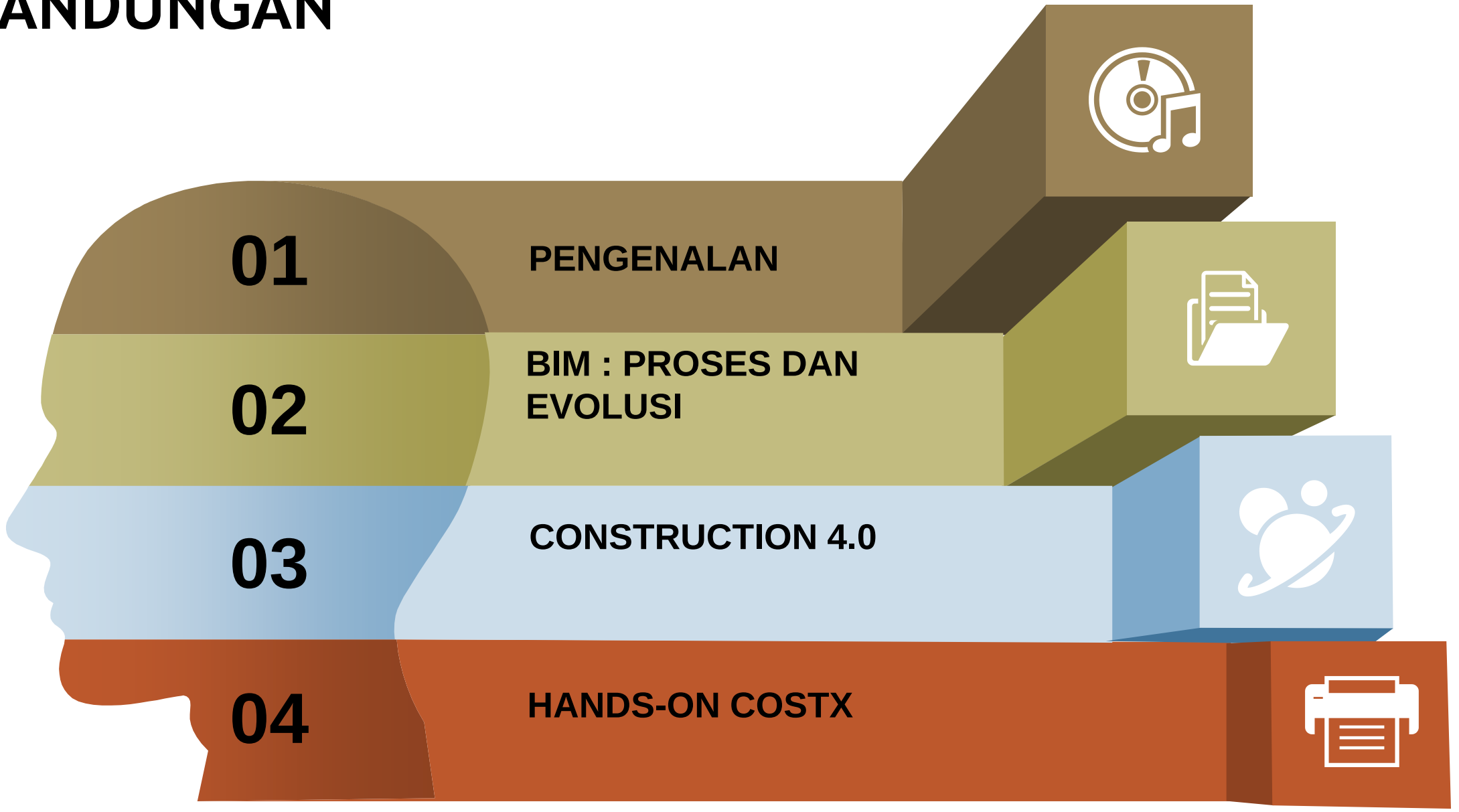
BIM & CONSTRUCTION 4.0

Sr NUR WAHEEDA BINTI HJ. ISMAIL
JURUUKUR BAHAN KANAN
BAHAGIAN DOKUMENTASI & ICT,
CAWANGAN KONTRAK DAN UKUR BAHAN
03-2614 1412/ waheeda@jkr.gov.my

KANDUNGAN


01
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BIM : PROSES DAN EVOLUSI
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04
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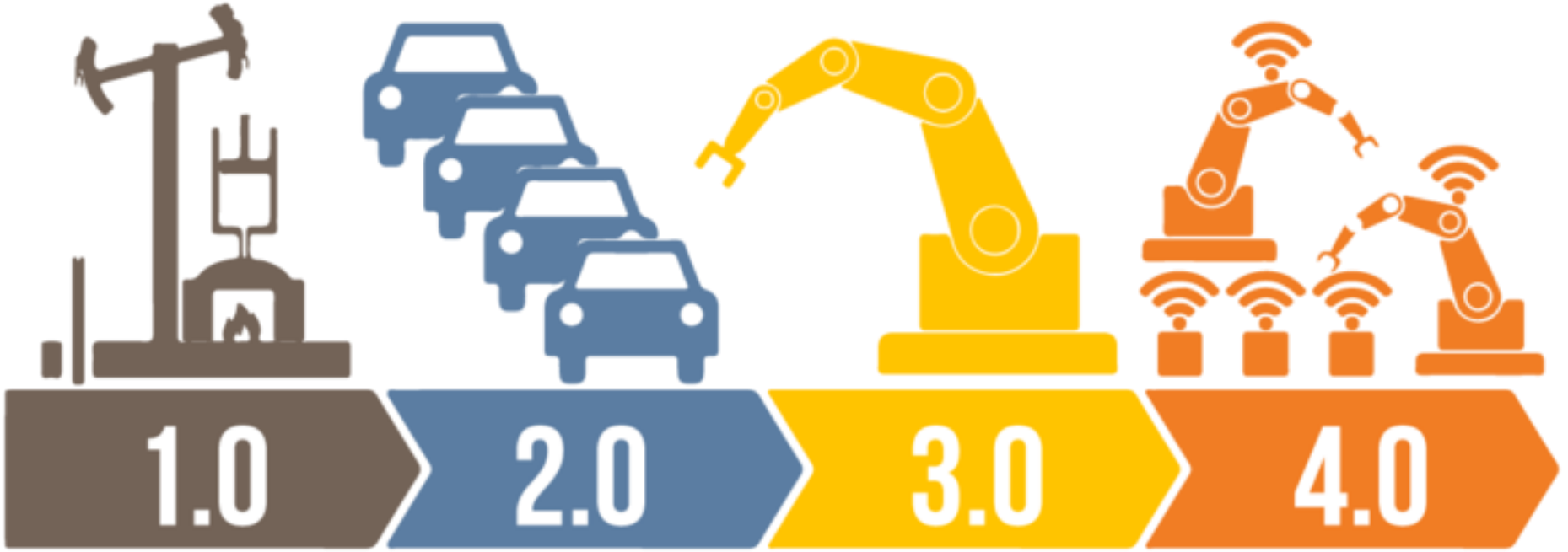
PENGENALAN
-IR 4.0 & BIM

REVOLUSI INDUSTRI



1790s	1890s	1960s	Today
WATER AND STEAM	**ELECTRICITY**	**AUTOMATION**	**CYBER PHYSICAL SYSTEMS**
• Enjin/kuasa stim menggantikan tenaga manusia & binatang dalam kerja	• Kuasa elektrik, enjin, kapal terbang, telefon, radio dan *mass production*	• Elektronik, teknologi maklumat meningkatkan pengeluaran	• Automasi, robotic, Internet, *3D printing*

