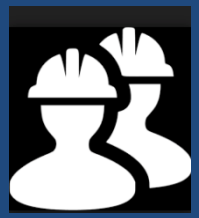
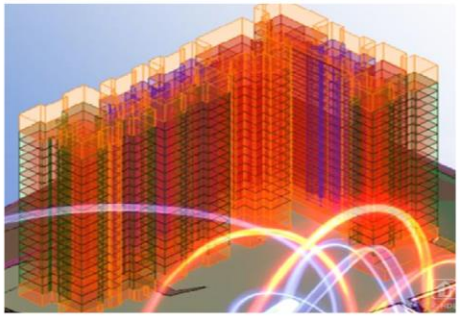
GOVERNMENT FOREIGN MANPOWER



INFORMATION SHARING PLATFORM



BIM

SINGAPORE

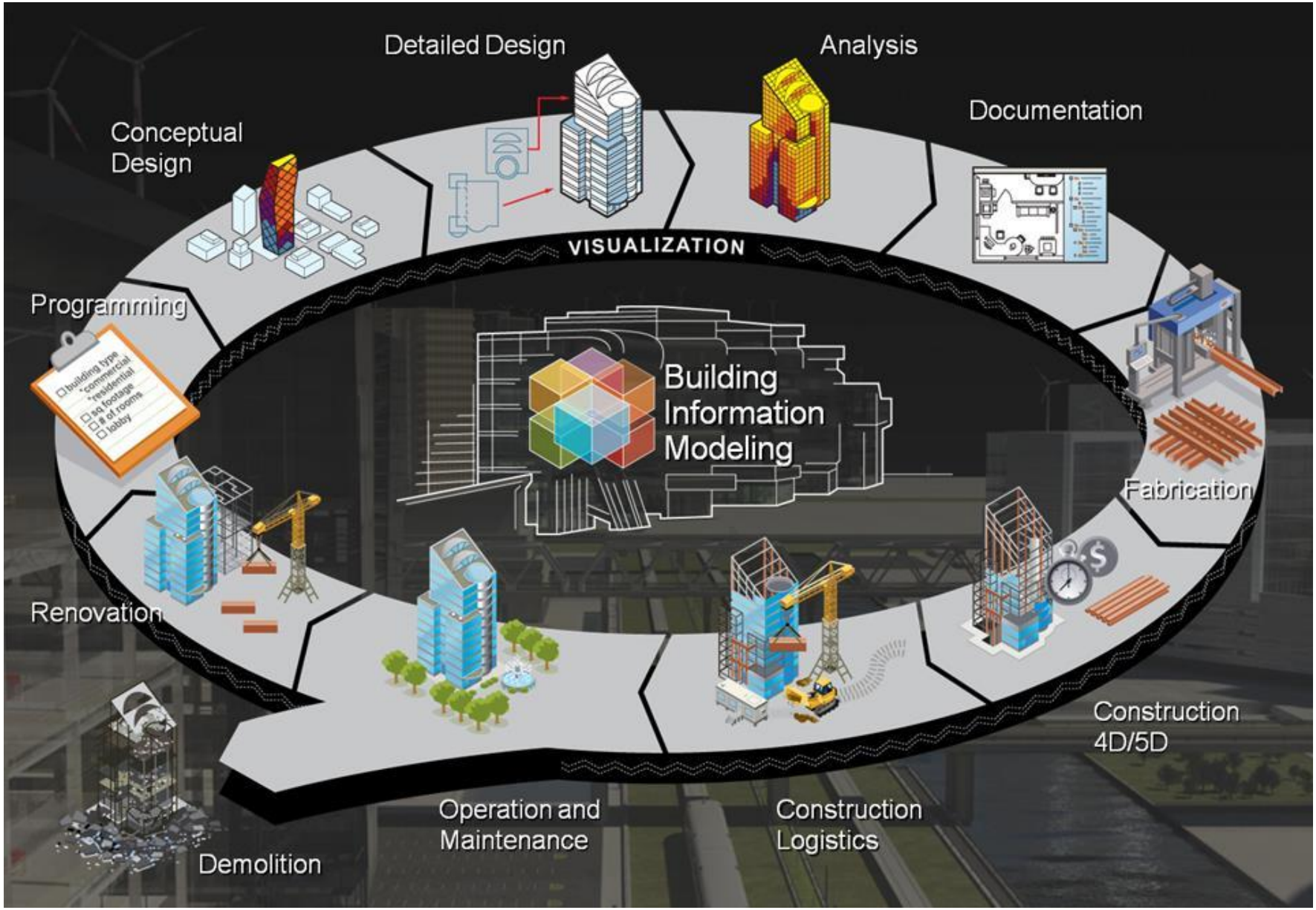
For Sustainable Urban Development

IMPROVE PRODUCTIVITY

CONSTRUCTION'S COST PLANNING

AGENDA

1. Introduction to BIM
2. What has Singapore done?
3. What about Land Surveyors' Journey in BIM?
4. Integration and Collaboration with Stakeholders
5. Other Benefits from BIM



Courtesy of Autodesk

Introduction to BIM

BIM Definition

BIM is a 3D modelling technology that allows the exploration of the building project digitally for better visualisation. It is an essential tool for professionals to improve the construction productivity and the integration across the various disciplines.

Benefits & Barriers of BIM

- ✓ Increase productivity & profit
- ✓ Improve management & quality
- ✓ Reduce clashes and errors
- ✓ Decrease reworks
- ✓ Cost & project duration reduction
- ✓ Increase collaboration
- ✓ Project control & predictability
- ✓ Visualisation

- ✗ Lack of experience
- ✗ Data Interoperability
- ✗ Collaboration between different disciplines
- ✗ Authorisation & Legislation
- ✗ Cost of software & hardware
- ✗ Culture (new technology vs “old school”)
- ✗ Awareness

Difference between 3D CAD, GIS and BIM

	CAD	GIS	BIM
