Implementing Building Information Modeling

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Course ID: AR11-1

Design Technology Evolution

- Manual Drafting
- 2D CAD Model
- 3D Model
- Object Based
- Parametric Model
- Building Information Modeling

< 1980 ………1990 …………2000

Design Technology Evolution

- Manual Drafting
- 2D CAD Model
- 3D Model
- Object Based
- Parametric Model
- Building Information Modeling

- Design Freedom
- Time consuming
- Error Prone
- Inflexible to change
Design Technology Evolution

- Designed for Mechanical CAD
- Store and manipulate geometry
- Automate manual drafting tasks
- Restrictive linear process

- Create extrusions from 2D lines
- 3D model used mostly for visualization
- 2D drawings "extracted" for further development
- Disjoin between 3D model and 2D drawings

- Architectural objects are recognized
- Objects relate better to architecture than lines
- Provides for data re-use
What is BIM?

Building Information Modeling is a consolidation of all the best aspects of 2D drafting, 3D Modeling, Object Based design and Parametric modeling to create a central data representation of the building.
Building Information Modeling

coordination

communication

accuracy

Building Information Modeling

efficiency

quality

speed

What is Autodesk Revit?
The premier BIM that offers
• Substantial productivity gain
• Superior quality level
• Increased information deliverables

Revit is used by
• Architectural firms
• Design-build teams
• Retail/hospitality corporations

Revit supports the entire process
• Conceptual Design
• Design Development
• Construction Documentation
• Construction Management
How Does Autodesk Revit Work?

1. The Single Building Model
2. Relationships
3. Design Phase Detailing

The Single Building Model

STEP 1: SET UP YOUR PROJECT TEMPLATE

STEP 2: START TO BUILD YOUR MODEL
The Single Building Model

STEP 3: GENERATE WORK PRODUCTS

- Schedules & Reports
- Design Development Drawings
- Site Studies
- Construction Documents
- Colored Space Plans
- Conceptual Representation Models
- Plans, Elevations, Sections
- Massing Models
- Realistic Renderings

Building Relationships

Building Information Modeling

Building Components

Annotations

Views
Building Relationships

Building Components
- Individual components
- Relationships between components
- Design intent

Views
- Bi-directional associativity
- Schedules, sections, elevations
- Work directly on drawings

Annotations
- Drawings callouts
- Section elevation markers
- Level heights

Design Phase Detailing

Benefits Realized by Clients

“We embrace change and are willing to adjust our process to benefit from the best technology we can find. A tool like Autodesk Revit allows us to do the work of a conventional firm twice our size.”

-- Ron Reim, founder and principal of Oculus, Inc.
Benefits Realized by Clients

1. Early Design Phase Benefits
2. Space Planning Tools
3. Preservation of Design Information
4. Extending the Use of the Model

Early Design Phase Benefits

Visualization

Presentation
Early Design Phase Benefits

Multiple Scheme Exploration

Earlier Construction Budget Estimation

Space Planning Tools

- Save time on space planning
- Enter departmental/utilization data directly
- Create color coded and labeled space plans
- Generate a space planning analysis
- Update the data instantly
- Data available in real time based on client feedback
The digital design data that is generated from the Autodesk Revit building model not only supports the design and construction documentation phases but can also be used in downstream project phases to support the complete life cycle of a facility.
"There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old conditions, and lukewarm (indifferent, uninterested) defenders in those who may do well under the new."

-- Machiavelli, The Prince

### Overcoming the Objections

**TECHNOLOGY**

<table>
<thead>
<tr>
<th>Hardware costs</th>
<th>Price of hardware spiraling downward</th>
</tr>
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<tbody>
<tr>
<td>Software costs</td>
<td>Option of subscription based license</td>
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<tr>
<td>Learning new software</td>
<td>Software designed to be intuitive for architects</td>
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<tr>
<td></td>
<td>Very fast to learn</td>
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<td></td>
<td>Graphical user interface</td>
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<td></td>
<td>Readily available training and support services</td>
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</table>

### Overcoming the Objections

**ORGANIZATION**

<table>
<thead>
<tr>
<th>Work processes resistant to change</th>
<th>Revit provides a clear proven strategy for successful implementation</th>
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<tbody>
<tr>
<td>Using tools like old tools</td>
<td>Proper training and understanding of the BIM process minimizes misuse of tools</td>
</tr>
<tr>
<td>Job description changes</td>
<td>Revit support personnel help you understand in advance how BIM changes the duties of individuals and lets you be prepared for it</td>
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</table>
Overcoming the Objections

