Future of Making Things for Construction

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Agenda

- Construction industry challenges
- Technology trends
- Technology solutions
- Case studies
- Learning resources
Construction industry challenges
Challenges facing the construction industry

- Construction demand is growing rapidly
  - 2014
  - 2030

- On-time completion rates are dismal
  - 25% projects
  - 10% deadlines

- Construction labor pool is shrinking

Technology trends
Technologies as enablers

- Cloud computing
- Prefabrication
- Internet of Things
- Virtual reality
- Digital construction sites
Five technology trends in construction

Pre-construction
- Cloud computing
- Virtual reality

Construction
- Prefabrication
- Digital construction sites

Commissioning / Handover
- Internet of Things
Cloud computing

- Evaluate multiple “what-if” scenarios
- Analyze big data
- Create construction intelligence
Virtual reality

- Experience immersive environments
- View project delivery in context
- Shrink boundaries between physical and virtual worlds
Prefabrication
Prefabrication

- Manufacture in controlled environments
- Produce higher quality products
- BIM to manufacturing is more accessible

Example of prefabricated modular construction

Example of traditional versus additive manufacturing
Digital construction sites

- Access centralized project information
- Access data anywhere
- Manage projects at the point of construction

Mobile applications

Virtual construction access on-site
Internet of Things

- Connecting physical things to systems
- Increase the number of smart buildings
- Reduce operational waste for owners
Technology solutions
Connected BIM

Pre-construction

Construction

Commissioning / Handover

AUTODESK® BIM 360™
Autodesk BIM 360

BIM 360 works for
• Owners
• Design teams
• Construction teams

• Access centralized project information
• Access data anywhere
• Manage projects at the point of construction
Autodesk BIM 360

Pre-construction
- Docs
- Glue
- Revit
- Team

Construction Execution
- Plan
- Field

Commissioning / Handover
Collaboration for Revit

Get centralized access to BIM data in the cloud for the whole team.

Collaboration for Revit Benefits

- Multidisciplinary collaboration in Revit
- Real-time communication in the model
- No IT hardware required
- Sync to BIM 360 Team
BIM 360 Team

BIM 360 Team Benefits

- View, comment, and markup
- Keep track of version history
- Model version comparison
- Web and Mobile access to BIM models

Owner  Design team  Construction team
Case studies
About the project
- CM students develop a preconstruction proposal based on the given Revit model of the Trios Care Center at Kennewick, WA provided by general contractor

Student outcomes
- Leverage cloud-based collaboration workflows
- Access information from BIM models

Autodesk tools used
- Revit – model quality control and quantity takeoff
- BIM 360 Glue – Clash Detection in the cloud
- Navisworks – 4D Simulation
Milwaukee School of Engineering

Structural & Electrical clashes

Structural & Plumbing clashes

Structural & HVAC clashes
University of Florida | Dr. Raymond Issa
University of Florida – Graduate BIM Course

Autodesk BIM 360 Glue

About the course

- Teams create BIM models of existing public schools in the State of Florida based on as-built drawing sets
- Teams coordinate and manage as-built models using BIM 360 Glue cloud service
- Teams are graded primarily on: Model quality, accuracy, collaboration, and presentation

Team Project Process

- Creates group projects in BIM 360 Glue
- Install Glue and setup their individual Glue accounts
- Provide access rights each student group member for their specific project
- PUBLISH project models to Glue directly from Revit
- OPEN & VIEW Glue Projects
- MERGE published models representing group members individual scope of work
- ANALYZE the federated model and communicate any necessary changes
- REFRESH the published model as changes are made
- Monitor group collaboration milestones and each students contributions

Task Types

- Instructor Task
- Student Task

Source: University of Florida, M.E. Rinker, Sr. School of Construction Management, Center for Advanced Construction Information Modeling
Student outcomes

- Acquire virtual collaboration experience using BIM 360 Glue
- Perform 3D model coordination and clash detection to comprehend changes
- Gain an appreciation for coordination workflow processes prevalent in AEC projects

Clash Example from team project

Source: University of Florida, M.E. Rinker, Sr. School of Construction Management, Center for Advanced Construction Information Modeling
University of Florida – Graduate BIM Course
Autodesk ReCAP 360 Pro

