

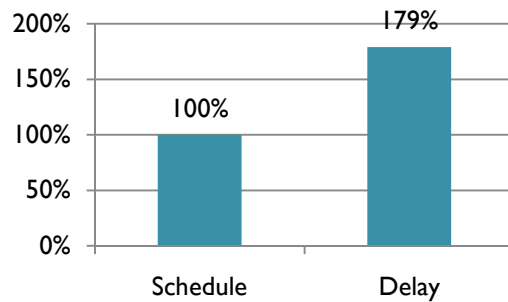
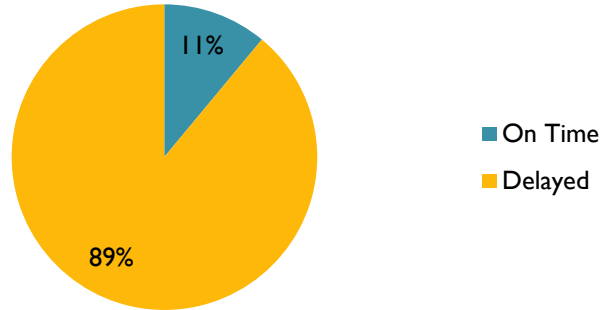
# ADDRESSING COST AND TIME OVERRUNS USING BIM

Dr. Ashwin Mahalingam, IIT-Madras  
3<sup>rd</sup> Nov, 2018

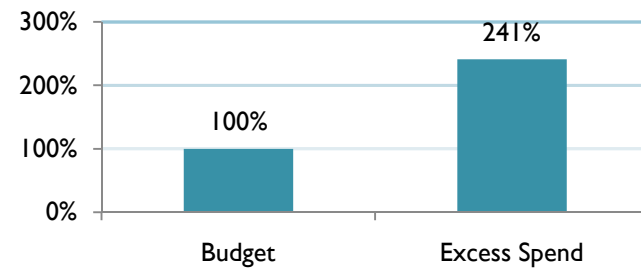
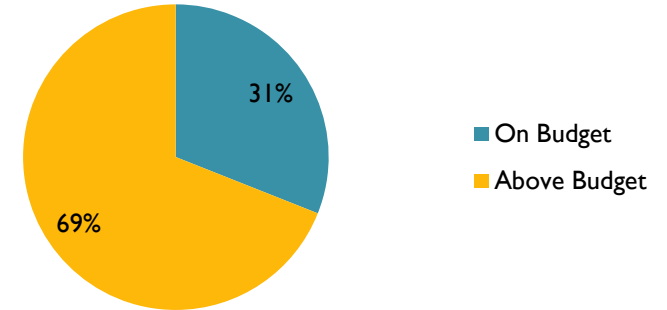