<table>
<thead>
<tr>
<th>Overcoming the Objections</th>
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<tbody>
<tr>
<td><strong>ACCEPTANCE</strong></td>
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<tr>
<td>Why do we need to change?</td>
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<tr>
<td>To keep up with the industry</td>
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<tr>
<td>Can it do what our current product can?</td>
</tr>
<tr>
<td>Yes.</td>
</tr>
<tr>
<td>Will Revit last?</td>
</tr>
<tr>
<td>Autodesk has complete confidence that Revit is the architectural design solution of the future.</td>
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Introducing Revit into the Office

Phased Implementation
- Phased Implementation on a project by project basis
- Phased implementation by group
- Ex: Oculus currently has 16 CAD stations – 10 with Autodesk Revit

Taking Advantage of Interoperability
- Existing drawings in AutoCAD can be imported
- Coordination with team members using conventional CAD is smooth
- CAD files exported by Autodesk Revit well received by engineers and consultants

Training
- Many different training resources
- Use Role-Based learning
- Use Teamwork – Set up a forum for discussion

Proper Team Management

Understanding Your Team Skills & Culture
- Employees without CAD experience can learn Revit easily – Straightforward UI and intuitive for architects
- Help transition expert CAD users by setting up a familiar environment – keyboard shortcuts, black background screen

Positive Attitudes
- Choose a first team with a positive attitude
- Skeptics on the first team can lower morale
  - may be subconsciously looking for ways to make the project fail
- May not look for tools that exist
- May not try as hard to learn the product
- After a first success, users will be more receptive
Work Flow Changes

Conventional Office

Entering

Marking Up

Changes

Drawings

Conventional Office Autodesk Revit

Changing Roles

Team organization changes
- Fewer people get more work done faster
- Team members need to be versatile in design and documentation roles
- Senior / intermediate designers regain direct control of the design - More upfront thought about design/building systems.

Old tasks are obsolete
- Building elevations, interior elevations, sections are automatic
- Coordinating detail and sheet numbers
- Coordinating changes among redundant views
- Creating schedules / key items in drawings to schedules
- Coordinating project files and references

New areas of expertise evolve
- Rendering
- Site development
- Family component building

Work Distribution

Conventional Office

Autodesk Revit

- DESIGN
- COORDINATING CHANGES
- GENERATING DRAWINGS
Overview of Implementation Methodology

Phase 1: Process Review
Fact Finding
- Understand your current design process
- Evaluate existing tools and level of customization
- Collect office standards
- Review the makeup of the design team
Establish the Foundation
- Decide on the project for the implementation
- Understand the scope of the project and establish a clearly defined set of goals for the implementation
- Establish communication with Autodesk Revit Support
- Develop a training plan
- Set up a forum for communication

Phase 2: Getting Started
Phase 3: Schematic Design
Phase 4: Design Development
Phase 5: Construction Documentation
Phase 6: Post-Project Analysis

Training Agendas
- Implementing Building Information Modeling (1/2 Day)
  - Orientation for client including senior staff regarding the issues around implementing a building information modeler in your firm.
- Autodesk Revit Concepts and Principles (1/2 Day)
  - Overview of basic Autodesk Revit functionality.
- Fundamentals of Autodesk Revit (2 Days)
  - Basic Geometry creation, view creation and drawing creation.
- Autodesk Revit Advanced Concepts (2 Days)
  - Advanced topics including multi-user collaboration, family creation, phasing and rendering
Phase 2: Getting Started

Implement Training Plan
- Attend Distance Learning seminars
- Use Self-paced Tutorials
- Participate in 1-week comprehensive technical training program

Establish Project Standards
- Set up drawing title block
- Set up Project Template
- Set up typical views such as schedules, floor plans, equipment plans, etc.
- Set up typical sheets

Develop a Strategy for Reuse
- Create custom component families
- Decide if Groups can be used to your advantage
- Building Prototypes

Phase 3: Schematic Design

Strategy for Multi-User Collaboration
- Decide if Worksets are needed
- Develop a logical workset structure
- Subdivide the project

