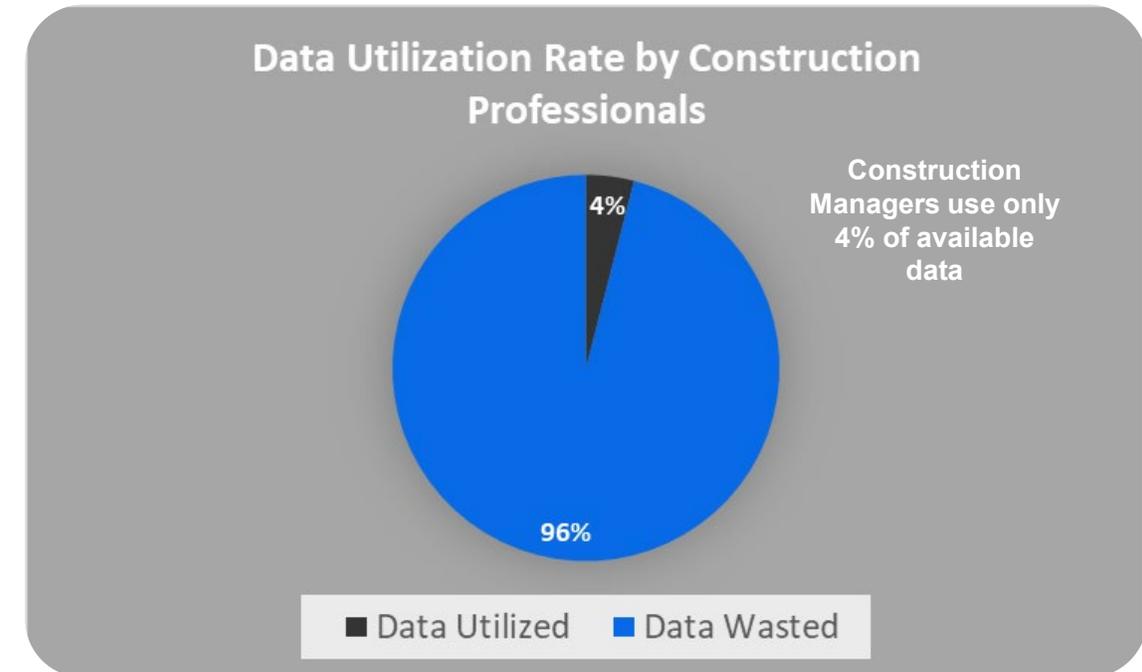
The Issue with Construction Projects

Construction Projects Completed On Time

■ Completed On Time
■ Completed Late

15%

85%

Construction Projects Delivered On Budget

■ Completed On Budget
■ Completed Over Budget

30%

70%

Probability of On Time & On Budget

■ On Time & On Budget
■ Late & Over Budget

5%

95%
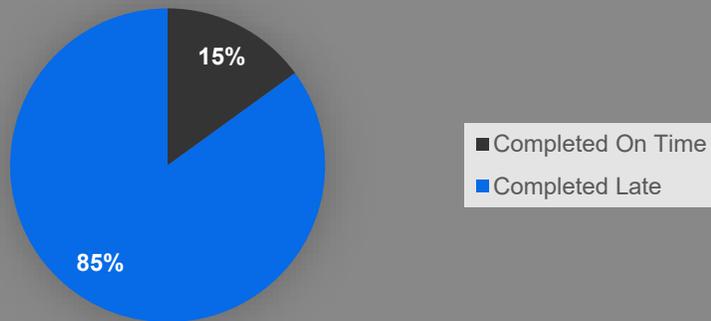
Only **15%** of projects are completed on time
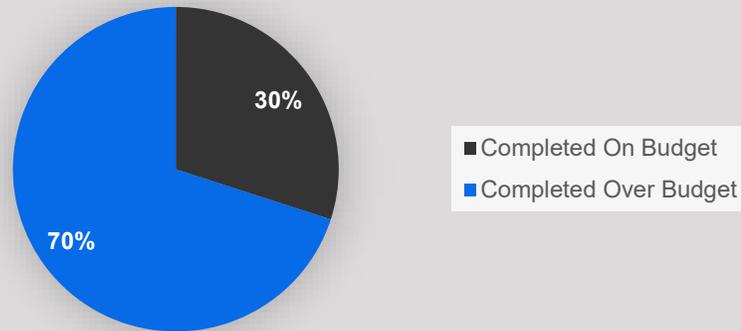
Only **30%** of projects are delivered on budget
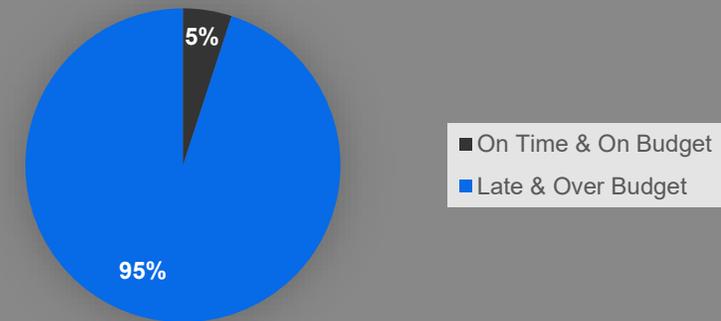
Chance of On Time & On Budget is less than **10%**

