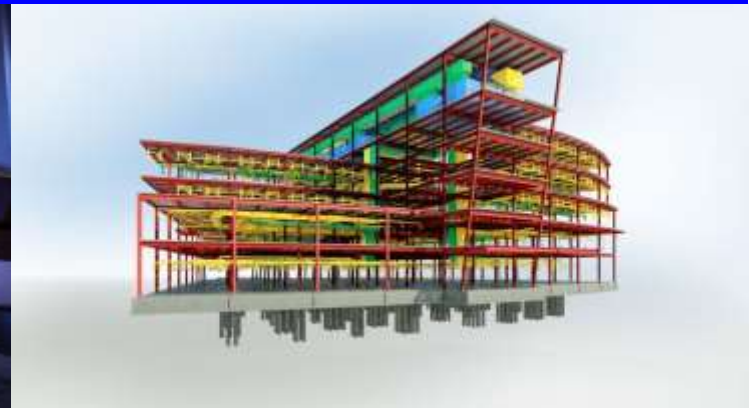


# AT THE FOREFRONT OF THE CONSTRUCTION INDUSTRY WITH BUILDING INFORMATION MODELING (BIM): THE CHALLENGES



19<sup>th</sup> October 2016



**BY: IR. SHARIFAH AZLINA RAJA KAMAL**



# What is BIM ?



# WHAT IS BIM ?

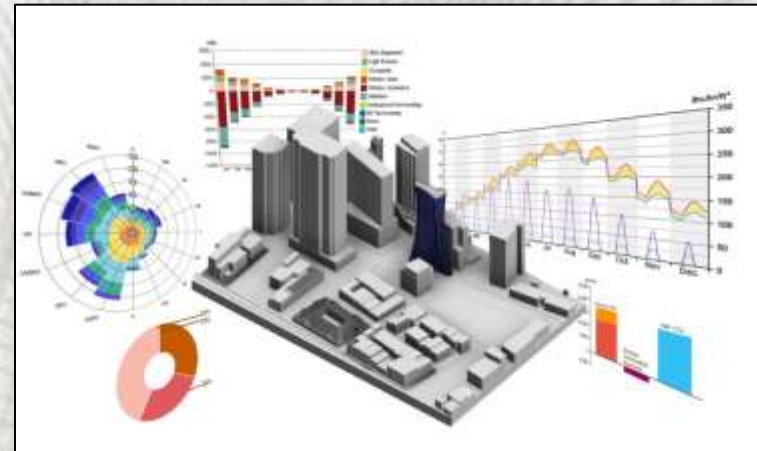
***TECHNOLOGY ?***



***SOFTWARE ?***



**PROCESS**

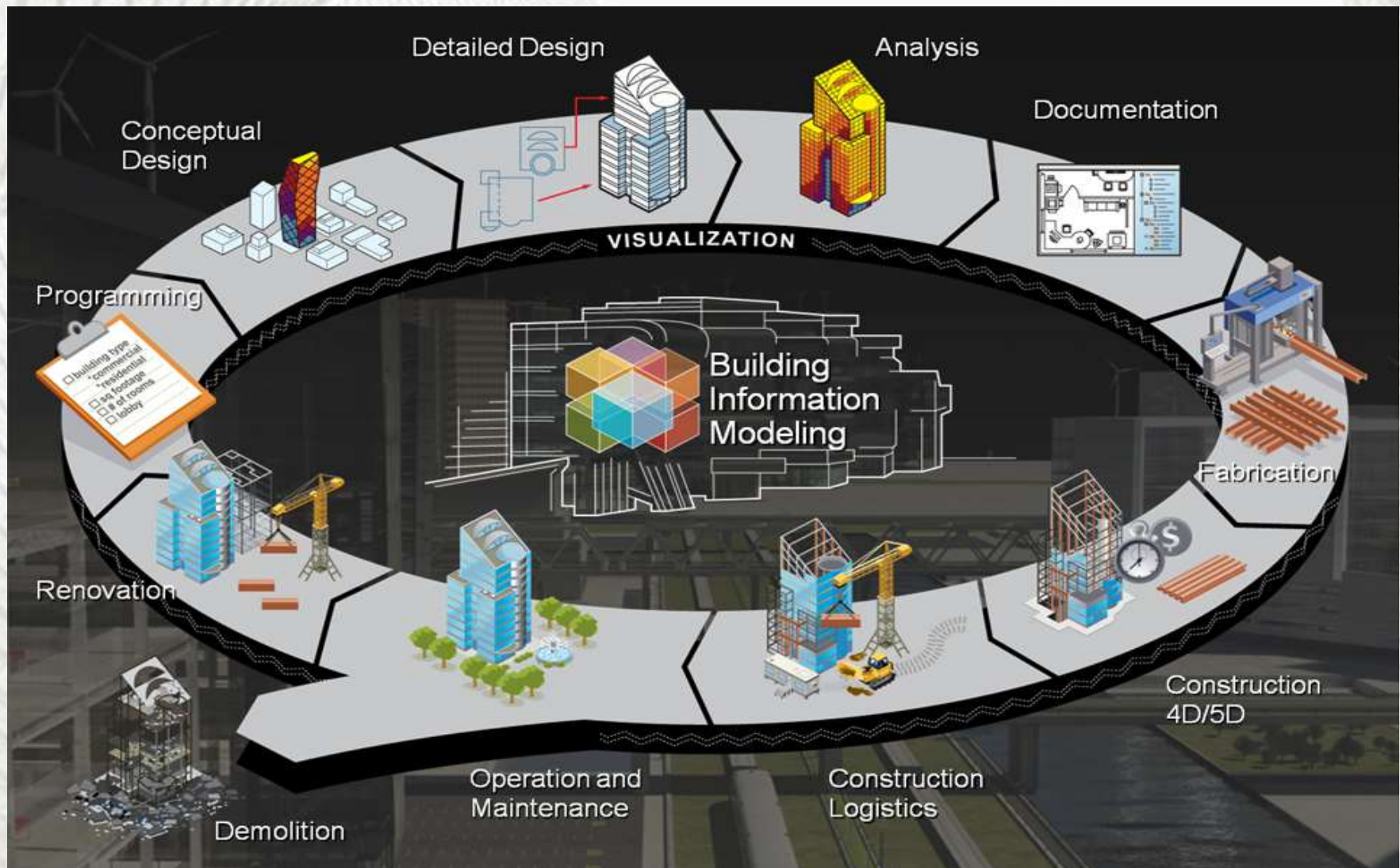


## ***“ Building Information Modelling ”***

***A process in Developing, Collating & Managing high level information of an asset, from its inception, design, construction and ultimately operation & maintenance.***



# BIM – PROJECT LIFE CYCLE



# Why BIM ?



## Why BIM ?

*Enhances all – stage progress visibility*

*Increases productivity through collaboration amongst industry players*

*Reliably and accurately visualize the project at early stage providing clearer understanding of design intent & facilitate in modification to achieve desired outcome*

*Identifies interface issues, detects & addresses conflicts / clashes early*

*Eliminates time-consuming changes at later stage*

*Eliminates time-waste by resolving complex construction details before going on-ground*

# MAJOR ISSUES IN CONSTRUCTION

**Lack of project co-ordination**

**Time & Cost  
over-runs**

**Manual bill of quantities or no  
integration**

**No accuracy in Job Costing &  
Budgeting**

**Not feasible to integrate with facility  
management applications and  
preventive, corrective maintenance**

**Further investment needed  
for data procurement &  
incurring cost per year**



# BIM: RETURN ON INVESTMENT

- Up to 40% elimination of unbudgeted change
- Up to 80% reduction in time taken to generate a cost estimate
- Cost estimation accuracy within 3%
- A savings of up to 10% of the contract value Through clash detections
- Up to 7% reduction in project time
- Ongoing saving in Facility Management System

*Source :*

*Stanford University Center for Integrated Facilities Engineering (CIFE) figures based on 32 major projects using BIM*

