BIM GUIDE



READINESS







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WHY BIM should be implemented in Malaysia?

Booklet 2 aims to equip readers with the knowledge on the fundamentals of Building Information Modelling (BIM).

This booklet will explain the fundamentals of BIM, types of BIM tools and Level of detail (Lod) that involves in the BIM process.

With strong understanding of BIM fundamentals, readers will be aware of the benefits and know **WHY** they should adopt BIM in their project/organisation.

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THE FUNDAMENTALS

Building Information Modelling (BIM) is a methodology of process in the construction practice. It involves process of creating the digital model during the design stage, develop progressively/update during construction stage and used throughout the operation as well as maintenance stage.

The process of developing a digital model requires collaboration among all players. This will ultimately improve productivity and efficiency of the construction process. As early as the design stage, BIM facilitates in producing reliable and enriched data that will be used throughout the construction life cycle. This results in enhanced project productivity and efficiency throughout the project lifecycle. Most importantly, this could minimise the operational, management and maintenance cost of a building/project.



MAKING A MOVE FROM CONVENTIONAL PROCESS TO BIM-BASED PROCESS

Construction drawings using conventional process (2D-based design practice) are created from 2D graphic elements (represented by lines, hatches and texts). It involves management of multiple files in an unstructured and fragmented manner. As result, the coordination of documentation and design changes need to be done manually.

In contrast, BIM allows files to be managed systematically. By implementing BIM, the designer can create a 3D model with integrated building information that virtually models the design and component of a building in a similar way as they are built. Throughout the process, any changes are automatically followed up and updated. This promotes better communication, improves data management, strengthens collaboration and enhances project process and performance.





2D Drawing Drafting done on paper in forms of blueprints.	2D CAD Design drawn on the computer.	3D CAD 3D Model for visualisation purposes.	3D with integrated building information.	4D (Incorporated time)	5D (Incorporated cost)	nD

2D CAD/3D Model

BIM-based process

COMMUNICATION, COLLABORATION AND COORDINATION OF BIM BASED PROCESS

Traditionally, every construction process involves a complex network of construction players. Within this complex network, exchange of information processes are fragmented and not coordinated in a systematic manner. This leads to various issues of inefficiency, inconsistency and redundant documents. This could lead to increased construction cost, delay and disputes.



Conventional Construction Process



Adoption of BIM can facilitate in streamlining collaboration among clients, consultants, contractors and all stakeholders. BIM enables the construction players to move from disconnected communication process to a systematic communication, collaboration and coordination process.



STAGES AND PROGRESSION OF BIM MODEL

As BIM progresses through project life cycle, the BIM Model evolves in the following sequences:



The concept stage BIM model (also called the massing model) - i.e : Surface and shape of building



The preliminary stage BIM model - i.e: Space planning

The detail design stage BIM model - i.e: Comprehensive design for tender

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The construction-stage BIM model (also called the construction model); - i.e. Comprehensive design for construction



Detail information and model to support the construction - i.e: Comprehensive data and model of project

The facility management stage BIM model (also referred to as the operation and mantainance model) - i.e: Comprehensive data and model to support the asset and facility management

LEVEL OF DETAIL

Level of detail (Lod) is the degree of information detail (geometrical and non-geometrical) throughout the project life cycle. Progression of each Lod carries detailed specifications accordingly. A simple example can be illustrated in the diagram below.

Family				_			
Stage		Concept	Preliminary	Detailed	Construction	As-Built	Operation
LOD		100	200	300	400	500	600
	Width	-	900mm	900mm	900mm	900mm	900mm
Dimension	Height	-	1800mm	1800mm	1800mm	1800mm	1800mm
	Thickness	-	50mm	50mm	50mm	50mm	50mm
Material		-	-	Wood	Wood	Wood	Wood
Finishing		-	-	Painting	Painting	Painting	Vanish
ldentity data	Manufacturer	-	-	-	XY Sdn.Bhd	XY Sdn.Bhd	WZ Sdn.Bhd
	Model	-	-	-	XD 001	XD 001	F 005
	Fire rated	-	-	2 Hours	2 Hours	2 Hours	2 Hours
	Cost	-	-	-	RM200	RM200	RM250
	Installation date	-	-	-	12.08.16	12.08.16	02.03.16

BIM TOOLS

BIM process involves creating, managing, analysing and using digital information throughout the project lifecycle. Meanwhile, the designer and users need to use BIM software as a platform to generate and exchange information.

BIM process involves creating, managing, analysing and using digital information throughout the project lifecycle. Meanwhile, the designer and users may use BIM software as a platform to generate and exchange information.

