



TAYLOR'S UNIVERSITY

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Construction Supply Chain Management

(MGT60803)

Bachelor of Quantity Surveying (Honours)

School Of Architecture, Building & Design

Group Project

Building Information Modelling (BIM)

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Dimensions of BIM ranging from 3D to 7D and each dimensions providing different services addition to the project, which are visualization model (3D), time model (4D), cost model (5D), energy model (6D) and facilities management (7D). Each dimensions of BIM will house each chapter, where the services and software available for the BIM dimensions as well as the advantages and costs of BIM to construction supply chain management (CSCM) are discussed in detail.

BIM 3D - 3D Modelling

BIM revolves around an integrated data model from which various stakeholders such as Architects, Civil Engineers, Structural Engineers, MEP System Engineers, Builders, Manufacturers and Project Owners can extract and generate views and information according to their needs.

3D BIM's visualizations capabilities enables participants to not only see the building in three dimensions before ground is ever broken, but also to automatically update these views along the project life cycle, from earliest conception to demolition.

BIM 3D helps participants to manage their multidisciplinary collaboration more effectively in modelling and analysing complex spatial and structural problems.

Furthermore because accurate data can be collected along the project life cycle, and stored in the Building Information Model, new value can be added to predictive models allowing to resolve issues proactively.

Benefits

1. Improved visualization of the project, communication of design intent
2. Improved multidisciplinary collaboration
3. Reduced rework

2.2 List of Software for 3D Modelling

2.2.1 Architecture

1. Autodesk Revit Architecture
2. Graphisoft ArchiCAD
3. Nemetschek Allplan Architecture

2.2.2 Structures

1. Autodesk Revit Structure
2. Bentley Structural Modeler

3. Glodon

MEP

1. Autodesk Revit MEP
2. Bentley Hevacomp Mechanical Designer
3. 4MSA FineHVAC + FineLIFT + FineELEC + FineSANI

SCHEDULING

4D-BIM (four-dimensional building information modelling) is used for construction site planning related activities. The fourth dimension of BIM allows participants to extract and visualize the progress of their activities through the lifetime of the project.

The utilization of 4D-BIM technology can result in improved control over conflict detection or over the complexity of changes occurring during the course of a construction project. 4D BIM provides methods for managing and visualizing site status information, change impacts as well as supporting communication in various situations such as informing site staff or warning about risks.

Benefits

Integrating BIM with 4D CAD simulation models bring benefits to participants in terms of planning optimization.

Builders and manufacturers can optimize their construction activities and team coordination.

List of Software for 4D Modelling

1. Synchro Professional Software
2. Navisworks
3. Vico Control Software
4. Navigator 5

ESTIMATING

5D-BIM (fifth-dimensional building information modelling) is used for budget

tracking and cost analysis related activities. The fifth dimension of BIM associated with 3D and 4D (Time) allows participants to visualize the progress of their activities and related costs over time.

The utilization of 5D-BIM technology can result in a greater accuracy and predictability of project's estimates, scope changes and materials, equipment or manpower changes. 5D BIM provides methods for extracting and analysing costs, evaluating scenarios and changes impacts.

Benefits

Integrating BIM with 5D CAD simulation models enables the development of more efficient, cost-effective and sustainable constructions.

List of Software for 5D Modelling

1. Autodesk Navisworks
2. Solibri Model Checker
3. Vico Office Suite
4. Vela Field BIM
5. Bentley ConstrucSim

SUSTAINABILITY

6D-BIM (sixth-dimensional building information modelling) helps perform energy consumption analyses.

The utilization of 6D-BIM technology can result in more complete and accurate energy estimates earlier in the design process. It also allows for measurement and verification during building occupation, and improved processes for gathering lessons learned in high performance facilities.

Benefits

Integrating BIM with 6D CAD simulation models leads to an overall reduction in energy consumption.

List of Software for 6D Modelling

1. Autodesk Ecotect Analysis
2. Autodesk Green Building Studio
3. Graphisoft EcoDesigner
4. IES Solutions Virtual Environment VE-Pro
5. Bentley Tas Simulator
6. Bentley Hevacomp
7. DesignBuilder

MANAGEMENT

7D-BIM (seventh-dimensional building information modelling) is used by managers in the operation and maintenance of the facility throughout its life cycle. The seventh dimension of BIM allows participants to extract and track relevant asset data such as component status, specifications, maintenance/operation manuals, warranty data etc.

The utilization of 7D-BIM technology can result in easier and quicker parts replacements, optimized compliance and a streamlined asset life cycle management over time. 7D BIM provides processes for managing subcontractor/supplier data and facility component through the entire facility life cycle.

Benefits

Integrating BIM with 7D CAD simulation models optimizes asset management from design to demolition.

IM 3D, 4D, 5D, 6D AND 7D

List of Software for 7D Modelling

1. Bentley Facilities
2. FM:Systems FM:Interact
3. Vintocon ArchiFM (For ArchiCAD)
4. Onuma System
5. EcoDomus

How does each dimension of BIM improve the construction supply chain management?

