



CONSTRUCTION INDUSTRY COUNCIL
建造業議會

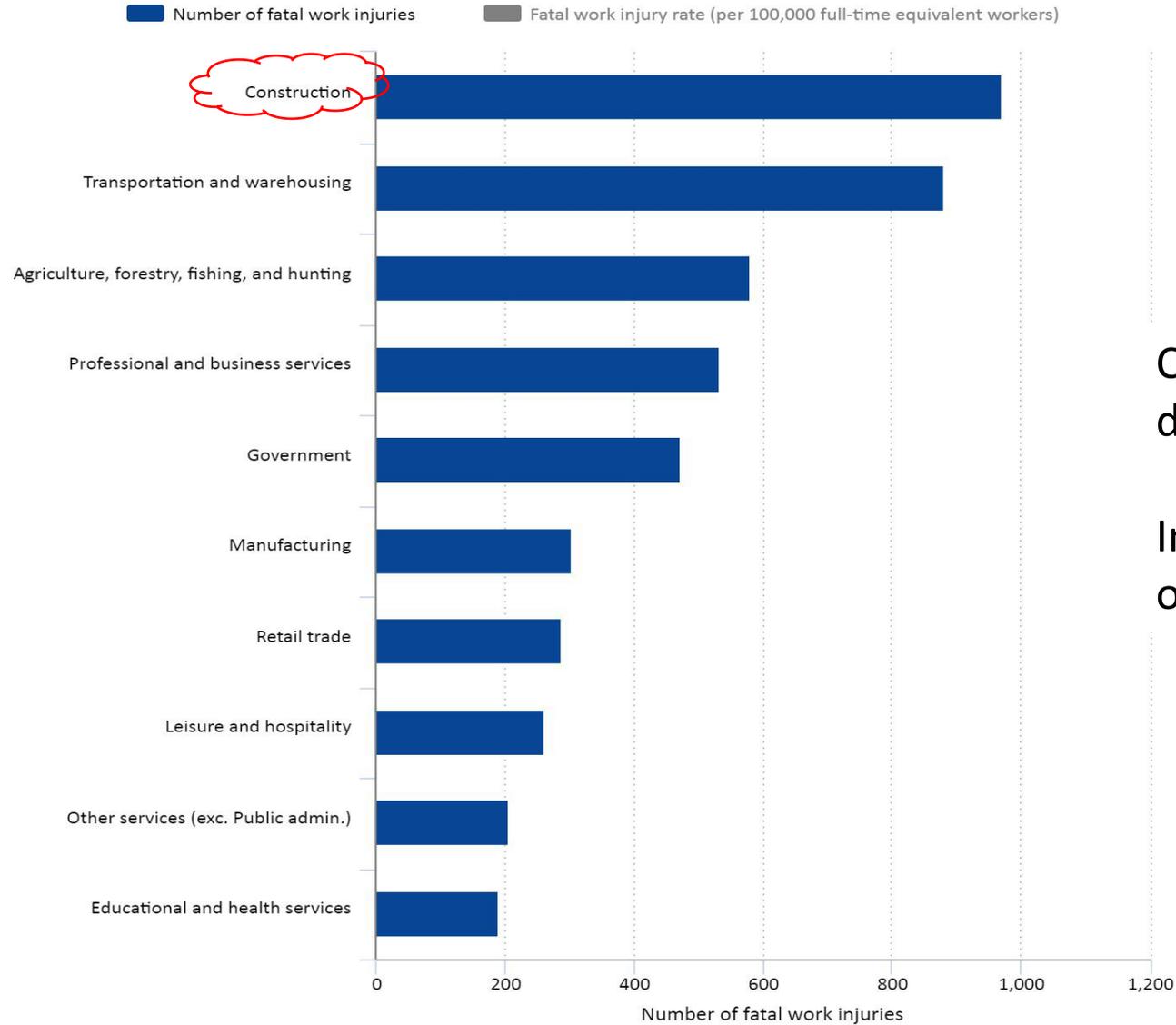
Innovation and Use of Technology in Construction Safety

Mr Donald CHOI

Chairman of Construction Innovation and Technology Application
Centre (CITAC)



Number and rate of fatal work injuries, by industry sector, 2017



Hover over chart to view data. Click legend to change data display.
Source: U.S. Bureau of Labor Statistics.



Construction continues to be one of the most dangerous industries in the United States.

In 2017, about 20 percent of all worker fatalities occurred at a construction site.



上半年建筑业事故起数和死亡人数“双上升”

贺迎春

2018年07月25日15:20 来源：人民网-环保频道

分享到：



原标题：上半年建筑业事故起数和死亡人数“双上升”

人民网北京7月25日电（记者贺迎春）应急管理部消息，国务院安委办近日通报了全国建筑业安全生产形势。今年上半年，全国建筑业安全生产形势总体稳定，但事故总量同比增加，且发生1起重大事故，安全生产形势依然严峻复杂。

通报显示，建筑业事故总量持续保持在高位。上半年全国建筑业共发生生产安全事故1732起、死亡1752人，同比分别上升7.8%和1.4%，事故总量已连续9年排在工矿商贸事故第一位，事故起数和死亡人数自2016年起连续“双上升”。

上半年部分地区和行业领域建筑业较大事故多发，9个省份发生2起及以上较大事故，房屋建筑及市政工程领域的较大事故占比最大，其余依次是交通建设工程和电力建设工程领域。高处坠落和坍塌是建筑业事故主要类型，在一般事故中，高处