# Key Problem: Time and Cost Overruns

## Time Overruns




## Cost Overruns



# What's the Problem?



Drawing  
Unavailable



Errors in  
Drawing

# COORDINATION



Material  
Unavailable

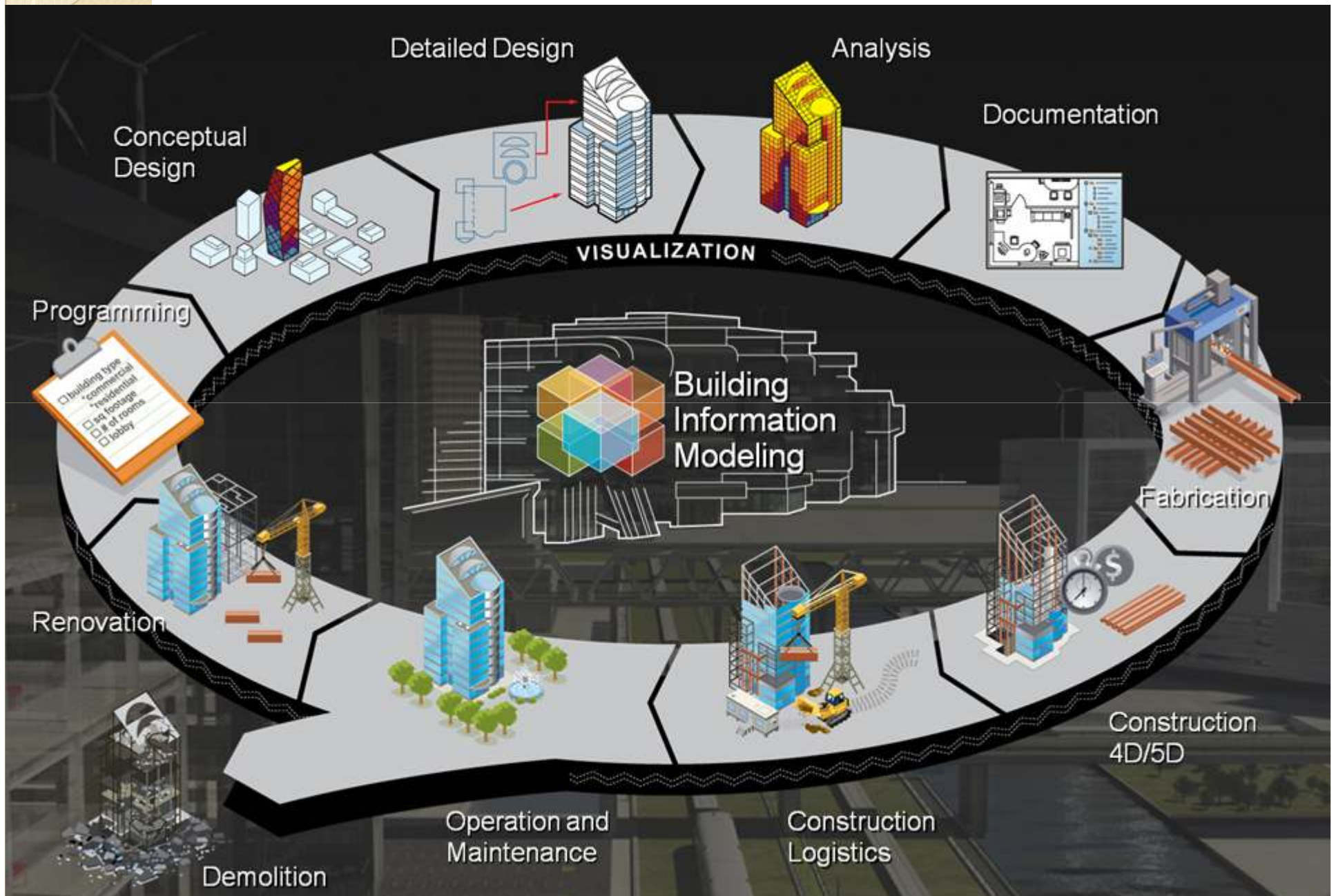


Work-Front  
Not Free

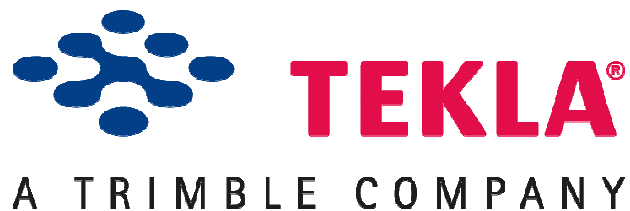


Labour  
Unavailable

# What is BIM?



# Who Provides BIM?





# BIM DELIVERABLES

DESIGN

CONSTRUCTION

OPERATIONS

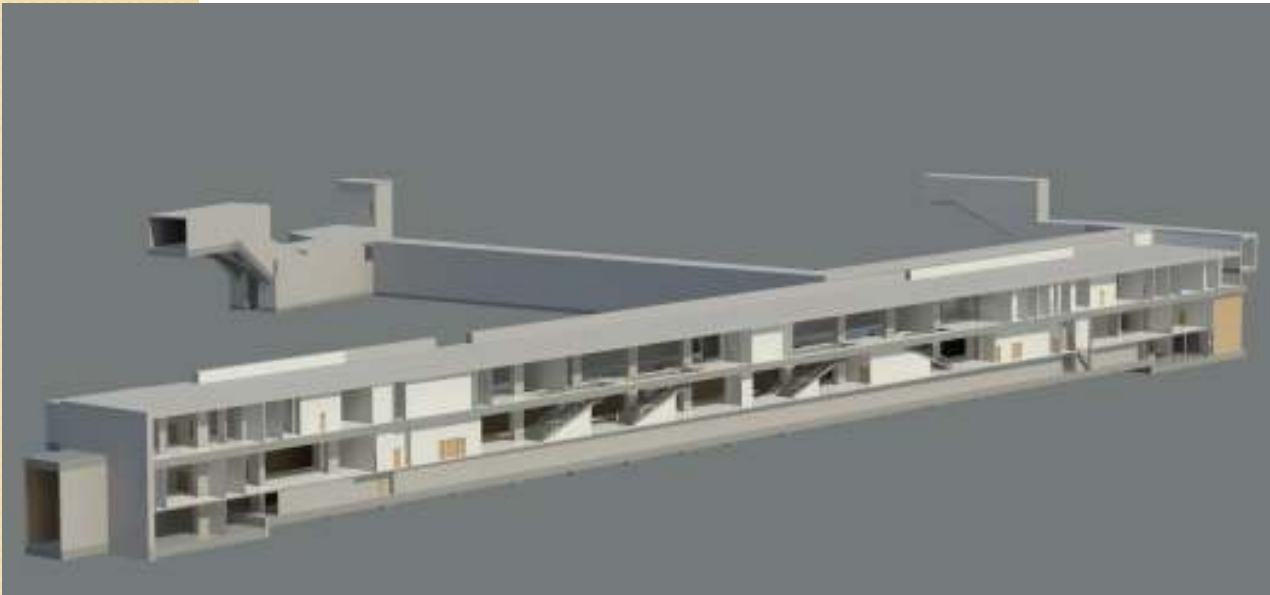
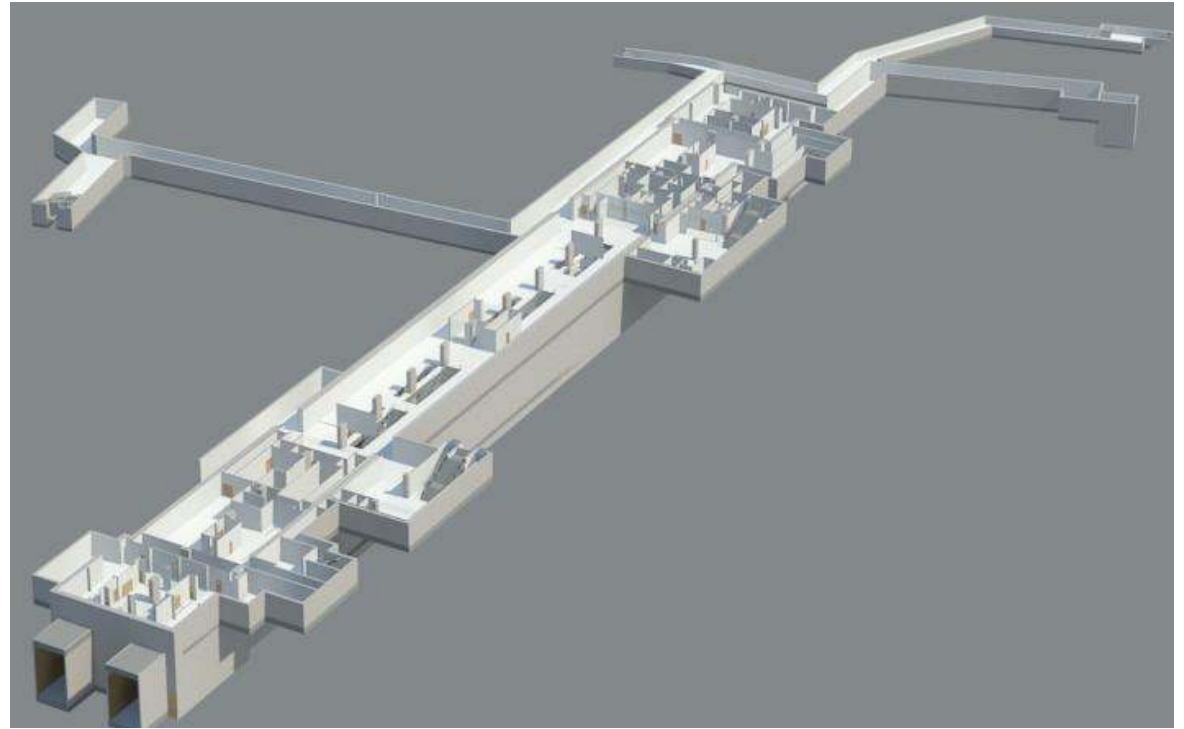


Visualisation/Walkthrough

Generate drawings



# 3D Rendered Views



# BIM DELIVERABLES

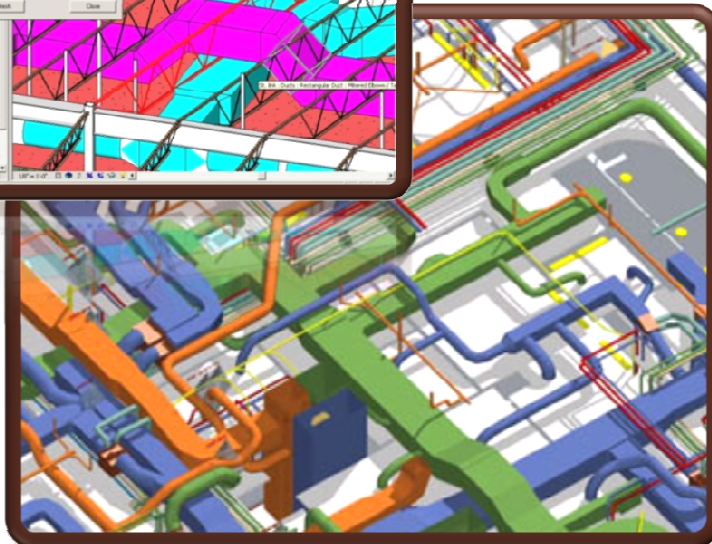
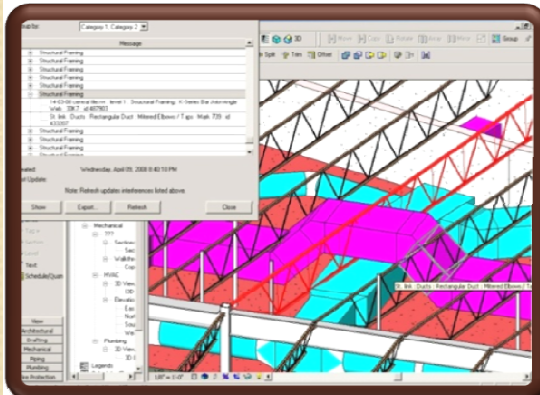
DESIGN

