

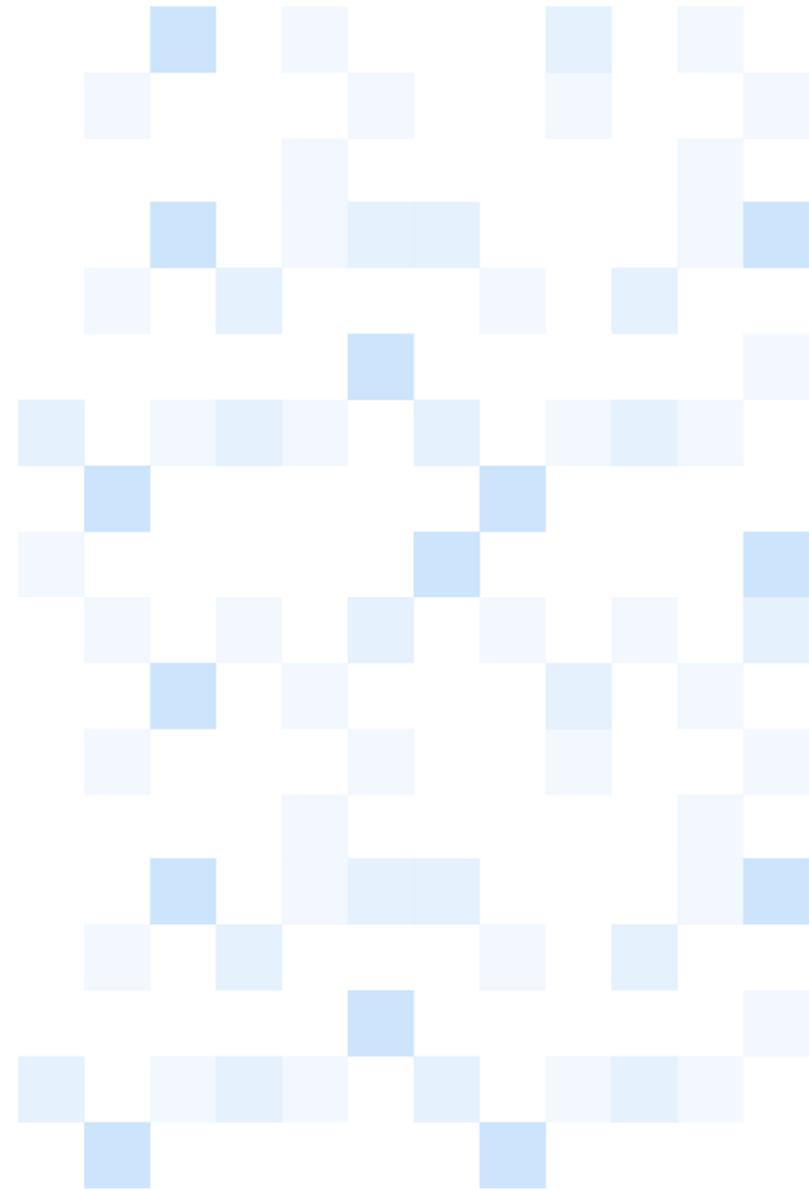
innovations for construction

TECHNOLOGY DISRUPTORS IN THE CONSTRUCTION INDUSTRY

infotech



JOBSITE
TECH GROUP





Bio

RON PERKINS

President | Jobsite Tech Group

BUSINESS

- + JOBSITE TECH GROUP, LLC
- + CONSTRUCTION MARKET DATA (CMD)
- + ARCHITECTS FIRST SOURCE
- + AUTODESK | BUZZSAW
- + NRI (NOW BLUEEDGE)
- + CONSULTANT FOR:
 - + HP
 - + SYNnex
 - + INFOTECH
 - + DROPBOX
 - + SMARTVID.IO
 - + SAMSUNG

SPEAKER

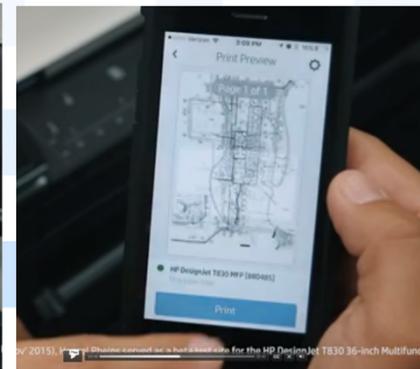
- + AUTODESK UNIVERSITY
- + ENR CONSTRUCTION FUTURETECH
- + AGC IT FORUM
- + AGC BIM FORUM
- + TRB
- + USMCA
- + SYNnex RED, WHITE & YOU
- + AIA
- + ABC
- + TEXO
- + ORACLE
- + MERIDIAN

EDITORIAL | RESEARCH

- + DESIGN INTELLIGENCE
- + BUILDING DESIGN AND CONSTRUCTION
- + ENR
- + CONSTRUCTION EXECUTIVE
- + COMMERCIAL CONSTRUCTION RENOVATION
- + AEC CAFÉ'
- + DIXIE CONTRACTOR
- + CALIFORNIA BUILDER & ENGINEER
- + NEW ENGLAND CONSTRUCTION
- + CONSTRUCTIONEER
- + TEXAS CONTRACTOR
- + CONSTRUCTION NEWS



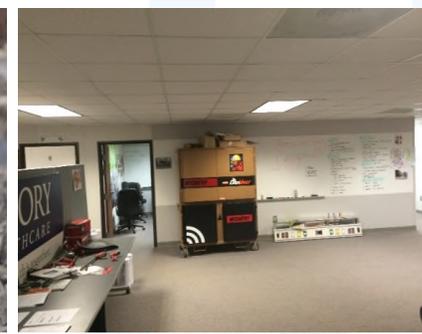
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At the time of this video (Nov 2015), the printer was used as a test site for the HP DesignJet T830 36-inch Multifunction printer. © 2015 HP. All rights reserved. HP and the HP logo are trademarks of Hewlett-Packard Development Company, L.P. in the United States and other countries. HP, the HP logo, and the HP DesignJet logo are trademarks of Hewlett-Packard Development Company, L.P. in the United States and other countries. HP DesignJet T830 36-inch Multifunction printer is a registered trademark of Hewlett-Packard Development Company, L.P. in the United States and other countries. HP DesignJet T830 36-inch Multifunction printer is a registered trademark of Hewlett-Packard Development Company, L.P. in the United States and other countries.



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UAVs



Cameras



BIM Box



Print/Scan



Asset Tracking



Electronic Plan Table / Whiteboard



Ruggedized Portable Devices



Wearables



3D Scanner



AR/VR

With an ever-expanding list of devices and means of field data acquisition tied to project delivery systems it is growing more important every day to automate or streamline as many of these data paths as possible.



- + Leveraging these technologies is critical because of the accuracy and efficiency they bring to the project.
- + Incorporating this data in the project workflow while maintaining integrity is only the first step in the process.
- + Maintaining the data and adding functionality to manipulate or run analysis during project delivery is the stage we will further explore during the session.

McKinsey & Company



Goldman Sachs

...VR market will generate \$110 billion dollars compared to TVs \$99 billion in 10 years.

Source: Goldman Sachs Global Investment Research, IDC



National Institute of BUILDING SCIENCES

An Authoritative Source of Innovative Solutions for the Built Environment

Technology, including BIM, virtual and augmented reality, gaming, and 3D printing provide a wide range of opportunities to improve productivity throughout the project lifecycle, as well as attract new talent to the industry.

<http://facilityexecutive.com/wp-content/uploads/2016/01/TacklingProductivity.jpg>



"momentum will continue to mount around cloud-based enterprise applications in 2016, according to a new survey of CIOs and other tech leaders."

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BUILTWORLDS

VR and AR promise to transform AEC, but for many firms it's still out of reach

RedVector
Online Education for Design and Construction

Virtual Design and Construction (VDC) processes deliver...

- 50% time-savings in the design document phase
- 80% reduction in time to complete cost-estimate
- 60% fewer Requests-for-Information (RFIs)
- 7% schedule savings
- 600 total days direct schedule reductions
- Productivity increases of 25% or more
- **2.95% average direct cost reductions**

Source: Top 5 Emerging Technologies for 2016 in Engineering & Construction by Red Vector

ARCHITECT

THE JOURNAL OF THE AMERICAN INSTITUTE OF ARCHITECTS

...virtual reality, human-to-machine collaboration, and wearable technologies will integrate into the building industry.

