



Building Information Modeling

Building information modeling (BIM) is an integrated workflow built on coordinated, reliable information about a project from design through construction and into operations. The Revit® platform is purpose-built software for building information modeling.

Objective

After completing this chapter, you will be able to:

- Describe building information modeling methodology.

Lesson: Building Information Modeling

Overview

This lesson describes building information modeling (BIM).

Applying building information modeling results in better drawings, shorter timelines, and improved productivity. It offers an opportunity for building industry professionals to design, construct, and operate buildings of higher quality at a lower cost.



Objectives

After completing this lesson, you will be able to:

- Describe building information modeling.
- Describe bidirectional associativity.

About Building Information Modeling

Building information modeling is a building design and documentation methodology. It enables you to create and manage information about a building project. The information about the building project is stored in a single building model. This ensures that the information is coordinated, consistent, and complete.

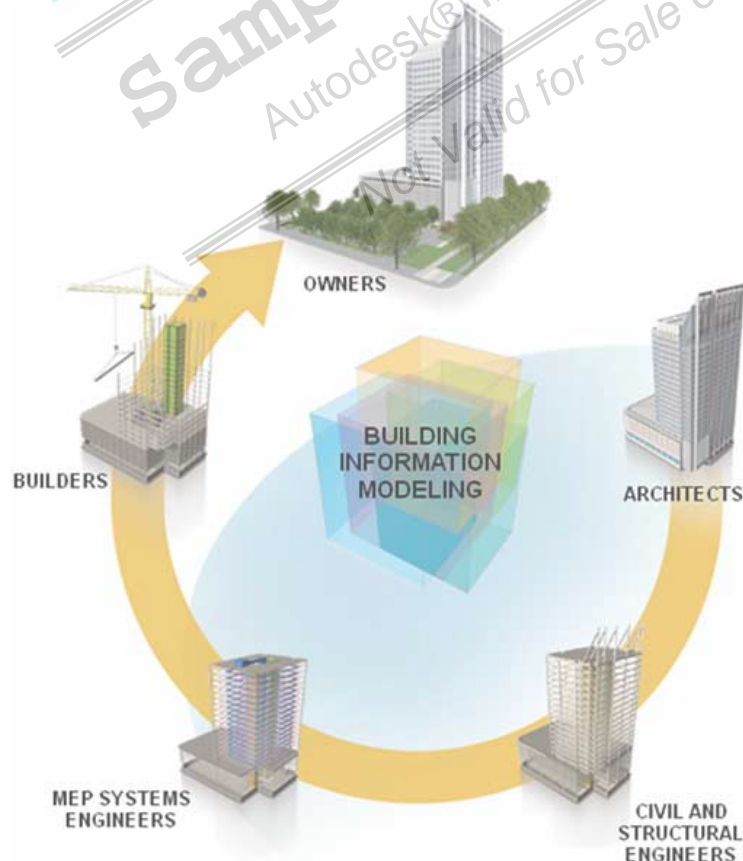
The building industry has traditionally illustrated building projects with manually created drawings. Information was added to these illustrations by using notes and specifications. With the advent of CAD technology, this process was automated. However, the output of manual drafting, graphics CAD systems, and object-oriented CAD systems remained the same: a graphic abstraction of an intended building design.

The development of the building information modeling methodology has turned this relationship around. Building information modeling software captures information about a building and then presents that information as 2D and 3D views, schedules, or in other required formats.

Definition of Building Information Modeling

BIM is an integrated workflow built on coordinated, reliable information about a project from design through construction and into operations.

By adopting BIM, architects, engineers, contractors, and owners can easily create coordinated, digital design information and documentation; use that information to accurately predict performance, appearance, and cost; and reliably deliver the project faster, more economically, and with reduced environmental impact.



Revit and Building Information Modeling

Revit is purpose-built software for building information modeling.