Utilizing Existing Conditions
- Import existing site data in DWG/DWF/DGN to be used to generate site surface
- Import or link any existing DWG/DWF/DGN plans to be used to reference in creating the project
- Scan in and trace over hand drawings that can be used to generate the model

Establish the Project Environment
- Create the levels
- Create the column grids

Phase 3: Schematic Design (cont'd)

Create Design Studies
- Massing tools applicable
- Using walls tool
- Add doors, windows
- Add floor, roof and additional geometry
- Use Phasing if needed

Set up Additional Views
- Create needed views of the model: Plans, Sections, Elevation...
- Adjust the Visibility of objects to display desired elements
- Create Schedules/Cost Reports
- Presentation image creation

Utilize Productivity Tools
- Use Move, Copy, Rotate, Array, Mirror, Group
- Generate a Cartoon/Block sheet set

Review Schematic Design
Phase 4: Design Development

Developing the Model
- Additional geometry added (furniture, equipment, lighting, etc.)
- In-Place families (project specific entities)

What to Model
- Keep project simple (does it convey design intent?)
- Use 2D where applicable (ex: plans of bathrooms, kitchens)
- Copy existing views and adjust visibility

Utilize Productivity Tools
- Use Move, Copy, Rotate, Array, Mirror, Group
- Generate a Cartoon/Mock sheet set

Review Design Development

Phase 5: Construction Documentation

Documenting the Model
- Add sheets to compile views from browser
- Add annotations
- Add dimensions

Detailing the Model
- Use of visibility of views to display proper information
- Display mode (wireframe, hidden line, shaded)
- Line work tool for readability
- Manipulation of model geometry (edit cut profile)
- Detailing over model (trace select)

Utilize Interoperability
- Legacy CAD (details, symbols, etc.)
- Import / Export tools
- Power of linking drawings

Review Construction Documents

Phase 6: Post Project Analysis

Evaluate CD Phase

Changes to the Model
- Add changes to the model that were made during construction

Evaluate Project Template
- Standards kept
- Sheets kept

Evaluate the Design Team
- Adequate training needed met

Evaluate the Workflow
- Process check
- Multi-user check

Target Next Project
Conclusion

The stage is set, you have been introduced to a new CADD paradigm. It is time for your design team to focus on the specifics of what this powerful parametric change engine can and will do for their projects. Please remember, implementing building information modeling within your firm is not so much about learning a new program, it is more the understanding that there now exists a solution which becomes the portal through which you present all the creative endeavors taken along the project path. It's the database which holds all the pertinent project information for your team, your suppliers, your contractors, and most importantly, your client.
Introduction

Building information modeling is Autodesk’s strategy for the application of information technology to the building industry. Building information modeling solutions have three characteristics:

1. They create and operate on digital databases for collaboration.
2. They manage change throughout those databases so that a change to any part of the database is coordinated in all other parts.
3. They capture and preserve information for reuse by additional industry-specific applications.

The application of building information modeling solutions results in higher quality work, greater speed and productivity, and lower costs for building industry professionals in the design, construction, and operation of buildings.

This paper discusses how the use of information technology in the industry has led to the idea of building information modeling and the characteristics and benefits of building information modeling solutions.

The Road to Building Information Modeling

In the early 1980s architects began using PC-based CAD. The familiar layer metaphor that originated with pin-bar drafting was easily adapted to the layer-based CAD systems of the day, and within a few years a large percentage of construction documents and shop drawings were plotted from computers rather than being manually drafted on drawing boards.

Slowly technology began to affect the process. DWG files were exchanged with consultants instead of physical underlay drawings. Beyond simple graphics these files communicated information about a building through their layer structure; a rectangle on one layer represented a concrete column, but on another layer a tile pattern on the floor. Electronic file formats originally designed to store only graphics and drive plotters now directly conveyed information about the building that would not appear in the plotted version of the file. The use of CAD files was evolving toward communicating information about a building in ways that a plotted drawing could not.

This evolution continued with the introduction of object-oriented CAD in the early 1990s. Data “objects” in these systems—doors, walls, windows, roofs—stored nongraphical data about a building in a logical structure together with the building graphics. These systems often supported geometrical modeling of the building in three dimensions, thereby automating many of the laborious drafting tasks like laying out building section drawings.
and generating schedules. Forward-thinking design firms adopted these tools, realizing that the data in the object-oriented CAD files, if carefully structured and managed, could be used to automate certain documentation tasks like schedules and room numbering.