Source: Autodesk University 2015 Bets on the Augmented Age

CONSTRUCTION BUSINESS OWNER
THE LEADING BUSINESS MAGAZINE FOR CONTRACTORS

As an industry of professionals specializing in the design and construction and operations of a physical, spatial environment, we are uniquely suited to master this new virtual, spatial environment. **If you haven't begun to embrace these tools and embed them in your operations, what are you waiting for?**

engineering.com

The Internet of Things, blockchain, robotics, 5G Internet, quantum computing—these are all advancing individually, and increasingly overlap with one another.



Drone use is skyrocketing in construction work, at a rate even higher than agriculture and manufacturing, data shows. **Construction drone usage has skyrocketed by 239 percent year over year**



“The vision of the AR cloud will come to fruition in the next five to seven years,” says Adamek. **“A virtual copy of everything on earth, including buildings, will be scanned and converted into 3D.** All of this 3D will make up an entire, new virtual world that will be available for billions of users to step into via their persistent mobile connections.”

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DesignNews

Drones are leveraging artificial intelligence and machine learning to find a stronger foothold in construction and other enterprise markets.



In the future, not only will IoT devices be used on the construction site, but they'll be used throughout the building operations to give us continued insights on how that building is performing. There's so much opportunity for IoT to support construction safety, quality, efficiency, productivity, and sustainability.



While there may be some attrition in the future, the most likely scenario is that **robots will be used alongside human workers to augment their work**, keep them safer and boost productivity. The current capabilities of existing robot combined with a growing labor shortage will probably lead to robots handling some of the more menial repetitive tasks, leaving the human worker to focus on other aspects of their job.



**DRONES IN CONSTRUCTION:
NOT JUST THE LATEST TECHNOLOGY,
BUT A BUSINESS TOOL**

Q4 2018 | COMMERCIAL CONSTRUCTION INDEX



U.S. CHAMBER OF COMMERCE

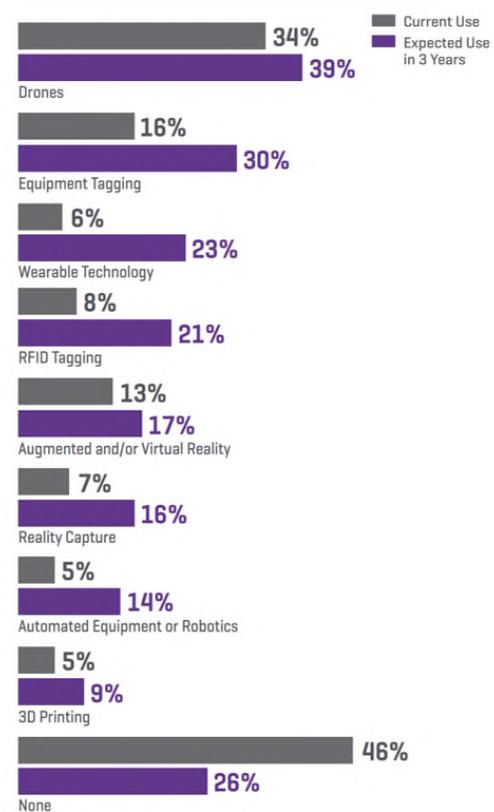


CURRENT USE OF ADVANCED TECHNOLOGIES BY CONTRACTORS

This quarter, contractors were asked about the use of advanced technologies in their construction projects. Over half [54%] of contractors report that they have used at least one of these technologies on their jobsites, with drones selected as the most widely used technology in this survey. Nearly three-quarters [74%] of contractors expect to adopt one or more of these technologies in the next three years.

Contractors indicated which technologies their companies were most likely to adopt in the next three years. Notably, all of the technologies included in the survey are expected to grow in use. Respondents expect drones, equipment tagging, wearable technologies and RFID tagging to be most widely adopted, with the use of wearables expected to increase by the greatest amount. These findings suggest that the commercial construction industry is beginning to embrace many of the emerging technologies available in the marketplace.

Current and Expected Future Use of Advanced Technologies Onsite by Contractors



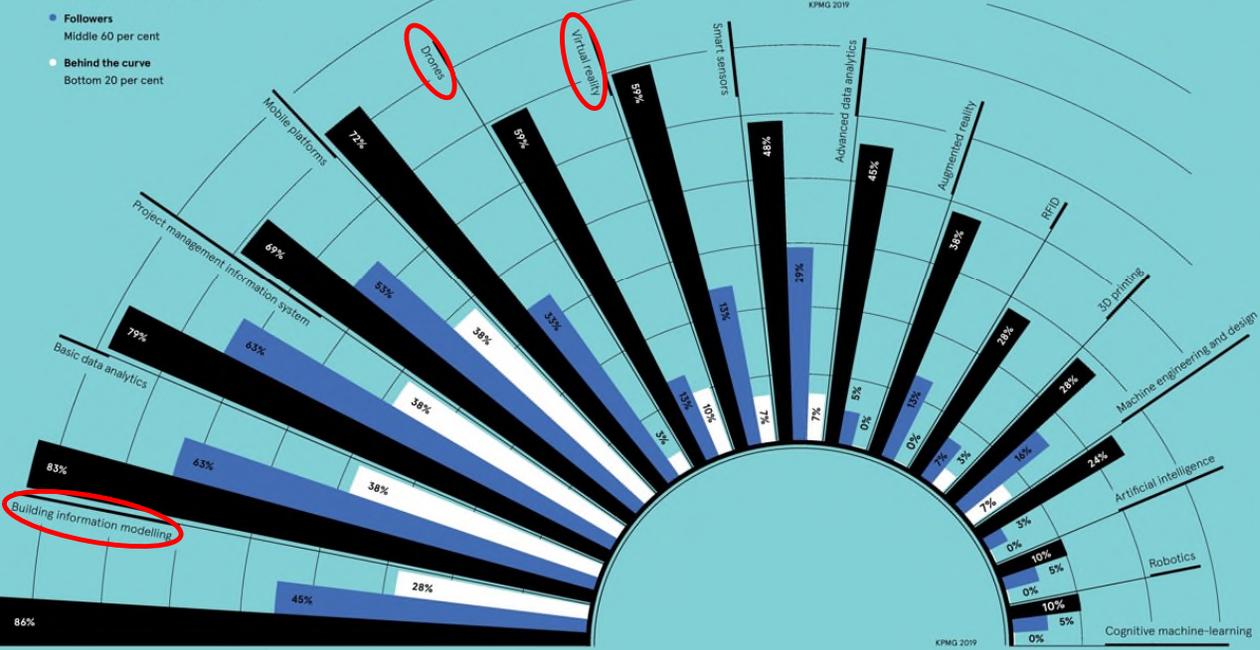
CONSTRUCTION DISRUPTION

While building information modelling and data analytics are widespread among the most innovative construction companies, a host of emerging technologies are starting to have an impact on the sector, and it is the early adopters who are racing ahead of the competition

TECHNOLOGY ADOPTION BY INNOVATION STAGE

KPMG's Future-Ready Index analysed global construction and engineering organisations and ranked them by three key stages of innovation, looking at: governance and controls, technology and innovation, and human capital

- Innovative leaders**
Top 20 per cent in the Future-Ready Index
- Followers**
Middle 60 per cent
- Behind the curve**
Bottom 20 per cent



IMPACT OF DIGITISATION ON THE CONSTRUCTION SECTOR

Where construction companies agree or disagree with the following statements about digitisation

● Agree ● Neutral ● Disagree



52%

of innovation leaders (ranked among the top 20 per cent) say that machine-learning and AI will be commonplace in the sector within five years

KPMG 2019

70%

of construction companies believe those who do not adopt digital ways of working will go out of business

62%

believe the sector is behind others when it comes to adopting digital technologies

89%

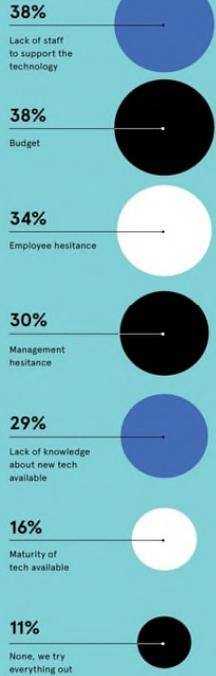
agree that digitisation will transform the way they work

NBS 2019

BARRIERS TO ADOPTING NEW TECHNOLOGIES

Percentage of construction companies who said the following are limiting factors to adoption of new technology