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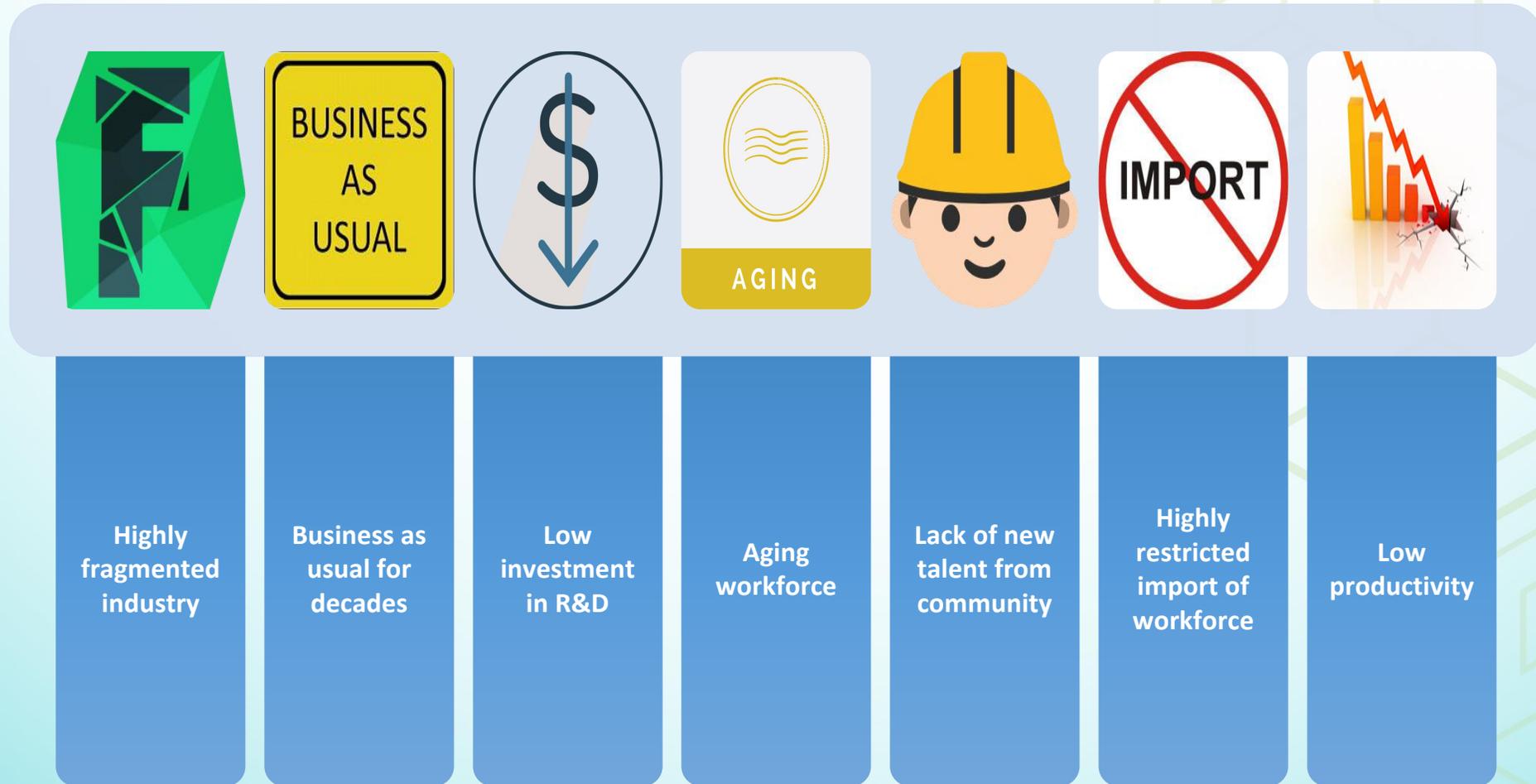
上半年建筑业事故起数和死亡人数“双上…

**Industrial Accidents in All Workplaces in 1st Half of 2018
- analysed by Industry Section**

二零一八年上半年所有工作地點之工業意外個案 - 按行業主類分析

Industry Section 行業主類		1 st Half of 2017 二零一七年上半年		1 st Half of 2018 二零一八年上半年		Change 增減	Percentage Change 增減率
Agriculture, forestry and fishing	農業、林業及漁業	0		0		---	not applicable 不適用
Mining and quarrying	採礦及採石業	0		0		---	not applicable 不適用
Manufacturing	製造業	671	(3)	628		-43	-6.4%
Electricity, gas and waste Management	電力、燃氣及廢棄物管理	30	(1)	23		-7	-23.3%
Construction	建造業	1 816	(8)	1 700	(6)	-116	-6.4%
Import/export, wholesale and retail trades	進出口貿易、批發及零售業	0		0		---	not applicable 不適用
Transportation, storage, postal and courier services	運輸、倉庫、郵政及速遞服務	181	(2)	179	(1)	-2	-1.1%
Accommodation and food services	住宿及膳食服務	2 409		2 419		10	0.4%
Information and communications	資訊及通訊	3		2		-1	-33.3%
Financing and insurance	金融及保險	0		0		---	not applicable 不適用
Real estate	地產	0		0		---	not applicable 不適用
Professional and business services	專業及商用服務	0		0		---	not applicable 不適用
Public administration, and social and personal services	公共行政以及社會及個人服務	90		63		-27	-30.0%
Other industries	其他行業	0		0		---	not applicable 不適用
TOTAL	總數	5 200	(14)	5 014	(7)	-186	-3.6%

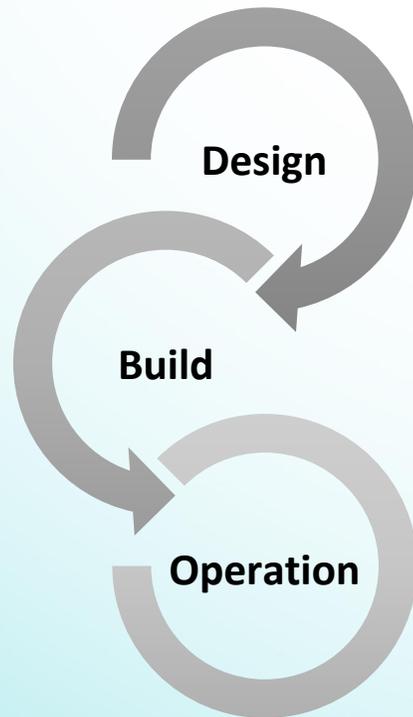
McKinsey Interim Report – Situation of Hong Kong Construction Industry