Definition	Computer-Aided Drafting for automating the drafting function Features were represented by simple, graphic symbols	Geometry with Topology and underlying Relational Database Management System (RDBMS) Now loosely understood to include all Geospatial data (including vector and raster and grid formats)	3D object based parametric digital models
Scale	Site, Building  (with larger survey coverage organised through collage/key map for mapping purpose)	Site, Neighbourhood, Town, City, Region 	Building, infrastructure 
Software	Autodesk AutoCAD, Bentley Microstation	3DS Max, ESRI City Engine, Autocad Map, ArcGIS, …	Graphisoft, Autodesk Revit, Naviswork, (see below for more details on BIM tools)
Application	Mapping/Design/Manufacturing/ AM/FM/Engineering/Administrative Boundaries	Any field which requires a geospatial component	Documentation, Construction, FM, QS
Formats	Dwg, dwf, dgn	Geotiff, DEM, shapefile, …	Revit (rvt), Naviswork, Bentley Architecture, …
Open formats	dxf	City GML, …	IFC, …

What has Singapore done?

- Raise industry awareness by conducting seminars, workshops and conferences on the benefits of BIM technology
- Collaboration with Institutes of Higher Learning for BIM training
- ***2009*** Pioneering BIM use in public housing by the Housing & Development Board (HDB)
- ***2010*** BIM funds: training, consulting, hardware and collaboration software
- ***2015*** BIM e-submission for all projects greater than 5,000sqm
- BCA implement the world's first BIM e-submission

