



**FORUM8 DESIGN FESTIVAL
THE 5TH CONFERENCE – 17 NOV 2011**

*ENHANCING PRODUCTIVITY: ELECTRONIC
QUICK BILLS OF QUANTITIES VIA BIM*

BY

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SUMMARY OF PRESENTATION

- **PART 1: Why?**
 - Why use BIM?
- **PART 2: What?**
 - What had been done?
- **PART 3: Where?**
 - Where to get help?
- **PART 4: Successful Case Studies**
- **PART 5: Conclusion**

The left side of the slide features a decorative design consisting of several vertical stripes in shades of light blue and teal, and a cluster of five teal circles of varying sizes arranged in a roughly vertical line.

PART 1: WHY BIM?

TRANSFORMING PRACTICES IN THE PROJECT MANAGEMENT OF CONSTRUCTION PROJECTS

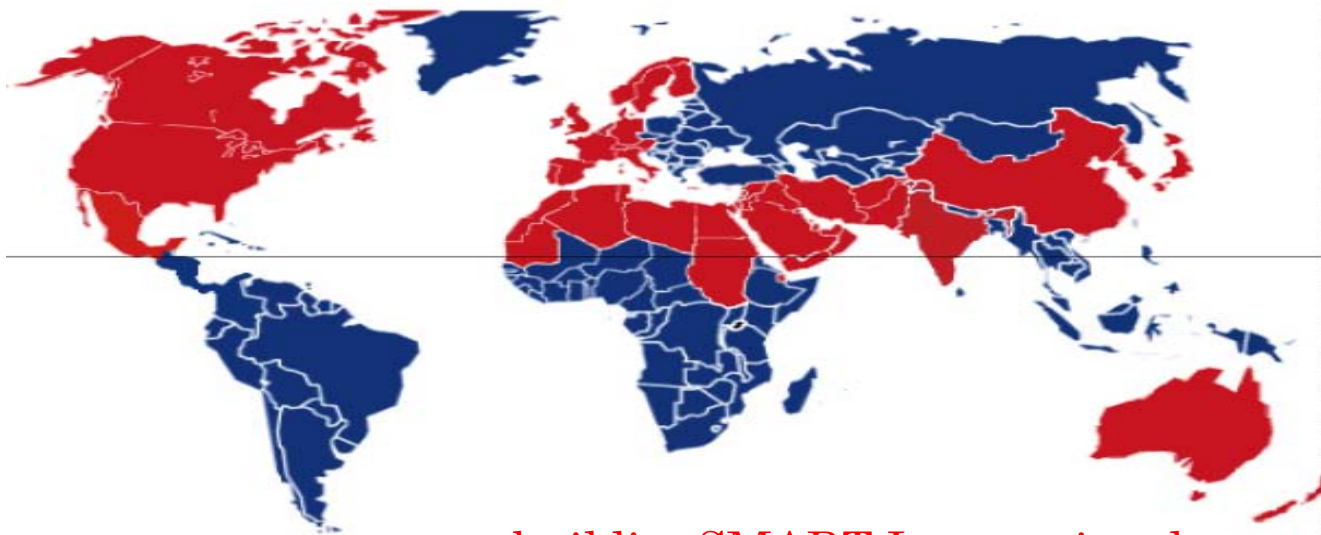
WHY BIM?

- According to Smith and Tardif (2009)
 - In order to increase in efficiency, construction industry has
 - to think of new means and methods of production to enhance productivity by converging inefficiency and waste into profit via BIM.
- My presentation is to share
 - How BIM sustains more *integrated and efficient business processes* throughout the life cycle of buildings.
 - *better quality buildings with lower costs,*
 - *shorter project turnaround times, and*
 - *a higher quality of building information to support better business.*

WHY BIM?

- bSI & bSS

.....a neutral, international/local
and unique organisation
supporting open BIM
throughout the PROJECT
life cycle.....



buildingSMART International

- Australasia
- Benelux
- buildingSMART Alliance (North America)
- China
- French speaking Alliance
- German speaking Alliance
- Iberian Alliance
- Italia
- Japan
- Korea
- Nordic
- Singapore
- United Kingdom & Ireland

WHY BIM?

PHASED MANDATORY BIM E-SUBMISSION

2013

Mandatory Architecture BIM e-Submissions for all new building projects > 20,000 m²

2014

Mandatory Engineering BIM e-Submissions for all new building projects > 20,000 m²

2015

Mandatory Architecture & Engineering BIM e-Submissions for all new building projects > 5,000 m²

WHY BIM?

PM/BUILDER OF TOMORROW: ARE YOU E-READY?

○ Revolution of Drawings

- Manual
- Computerized
 - 2D
 - 3D
 - 4D
 - 5D

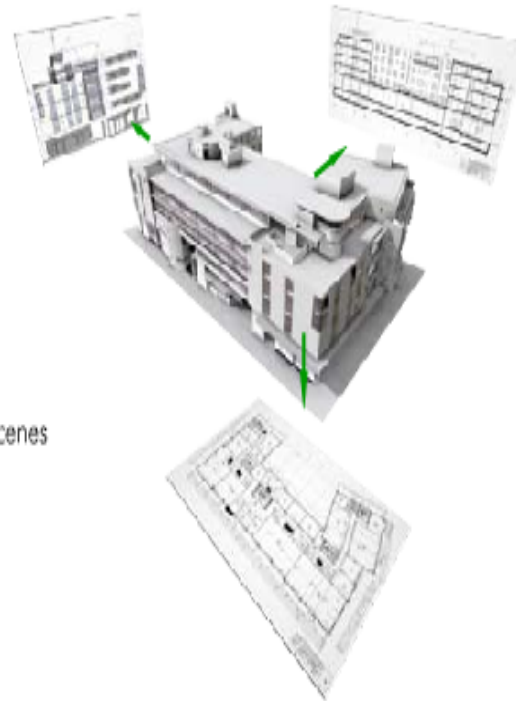
○ do the e-ways using BIM

- e-cost planning
- e-cost control
- e-taking off
- e-BQ
- e-tendering
- e-procurement
- e-collaboration
- e-facilities management

TRENDS

So at any time you can derive:

- complete plans
- sections
- elevations
- architectural and construction details
- bills of material
- window, door, and finish schedules
- renderings and animations
- and Virtual Reality scenes



This integrated database

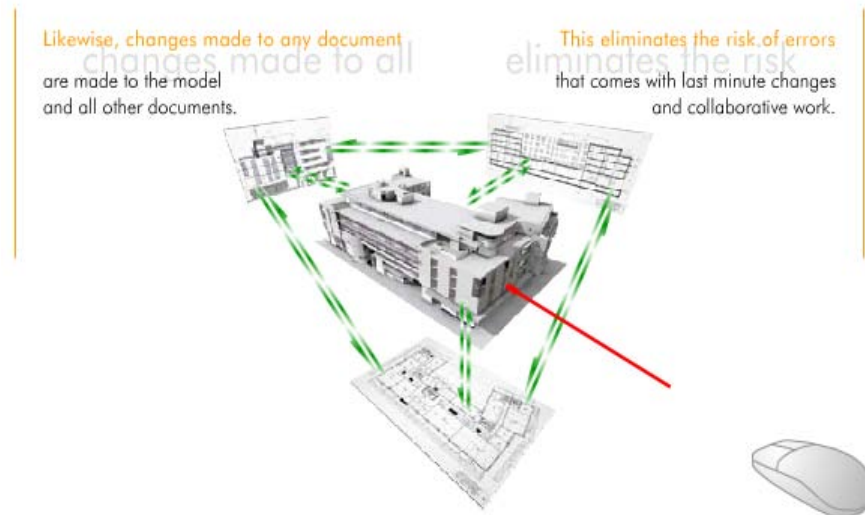
also means that if you modify or add data to the 3D model, changes are automatically reflected in all documents.



WHY BIM?

WHAT BIM CAN DO FOR DEVELOPERS' AGENTS?