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Construction`s Big Data Problem

## Benefits of Utilizing Construction Data

1. More accurate quoting & bidding

2. Reduction of human error

3. Improves timelines and hits deadlines

4. Mitigate risks to workers

5. Drives predictability in project execution

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The next industry use case... Construction

How might we?:

1. Collect real time project execution data

2. Leverage data for more precise bidding

3. Predict & prescribe project resources utilizing AI & ML

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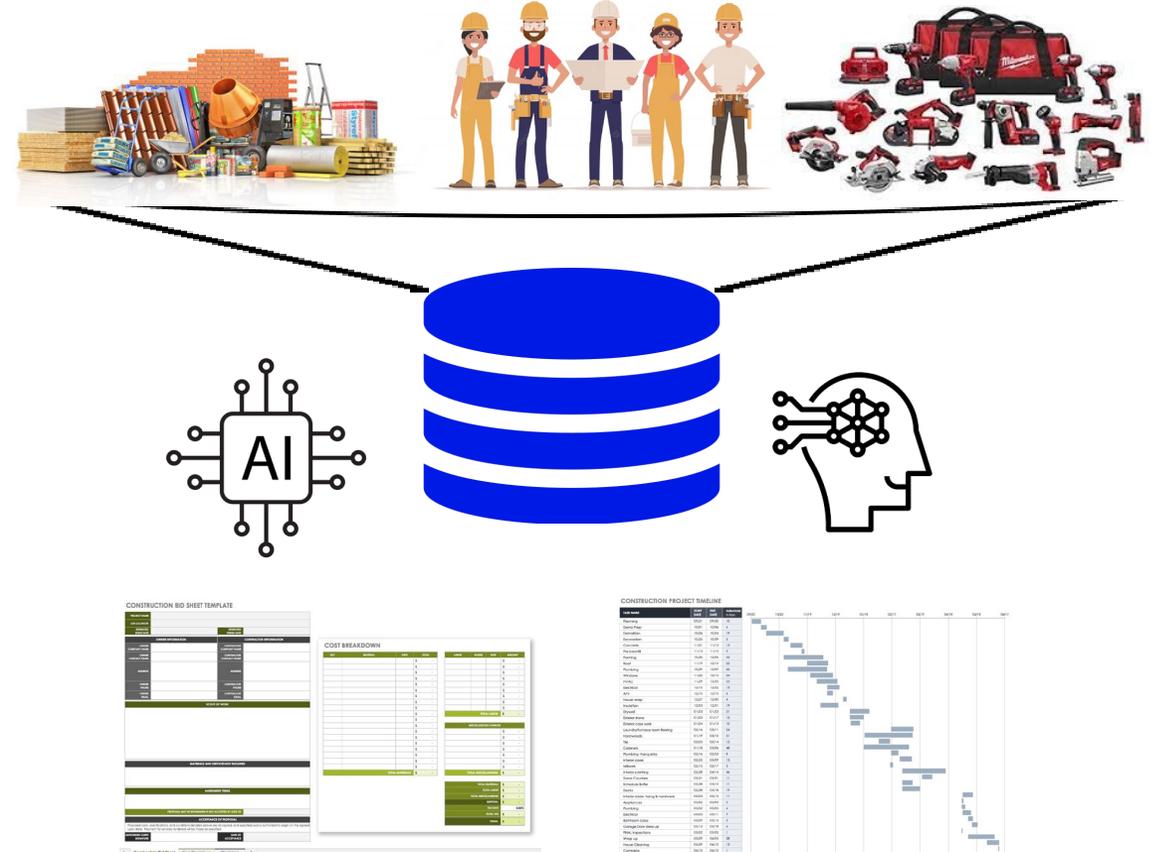
Looking Forward:
Examples of Big Data found in Construction

