Business Drivers: Understanding ROI—The Business Value of BIM

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Class Summary

- Understanding the business value of the process change to Building Information Modeling (BIM) is a critical factor for successful BIM adoption. Based on this understanding, executives can develop strategies for business change and efficiently plan the necessary steps to lead project teams to positive outcomes.

- This session will present an innovative workshop model designed to delve into the most appropriate strategies for achieving return on the BIM investment for specific design-construction teams. By participating in the workshop process, participants will learn techniques that have been used to achieve insights about sources of return and identify ideas for process improvements with over twenty interdisciplinary project teams.
Learning Objectives

- Understand through examples how leading firms approach the question of ROI (return on investment) regarding BIM
- Identify three ways to calculate the economic impact of BIM in design
- Identify three ways to calculate the economic impact of BIM in construction
- List three ways that collaboration impacts return and value in BIM projects
Business Drivers: Understanding ROI—The Business Value of BIM
Shall we enjoy this?
Agenda – 3 topics

- Waste - The Dominos of Failure
- BIM Return on Investment Workshop
- Metrics – Evaluating the Effectiveness of your BIM Initiative
The Dominos of Failure
Project Waste – What are the big ones, the key ones, the root causes?

- Inaccuracies in Existing Conditions in 2D
- Design in 2D Constrains Understanding
- Incomplete Coordination and Inconsistencies
- Review/Approval of Plans, Sections, Elevations
- Bids with Inadequate Information
- Trade Coordination findings
- Requests for Information
- Change Orders
- Rework
- Delays
- Low Confidence/Prefabrication
- Field Fit Problems/Rework
- Blaming Other Stakeholders
- Late Completion
- Litigation
- Payments to Attorneys – Reduced Profits
Project Waste – the Dominos of Failure

………when things go bad, they often go very bad.

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Benefits of BIM Environment

- Design Productivity - Parametrically Coordinated Documents
- Model Based Energy and Sustainability Analysis
- Fewer Owner Changes
- Fewer and Leaner RFIs Addenda ASIs
- More Universally understood Scope of Project Design
- Fewer Design Change Orders
- Easier Quicker Visualization for the GC’s, Subs, Inspectors
- Lower General Conditions for GC and Subcontractors - Shorter Project
- Deliver Earlier C of O and Information-Rich As-Built Model
- Lower Printing, Packing, Copying, Shipping, Receiving, Distributing
- More Organized Efficient Document Management System
- Lower Prices, Less Anticipated Risk by Subcontractors - Prefabrication and Just in Time Deliveries
- Overall Design Duration
- Faster More Accurate Prices
- Smaller, more focused Team
- Higher Quality Facility, Fewer Warranty Problems
- 3D and 4D Visualization Logistics/Sequencing Studies - Efficiencies
- Field BIM - Safer Site, More Control, Digital Survey, Crew Tracking

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Best Practice Principles Evidence from Research

Here, just the first 5 of 56 Interactions

1. Due to **better appreciation of design at an early stage**, and also due to the early functional evaluation of design against performance requirements (such as energy, acoustics, wind, thermal, etc) the quality of the end product is higher and more consistent with design intent. This reduces variability commonly introduced by late client-initiated changes during the construction stage. (Eastman et al. 2008 p.390; Manning and Messner 2008)

2. **Building modeling imposes a rigor on designers** in that flawed or incompletely detailed parts are easily observed or caught in clash checking or automated checking. This improves design quality, preventing designers from ‘making-do’ (Koskela 2004a) and reducing rework in the field as a result of incomplete design. (Dehlin and Olofsson 2008; Eastman et al. 2008 p.422)

3. **Building systems are becoming increasingly complex. Even trained professionals have difficulty generating accurate mental models with drawings alone**. BIM simplifies the task of understanding designs, which helps construction planners deal with complex products. (Eastman et al. 2008 p.382)

4. As all aspects of design are captured in a 3D model the client can easily understand, the requirements can be captured and communicated in a thorough way already during the concept development stage. This can also **empower more project stakeholders to participate in design decision making**. (Eastman et al. 2008 p.378; Manning and Messner 2008)

5. **Virtual prototyping and simulation due to the intelligence built in the model objects enables automated checking against design and building regulations**, which in turn makes verification and validation of the design more efficient. (Eastman et al. 2008 p.390; Khanzode et al. 2008)

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The Interaction of Lean and Building Information Modeling in Construction
Rafael Sacks1, Lauri Koskela2, Bhargav A. Dave3 and Robert Owen4

"…the sheer amount of the constructive interaction mechanisms identified strongly supports the argument of a significant synergy between BIM and lean."

