

# Building Information Modeling



# Fragmentation in Construction Industry

# Productivity of Construction Industry

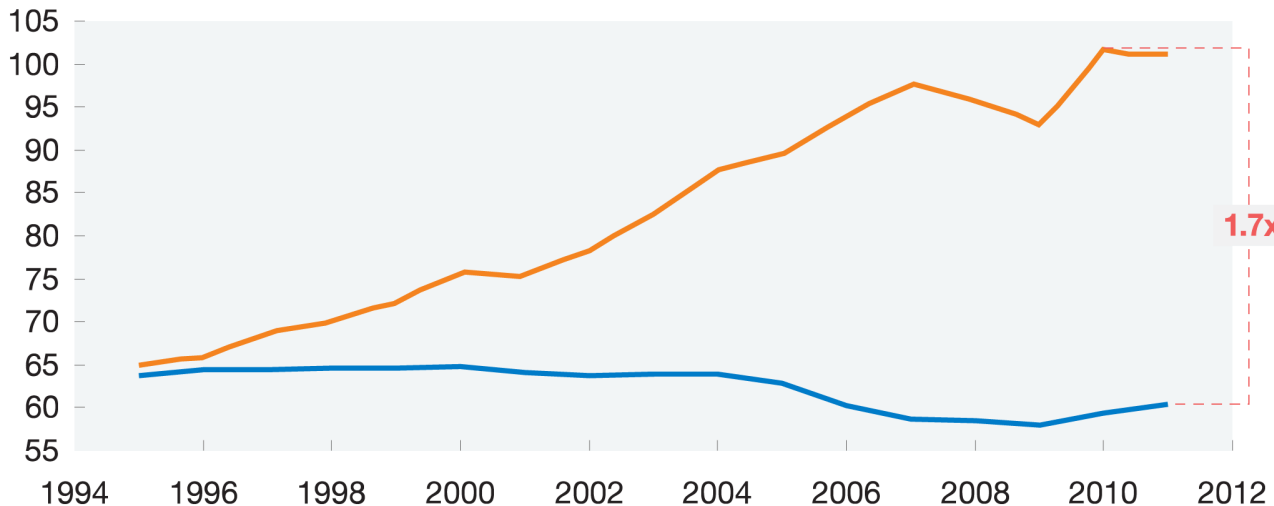
Productivity in manufacturing has nearly doubled, whereas in construction it has remained flat.

## Overview of productivity improvement over time

Productivity (value added per worker), real, \$ 2005

— Manufacturing  
— Construction

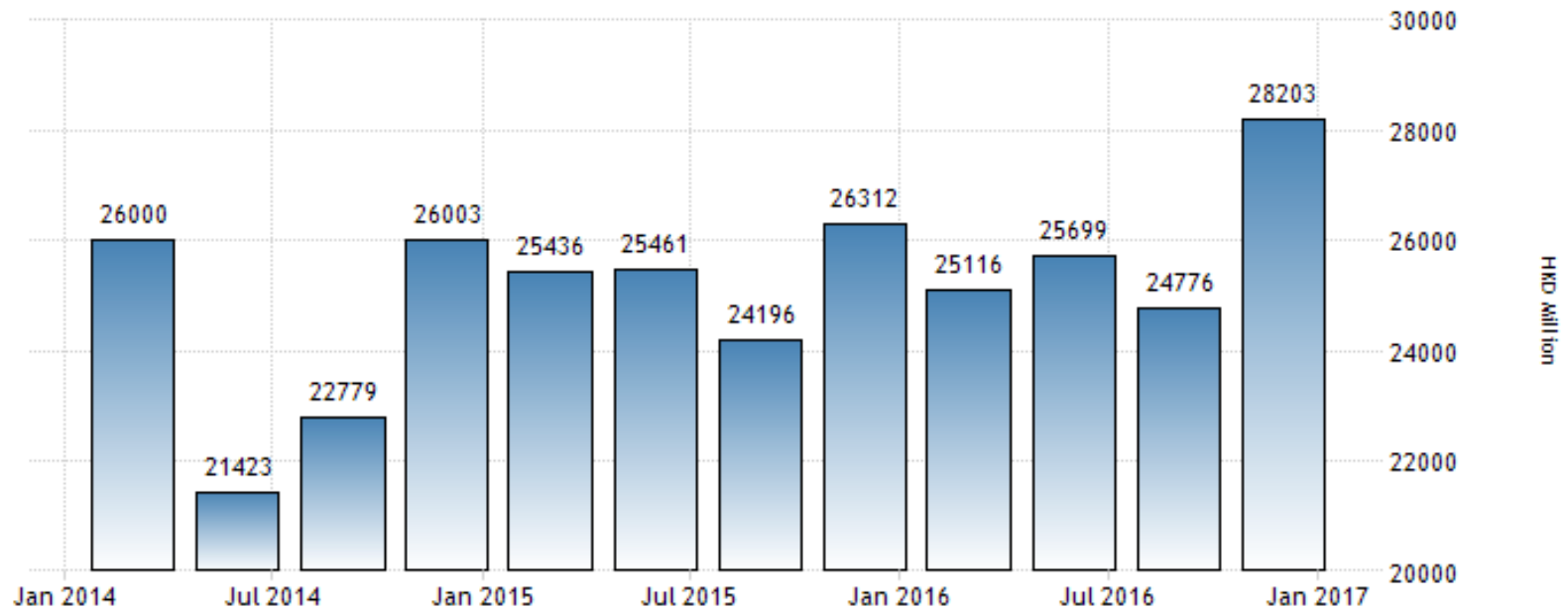
\$ thousand per worker



Source: Expert interviews; IHS Global Insight (Belgium, France, Germany, Italy, Spain, United Kingdom, United States); World Input-Output Database

McKinsey&Company

## HONG KONG GDP FROM CONSTRUCTION



SOURCE: [WWW.TRADINGECONOMICS.COM](http://WWW.TRADINGECONOMICS.COM) | CENSUS AND STATISTICS DEPARTMENT, HONG KONG

# Percentage Contribution of Construction to Total Employment & GDP

	Hong Kong		Shanghai		London		Singapore	
	% of GDP	% of Total Employment	% of GDP	% of Total Employment	% of GDP	% of Total Employment	% of GDP	% of Total Employment
Average 2000s	3.44	8.11	3.91	5.66	4.90	5.28	4.0	5.0

***P.S. Singapore Worksite productivity improved by about 1.2% per annual as measured as the total floor area constructed per man day from 2010-2013***

# Common Problems for Mega Project



# Causes of Low Construction Productivity in HK

- Increasing demand coordination due to high complexity of project
- Lack of communication between parties involved
- Poor construction planning and management

# Consequence of Low Productivity....

Year	Hong Kong Cost of construction ranking
2014	4th in the World
2015	4th in the World
2016	3rd in the World
2017	2nd in the World

From: Arcadis International Construction Costs Report

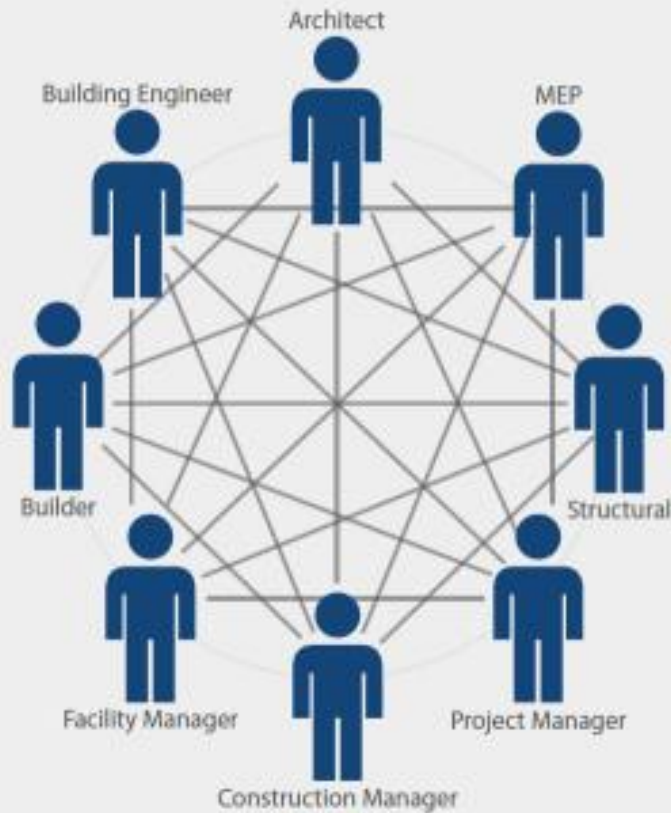
- Directly affect the price of homes and consumer goods
- The robustness of HK economy; competitiveness in the regional and global market