CONSTRUCTION

OPERATIONS



Compare and analyse different design alternatives



Clash Detection/Design coordination





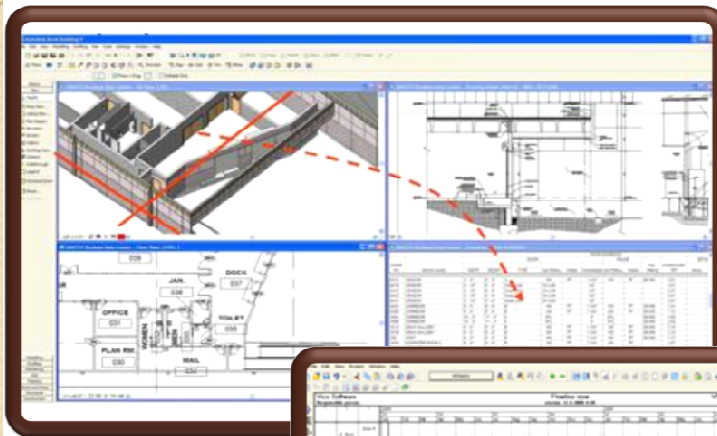


# BIM DELIVERABLES

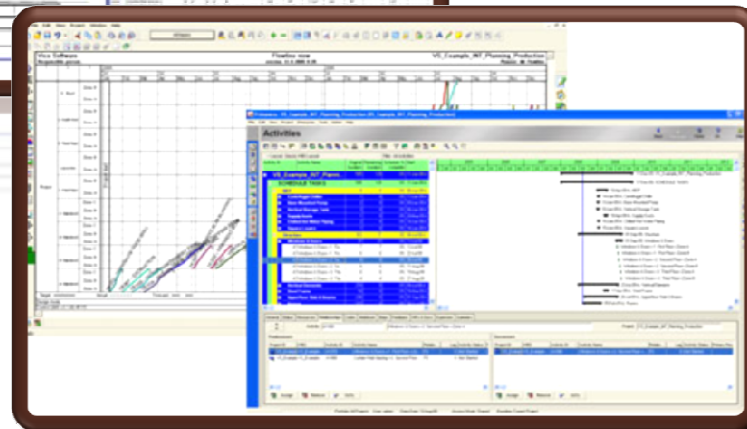
DESIGN

CONSTRUCTION

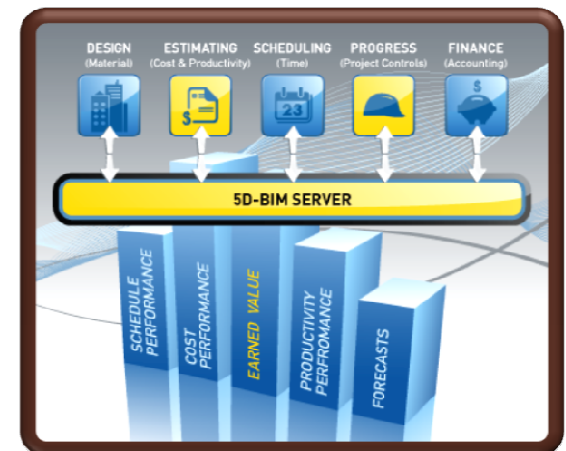
OPERATIONS



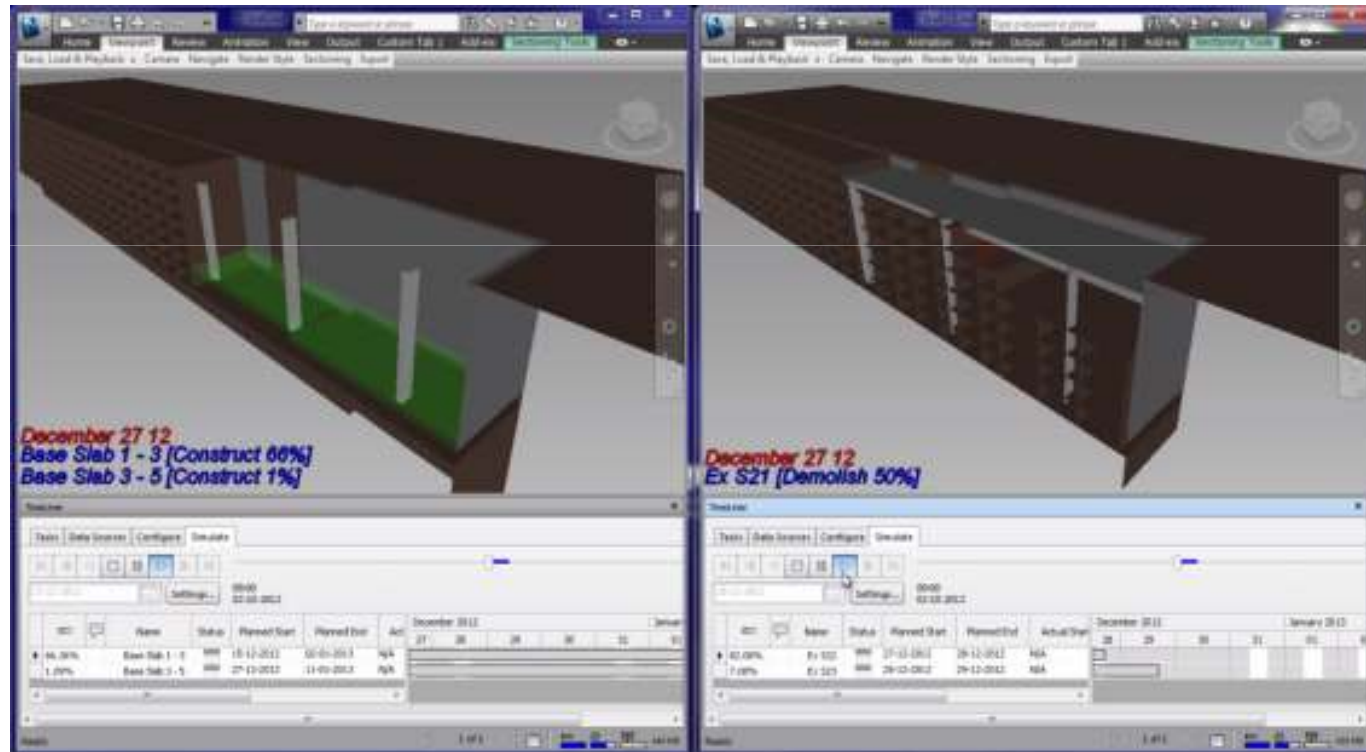
Construction schedule development (sequencing) -4D



Cost analysis and estimation (5D)