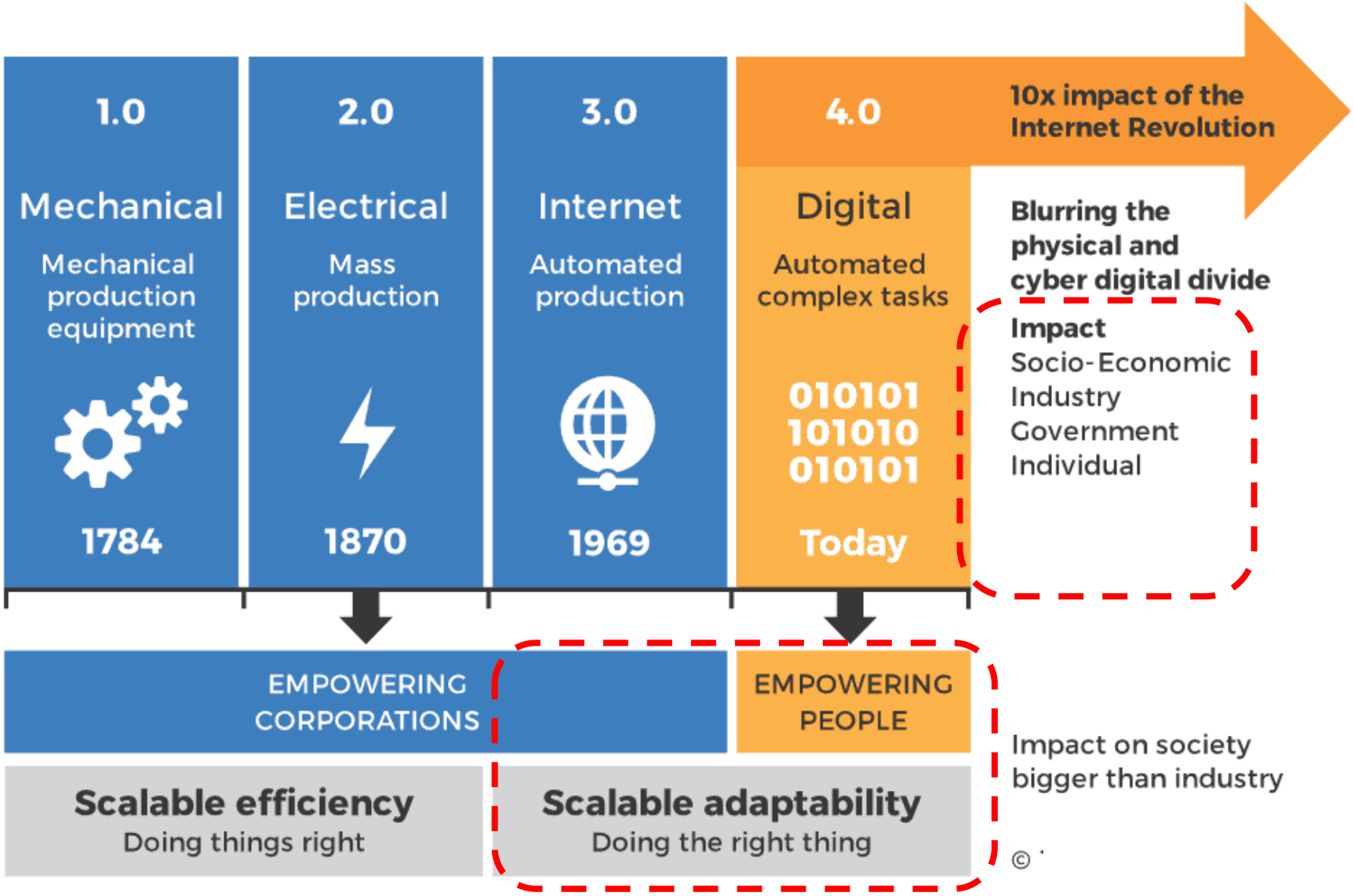
REVOLUSI INDUSTRI KEEMPAT (INDUSTRI 4.0)

Penemuan teknologi baru yang menggunakan automasi, analisis, *big data*, simulasi, integrasi sistem, pengunaan robotik, *Cloud*, *Internet of Things* (IoT) dan seumpamanya.

Ianya melibatkan teknologi automasi di mana semua sektor industri perlu melakukan perubahan seiring dengan transformasi digital untuk membolehkan kekal berdaya saing dalam merancakkan kemajuan landskap dunia moden.

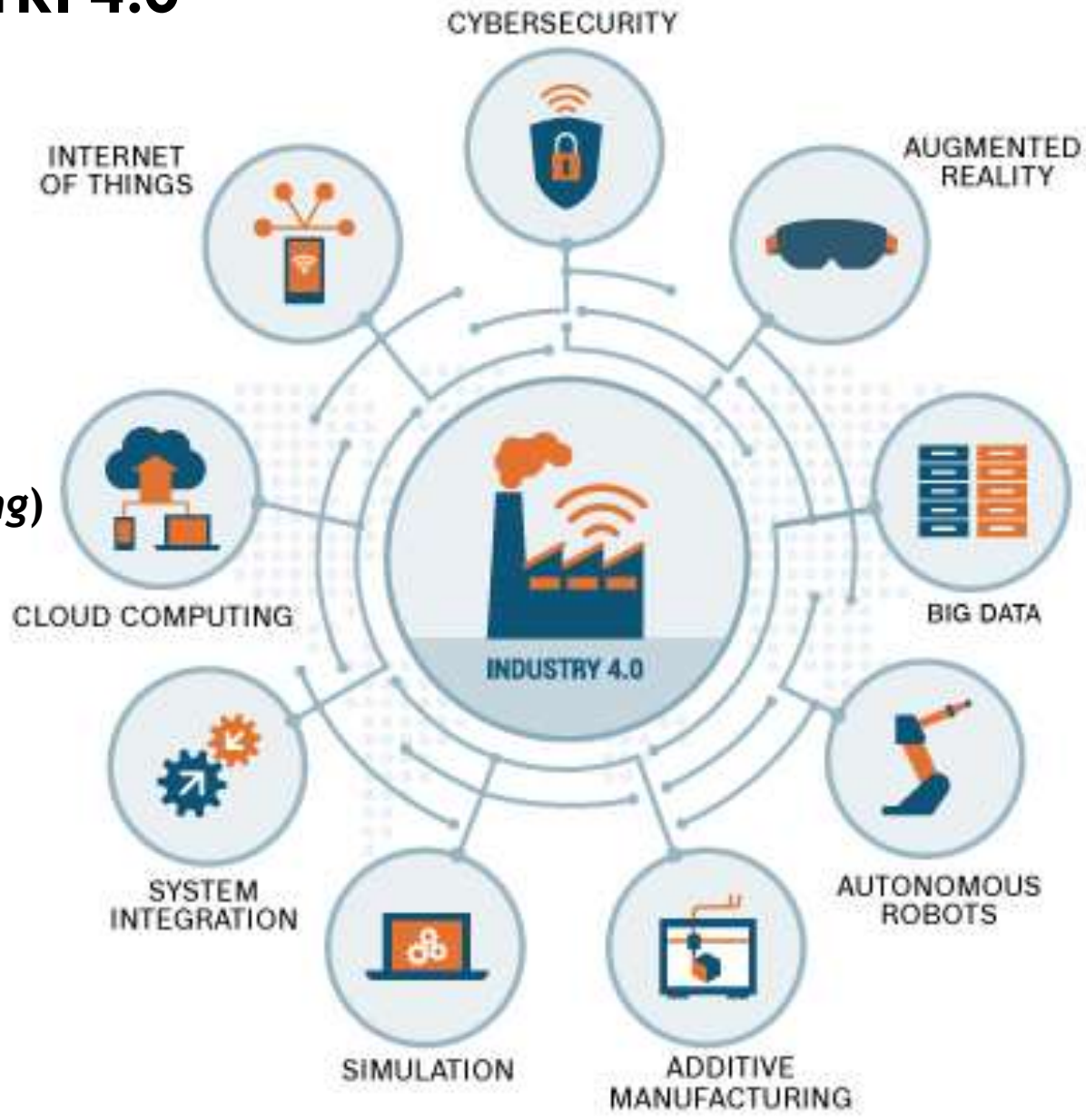
Mengatasi masalah kebergantungan terhadap sumber tenaga manusia yang secara signifikasi mengubah masa depan dunia pekerjaan

REVOLUSI INDUSTRI



SEMBILAN (9) TONGGAK INDUSTRI 4.0

1) Realiti Maya
2) Analisis Data Raya
3) Robot Automasi
4) Pembuatan Bahan Tambahan (*3D printing*)
5) Simulasi
6) Integrasi Sistem
7) Pengkomputeran Awan
8) Teknologi Peranti Pintar
9) Keselamatan Siber



DEFINISI ‘BIM’