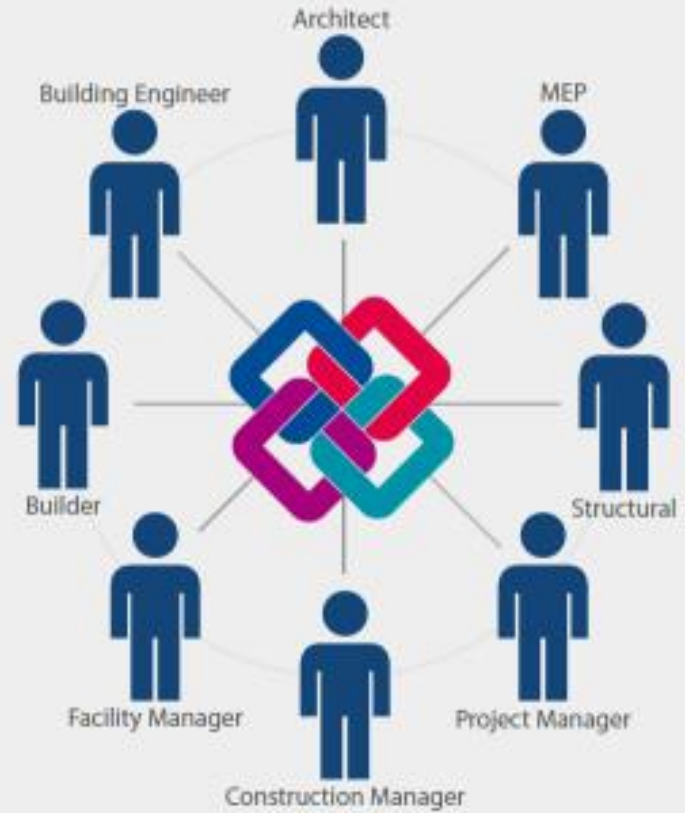
# Tipping Point for Change...