Traditional drafting and CAD software represent the geometry of a design by using stylized symbols from designated illustrations. Some examples of these illustrations may be a series of plans, elevations, and sections. These illustrations are essentially independent of one another.

Building information modeling software represents the design as a series of intelligent objects and elements such as walls, windows, and views. These objects and elements have parametric attributes. The information about these objects and elements is stored in a single building model. You can extract any number of different views of the data from the model.



The Revit platform is a building design and documentation system that supports the design, documentation, and even construction efforts required for a building project. Because of its parametric change technology, any change you make is automatically coordinated everywhere in your project, including model views, drawing sheets, schedules, sections, and plans.

Building Information Tailored to the User

In building information modeling software, the building information is stored in a single building model instead of in a format predicated on a presentation format, such as a drawing file or a spreadsheet. The building information model presents information for editing and review in views and formats that are appropriate for and familiar to the user. Some examples of these formats are a 2D elevation or a 3D rendering.

Architects, for example, work on the information in the building model by using the conventions of the highly stylized, symbolic, and graphic language of building design. They may enter and review information in a format similar to architectural drawings, such as plans, sections, and elevations. Structural engineers work with the same data presented graphically in the form of framing and bracing diagrams. Therefore, the structural engineers' interface to data or the MEP engineers' is quite different from the architects' interface to data.

Managing Change with Building Information Modeling

Building information modeling solutions manage iterative changes in a building model throughout the design, construction, and operation phases. A change to any part of the building model is replicated in all other associated parts.

Maintaining a single, internally consistent representation of the building can improve drawing coordination and reduce the number of errors in the documents. You can invest the time that you would otherwise spend manually checking and coordinating documents in making the building project even better. As a result, building documents can be of higher quality, and the costs of changes and coordination reduced. Building information modeling tools can enable the design, construction, and occupancy of the building to proceed with less friction and fewer difficulties than conventional tools.

Capturing and Reusing Information

Building information modeling solutions capture and preserve information for reuse by third party industry-specific applications. Data is captured once as close as possible to its point of origin and stored so that it is available and can be presented whenever required.

For example, consider a personal financial management software application that captures information from your checkbook register as you write checks and make deposits. It stores and manages that information for a variety of purposes, such as to prepare your income tax return and to create a statement of your net worth. Building information modeling leverages data in a similar manner.

Characteristics of Building Information Modeling

Work the way architects and designers and engineers think about buildings:

- Enjoy a more intuitive process with software that mirrors the real world.
- The building information model contains essential information about a project, so as you design, Revit software automatically creates accurate floor plans, elevations, sections, and 3D views, as well as area calculations, schedules, and quantity takeoffs.
- Gain better design insight through in-process visualization and analysis.

Capture early design thinking to better support design, documentation, and construction:

- Enhance conceptual building design efforts to gain better design insight earlier in the process.
- Support smarter, more sustainable design through the analysis of materials, quantities, sun position, and solar effects. Exchange building information with partner applications to perform energy analysis and better predict building performance.
- Provide essential BIM data for use in clash detection, construction analysis, and fabrication.

Improve your business through better-coordinated, higher-quality project work:

- Accelerate decision making and shorten production time.
- Minimize coordination mistakes and rework with fully parametric change management.
- Gain a competitive advantage with increased client satisfaction and greater profitability through more efficient project delivery.