About the course

- Reality capture technology can be used for a wide range of purposes and for development of as built models

- Laser scanning, mobile lidar, photogrammetry and infrared scanning are some of the techniques used for reality capture

Source: University of Florida, M.E. Rinker, Sr. School of Construction Management, Center for Advanced Construction Information Modeling
Student outcomes

- Create dimensionally accurate models of buildings where access to spaces or existing documents is limited
- Expose students to documenting existing conditions within a BIM enabled process

Sample image used for photogrammetry

Photogrammetry derived point cloud

Source: University of Florida, M.E. Rinker, Sr. School of Construction Management, Center for Advanced Construction Information Modeling
University of Florida – Graduate Research

BIM visualization with holograms

Source: University of Florida, M.E. Rinker, Sr. School of Construction Management, Center for Advanced Construction Information Modeling
About screencast

- Screencast is used to record the class lectures and keystrokes used in Autodesk platform
- Graduate level BIM courses covers each modeling discipline as well as coordination, simulation and data management
- Screencast is used to support 1:1 instruction

Student outcomes

- Provides students reference material for working on assignments outside of class
- Improves student comprehension of workflows quicker
- Instructors can scale their impact more effectively

Example of finished Screencast recording

Source: University of Florida, M.E. Rinker, Sr. School of Construction Management, Center for Advanced Construction Information Modeling
University of Florida – Graduate BIM Course
Moving Forward ~ BIM 360 Integration
Integration Strategy

- **BIM360**
  - Docs
  - Glue
  - Field
  - Collaboration for Revit (Team)

- Virtual collaboration thru BIM 360
- One common workspace
- Instructors can interact with students directly in the models or in the documents throughout the semester on individual and group projects
- Use model comparison tools for coordination

Source: University of Florida, M.E. Rinker, Sr. School of Construction Management, Center for Advanced Construction Information Modeling
Learning Resources
Engaging with Autodesk

Autodesk Education Community
Free* access to software for students and educators
autodesk.com/education

Educational licenses for
• individual use at home or school
• institutional use inside classrooms or computer labs

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Unlock student creativity with free projects and courses to introduce students to new technologies and practices in 3D design

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academy.autodesk.com

**Unlock student creativity with free projects and courses to introduce students to new technologies and practices in 3D design**

**Autodesk ConTech Academy**
Construction technology learning for construction professionals
contechacademy.bim360.autodesk.com/

**Bolster your existing construction project programs with the latest technology trends.**

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Featured curriculum for construction

Reality Computing for Design and Construction
ReCAP 360 Pro, Revit

Introduction to BIM
Revit

BIM for Construction Mgt and Planning
Revit, NavisWorks, BIM 360 Glue
## BIM use in curriculum example

<table>
<thead>
<tr>
<th>Year 1 Freshman</th>
<th>Year 2 Sophomore</th>
<th>Year 3 Junior</th>
<th>Year 4 Senior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro to Construction Mgt</td>
<td>Construction Graphics</td>
<td>Construction Drawings and Specs</td>
<td>Electrical and Mechanical Systems</td>
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<tr>
<td>Construction Materials and Systems</td>
<td>Soil Mechanics and Foundation</td>
<td>Construction Equipment</td>
<td>Temporary Structures</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Construction Project Mgt</td>
</tr>
</tbody>
</table>
Certification
Industry-recognized credentials

Help your students stand out with Autodesk Certification
• Accelerate their professional development
• Validate their industry-recognized credentials
• Get them noticed

Product certification exams:
• Revit
• AutoCAD
• Civil 3D
Autodesk labs for construction
Building, Innovation, Learning and Design (BUILD) Boston
autodesk.com/build-space

The Autodesk BUILD Space offers a residency based opportunity for institutions for access to:
• a high-tech workshop for the construction industry
• 3D printers, computer numerical controlled (CNC) machines, and robotic arms
• exploring the potential for factory-based construction
Career readiness ladder

Career role
• CAD Technician
• Drafter

Era of documentation

Career role
• BIM Specialist and Eng.
• BIM Project Coordinator

Era of optimization

Best

Career role
• BIM Manager
• BIM Integrator

Era of connection

Better

Good
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