BIM V Keynote

“BIM anywhere all the time for everyone”

Martin Fischer, CIFE, Stanford University
Major trends

• Owners demand measurably higher performance
• Owners are more engaged with their projects through BIM
  • Virtual Reality (VR) for user experiences
  • BIM for FM
• Designers use BIM for automated exploration of design options
• Contractors and designers engage more fully with each other through BIM
• Contractors take BIM to the field
• Many apps are emerging
• BIM is becoming an integral part of how work is done
• BIM is leveraged on smaller projects
• Reality capture and BIM are increasingly connected
Why is BIM so powerful?
How can we create a high-performing building?

Create a unique shopping, eatery and leisure space in the heart of a traditional downtown.

Maximize daylight

Stay within budget of € 100 Mio

Open by September 2015
You realize that ...

• ... better collaboration would improve the project
• ... collaboration is not good because the project information is a mess
• ... the information is messy because the workflows are poorly defined

• Where to start improving?
Visualize the future you want to create!

Maximize daylight

Integrate underground parking structure

Courtesy of Max Bögl
Visualize the future you want to create!

LOD 400 BIM for manufacturing process

Courtesy of Max Bögl
Working together

Integrated Information

Process Integration

Integrated Organization
Working together
Creating clear and more efficient workflows

3.5 hours saved for each inspection

Courtesy of Max Bögl
Continue improving
The high-performance building

Created a unique shopping, eatery and leisure space with maximum daylight in the heart of a traditional downtown.

- Stayed within budget of € 100 Mio and opened on time in September 2015
- Leveraged state of the art building techniques such as carbon fiber reinforcement for ultra-thin precast façade elements.
- Used BIM end to end from first 3D sketch until and during operation of facility.

Courtesy of Max Bögl
At BIM IV, I introduced BIM as VIA

- Visualization
- Information Integration
- Automation
Beyond visualization: integrating information

BOQ

BIM

Cash Flow

Courtesy of Max Bögl
Beyond integration: automation

Input parameters

MB Park-O-Mat Script

Output 3D model

Automatic, rule-based generation of a BIM

Courtesy of Max Bögl
VDC
Virtual Design and Construction
Integrating Project Delivery

Combines

- many practitioners’ experience with integrated practices compiled by DPR,
- Howard Ashcraft’s experience with IPD contracts, and
- almost 30 years of CIFE research

into

- a book that describes how projects should be done.
The Simple Framework for IPD

- Measurable Value
- Production Management
- Collaboration Colocation
- Simulation Visualization

High Performing Building

Integrated Systems
Process Integration
Integrated Organization
Integrated Information

Agreement/ Framework
The Simple Framework for IPD

- Measurable Value
- Production Management
- Collaboration Colocation
- Simulation Visualization

High Performing Building

Integrated Systems
Process Integration
Integrated Organization

Integrated Information BIM

Agreement/ Framework

VDC

IPD
How does BIM support integration?
Integrated Systems - Visualization

Do all the systems fit and work together?

Picture Courtesy of DPR
## Integrated Systems – Information Integration

How well do the systems fit together?

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Integrated Systems - Automation

- MEP modelers use over 1,300 mouse clicks per hour when modeling MEP systems
- Example courtesy of Brett Young, BuildingSP, brett@buildingsp.com
Process Integration - Visualization

Combine the knowledge of the field manager with a visualization of the work completed and the work to be done.
Process Integration – Information Integration
Process Integration - Automation

Daily Bill of Materials is generated automatically for each crew for each day.

<table>
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<tr>
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<table>
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<td>BIMSF-CEMCO-T 600T250-54: 18.0m</td>
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<td>BIMSF-CEMCO-T 600T200-54: 18.0m</td>
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<td>ClarkDietrich-SFIA-S-Column 600S250-68(50): 39.6m</td>
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<td>ClarkDietrich-SFIA-T-Horizontal 600T150-43(33): 5.1m</td>
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<td>ClarkDietrich-SFIA-S-Horizontal 600S162-43(33): 10.3m</td>
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<tr>
<td>ClarkDietrich-SFIA-T-Horizontal 600T150-43(33): 10.3m</td>
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<tr>
<td>BIMSF-CEMCO-S 600S200-54: 134.9m</td>
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EXTREME COORDINATION

1. 1-LEVEL TI IN EXISTING SHELL. CONSTRUCTION NEEDED TO BE COMPLETED IN JUST 10 WEEKS.
2. LASER SCAN & MODEL EXISTING CONDITIONS.
3. OVERHEAD MEP COORDINATION COMPLETE IN 2 WEEKS.
4. SINGLE SOURCE MODELING & COORDINATION RESULTS IN EXTREME CLASH RESOLUTION.

CONFIDENTIAL
4D SIMULATION & SCHEDULE OPTIMIZATION

1. 2-LEVEL TI IN EXISTING SHELL
2. CONSTRUCTION SCHEDULE NEEDED TO BE CONDENSED TO HIT NEW OPEN DATE
3. 4D SIMULATION, COMMUNICATION, AND CPM SCHEDULE UPDATES

Examples courtesy of Danielle Dy Buncio, President, VIATechnik, danielle@viatechnik.com
Facility Management (FM) needs information about spaces and building components

Where is it?

What is it?

construction

post - occupancy
Point clouds provide... [2.31, 2.25, 1.23] [2.01, 2.85, 1.43] [2.19, 3.03, 0.08] [2.58, 3.51, 1.69] [1.53, 2.53, 2.67]

Where is it? [✓]

What is it? [✗]

construction post-occupancy
Manual modeling: For 1,000 m²: 120h+

Not scalable!
Semantic Building Parser Research, in collaboration with Silvio Savarese, Iro Armeni, Amir Zamir, buildingparser.stanford.edu

Where is it? What is it? ✓ ✓

construction post-occupancy

Our work needed information needed
BIMforFM: Existing Buildings

Raw Point Cloud

Disjoint Space Parsing

Building Element Detection
Space Statistics

Chairs
Total Number: 106
Space Statistics

Ceiling
Total Area: 667.67 m²

Walls
Total Number: 42
Total Area: 479.5 m²

Chairs
Total Number: 106

Floor
Total Area: 639.36 m²

Table
Total Number: 45

Columns
Total Number: 39
Space Manipulation

Original Space

Manipulated Space: Removing walls
Major trends

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Question? Comments?

Please get in touch: fischer@stanford.edu

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