3D BIM– 3D Modelling

3D Modelling is able to provide scenario visualization for all types of buildings. In this case, it enables engineer to see potential issues in design that would have been impossible to catch prior to construction. Besides, lesser time would be used to fix drainage and utility conflicts during construction. It also brings benefits to the contractor as it is a model utilized in tandem with the latest automated machine controlled equipment. There would be fewer issues during construction because every inch and detail of the model can be designed and improvised. Furthermore, this could increase the efficiency of architects. Architecture design, drafting and modeling processes can be accomplished with substantial improvements in precision and efficiency. Architectural designers can now rapidly sketch out rough layouts of a floor plan, or make changes to the standard set of building designs and instantly let their customers preview their future homes. With the advancement of 3D Modelling, improved coordination is allowed among architects, engineers and contractor.

4D BIM– 4D Scheduling

4D model is a further development over 3D model. It challenges and changes many of the practices of traditional scheduling. 4D model enables the scheduler to view the entire construction site in a nutshell easily. The scheduler can zoom in and out, look inside and under the building to verify the progress of project. This will help the scheduler to detect inconsistency and avoid visual incongruities in the representation. Besides, 4D model provides

better Integration and cost estimation of the project. By integrating human resources, equipment and material resources with the BIM model, 4D scheduling helps to better schedule and cost estimate of the construction project. 4D BIM also monitors procurement status of project materials. Furthermore, it improves time management. Integrated with BIM modeling, 4D scheduling helps the owner and the project team to easily visualize time constraints and opportunities of improvement and investment in the project. It also maximizes the use of critical resources. 4D model allows the project team to evaluate various alternatives resources and work scopes over time to better optimize the resources and labor available accordingly.

5D BIM - Cost

5D-BIM allows users to visualize the progress of their activities and related costs over time. It provides greater accuracy and predictability of project's estimates, scope changes, and materials, equipment and manpower change. With BIM, the model includes information that allows contractors and construction managers to generate an array of essential estimating information accurately and rapidly, such as materials quantities and costs, size and area estimates, and productivity projections. When changes are made, estimating information will adjust automatically which allowing greater contractor productivity. Hence, 5D-BIM lower the cost amidst of supply chain.

6D BIM- Sustainability

The use of 6D-BIM technology can produce more accurate and complete energy estimates in the earlier part of design process. Model is created by the designers or architects is then updated throughout the construction phase and it will have the capacity to become an 'as built' model, which also can be turned over to the owner. In addition, it can record data and give feedback which relevant to the operation phase of the building and optimise its cost efficiency. It enables the owner to evaluate the cost-effectiveness of any proposed upgrades.

7D BIM- Facility Management

7D- BIM used by managers in the operation and maintenance of the facility throughout its life cycle. It provides processes for managing subcontractor or supplier data and facility component. It develops an expert visualization for all

the parties to plan their roles and duties from design to demolition. Not only that, 7D-Bim provides predictable planning and actions plan for uncertain “in case” incidents. Lastly, it provides proper management of facilities and assets for the clients

Disadvantages of BIM

Cost involved in each dimension of BIM

- Kenneth

Identify And Discuss The Disadvantages Of BIM

1.) Incompatible with partners

BIM is not yet widely used among all construction professionals all over the world. This caused a high chance that one of your partners or subcontractors may not be able to use the drawing created by BIM due to lack of knowledge. Thus, it may cause some conflict or difficulty between parties.

2.) Costs of the Software

BIM software requires substantial investment in new technology. The price of BIM is very expensive as for those smaller construction companies may have difficulty buying it as they need to come out with extra money to purchase it. Without this software, it will cause the particular company to be less updated as compared to those who already had it.

3.) Lack of Experts

Due to the software is still considered relatively new in the market, which means that there are also limited number of working experts in the field. Furthermore, people tend to avoid using it because of the unfamiliarity due to lack of knowledge. BIM is more of a philosophy and not just a piece of software. Many people don't understand this. Construction is often slow to understand and embrace change.

4.) Software Training is Required

The use of BIM software requires significant training as with any software program there are costs associated with the software such as purchasing, licensing and training. For example, some construction companies will constantly send their employees to attend the BIM training program so that they are able to keep themselves up to date to the latest software that are used in the industry.

5.) Work More Upfront

BIM software requires more effort at the outset of the project as compared with the traditional method. Every time when the BIM software is used, it is

insufficient for the contractor to submit the plan on it own and then begin with the construction because they have to sit down with the team such as architect, engineer, designer and etc or other prime contractor to create a collaborative model in order to begin the construction.

6.) Disruptive

Although any particular changes and be made using the BIM software, BIM software can also be very disruptive as it can disrupt the general procurement and construction process when ordering item that required a long lead time. For example, a contractor may need to order the material needed in the construction site. For normal delivery time, it make takes several weeks to months. However, if there is any changes in the construction sites or dimension of the particular object, it may occur when multiple contractors are inputting information into a model on a continual basis, the contractor may be left with insufficient time to order the material.

7.) Design Errors

There is a line between responsibilities since each party has participated on planning stages, revisions and input to the BIM models. In some situation, some legal issues could become triggered by claims due to faulty design or misrepresentation. This types of error could causes additional legal fees that were not contemplated in the original contract reducing or minimizing the saving generated by the BIM process.

8.) Lack Of Operability

There is no smooth exchange of information across all BIM discipline involved. The fragmented construction industry caused the vendors often run software in proprietary type of format that restrict the exchange of critical building data between multiple organizations especially when it comes to cost information.

Conclusion

Recommendation to the QS Consultant

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