BUILDING INFORMATION MODEL

- A DIGITAL REPRESENTATION ON HOW A BUILDING IS DESIGNED

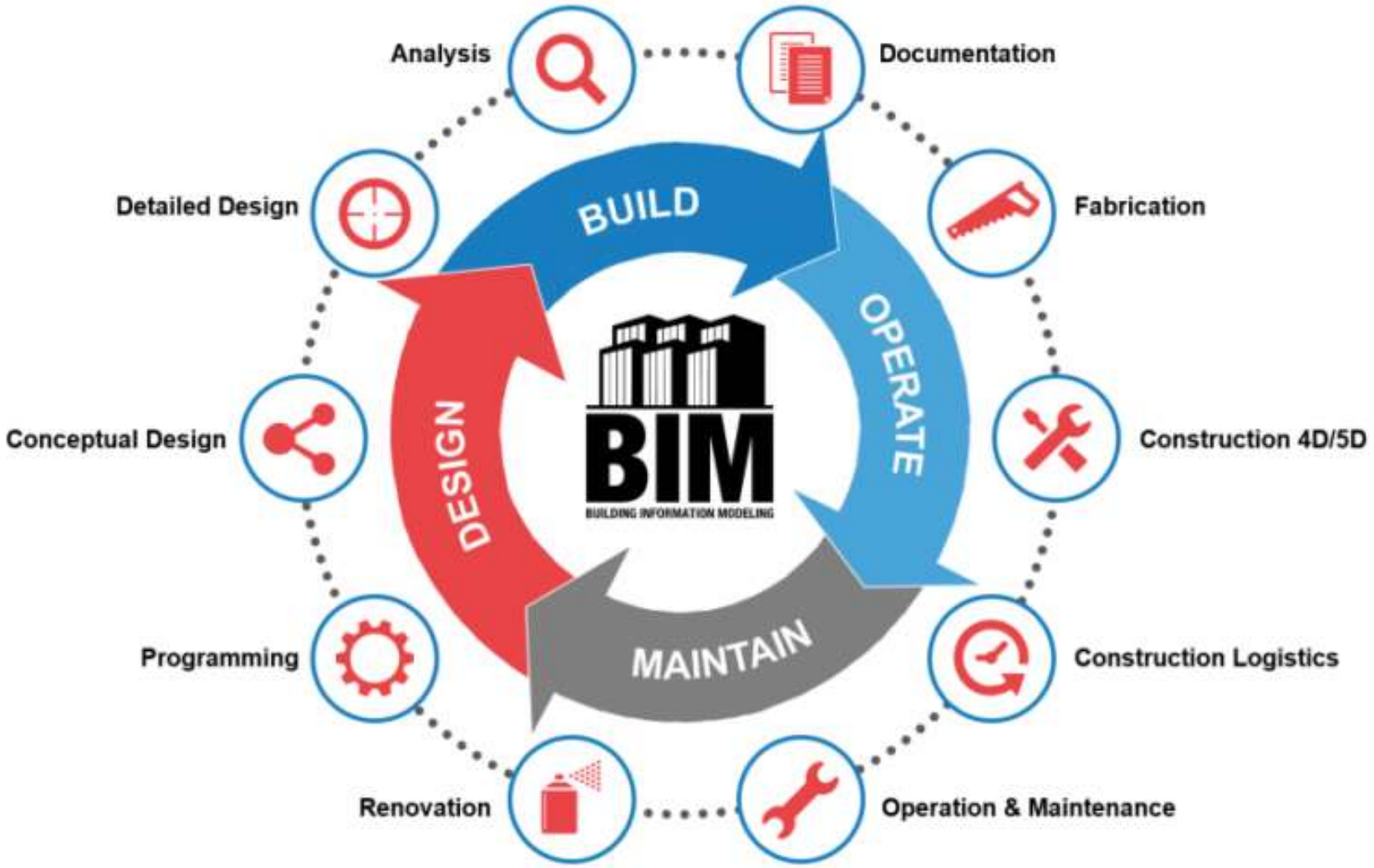
BUILDING INFORMATION MODELLING

– PROCESS COOPERATING AND A DIGITAL BUILDING MODEL

BUILDING INFORMATION MANAGEMENT

– FOCUSES ON THE INFORMATION ITSELF; THE STRUCTURE AND THE USE AND REUSE OF DIGITAL BUILDING INFORMATION DURING THE ENTIRE LIFE CYCLE OF A BUILDING

DEFINISI ‘BIM’



DEFINISI ‘BIM’

Digital 3D Model

Penyediaan dan pembangunan rekabentuk model 3D

Complete building

Gambaran projek yang lengkap dan berinformasi

Intelligent Components

Penghasilan komponen pintar

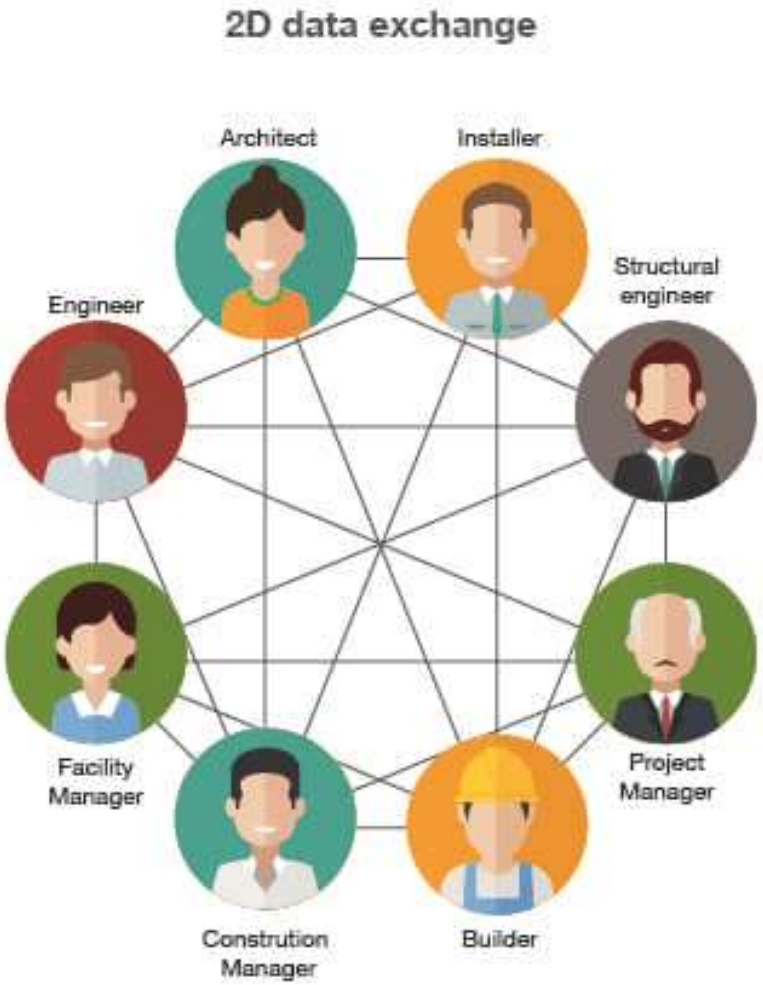
Shared by the team

Satu model 3D gunasama (perkongsian data)

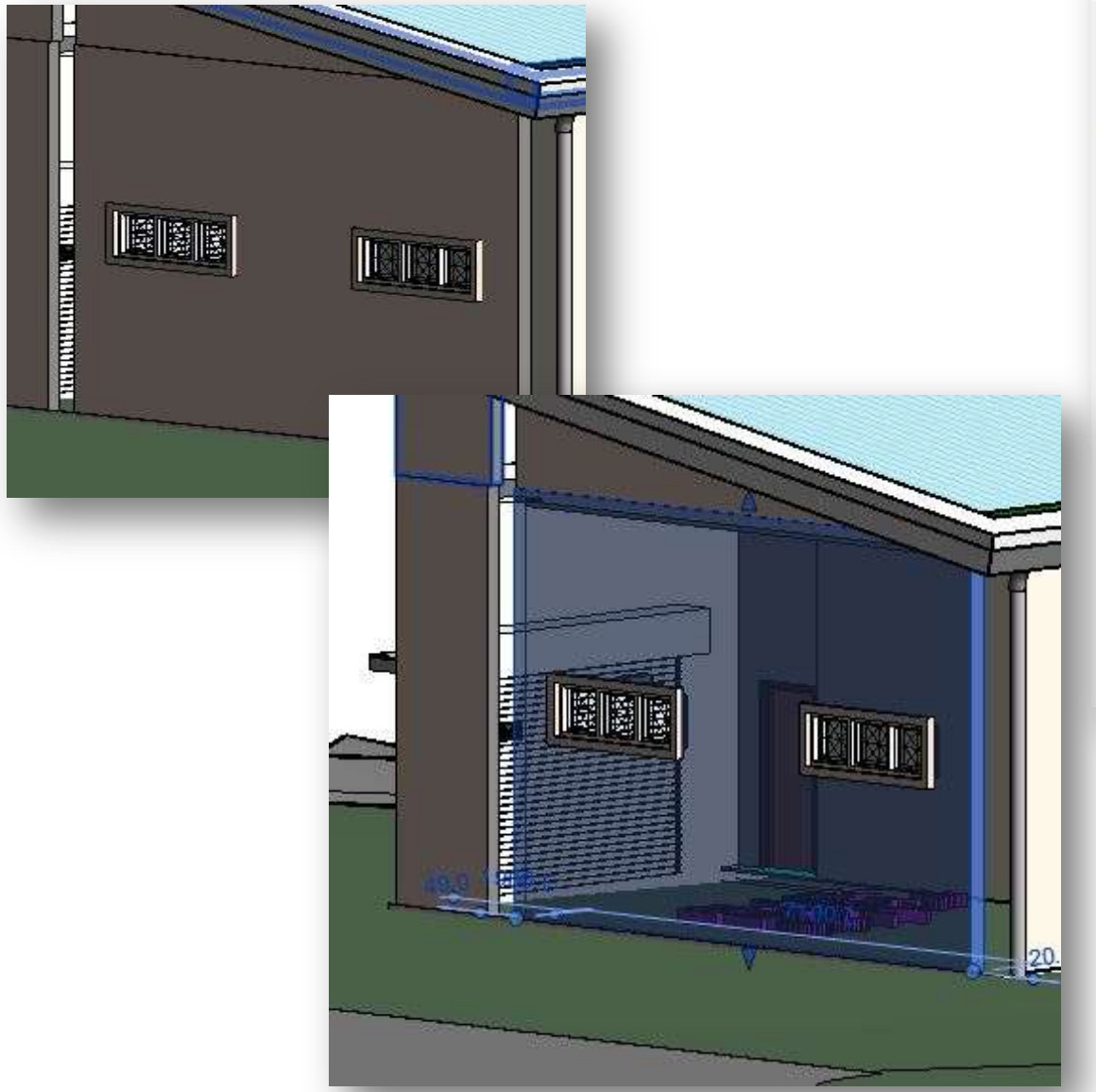
Used for Analysis

Setiap analisis menggunakan model 3D yang sama

DEFINISI ‘BIM’



DEFINISI ‘BIM’



Edit Assembly

Family: Basic Wall

Type: jkr13ARs_wall_(d02a-L)-3 125mm blok konkrit CSR (Luaran Umum -Service-Lokap) pada ketinggian sofit lantai / rasuk