# Simulations



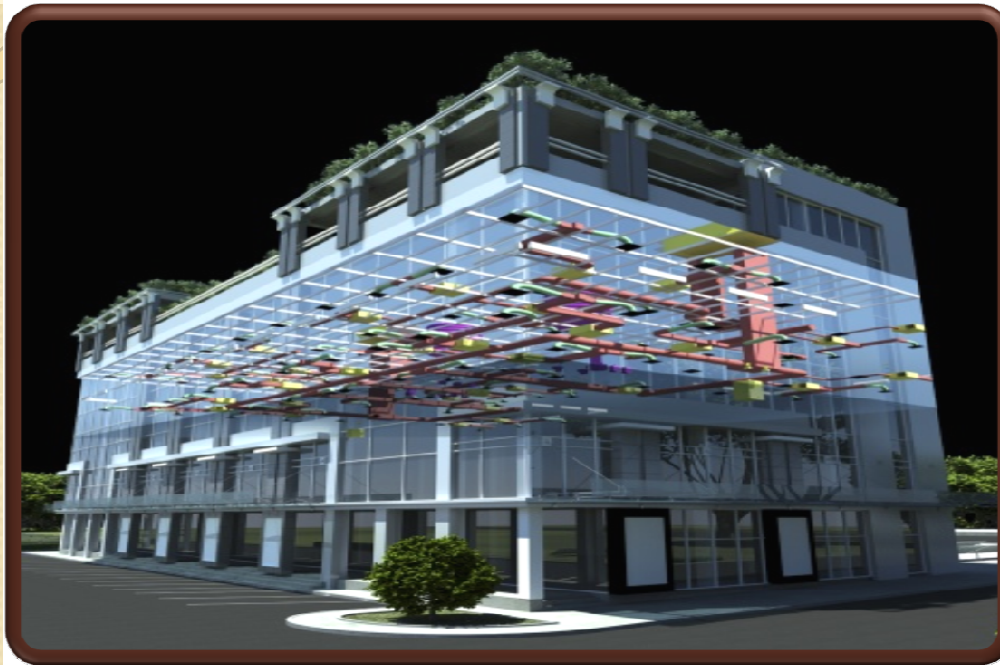


# BIM DELIVERABLES

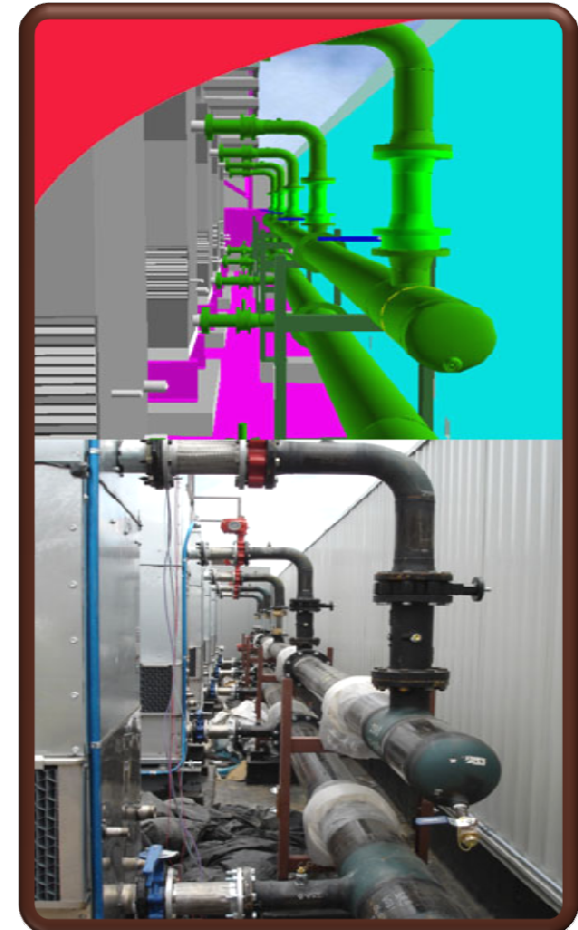
DESIGN

CONSTRUCTION

OPERATIONS



- Generate "as-built" models
- Repair strategy development
- Emergency response planning