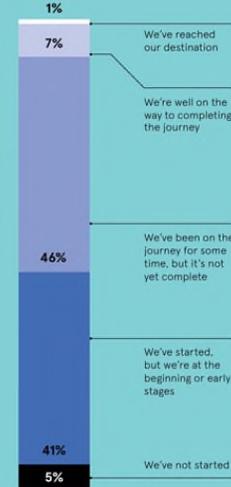
JIBKnowledge 2018



STATE OF DIGITAL TRANSFORMATION

Where construction companies self-identify in the digital transformation journey

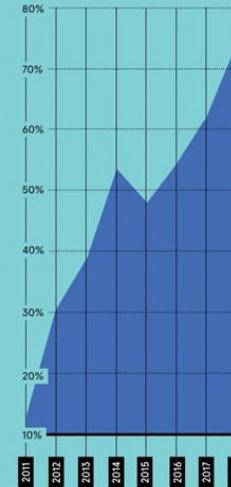
NBS 2018



BIM ADOPTION RATES HAVE SURGED IN RECENT YEARS

Percentage of construction companies that are using building information modelling or BIM

NBS 2018



In the construction phase, the contractors can use this information for AMG during earthwork operations (such as excavating and grading) and obtaining stakeout location for structural elements. Pavement operations for asphalt and concrete slipform paving generally require augmentation of vertical accuracy for **machine control**, and **Robotic Total Stations** (RTS) are commonly used for this purpose. Subsequently, field representatives can perform as-built surveys after construction using GPS-based technology such as **rovers**. They can also deploy **drones** for site inspection, progress monitoring, and estimation of quantities.

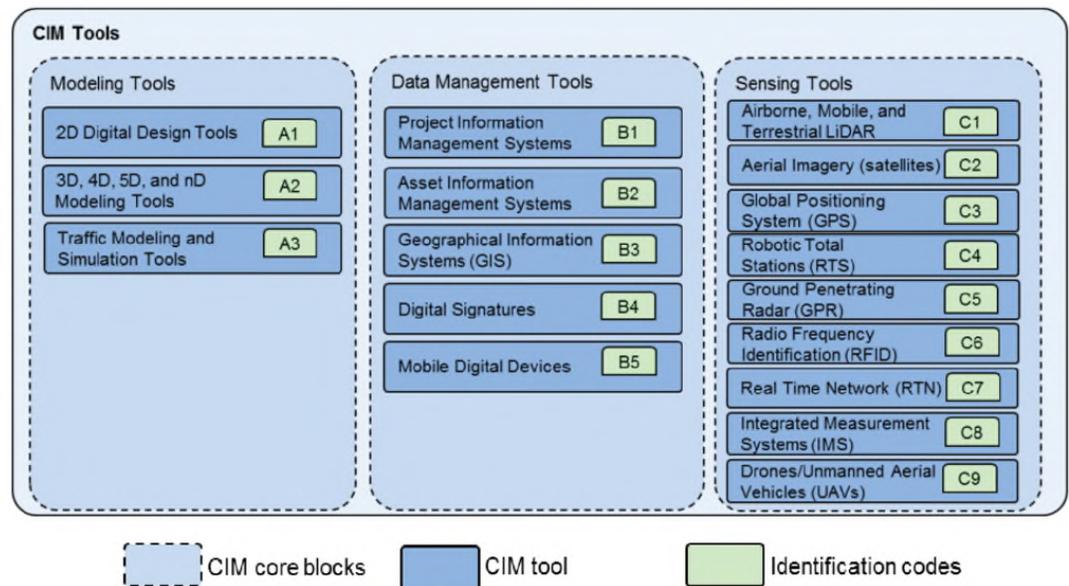
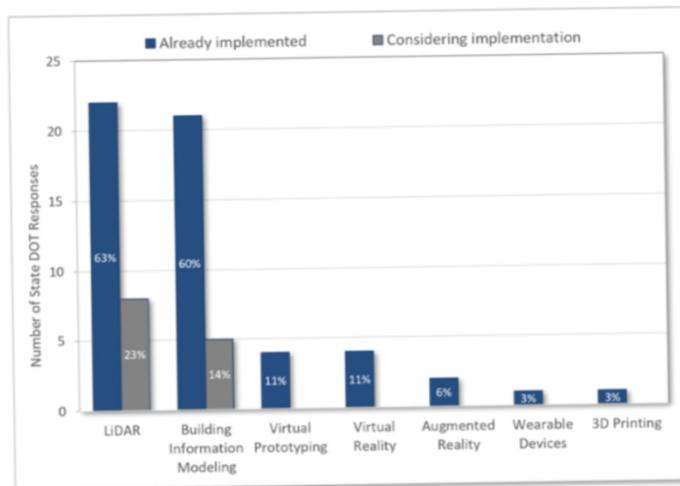


Figure 2.1. Pictorial representation of CIM tools.

SOURCE: Civil Integrated Management (CIM) for Departments of Transportation, Volume 1: Guidebook

1. Visualization and Modeling

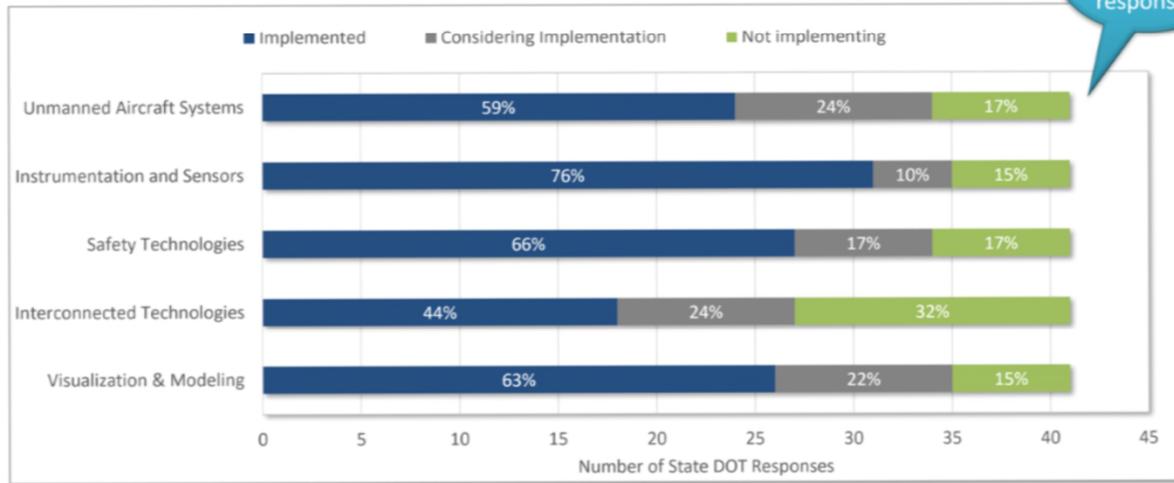


Uses:

- Constructability reviews
- As-built plans and models
- Simulating bridge and non-bridge construction
- Construction inspections
- QC/QA
- Monitoring progress of work
- Utility locations and conflicts
- Work verification for progress payments
- Virtual design and construction
- Fabrication of components

Survey Analysis

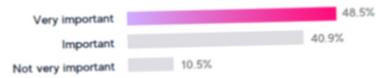
41 total DOT responses



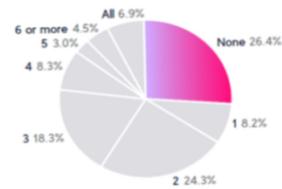


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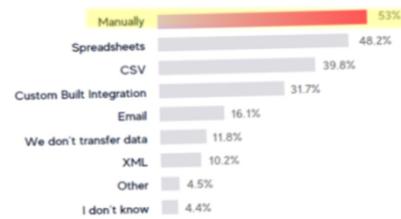
HOW IMPORTANT ARE MOBILE INTEGRATION AND CAPABILITIES WHEN MAKING SOFTWARE PURCHASING DECISIONS?



NUMBER OF APPS THAT INTEGRATE DATA



METHOD FOR TRANSFERRING BETWEEN APPS THAT DON'T INTEGRATE



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SOURCE: Dodge DATA & Analytics - ICA

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SOURCE: Dodge DATA & Analytics - ICA



SOURCE: Dodge DATA & Analytics - ICA

PRINT | SCAN | COPY | SHARE



HP DesignJet MFP solutions solve some of the toughest challenges in the construction industry. Stay up-to-date and focused on building with the complete portfolio of products from HP. Designed to fit your unique requirements, printing, scanning solutions and accessories, like the HP DesignJet Rugged Case make it easy to transport and protect your MFP from onsite damage.