CORENET

What has Singapore done? *cont…*

Mandated BIM e-submissions for regulatory approvals

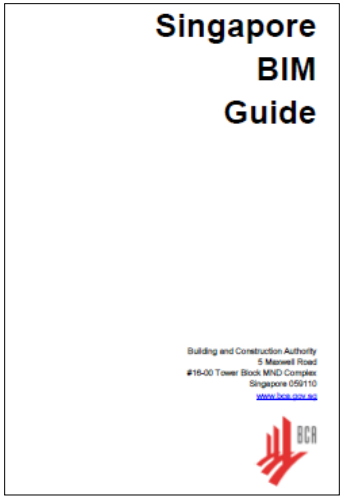
JUL 2013	Architectural BIM e-submission for GFA > 20,000 sqm.
JUL 2014	Engineering BIM e-submission for GFA > 20,000 sqm.
JUL 2015	All BIM e-submission for GFA > 5,000 sqm.
OCT 2016	Mandatory submission in Native BIM format for all BIM e-submission for GFA > 5,000 sqm: Architectural plans – second half of 2017 Engineering plans – second half of 2018

What has Singapore done? *cont…*

Building & Construction Authority (BCA)

BIM Roadmap (2010)

80% of construction industry use BIM by 2015

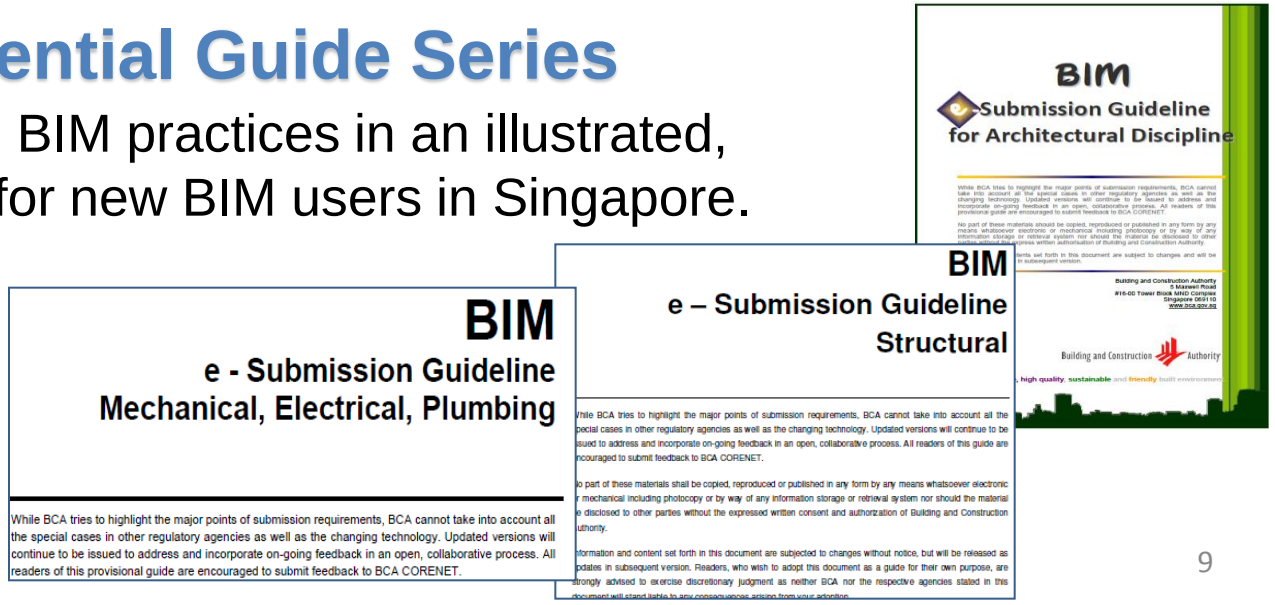


Singapore BIM Guide Version 2.0

Outline the roles and responsibilities of project members at different stages of a project

BIM Essential Guide Series

References on good BIM practices in an illustrated, easy-to-read format, for new BIM users in Singapore.



What has Singapore done? *cont…*

Collaborations in BIM Implementation Programme

HOUSING & DEVELOPMENT BOARD

Land Transport Authority

MOH HOLDINGS

NUS National University of Singapore

Ministry of Education SINGAPORE

People's Association

DSTA Defence Science & Technology Agency

National Environment Agency Safeguard · Nurture · Cherish

NANYANG TECHNOLOGICAL UNIVERSITY

SINGAPORE SPORTS COUNCIL

Building and Construction Authority

We shape a **safe**, **high quality**, **sustainable** and **friendly** built environment.