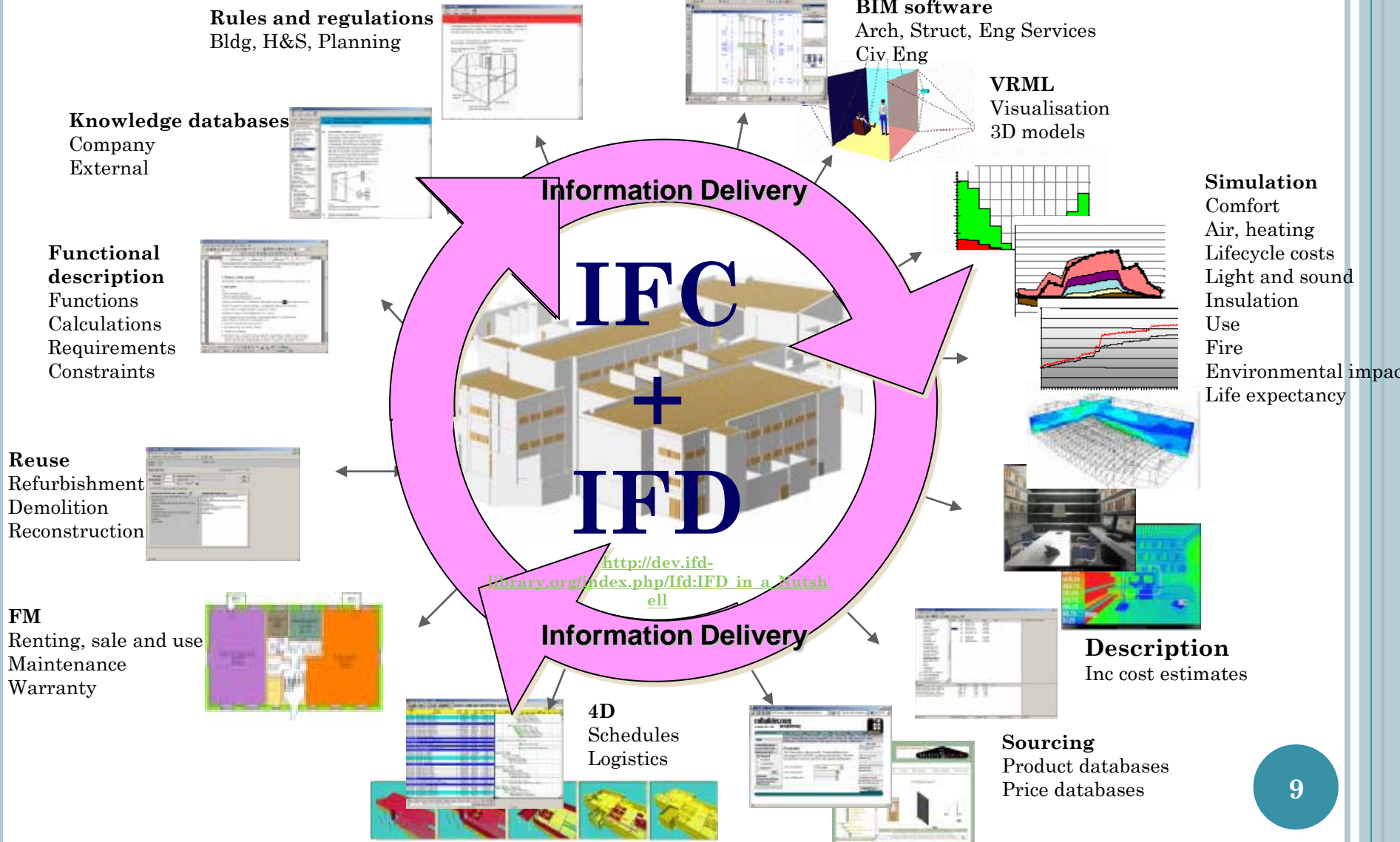
- Using BIM
 - Ensure **resources** are utilized to the best advantage
 - **Provide cost consultancy service** to Client
 - **Describe work** (BQ...)
 - Predict, analyze, plan, value, **manage & control cost**
 - Ascertain **maintenance costs**
- **Impact of BIM**
 - **Increase productivity**
 - reduction in time
 - **speed** in execution of tasks
 - Improvement in **communications**
 - Enhancement of **quality of service for customers/homeowners/etc**



• **Reduce Risk** through **Improved Coordination**

WHY BIM?

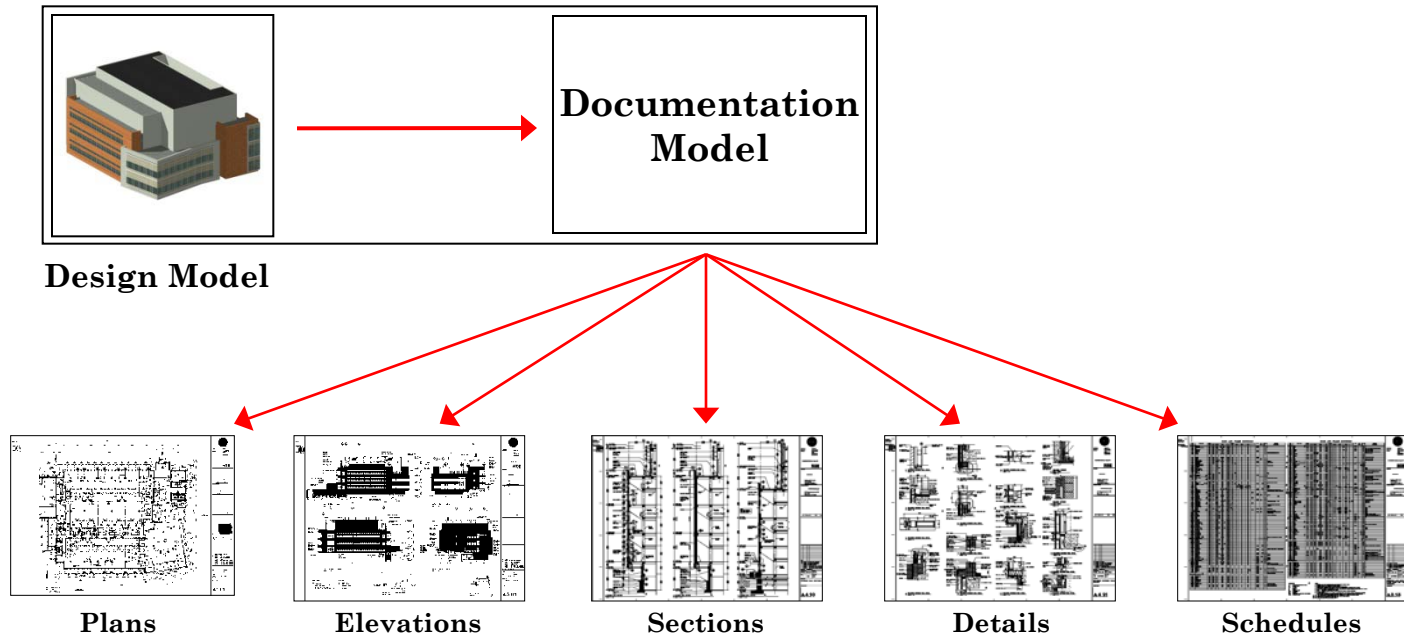
INFORMATION DELIVERY FOR SEAMLESS INTEGRATION



International Framework for Dictionaries

Source: Janne Aas-Jakobsen modified. Pictures from: Selvaagbygg, DDS, Byggforsk, NBLN University of California, CIFE Stanford, Pythagoras and Oluf Granlund Yo.

Why BIM? Automating Documentation



- Dimensioning is both **automatic** and **associative**.
- Intelligent objects are **scale-sensitive**.
- Detailing is faster due to **intelligent objects** and **enhanced drafting** features.
- Zone tool will **manage and track** area calculations, room finishes or furniture schedules.
- Intelligent layouts **reduce errors and redlining** through linked drawing info such as linking of sheet/drawing numbers to section and detail symbols.

The left side of the slide features a decorative design consisting of several vertical stripes in shades of light blue and teal, and a cluster of five teal circles of varying sizes arranged in a roughly vertical line.

PART 2: WHAT?

*TRANSFORMING PRACTICES IN THE
PROJECT MANAGEMENT OF
CONSTRUCTION PROJECTS*

WHAT HAS BEEN DONE TO ENCOURAGE USE OF BIM?