A parallel development in the 1990s was the increasing use of the Internet for sharing data digitally. Suddenly information could not be effectively communicated unless it was represented digitally. CAD files that had been exchanged on floppy disks within the design team appeared instead on Internet FTP sites, on web pages, and attached to emails. The same forward-thinking design firms who were adopting object-oriented CAD into their practices began sharing and delivering their documents to clients digitally and began investigating web-based project management and collaboration services.

But object-oriented CAD systems remain rooted to building graphics, built on graphics-based CAD foundations, and as a result are not fully optimized for creating and managing information about a building. Other industries, such as Manufacturing, have realized great benefit from non-graphical, parametric information technology tools. Another generation of software solutions, designed with current technology and purpose-built, is required to fully realize the benefits information technology can bring to the building industry. This next generation of information-centric software provides building information modeling in place of building graphic modeling.

By storing and managing building information as databases, building information modeling solutions can capture, manage, and present data in ways that are appropriate for the building team member using that data. Because the information is stored as a database, changes in that data that so frequently occur during design can be logically propagated and managed by the software throughout the project life cycle.

Building information modeling solutions add the management of relationships between building components beyond the object-level information in object-oriented CAD solutions. This allows information about design intent to be captured in the design process. The building information model contains not only a list of building components and locations but also the relationships that are intended between those objects. For example, that a door should be 3 feet from a window or the eaves of the roof should overhang the exterior wall by 550 mm. Or that three beams should be spaced equally across a structural bay or that the slope of an excavation should be maintained at a certain angle. These relationships, implicitly understood by the designer, become explicit when the building is described in a building information modeler.

Further, these relationships can be inferred by the building information modeler as the user works, or explicitly entered as work progresses. These relationships then allow for changes to the building information model to be managed by the software consistent with the design principles and intent for the project. The richness of the relationships embedded within building components themselves, as well as those embedded in the overall model, makes reuse of the data in other applications even more powerful and the design process significantly more efficient.

The Characteristics of Building Information Modeling

Building information modeling solutions create and operate on digital databases for collaboration, manage change throughout those databases so that a change to any part of the database is coordinated in all other parts, and capture and preserve information for use by additional industry-specific applications.
Digital Databases

Building information modeling solutions create and operate on digital databases for collaboration. The building industry has traditionally illustrated building projects through drawings and added information over those illustrations via notes and specifications. CAD technology automated that process, and object-oriented CAD extended the idea of adding information to illustrations and graphics into software. The result of earlier manual drafting, graphics CAD systems, and object-oriented CAD systems were identical: the creation of graphic abstractions of the intended building design.

The principles of building information modeling turn this relationship around. Building information modeling applications start with the idea of capturing and managing information about the building, and then present that information back as conventional illustrations or in any other appropriate way. A building information model captures building information at the moment of creation, stores and manages it in a building information database, and makes it available for use and reuse at every other point in the project. Drawings become a view into the database that describes the building itself.

In a building information modeler, the building information is stored in a database instead of in a format (such as a drawing file or spreadsheet) predicated on a presentation format. The building information modeler then presents information from the database for editing and review in presentation formats that are appropriate and customary for the particular user. Architects, for example, work on the information using the conventions of the highly stylized symbolic graphic language of building design (such as plan, section, and elevation), entering and reviewing information in a format that looks just like the architectural drawings they have worked with for years. They work on the building information through a drawing rather than working directly on a drawing in the computer. Similarly, structural engineers work with the data presented graphically in familiar framing and bracing diagrams, quite different from the architects’ interface to the data. Builders work with some of these same presentations and also isometric views of the building geometry to study phasing and coordination issues and databases or spreadsheets of quantity data provided from the building information model.

Although each professional working on the building project views the building information in the way he or she expect to see it, these presentations of the information—drawings, schedules, cost estimates, other conventional presentations of the building information—are all views into the same information model. While each discipline interacts with familiar and customary views of the information, the building information modeler assures that changes made in any of these views is reflected in all other presentations.