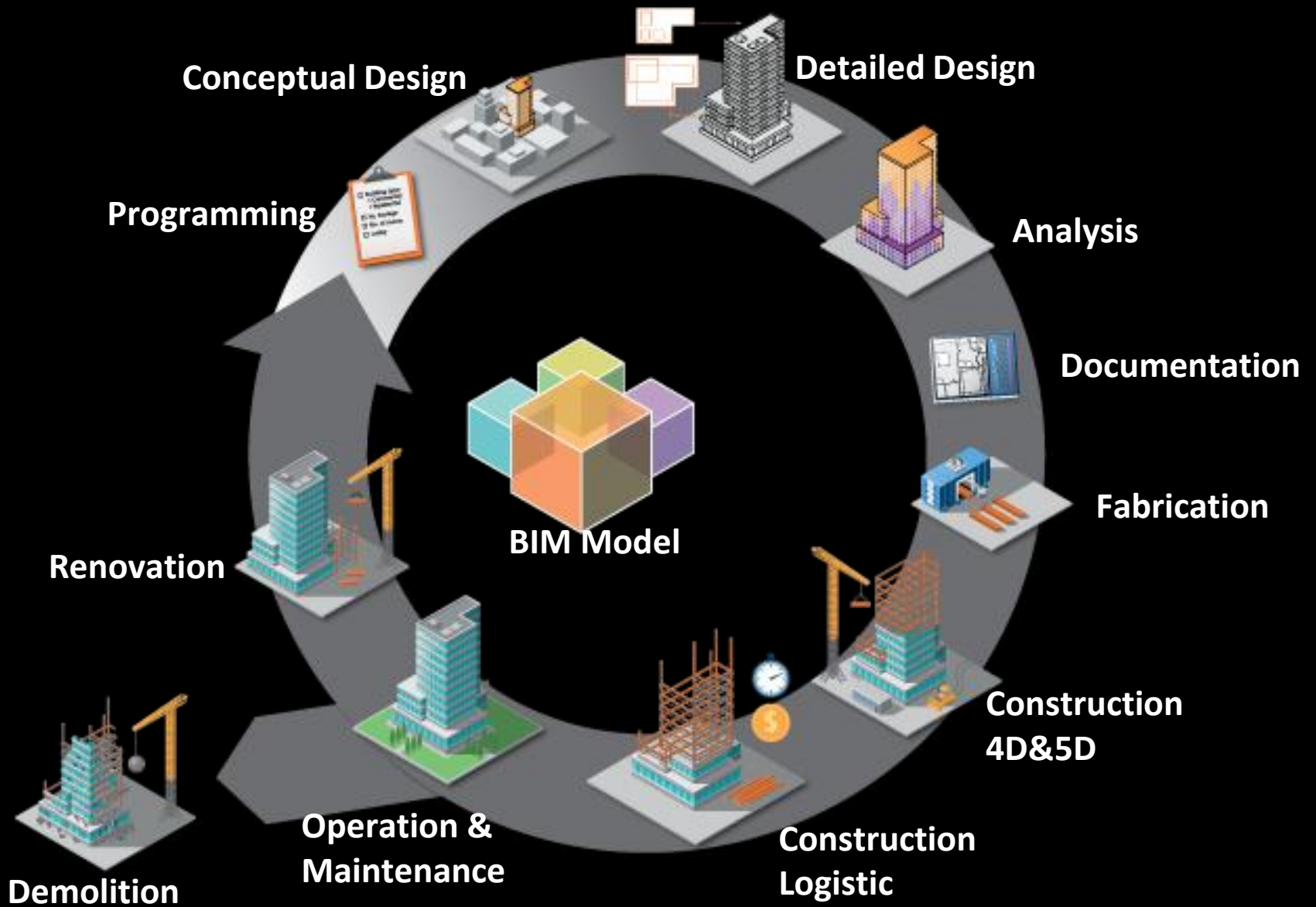
# BIM



Exchange of 2D Drawings



IFC/BIM Project Execution

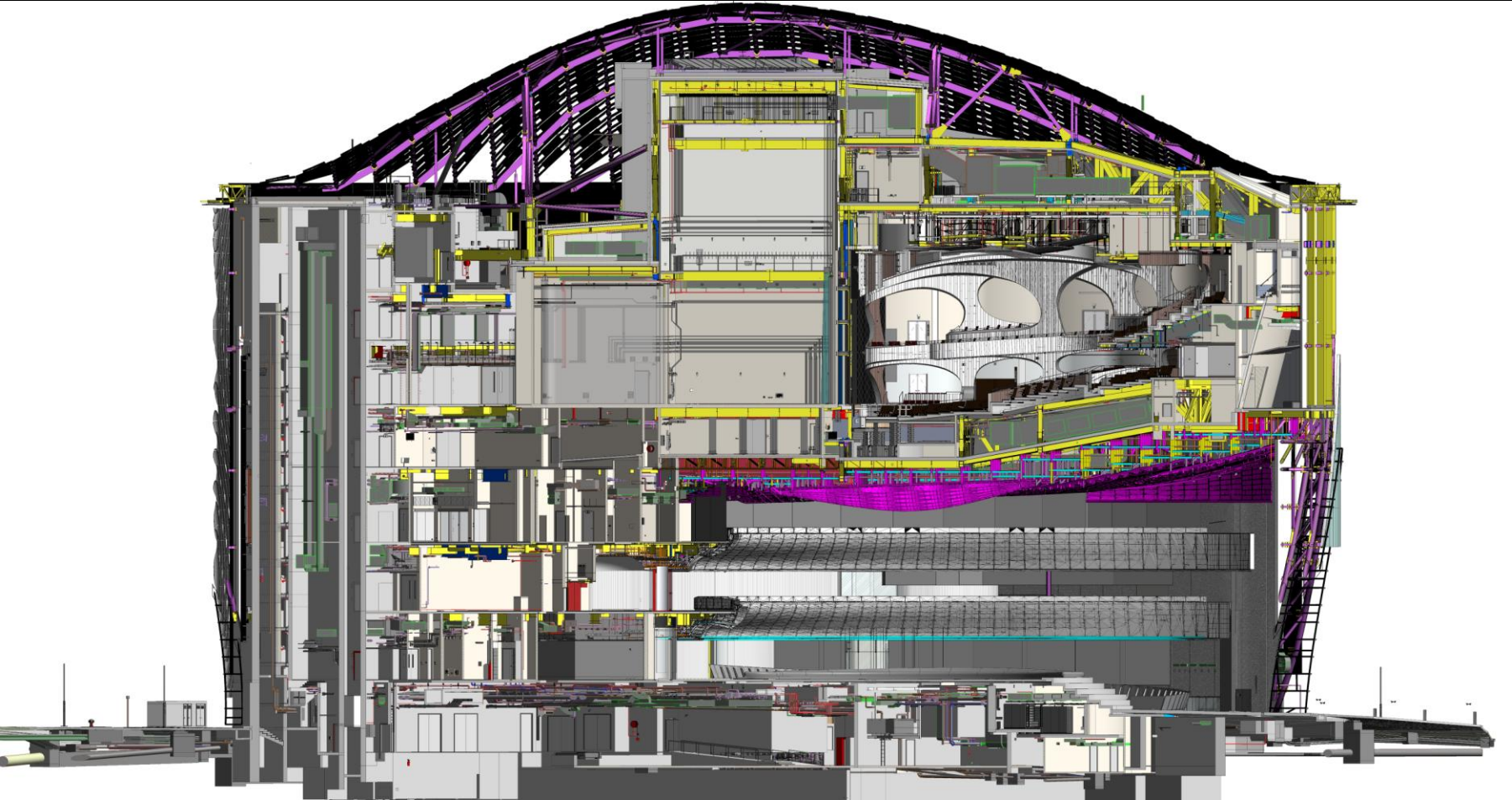


# BIM for Coordination, Planning & Safety.....

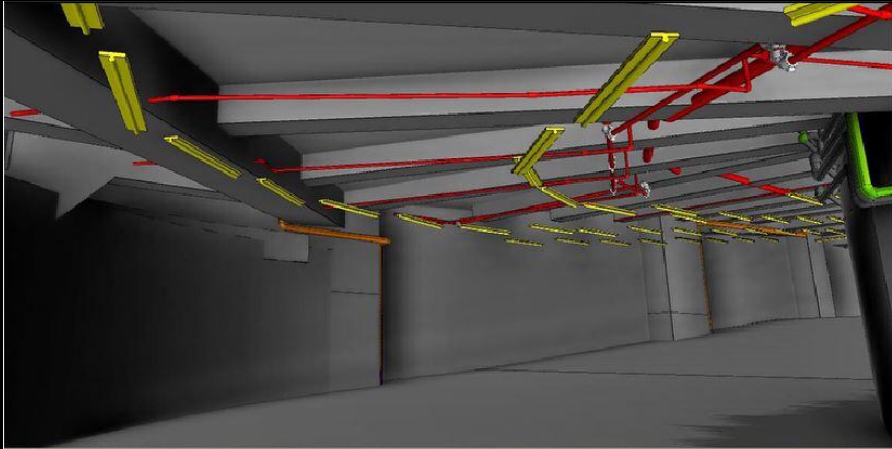
# Xiqu Centre



# Xiqu Centre

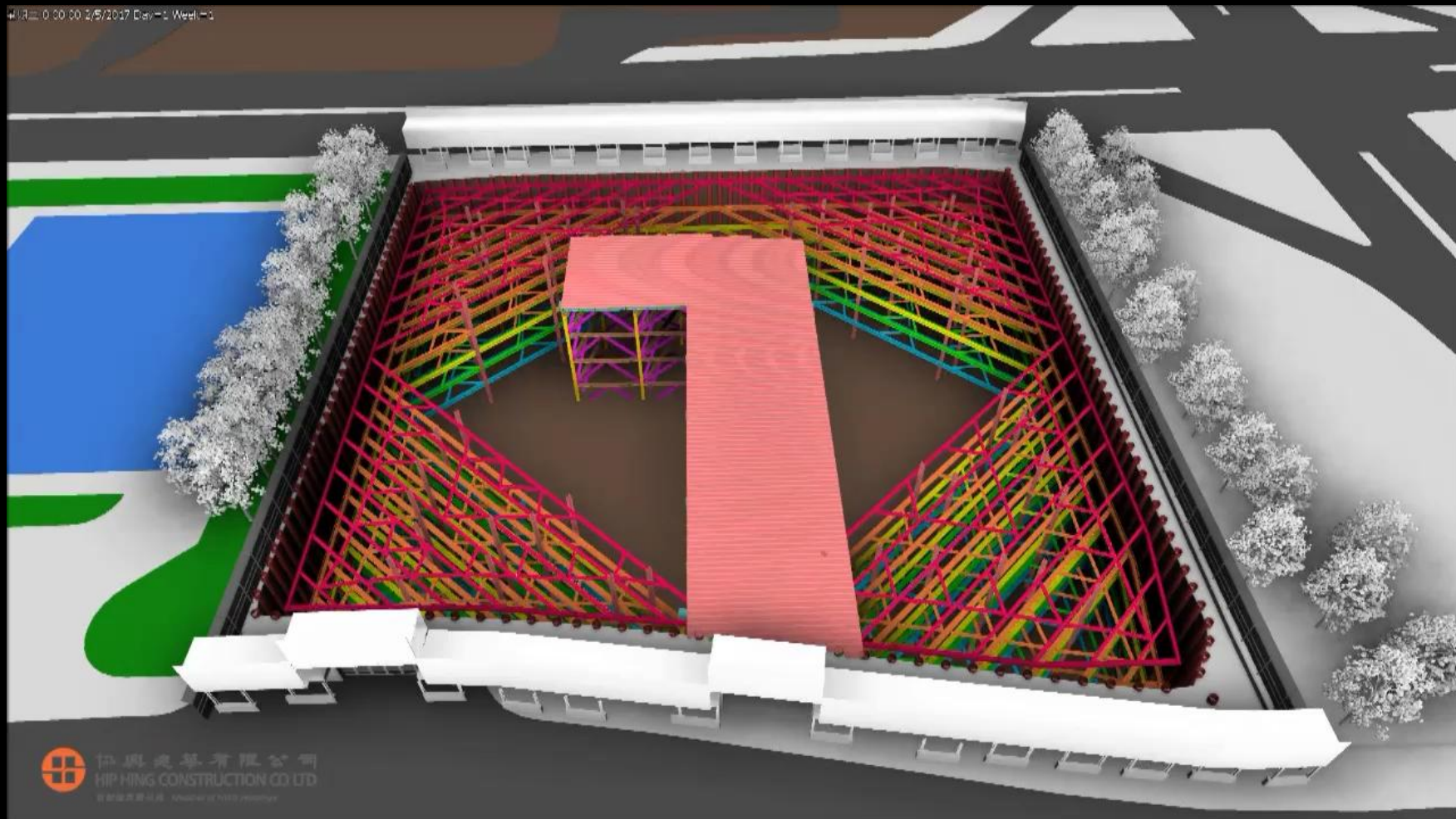


# Enhance Co-ordination



# 4D BIM

時間: 0:00:00 2/5/2017 Day: 1 Week: 1



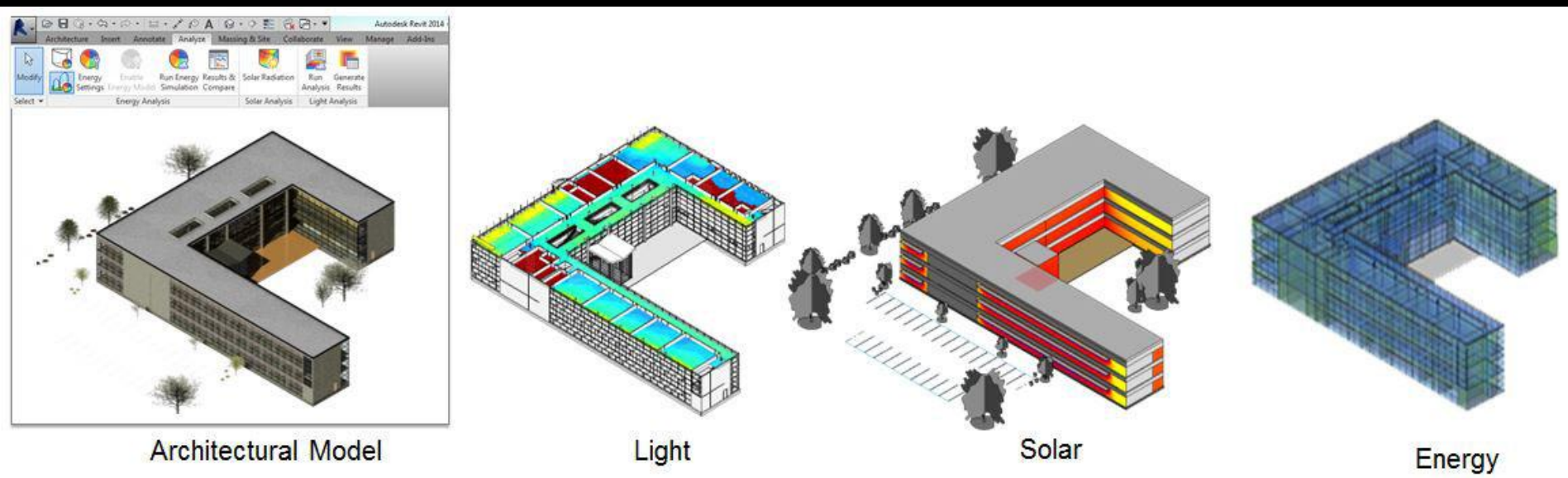


# 5D BIM for Cost Estimate

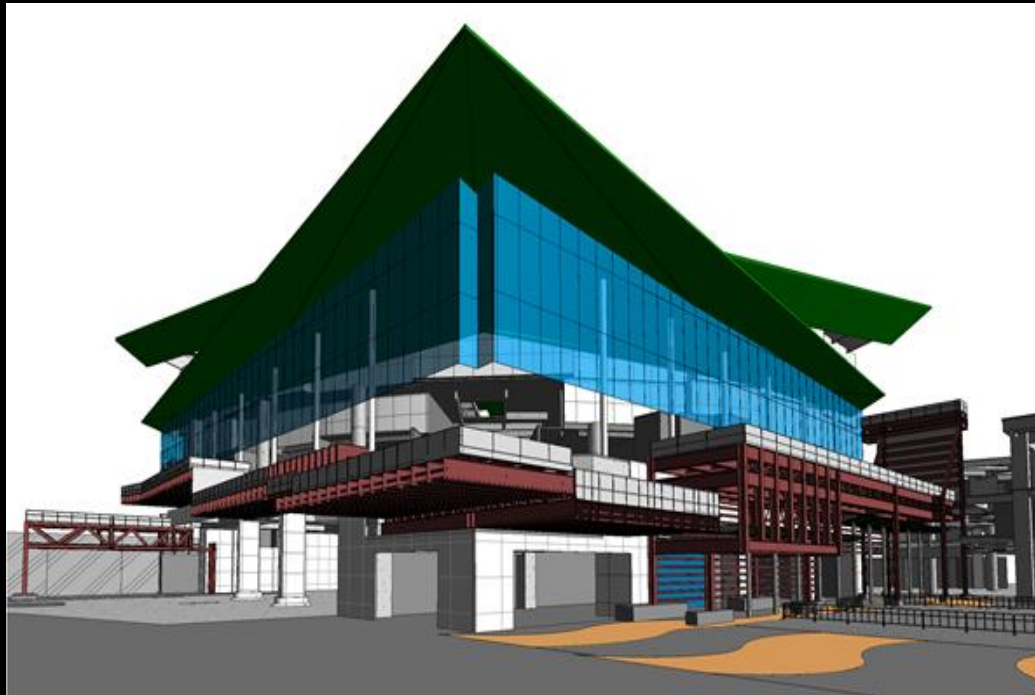
The screenshot displays the Revit software interface. The central view is a 3D exterior perspective of a modern building with a glass facade and a red brick section. On the right, a schedule window titled 'Revit\_Conference\_Center\_r2011.rvt - Schedule: Wall Material Takeoff' is open, showing a table of material quantities.

Material Name	Volume	Area	Type	Family
<b>Basic Wall: Cast In Place 10"</b>				
Concrete - Cast-in-Place Lightweight Co	2362.86 CF	2835 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	2154.87 CF	2586 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	1317.31 CF	1581 