Source: Mckinsey Interim Report “Building for a Better Future – Vision 2030”

Project Delivery with BIM

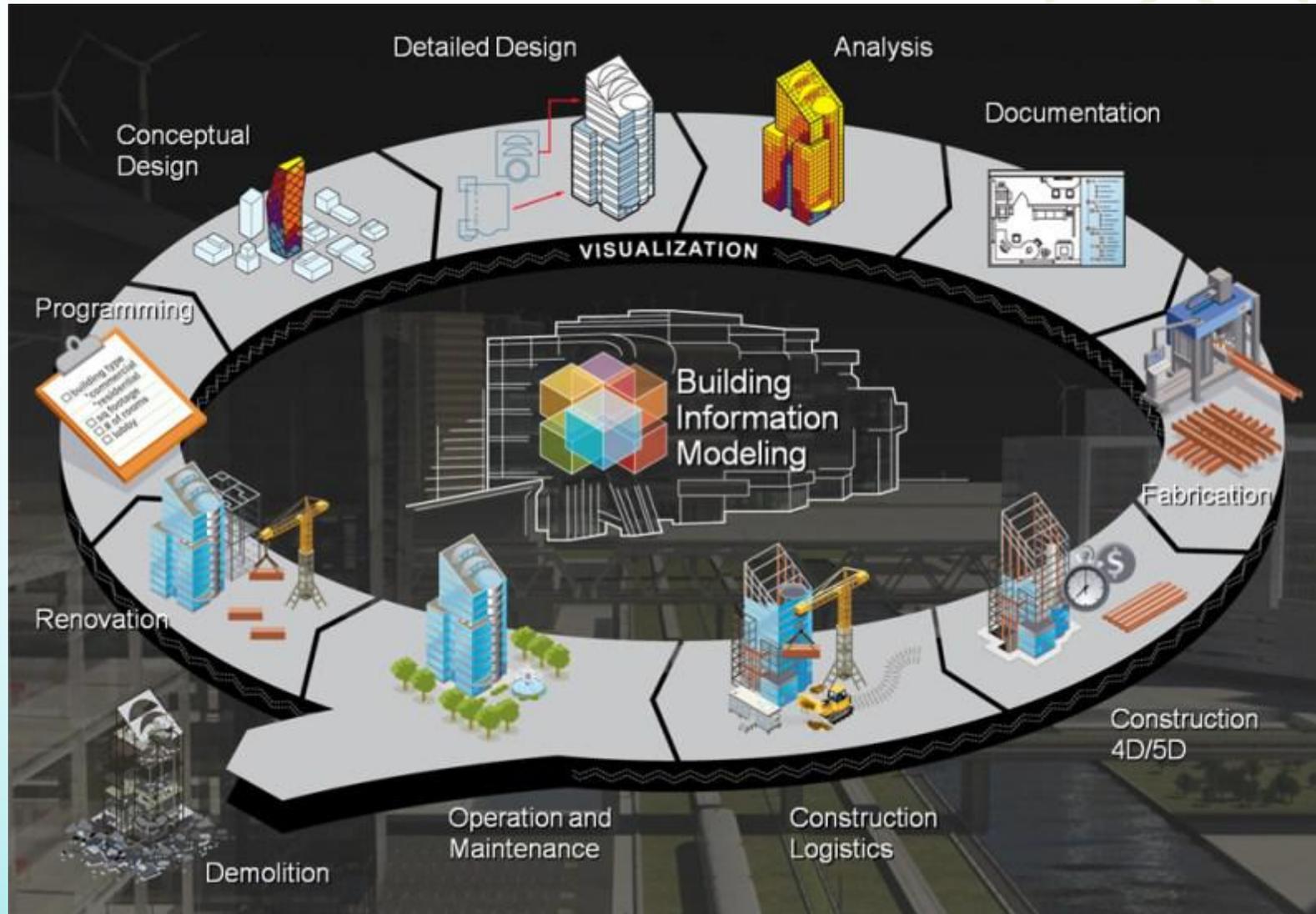
Definition of Building Information Modelling



“Building Information Modelling (BIM) is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition”

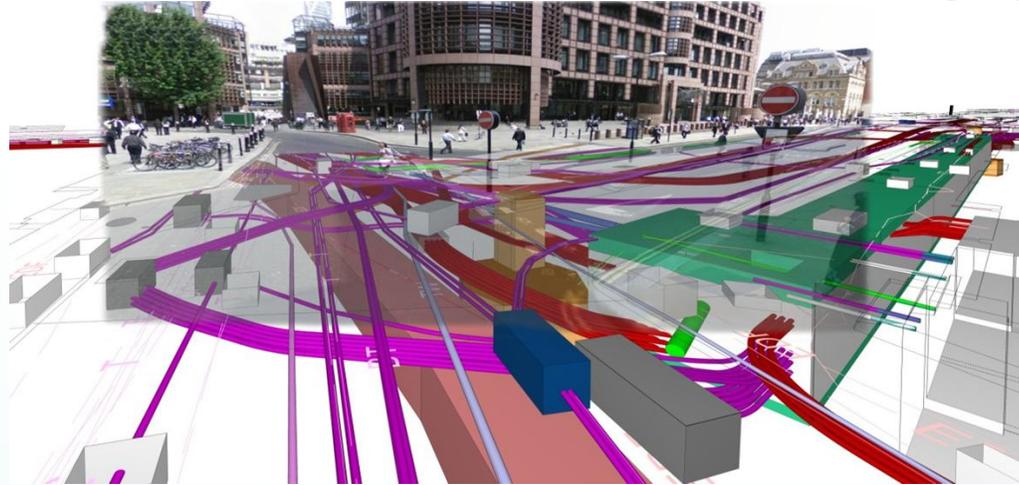
by US National Building Information Model
Standard Project Committee