- buildingSMART Singapore Chapter's effort



- NUS's effort
 - Introducing BIM in our curriculum
 - Encouraging students to participate in BIM competitions
 - R&D in BIM

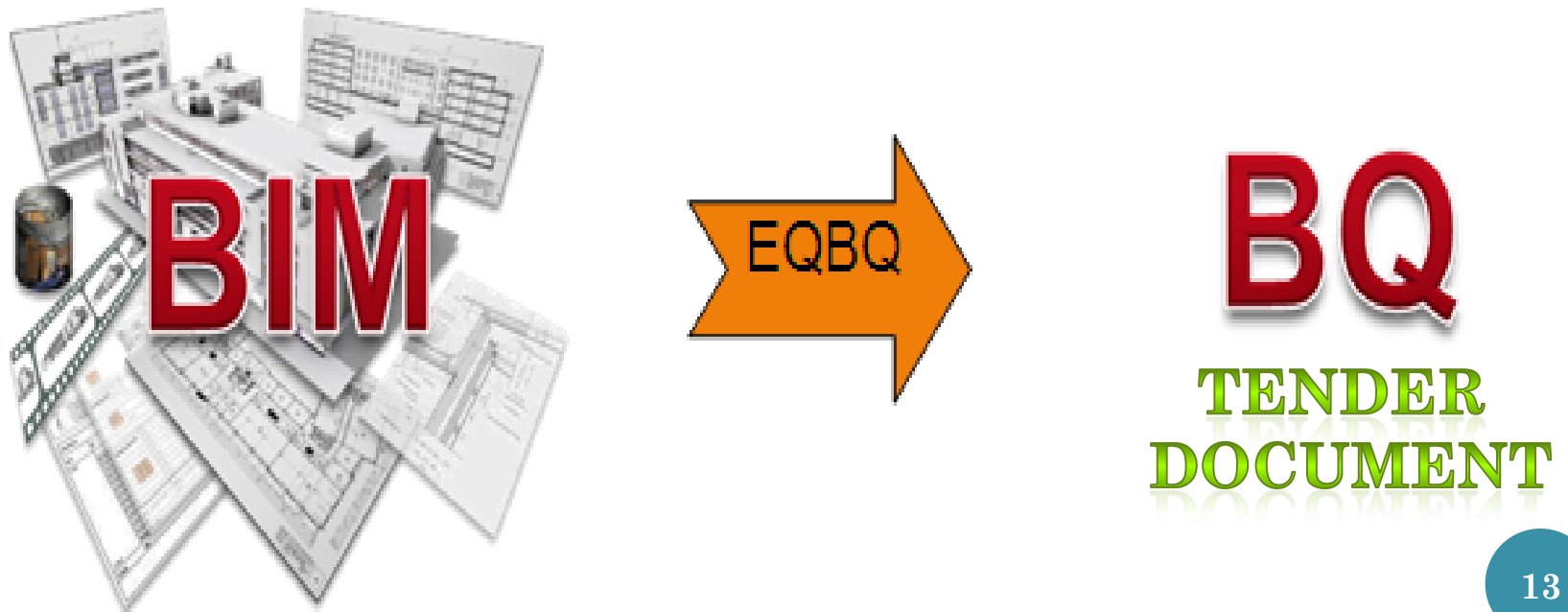
WHAT HAS BEEN DONE TO ENCOURAGE USE OF BIM?

R&D - PRODUCE BQ DIRECTLY FROM BIM

- e-Quick-BQ (EQBQ)

Figure 2: BIM QTO Process, producing Bills of Quantities directly from BIM

Produce BQ directly from BIM



WHAT HAS BEEN DONE TO ENCOURAGE USE OF BIM?

R&D - USING BIM BASED QTO: EQBQ TO IMPROVE PRODUCTIVITY

- eQbq system can **produce BQ accurately & automatically**
- **Re-measurement** is **fast** as the **changes** are **done in BIM** & quantities of BQs will be automatically changed
- As eQbq system can be **used for further processing throughout building life cycle** by **different stakeholders** of construction industry
- eQbq system (BIM QTO Tool) has many **features** – it can prepare
 - **progress payments,**
 - **variation orders claims,**
 - **final accounts,**
 - **sub-contractors' claims;**
 - **used for tendering stage, construction stage, facilities management stage**
- **Elimination of manual taking-off of quantities** thus
 - **saving** in manpower cost;
 - **quantities are more accurate** compared to manual taking-off since all quantities are directly extracted from BIM

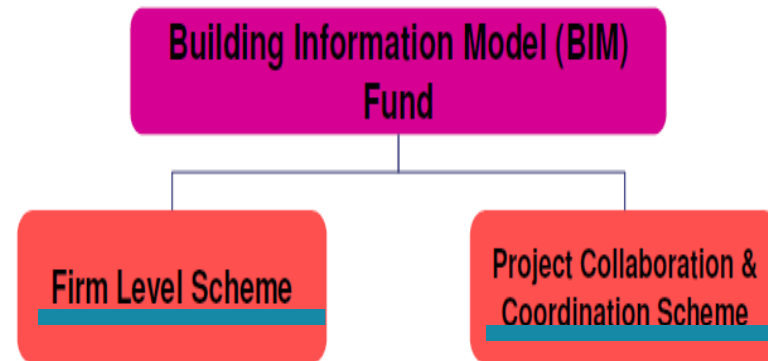
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PART 3: WHERE?

*TRANSFORMING PRACTICES IN THE
PROJECT MANAGEMENT OF
CONSTRUCTION PROJECTS*

WHERE? TECHNOLOGY ADOPTION: BUILDING INFORMATION MODEL (BIM) FUND

- Aims to help firms to adopt BIM technology
 - into their work processes
 - to **improve** their **productivity**
- Helps to defray part of the cost incurred in
 - training,
 - consultancy,
 - software or hardware



Help defray cost of software, hardware, training & consultancy
(50% subsidy)

For more info – go to www.bca.gov.sg



PART 4: SUCCESSFUL CASES
*TRANSFORMING PRACTICES IN THE
PROJECT MANAGEMENT OF
CONSTRUCTION PROJECTS*

- ✓ UC-win/Road
- ✓ Architecture System
- ✓ M&E System



Creation of Pioneer Road
in virtual reality
using
UC-win/Road



Rich graphics &
realistic
representation
allow for
better
understanding of
projects & an
effective
platform for
discussion.



Creation of
Tuas West Drive
in virtual reality
using
UC-win/Road



Use of
geographical
coordinates
ensures accuracy.
True-to-life
representation and
real-time
simulation.



Creation of Tuas West Road in virtual reality using **UC-win/Road**



Easy creation of roads in 3D virtual space. Rich texture libraries allow for quick data generation.

SUCCESSFUL CASE STUDIES USING BIM FOR ENHANCED EFFICIENCY TO MANAGE PROJECT



CHALLENGES & BIM TECHNOLOGY

Challenges

Labour cost increases and short duration given

Low Work Efficiency

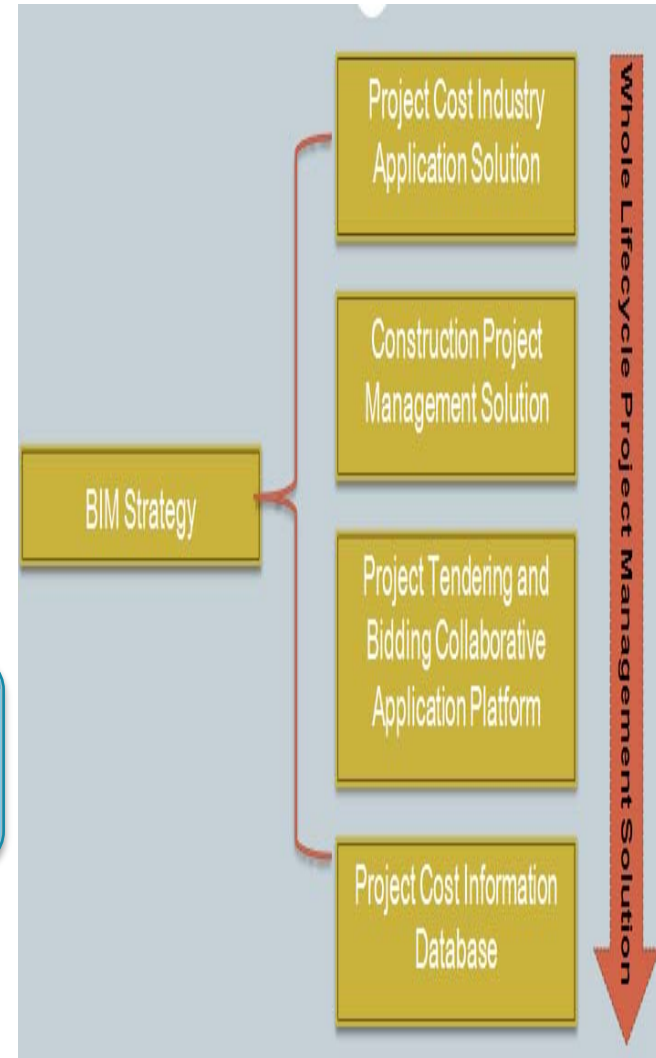
Work fall below the expectations – as human cannot cope thus affecting accuracy and efficiency