"…any company or project on a lean journey should seriously consider using BIM for enhancing the lean outcomes."

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Measuring the Impact of Rework on Construction

- Using the data obtained from 359 construction projects in the Construction Industry Institute database…

- “Rework continues to affect both cost and schedule performance throughout the construction industry.

- The direct costs alone often tally to 5% of the total construction costs.
Waste – Questions or Assertions

- What in your mind are the most significant generators of waste in your process?

- What changed conditions/interventions might serve to reduce waste?

- What metrics would help us identify and quantify waste?

- Assertion: We as an industry would benefit from an effort to illuminate the root causes of waste in our project environment.
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The Benefits of All-in BIM

- 19 Benefits
Evolving, Structured Benefits Evaluation
19 Benefits – Focused on Value, not Technology
Better Understood Scope of Work

“Complete” buy-in and cooperation with all stakeholders
Higher Quality
“Better Final Product, Fewer Warranty Problems, Less Rework
Design Productivity and Better Documents
Coordinated Documents, More and Better Views, 3D Capabilities
Model Based Analysis

Energy savings, stress analysis, CFD, etc.
Overall Design Duration

Pace of change, better decision making, more/better views
Requests for Information

Fewer, Quickly Resolved, ASI’s Reduced, etc.
Fewer Design Change Orders
Coordination Errors, Inconsistencies, Omissions
Owner Satisfaction

Greater awareness, more confidence, etc.
Easier, Quicker Visualization for the GC, Subcontractors, Inspectors
3D and 4D Visualization, Logistics/Sequencing Studies – Field Efficiencies
Simple, Secure document, design, and data management tools
Smaller, Higher Performing Project Staff, more efficient, focusing on project excellence
PAPER: Lower Costs of Printing, Packing, Shipping, Receiving, Distributing, Copying, ......
Subcontractors – Bids with Lower Risk, Less Built-in Contingency, Confidence in Prefab/Preassembly

Images Courtesy of Skanska - Schook – COAA 2011
Shorter Construction Phase: Lower General Conditions for GC, Subcontractors...
Field BIM – Equipment Tracking, Safer Site, Digital Survey, Machine Guidance
BIM for Safety Budget & Planning:

- Design a clip-in cable for fall protection
- Diagram a crane swing safety zone
- Diagram a construction safety net
Earlier Certificate of Occupancy... As-Built Model...
with Rich Information Useful for Operations & Maintenance
Benefits – Questions and Assertions

- Do your project teams – and your executives – understand the many potential benefits (19 categories) of BIM?

- Do your project teams thoughtfully select goals for their BIM initiatives?

- Assertion: The contractual and cultural habits that form the 2-dimensional environment constrain our ability to leverage all the many benefits of BIM.

- Assertion – Most projects are leaving money (financial benefits) on the table.
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Metrics
Messer Construction as Example

- Reduced number of RFI's (Request For Information) generated during the construction phase by 72% when compared to similar projects that did not use BIM.
- Reduced number of Change Orders and Contingency spends by 47%
- Reduced the average cost of these changes by 55%.

Andy Burg, Messer Construction, Cincinnati, OH 45216
Four Primary Evaluation Areas

**Planning**
Establish objectives and protocols

**Adoption**
Find the right people & process

**Performance**
Track impact, progress

**Technology**
Provide the right tools

[2] Source: www.us.spinnaker-it.com; betterhiringtoday.com/5-signs-your-hiring-process-needs-help
[4] Source: Ipoint 3D
VDC Scorecard Framework

1 Score

4 Areas

Planning 20%
Adoption 20%
Technology 25%
Performance 35%

10 Divisions

Objective 40%
Standard 30%
Preparation 30%
Process 50%
Organization 50%
Maturity 40%
Coverage 20%
Integration 40%
Quantity 70%
Quality 30%

60+ Measures

Documentation
Guideline
Budget
Project
Stakeholders
Depth
Level of Detail
Communication
Stakeholder Survey
Reduced Design Errors

Guideline
Benchmark
Tool
Broader Context
Training
Breadth
Model Use Life Cycle
Interoperability
Post Occupancy S.
Reduced Labor

Metric
Etc.

Tool
Etc.

Training
Etc.

Interoperability
Etc.

Reduced Labor
Etc.
Confidence Level

- Reflects completeness and diversity of data used to derive the score
Global BIM Trend

Planning
Adoption
Technology
Performance

Confidence Level

10%
Metrics – Questions and Assertions

- Would it be beneficial for your teams to improve the measurement of your BIM objectives?

- What do you measure?

- Have you proposed (or reluctantly approved) “BIM Action(s)” for your projects? Do these actions support your business goals?

- How is the achievement of these goals supported by your project execution plans?