"The HP DesignJet T830 printer enables us to scan and print virtually anywhere we choose, which frees up a lot of resources and helps us work more efficiently. It is currently sitting in a dusty trailer but that less than ideal environment hasn't affected its performance. Compared to some of the plotting devices we have used in the past, which needed serious effort to move, it's night and day. This machine is truly portable."

Maurice Clarke
Virtual Design and Construction Manager

 **Hensel Phelps
Construction Co.**

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**Versatile Jobsite Plotter Has
More Than 253 Shades of Gray**

Source: ENR Magazine
December 21, 2015 **ENR**



“A lot of our markups that we will do in Bluebeam for example it is very helpful to have that in color....comments from the architect in green, you’ve got comments from the contractor in red, you got comments in blue from the engineer...**to be able to print in color is very helpful... Its very important to have that ability to print be able right there onsite**, it really helps minimize the time it takes to get an updated submittal...”

Jason Jones, Technology Director
O'Neal, Inc.



“The majority of the subs still build off of their shop drawings at the end of the day which is produced from the model but its paper drawings that they are producing from the model that they’re building off of.”

Jason Waddell, Director of Construction Technology Development
Batson-Cook



“There was a definite benefit of being able to get one sheet, one pertinent bit of information, whether it was a plan or a detail or a section whatever the case may be. **Being able to print that on the spot** the most up to data from our Bluebeam PDF session. That was a very good benefit to have and it was received very well...”



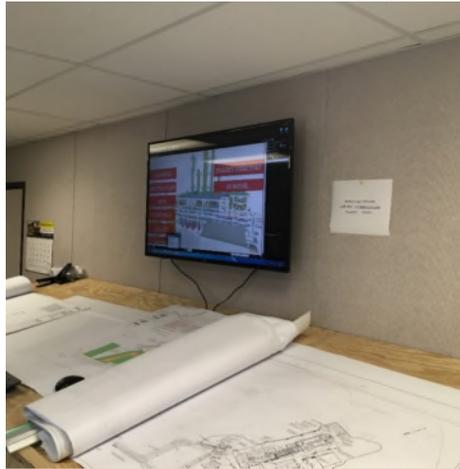
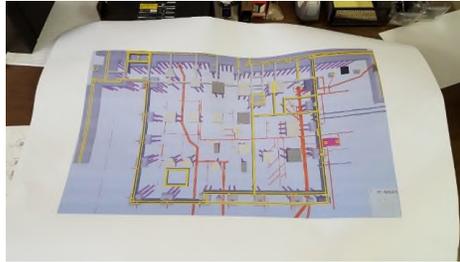
Maurice Clarke, Virtual Design and Construction Manager
Hensel Phelps Construction Co.



“There are times where there are particularly tough areas where its easier just to print out that view or a couple of views there and get around the group and they can easily mark it up.”



Benjamin Crosby, Director of BIM / VDC
W.G.Yates & Sons Construction



- Printing BIM models for better collaboration
- Scanning marked up models to send to BIM Manager for Revit® modifications
- Printing in color supports LEAN and reduces latency on the jobsite!
- **INSTANT PRINT AND THE TARGETED PRINTING SUPPORTS THE BIM PROCESS AND KEEPS US INTO IT**



SCANNING | AS-BUILT | INSPECTION | VERIFICATION | ARCHIVE



“A lot of this wouldn’t happen at all without scanning and 3D models. True, it’s exactly what surveyors have been doing for a long time, gathering 3D coordinates, *but what we have now is a system and method that can collect all these 3D data points incredibly quickly.* We’re solving the same problems—defining shapes and surfaces—but we’re doing it a heck of a lot quicker, and in a way that is perceived as exciting.”

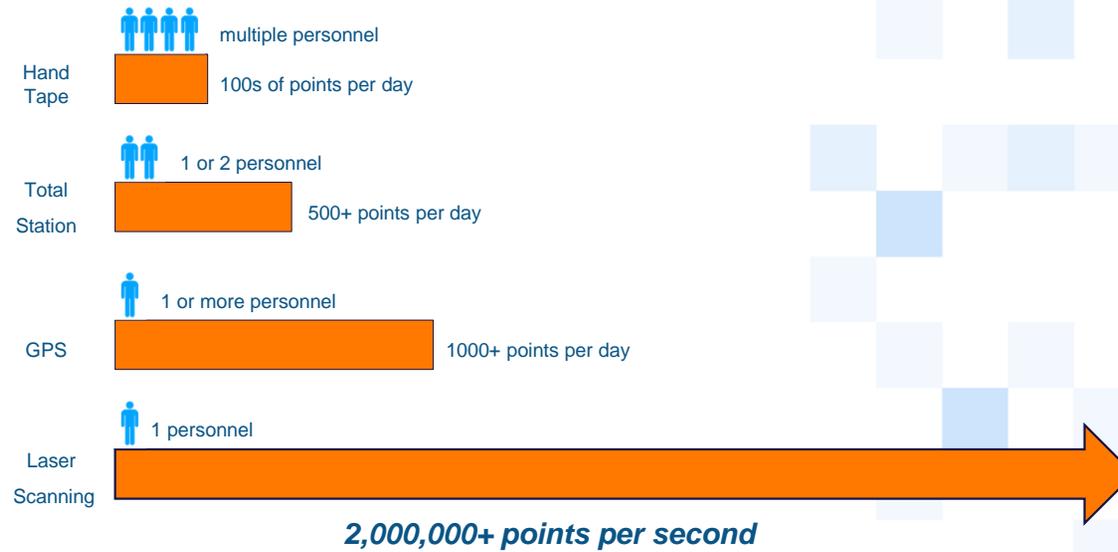
Simon Barnes, RICS,
CEO of Plowman Craven

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3D Scanning Technology permits **precision measurement**, imaging and comparison for production and **quality assurance** in the design, building and restoration industries. **Inspections**, planning or **documenting structures in 3D**, laser measurement technology allows companies to maximize efficiencies and improve processes.



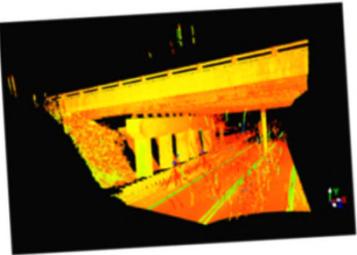
SCANNING | AS-BUILT | INSPECTION | VERIFICATION | ARCHIVE





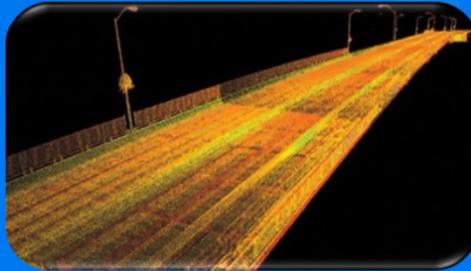
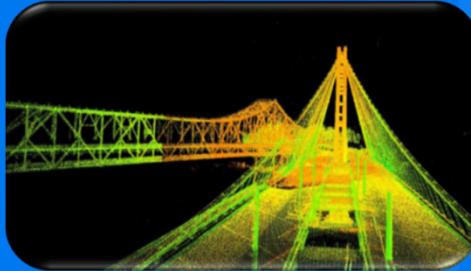

IOWA STATE UNIVERSITY
 Institute for Transportation

3D Modeling & 3D Laser Scanning for Bridge Inspection and Structural Analysis



Yelda Turkan, Ph.D.
 Simon Lafamme, Ph.D., PE
 Iowa State University






Caltrans' Randy Wigman uses the Leica ScanStation C10 to capture high-resolution scan data under the next span of the Bay Bridge.

HOW TO LASER SCAN A BRIDGE IN FIVE DAYS

Capturing an accurate 3D as-built of the entire San Francisco-Oakland Bay Bridge under a tight timeline required state-of-the-art technology, survey expertise and the vision to know it was possible.

When the magnitude 6.9 Loma Prieta earthquake struck Northern California on Oct. 17, 1989, the San Francisco-Oakland Bay Bridge (SFBRB) system, one of the major man-made structures that sustained damage. A section of the east span's upper deck collapsed onto the lower deck, killing one person and

facing a month-long closure of one of the most important transportation arteries in the region.