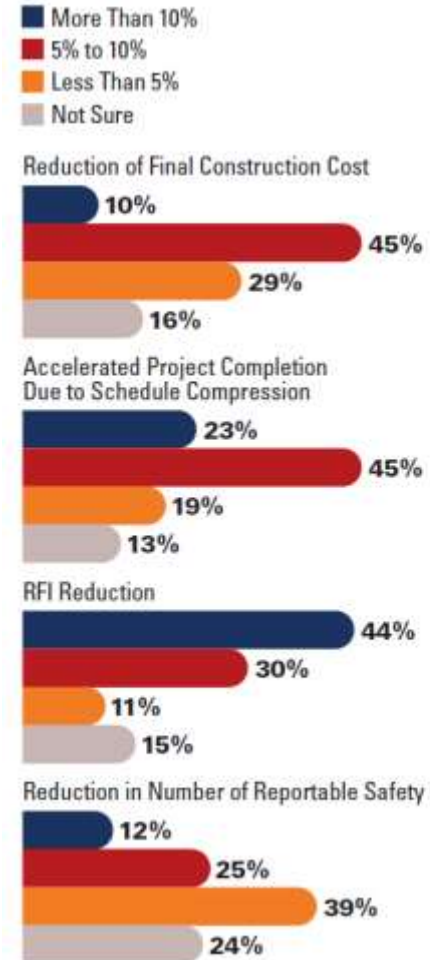


# BIM: RETURN ON INVESTMENT

## Five Top-Rated Positive Impacts of BIM

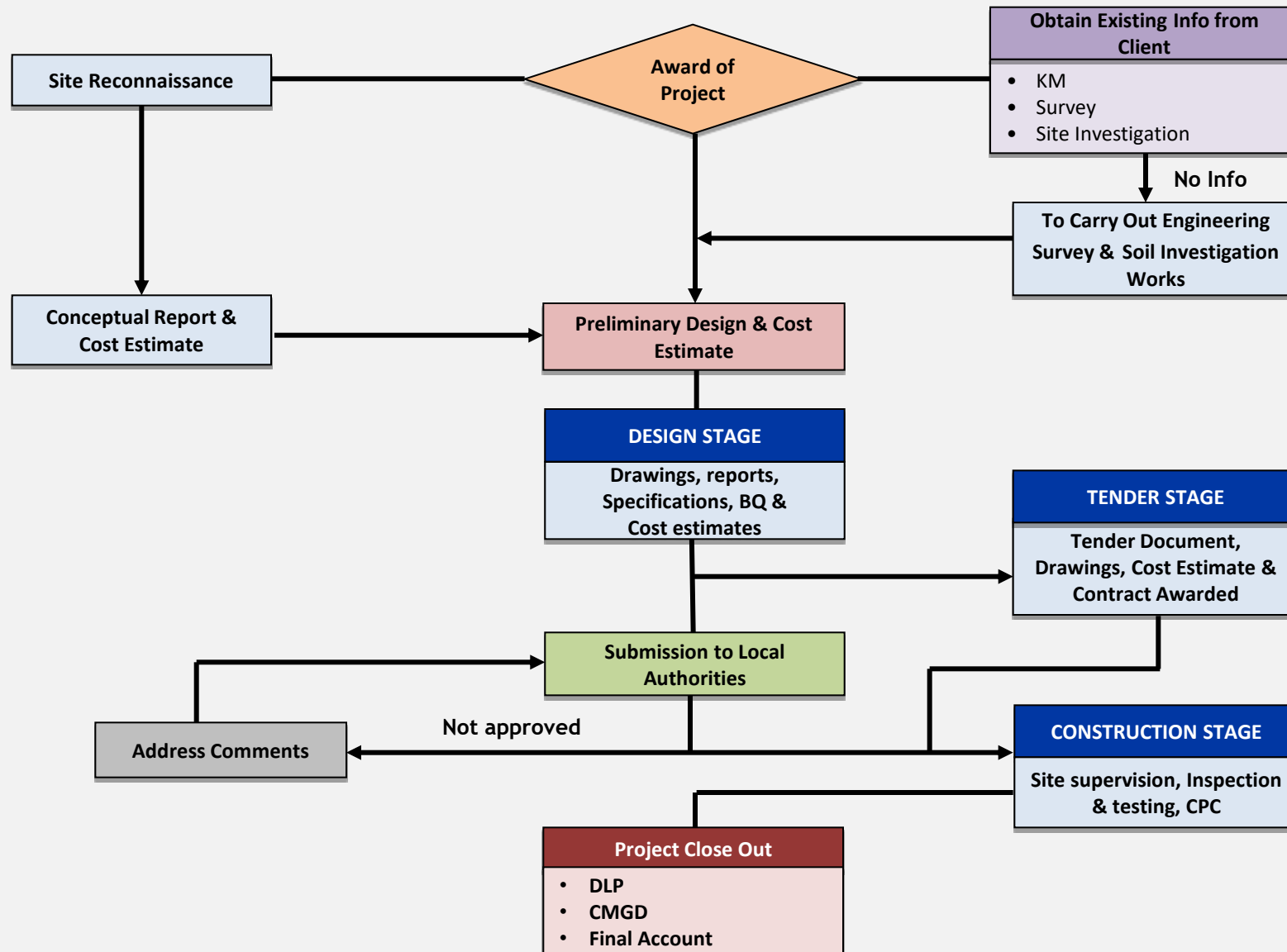
|  | Respondent Type | % Rating High or Very High |
|--|-----------------|----------------------------|
| Improved Constructability of Final Design                    | Contractors     | 74%                        |
| Increased Owner's Understanding of Proposed Design Solutions | Owners          | 73%                        |
| Improved Quality / Function of Final Design                  | Engineers       | 71%                        |
| Generated Better Construction Documents                      | Owners          | 70%                        |
| Improved Ability to Plan Construction Phasing and Logistics  | Owners          | 70%                        |