Solution

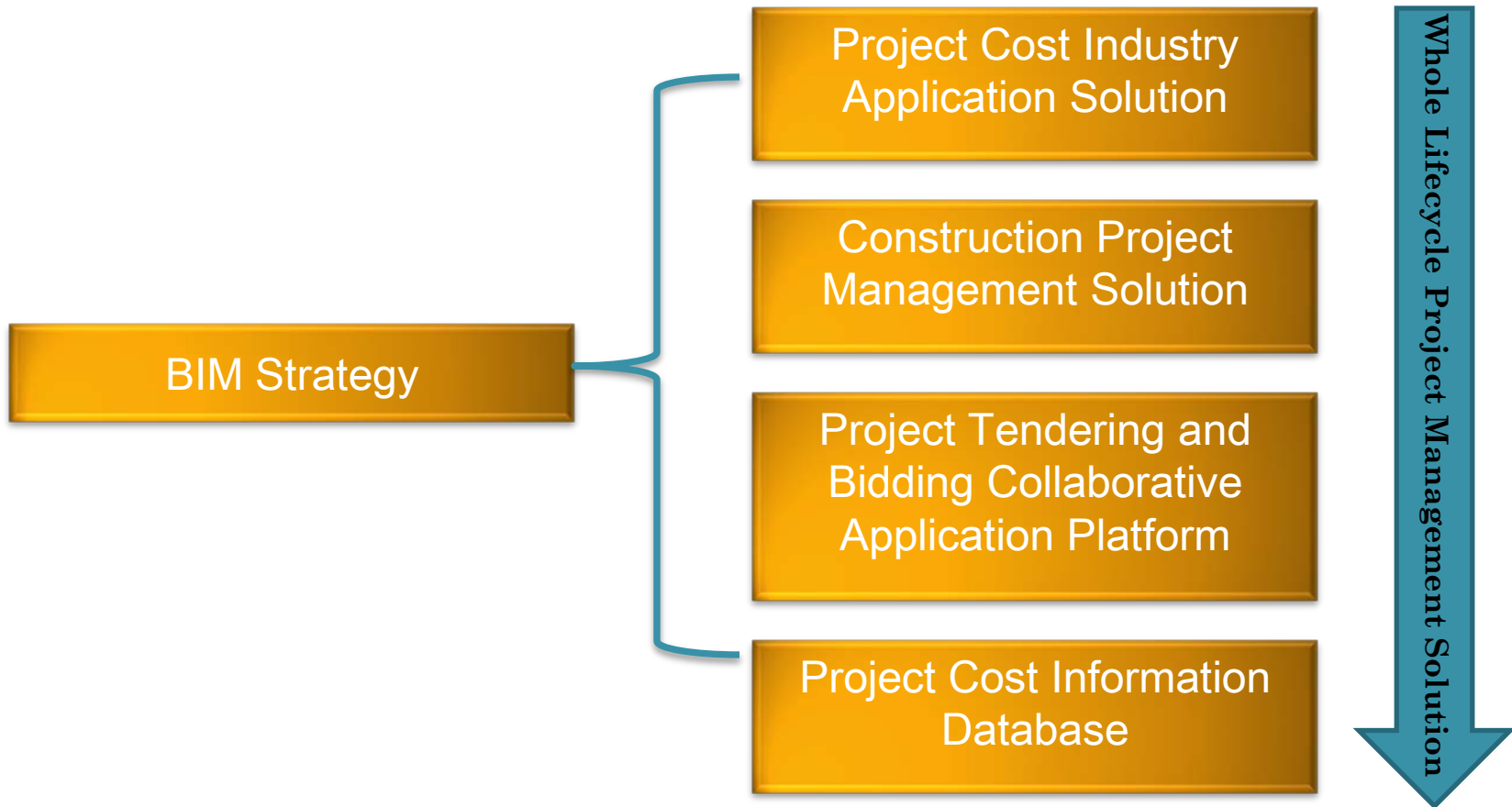
Use BIM technology

Improve Quantity Surveyors efficiency up to 70% reduce QS workload and win more Tenders

Easy to Extract More Precise Quantities From 2D and 3D BIM Models



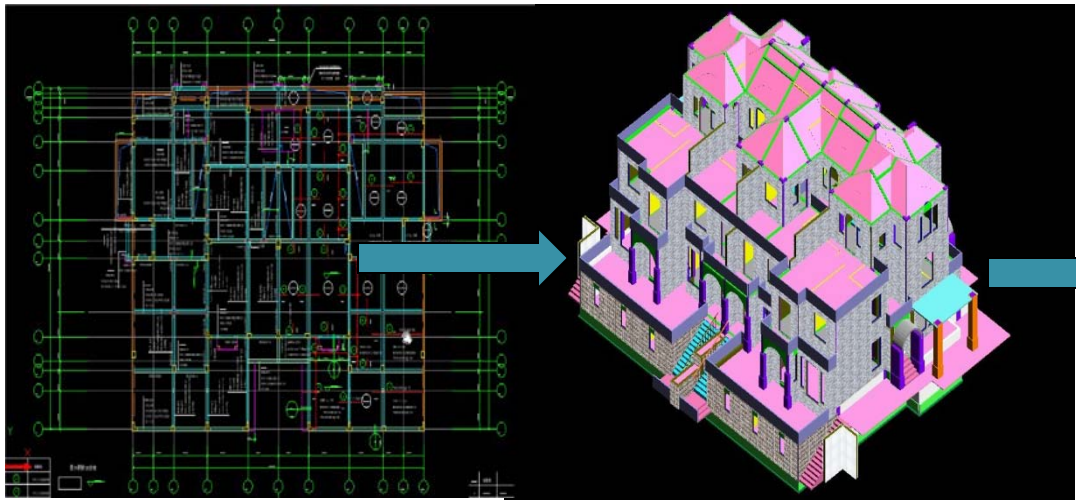
BIM TECHNOLOGY



QTO System: GAS2011

A **powerful** and **easy-to-use** QTO software (**architecture**). It enables you to quickly and accurately take off quantities from 2D drawings and generate automatic quantities from 3D BIM models using the most advanced on-screen electronic measurement system available. Prepare estimates, bills of quantities and tenders easily and all in a fraction of the time and cost!

System Architecture for Quantity Take Off



Floor	Element Name	Quantity Name						
		Volume(m ³)	Formwork Area(m ²)	Scaffold area(m ²)	Cross-section Girth(m)	Clear Span of Beam(m)	Axis Length(m)	Side area of beam(m ²)
	KLM(1)(200*420)	0.31	4.34	22.19	1.24	6.2	7.1	5.208
	KL.C(2)(200*420)	0.7888	10.288	34.176	1.24	12	12.95	10.08
	WKL4(1)(200*400)	0.224	3.074	12	1.2	4	4.8	3.2
	KL4-B(2)(200*500)	1.208	14.954	40.56	1.4	14	16.4	13.866
	KL-C(4)(200*620)	1.6012	18.6948	58.962	1.64	14.7	19	18.028
	KL-B(2A)(200*420)	0.8301	11.061	45.014	1.24	13.8	14.8	11.28
	KL3-4(1)(250*420)	1.1136	12.16	35.778	1.34	12.8	13.8	10.416
	WKL3(1)(200*400)	0.3696	5.016	17.28	1.2	6.6	7.2	5.28
	WKL5(1)(200*400)	0.4302	5.962	20.16	1.2	7.8	8.4	6.12
	KL5-4(1)(250*420)	1.0538	12.1574	38.448	1.34	14.2	14.8	11.7801
	KL6-B(2)(200*400)	0.8632	11.672	49.452	1.2	15.2	16.4	12.16

Core Business Values

POWERFUL

Powerful performance for lowering workload

- Support rich drawing format
- Built-in SMM2 and CP97 calculation rules
- 3D modeling more efficient and precise
- Support various reports input and output

EASY-TO-USE

User-friendly software for processing architecture quantity take off

- Easy to get started and easy to master
- Fast quantity takeoff and centralized accuracy
- Import and export data of results easily

BEST VALUE

Best value for your technology investment

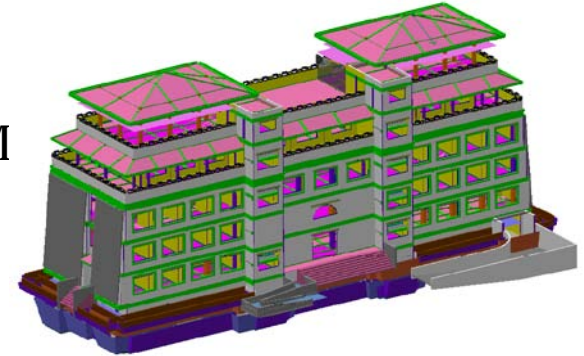
- Full-functionality & Comprehensive Solution
- Simplified pricing & maintenance
- Low demand for computer hardware
- Easy maintenance program

Powerful

Powerful performance for lowering cost engineers workload

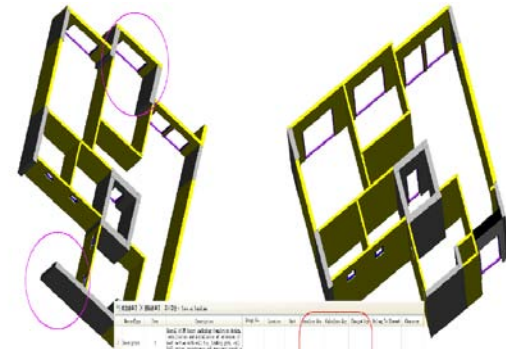
Support Rich Drawing Format

- Supports scanned, PDF, CAD drawings and BIM models – all without need to buy CAD software.
- Supports BIM by using digital design data to accurately estimate quantities and costs.