CHANGI airport singapore

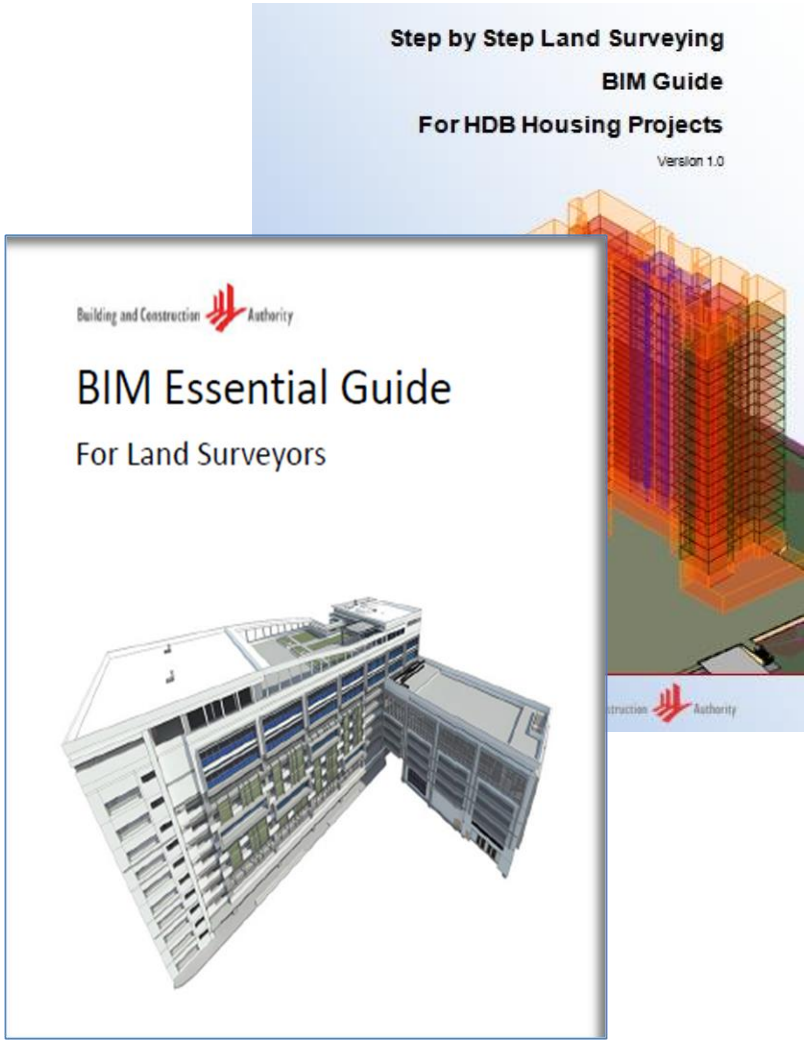
What about Land Surveyors' Journey in BIM ?