## Metrics for the Impact of BIM on Cost, Schedule, RFIs and Safety

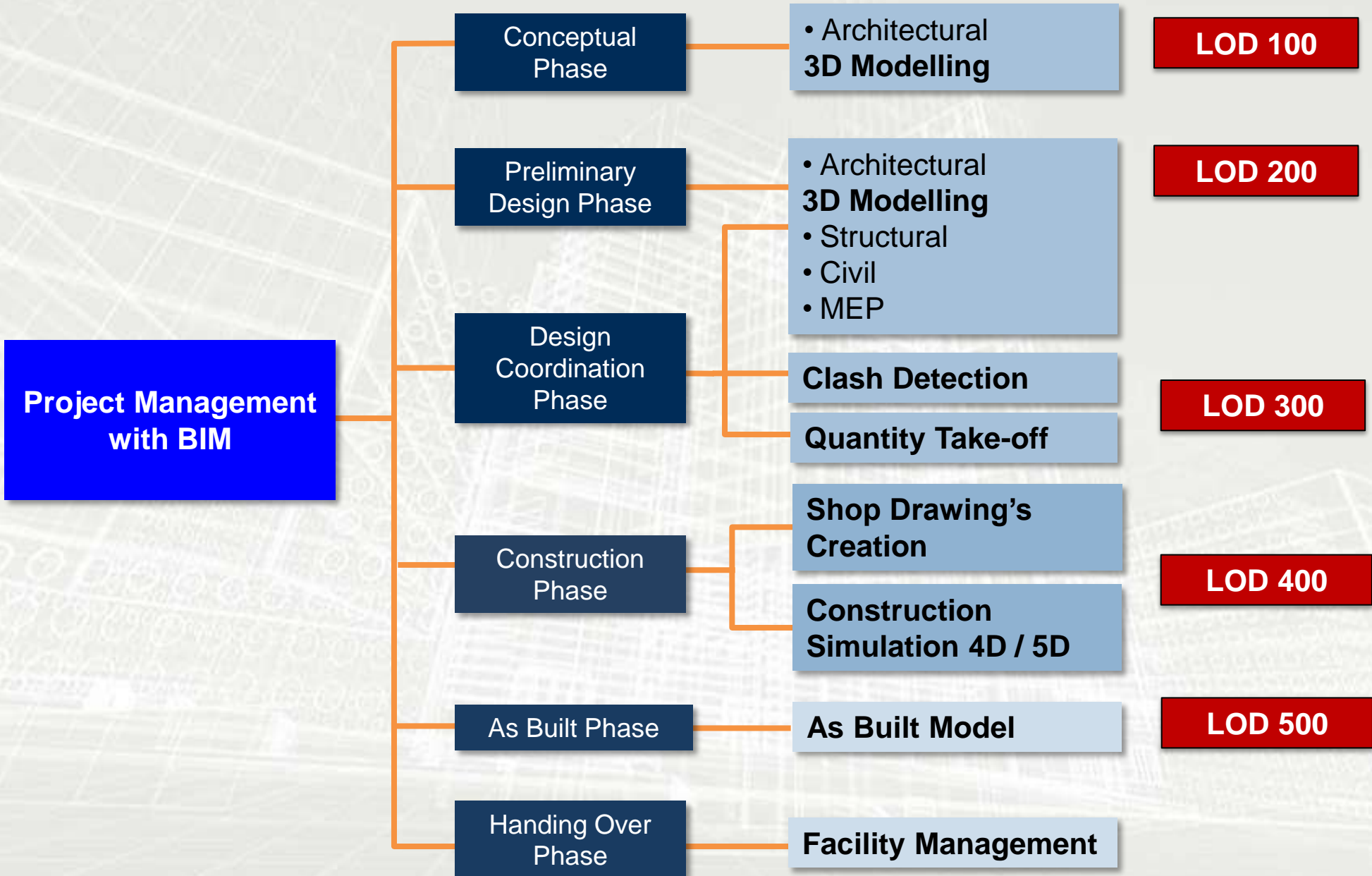


Source : Dodge Data & Analytics – Smart Market Report  
Published on 2015 in Associate with Building Smart Alliance

# PROJECT FLOWCHART (Design & Supervision)



# BIM PROCESS



To provide IPD (Integrated Project Delivery) using BIM technology to manage and maintain projects effectively

## IPD - BIM Deliverables

- 3D modelling & Outputs
- Clash detection
- Clash Resolution
- Quantity take off
- 2D Extraction
- Construction simulation – 4D & 5D
- Facility Management Solutions

# CHALLENGES



# Signature Address in KL



## 55-storey Hotel & Condominium

- D&B Contract