Built-in SMM2 and CP97 Calculation Rules

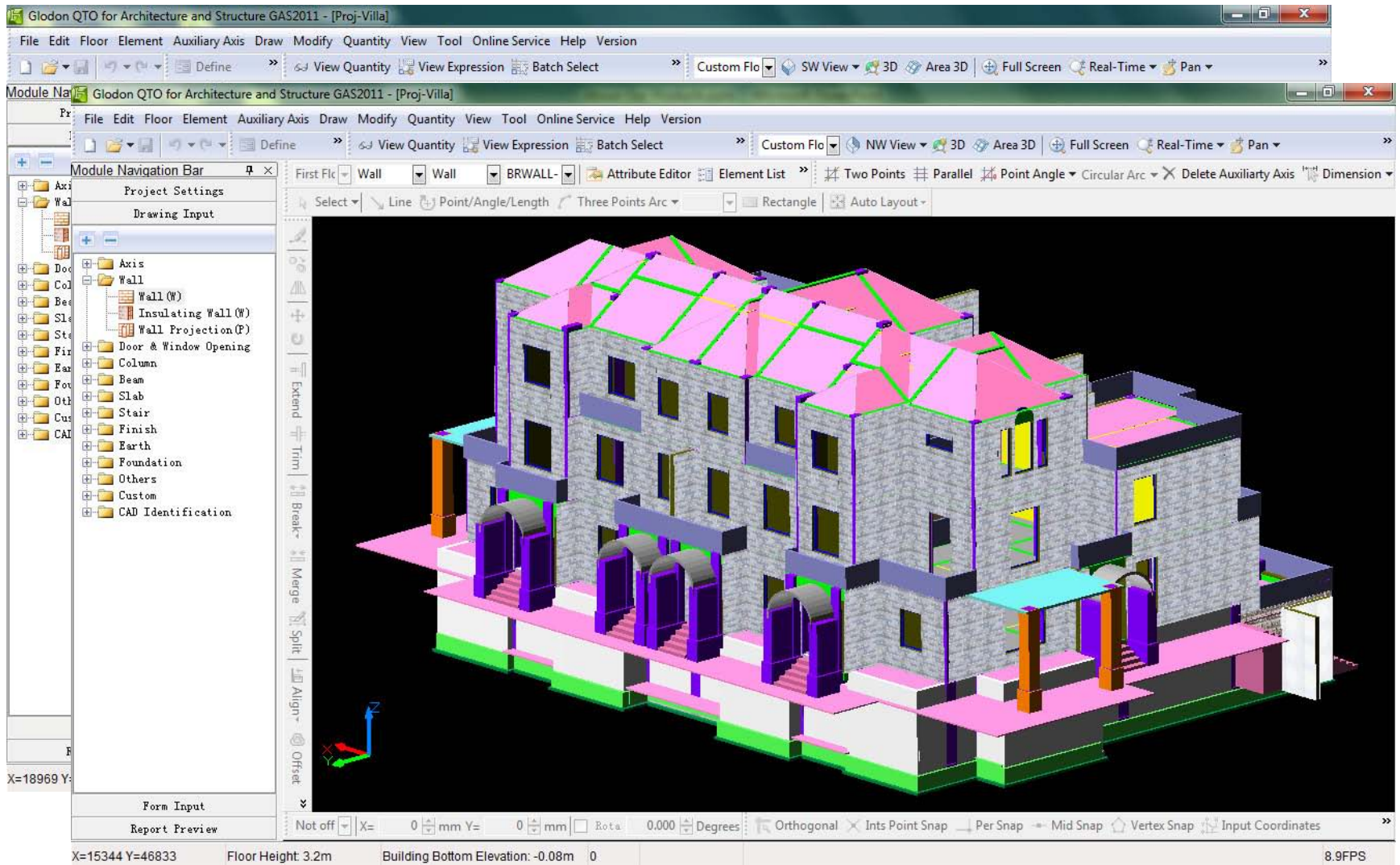
- Open rules, adjusting the special calculation rules according to the actual project.