Total thickness: 185.0

Sample Height: 6000.0

Resistance (R): 0.0000 (m²·K)/W

Thermal Mass: 0.00 kJ/K

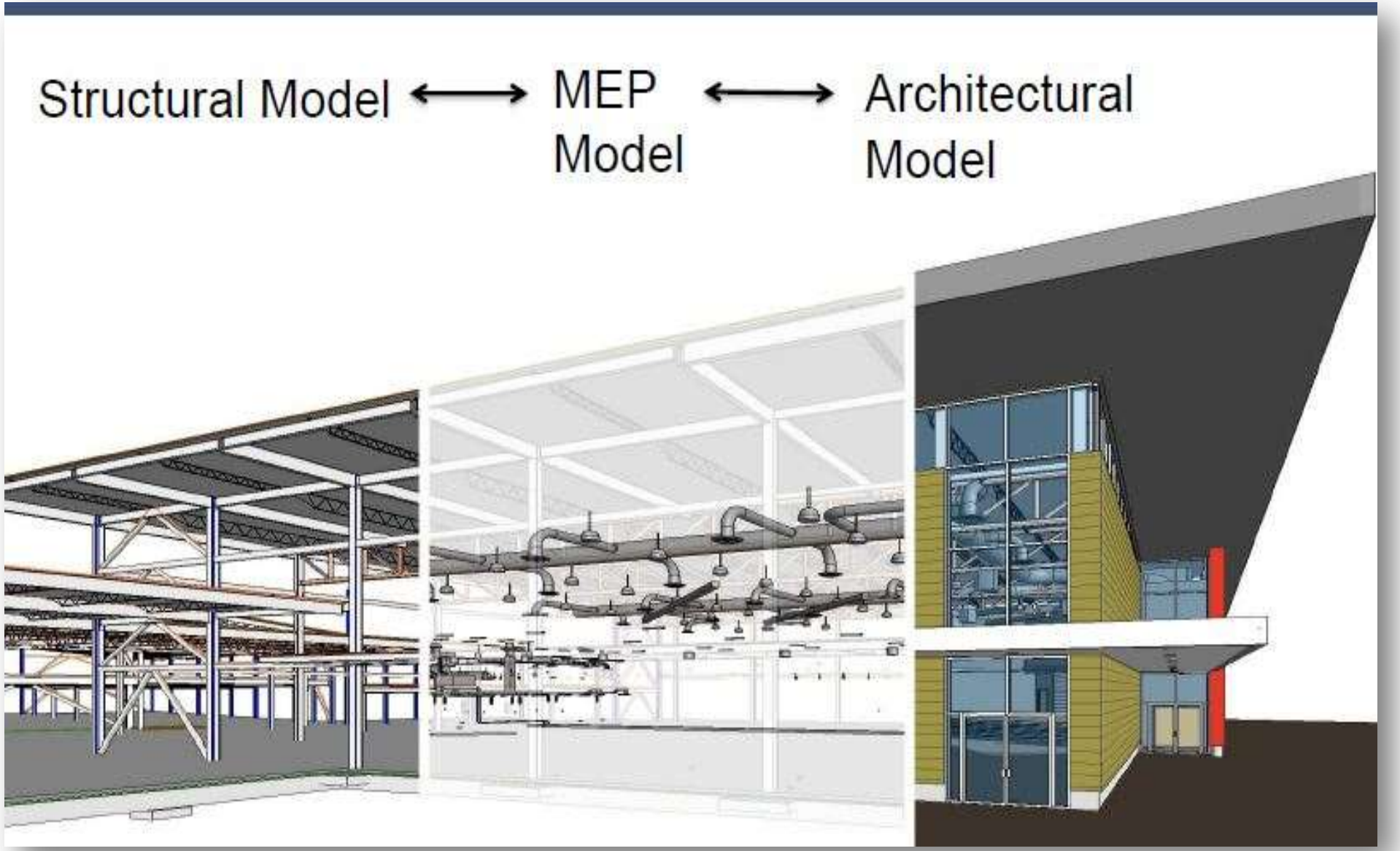
Layers

EXTERIOR SIDE

	Function	Material	Thickness
1	Finish 1 [4]	jkr wall (dk01) Kemasan Dinding Acrylic Base Exterior Fini	10.0
2	Substrate [2]	jkr wall (dk04) Kemasan Dinding Simen	20.0
3	**Core Boundary**	**Layers Above Wrap**	**0.0**
4	Structure [1]	jkr wall (d02) Dinding blok konkrit CSR AAC (Luaran)	125.0
5	**Core Boundary**	**Layers Below Wrap**	**0.0**
6	Substrate [2]	jkr wall (dk04) Kemasan Dinding Simen	20.0
7	Finish 1 [4]	jkr wall (dk02) Kemasan Dinding Acrylic Matt Finish Mid	10.0

INTERIOR SIDE

Insert Delete Up Down


Structural Model
MEP Model
Architectural Model

LEVEL OF DEVELOPMENT (LOD)

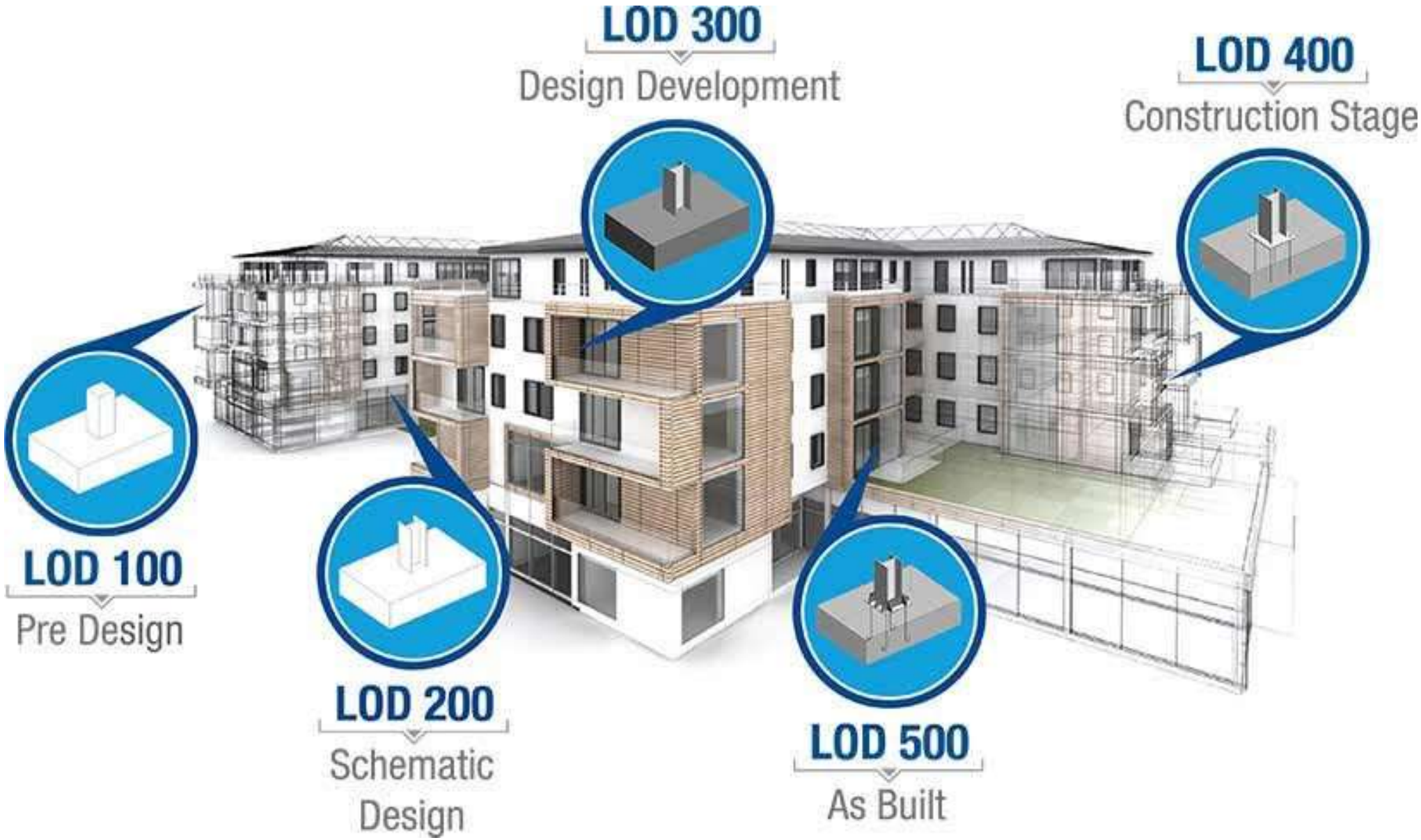
Fasa Pembangunan Model	*Level of Development* (LOD)
Model rekabentuk konsep	LOD 100
Model rekabentuk awalan	LOD 200
Model rekabentuk terperinci	LOD 300
Model pembinaan	LOD 400
Model siap bina	LOD 500
Model operasi dan penyenggaraan	

"LOD identifies how much information is known about a model element at a given time. This ***information richness grows*** *as the project comes closer to breaking ground"–* ***www.vicosoftware.com***

LEVEL OF DEVELOPMENT (LOD)