California Department of Transportation (Caltrans) officials and project partners needed to know how much movement had occurred across the original east span due to the collapsed and damaged deck sections. Unfortunately, as-built measurement records of the Bay

Bridge and the other main bridges in the Bay Area did not exist, so obtaining original east span trim section data was not possible.

It was a dilemma that Caltrans District 4 Right of Way Field Surveys and District Office Chief Melissa Aguilas, PLS, was determined to prevent in the future.

BY VICKI SPEED

SCANNING | AS-BUILT | INSPECTION | VERIFICATION | ARCHIVE

VERSATILE

PORTABLE

ACCURATE

USER-FRIENDLY

- **Rapid, simple and complete** recording of the current status of buildings and building sites.
- **Millimeter-accurate measurement** of large environments and objects in only a few minutes
- **Immediate processing** of the data in all commonly used CAD programs.
- Simple **variance comparison** in the construction process and in the case of final building inspections.
- Greater **transparency**, greater legal certainty in claim management.

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VIRTUAL REALITY (VR) | AUGMENTED REALITY (AR)



VR has captured the imagination of architects seeking the ultimate experience for design and creation. Likewise, AR has captivated contractors, seeking the “ultimate stud-finder” to assist in layout and inspections.

Unlike VR, which fully immerses participants in an artificial environment, AR enhances the experience of the real world by incorporating contextual information when and where it is needed. **AR will be more integrated into our everyday lives than VR, and a much larger market opportunity in construction and facilities maintenance.** The sweet spot for AR lies at the intersection and overlay of domains of information.

CONSTRUCTION
BUSINESS OWNER
THE LEADING BUSINESS MAGAZINE FOR CONTRACTORS

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VIRTUAL REALITY (VR) | AUGMENTED REALITY (AR)



PHYSICAL MOCK-UP
12 WEEKS



VIRTUAL MOCK-UP
2 WEEKS

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VIRTUAL REALITY (VR) | AUGMENTED REALITY (AR)

"Manipulating large and complex Revit® files to convey critical information pertaining to a high profile, mega project can be a daunting task. Utilizing visualization tools such as Samsung Gear VR, VIMaec™, and Unity enabled our project team to communicate more effectively, collaborate in a virtual environment, and minimize project delays - therefore minimizing cost impacts."

MCCARTHY

Alexa Malusky

Virtual Design and Construction Engineer.

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VIRTUAL REALITY (VR) | AUGMENTED REALITY (AR)

"We use VR to communicate with our project staff and the owner on how we are building the job, The value of augmented reality is being able to take the model in the field," "You can see the work that is real and virtual overlaid on top of each other. **We can identify scheduling, coordination and production impacts.**"



Brian Krause
Director of Virtual Design and Construction
Clark Construction



"It's powerful and adds another dimension to the way in which we can de-risk the project,"
"Pixels are cheaper than bricks."



Chris Mayer
Chief Innovation Officer
Suffolk

"Some benefits accrue to the client, because they have a better sense of the structure they will have when it's done, but other benefits accrue to the contractors and engineers,"



Jim Dray
Chief Information Officer
Thornton Tomasetti

"Our biggest clients are requesting to have VR on their future projects – proof enough that it's been a great success. It not only benefits our clients but also benefits our own project teams and estimators."



Wade Martin
Virtual Design and Construction Coordinator
Brasfield & Gorrie



constructor
THE MAGAZINE OF THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AR enables Pepper Construction to understand scale, check placement of mechanical, electric and plumbing or other equipment as a way of assuring quality control and will inspect a site before a concrete pour to check sleeves and imbeds are in place and in the right spot.



Jennifer Suerth
Vice President of Technical Services
Pepper Construction Co.

VIRTUAL REALITY (VR) | AUGMENTED REALITY (AR)



BENEFITS

- Immersive experience
- Realistic presentations
- Free roam walk-throughs
- Easy to Use
- Improves collaboration
- Retains all BIM data
- No need for Revit® to view
- Cloud based
- No file size limits

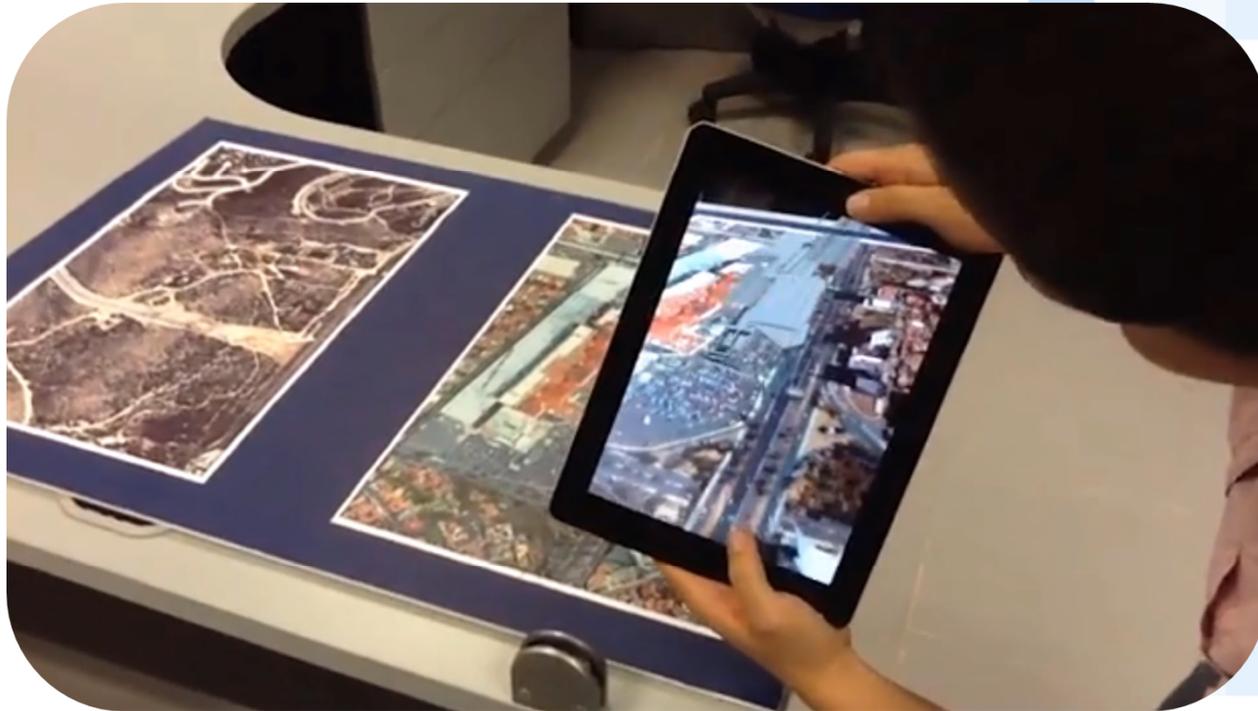


VIRTUAL REALITY (VR) | AUGMENTED REALITY (AR)



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VIRTUAL REALITY (VR) | AUGMENTED REALITY (AR)



BIM in the FIELD

The Smart Jobsite: BIM in the Field at Turner Construction Company

Before the Field

Turner Construction Company uses Building Information Modeling (BIM) throughout the life of a project. Starting early in the design phase, Turner works with designers, trade subcontractors, and owners to identify the risk areas on the job and leverage the use of BIM to control that risk. This includes applications such as 3D virtual trade coordination, estimating, scheduling, constructability reviews, and logistics planning. Early planning is integral to the implementation of BIM throughout the rest of the project process.



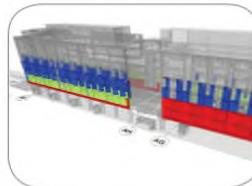
Eliminating Surprises: Laser Scanning to Capture Existing Conditions

Turner uses laser scanning to capture detailed geometric information about existing conditions and has used the scanning process on 8.5% of all BIM projects to rapidly and accurately produce a model-based representation of existing conditions for the project team. The process often uncovers information about existing conditions, identifying variances from as-built documentation and deficiencies in surfaces not being level or plumb due to settlement or improper placement. This information can be critical for alterations or additions.



Scientific Management of Work: Visual Production Control™

Turner captures jobsite material information in several ways, using tools such as Radio Frequency Identification (RFID) tags and barcodes, and can represent that information visually in digital models for user-friendly, rapid project status updates. Reviewing the steel and curtainwall tracking images below, it is easy for the project team and the owner to quickly understand which materials are on site, in place, or not yet installed. This accurate and up to date record keeping can be used to identify issues with supply lines or rapidly adjust the project schedule.