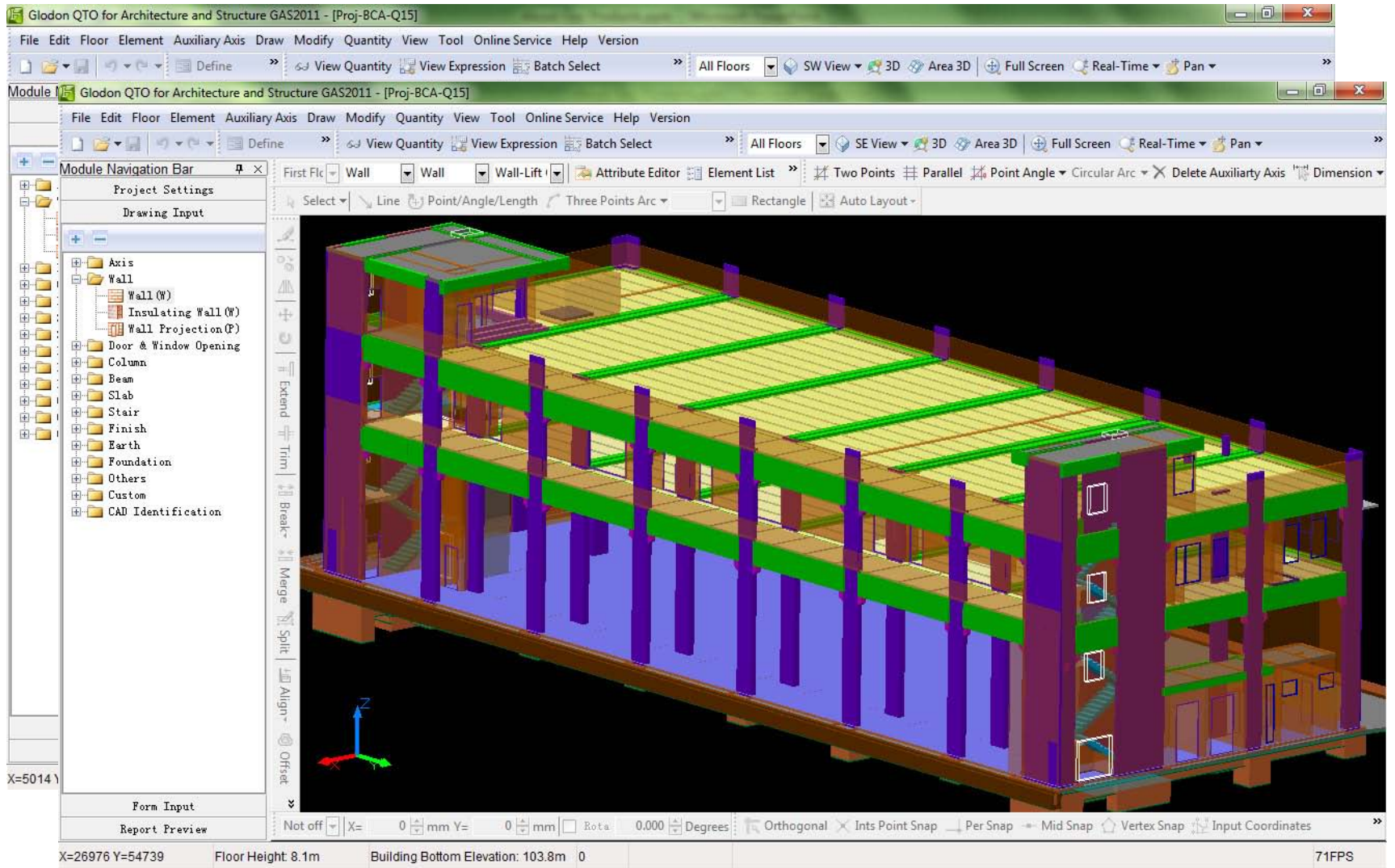


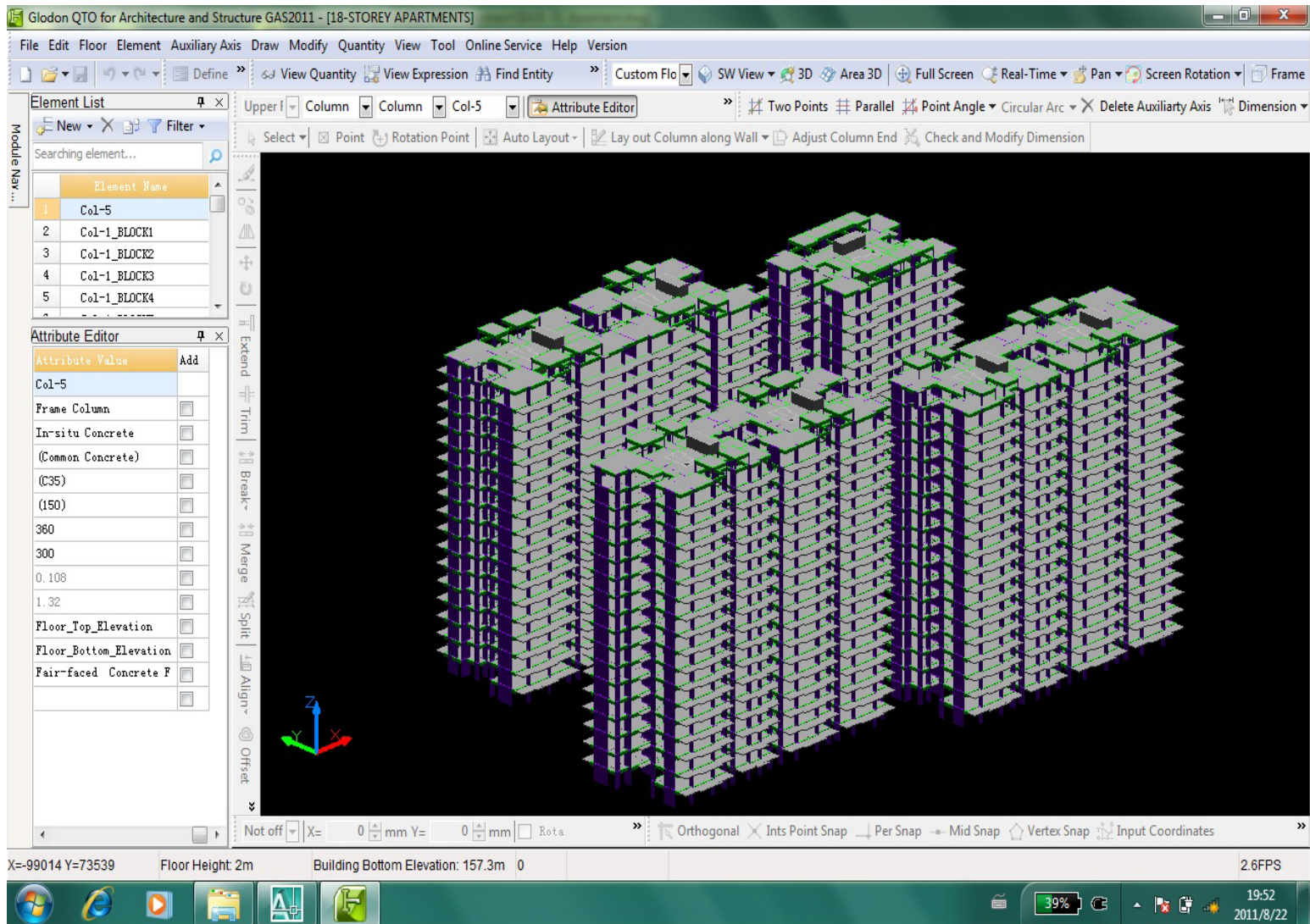
3D Modeling More Available & Precision

- Only one click, VO change visible
- Modify element and entity flexible
- 3D calculation makes result more accurate

A screenshot of a software interface showing a 3D model of a building structure and a data table. The table has columns for 'Quantity', 'Unit', 'Description', 'Rate', and 'Amount'. The data is organized into rows, with some cells highlighted in red and yellow. The table is titled 'BIM Model - SMM2 - CP97 - Cost Estimate'.







Powerful

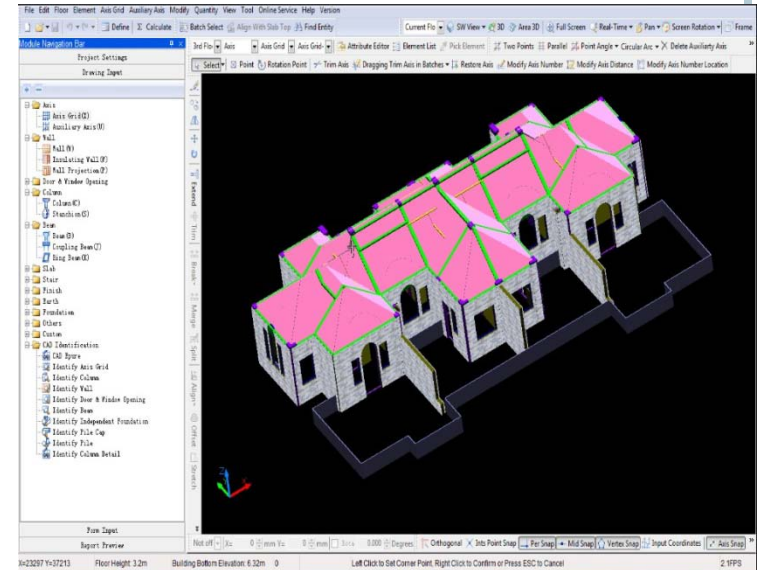
Powerful performance for lowering cost engineers workload

Support Various Reports Output

DTQ-1

Formwork Area = 100.762m2	
<11,M><11,L>	Formwork Area = (1.4<Left sideline length>+1.6<Right sideline length>)*3.87<Wall height>-0.75<Deduct raft>-1.115<Deduct FD beam>-3.22<Deduct column>-0.22<Deduct in-situ slab> = 6.305m2
<7-49,N><5+50,N>	Formwork Area = (5.6<Left sideline length>+5.2<Right sideline length>)*3.87<Wall height>-2.7<Deduct raft>-4.86<Deduct FD beam>-5.706<Deduct column>-0.96<Deduct in-situ slab> = 27.57m2
<8+50,P><9,P>	Formwork Area = (2.8<Left sideline length>+3.2<Right sideline length>)*3.87<Wall height>-1.5<Deduct raft>-2.13<Deduct FD beam>-2.586<Deduct column>-0.624<Deduct in-situ slab> = 16.38m2

Indicator Item	Floor	Quantity of Volume(m3)	Rebar Weight (kg)	Average Rebar Content(kg/m3)
Concrete Wall	Base Floor	45.1925	1355.7739	30
	Sub-total	45.1925	1355.7739	30
Lintol	First Floor	0.2339	4.679	20.0043
	Sub-total	0.2339	4.679	20.0043
Beam	-1st Floor	22.6511	3397.671	150.0003
	First Floor	24.1392	3620.8793	150
	2nd Floor	20.4427	3066.406	150
	3rd Floor	11.4817	1722.2481	149.9994
	Sub-total	78.7147	11807.2044	150
In-situ Slab	-1st Floor	59.3359	2966.7945	50
	First Floor	54.1679	2708.3935	50
	2nd Floor	43.1838	2159.1878	49.9999
	3rd Floor	30.7669	1538.3456	50
	Sub-total	187.4545	9372.7214	50
Column	Base Floor	0.1555	23.3238	149.9923
	-1st Floor	23.1727	3475.905	150
	First Floor	35.1156	5267.34	150
	2nd Floor	17.952	2692.8	150
	3rd Floor	16.6081	2491.2158	150
	Sub-total	93.0039	13950.5846	150



Floor	Element Name	Quantity Name						
		Volume(m3)	Formwork Area(m2)	Scaffold ar ea(m2)	Cross-sec tion Girth(m)	Clear Span of Beam(m)	Axis Leng h(m)	Side area of beam(m2)
	KLM(1)(200*420)	0.31	4.34	22.19	1.24	6.2	7.1	5.208
	KLC(2)(200*420)	0.7888	10.288	34.176	1.24	12	12.95	10.08
	WKL(1)(200*400)	0.224	3.074	12	1.2	4	4.8	3.2
	KL4-B(2)(200*500)	1.208	14.954	40.56	1.4	14	16.4	13.886
	KL4-C(4)(200*620)	1.6012	18.6948	58.962	1.64	14.7	19	18.028
	KL3-B(2A)(200*420)	0.8301	11.061	45.014	1.24	13.8	14.8	11.28
	KL3-A(1)(250*420)	1.1136	12.16	35.778	1.34	12.8	13.3	10.416
	WKL3(1)(200*400)	0.3696	5.016	17.28	1.2	6.6	7.2	5.28
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	KL5-B(2)(200*400)	0.8632	11.672	49.452	1.2	15.2	16.4	12.16

EASY-TO-USE

Fast start with software for processing architecture quantity takeoff

Easy to Get Started and Learned

- Simple and clear software operating interfaces
- Simple and few operation steps
- No need for Professional CAD knowledge

Fast take-off quantity and centralized accuracy

- 3D quantity takeoff platform with accuracy calculation rule, make the quantity more accurate

Easily and accurately export BQ

- Embedded rich BQ format, it allows users to choose according to practical needs.