LOD 100	Conceptual Design/ Development Order
LOD 200	Schematic Design/ Design Development
LOD 300	Tender Documents/Construction Document
LOD 400	Shop/Fabrication Drawings
LOD 500	As Built / As Installed / Facilities Management

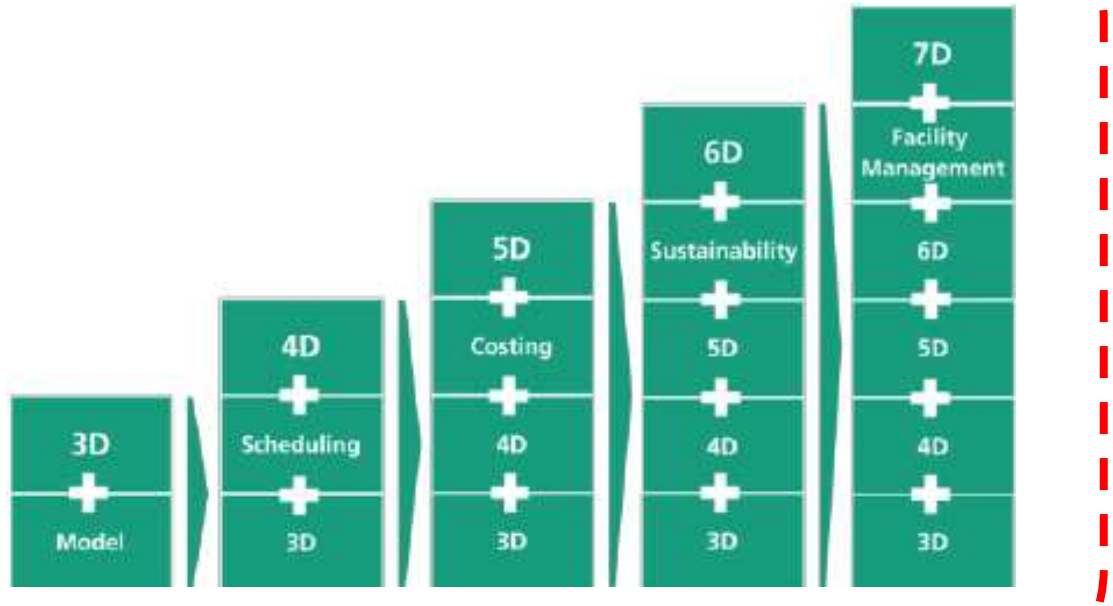
LEVEL OF DEVELOPMENT (LOD)



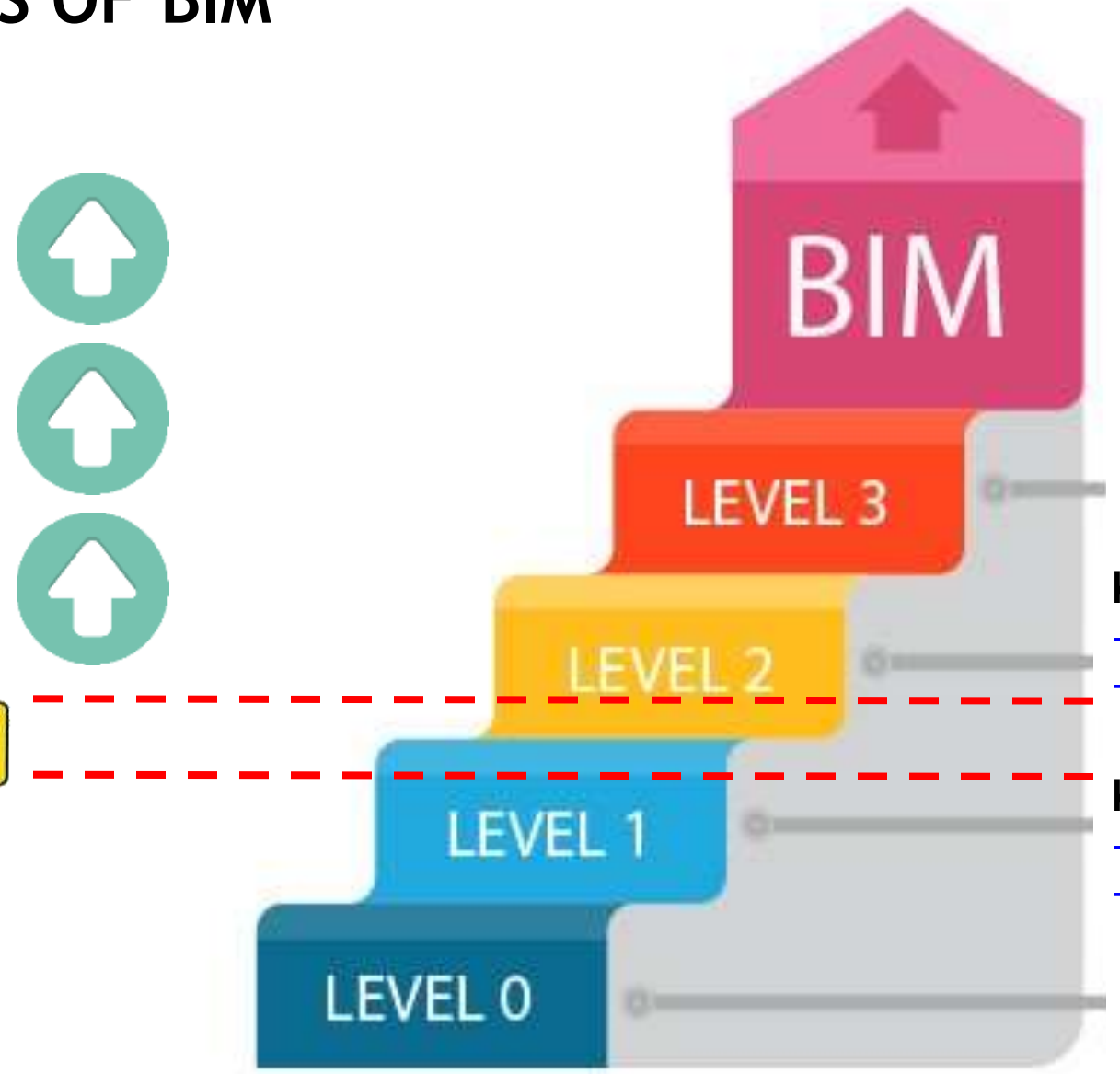
LEVEL OF DEVELOPMENT (LOD)

	Family						
	Fasa	Konsep	Awalan	Terperinci	Pembinaan	Siap Bina	Operasi & Senggaraan
	LOD	100	200	300	400	500	500
Dimension	*Width*	-	60mm	60mm	60mm	60mm	60mm
	Length	-	500mm	500mm	500mm	500mm	500mm
	Height	-	182mm	182mm	182mm	182mm	182mm
Electrical Loads	*Phase*			1Ø	1Ø	1Ø	1Ø
	Frequency			50Hz	50Hz	50Hz	50Hz
	Wattage (W)			2 X 8W	2 X 8W	2 X 8W	2 X 8W
	Voltage (V)			240 AC	240 AC	240 AC	240 AC
Identity data	*Manufacturer*	-	-	-	A Sdn Bhd	A Sdn Bhd	C Sdn Bhd
	Model	-	-	-	KSP 28F	KSP 28F	KSP 28F
	Cost	-	-	-	RM 150	RM 150	RM 180
	Installation date	-	-	-	20.06.14	20.06.14	12.02.20

DIMENSI BIM / *BIM DIMENSION*



LEVELS OF BIM



Integrasi Lengkap / *Open BIM (6D)*
- *Open BIM untuk perkongsian data yang lebih meluas - Cloud, Big data, IoT*

Kolaborasi Lengkap (4D - 5D)
- *Information exchange process*
- *Platform universal*

Kolaborasi Berperingkat (2D - 3D)
- *Kenalpasti R&R*
- *Naming convention, guide, manuals*