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	3155.71 CF	3787 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	1585.81 CF	1903 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	105.89 CF	127 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	353.75 CF	425 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	145.98 CF	175 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	145.98 CF	175 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	414.42 CF	500 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	37.47 CF	45 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	77.12 CF	93 SF	Cast In Place 10"	Bas
<b>Basic Wall: Cast In Place 10" Plaster 2 sides</b>				
Concrete - Cast-in-Place Lightweight Co	3441.11 CF	3591 SF	Cast In Place 10" Pl	Bas
Finishes - Interior - Plaster	3441.11 CF	3591 SF	Cast In Place 10" Pl	Bas
Concrete - Cast-in-Place Lightweight Co	3404.50 CF	3591 SF	Cast In Place 10" Pl	Bas
Finishes - Interior - Plaster	3404.50 CF	3591 SF	Cast In Place 10" Pl	Bas
<b>Basic Wall: Cast In Place 10" with Gyp</b>				
Metal - Furring	254.35 CF	265 SF	Cast In Place 10"	Bas
Finishes - Interior - Gypsum Wall Board	254.35 CF	265 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	254.35 CF	265 SF	Cast In Place 10"	Bas
Metal - Furring	263.17 CF	275 SF	Cast In Place 10"	Bas
Finishes - Interior - Gypsum Wall Board	263.17 CF	275 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	263.17 CF	275 SF	Cast In Place 10"	Bas
Metal - Furring	446.10 CF	466 SF	Cast In Place 10"	Bas
Finishes - Interior - Gypsum Wall Board	446.10 CF	466 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	446.10 CF	466 SF	Cast In Place 10"	Bas
Metal - Furring	227.61 CF	238 SF	Cast In Place 10"	Bas
Finishes - Interior - Gypsum Wall Board	227.61 CF	238 SF	Cast In Place 10"	Bas
Concrete - Cast-in-Place Lightweight Co	227.61 CF	238 SF	Cast In Place 10"	Bas
<b>Basic Wall: Cast In Place with GWB ea Side</b>				
Concrete - Cast-in-Place Lightweight Co	4112.27 CF	4486 SF	Cast In Place with	Bas
Finishes - Interior - Plasterboard	4112.27 CF	4486 SF	Cast In Place with	Bas
<b>Basic Wall: Concrete C1 - 1'-8"</b>				
Concrete - Cast-in-Place Concrete	11627.74 CF	7012 SF	Concrete C1 - 1'-8"	Bas