Project Delivery with BIM

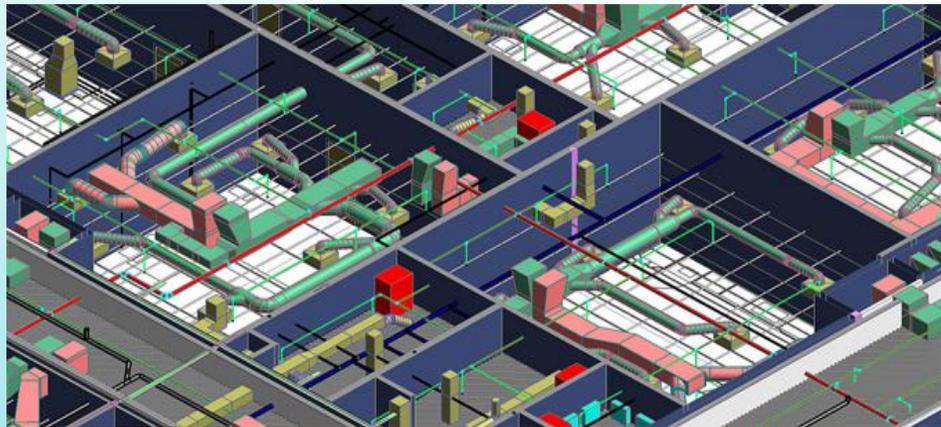


** Image from Autodesk*

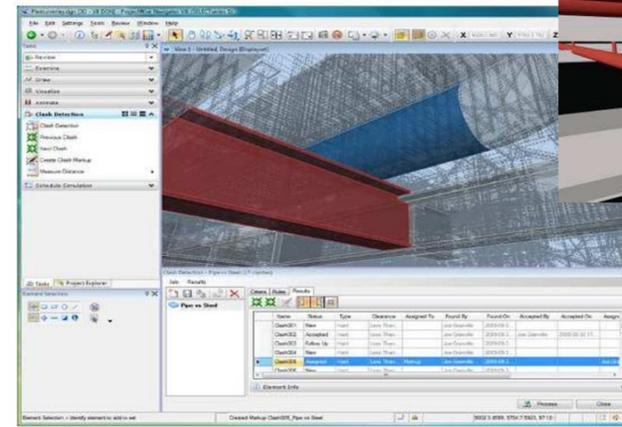
Application of Building Information Modelling – 3D dimension shape information (3D)