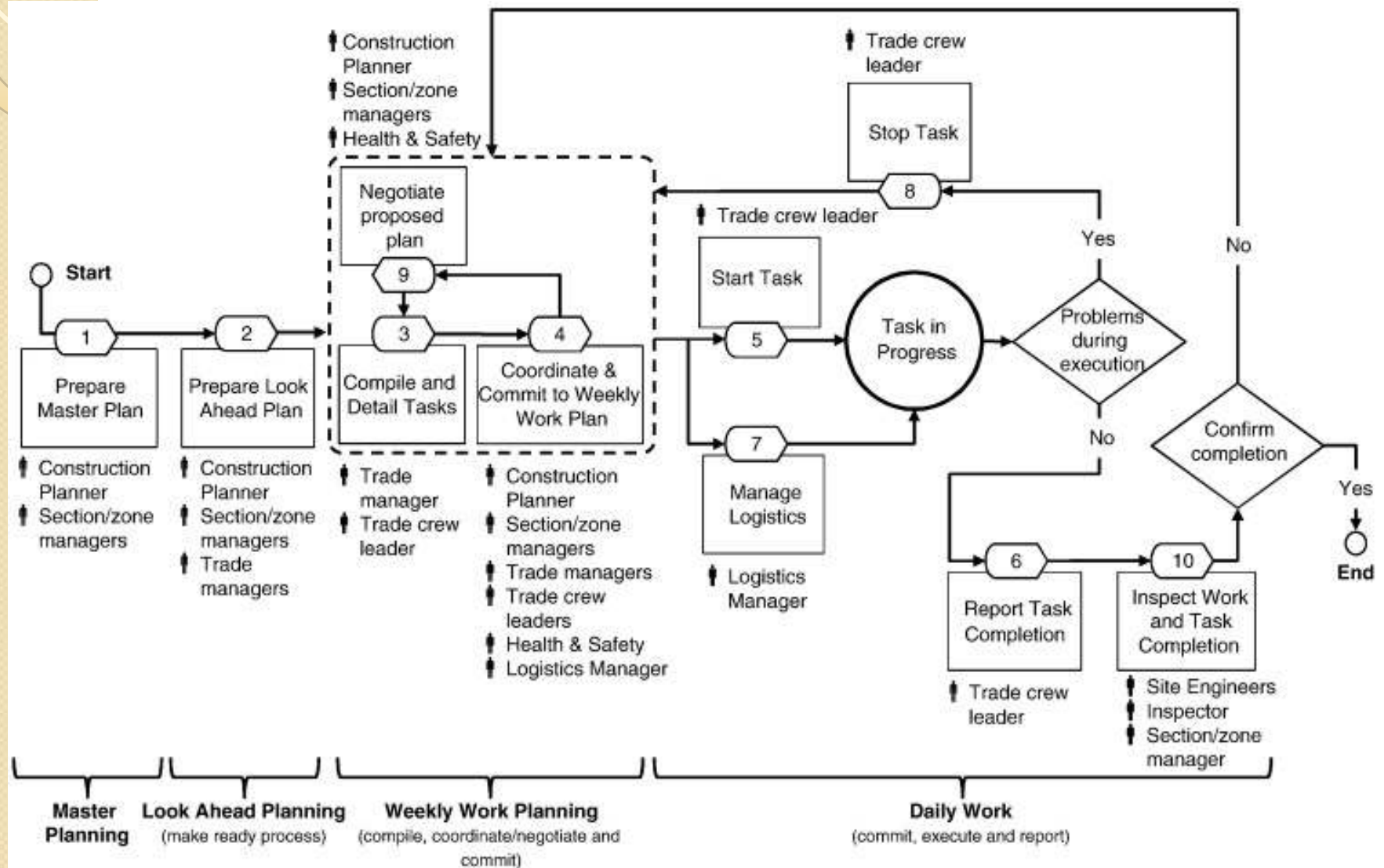




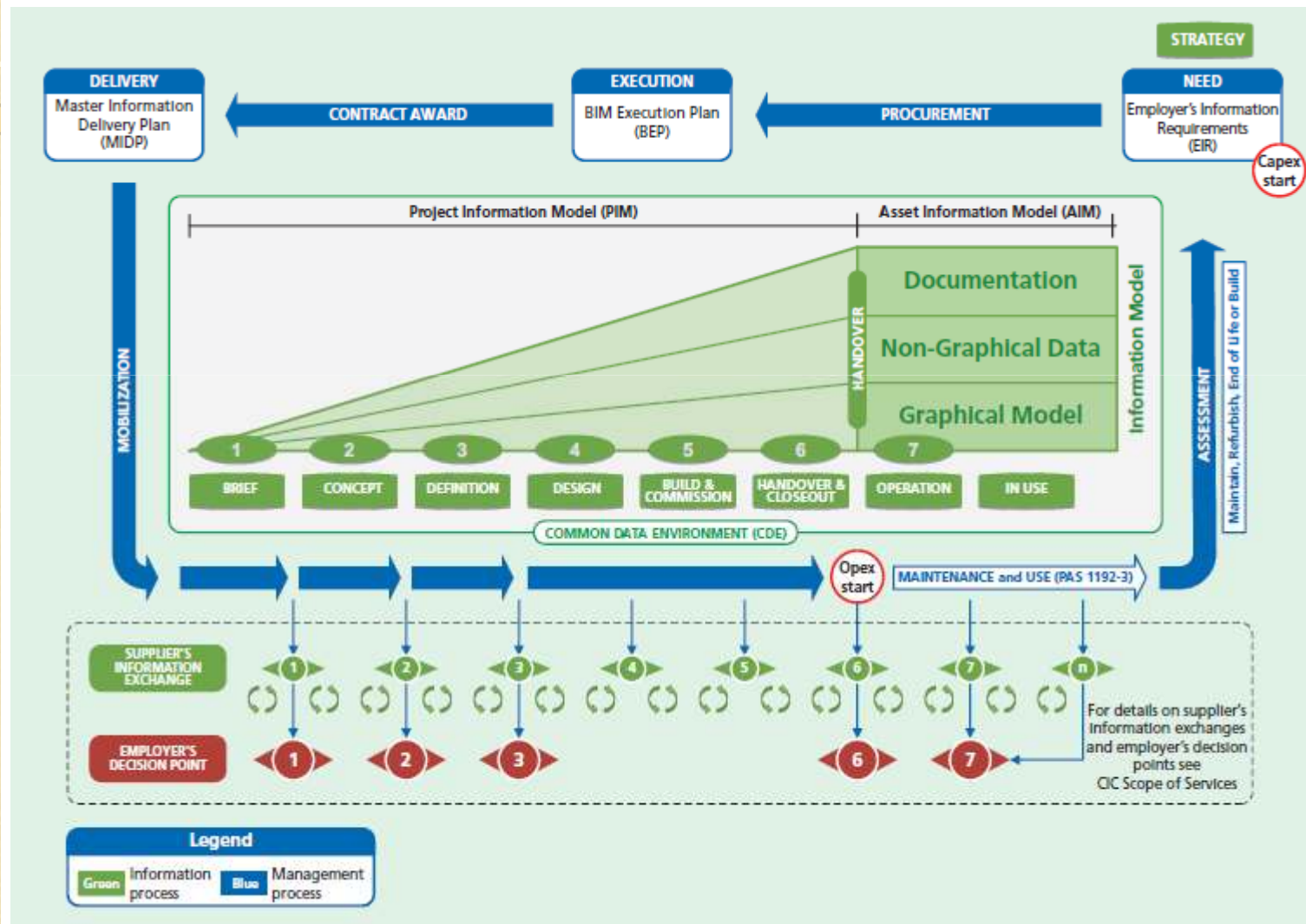
# DOES IT WORK IN INDIA?

S.No	Metric	Definition	Target
1.	Schedule Delays Avoided	Proportion of delays that could have been saved by coordinating with BIM	<u>25%</u> (8 months)
2.	Cost Savings	Extra amount spent on rework project that could have been avoided through BIM	<u>4%</u>
3.	Savings in Estimation	Time that could have been reduced while preparing an estimate	<u>48%</u>
4.	Drawing Generation	Reduction of time for drafting and document preparation	<u>52%</u>