There are two main categories of BIM software used in the modelling process. There are :

i. Primary Tools (Design authoring software)

BIM authoring tools provide a common platform for designers to create and manage the digital modelling of a BIM Model (i.e. Architectural, Structural, MEP, Civil, contractors and others).

ii. Supporting Tools (Visualization, Analysis, Coordination, Estimation and Simulation software)

Supporting Tools are additional tools required by certain stakeholders based on the specific purpose and objective (i.e Visualization, Analysis, Coordination, Estimation and Simulation). These may include:

i. Sustainability Analysis	To assess the sustainability performance of a design.
ii. Engineering Analysis	To determine the most effective engineering design (i.e. energy, structural analysis, acoustic and lighting) during the construction project lifecycle.
iii. Cost Estimating	To generate accurate quantity take-offs, cost estimates and cost information throughout the project lifecycle.
iv. Construction Planning	To establish the scheduling, planning and constructability of a construction project.
v. 3D Printing and Machining	To create concept physical models or prototypes during the manufacturing phase.
vi. Facility Management	To create and manage the information during facility management processes.
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FACTORS TO BE CONSIDERED WHEN CHOOSING SUITABLE BIM TOOLS

The organisation/project should use BIM tools to support the BIM process. There are various types of BIM software in the market. It is crucial to choose the right BIM software according to their requirements.

These are factors to consider before acquiring BIM tools:

- **BIM requirement** In order to decide the right BIM tools, the users must determine the specific BIM requirements and outcomes they wish to achieve from their BIM implementation.
- Initial cost of BIM tools Users have to determine their financial capabilities prior to investing in BIM tools. Range of BIM tools are available in the market from free to high end software. The Return of investment (ROI) for BIM software cannot be quantified on monetary basis alone. It also involves intangible values such as producing reliable information, reducing time to generate project documentation and increasing productivity and efficiency of construction process.
 - **Hardware capability** Each software has specific hardware requirements. Users must decide whether to use existing hardware, upgrade or buy new hardware to compliment the software and BIM process requirement.

Resources to use BIM tools- Prior to acquiring a BIM tool, an organisation/project must assess the available manpower/resources capabilities. Some of BIM tools involves steep learning curve. Therefore, the organisation/project must consider training the staff internally, on job training, specific training or recruit BIM facilitator to support the BIM process.

EXAMPLE OF BIM TOOLS Primary Tools (Design authoring softwares)

Product Name	Provider	BIM Uses	Category	Website Link
Allplan Architecture Allplan Engineering	Nemetschek	Universal BIM planning tool with extensive CAD functionality. Supports the entire planning process in engineering and design offices, as well as construction companies	Architecture	www.allplan.com www.nemetschek.com
ArchiCAD	Nemetschek Graphisoft	Focus on architecture, design, and creativity, combined with cutting-edge technology and innovation, allowing architects to design buildings.	Architecture	www.graphisoft.com www.nemetschek.com
AutoCAD AutoCAD Architecture AutoCAD Mechanical AutoCAD Electrical AutoCAD Civil 3D	Autodesk	2D and 3D computer-aided design and drafting software application used in architecture, construction, and manufacturing to assist in the preparation of blueprints and other engineering plans.	Architecture Structural MEP	www.autodesk.com
CypeCAD / CypeCAD LT Cype 3D	Суре	Analysis and design of reinforced concrete and steel structures	Structural	www.cype.com
CypeCAD MEP	Суре	Design of the envelope, distribution and services of the building	MEP	www.cype.com
Graitec Advance BIM Designers Advance CAD Advance Concrete Advance Steel	Graitec Group	Superior solution for the structural analysis and design of Reinforced Concrete, Steel and Timber structures.	Structural	www.graitec.com
Microstation	Bentley	Provides the power & versatility to precisely view, model, document, & visualize information-rich 2D & 3D designs of all types and scales for professionals in every discipline on infrastructure projects of every type.	Architecture	www.bentley.com
Revit Architecture Revit Structure Revit MEP	Autodesk	Supports BIM workflow from concept to construction. Use for modeling designs with precision, optimize performance, and collaborate more effectively. Also a 4D BIM capable with tools to plan and track various stages in the building's lifecycle, from concept to construction and later demolition.	Architecture Sructural MEP	www.autodesk.com
Renga Architecture	Ascon Group	Focused on making design comfortable, and on making all tools available in 3D.	Architecture	www.rengacad.com www.ascon.net
SketchUp Pro	Trimble	Mainly for concepting, visualization, communication, and planning. An intuitive way to design, document and communicate your ideas in 3D.	Architecture	www.trimble.com www.sketchup.com
Tekla Structures	Trimble	Models created in the software carry the accurate, reliable and detailed information needed for successful construction execution.	Structural	www.tekla.com www.trimble.com
TiffinBIM Architecture TiffinBIM Structure TiffinBIM MEP	Innovacia Sdn Bhd	A local product powered by European technology, used for the object-oriented creation of architectural plans and sections, interactive 3D previews and realistic visualisation.	Architecture Structural MEP	www.innovacia.com.my www.tiffinbim.com.my www.trn2u.com
Vectorworks Architect	Nemetschek	Offers a full range of design and documentation capabilities with a user-friendly interface	Architecture Engineering	www.vectorworks.net www.nemetschek.com