- Design Simultaneously with Construction
- Foreign Contractor Participation

## Challenges

- Collaborative design contribution including from contractor / builders
- Departure from traditional delivery method of isolated responsibilities

# SMART TOWNSHIP

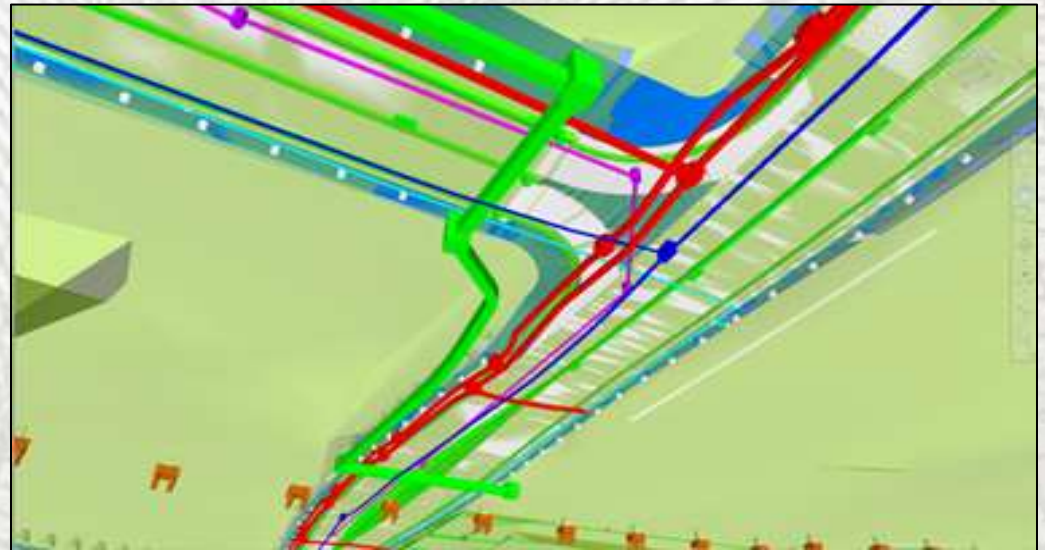


## 2300 Acre Township in Sungai Buloh

- Conventional Contract
- Modeling of external infrastructure on design completion
- Updating by contractor

## Challenges

- BIM was not in initial procurement
- Correct software & Inter-Operability issues
- Quantity measurement (earthwork & contingencies)





