The Art and Science of Performance Measurement

Tyler Goss | CASE | www.case-inc.com | @tywygo
Change the Narrative

BI
Building Information is not:

- Hardware
- Software
- Bound by Scale or Scope
- Being fully monetized by the AECO Industry
Building Information is:

- A Process
- A Mindset
- A Huge Opportunity for AECO Enterprises
Building Information is about:

- Data
- Analytics
- Metrics
- Decisions
- Insight
- Performance
Building Information is constrained by:

- Tedious Data Gathering
- Closed or Discrete Ecosystems
- Standard of Care and Liability
- The “Unique Snowflake” Conundrum
Process Analytics, not Outcomes Analysis

- Transactional
- Common Variables
- Empirical and Generalizable
- Process Improvement
Case Study: Major Trade Coordination

Coordination of Level B4 is substantially complete given the information provided by the design team and owner to date. All trades to advance to the production of shop drawings for Day 1 and Day 2 work on B4. B3 drafting to begin on December 21st.
Case Study: Major Trade Coordination

- Resolve Constraints **Quantitatively**
- Identify **Best Practices**
- Write **Better Contracts**
Case Study: Major Trade Coordination

- Now Real-Time Tracking
- Next Empirical Project Planning
Case Study: Production Control
## BASIC TASK DATA

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<tr>
<th>Units</th>
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<th>Duration</th>
<th>Rate</th>
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## ERP DATA

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<td>15-191-2</td>
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<td>12-551-759</td>
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<td>4.22</td>
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<tr>
<td>12-551-755</td>
<td>4.22</td>
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## Task Description

- Parapet Framing Vertical Corner Frame
- Parapet Framing Horizontal Mullion Back
- Parapet Framing Connector Angle
- Parapet Framing Vertical Standard Frame
- Parapet Framing Connector Angle
- Parapet Framing Vertical Corner Frame

## Task Type

- Construction

## Planned Start/End

- 2/3/14 7:00 to 2/3/14 7:37
- 2/3/14 8:15 to 2/3/14 8:52
- 2/3/14 9:30 to 2/3/14 10:07
- 2/3/14 10:45 to 2/3/14 11:22
- 2/3/14 11:22 to 2/3/14 12:00
- 2/3/14 12:00 to 2/3/14 12:37
- 2/3/14 13:52 to 2/3/14 14:30
- 2/3/14 14:30 to 2/4/14 7:07
- 2/4/14 7:45 to 2/4/14 8:22
- 2/4/14 8:22 to 2/4/14 9:00
- 2/4/14 9:00 to 2/4/14 9:37
- 2/4/14 9:37 to 2/4/14 10:15
- 2/4/14 10:52 to 2/4/14 11:30
- 2/4/14 11:30 to 2/4/14 12:07
- 2/4/14 12:07 to 2/4/14 12:45
- 2/4/14 13:22 to 2/4/14 14:00
- 2/4/14 14:00 to 2/4/14 14:37
- 2/4/14 14:37 to 2/5/14 7:15
- 2/5/14 7:15 to 2/5/14 7:52
- 2/5/14 7:52 to 2/5/14 8:30
- 2/5/14 8:30 to 2/5/14 9:07
- 2/5/14 9:07 to 2/5/14 9:45
- 2/5/14 9:45 to 2/5/14 10:22
- 2/5/14 10:22 to 2/5/14 11:00
- 2/5/14 11:00 to 2/5/14 11:37
- 2/5/14 11:37 to 2/5/14 12:15
- 2/5/14 12:15 to 2/5/14 12:52
- 2/5/14 12:52 to 2/5/14 13:30
- 2/5/14 13:30 to 2/5/14 14:07
- 2/5/14 14:07 to 2/5/14 14:45
- 2/5/14 14:45 to 2/6/14 7:22
- 2/6/14 7:22 to 2/6/14 8:00
- 2/6/14 8:00 to 2/6/14 8:37
- 2/6/14 8:37 to 2/6/14 9:15

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**Case Study:** Production Control

- Parapet Framing Vertical Corner Frame
- Parapet Framing Horizontal Mullion Back
- Parapet Framing Connector Angle
- Parapet Framing Vertical Standard Frame
- Parapet Framing Connector Angle
- Parapet Framing Vertical Corner Frame

- Parapet Roof Glass 22x1280 Corner
- Parapet Roof Glass 22x1280 Corner
- Parapet Roof Glass 22x1280 Corner
- Parapet Roof Glass 22x1280 Corner
- Parapet Roof Glass 22x1280 Corner
- Parapet Roof Glass 22x1280 Corner

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- Parapet Framing Connector Angle
- Parapet Framing Vertical Standard Frame
- Parapet Framing Connector Angle
- Parapet Framing Vertical Corner Frame
Case Study: Production Control

Plan Percent Complete

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<th>Total to date</th>
<th>Last 7 Days</th>
<th>Last Day</th>
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<tr>
<td>Total</td>
<td>95.17%</td>
<td>20.63%</td>
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Activity Analysis

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<tr>
<th></th>
<th>Done Early</th>
<th>Done On Time</th>
<th>Done Late</th>
<th>Lagging</th>
<th>Close</th>
<th>Planned</th>
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<td>1</td>
<td>79</td>
<td>499</td>
<td>666</td>
<td>1185</td>
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<tr>
<td>Last 7 Days</td>
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<td>0</td>
<td>20</td>
<td>69</td>
<td>20</td>
<td>69</td>
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<tr>
<td>Last Day</td>
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<td>0</td>
<td>9</td>
<td>14</td>
<td>9</td>
<td>14</td>
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Progress Status

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<th>Total to date</th>
<th>Last 7 Days</th>
<th>Last Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Case Study: Production Control

- Activity vs. Productivity
- Enhanced Schedule Logic
- Controlling the Change Management Narrative
Case Study: Production Control

Now: 3,026 Assemblies tracked Daily
Next: 53,420 Assemblies tracked in Real Time
Data Logistics
So What?