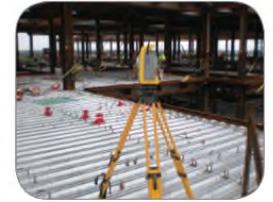
BIM BEFORE THE FIELD

BIM IN THE FIELD

Turner

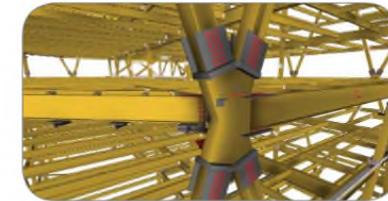
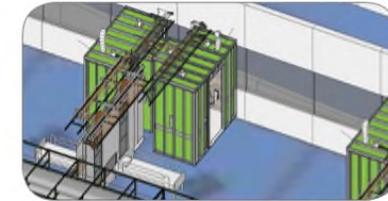
Building in Quality: Model-Based Layout with Robotic Total Stations

With model-based layout, Turner takes traditional survey methods further and adds precise location coordinates from the model. This helps Turner leverage detailed models built for trade coordination or other purposes and accurately lay out building systems in the field exactly as planned during the 3D model-based coordination process. Model-based layout not only increases the level of layout precision, but also takes less manpower than traditional layout methods. This confidence and trust level is based on a reliance of the accuracy of the BIM model.



Offsite Construction Prefabrication of Systems and Assemblies

The use of BIM enables Turner's subcontractors to prefabricate a wider variety of building systems than was possible in the past. Prefabrication from a coordinated model assures project team members that building elements will be fabricated and installed just as modeled. Prefabrication has other advantages as well; prefabrication work that is completed offsite under controlled conditions improves safety and quality. Building systems that have been pre-assembled can be rapidly installed, requiring less rework than traditional methods.



Turner

BIM in the FIELD



DataVault™



DataVault™ Mobile



BIM in the FIELD



KNAACK **DATAVAULT™**
PRODUCTIVITY

- Bringing information closer to the work area
- Save time - View Forms, RFI's, Drawings with no travel
- Extend the Trailer – hold coordination meetings and safety briefings at the “BIM” Box

“Placing a DataVault in the work area will guarantee two hours of time savings per day. For each floor you move up you can add an additional 30 minutes of productivity”

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Jason Jones | VDC Director | **O'NEAL**
THE BUSINESS OF PROJECT DELIVERY

BIM in the FIELD



Miron's Ci Hubs are essentially modified gang boxes equipped with a TV monitor, computer, printer, and file-synchronizing software. A complete synchronized system provides the construction team with the building information model and the digital drawing set right where they need it, just in time, and always current. **Crews are trained to use the unit and provide everyone on site (including subcontractors) with increased efficiency due to the ability to not only view plans, sections, and details, but print them!**



BIM in the FIELD



CONNECTIVITY

PRODUCTIVITY

MOBILE

SECURE

- Faster access to the data
- Increased confidence in the build and reduced mistakes
- Improved Building Information Modeling Integration
- Reduced wait times
- Improved durability, security and mobility
- Connectivity
- Productivity - Building Information Modeling (BIM) access directly at the jobsite
- Mobile Work Environment - Reach nearly every job on the construction site during any stage of construction.
- Securing Assets - KNAACK® quality steel box is built to protect against theft and resist jobsite conditions.

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DRONES IN CONSTRUCTION

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DRONES IN CONSTRUCTION

For builders, the case for return on investment is straightforward. Drones are cheaper to fly than manned aircraft and faster than human surveyors, and they collect data far more frequently than either, letting construction workers track a site's progress with a degree of accuracy previously unknown in the industry. With the right computing tools, builders can turn sensor data into 3D structural models, topographical maps, and volumetric measurements (useful for monitoring stockpiles of costly resources like sand and gravel). **Collectively, that intelligence allows construction companies to more efficiently deploy resources around a job site, minimize potential issues, trim costs, and limit delays.**

FORTUNE

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According to a March 2016 [report](#) from Goldman Sachs, **construction will be the largest use case for commercial drones in the immediate future, generating \$11.2 billion of the projected \$100 billion in global spending over the next five years.**

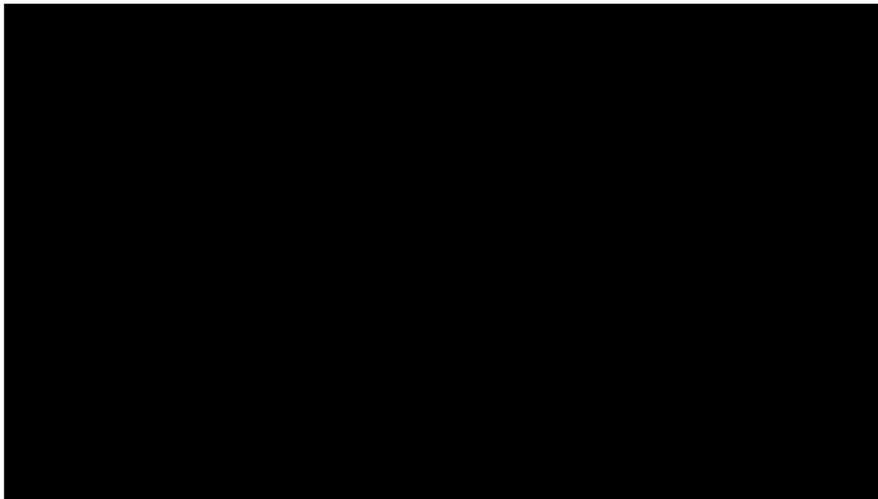
Goldman
Sachs

Intel Flies Drones for Bridge Inspection

According to Intel, the aerial survey made the survey far quicker and less expensive. The Stone Arch inspection saw a **cost savings of approximately 40 percent**, and across both projects, the drone inspection **reduced overall workhours by 28 percent.** ([Read More](#))

DRONES IN CONSTRUCTION

Preconstruction survey, topographical measurements, project progress, and even as-Designed/as Built become concise and efficient using unmanned aviation solutions. The Yuneec H520 is designed to fly repeatable, perfect-placement flight over construction sites, providing not only measurable and demonstrable project data, but also helping to identify shrink points, at-risk areas, or security breach points.



“We’ve mapped 1,400 acres of Brasfield & Gorrie job sites. Over the next five years, we hope to use drones on most, if not all, of our 200-plus job sites. People often think of drones and reality capture as a future concept, pie-in-the-sky dream, but at Brasfield & Gorrie we’re seeing real value using UAS today.”

**BRASFIELD
& GORRIE**
GENERAL CONTRACTORS

Hunter Cole
Virtual Design & Construction

YUNEEC

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← THE TECHNOLOGY CONTINUUM IN DESIGN AND CONSTRUCTION →



THE OFFICE



THE TRAILER



THE JOBSITE



THE FIELD



ASSET MANAGEMENT



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AECOM HUNT



AECOM Hunt's Innovation Center in Indianapolis supports several Midwest U.S. projects in implementing BIM.



“Suffolk is ahead of the curve, using machine learning to analyze data, predict risk, and deliver better buildings.”

Jit Kee Chin

Executive Vice President and Chief Data Officer



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SKANSKA

Innovation

Our innovation services continue to evolve alongside technology's exponential growth. As pioneers in construction and project development we are not bystanders to the future of our industry – we are its builders. We are actively pushing our people, our projects and our industry forward with today's most exciting emerging technologies to deliver on the needs of our clients.

*"BIM is evolving very rapidly as new software and processes are developed. Some of the things Skanska is pioneering include the use of **drones, virtual reality, laser scanning** and leveraging **gaming technology** to easily navigate models."*

*"We are also using **cloud-based** systems for quantifying and estimating, and for project collaboration."*

Mark King
VIRTUAL DESIGN & CONSTRUCTION MANAGER
SKANSKA USA

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Reality Capture

With advanced reality capture tools, including laser scanning and 360-cameras we can reveal inconsistencies between real-life and a plan.



Connected Jobsite

Access the most current information in the field, with technologies, including sensors, real time location tracking systems and IoT.



Immersive Experiences

Enhance the client experience and accelerate decision making with virtual reality, augmented reality and mixed reality.