1. **Smart Tools**

2. **Building Information Modeling**

3. **Asset Management**

4. **Data Integrations**

5. **Advanced Technology**

6. **Technology Ecosystems**

Big Data and Smart Tools

- IoT (internet of things) embedded tools enhance jobsite connectivity

- Tools are a potent data source ripe for mining

- Downtime is the #1 source of jobsite inefficiency

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Building Information Modeling is Optimized for the Construction Industry

BIM Overview:

1. Highly detailed plans

2. Multi-layered virtual simulations

3. A design for every phase of a plan`s lifecycle

4. Ease of collaboration

➤ Integrations such as ONE-KEY and Autodesk BIM 360 allow inventory managers and BIM specialists to collaborate seamlessly
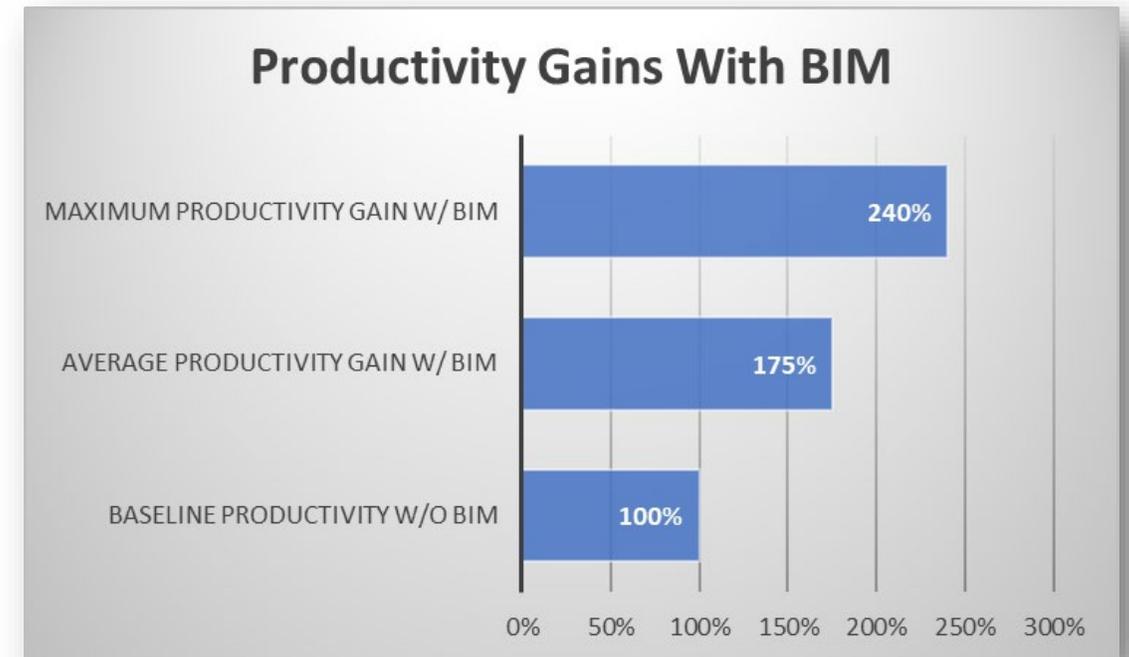
Source: Advances in Civil Engineering

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Asset Management Software

- The modern construction site requires asset management software

- Reducing theft, loss & waste are key goals of asset management software

- Less downtime means more projects completed on time and on budget

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Tool & Equipment Tracking

- Big data comes from the jobsite

- Track tools, equipment, & jobsite consumables

- Drive cost-effective solutions with Bluetooth tracking & scannable Asset ID tags

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The Power of Data Integrations

Data Integration: Combining data residing in different sources and providing users with a unified view

- Enables data synchronization that deliver enhanced workflows and value streams

- Allows each integration partner to focus on the key strengths of their product offering

Looking Forward: (GIS)

Geographic Information Systems

- GIS: Provides digital representations of physical environments

- GIS ensures accuracy and data integrity due to proven geospatial recordings

- GIS allows for faster construction and road development

- Visual databases that are integrated with traditional ones allow for greater efficiency

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Looking Forward: Drones

- Construction Drones are one of the most valuable and versatile tools on the jobsite

- Every photograph and video is a vital information source

- LiDAR (Light Detection and Ranging) provide essential technology for surveyors and BIM builders