Crossrail - UK

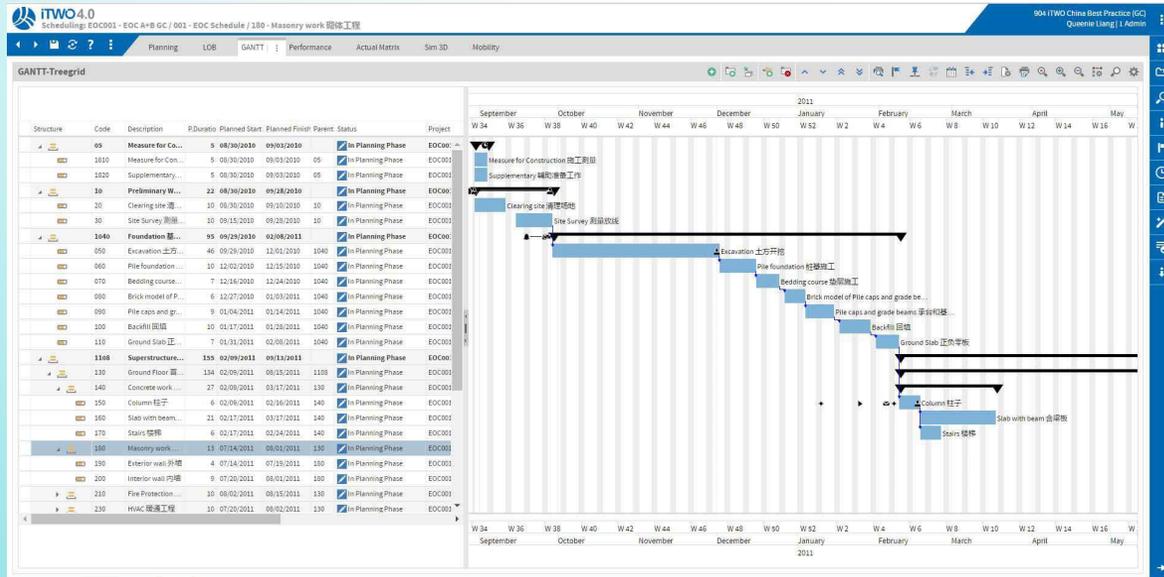


*Heating, ventilation, and air
conditioning (HVAC) design with BIM*



Clash analysis by BIM at design stage

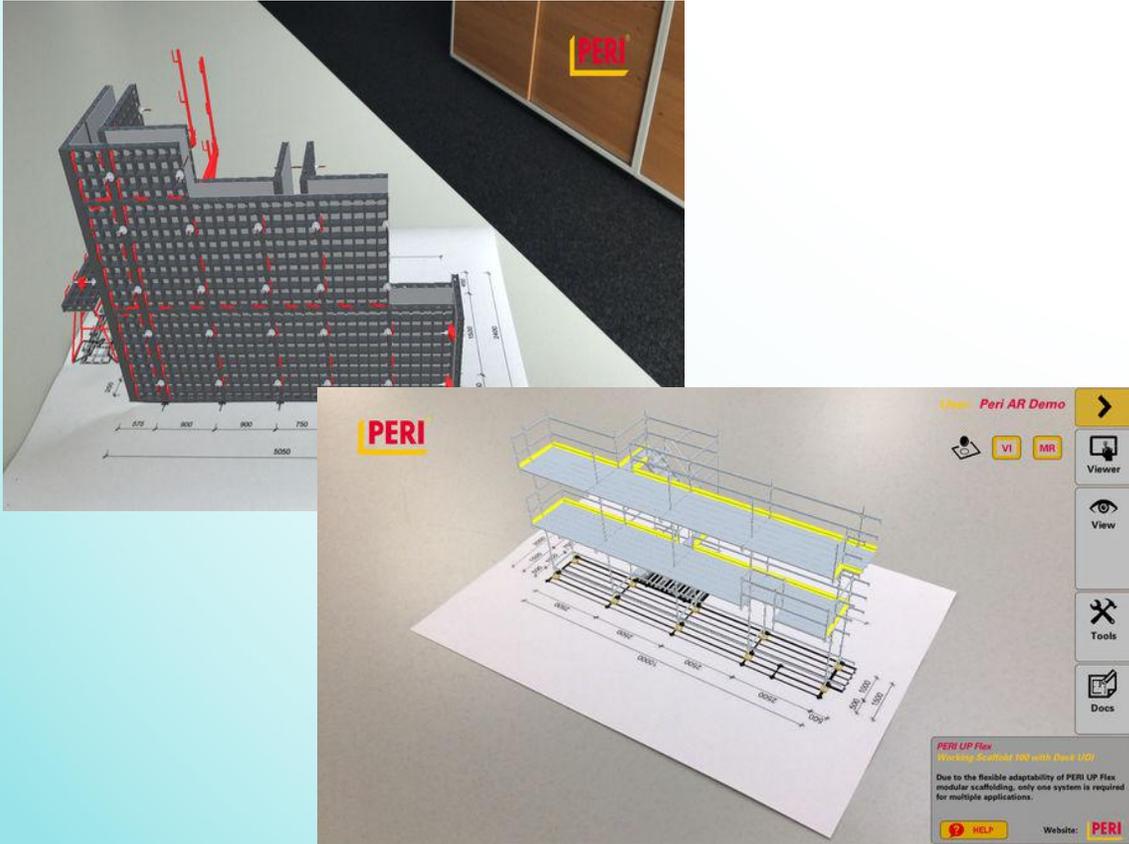
Application of Building Information Modelling Planning and Simulation



BIM for schedule planning



Virtual Reality/Augmented Reality



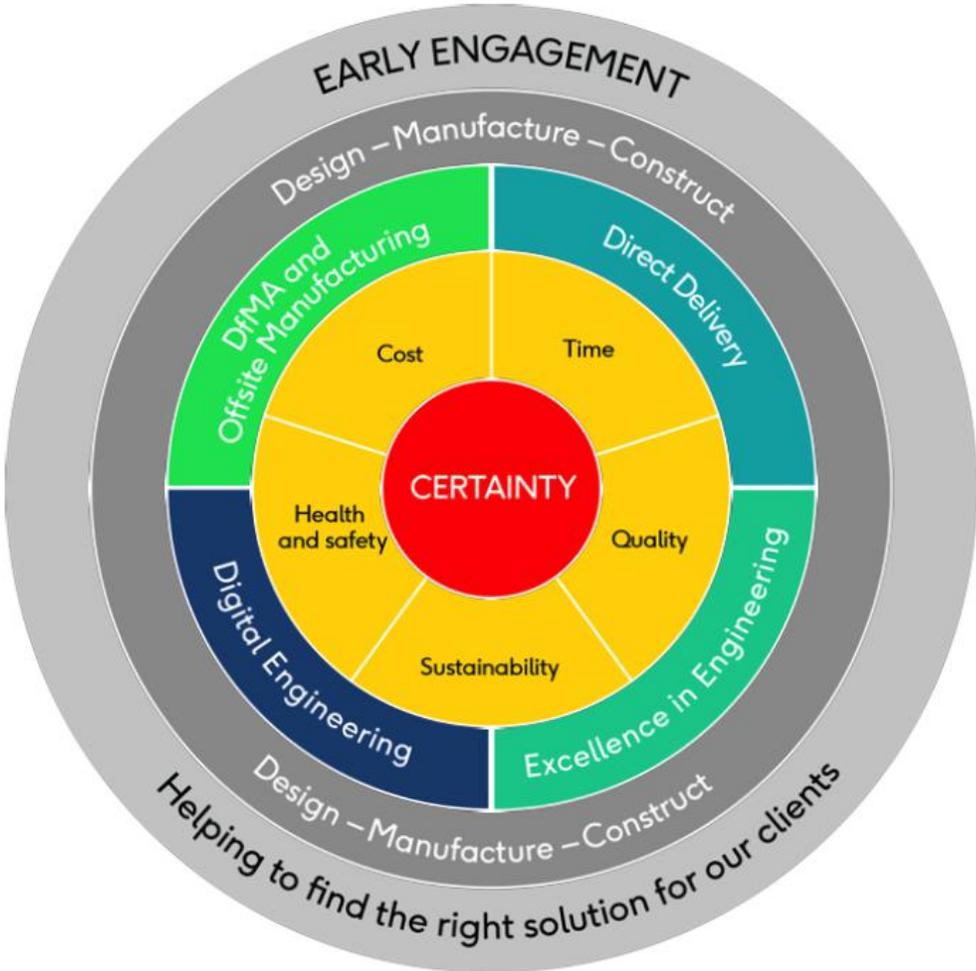
AR for standardized modular structure installation
* Image from Peri



VR for installation training
* Images from Kallos Studio

Design for Manufacture and Assembly (DfMA)