BIM Guide for Land Surveyors

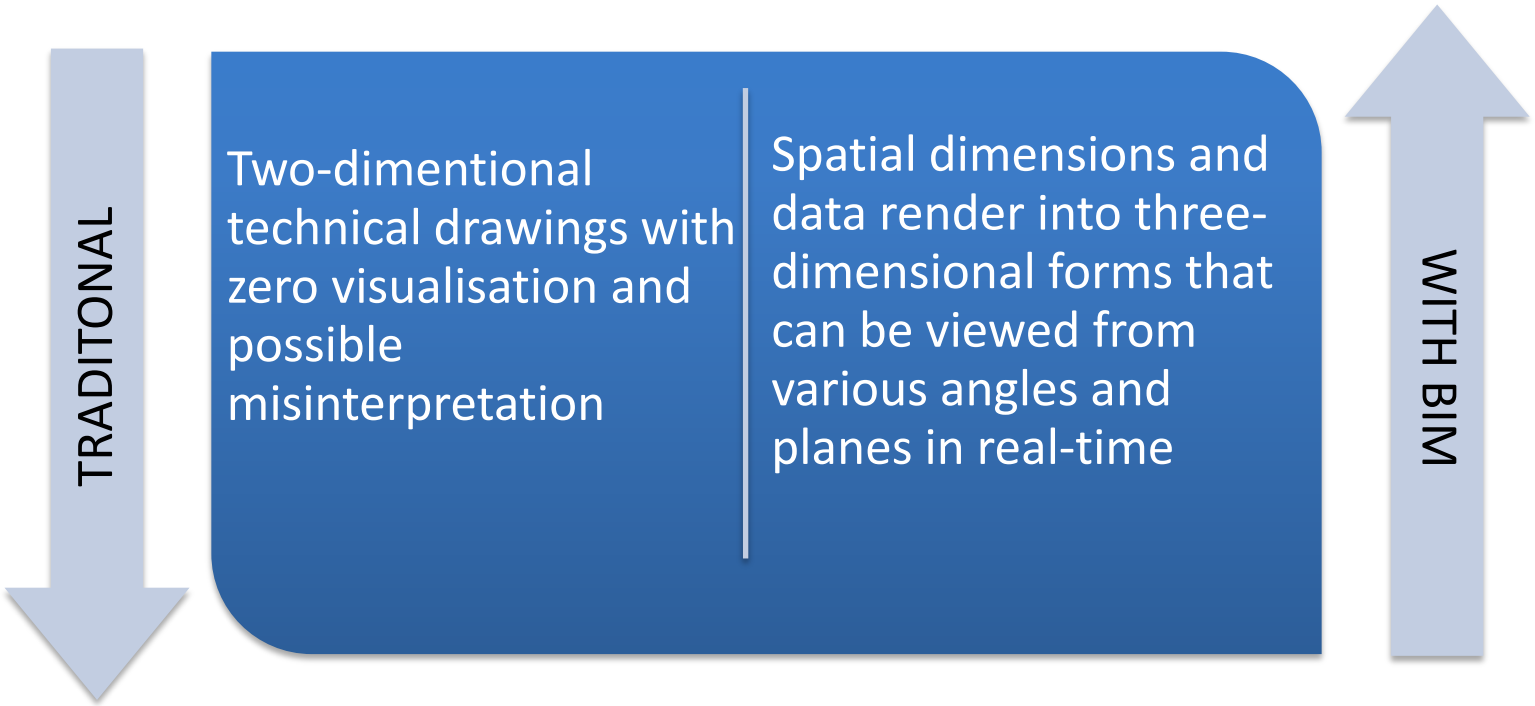
- Collaboration between **Singapore Institute of Surveyors & Valuers (SISV), Singapore Land Authority (SLA), Housing Development Board (HDB), architects and Austodesk**

- Assist surveyors in preparing BIM site model that meets the requirement of architect for their submission to authority

- Essential guide for development life cycle



Traditional & Current

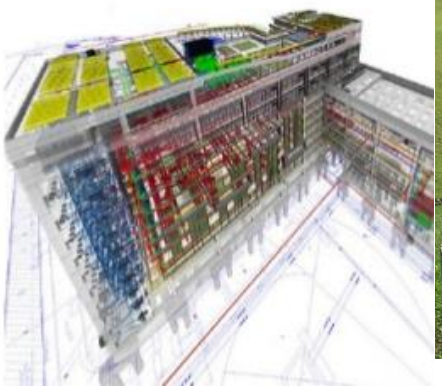


Evolution of Land Surveyor's Role

Tape or chain measures, theodolites, dumpy levels, staffs

Total station, GPS, GIS, laser scanning technology

Land survey technique + BIM technology



BIM for Land Survey

- Provide geolocation information
- Model existing site contour and location
- Surface model and condition, orientation and georeferenced