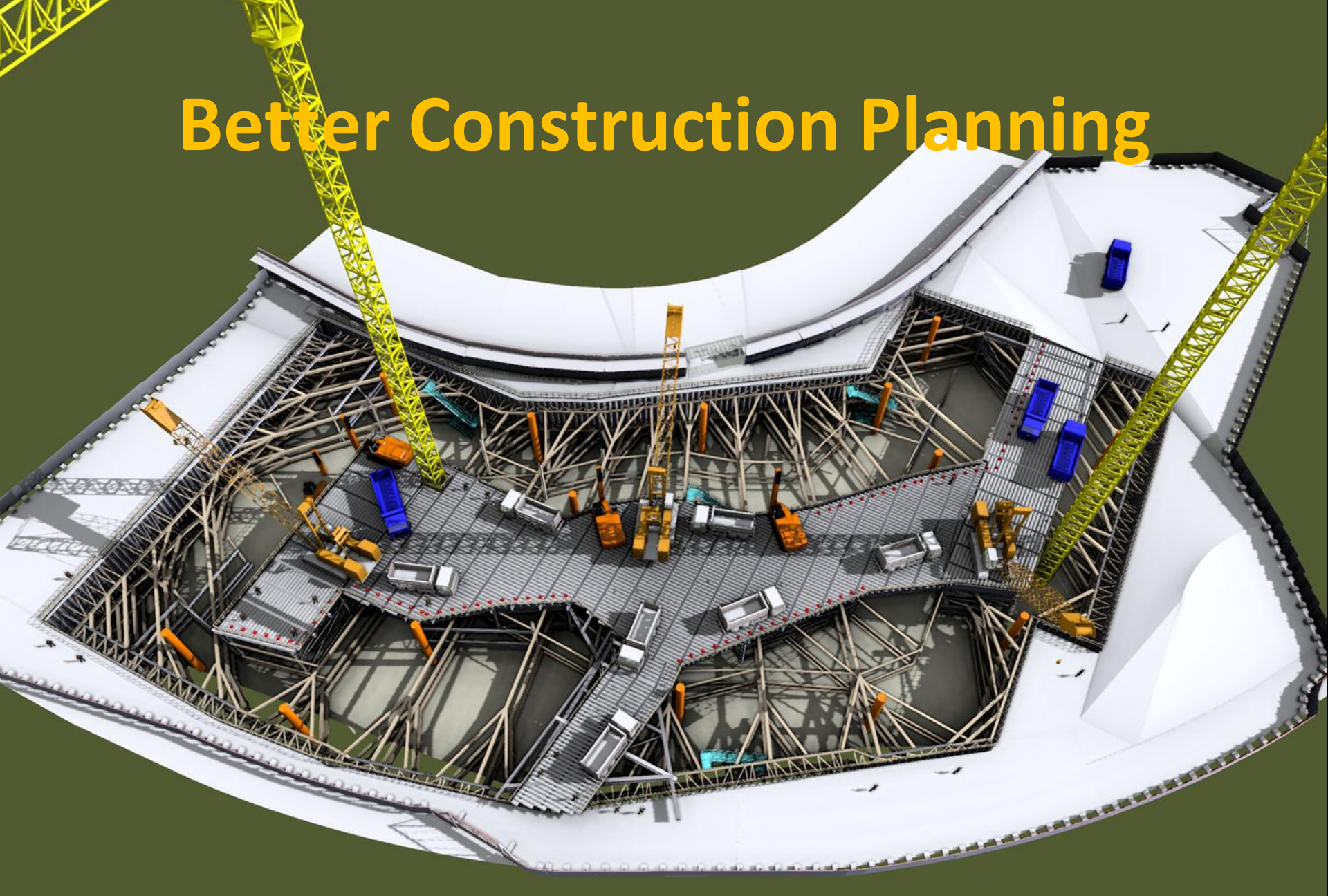
# 6D BIM for Sustainability Design



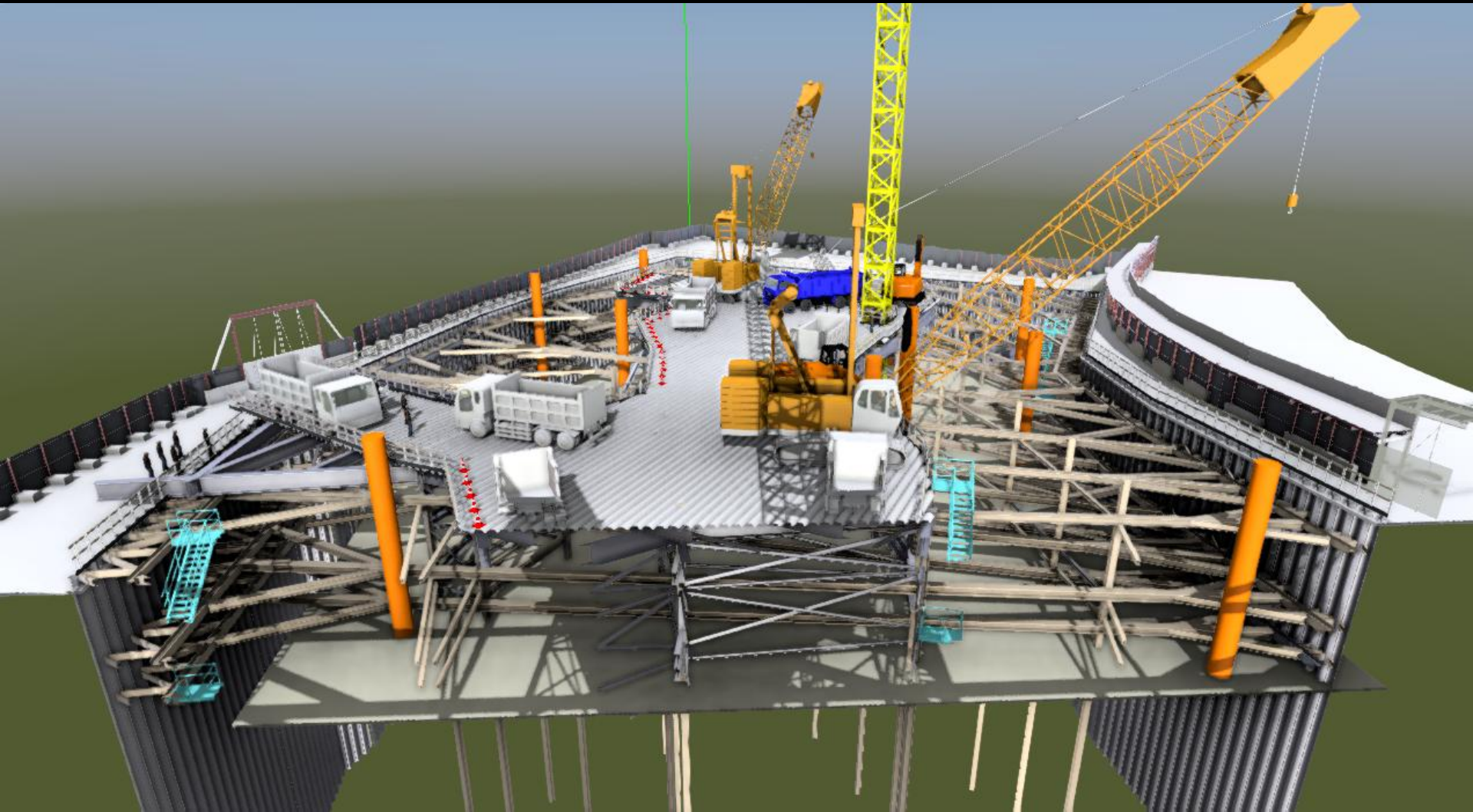
# BIM for Demolition Planning



# Better Construction Planning



# Site Logistic Planning



# BIM for Safety

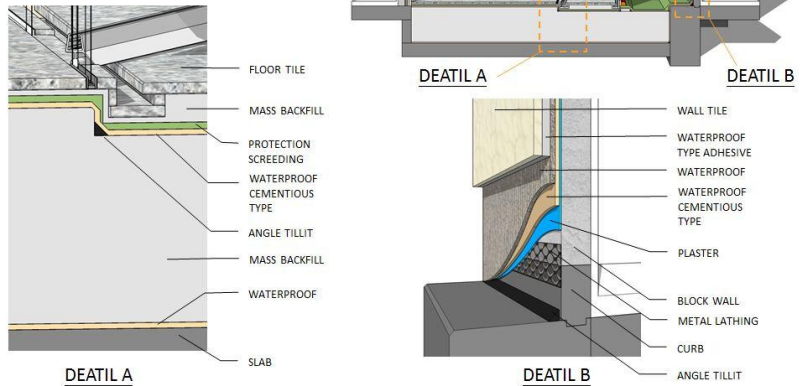


# BIM for Better Quality



## INTERFACING BATH ROOM:

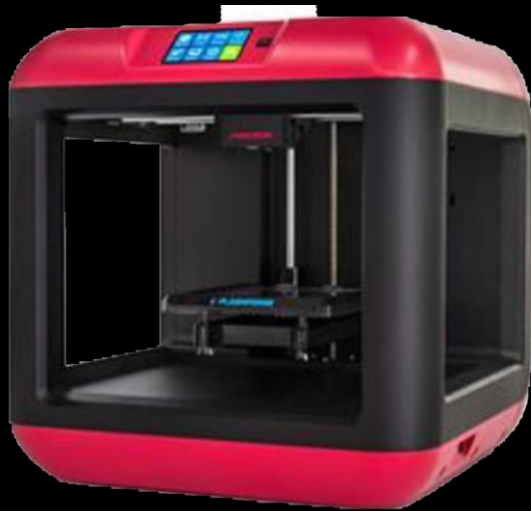
- PERSPECTIVE VIEW
- TYPICAL DETAIL OF WALL & SLAB



# Integrating Emerging Technology







3D Printing



Virtual Reality



RFID

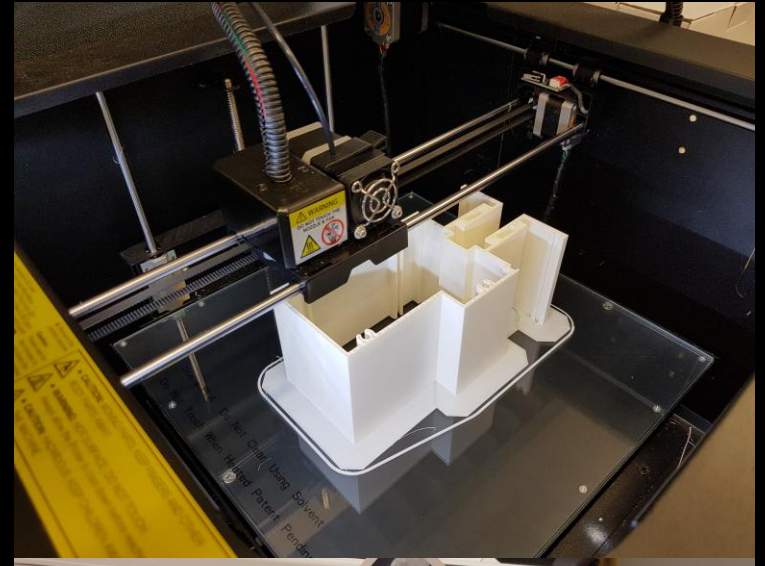


3D Laser Scanning



Drone

# BIM + 3D Printing- Rapid Prototyping

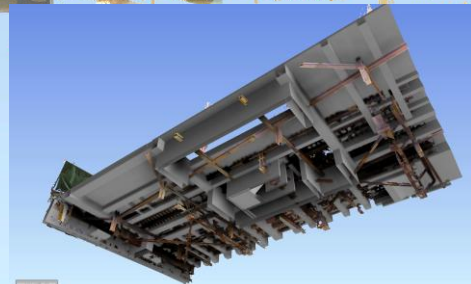
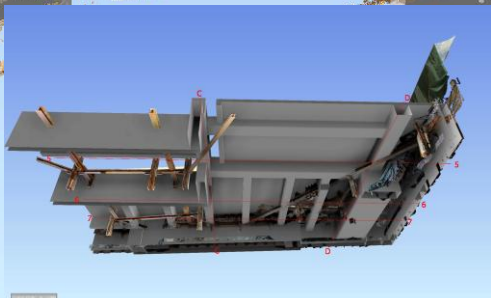