BEST VALUE

The best value for your technology investment

Full-functionality & Comprehensive Solution

- All-In-One: Earth, Concrete, Template, Finishing, Rebar quantity
- Advanced reports, rich content

Simplified Pricing and Maintenance

- One edition, one price
- All the functionality you need for less than 6K
- No need for additional CAD software



Low Demanding for Computer Hardware

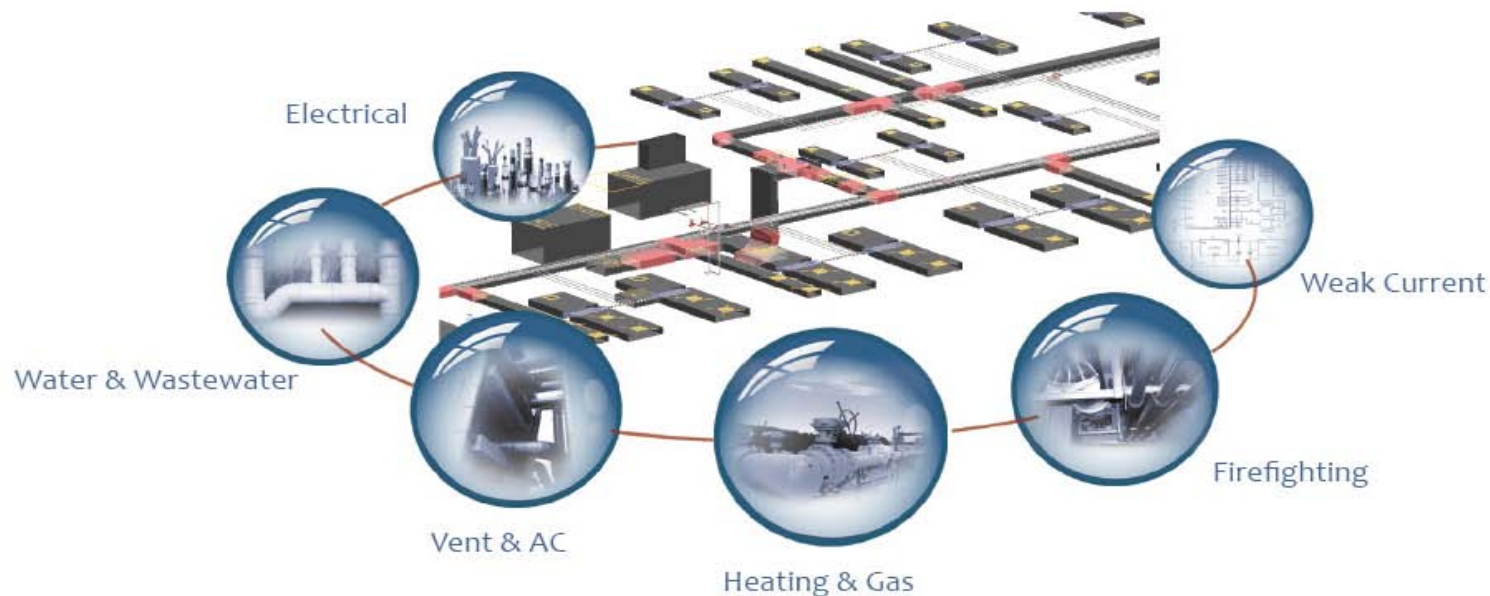
- Intel® Pentium® 4 processor 2.0 GHz or higher , 1GB RAM, 2GB free disk space.

Easy maintenance program to keep your investment up-to-date

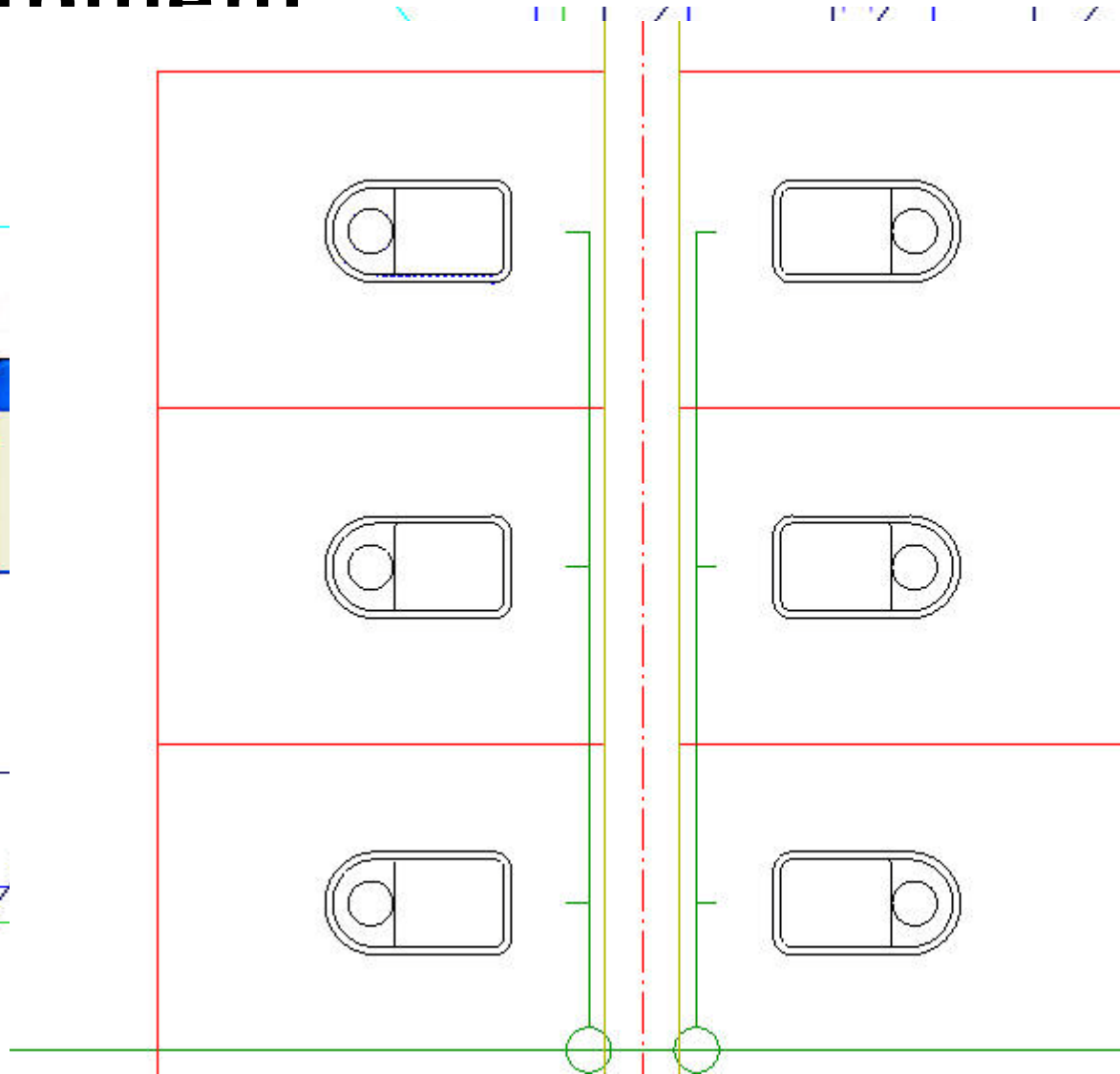
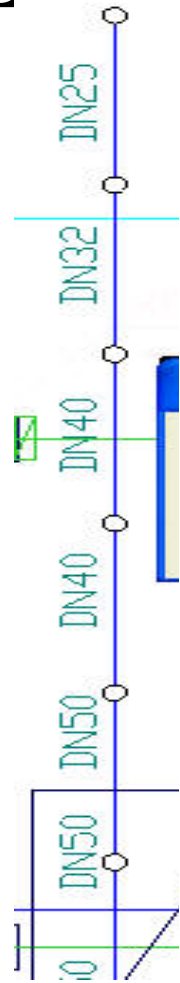
M&E System: GME2011 Overview

GME2011 for **mechanical and electrical** is a BIM based quantity take-off software. It can help to efficiently generate a 3D cost information modeling.