	CAD	GIS	BIM
Sample of Topography (See Enlarged images as follows)	Scale 1:500 	Scale 1: 100,000 or 50,000 (State or National) 	Data extracted from Topo plan Scale 1:500 

Integration & Collaboration with Stakeholders

Softwares

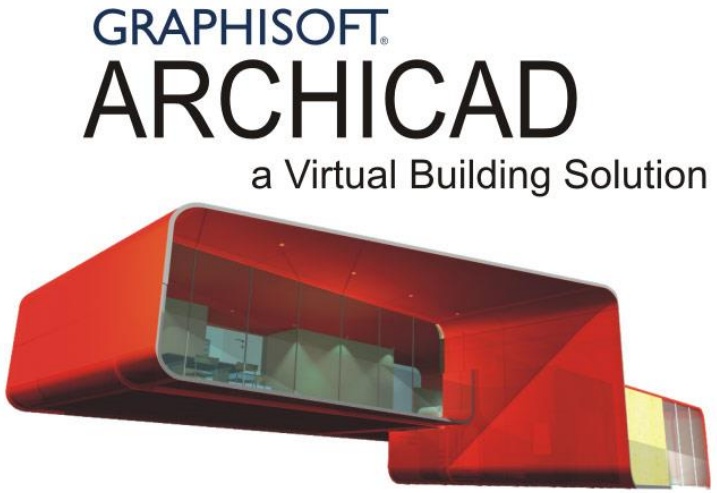
Revit (Autodesk)

- Supports a multidiscipline design process for collaborative design
- Interoperability capability (imports, exports, and links your data with commonly used formats, including IFC, DWG™ and DGN)

Softwares *cont…*

ArchiCAD (Graphisoft)

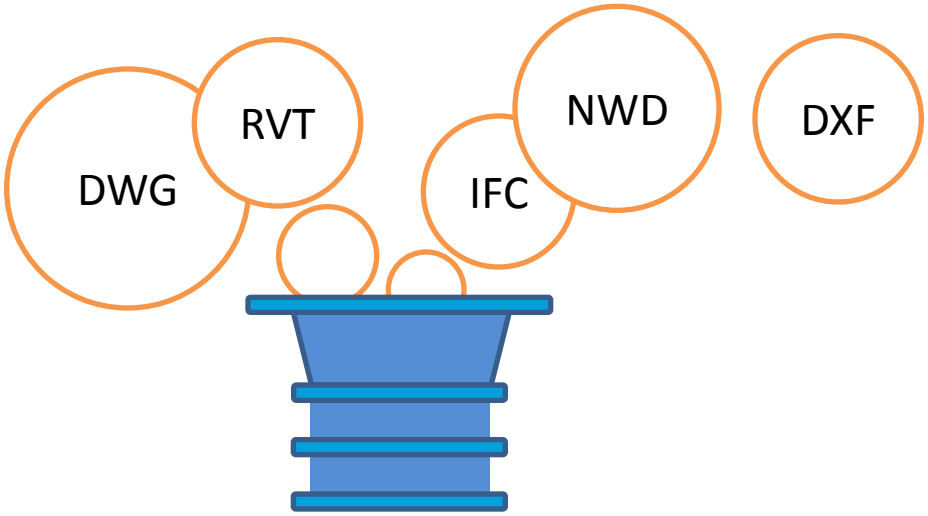
- Industry first BIM software for architects
- Offers wide array of add-on products and solution to extend the capability of its BIM tools
- Easily store and maintain design information that was not created using CAD or BIM tools, eg.Excel spreadsheets



Data Interoperability

"Technology issues include data interoperability problems, accuracy of extracted data or transferring from BIM design and simulation software (Bernstein & Pittman, 2004)"

- can be easily solved by using the most common software or IFC format.
- establishment of BIM library & standardization of BIM objects