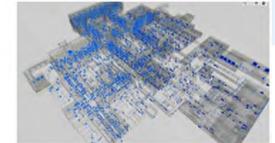
Unmanned Aerial Systems (UAS)

UAS/drones help reduce costs of surveying and project monitoring, and safely verify and validate work-in-place of hard to reach locations.



Advanced Visualization with BIM

Advanced visualization reduces rework through improved communication and collaboration, and optimizes project timelines with construction simulations.



BIM Analytics

Merging BIM data and visualization tools creates context for project costs and schedules, leading to smarter decisions during project planning.



VDC / BIM

VDC / BIM enhances quality, minimizes cost, improves safety, reduces schedules, and strengthens collaboration across the project life cycle.



Prefabrication / Industrialization

A manufacturing approach to construction can help reduce construction waste, shorten the project schedule, and improve worker safety.

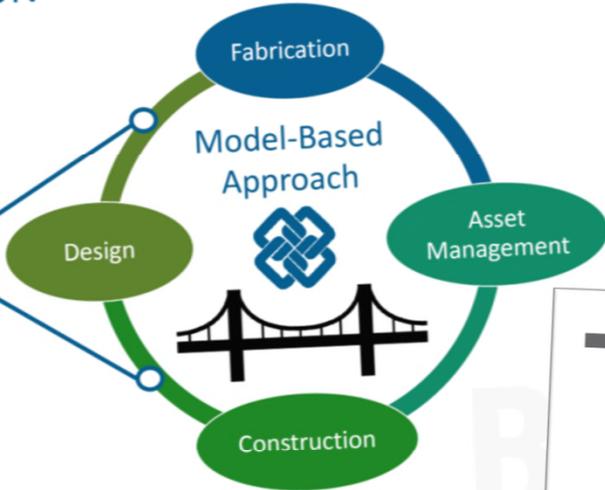


Global R&D

Our Skanska Global Research & Innovation network is the hub for technical expertise and knowledge transfer between the various Skanska units across the world.

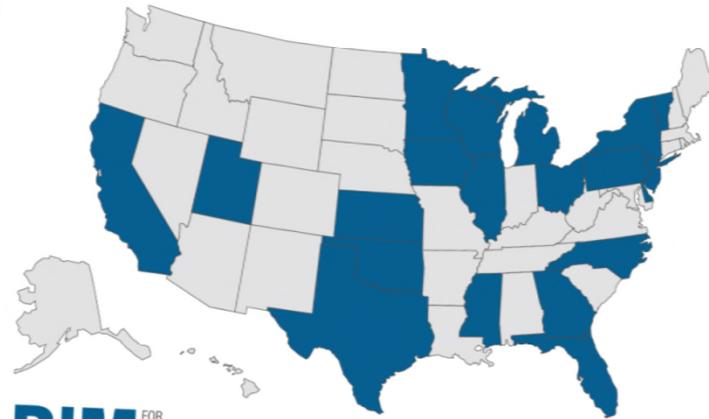
PROJECT VISION

Focus of pooled fund project
BIM
FOR BRIDGES AND STRUCTURES
TPF-5(372)



BIM
FOR BRIDGES AND STRUCTURES
TPF-5(372)

TRANSPORTATION POOLED FUND – TPF-5(372)



20 STATES*
PARTICIPATING

- 01 California DOT
- 02 Delaware DOT
- 03 Florida DOT
- 04 Georgia DOT
- 05 Illinois DOT
- 06 Iowa DOT
- 07 Kansas DOT
- 08 Michigan DOT
- 09 Minnesota DOT
- 10 Mississippi DOT
- 11 New Jersey DOT
- 12 New York State DOT
- 13 North Carolina DOT
- 14 Ohio DOT
- 15 Oklahoma DOT
- 16 Pennsylvania DOT
- 17 Texas DOT
- 18 Utah DOT
- 19 Vermont VTRANS
- 20 Wisconsin DOT

BIM
FOR BRIDGES AND STRUCTURES
TPF-5(372)

* Plus FHWA and NIBS

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HDR

SOURCE: BIM FOR BRIDGES AND STRUCTURES | Transportation Research Board (TRB) Annual Conference 2020
Connor Christian | Transportation BIM Program Manager | HDR



Model Based Contracting at NYSDOT
TRB – Building Information Modeling for Bridges and Structures
January 12th, 2020

Brenda Crudele, P.E.
NYSDOT
Director, Structures Design Bureau

TRB Session 1437

Building Information Modeling for Infrastructure:
National Strategic Roadmap Strategies for Implementation



George Lukes, Utah DOT
Outlook for CAD-BIM-GIS and IFC Standards - BIM
Tuesday January 14, 2020 Session 10:15 AM to 12:00 PM

ABJ95- Visualization In Transportation Committee
TRB 99th Annual Meeting, January 2020, Washington, DC



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BIM was the catalyst for rapid technology adoption in Commercial Construction in US and throughout Europe and Asia Pacific



BIM Standards are being developed by WSP



Digital Delivery 2025 - They intend to be fully BIM by then.



Developing MBDC- model based design and construction and have awarded 11 projects with the model as the legal contract since 2016



Developing Model Based Contracting

Goals for Pilot Project:

1. Create a process to include models as part of the legal contract documents for NYSDOT projects
2. Leverage technology to explore more efficient ways for NYSDOT to do business (design to construction)



WisDOT reported \$57.8M LET savings and \$28.2M reduction in Change Orders as a result of using BIM on the \$1.7B Zoo Interchange project

BIM PILOT PROJECTS



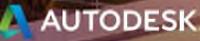


TRANSPORTATION

A guide to Florida's transformation to BIM

Building Information Modeling (BIM) is an intelligent model-based process that provides insight for creating and managing projects faster, more economically, and with less environmental impact.

A nighttime photograph of a city skyline with several illuminated skyscrapers. In the foreground, a multi-lane highway with a concrete barrier runs across the frame. The sky is a deep blue, and the city lights create a warm glow. The Autodesk logo is visible in the bottom left corner of the image, and a "Get started >" button is in the bottom right corner.

 AUTODESK

[Get started >](#)

<https://www.autodesk.com/campaigns/fdot-transformation-to-bim>



SO MANY DEVICES...

BUILDING SYSTEMS



SCAN DATA



TABLETS
DEVICES



DRONE DATA



AR / VR



SECURITY &
PROGRESS



PRINT | SCAN



INTERACTIVE
DATA ACCESS



MACHINE
CONTROLS



WEARABLES

ASSET TRACKING
VEHICLES



ASSET TRACKING
TOOLS



ASSET TRACKING
PERSONEL



INTERACTIVE
DATA ACCESS



EQUIPMENT | MATERIAL
DELIVERY



RFID TAGS



MATERIAL
SENSORS

SO MANY DEVICES...



Appia®

Doc Express®

Bid Express®

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<p>3D VISUALISATION & COMMUNICATION</p> <p>Enscape Fuzor Autodesk Live</p>	<p>VR & AR SOFTWARE</p> <p>Iris VR Fuzor Autodesk Stingray</p>	<p>MOBILE 3D REVIEW</p> <p>BIM 360 Glue Revitzo Fuzor BIM anywhere Rendra Dalux</p>
<p>DOCUMENT MANAGEMENT SYSTEM (COMMON DATA ENVIRONMENT)</p> <p>Aconex Field A360 Teams Newforma A360C4R</p>	<p>AUTOMATION</p> <p>Dynamo iConstruct Flux Kiwi Codes UNIFI Xrev Coins RTV Tools Autodesk Model Checker Colour Splasher</p>	
<p>AS-BUILT HANDOVER DOCUMENTATION</p> <p>Zutec Dome Connect WebFM</p>	<p>3D DESIGN (ARCHITECTURAL)</p> <p>Autodesk Revit ArchiCad</p>	<p>3D REVIEW & COORDINATION & CLASH DETECTION</p> <p>BIM 360 Glue A360 Teams Fuzor BIM collab Revitzo BIM Track Solibri Model Checker Navisworks Manage</p>
<p>2D ACCESS / MARKUP TOOLS</p> <p>Field Wire Bluebeam Revu ShapeDo Procore PlanGrid Drawboard Bulclip</p>	<p>CONNECTED CONSTRUCTION FIELD DATA</p> <p>Field Wire OnTarget Fieldlens Procore BIM 360 Glue Aconex Field</p>	
<p>DATA VISUALISATION</p> <p>Tableau Kibana Elastic</p>	<p>4D PLANNING</p> <p>Asta Power Project Synchro Navisworks Simulate/ Manage Fuzor Construction C3D Interactive</p>	<p>5D COSTING</p> <p>CostX Rib ITWO C3D Interactive</p>
		<p>6D FACILITIES MANAGEMENT</p> <p>Ineni & iViva Works EcoDomus VEO</p>