Example of Building Information Modeling

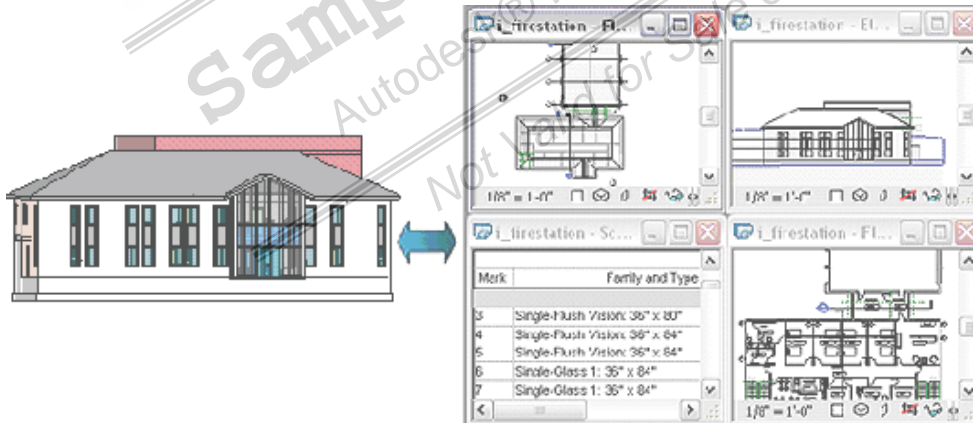
During the design of a building, if there is any change in the load conditions on the floor area, you may need to modify the design parameters of the structural system. Modifications could include an increase in the depth of beams or a change in beam profiles. A change in beam profiles may result in a change in the geometric parameters of these members in a 3D view. This change would also be reflected in plan and section views. Therefore, building information modeling ensures an effective interaction between the design and its representation.

About Bidirectional Associativity

A key feature of Revit is bidirectional associativity, which ensures that changes to any part of the design are immediately reflected in all associated parts.

Definition of Bidirectional Associativity

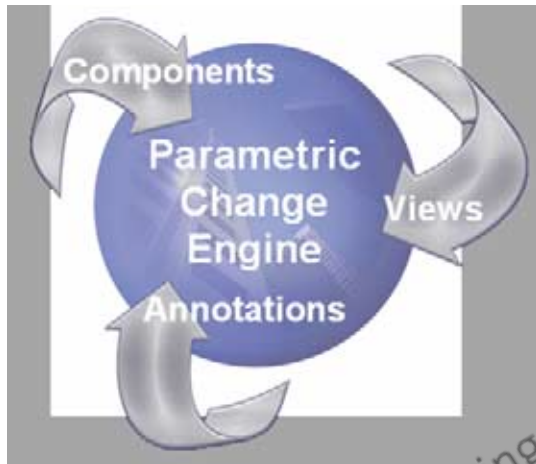
Bidirectional associativity is the ability of the building information model to coordinate changes made in any view and propagate these changes out to all other views. Bidirectional associativity is applied automatically to every component, view, and annotation. For example, a change in the dimensions of a wall is reflected in all elements such as windows, doors, ceilings, and electrical outlets; all of which are associated with the wall and influenced by the change in the dimensions of the wall. These elements are also affected by the constraints and alignments that have been established for the wall. Revit helps ensure that building sections and elevations are immediately available, up-to-date, and accurate.



Parametric Relationships

The term parametric refers to the relationships among the elements of a building model. These relationships enable the software to coordinate and manage the changes made to the building model. The relationships are created either automatically by the software or by you. In mathematics and mechanical CAD, the numbers or characteristics that define these relationships are called

parameters; therefore, the operation of the software is called parametric. It is these parametric relationships that deliver fundamental coordination and productivity benefits provided by the building information modeling methodology.



Examples of Bidirectional Associativity

- Flip a section line and all views update.
- Draw a wall in plan and it appears in all other views including material takeoffs.
- Change a beam type or an electrical fixture type in a schedule and the change propagates throughout the graphical and non-graphical views.

Examples of Parametric Relationships

- A floor is attached to the enclosing walls. When a wall moves, the floor updates to remain connected to the walls.
- A series of equidistant windows have been placed along a wall. When the length of the wall changes, the windows redistribute to remain equidistant across the length of the wall.
- A relationship has been established between a column and a HVAC duct system to ensure that a design requirement or code requirement is maintained. When the column is moved, the duct system moves with it.

Chapter Summary

In this chapter, you learned about building information modeling methodology and its benefits.

In this chapter, you learned to:

- Describe building information modeling methodology.

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Sample Chapter

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