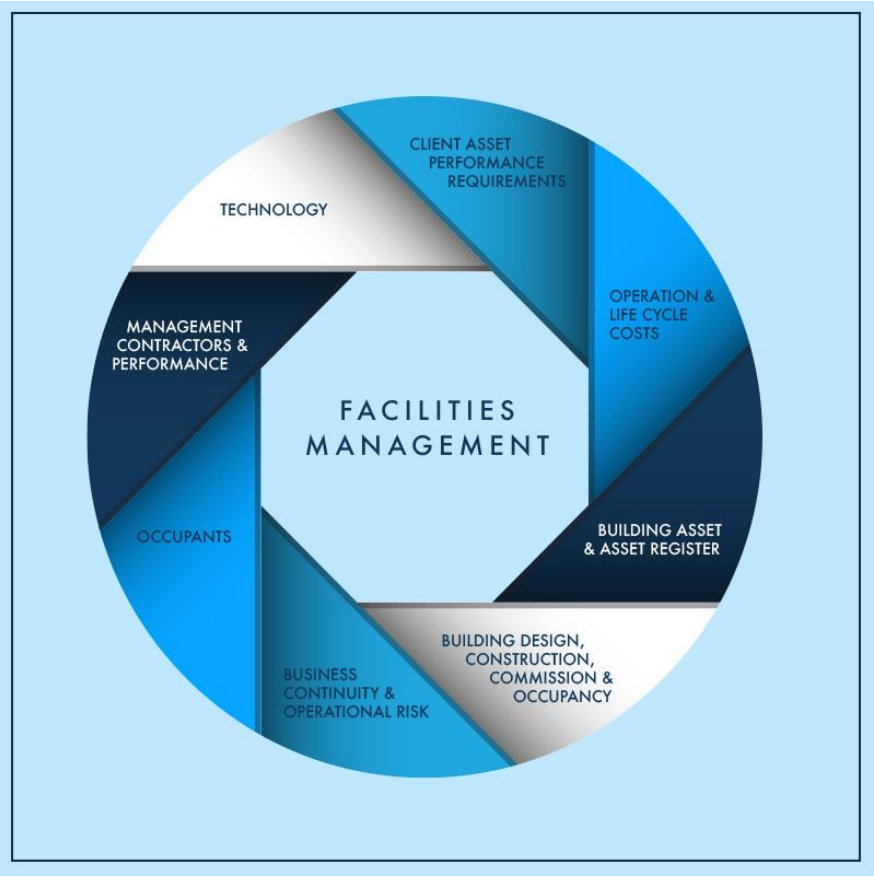


Other Disciplines Benefiting from BIM

- Facility Management
- Cost Estimation
- Sustainability Simulation

Facility Management

- Includes multiple disciplines to ensure building is fully functional
- To coordinate the demand and supply of facilities and services
- Manage operation and maintenance of buildings throughout the operational lifecycle



Courtesy of alexandermac.com

Facility Management *cont…*

Facility Manager finds value in how much the building operation benefit from enhanced data in BIM model.

- **Better Space Management**
- **Accurately Updated Maintenance System**
- **Efficient Use of Energy**
- **BIM Model Representation of Building Facilities**
- **Enhanced Lifecycle Management**

Courtesy of safety-smart.co.uk

Cost Estimation

- Estimators typically digitise the architect's paper drawings, or importing their CAD drawings into a cost estimating package, or doing manual takeoffs from their drawings.
- Using BIM, when a change is made in the design, it will automatically reflect to all related construction documentation and schedules

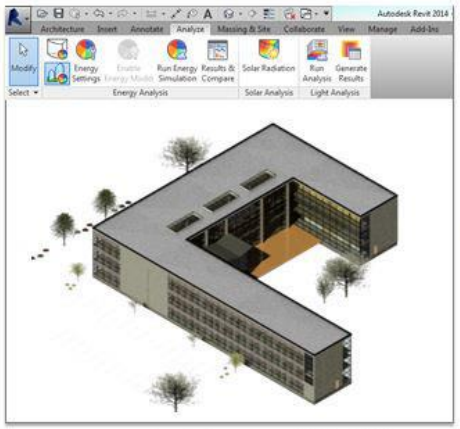
Cost Estimation *cont…*

By adopting BIM in cost estimating process...