CAD
- Tiada kolaborasi

PERISIAN KEUPAYAAN BIM

PERISIAN BIM @ JKR

BIM

- DESIGN AUTHORING
  Reka Bentuk
- CLASH ANALYSIS

Koordinasi

Visualisasi *cinematic*

Tekla®

Analisis

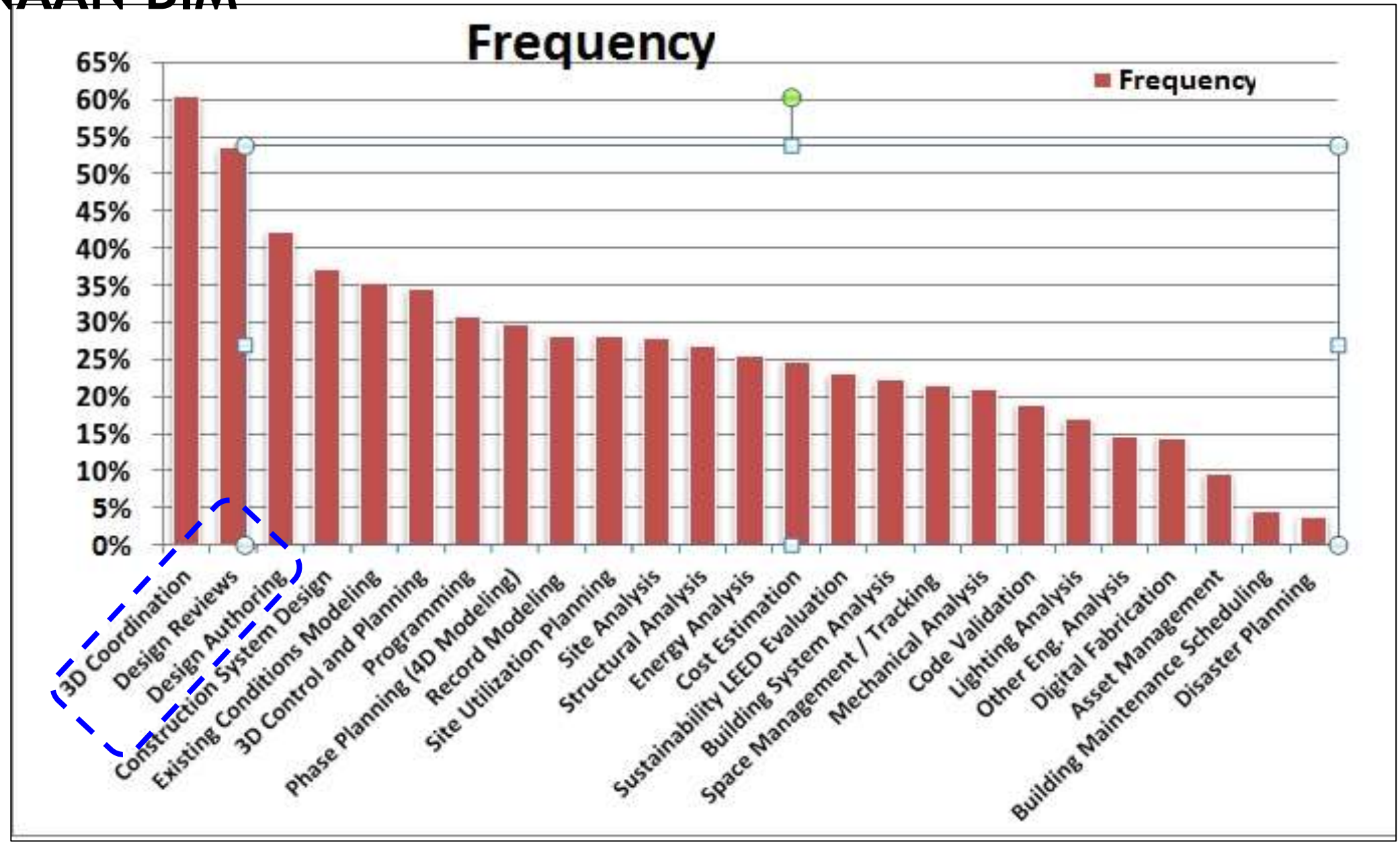
Penyimpanan & Perkongsian Fail dan

exactal

Penyediaan Kuantiti

BIM ; PROSES DAN EVOLUSI

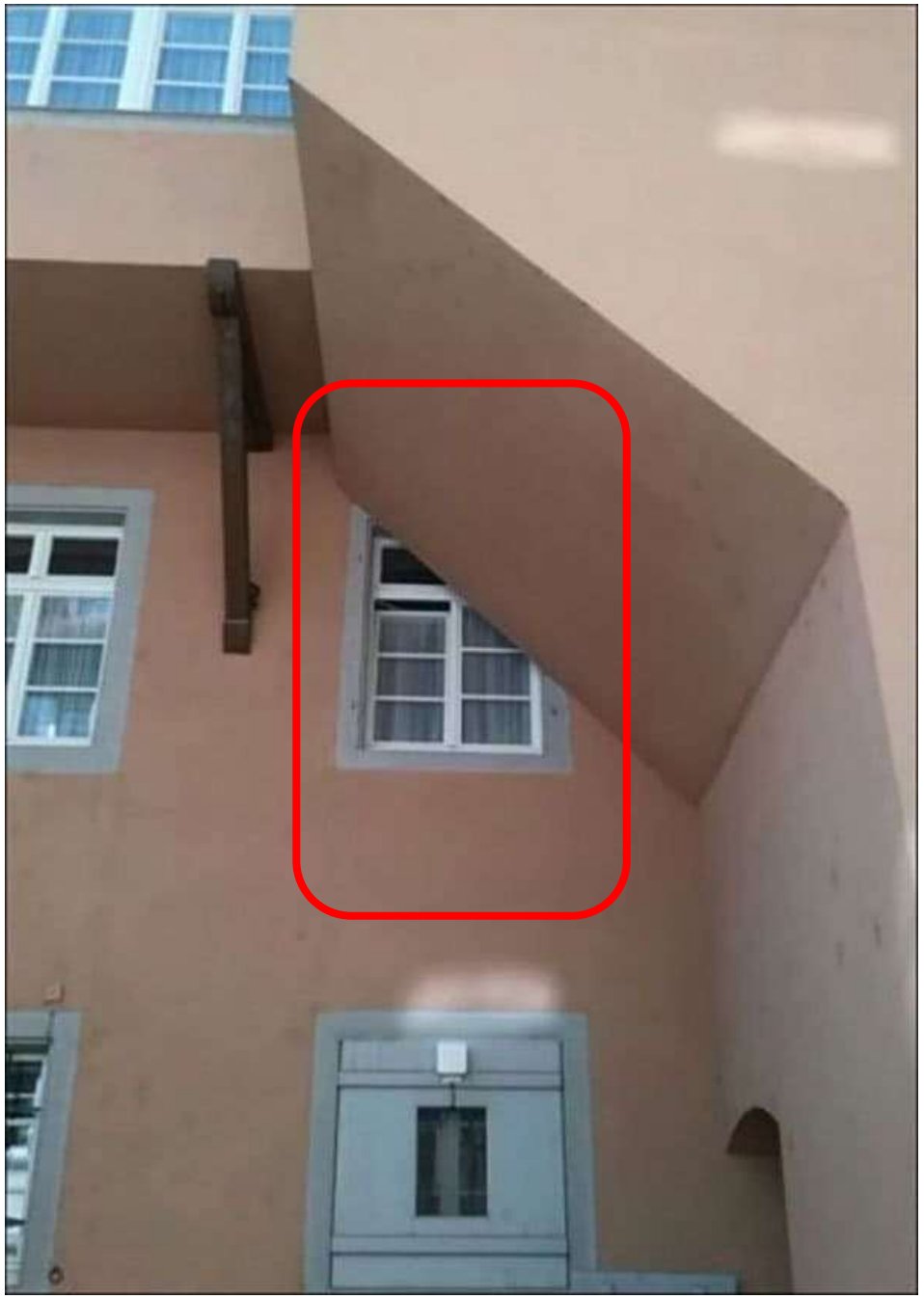
KEGUNAAN BIM



Sumber :(AN ONTOLOGY OF THE USES OF BUILDING INFORMATION MODELING, A Dissertation in Architectural Engineering By Ralph G. Kreider; 2013)

BIM USES

- VISUALISATION
- DESIGN REVIEW
- 3D COORDINATION (CLASH ANALYSIS)



BIM USES

- VISUALISATION
- DESIGN REVIEW

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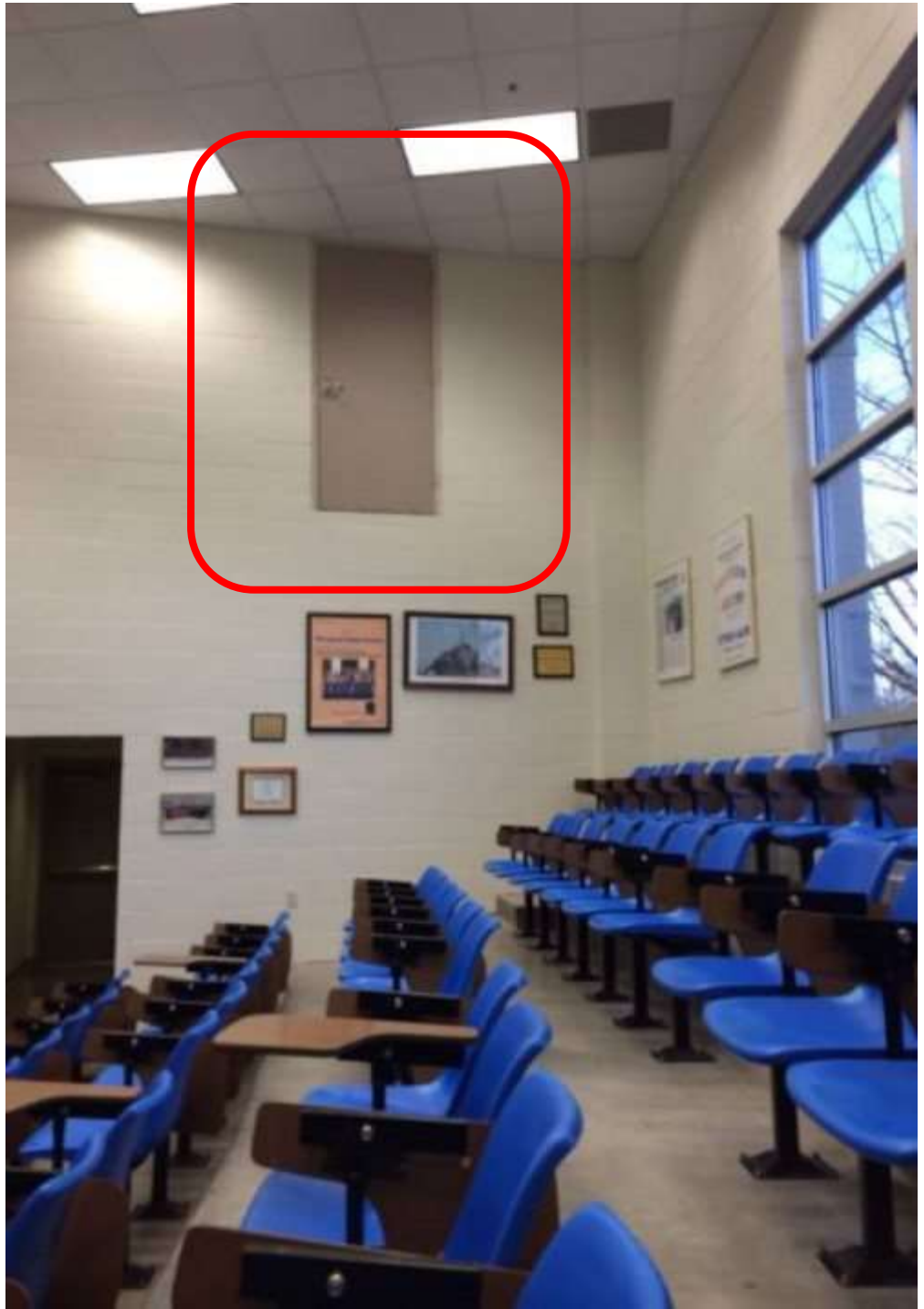


