SRC 221

Assignment 3 Written report on Building Information Modelling

Scott Kennedy

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Building Information Modelling Processes

Building Information Modelling (BIM) refers to many different three dimensional programs which create digital representations of the structural, functional and aesthetic aspects of a building. BIM serves to establish a working knowledge of the structure and construction of a facility. BIM also conveys the information of each individual phase of construction and can heavily influence decisions made during the life-cycle of the building.

<u>Part 1</u>: Interoperability and Building Information Modelling BIM

"Interoperability is often defined as the ability to implement and manage collaborative relationships among members of cross-disciplinary build teams that enables integrated project execution." (McGraw Hill Construction, 2007, pg. 4).

Interoperability is become an important requirement in building design, particularly in the US; "The move towards BIM is driven in part by large building owners, including the U.S. General Services Administration (GSA), which, as of 2007, accepts delivery of designs for major projects only as interoperable models. Owners like GSA have documented the wastefulness of the conventional paper-based building delivery process and are dictating a more integrated approach." (Environmental Building News, 2007)

The various design components within a BIM file, can be altered and developed while still remaining linked together, providing design flexibility and interoperability of the BIM software between various building consultants.

a. Geometry

The geometry of building information models can be mapped by manually entering the dimensions or using snap points. Snap points allow lines and geometric nets to connect seamlessly. These aspects of BIM help make quick work of simple construction aspects allowing more time to model more complex structural elements of a building.

b. Spatial Relationships

The three dimensional representations of a building, made available by the BIM program, allows the consultants involved with the projects to see the spatial relationship of various aspects of the building. These are options in the software that allow "walking around" the model. This option creates views from various points in the structure such as from ground level or viewed from the perspective of other structures around it.

c. Geographic Information

Geographic information is needed in the development of the BIM. An example of how this can be applied is in footings and foundations, the footings can be models according to the soil type.

d. Quantities and Properties of Building Components

The quantities and properties of building components are found in the manufacturer's details. The materials of specific building elements can be rendered in most BIM programs modelling the visual aspects of the material and most importantly, the texture. The materials use and in building components can alter the design. For example, a beam may need to be thickened if a less strong material is chosen for its aesthetic qualities.

e. Lead Architectural Firm Design Standards

All architectural firms have to comply with industry standards, such as information presentation and symbols used. However, each architectural firm has their own interpretation of these standards. Some examples are changing the font style and having unique placements of title blocks.

f. Architectural or Engineering Design:

(i) Form

Form is the three dimensional relationship between different faces of a certain shape. Form can be created by connecting shapes together which can be conventional or in some cases more creative.

(ii) Appearance and Layout

There are two different types of document layout; presentation for clients and working drawings. Presentation for clients is usually more artistic in nature with lots of colour and many different three dimensional renders to give the client an easy to understand and somewhat realistic view of the design. The working drawings on the other hand, use industry standard symbols that are to be read by contractors and other specialists involved in the project.

(iii) Functional Relationships

All materials chosen for building elements need to be functionally relative. This means they need to either complement each other's or cancel each others flaws. For example concrete has a lack of tensile strength and therefore it must be supplemented by steel reinforcing beams. Another functional relationship besides materials used is that of the structure and the movement of people in and outside it.

(iv) Area Definition

Area definition refers to the boundaries that define a space. The expression of boundaries can vary. For example the use of glass as a wall to create the illusion of freedom. Playing with the idea of space can bring with it structural problems, such as moving load bearing walls in an attempt create interesting boundaries.

(v) Location and Site Plans

Sometimes, locations are fixed as the shape and size of a site may not allow much flexibility. At other times, the structure can be placed anywhere on the site. The location of a structure is limited by some industry standards such as the location of an easement, the legal discharge point, nature strips and other council regulations. The site plan influences the design as it contains information like wind and sun direction and the angle of the sun during various times of the year.

(vi) Plans

Plans show the relationship between people and the structure, the amount of utility space and useable space as well as the relationship between people and the structure.

(vii) Elevations

Elevations show the relationship between the structure and the sky. This relationship represents a major visual contrast between the building and its surroundings (sky).

(viii) Sections

Sections are the most important of documentation drawings. Like elevations, sections convey the relationship between the structure and the sky. In addition, sections convey the relationship between people and the structure. Sections are commonly used to help make sense of more complex structural elements by providing extra details. Sections can also be used in presentations to clients as they show a great deal of detail regarding the materials of the building.

(ix) Material Selection

The selection of materials can be a complex process as it can be difficult to find the perfect balance between aesthetics and function. Materials should be chosen for specific needs, such as structural or aesthetic. Structural materials are generally not for aesthetics, but can be painted or rendered.

g. Documentation and Drawing Sets

Sections, elevations, plans and utility diagrams are all comprise a complete set of documentations and drawings.

<u>Part 2</u>: Drawings and Reports

a. Mechanical and Electrical Systems

Mechanical and electrical systems are included in various diagrams also known as utility diagrams. These show exactly where electrical wiring and moving mechanisms go. Electrical diagrams or circuit diagrams uses complex symbols which are designed for contractors to read. Mechanical diagrams use a similar form of complex symbols describing the locations of mechanical working parts that need to be included during the construction process.

b. Overview Documentation

An overview document shows all the mechanical, electrical and plumbing diagrams laid over one another. These are usually used by building supervisors and viewed by chaperoned clients inspecting the structure.

c. Building Management System Outline

This system uses building project management principles to identify the cost of materials and labour to ensuring that everything falls within the budget.

d. Subset of building consultants

The growing demand for building design projects that include interoperability between many components of a building project means that a subset of building consultants involved in the project is essential. The consultants can be as diverse as environmental energy specialists to Feng Shui consultants so it is important that this list is comprehensive.

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