6 PROFESSIONALS IN GME2011



GME2011 for Counting Equipment



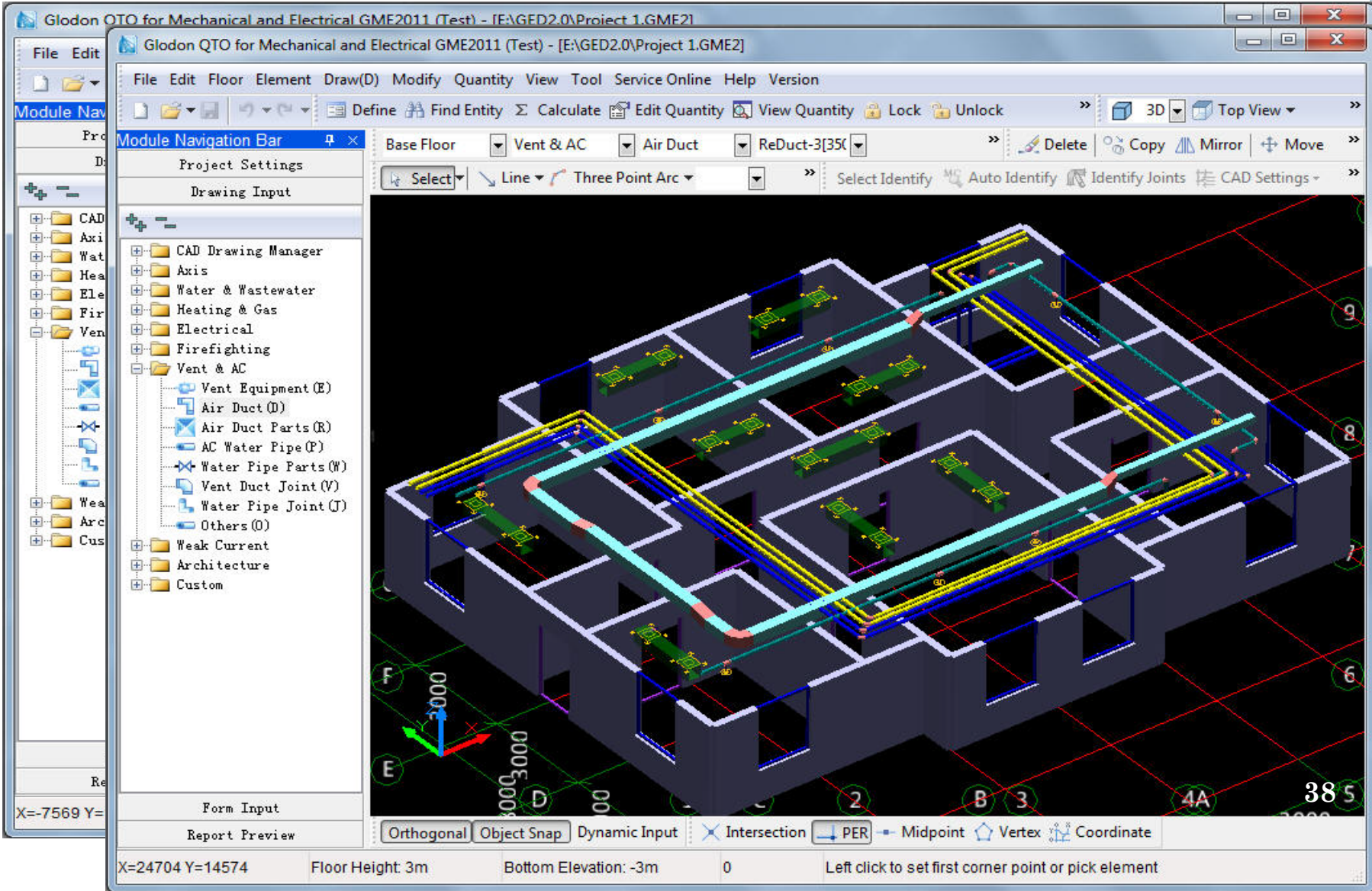
JL1

GME 2011 FOR ELECTRICAL

The screenshot displays the Glodon QTO software interface for electrical design. The main window shows a 3D perspective view of a floor plan with a complex network of electrical wiring, outlets, and equipment. The interface includes several toolbars and panels:

- Top Menu Bar:** File, Edit, Floor, Element, Draw, Modify, Quantity, View, Tool, Online Service, Help, Version.
- Module Navigation Bar:** Contains project settings and drawing input options.
- Left Panel (Project Settings):** A tree view showing the project structure, including folders for CAD Drawing Manager, Axis, Water & Wastewater, Heating & Gas, Electrical, Firefighting, Vent & AC, Weak Current, Architecture, and Custom. The 'Electrical' folder is expanded, showing sub-items like Lighting Fixture, Switch Socket, Distribution Cabinet, Electrical Equipment, Wire Conduit, Cable Conduit, Bus, and Lightning Protection.
- Right Panel (Drawing Input):** A similar tree view for drawing input, mirroring the project settings structure.
- Top Right Toolbar:** Includes options for 3D, SW View, Dynamic View, Area 3D, Full Screen, Zoom, and Pan.
- Bottom Toolbar:** Contains drawing tools such as Select, Point, Rotation Point, Linear Layout, Generate Junction Box, Legend Identify, Mark Identify, CAD Operation Setting, Break CAD Line, and Modify Text.
- Bottom Status Bar:** Displays coordinates (X=22863 Y=3125), Floor Height (3.3m), Bottom Elevation (0m), and a prompt: 'Left click to set first corner point or pick element'.

GME2011 for Plumbing



GME2011 Report

D

Drawing Input Vent-Pipe Quantity Summary Report

System	E
[-] Pipe (Water)	
Water Supply System	

W

System	Element Name	Qty Name	Character	Unit	Project Qty	Remarks
[-] Vent Pipe (Ventilation)						
Ventilation System	ReDuct-1[200*200]	Length	Sheet Steel Vent-Pipe Width: 200 Height: 200 Insulation Thickness: 0 Glass Wool Plate Ventilation Thickness: 0.75 straight	m	15.38	
		Expanded area	Sheet Steel Vent-Pipe Width: 200 Height: 200 Insulation Thickness: 0 Glass Wool Plate Ventilation Thickness: 0.75 straight	m2	12.30	
	CoverArea	Sheet Steel Vent-Pipe Width: 200 Height: 200 Insulation Thickness: 0 Glass Wool Plate Ventilation Thickness: 0.75 straight	m2	12.30		
	ReDuct-2[300*300]	Length	Sheet Steel Vent-Pipe Width: 300 Height: 300 Insulation Thickness: 0 Glass Wool Plate Ventilation Thickness: 0.75 straight	m	58.87	
Expanded area		Sheet Steel Vent-Pipe Width: 300 Height: 300 Insulation Thickness: 0 Glass Wool Plate Ventilation Thickness: 0.75 straight	m2	70.65		

GME2011 for Variation Orders

+ Add Main Title + Add Subtitle + Add Same-level Title + Add BOQ items X Delete C Copy ↓ Move Down ↑ Move Up Import/Export Save as Baseline >>											
RecordType	Item	Description	Drwgs No.	Location	Unit	Baseline Qty	Calculate Qty	Changed Qty	Belong To Element		
1	Item	BQ11				0.00000	0.00000	0.00000			
2	Item	BQ11001			m	316.77058	400.00000	83.22942	Sanitary Ware (Water)		
3	Item	BQ11003			m	85.16614	85.16614	0.00000	Pipe (Fire)		
4	Item	BQ11004			m	0.00000	0.00000	0.00000	Pipe (Fire)		
5	Item	BQ11005			m	6.00000	6.00000	0.00000	Pipe (Fire)		
6	Item	BQ11006			m	15.37566	47.89688	32.52122	Air Duct (Vent)		
7	Item	BQ11007			m	58.87482	58.87482	0.00000	Air Duct (Vent)		
8	Item	BQ11008			m	37.34938	37.34938	0.00000	Air Duct (Vent)		
9	Item	BQ13				0.00000	0.00000	0.00000			
10	Item	BQ13006			m2	12.86760	38.88458	26.01698	Air Duct (Vent)		
11	Item	BQ13003			m3	0.00000	0.38000	0.38000	Pipe (Water)		
12	Item	BQ13004			m3	0.17183	0.17183	0.00000	Pipe (Fire)		
13	Item	BQ13005			m3	0.00430	0.00430	0.00000	Air Duct (Vent)		
14	Item	BQ13007			m2	70.64976	70.64976	0.00000	Air Duct (Vent)		
15	Item	BQ13008			m2	52.28916	52.28916	0.00000	Air Duct (Vent)		
16	Item	BQ15				0.00000	0.00000	0.00000			
17	Item	BQ15001			piece	8.00000	8.00000	0.00000	Sprinkler (Fire)		
18	Item	BQ23				0.00000	0.00000	0.00000			
19	Item	BQ23001				0.00000	0.00000	0.00000			
20	Item	BQ23002			piece	36.00000	45.00000	9.00000	Pipe Joint (Water)		

SUCCESS CASES FROM US

- BIM not only enhances efficiency but also saves costs (LeFevre, 2011) for the following stakeholders:
 - Owner
 - Architect/ Engineer
 - Construction Manager
 - Contractor
 - Manufacturer
 - Users

CONCLUSION

- Goethe - *“until one is committed, there is hesitancy, the chance to draw back ... whatever you can do, or dream you can do, begin it. Boldness has genius, power and magic in it. Begin it now.”*

BIM in 48 hours

Q & A

Thank You!

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