CONSTRUCTION DISRUPTION
How Drones, Sensors and Integrated Apps are Rewriting All of the Rules

Presented by James M Benham
James M Benham
CEO

jbknowledge.com | @JBKnowledge

Contact Info

@JamesMBenham
#JBTechTalk

linkedin.com/in/jbenham

james@jbknowledge.com

jamesbenham.com
Annual Construction Technology Survey

Survey Participants

- June 2012: 452 Survey Participants
- July 2013: 706 Survey Participants
- June 2014: 1,028 Survey Participants
- July 2015: 2,044 Survey Participants
- July 2016: 2,604 Survey Participants

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Percentage of Corporate Revenue Spent on IT

- I don't know: 14.8% (2015), 14.8% (2016)
- Less than 1%: 55.9% (2015), 55.9% (2016)
- 1%: 14.1% (2015), 7% (2016)
- 2%: 7% (2015), 2.8% (2016)
- 3%: 2.8% (2015), 1.1% (2016)
- 4%: 2.1% (2015), 0.2% (2016)
- 5%: 1.9% (2015), 0.2% (2016)
- 6%: 1.9% (2015), 0.2% (2016)
- 7%: 1.9% (2015), 0.2% (2016)
Percentage of Corporate Revenue Spent on IT

Source: IT Key Metrics Data 2014, Gartner Benchmark Analytics
Dedicated IT Department

2015

- Yes: 57.4%
- No: 42.6%

2016

- Yes: 42.4%
- No: 57.6%
The Most Limiting Factor in Adopting New Technology

- Lack of staff to support the technology: 39.7%
- Budget: 37.2%
- Employee hesitance: 31.6%
- Lack of knowledge about what new technology is available: 29.6%
- Management hesitance: 28.3%
- Maturity of technology available: 16.4%
- None, we try everything out: 9.4%
- Other: 5.4%
- I don't know: 5%
The Presence of IT Department vs Sales Volume

- Less than $1 Million
- $1-5 Million
- $6-20 Million
- $21-50 Million
- $51-100 Million
- $101-200 Million
- $201-500 Million
- $500+ Million
The Presence of IT Department vs Number of Employees

- 1-5 employees
- 6-20 employees
- 21-50 employees
- 51-100 employees
- 101-200 employees
- 201-500 employees
- 501-1,000 employees
- 1,000+ employees
Size of IT Department Depends On

- I don't know: 39.3%
- The number of employees needing support: 38.1%
- The number of internal software applications needing support: 23.5%
- The size of current and upcoming projects: 21.4%
- Other: 7.9%
- It is strictly determined by a percentage of revenue: 3.2%
Billing IT Expenditures to Projects

- 47% No
- 36% It depends on the expense
- 14% Yes
- 3% I don't know
Converging The Cloud, Big Data & Machine Learning

SMARTVID.IO

Model Objects
Statuses
Activity IDs

Videos & Photos
Tag Dictionary
Smart Tag™ Engine
Smart Comment
Smart Share

Media Manager
Media Reviewer
Media Search

Videos & Photos

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AUTODESK® RECAP 360®
## Converging The Cloud, Big Data & Machine Learning

### SMARTVID.IO

<table>
<thead>
<tr>
<th>Step/Challenge</th>
<th>Before</th>
<th>Now with Smartvid.io</th>
<th>Old Process</th>
<th>Minutes Saved</th>
<th>Instances*</th>
<th>Hours Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Data Gathering</td>
<td>Write room name on whiteboard so location is known</td>
<td>Take video of room</td>
<td>5 min/room</td>
<td>3</td>
<td>4,500</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>Take 5-10 pictures/room</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office Organization Time</td>
<td>Create file folder with room name, rename files with room names</td>
<td>Run Smart Tagging</td>
<td>2 min/room</td>
<td>1</td>
<td>4,500</td>
<td>75</td>
</tr>
<tr>
<td>Finding Imagery Later</td>
<td>Look through pictures to find correct image for location</td>
<td>Search</td>
<td>30 min/search</td>
<td>25</td>
<td>150</td>
<td>63</td>
</tr>
<tr>
<td>Forgetting a specific shot</td>
<td>Need to go back to the field and retake</td>
<td>Review video for needed shot</td>
<td>15 min/instance</td>
<td>15</td>
<td>25</td>
<td>6</td>
</tr>
</tbody>
</table>

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Viewing Plans

PlanGrid

Typical parapet detail for nailing required here
## Robotic Total Stations

(from Buck Davis) https://www.linkedin.com/pulse/20140808182339-29646507-roi-of-robotic-total-stations-vs-traditional-layout