# HYPERMARKET IN SETAPAK & KAMPAR



## Hypermarkets

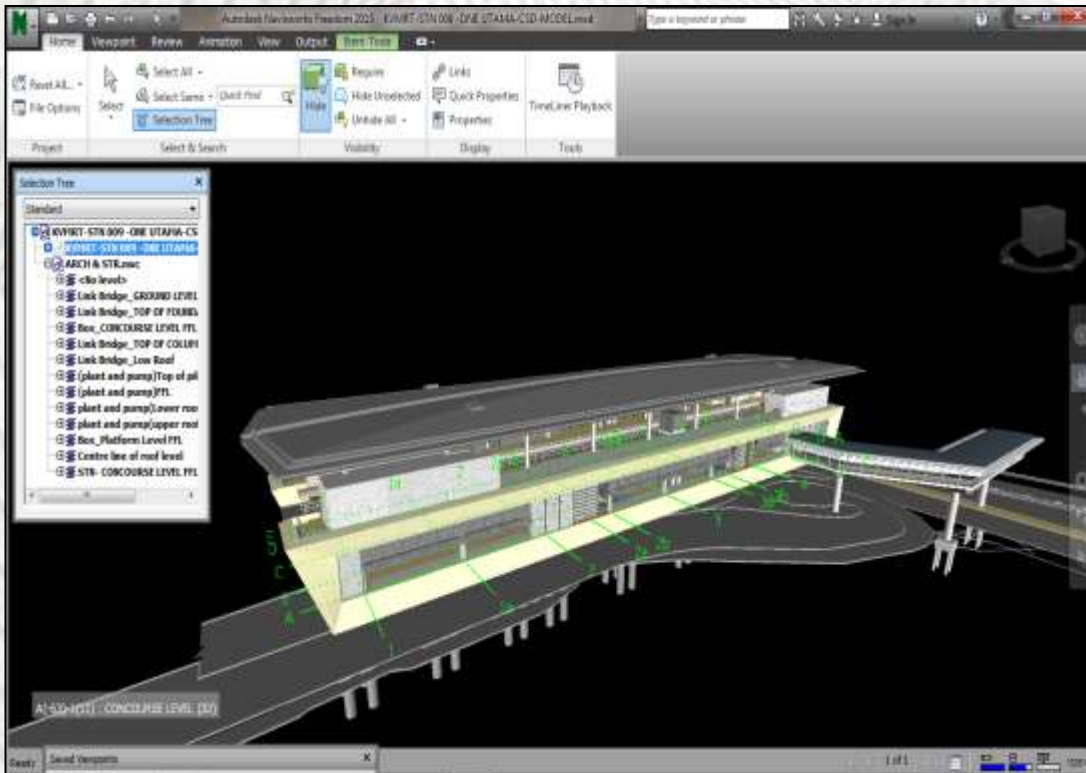
- Simple Buildings
- Conventional Contract
- 13,500 sqm & 14,000 sqm.

## Challenges

- Collaboration amongst project proponents



# Transit Station in Klang Valley



## Transit Station in Klang Valley

- 24 Stations
- 1 Depot
- Klang Valley Vicinity

## Challenges

- BIM process and deliverables
- Workshop participations
- Time & Schedule

[Station Walkthrough Video](#)

# HOTEL IN ABU DHABI



## Hotel built over F1 Race circuit in Abu Dhabi

- 499 rooms, 75 suites, 7 restaurants
- 85,000 sqm
- Modeling include temporary works

## Challenges

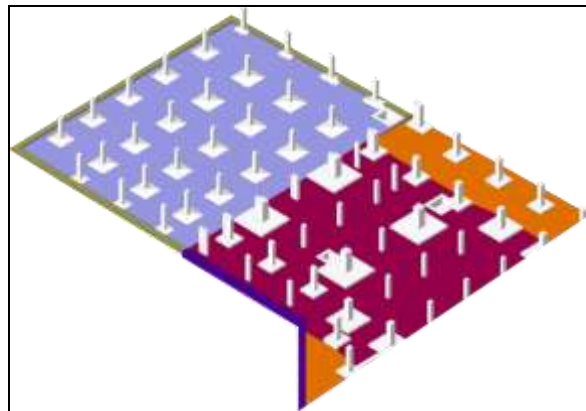
- Modelling temporary structure to achieve cost economy
- Construction simulation to achieve design intent
- Decision Making process