Building information models organize collaboration by the building team through digital databases. The building information model can be distributed to individual team members working on a network or sharing files through project collaboration tools such as the Autodesk® Buzzsaw™ service. Team members work independently on local data sets while the building information modeling solution manages changes to the model from each of these local databases in a central shared location. Team members can compare their work to concurrent work by other team members and dynamically reserve and release portions of the database for use over the network. A record of these interactions—who changed what, and when—is available for review, and a history of all changes made by all team members can be preserved in the building information model for as long as this information is useful. Changes can be selectively rolled back to support investigations of options or changes in design direction.
Change Management

Building information modeling solutions manage iterative change through a building’s design, construction, and operation. A change to any part of the database is coordinated in all other parts.

The process of building design and documentation is iterative. The understanding of a design problem develops during the design process. In addition to the refinements typical to any design process, a new insight into the design problem may lead the design team to discover that the solution could be quite different, and possibly better. At that point another iteration occurs that may reconsider earlier assumptions. Managing this iterative change is an inherent part of the design process. Technology tools and work processes that do not allow the design to be refined and reconsidered in an iterative way as the project develops discourage the best possible solutions to the design problem. Building information modeling solutions, because of the management of relationships within the data and change to that data, are ideal for this approach. And using building information modeling tools results in the highest quality project for the owner and the best possible work by the team.

Maintaining an internally consistent representation of the building as a database improves drawing coordination and reduces errors in the documents to the benefit of all building team members. Time that would otherwise be spent in manual document checking and coordination can be invested instead in the real work of making the building project better. The resulting documents are of higher quality, and thus the costs of changes and coordination are reduced. Building information modeling tools enable the design, construction, and occupancy of the building to proceed with less friction and fewer difficulties than conventional tools.

Estimating, procurement, and construction are also iterative processes of definition and elaboration. Specific materials and products are selected from among the range of possibilities that meet the project specification. Selection, refinements, and substitutions may result in changes to some aspects of the design. Ambiguities in the design documents are resolved between the design and construction teams before construction. The construction and design teams consider changes to improve constructability and value for the client. Each of these decisions requires evaluation and that new information be captured to support later evaluations as well as operation and management of the building. Building information modeling solutions capture and manage this information and make it available to support the collaborative process.

The operation of buildings after completion is also an iterative process that is well supported by building information modeling solutions. The first occupancy of a building—the end of the conventional design and construction cycle—is just the beginning of the life and use of the structure. The evolving occupancy of the building together with the maintenance requirements of the building materials, assemblies, and systems result in changes throughout the life of the building. Building information modeling supports the building life cycle with solutions for the design and documentation of the continuing maintenance, renovation, and renewal of the building itself within the building information model. For example, information about all the successive renovations to a building can be maintained in the building information model, forming a record of all changes that have been made to the building in its history.

Reuse of Information

Building information modeling solutions capture and preserve information for reuse by additional industry-specific applications. Successful information technology solutions outside the building industry are based on one primary principle: Data is captured once, as close to its point of origin as possible, and stored in a way that it is always easily available and can
be presented in context whenever required. A simple example is a personal financial management package that captures information from your checkbook register as you write checks and make deposits, stores and manages that information for a variety of purposes, and presents it back as your income tax return in one case and a statement of net worth in another. Building information modeling accomplishes the same thing for the building industry.

The moment that an architect sketches the outline of a building on a site survey, data is created. The general size of the building footprint is now known. General program requirements and planning ratios can be applied to deduce the overall building configuration. Similarly, when an architect is working out the building plan, data is being created that can be re-presented in interior elevations, sections, and schedules. Conventional tools require all this data to be rederived at the point in the project where the information about building size or sections and schedules is required. Building information modeling tools capture this data at the moment it is created, store it, and make it available for re-presentation as information in other documents and artifacts as needed.

A construction cost estimator traces over a drawing on a digitizing tablet to derive quantities for a cost estimate or bid or to measure that drawing manually. The construction project manager in the same company traces over these same drawings to develop plans for construction sequencing and phasing. Using building information modeling, instead of tracing over the plans for the quantities, the estimator and the design team can interact with the building information model. Or, if the project team is not ready for that level of collaboration, the estimator can trace over digital plans in software, constructing a building information model in about the same amount of time required for the manual tracing. Now this data is captured in the building information model itself and can be re-presented as a phasing and sequencing plan. A design-build firm, in which the building information model can be easily shared between design and construction professionals, can realize even greater benefits.