<table>
<thead>
<tr>
<th></th>
<th>Traditional Layout</th>
<th>Robotic Total Station</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Workers on a Layout Crew</td>
<td>2-3</td>
<td>1</td>
</tr>
<tr>
<td># of Layout Crews/Project</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hours Worked/Week</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Hourly Cost/Person</td>
<td>$75</td>
<td>$75</td>
</tr>
<tr>
<td># of Layout Points/Day</td>
<td>75</td>
<td>300</td>
</tr>
<tr>
<td>Total Cost Per Point</td>
<td>$16</td>
<td>$2</td>
</tr>
<tr>
<td>Points per Floor</td>
<td>2000</td>
<td>2000</td>
</tr>
<tr>
<td># of Floors</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total Project Points</td>
<td>12000</td>
<td>12000</td>
</tr>
<tr>
<td>Time to Complete Project (days)</td>
<td>160</td>
<td>40</td>
</tr>
<tr>
<td>Percentage of Time Robotic vs Traditional</td>
<td>100%</td>
<td>25%</td>
</tr>
<tr>
<td>Total Project Labor Cost</td>
<td>$192,000</td>
<td>$24,000</td>
</tr>
<tr>
<td>Upfront Equipment Cost*</td>
<td>$1,400</td>
<td>$45,000</td>
</tr>
<tr>
<td>Total Project Cost</td>
<td>$193,400</td>
<td>$69,000</td>
</tr>
<tr>
<td>*one time investment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Projects per Year</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Cost per Year (One time equip purchase)</td>
<td>$1,353,800</td>
<td>$213,000</td>
</tr>
<tr>
<td>Percentage of Cost Robotic vs Traditional</td>
<td>100%</td>
<td>16%</td>
</tr>
</tbody>
</table>
Prefabrication Build

Traditional Build

Cumulative Time to Construct: 015 hrs 35 mins 36 secs

Cumulative Time to Construct: 023 hrs 11 mins 15 secs
Tracking - How do you analyze it

![Graph showing miles traveled vs. hours to complete for different tasks such as Wall Frame, Gypsum Top Out, and Ceiling Frame.

25 total carpenter hours

7 total carpenter hours
## Tracking - How do you analyze it

<table>
<thead>
<tr>
<th>Prefab</th>
<th>Traditional Build</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8 miles walked</td>
<td>13 miles walked</td>
</tr>
<tr>
<td>18 hours to build</td>
<td>58 hours to build</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit 2</th>
<th>Unit 23</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 hours</td>
<td>7 hours</td>
</tr>
</tbody>
</table>
The Internet Of Things Has Arrived
Smart Tools & Tool Management

ONE-KEY
UNLOCKING THE DIGITAL JOBSITE

SMART TOOLS
SYNC WIRELESSLY
ONLINE & MOBILE RECORD KEEPING

Steel Gauge: 22
Screw Length: 3/4"
Screw Diameter: #10
Head: Pan

STARTING SPEED
Slower: Faster

DRIVING SPEED
Slower: Faster

FINISHING SPEED
Slower: Faster

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Smart Tools & Tool Management

DeWALT Tool Connect™

- **Alert**
- **Identify**
- **Enable/Disable**

- **Last Seen Location Finder**: Quickly track your battery and tool with Tool Connect’s new Last Seen mapping feature. Last Seen allows you to pull up the address where your device was last located. Map, Hybrid or Satellite views available.

- **Charge Status**: Remotely check your battery’s state of charge and its current temperature.

- **Virtual Fence**: Create a “virtual fence” for your batteries at the job site. The app can issue an alert and even disable one of your batteries if it exceeds the Bluetooth range of your smart device.

- **Remote Enable/Disable**: The ability to enable or disable the battery at any time while you are within the Bluetooth range may act as a deterrent for unauthorized battery usage.

- **Identify Battery**: Easily identify a battery, visually, by flashing the battery’s built-in identity light.

- **Lend Battery**: The Lend feature will allow you to set the battery to disable itself after a predetermined time frame, rendering the battery useless until it’s returned.

- **Alerts**: Alerts notify you when your battery is in need of charging, or if one of your batteries exceeds the Bluetooth® range of your smart device.

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Computer Vision - High Precision Laser Scanners

- **P16**: Highest accuracy, Durable (IP54), Most expensive
- **TX8**: Lower accuracy, Durable (IP54)
- **X330**: High accuracy, Easiest to use, Most affordable
Industry standard survey:

- The cost to capture the installed C channel: $29,300
- The schedule impact: 16 days (potentially creating liquidated damages for the project)
- The cost to capture the installed steel angle: $13,000
- The schedule impact: 10 days

3D laser scan survey:

- The cost to capture the installed C channel and the steel angle: $11,000
- The schedule impact: 10 days
Handheld scanners

Freestyle
- Highest quality (laser)
- Requires two hands
- Can bog down

Paracosm
- High quality (optical + IR)
- 8000 sqft range
- Real time registration

Matterport
- Low quality (optical + IR)
- Tripod based
- Best for 360° photos
Computer Vision
Aerial Drone Software for 4D Data Capture

INTRODUCING SKYCAST COMMANDER FOR DJI

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My Recommendation:
DJI Phantom 3 Pro ($1,100)  or  DJI Phantom 4 ($1,400)
Easy to use
Scanning, Drone & Photogrammetry Software
Solibri - Rules based clash detection
Dedicated R&D Department

- **2015**
  - Yes: 32.8%
  - No: 67.2%

- **2016**
  - Yes: 42.4%
  - No: 57.6%

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Invitation To Bid Software For Commercial General Contractors

Over 12,000 GC users at over 800 Companies
(throughout the U.S., Canada, Caribbean and Middle East)

- Invitations to Bid
- Plan Distribution
- Subcontractor Data
- Prequalification
- Project Communication

Founded In 2006 | smartbidnet.com
Certificate Of Insurance, Contract & Compliance Management Software for Risk Managers

- Certificate & contract collection
- Certificate issuance
- Vendor management
- Compliance management
- Optical Character Recognition (OCR)
Online Construction Network for Searching, Selecting & Verifying Contractors

Over 130,000 member companies.
Over 500,000 public agency records.

- Centralize company financial, operational, project history, qualification data and more
- Request and share prequalification data for construction projects
- Connect with potential project partners
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