BIM WORKFLOW SOFTWARE

assemble
 CLEAREDGE 3D
 VERITY

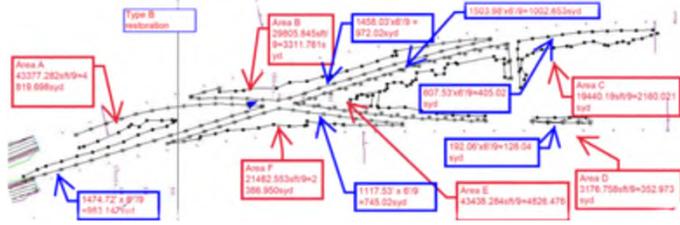
PHOTO MANAGEMENT

PIX4D
 MULTIVISTA
 EarthCam

PHOTO / AI

SMARTVID.IO

CASE STUDY



FieldGenius

Area Calculations

Calculate Area Determine Area

Calculate Area

Area: 29805.8455SqFt

0.684Acre

Perimeter: 2095.01'

Define Area Map View Close



HNTB

Station: East Crossway Field measured with Rover

Type B areas

- 829.498 Sqft
- 972.02 Sqft
- 409.02 Sqft
- 238.04 Sqft
- 1062.853 Sqft
- 2127.02 Sqft
- 7969.466 Sqft**

Total area measured

- 829.498 Sqft
- 972.02 Sqft
- 2080.021 Sqft
- 352.973 Sqft
- 4826.479 Sqft
- 3863.99 Sqft
- 12797.08 Sqft

Type A

- 29805.8455 Sqft
- 29805.8455 Sqft**



Appia[®]
Mobile Inspector[®]

Model and Communication

Make: Leica Model: TPS Robot (GeoCOM)

Status: geo-FENNEL

Status: GeoMax

Status: KOLIDA

Port: Leica

Device: LINERTEC

Device: Nikon

Device: PENTAX

Device: Sanding

Device: Sokkia

Device: South

Device: Stonex

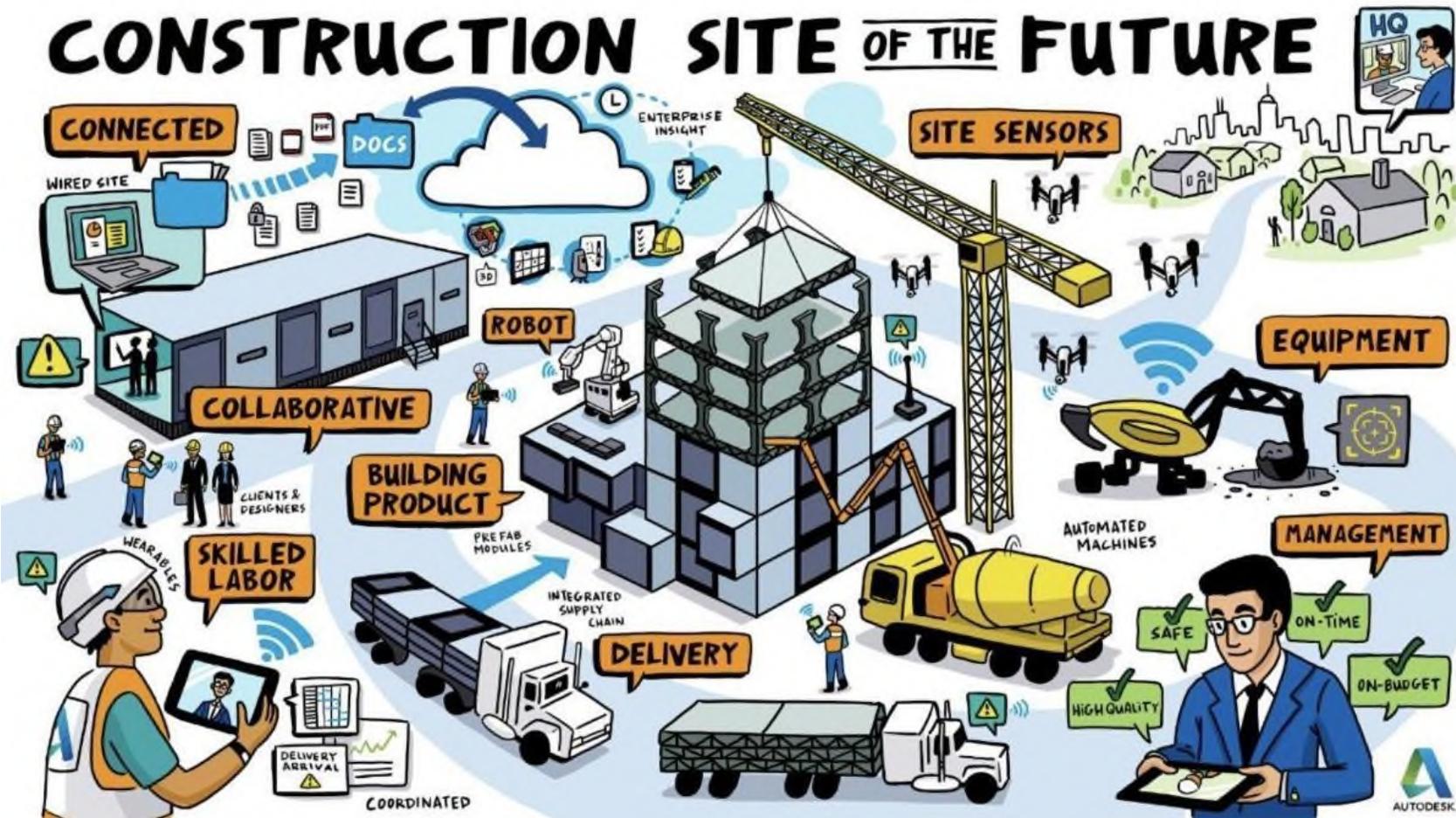
Connect Radio Settings Close



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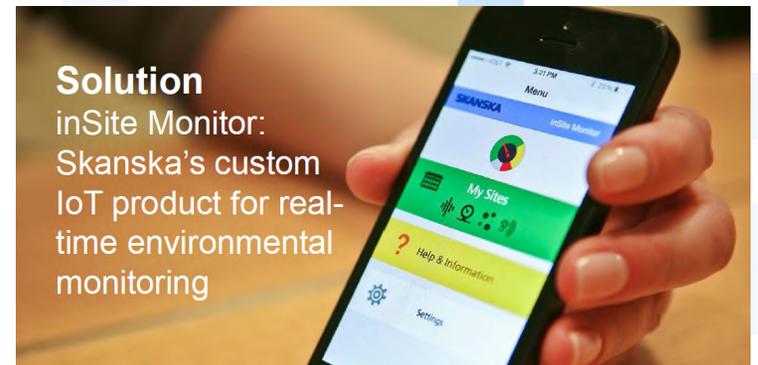
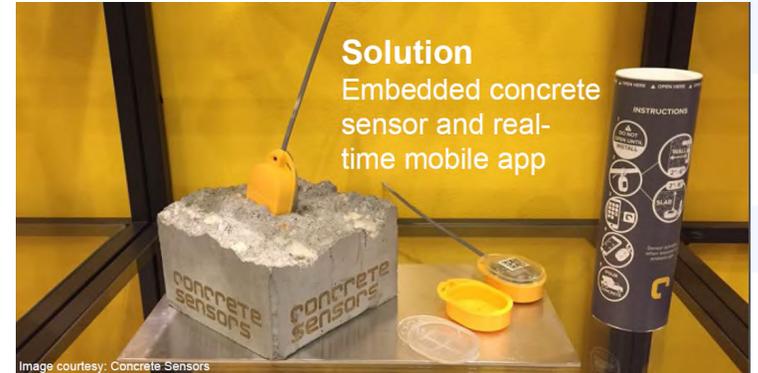
CONSTRUCTION SITE OF THE FUTURE





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SOURCE: SKANSKA



NEW WORKFORCE?





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THANK YOU!

RON PERKINS // rperkins@jobsitetechgroup.com

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infotechinc.com