A third example is the use of schedule data in a building information model for inventory management in a retail operation. As the display unit layout is planned for a store in a building information model, the possible configurations and capacity for each unit are captured and reported back later in a schedule for inventory calculations, and the inventory schedule information can be linked to a procurement system to coordinate the management of inventory with the capacity of the store. The building information model data extends to the support of the store operations.

Reuse of building information leads to connections from Autodesk’s current solutions to other applications for energy analysis, structural analysis, cost reporting, facility management, and many others. The persistence of the building information model through the building design, procurement, construction, and operation supports the management of workflow and process around this information.

**The Benefits of Building Information Modeling**

The application of building information modeling solutions results in higher quality work, greater speed and productivity, and lower costs for building industry professionals in the design, construction, and operation of buildings.

**Higher Quality**

Building information modeling solutions allow exploration and changes to the project at any time in the design or documentation process without encumbering the design team with laborious recoordination tasks. They also return more time for design and solving real
architectural problems to the design team by minimizing coordination time and manual checking. By sharing common building information modeling tools, more experienced team members work together concurrently with the production members of the project team through all phases of the project, providing close control over technical and detailed decisions about the execution of the design. In construction the consequences of proposed or procured products can be studied and understood easily. The builder can quickly and easily prepare plans showing site utilization or renovation phasing for the owner, communicating and minimizing the impact of construction operations on the owner’s operations and personnel. The building owner uses building information models to improve quality in the management of the building. The building information model provides a digital record of building renovations and improves move planning and management.

Greater Speed

With building information modeling solutions the design and documentation of the building can be done concurrently instead of serially. Design thinking is captured at the point of creation and embedded in the documentation as the work proceeds. All deliverables for the design team—schedules, color-filled diagrams, drawings—are created dynamically while the design work is being done. When a change is made, all the consequences of that change are automatically coordinated through the project. All of this allows the design team to deliver better work faster. The production of key project deliverables, like visualizations and regulatory approval documents, requires less time and effort by the design team, so the project can move ahead faster. In construction the builder can use the building information model (or create one) to accelerate the quantification of the building for estimating and value engineering purposes. This same model is then reused for revised estimates and construction planning. Building information modeling accelerates the adaptation of standard building prototypes to site conditions for businesses such as retail that require similar buildings in many different locations.

Lower Cost

Using building information modeling, design teams get more work done with fewer people. A smaller design team means lower costs and less chance for miscommunication. Because the documents are coordinated by the computer and therefore can be more complete, the cost of changes and coordination in construction administration is reduced.

Floor area-based (square-foot) budgeting and cost estimating are easier with a building information model, and cost information is available earlier and can be updated more frequently than with conventional tools. Changes late in the design process to reduce construction costs are difficult, inefficient, and expensive for the design team. With better cost information available from a building information model these kinds of changes are less likely.

In construction, less time and money are spent in process and administration because document quality is higher and construction planning is better. More of the owner’s construction dollar goes into the building instead of administration and overhead in design and construction. The building information model is also used to access and manage physical information about the building such as finishes, tenant or department assignments, and furniture and equipment inventory, as well as financially important data regarding leasable areas and rental income or departmental cost allocations. Access to this information improves both revenue and cost management in the operation of the building.
Conclusion: Better Building Projects

Building information modeling solutions create and operate on digital databases for collaboration, manage change throughout those databases so that a change to any part of the database is coordinated in all other parts, and capture and preserve information for reuse by additional industry-specific applications. Through the application of information technology to the problem of describing a building in software, they enable higher quality work, greater speed, and improved cost effectiveness for the design, construction, and operation of buildings.

What all of us in the building industry are working toward is the building; that is our accomplishment and the value delivered. Every bit of time and effort in the process that goes into something not manifested in the building itself is energy wasted; energy dissipated as heat from friction instead of energy used to make the building better. The time spent coordinating the documents isn’t improving the architect’s real work nor making the building any better—it’s just making the drawing set better. Time spent transferring a pile of dirt from one part of the site to another to get it out of the way of the concrete trucks doesn’t make the building any better. Building information modeling solutions allow more of the building team’s effort to go into the result rather than the process.

Thank you for your interest in Autodesk solutions for the building industry. If you have any questions about this paper or are interested in further information about building information modeling solutions from Autodesk please contact us at http://www.autodesk.com/buildinginformation.