- Cross-Connected Data Sources
- Delivery Lifecycle Analytics
- Emergent Knowledge
Analytics for Planning

- BIM
- GIS
- CENSUS
- FOURSQUARE
- TWITTER

BUILDING ANALYTICS

DASHBOARD
Analytics for Planning

Summary of all Projects
Number of Projects
- GCPC (35%)
- Hospital (30%)
- ILU (35%)
- Total: 50

Total Area
Gross Square Footage (in millions)
- GCPC (52%)
- Hospital (43%)
- ILU (5%)
- Total: 6.0 million

Project Stats
- Lived Areas
- Total Construction Cost
- Avg. Rentable Area
- Avg. Cost/Sup.
- 6.000
- $3.8 billion
- 7.6% of total
- $590

Program Areas
- Area 1
- Area 2
- Area 3
- Area 4

Program Area Breakdown
- Office
- Residential
- Hospitality
- Retail

% Site Coverage
- 75%

% Green Space
- 16%

% Green Roof
- 50%

Project Components by Area

Area Breakdown Comparison

Gross Floor Area
- Option 1
- Option 2
- Option 3

Total Façade Area
- Option 1
- Option 2
- Option 3

Façade Solar Gain (Average kWh)
- Option 1
- Option 2
- Option 3
Analytics for Planning

- Opportunity Assessment
- Market Intelligence
- Resource Deployment
Analytics for Design

PROJECT BIM

BIM LIBRARY

BUILDING ANALYTICS

DASHBOARD
Analytics for Design
Analytics for Design

- Team Performance
- Recurring Constraints
- Platform Performance
Analytics for Construction

- Project Data
- Staffing Data
- Coord. Metrics

Building Analytics

Dashboard
## Analytics for Construction

### VDC Operations Planner -

<table>
<thead>
<tr>
<th>Project Data</th>
<th>Complexity</th>
<th>Size</th>
<th>Schedule</th>
<th>Documentation</th>
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<tbody>
<tr>
<td>Project Volume (MM)</td>
<td>1.48</td>
<td>1.69</td>
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<tr>
<td>Project Size (SF)</td>
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<td>675000</td>
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<td>Preconstruction Start Date</td>
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<td>Preconstruction Schedule (MO)</td>
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<td>Construction Schedule (MO)</td>
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<tr>
<td>Design BIM LOD (000 if no BIM)</td>
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<tr>
<td>BIM Engineer Rate</td>
<td>50</td>
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<tr>
<td>BIM Manager Rate</td>
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### Project Risk Analysis

- **VDC Hours, Total**: 10798
- **VDC Hours/Year**: 3483
- **VDC Cost**: $648,433
- **VDC Cost/Year**: $210,303

### Estimating Support

<table>
<thead>
<tr>
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<th>Precon VDC Engineer</th>
<th>Field VDC Engineer</th>
<th>VDC Manager</th>
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<tbody>
<tr>
<td><strong>Model Creation</strong></td>
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<td>0.000 FTE</td>
<td>0.000 FTE</td>
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<tr>
<td><strong>Model Supplement</strong></td>
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<td>0.000 FTE</td>
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<tr>
<td><strong>Quantity Takeoff</strong></td>
<td>Y 0.12 FTE</td>
<td>0.000 FTE</td>
<td>0.007 FTE</td>
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<tr>
<td><strong>5D Model Development</strong></td>
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### Scheduling Support

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<th>VDC Manager</th>
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<tbody>
<tr>
<td><strong>4D Simulation</strong></td>
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<td>0.000 FTE</td>
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<tr>
<td><strong>Productivity-Based Scheduling</strong></td>
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<td><strong>Total for Scheduling Support</strong></td>
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<td>0.022 FTE</td>
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### Operations Support

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<th>Precon VDC Engineer</th>
<th>Field VDC Engineer</th>
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<tbody>
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<td><strong>Logistics Modeling</strong></td>
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Analytics for Construction

- Project and Team Planning
- Production Controls
- Cost and Process Benchmarking
Analytics for Owners and Operators
Analytics for Owners and Operators
Analytics for Owners and Operators

Aeron Chair

Product Information
- Vendor: Herman Miller
- Price Per Unit: $509.99
- Total Ordered: 2549
- Last Order: 3/14/2014
- Supplier: Sit For Life

Other Projects Using this Product

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<th>Quantity</th>
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Load More
Analytics for Owners and Operators

- Fleet and Asset Management
- Needs Assessments
- BMS and Energy Guarantee
Big Deal. What’s Next?

- Predictive Analytics
- Process Automation
- \( n = (\text{all}) \)
What can we do tomorrow?

- **Centralize** Digital Workflows
- **Establish** Empirical Variables
- \( n = \text{(some)} \)
bldgs = data