# Need Tech + Process



# I: Product and System definitions: BIM Execution Plans



## 2: Coordination Mechanisms



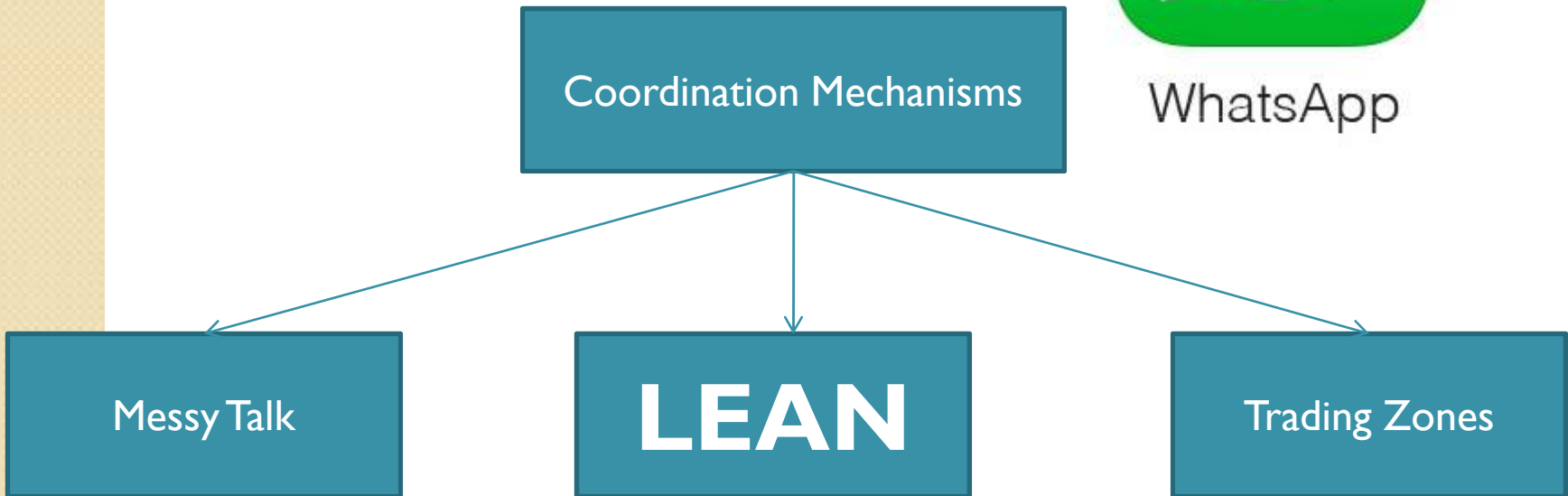
WhatsApp

Coordination Mechanisms

Messy Talk

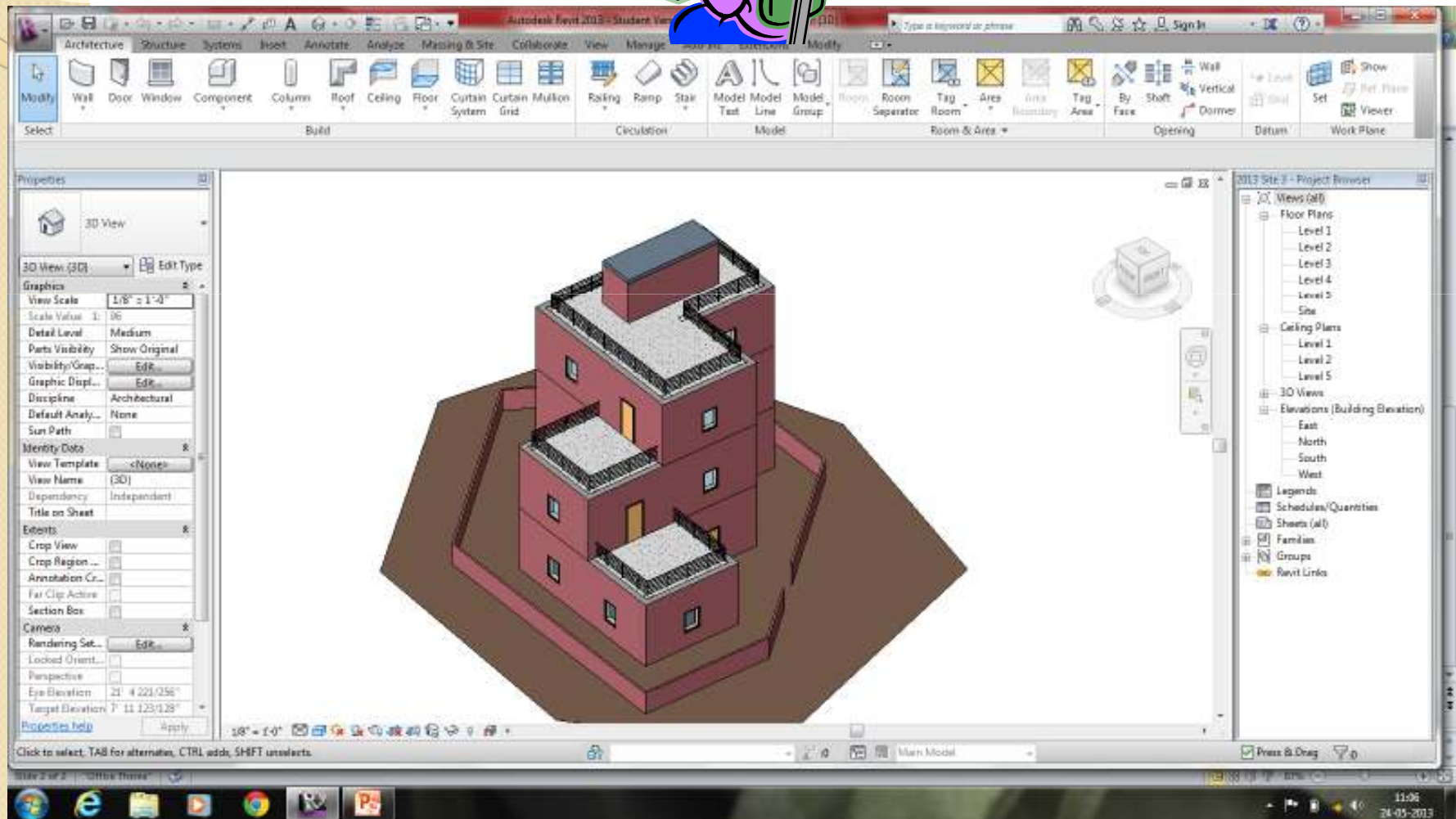
**LEAN**

Trading Zones





# I. DESIGN MODEL IN BIM



# 2. DETECT CLASHES IN BIM



The screenshot shows the Autodesk Navisworks Manage 2014 (STUDENT VERSION) interface. The main window displays a 3D wireframe model of a building structure with a red vertical bar and a green horizontal bar. The interface includes a menu bar (Home, Viewpoint, Review, Animation, View, Output, Render), a ribbon with various tool icons, and a Clash Detective panel on the left. The Clash Detective panel shows a table of clash results and a list of detected clashes.

Name	Status	Clashes	New	Active	Reviewed	Approved	Resolved
Test 1	Partial	9885	9885	0	0	0	0
Test 1	New	0	0	0	0	0	0
Test 1	New	0	0	0	0	0	0
Test 1	New	0	0	0	0	0	0
Test 1	New	0	0	0	0	0	0

Name	Status	Found	Approv...	Approved	Descri...
Clash1	New	11:56:37 24-05-2013			Hard
Clash2	New	11:56:37 24-05-2013			Hard
Clash3	New	11:56:37 24-05-2013			Hard
Clash4	New	11:56:37 24-05-2013			Hard
Clash5	New	11:56:37 24-05-2013			Hard
Clash6	New	11:56:37 24-05-2013			Hard
Clash7	New	11:56:37 24-05-2013			Hard
Clash8	New	11:56:37 24-05-2013			Hard
Clash9	New	11:56:37 24-05-2013			Hard
Clash10	New	11:56:37 24-05-2013			Hard
Clash11	New	11:56:37 24-05-2013			Hard