# CHALLENGES IN BQ

## QUANTITY TAKE-OFF

### Raft Slab Concrete Quantities

#### CROSS REFERENCE BOQ



#### LEGEND:-

- 300mm Thk RCC SLAB
- 450mm Thk RCC SLAB
- 600mm Thk RCC SLAB
- 800mm Thk RCC SLAB
- 900mm Thk RCC SLAB

| SCHEDULE OF RAFT SLAB - SECOND BASEMENT BLOCK A |           |                         |                         |
|---|-----------|-------------------------|-------------------------|
| TYPE  | TYPE MARK | AREA                    | VOLUME                  |
| 600mm-RCC SLAB                                  | RS-600    | 2309.474 m <sup>2</sup> | 1385.685 m <sup>3</sup> |
| 800mm-RCC SLAB                                  | RS-800    | 3181.904 m <sup>2</sup> | 2545.523 m <sup>3</sup> |
| 900mm-RCC SLAB                                  | RS-900    | 92.888 m <sup>2</sup>   | 83.599 m <sup>3</sup>   |
|   |           | 5584.266 m <sup>2</sup> | 4014.807 m <sup>3</sup> |

| SCHEDULE OF RAFT SLAB - SECOND BASEMENT BLOCK B |           |                         |                         |
|---|-----------|-------------------------|-------------------------|
| TYPE  | TYPE MARK | AREA                    | VOLUME                  |
| 600mm-RCC SLAB                                  | RS-600    | 3991.480 m <sup>2</sup> | 2394.888 m <sup>3</sup> |
| 800mm-RCC SLAB                                  | RS-800    | 3137.848 m <sup>2</sup> | 2510.279 m <sup>3</sup> |
| 900mm-RCC SLAB                                  | RS-900    | 83.019 m <sup>2</sup>   | 74.718 m <sup>3</sup>   |
|   |           | 7212.348 m <sup>2</sup> | 4979.884 m <sup>3</sup> |

| SCHEDULE OF RAFT SLAB - SECOND BASEMENT BLOCK C |           |                         |                        |
|---|-----------|-------------------------|------------------------|
| TYPE  | TYPE MARK | AREA                    | VOLUME                 |
| 300mm-RCC SLAB                                  | RS-300    | 1145.652 m <sup>2</sup> | 343.696 m <sup>3</sup> |
| 450mm-RCC SLAB                                  | RS-450    | 107.542 m <sup>2</sup>  | 48.394 m <sup>3</sup>  |
|   |           | 1253.194 m <sup>2</sup> | 392.090 m <sup>3</sup> |

## *Legal & Contractual*

- **Ownership of model**
- **Design liability / Modelling liability**
- **Responsibility of design / Modelling**
- **Integration of BIM with existing contracts**
- **Professional indemnity**
- **Commercial rates for BIM Consultants**

## *Delivery Standard & Processes*

- **Protocols to be set on processes**

- **Clear definition of roles & responsibility**

- **Deliverables to be defined**

# PROJECTS WITH BIM

## TECHNOLOGY



For construction of the \$1.2B new state capital corridor complex, the team coordinated a series of design & construction phase team meetings. The design phases through to operation and maintenance. Photo: Queensland State Corridor Centre from Sydney, Queensland Australia.

### Modelling technology poised to change construction

A recent survey revealed that business information modelling (BIM) is likely to make a big impact on the Australia and New Zealand construction market within the next few years.

BIM, the creation and use of digital models and related software processes among companies to leverage the value of its models and its models, were the subject of the report. The Business Value of BIM in Australia and New Zealand, released by McGraw Hill Construction (MHC) and Autodesk.

For the report, 835 industry professionals were surveyed: architects, engineers, general and specialty contractors, owners, consultants and other stakeholders using BIM – with 333 from Australia and 108 from New Zealand.

It found the awareness of BIM is high in Australia and New Zealand, but the commitment to and the use of the technology is still in the early stages compared with other major markets previously studied by MHC.

Several local partners also sponsored the study including Corridor Australia.

"Historically we are doing well, but compared with other regions, Australia is still behind the work in terms of commitment to and the use of BIM," Corridor Australia CEO, Megan Moran said.

"This means we have an opportunity to learn from elsewhere in the world, adopt best practice and deliver value for money solutions for all parties."

Results also showed that local firms, though relative new BIM users, are already making plans to deepen investment in the technology over time of design and work. BIM is used more than 10% of those projects, while saying they will be increasing with BIM on more than 30% of their projects by the end of 2015.

"Recognising the value of BIM is critical. And if we are going to manage the delivery of the rail infrastructure complex projects we see today along with the world's best technology."

Responses from some users indicated their BIM budget is decreasing by one-third – lack of time and human resources was cited as the primary reason decreasing to not available – or a reduction of BIM's efficiency for quality.

BIM efficiency is highest among larger and engineering firms, according to the study. It also pointed out that most of the use in Australia and New Zealand is driven from firms.