# BIM + 3D Scanning

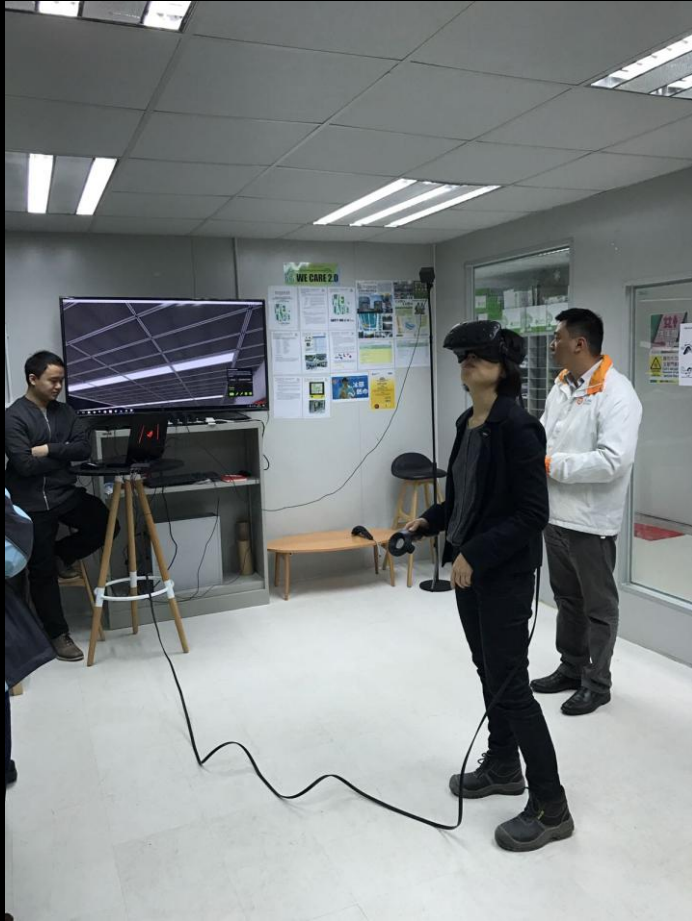




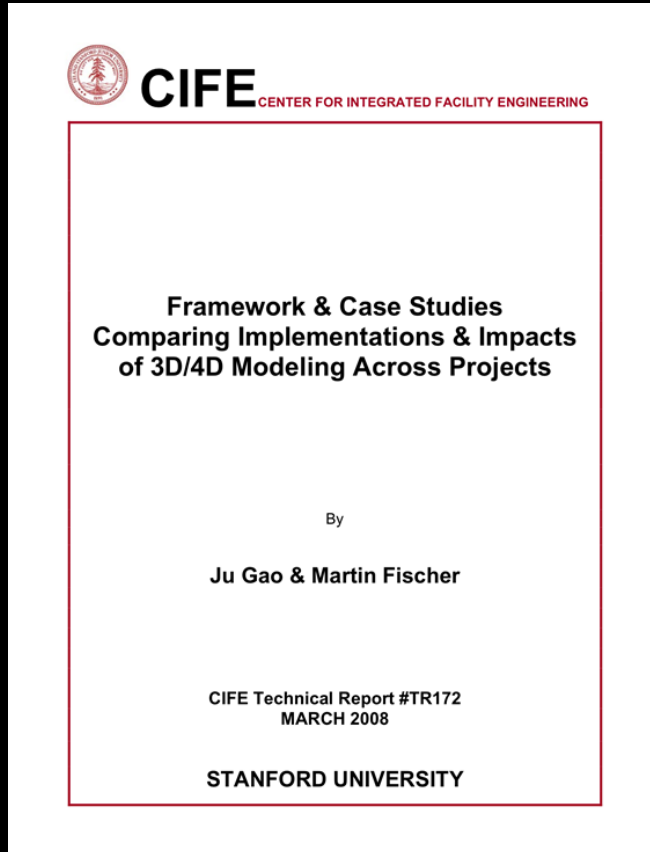
- More than 200 clashes were identified



# BIM and VR



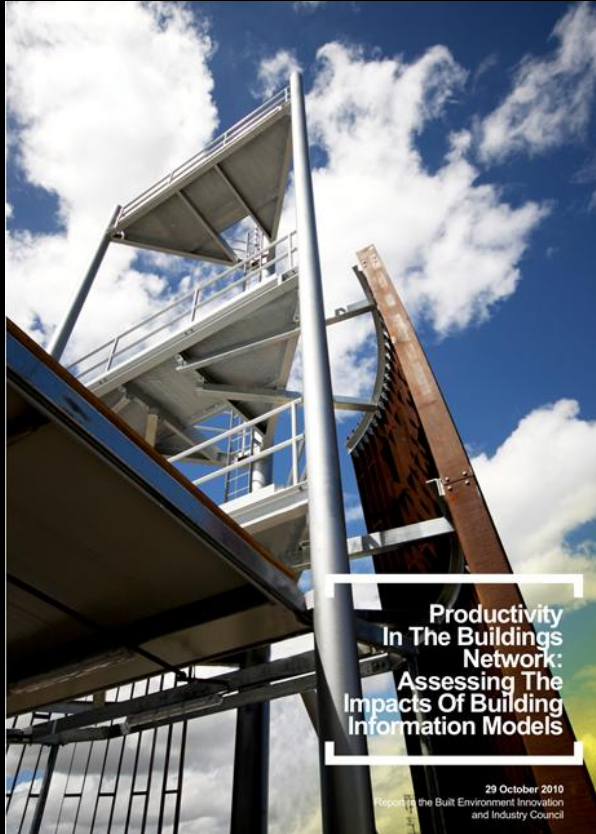
# Business Value of BIM



**Study of 32 projects across the US, Europe and Asia.**

- The study reports the use of BIM on a project could:
  - eliminate up to 40 per cent of unbudgeted changes,
  - increase cost estimation accuracy to within three per cent
  - reduce the time taken to generate a cost estimate by 80 per cent.

# Business Value of BIM (Au)



- The study's finding reported that the accelerated and widespread adoption of BIM on the Australian economy was likely to increase GDP by **0.2 basis points in 2011**.
- A cumulative effect by **2025** would mean **an increase of five basis points** in comparison to what they describe as a "business as usual" scenario.

# Business Value of BIM (UK)



- The UK Government has published cost data since 2012 in relation to achieving its overarching target of 15 to 20 per cent reduction in construction costs by 2016.
- Their July 2014 report, UK Departmental Cost Benchmarks Cost Reduction Trajectories and Cost Reductions demonstrates a continued decline in costs and further evidences that the target “remains practicable.”



# Business Value of BIM (US)

- US General Services Administration's (GSA) commitment for more than a decade to a National 3D-4D-BIM Program is realising consistent and measurable sustainability savings across a public sector building portfolio of more than 9,000 assets. Its initial 10 pilot projects reported cost savings that covered the cost of the first year's pilot program.
- It's now reporting regular savings in early detection of errors and omissions, reduced construction times, fast and accurate space measurements with less than five per cent variance and better transparency and reliability of energy performance measures.



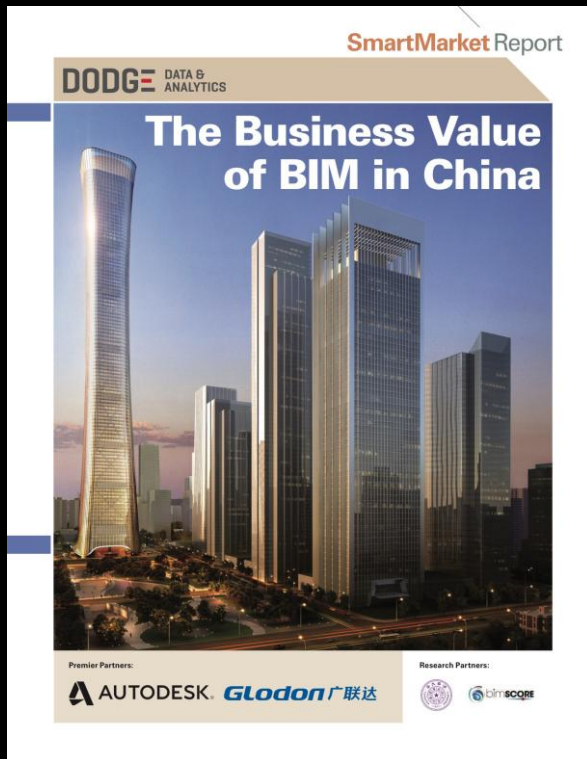
**U.S. General Services Administration**

# Business Value of BIM - Example



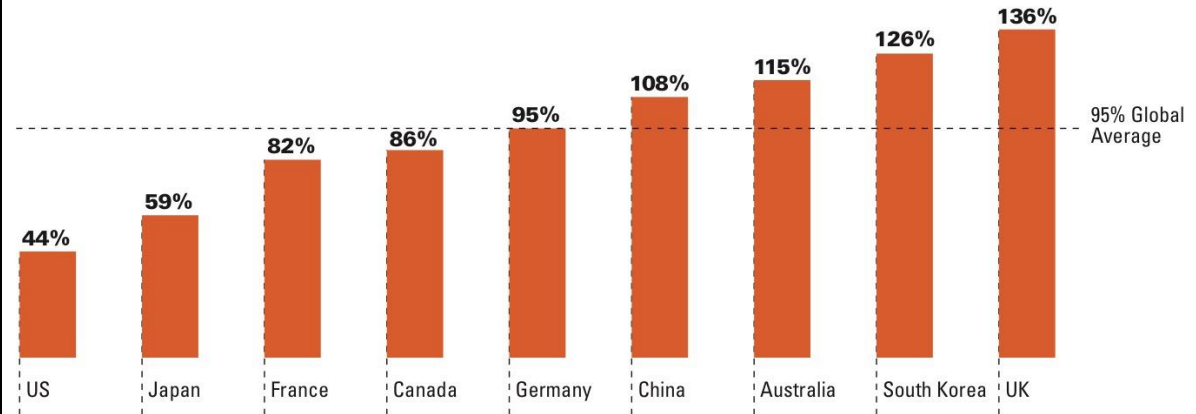
- The award-winning Collaborative Life Sciences Building (CLSB) in Portland, Oregon opened in 2014 with LEED Platinum certification.
- The \$295 million project involved the collaboration of 28 different design teams and directly attributes BIM technologies to a \$10 million saving on construction costs.