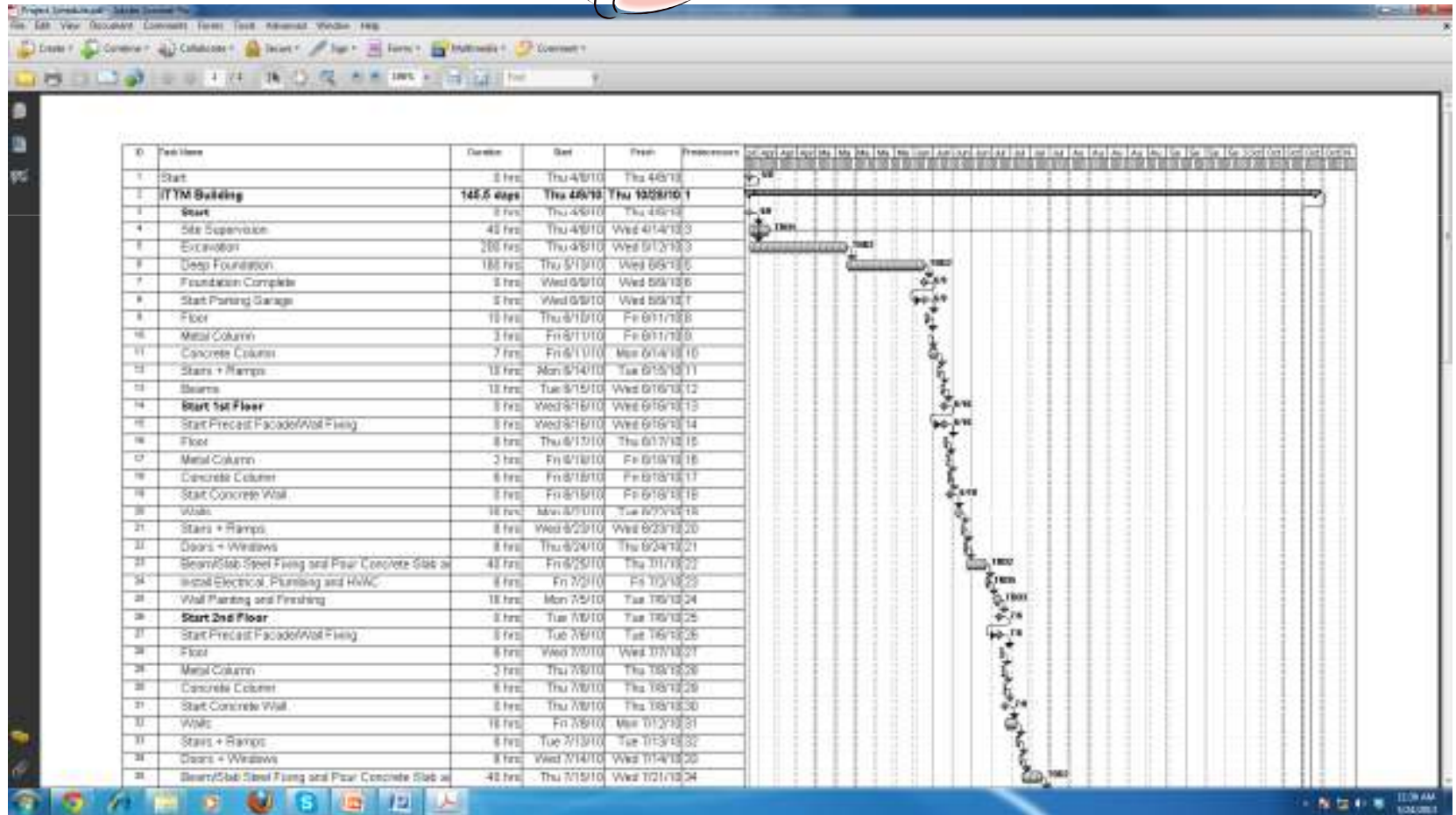
# 3. DEVELOP A BOQ WITH BIM. USE THIS FOR TENDERING



The screenshot displays the Autodesk Revit software interface. The main window shows a schedule titled 'Multi-Category Material Takeoff 2'. The schedule table contains the following data:

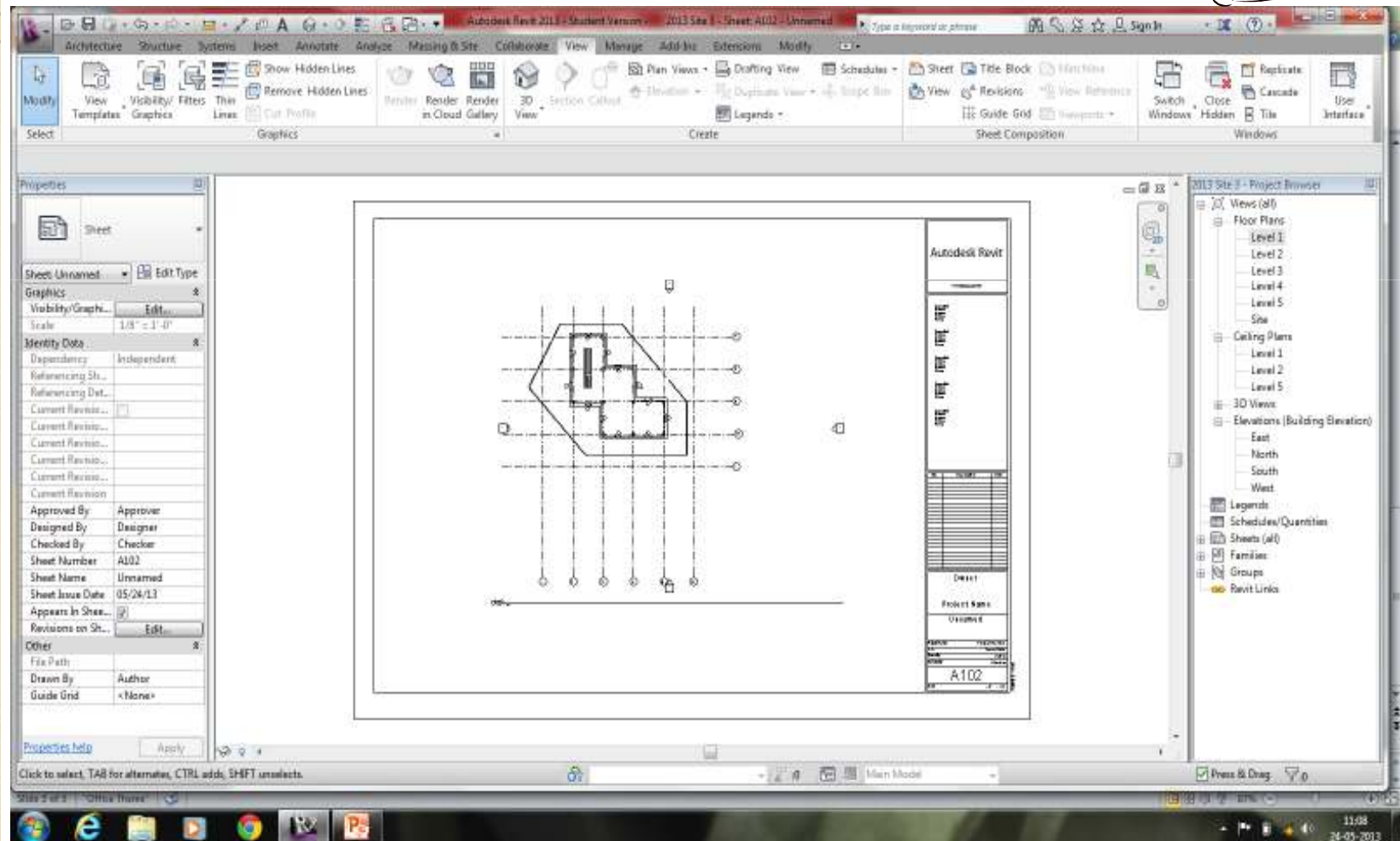
Assembly C	Assembly Del	Category	Family	Manufacture	Material Area	Material Vol	Material Mod
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
B10	Superstruc	Structural Co	Concrete		63 SF	18.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
A1010100	Footings & PE	Structural Fo	Footings-R		76 SF	36.88 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		206 SF	63.36 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		209 SF	103.14 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		206 SF	12.98 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		206 SF	52.18 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		208 SF	0.88 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		208 SF	0.88 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		203 SF	8.54 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		168 SF	51.27 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		185 SF	63.25 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		166 SF	10.48 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		187 SF	42.12 CF	
B2010150	Ext. Wall - Br	Walls	Basic Wal		168 SF	0.88 CF	

