Coordination

Closing the Loop Between Design and Construction
COORDINATION - CLOSING THE LOOP BETWEEN DESIGN AND CONSTRUCTION

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WEBCOR BUILDERS

COORDINATION

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History of Coordination
HISTORY OF COORDINATION
FROM ANCIENT TIMES TO TODAY

First Civilizations, e.g. Egypt:
• Coordination in hand of the "Royal Master Builder".

Medieval Ages:
• Coordination still in one hand "The Stone Mason"
HISTORY OF COORDINATION

FROM ANCIENT TIMES TO TODAY

Late 18th early 19th Century:
• Gradual transition from the Master Builder to Architects, Engineers and Builders

20th Century:
• Gradual separation from the Master Builder to Architects, Engineers and Builders
HISTORY OF COORDINATION

HISTORY OF BUILDING INFORMATION MODELING (BIM)

Do you know Chuck Eastman?

Charles M. Eastman:
• (Chuck Eastman) is a professor at Georgia Tech and director of the Georgia Tech Digital Building Lab (DBL)
HISTORY OF COORDINATION

HISTORY OF BUILDING INFORMATION MODELING (BIM)

ABSTRACT

Many of the costs of design, construction, and building operation derive from the reliance on drawings as the description of record of the building. As a replacement, this paper outlines the design of a computer system useful for storing and manipulating design information at a detail allowing design, construction, and operational analysis. A building is considered as the spatial composition of a set of parts. The system, called Building Description System (BDS) has the following associated with it: (1) a means for easy graphic entering of arbitrarily complex element shapes; (2) an interactive graphic language for editing and composing element arrangements; (3) hardcopy graphic capabilities that can produce perspective or orthographic drawings of high quality; and (4) a sort and format capability allowing sorting of the data base by attributes, for example, material type, supplier, or composing a data set for analysis. (Author)
HISTORY OF COORDINATION

OTHER INDUSTRIES

Computer Aided Design (CAD) in other Industries:
The Manufacturing Industries in the 80s used:
• Integrated analysis capabilities
• Reduction of errors
• Factory automation

Computer Aided Design (CAD)-Computer Aided Manufacturing (CAM):
• Combining design and engineering into a closed flow with manufacturing and production

Computer Integrated Manufacturing (CIM):
• In the 90s progressive companies are closing the loop and integrate design engineering and manufacturing in one workflow.
HISTORY OF COORDINATION

2D CAD in AEC Coordination

CAD in Building Industry:
- Adopted drawing editors such as AutoCAD and Microstation that augmented the methods of 2D construction documents.

CAD – Coordination in AEC:
- While other industries already coordinated in 3D, the AEC industry still used a light-table to coordinate
Current Situation

in Coordination
CURRENT SITUATION IN COORDINATION

TRADITIONAL VS CURRENT BIM WORKFLOW

- Decisions during design phase
- Lower cost with greater effectiveness
- Diverse expertise during design

MacLeamy Curve
CURRENT SITUATION IN COORDINATION

WHY?

Benefits:
• Higher accuracy of predicted work plan
• Better continuous work flow
• More collaboration of project participants
• Easier to meet deadlines
• Savings on unexpected changes
CURRENT SITUATION IN COORDINATION

PREREQUISITES

• Contract inclusion
• BIM Execution Plan
• Project settings
• Software / Platform
• Trade Coordinator
CURRENT SITUATION IN COORDINATION

- Merged Models from the Trades
- Clash Detection
- Model Update
- Sign-off Shop drawings creation
- Construction
- As-built for records
CURRENT SITUATION IN COORDINATION

MERGING MODELS

• Trades provide their own 3D models
• Trade Coordinator merges models
CURRENT SITUATION IN COORDINATION

CLASH DETECTION

- Weekly clash detection
- Action items assigned through viewpoints
CURRENT SITUATION IN COORDINATION

CLASH AVOIDANCE

- Cloud Based
  "Clash Analysis"
  24/7
CURRENT SITUATION IN COORDINATION

CLOSING THE COORDINATION CYCLE

- 3D – Deliverables
- 2D – Deliverables
Main Obstacles in Coordination and Their Root Causes
OBSTACLES AND ROOT CAUSES

OBSTACLE

1. Project team Value and Goal Misalignment
2. Team’s Level of Technical Knowledge and Training
3. Resources and Budget Misalignment
4. Schedule and Available Time for Coordination
5. Change Management and Associated Re-Work
OBSTACLES AND ROOT CAUSES

OBSTACLE

• Project Team Value and Goal Misalignment

ROOT CAUSE

• Goal definition in the early stages of the project
• Understanding contractual requirements
• Collaborative creation of BEP
OBSTACLES AND ROOT CAUSES

OBSTACLE

• Team’s Level of Technical knowledge and Training

ROOT CAUSE

• Team members need the capability of accomplishing the BIM commitments
• Outsourcing tasks instead of in house production
OBSTACLES AND ROOT CAUSES

OBSTACLE

- Resources and Budget Misalignment

ROOT CAUSE

- False expectations of coordination process
- Incorrect time estimation and resources allocation
OBSTACLES AND ROOT CAUSES

OBSTACLE

• Schedule and Available Time for Coordination

ROOT CAUSE

• Not being involved early enough before construction begins
• Late or delayed buyout process
<table>
<thead>
<tr>
<th>OBSTACLE</th>
<th>ROOT CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-Work</td>
<td>Change management</td>
</tr>
<tr>
<td></td>
<td>Incomplete consolidated design</td>
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</tbody>
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Living the future in Coordination Now

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LIVING THE FUTURE NOW

WHAT ARE THE KEY ASPECTS FOR SUCCESS?

- Early Involvement
- Collaboration
- Contracts
- Data Accessibility and Exchange
- Interoperability
Client BIM Guidelines

- Setting *expectations* and *goals* regarding BIM use
- *Project Origin* is set by the client before any design party starts any 3D modeling.
LIVING THE FUTURE NOW

EARLY INVOLVEMENT

• Early Design Coordination
  – The technology enables that all project participants have access to the created data:
    • Massing
    • Sun studies,
    • Energy analysis and
    • Daylighting studies
  – Conceptual Estimating using the available model quantities
LIVING THE FUTURE NOW

CONTRACTS

OWNER CONTRACTS:
• Integrated Project Delivery (IPD)
• Design Build (DB)

SUB-CONTRACTS:
• BIM-Exhibits
  • Model Progression Specification Matrix (MPS)
  • System Priority Structure (SPS) allows for more thoughtful buyout
LIVING THE FUTURE NOW

COLLABORATION

TECHNOLOGY:
- Integration with back-office and other systems
- Real-time collaboration, chat windows
- BIM in the cloud

PROJECT CO-LOCATION:
- Face-to-face problem solving
- Centralized project-server
- Current project information is visualized in a "Big Room"
LIVING THE FUTURE NOW
INTEROPERABILITY

EXCHANGE FORMATS:
• Industry Foundation Classes (IFC)
• BIM Collaboration Format (BCF)
• Construction Operations Building Information Exchange (COBie)

UNI SOFTWARE PLATFORM:
• Using the same 3D Software for design, manufacturing, construction and as-built models
LIVING THE FUTURE NOW
DATA ACCESSIBILITY AND EXCHANGE

DATA LAKE CONCEPT FOR PROJECTS:
• Raw data stored in the cloud in its native format
• Tools make the data viewable and searchable without additional software
QUESTIONS