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Looking Forward: Augmented Reality

- Smart glasses empower users to superimpose informational readouts

- Data transmits directly into their field of view

- Smart glasses can be used to:
 - Pilot drones
  - Navigate BIM simulations
  - Manage inventory

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# Looking Forward: (NFC) Near Field Communication

- NFC: Short-range radio connection

- Rapid & Secure communication between devices

- Turns items like credit cards and power tools into valuable sources of data

- Drives big data in smart tool inventory management

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Building an Ecosystem

2000's · **2010's** · **2020's**

| Single ERP Solution | Best-in-Breed solutions | Connected Ecosystem |
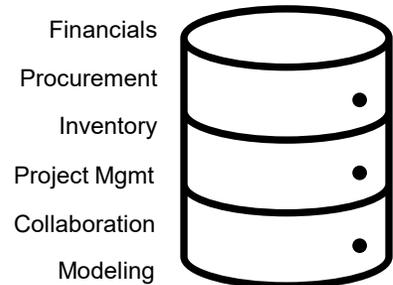
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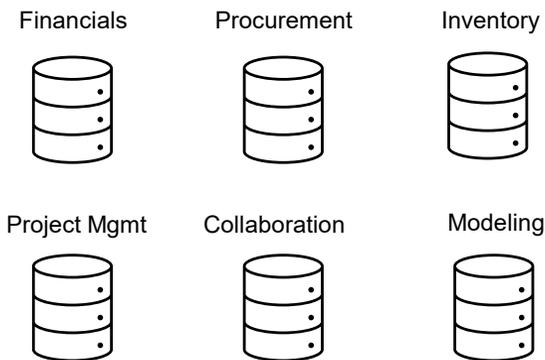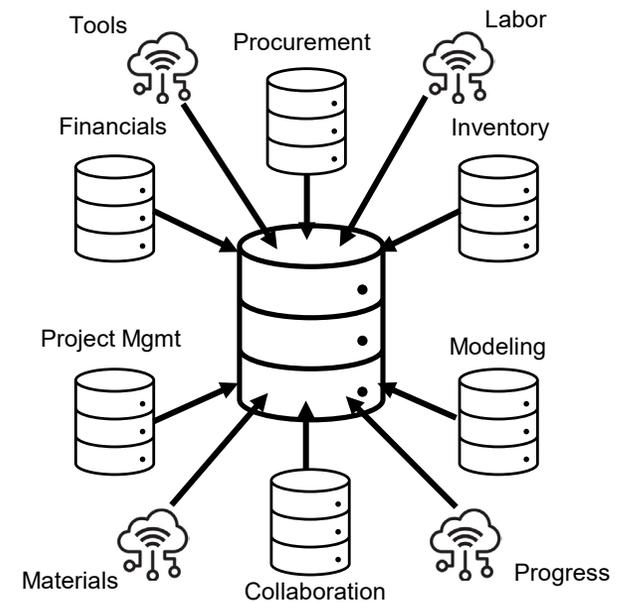
Summary
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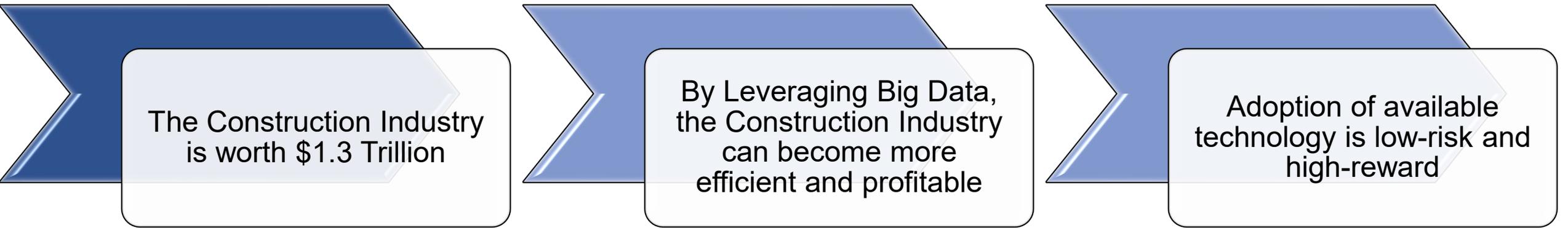
The Construction Industry is worth $1.3 Trillion

By Leveraging Big Data, the Construction Industry can become more efficient and profitable

Adoption of available technology is low-risk and high-reward

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