BIM USES

- VISUALISATION
- DESIGN REVIEW

BIM USES

- VISUALISATION
- DESIGN REVIEW
- 3D COORDINATION (CLASH ANALYSIS)
- SIMULATION

BIM USES

- VISUALISATION
- SIMULATION

BIM USES

- VISUALISATION
- DESIGN REVIEW
- 3D COORDINATION (CLASH ANALYSIS)

BIM USES

- VISUALISATION
- DESIGN REVIEW
- 3D COORDINATION (CLASH ANALYSIS)

BIM USES

- VISUALISATION
- DESIGN REVIEW
- 3D COORDINATION

BIM USES

- VISUALISATION
- DESIGN REVIEW
- 3D COORDINATION (CLASH ANALYSIS)

BIM USES

- VISUALISATION
- DESIGN REVIEW

BIM USES

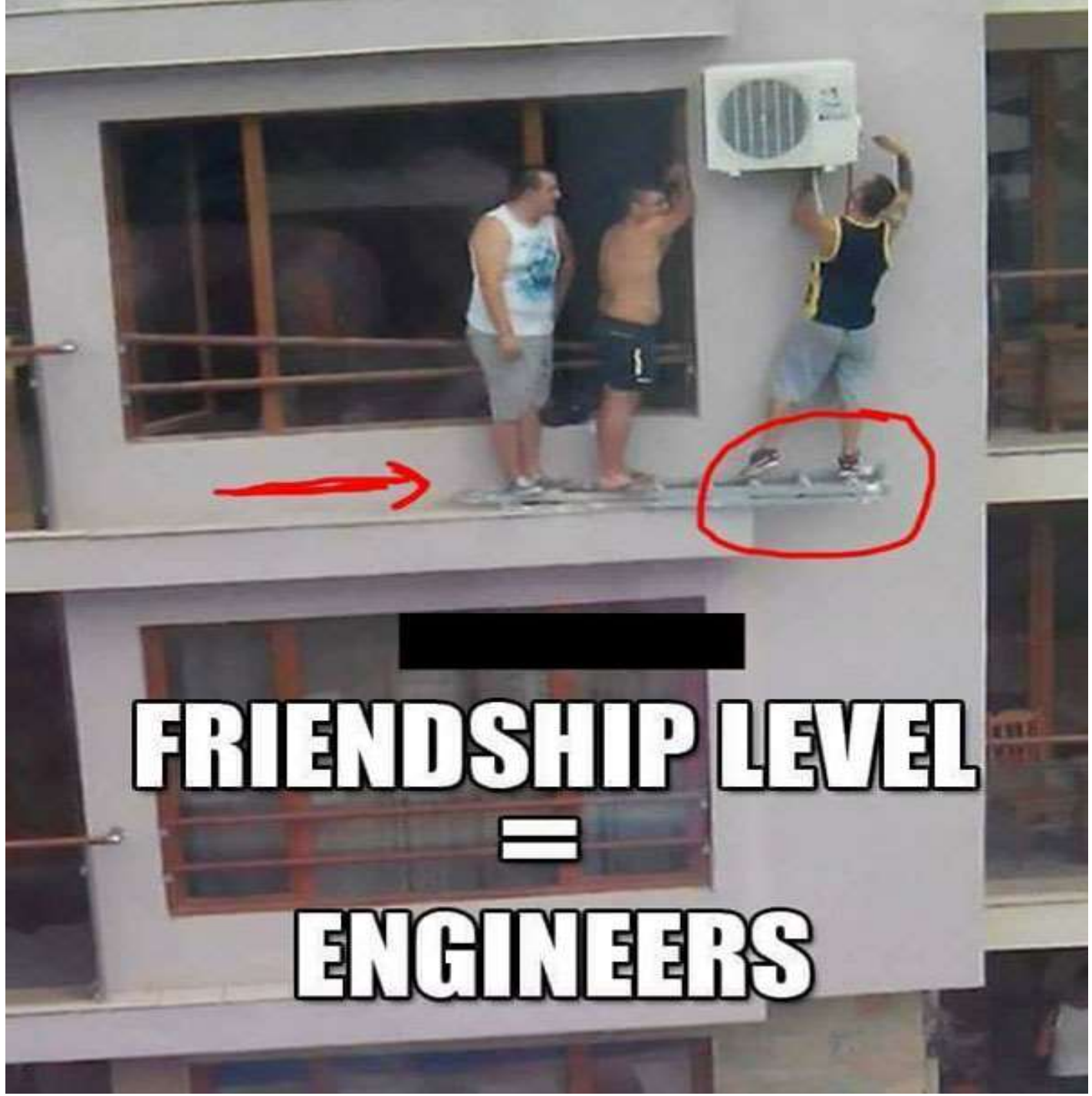
- VISUALISATION
- DESIGN REVIEW
- SIMULATION

BIM USES

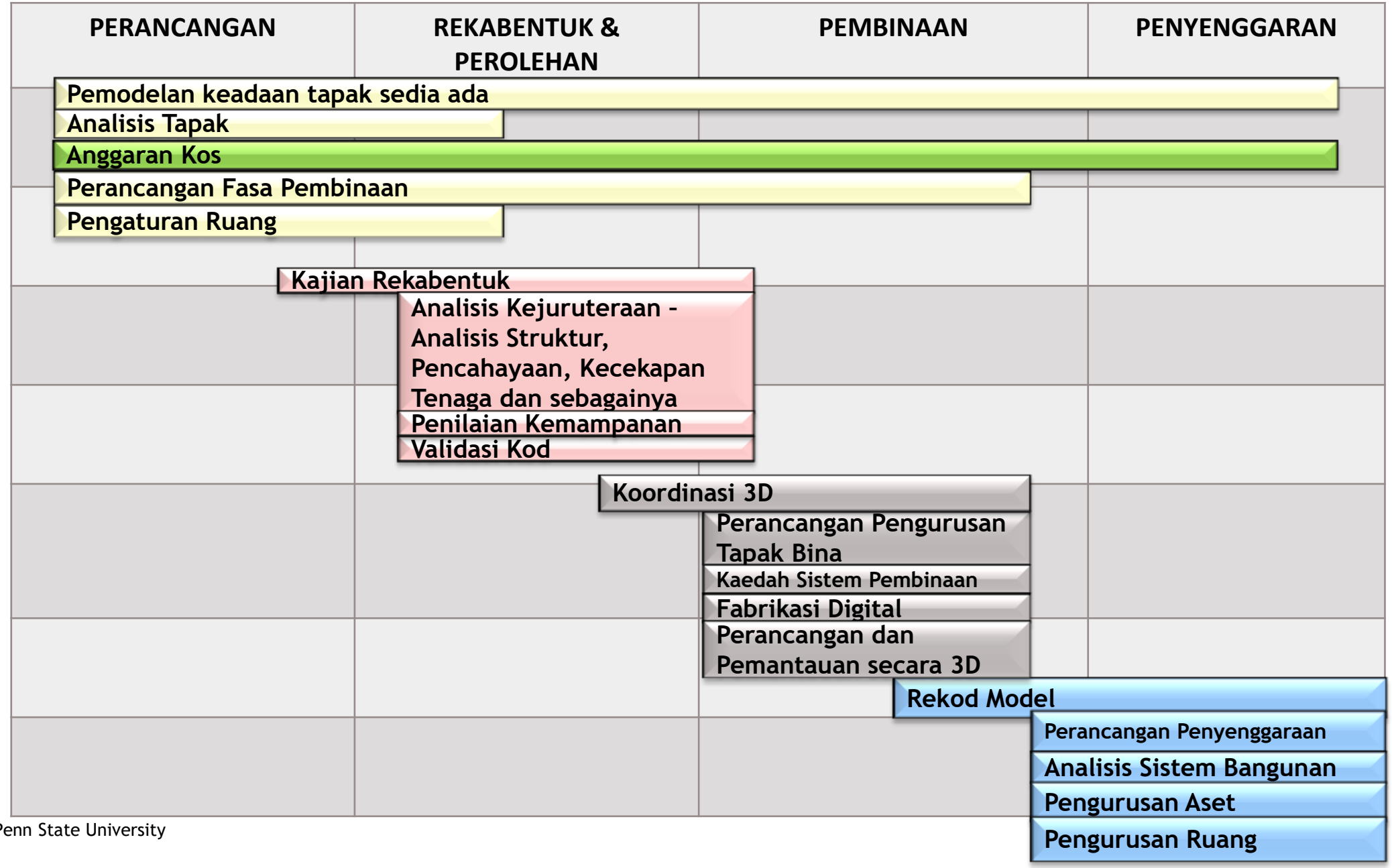
- VISUALISATION
- DESIGN REVIEW
- 3D COORDINATION (CLASH ANALYSIS)