A design approach that focuses on ease of manufacture and efficiency of assembly



**Image from Laing O'Rourke*

DfMA and Offsite Construction

Laing O'Rourke Explore Manufacturing



Cladding & Facades



Columns



Beams



Twin Wall



Lattice

DfMA and Offsite Construction

Video of Explore Manufacturing



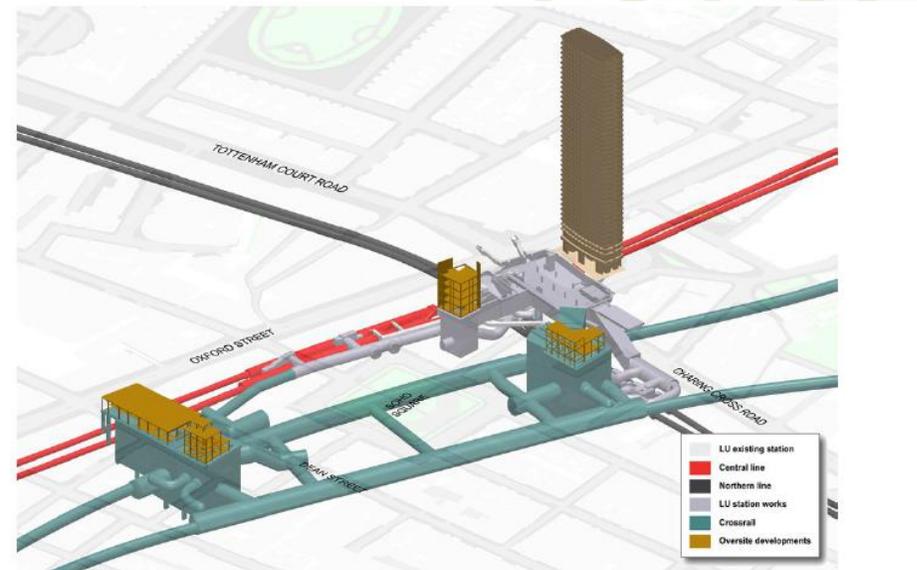
DfMA and Offsite Construction

Case Study: DfMA against Traditional Insitu

Two stations in similar scale with different delivery approach



Liverpool Street Station
Design for Manufacture
and Assembly



Tottenham Court Road Station
Traditional Insitu

DfMA and Offsite Construction

Case Study: DfMA against Traditional Insitu

Over **90% reduction** in man hours on site by adoption of DfMA approach!