This suggests that if the industry BIM efficiency is to increase, it will need to increase dramatically for smaller firms.

"For most users, now is when the time to BIM, as data suggests that the more challenging it will be for the competitors," senior director of Sydney Jones said.

Paul Englebert



Building information modelling allowed engineers and architects to work with steel details at the design of the new State Corridor Centre in Queensland.

CGI Engineers Australia / August 2014

## CORE - Steel Corridor Centre

"We had not completely finished modelling each section of the building as we sent the models to the detailer."

### BIM improves design process

Engineering consultancy CGI Engineers and the steel detailer is part of a design team of Peter Lyons Corridor Centre, recently under construction in Queensland. The approach was facilitated by building information modelling (BIM), particularly from 3ds Max and Revit software packages.

The high-rise steel design building and lower regional air gallery covers and display areas, rail and administration area. It has been designed to complement a surrounding facility that is planned to be built on the island. The \$1.2 billion project is scheduled to open to the public in August 2015.

CGI provided structural, architectural, civil, mechanical, electrical and building services engineering services to the team throughout the project.

CGI double. The main contractor is FWH Building and the steel detailer is part of a design team of Peter Lyons Corridor Centre, recently under construction in Queensland. The approach was facilitated by building information modelling (BIM), particularly from 3ds Max and Revit software packages.

According to CGI, the model shape and form of the building allowed them to coordinate elements more quickly and they saw BIM systems at various milestones and connections. The most challenging component was the external walls.

CGI said this approach resulted in less documentation and far fewer annotations than at the construction. It saved with drawings that were not highlighted straight away. It also allowed the design process also produced more efficient steel connections with less risk of variations.

"The communication between us and the steel detailer is paramount. We need to do as much as we could through the model. Because the way in which the program ran, we had not completely finished modelling each section of the building as we sent the models to the detailer," Peter said.

By such as that during construction, the early to the steel framework showed in the steel frame was the advantage of the steel detailer which had been drilled incorrectly in the construction shop.

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### BIM helps deliver RAIL PROJECT

Building Information Modelling is playing a key role in Sydney's North West Rail Link create looks at how the software is used from conception to decommissioning.

Expected to open in 2016, the North West Rail Link will be the first fully integrated rail system in Australia. It's planned to change the way people in one of Sydney's largest growing business hubs about transportation.

Professional services firm, SHoP, is leading the design effort on two parts of the project: operations, maintenance and safety, and safety. SHoP is also leading the design effort on the North West Rail Link. The rail line is the world's longest underground rail line built in a single phase, performing the use of Building Information Modelling (BIM) on the project.

BIM is an integrated model-based process that adds insight to every phase of construction projects. "The team wanted to define the form, fit, and quality before you see with a traditional process," explains Paul Davis, SHoP's Director of Design and Team Structure.

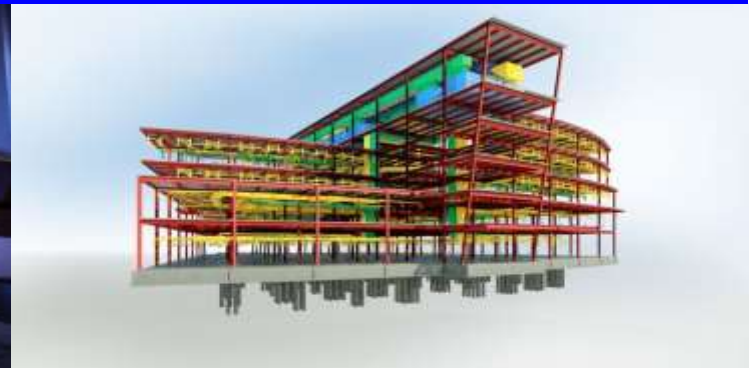
"The North West Rail Link project required us to coordinate the pace of our BIM adoption - and BIM is planned to be an iterative work of the project."

Longer rail tunnel The North West Rail Link will feature eight new 4,375 metre-long rail parking spaces and 100,000 sq m of parking spaces for commuters and visitors.

Elements of this new and complex require developed management - and project execution in the virtual domain. Long-term team members, including safety, operations, and information management, are contributing to a full-scale design process.

SOFTWARE

# TERIMA KASIH THANK YOU



19<sup>th</sup> October 2016



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