# Business Value of BIM (China)



### Two-Year Forecasted Increase in Percentage of Contractors at High/Very High BIM Implementation Level (Those With at Least 30% of Their Projects Involving BIM)

China Data: Dodge Data & Analytics, 2015; Other Country Data: *The Business Value of BIM for Construction in Major Global Markets SmartMarket Report*, Dodge Data & Analytics, 2013



# Benefits Generated by BIM

## Project Benefits Generated by BIM (By Percentage of Chinese Respondents Receiving Benefit at High/Very High Level)

Dodge Data & Analytics, 2015

- Architects
- Contractors

### Better Design Solutions



### Reduced Errors and Omissions in Construction Documents



### More Client Involvement and Improved Understanding



### Reduced Number of Field Coordination Problems



### Reduced Rework



### Better Collaboration With Other Project Team Organizations



### Reduced Number and Need for Contractor Information Requests to Architect



### Reduced Construction Cost



### Better Cost Control/Predictability



### Improved Safety



### Reduced Overall Project Duration



Source from Business Value of BIM in China by Dodge Datas & Analytics

# Investment in BIM

The investments are divided into two categories:

- Processes and People:
  - Investments like collaborative processes and staff training
- Technology and Content:
  - Investments like hardware, software and BIM content

## BIM Investments in Processes and People in China

(Percentage Planning to Invest More Than 1 Million RMB Over Next Two Years)

Dodge Data & Analytics, 2015

- Architects
- Contractors

Developing Collaborative BIM Processes With External Parties



Promotion Incentives for Staff Use of BIM



Developing Internal BIM Procedures



BIM Training



## BIM Investments in Technology and Content in China

(Percentage Planning to Invest More Than 1 Million RMB Over Next Two Years)

Dodge Data & Analytics, 2015

- Architects
- Contractors

New/Upgraded Computer Hardware



Software Customization or Interoperability Solutions



BIM Software



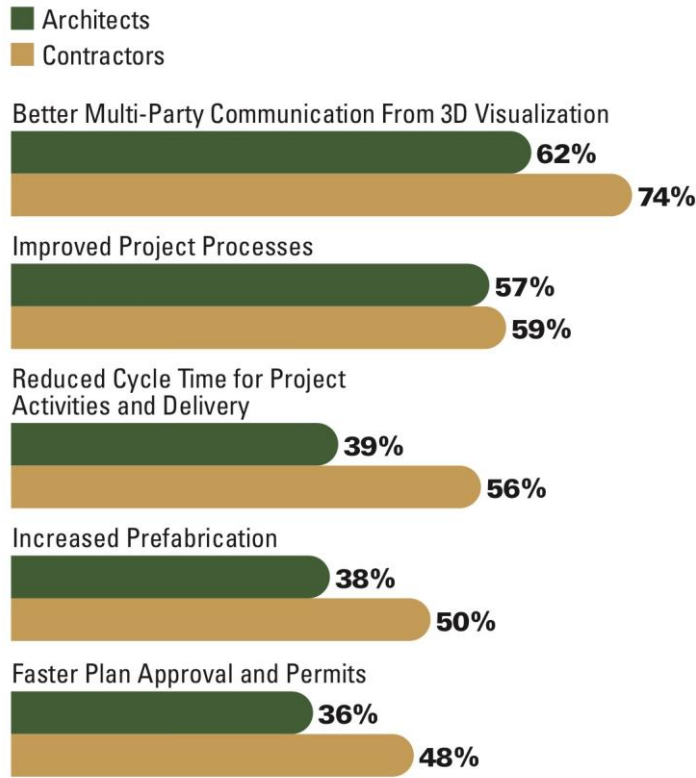
Developing Custom 3D Content Libraries



# ROI for BIM

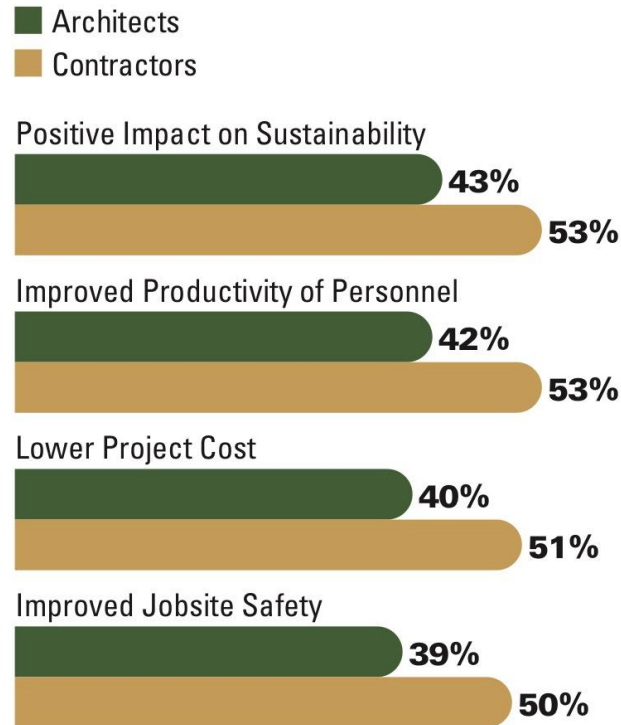
## Processes Improvements That Would Increase ROI for BIM (Percentage of Users in China Citing High/Very High Impact)

Dodge Data & Analytics, 2015



## Outcome Improvements That Would Increase ROI for BIM (Percentage of Users in China Citing High/Very High Impact)

Dodge Data & Analytics, 2015



Source from Business Value of BIM in China by Dodge Data & Analytics

# Global Market Trend



## Denmark

- Danish state clients
- Palaces & Properties Agency
- Danish University Property Agency 2010
- Defence Construction Services

## Norway

- Government committed to succeed in BIM adoption in 2010

## South Korea (2016)

- BIM Compulsory for
- All public projects
- All projects over S\$50 million

## Saudi Arabia

- BIM Standard

## Countries With Active Use of BIM

# BIM is Mandated in...



## United States (2007)

- General Services Administration
- U.S. Army Corps of Engineers
- U.S. Coast Guard



## Finland (2009)

- Requirement for building and structural design



## Singapore (2015)

- All government projects (2013)
- Regulatory building plan approval
- Building & Construction Authority (BCA) - 2015

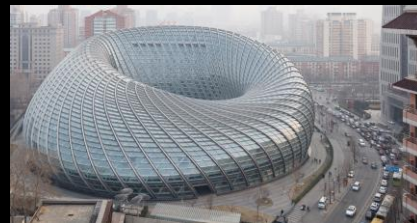


## England (2016)

- All government projects



Shanghai Tower



Phoenix TV Media Centre

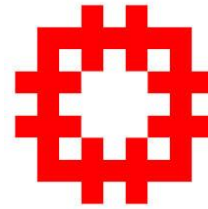
China National BIM Standard is now under preparation and the current two iconic building Phoenix TV Media Centre and Shanghai Tower use BIM extensively





# Development Bureau

The Government of the Hong Kong Special Administrative Region



## westKowloon

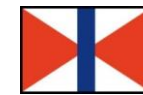
西九文化區



Hong Kong 香港科技園  
Science & Technology Parks



Hysan 希慎



SWIRE



## 新世界發展有限公司

New World Development Company Limited



中国移动通信  
CHINA MOBILE



## 協興建築有限公司 HIP HING CONSTRUCTION CO LTD

新創建集團成員 Member of NWS Holdings



# BIM should be Mandated...

- BIM can improve communication and coordination between stakeholders, better planning and enhance productivity
- Government need to fix a timetable to mandate the use of BIM as a single platform for Statutory submission and project delivery

# 2017 Policy Address on BIM

The screenshot shows a mobile browser interface for the '2017 Policy Address' website. The top navigation bar includes the title '2017 Policy Address', language options for '繁體' (Traditional Chinese) and '简体' (Simplified Chinese), and accessibility icons. A sidebar on the left lists various content categories such as 'Policy Address', 'Policy Agenda', 'Highlights', 'Webcast', 'Press Releases', 'TV Announcements', 'Other Publicity Items', 'Archives', 'Contact Us', and 'Sitemap'. The main content area is titled 'Policy Address' and features a sub-section 'Technology Application and Innovation'. This section contains two numbered paragraphs: paragraph 130 discusses Building Information Modelling (BIM) technology and government support, while paragraph 131 mentions the establishment of an innovation and technology application centre by the Construction Industry Council. At the bottom right of the content area, there are links for 'Contents' and 'Next'. The footer of the page includes logos for W3C WAI-AA WCAG 2.0 and 'Web For All'.

# Government need to have...

Follow  
THROUGH