0 safety accidents

2973 Man hours

0 outstanding Snags

617mm of platform per hour

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Liverpool Street Station

DfMA installation team = 7



3 safety accidents

36882 Man hours

12 outstanding Snags

152mm of platform per hour



Tottenham Court Road

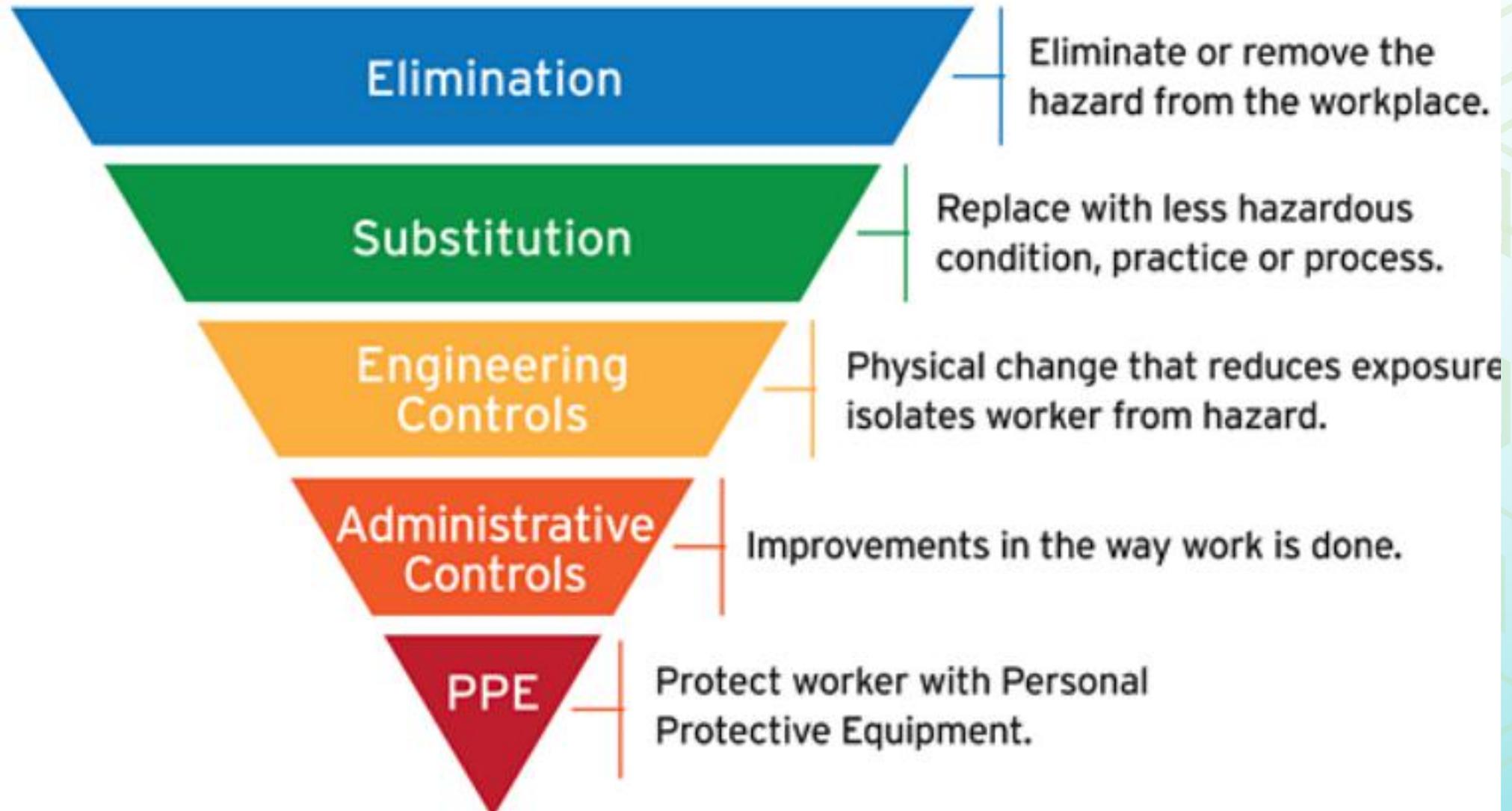
Insitu installation team = 57

DfMA and Offsite Construction

Case Study – Liverpool St Crossrail station



HIERARCHY OF CONTROLS



Robotic Application in Construction Industry



Eliminating work at dangerous condition



Increasing the quality of work



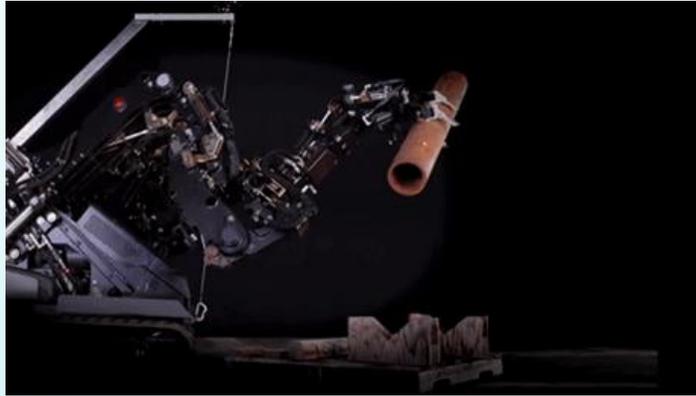
Increasing production outputs



Avoiding of wasting materials, energy, efforts, money, and time

Robotic Application in Construction Industry

Robotic for construction site



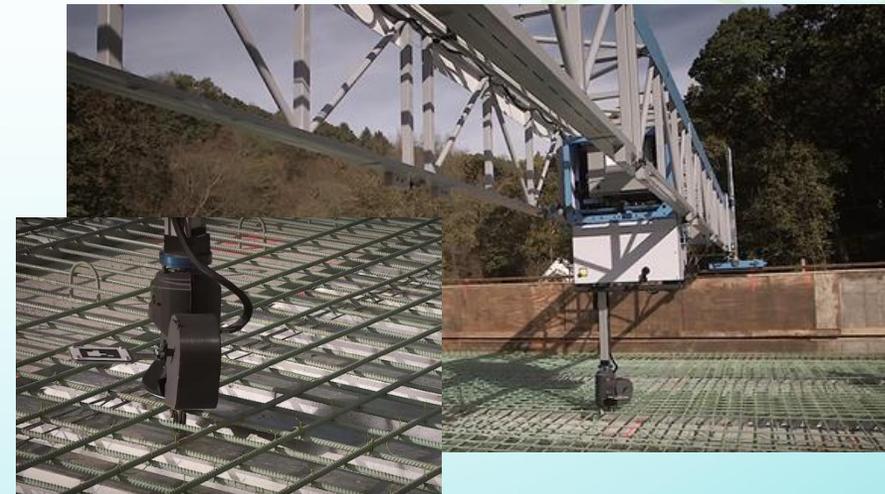
Material handling robot from SARCOS Robotics



Bricklaying robot from Semi-Automated Mason

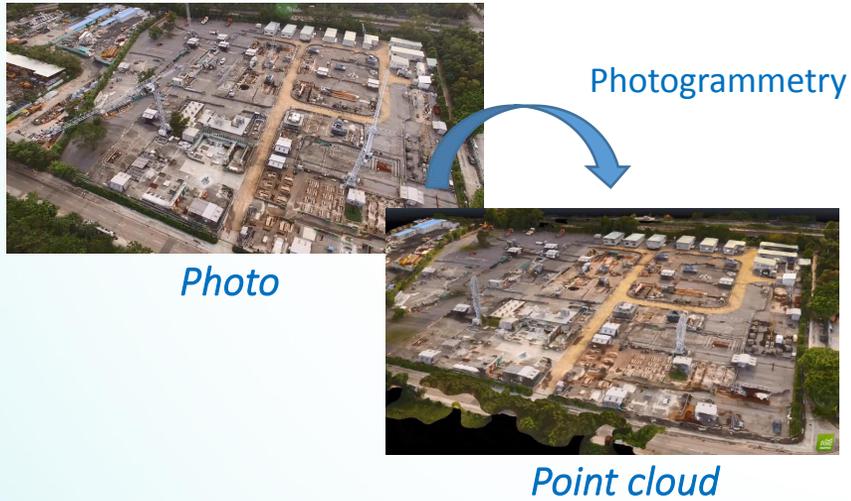


Curtain wall installation robot from GGR Group



Autonomous Rebar-tying robot from Advanced Construction Robotics

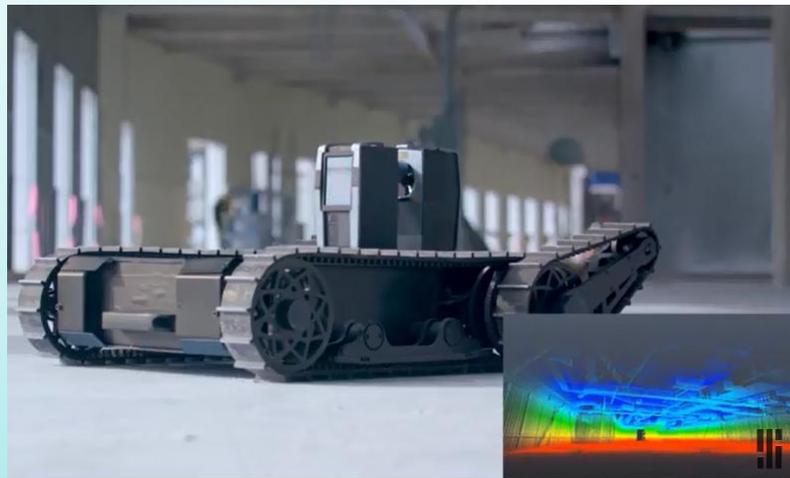
Robotic Application in Construction Industry