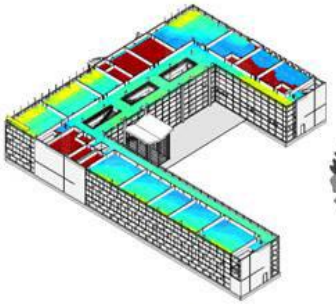
- Do not require manual calculation
- Save time
- Save cost
- Reduce the potential for human error

Sustainability Simulation

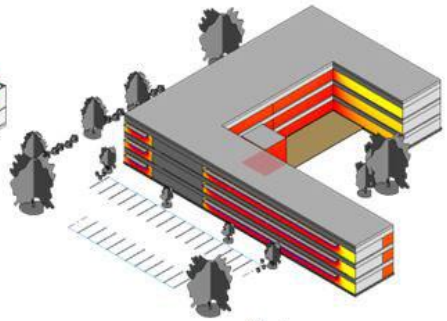
- Cost-effective technique of supporting energy efficient design and the subsequent operation and maintenance of buildings
- Foresee the potential errors in design and prevent the possibility of project failure
- Validate the performance of design enable designers to improve their designs



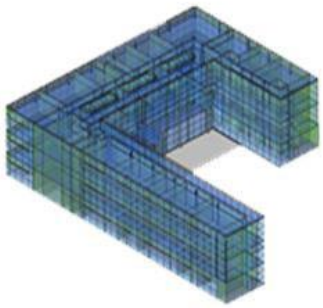
Architectural Model



Light



Solar



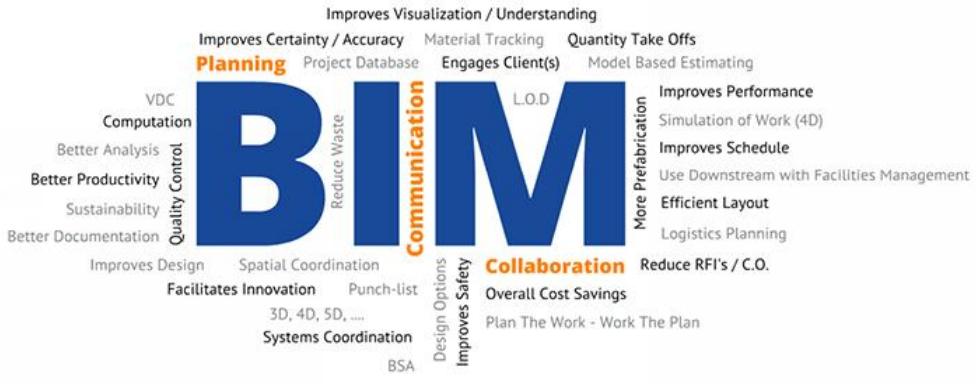
Energy

Courtesy of Autodesk

Conclusion

- Competency of professionals in BIM could be achieved by a more multidisciplinary approach
- Communication and collaboration between stakeholders make significant contribution to overall project success
- BIM requires collaboration between the public and private sector’s stakeholders

Thank You


Improves Visualization / Understanding
Improves Certainty / Accuracy
Material Tracking
Quantity Take Offs
Planning
Project Database
Engages Client(s)
Model Based Estimating
VDC
Computation
Better Analysis
Better Productivity
Sustainability
Better Documentation
Quality Control
BIM
Reduce Waste
Communication
L.O.D
Improves Performance
Simulation of Work (4D)
Improves Schedule
Use Downstream with Facilities Management
Efficient Layout
Logistics Planning
More Prefabrication
Improves Design
Spatial Coordination
Facilitates Innovation
Punch-list
3D, 4D, 5D, ...
Systems Coordination
BSA
Design Options
Improves Safety
Collaboration
Reduce RFI's / C.O.
Overall Cost Savings
Plan The Work - Work The Plan