# 4. GENERATE A SCHEDULE USING PRODUCTIVITY ALONE

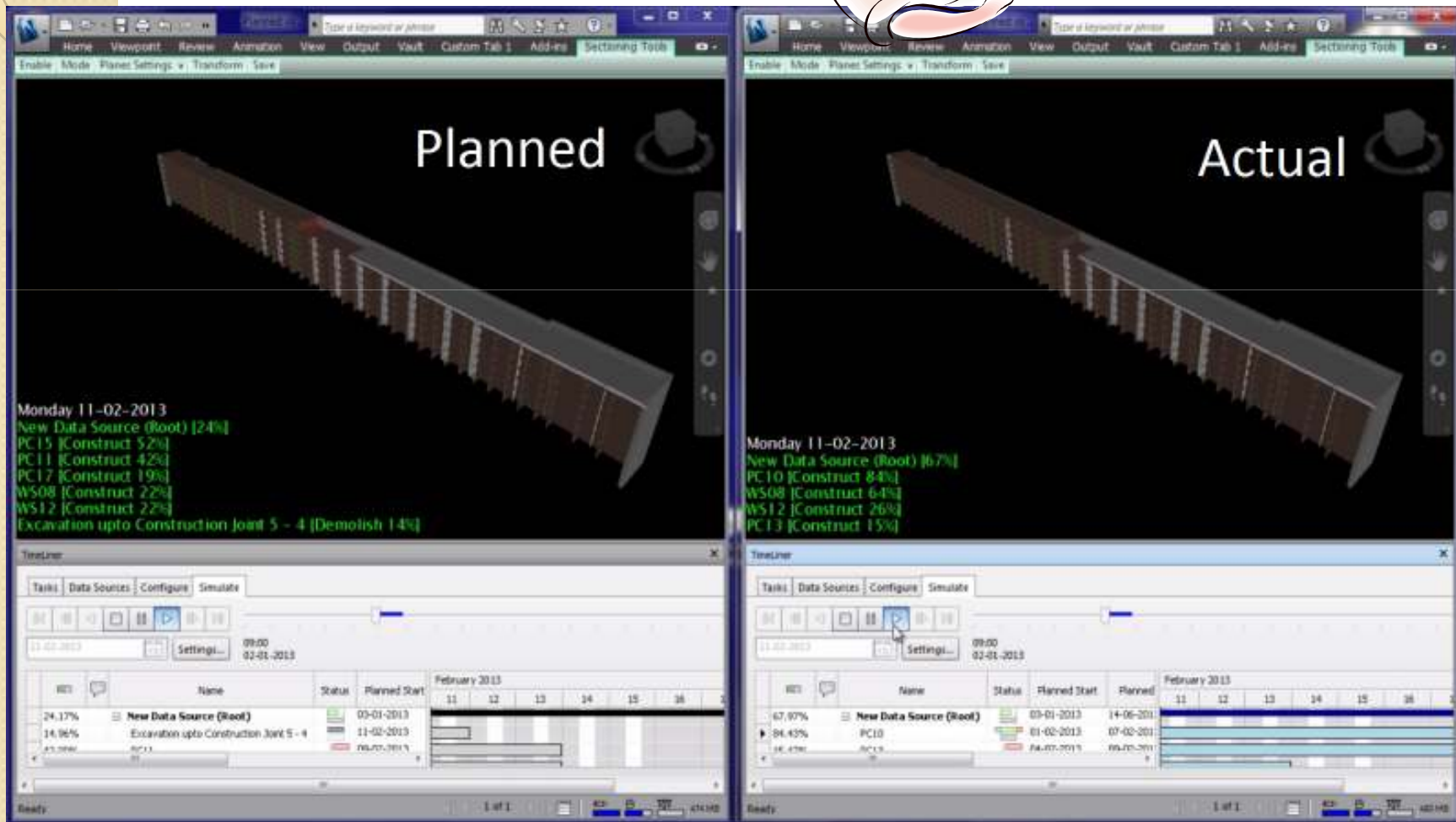




# 5. GENERATE 2D DRAWINGS FOR SITE WITH BIM



# 6. PLAN AND MONITOR WORK USING BIM

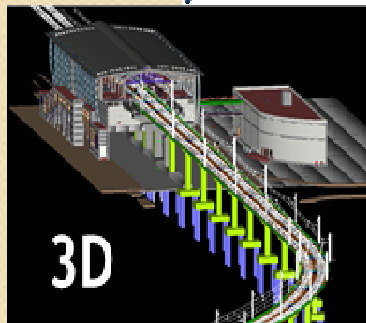


# Digital Project Management Solution @ Maha Metro: One

project one platform



2D

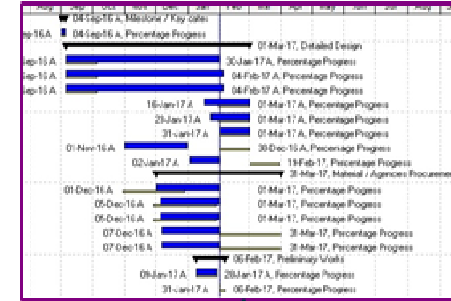


3D

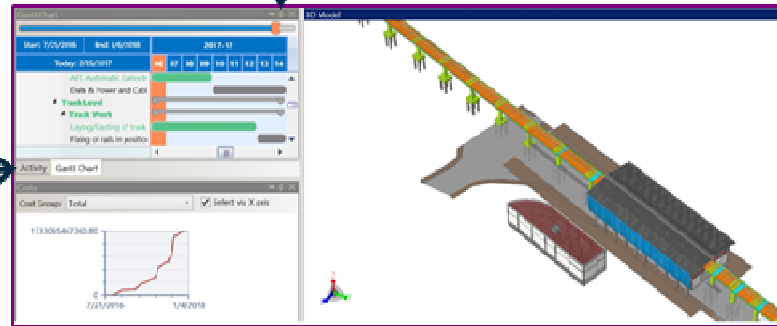


Project Structure: Description	Identification
R1 Stations	R1-SH9
R1 Stations	R1-SH9
Project Key Dates	R1-SH9_OKD
Execution Phase	R1-SH9_DDP
Viaduct	R1-SH9_DDP-VDT
Systems work	R1-SH9_DDP-VDT-S15
Viaduct 1 (P28 to P22)	R1-SH9_DDP-VDT-S15-1
Track Work	R1-SH9_DDP-VDT-S15-1-01
OHE Work	R1-SH9_DDP-VDT-S15-1-02
Signaling Work	R1-SH9_DDP-VDT-S15-1-03
Telecommunication Work	R1-SH9_DDP-VDT-S15-1-05
Power Supply Work	R1-SH9_DDP-VDT-S15-1-04
Viaduct 2 (P19 to P11)	R1-SH9_DDP-VDT-S15-2
Track Work	R1-SH9_DDP-VDT-S15-2-1
Section -1	R1-SH9_DDP-VDT-S15-2-1-01
Section -2	R1-SH9_DDP-VDT-S15-2-1-02
Power Supply Work	R1-SH9_DDP-VDT-S15-2-2
Section -1	R1-SH9_DDP-VDT-S15-2-2-1
Section -2	R1-SH9_DDP-VDT-S15-2-2-2
OHE Work	R1-SH9_DDP-VDT-S15-2-3

ACTUAL COSTS



SCHEDULE & PROGRESS



5D BIM

Enterprise Reporting

# What Benefits have accrued to Nagpur




Drawing Version Control



Detecting Clashes

**Reduced overruns, rework and errors**



Identifying gaps in the schedule



Automated Progress Alerts



Automated Asset Management



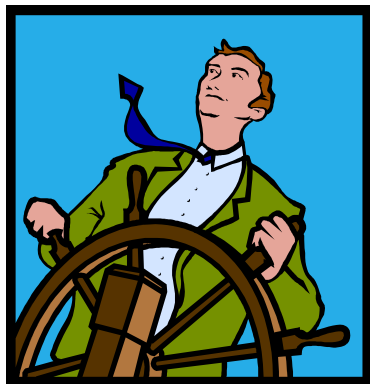
# The Keys to Success



**Contracts**



**Technology**



**Leadership**



**Processes**



**THANK YOU**