Drone for site surveying from D-reality



Drone for architecture installation from ETH

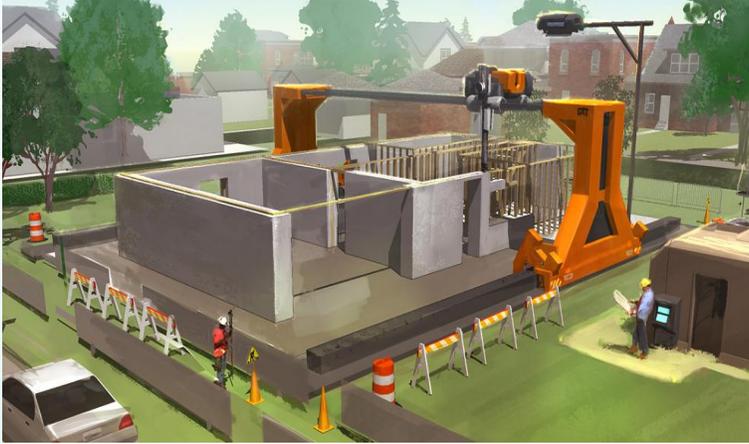


Autonomous robots for as-build structure inspection from Doxel



Drone guided robotic bulldozers for smart construction from Komatsu

Robotic Application in Construction Industry – 3D printing



Contour crafting from Brian Krassenstein



3D printing construction robot from Cazza



3D printing concrete building from Winsun and COHL



3D printing steel bridge from MX3D

Robotic Application in Construction Industry - Wearable Robot



Mechanical arm to maneuver tools from EkoBionics



Upper Body Exoskeleton for Reducing Forces from Strong Arm Technologies



Power assisted suit for assist the wearer's movement from Panasonic



Upper body exoskeleton to elevates and supports a worker's arms from Ekso Bionics



Exoskeleton to lift heavy tools by transfer its weight to ground from Fortis



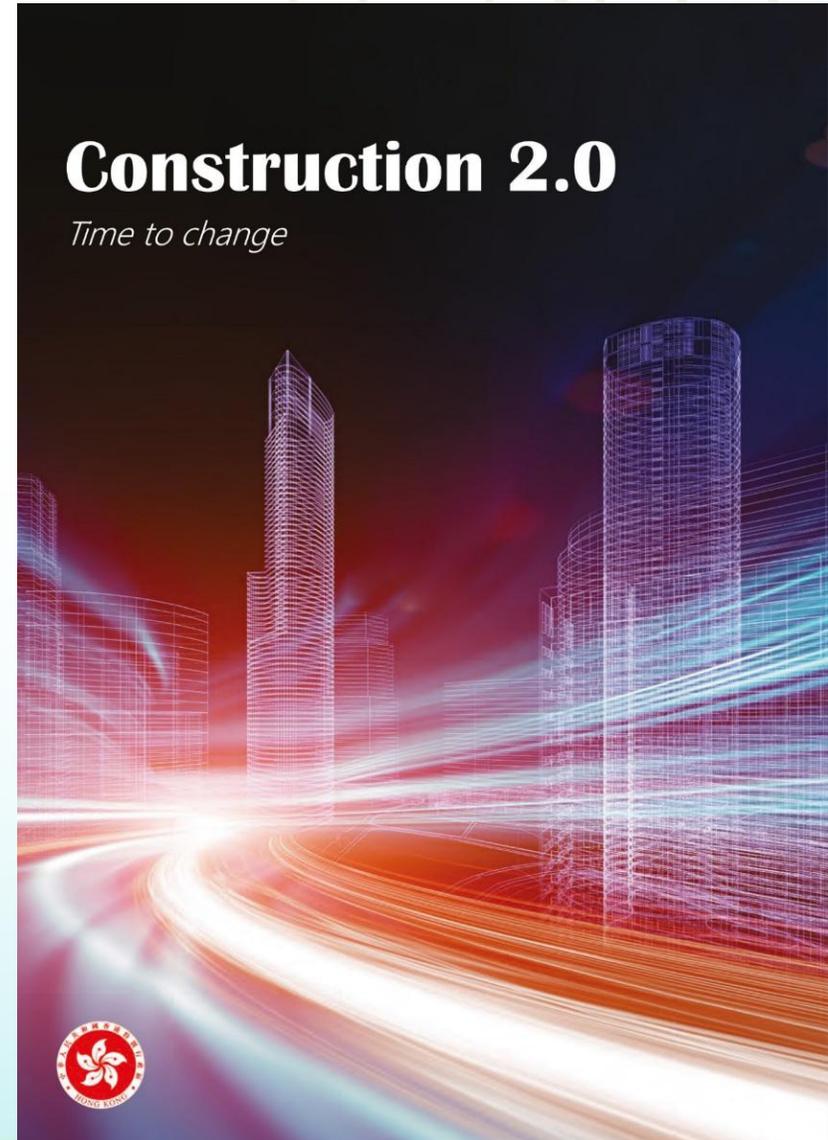
Full-Body Exoskeleton for Reducing Forces from SuitX

Construction 2.0

HKSAR Government is leading the changes

- The 'Construction 2.0' strategy recognises the following core challenges facing the construction industry:
 - Significant future construction volumes;
 - High costs;
 - Unsatisfactory mega-project performance;
 - Unsatisfactory **site safety performance**;
 - Declining productivity;
 - Lack of creativity and innovation.

Let's leave a legacy for the industry and be an enabler to modernising construction.



The Construction Innovation and Technology Application Centre (CITAC)

To collect, showcase and promulgate the latest local and overseas construction technologies that suitable for adoption in the Hong Kong construction industry for improvement of its productivity, sustainability and safety.



The Construction Innovation and Technology Application Centre (CITAC)

Industrialisation



Informatisation



Intelligentisation



Integration



Infinity





Building a better Hong Kong together - Innovation in Construction

Thank You

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