Supporting Tools

Product Name	Provider	BIM Uses	Category	Website Link
3ds Max Maya	Autodesk	The 3D software for modeling, animation, & rendering that allows you to create massive worlds in games and stunning scenes for design visualization & presentation.	Architecture Design visualization	www.autodesk.com
Allplan Allfa	Nemetschek	A browser-based CAFM software	Facilities Management	www.allplan.com www.nemetschek.com
Accubid Enterprise	Trimble	Emulate and optimize the project lifecycle from bid to completion. Use bid data to quantify changes.	Quantity Surveyors MEP	www.trimble.com www.accubid.com
Allplan BCM	Nemetschek	Simple, straightforward software solution for your construction cost planning, tenders, allocation and accounting.		www.allplan.com www.nemetschek.com
ArchiBus	ArchiBus	Simplify work, without adding technical complexity, by automating the flow of information from property design & build phases - to full asset lifecycle management of the global portfolio.	Facility and Asset Management Sustainability	www.archibus.com
Arquímedes	Суре	Tool for Project Management: bills of quantities, project certifications and specifications.	Quantity Surveyors Contractors	www.cype.com
Cadastral Mapping Software	Bentley	Take control of your data capture, management, processing, provisioning, and analytical requirements.	Structural Existing Condition Modelling	www.bentley.com
CAFM	McLaren Software	A fully integrated FM Application Suite for Safe, Efficient and Compliant Facilities.	Facility and Asset Management Sustainability	www.cafmexplorer.com
Cost X	Exactal	Taking advantage of the all-electronic estimation platform and offers interactive projects to clients and co-workers complete with detailed cost breakdowns and building revisions with live links.	5D Mode ll ing	www.exactal.com
CypeTherm Suite	Суре	Group of programs for thermal and energy analysis of buildings.	Structural Designers	www.cype.com
Ecotect Analysis (discontinued)	Autodesk	A comprehensive concept-to-detail sustainable building design tool. Ecotect Analysis offers a wide range of simulation and building energy analysis functionality that can improve performance of existing buildings and new building designs	Engineering (Energy) Analysis	www.autodesk.com
Cubicost TAS Cubicost TRB Cubicost TME Cubicost TBQ	Glodon	Cubicost provides construction industry a more efficient, precist and convenient exclusive BIM integrated solution. 3D models that contain massive engineering data can be created and high-tech cutting-edge technologies.	5D Modelling	www.glodon.com
lnsight 360 Green Building Studio	Autodesk	Provides a sensitivity analysis and combined factors for high performance building design.	Sustainability Analysis	www.autodesk.com
Innovaya	Innovaya	Automate and streamline the entire process of design and project management.	Estimators Project Coordinator and Construction Managers Owners	www.innovaya.com
LumenRT	Bentley Aeon Software	Quickly create images, videos and real-time presentations of Architecture, Landscape, Urban and Infrastructure Designs.	Visualization Presentation	www.lumenrt.com

Product name	Manufacturer	BIM Uses	Category	Website Link
Lumion	Act-3D BV	Real time animation authoring software to create a stunning walkthrough animation presentation.	Visualization Presentation	www.lumion3d.com
Navisworks	Autodesk	Enable architecture, engineering, and construction professionals to holistically review integrated models and data with stakeholders to gain better control over project outcomes.	3D Coordination 4D Modelling	www.autodesk.com
Solibri	Nemetschek	Offering 3D visualization and walk in functionality to reveal potential clashes, flaws and weaknesses. Allows you to quantify the amounts of building materials needed	Structural 3D Coordination	www.solibri.com www.nemetschek.com
StaadPro	Bentley	A 3D structural analysis and design software, with comprehensive and integrated finite element analysis and design offering, including a state-of-the-art user interface, visualization tools, and international design codes.	Structural	www.bentley.com
StruBIM Suite StruBIM Pro	Суре	Calculates structural elements: analysis, design, check and provide technical drawings for the structural project.	Structural	www.cype.com
Tekla BIMsight	Trimble	Enables the entire construction workflow to combine models, check for dashes, and share information, empowering project participants with the insight to solve issues in the design phase, before construction begins.	Structural	www.tekla.com www.trimble.com
Vico Office	Trimble	Delivers an integrated BIM workflow for construction projects. Extends the basic 3D model with constructability analysis and coordination, quantity takeoff, scheduling and production control, estimating, and layout.	4D & 5D Modelling	www.vicosoftware.com www.trimble.com

MOVING FORWARD

Adoption of BIM based process has clear outcomes in enhancing construction productivity and efficiency in Malaysia. But, the industry needs to equip the key players with knowledge of collaborative processes, information dissemination and the use of modelling technology that support BIM.

So, are we **READY** to **ADOPT** and reap the benefits of BIM in our organisation/project?

For further information, you may refer to :

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