BIM USES

- VISUALISATION
- DESIGN REVIEW
- SPATIAL ANALYSIS
- SIMULATION



KEGUNAAN BIM



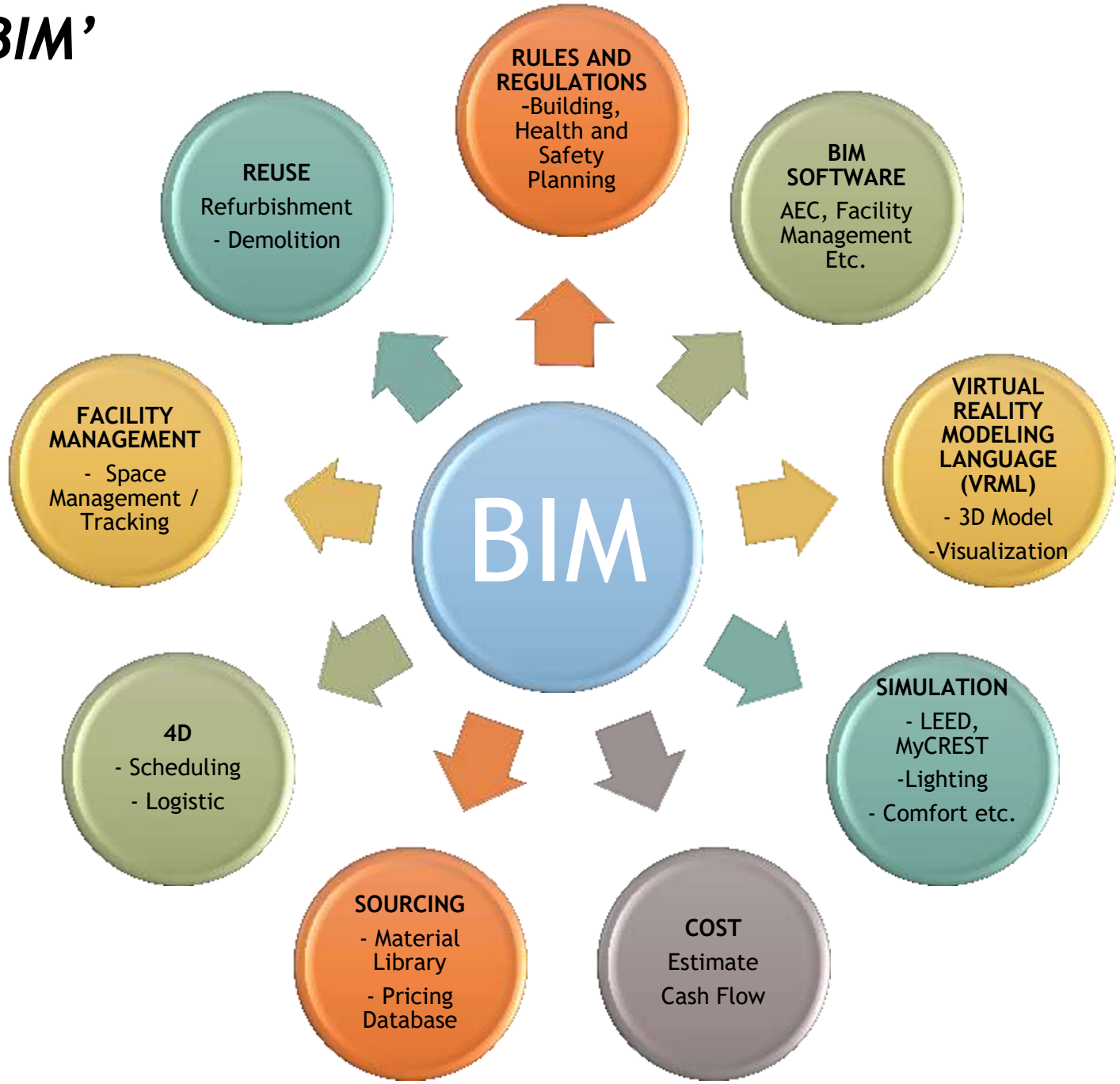
Sumber : Penn State University

'FULLY FUNCTIONAL BIM'

BIM

"...adalah satu set interaksi antara polisi, proses dan teknologi untuk menghasilkan satu 'kaedah untuk menguruskan kepentingan reka bentuk bangunan dan data-data projek dalam format digital atau alam maya menerusi kitaran hayat bangunan tersebut'

(Penttilä, 2006).



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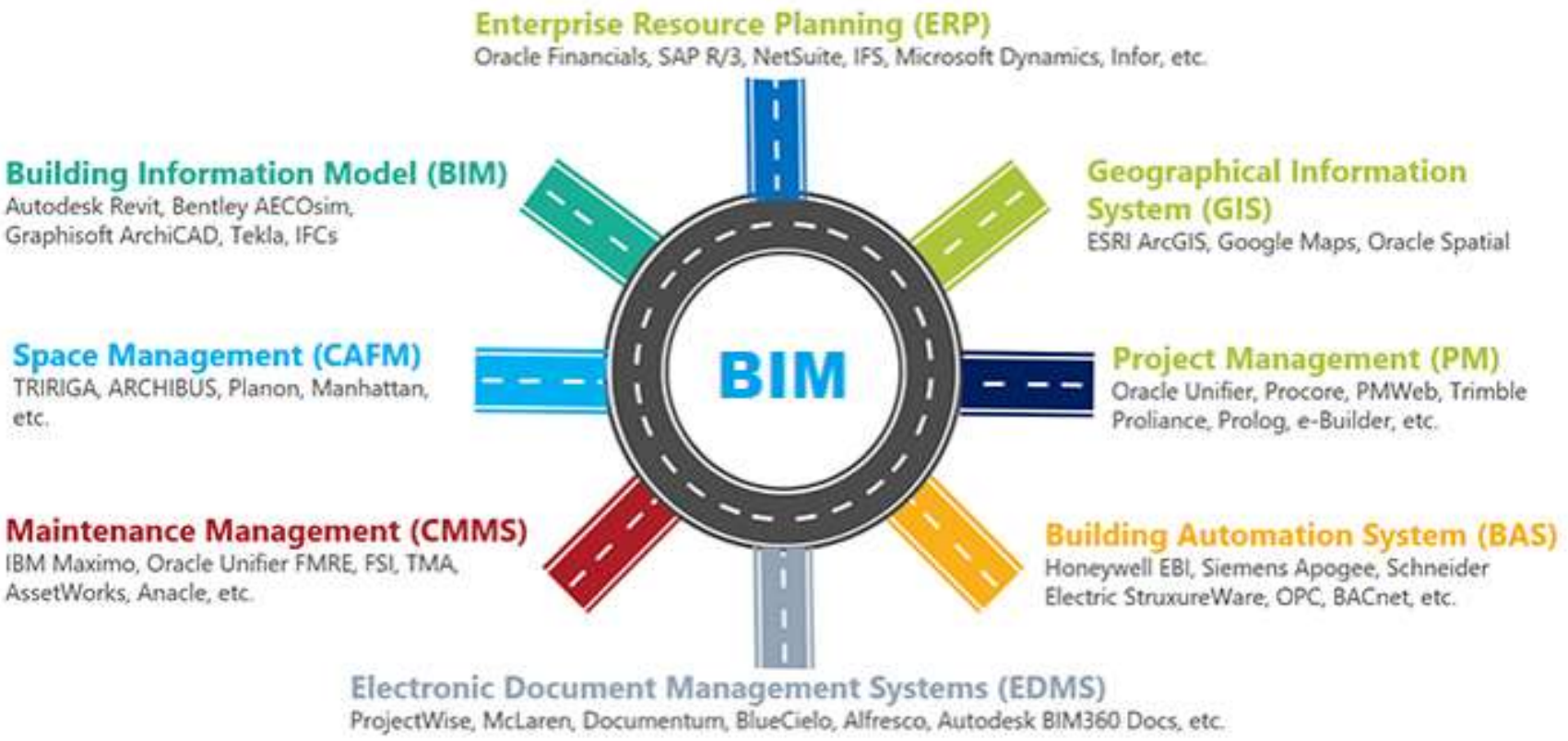
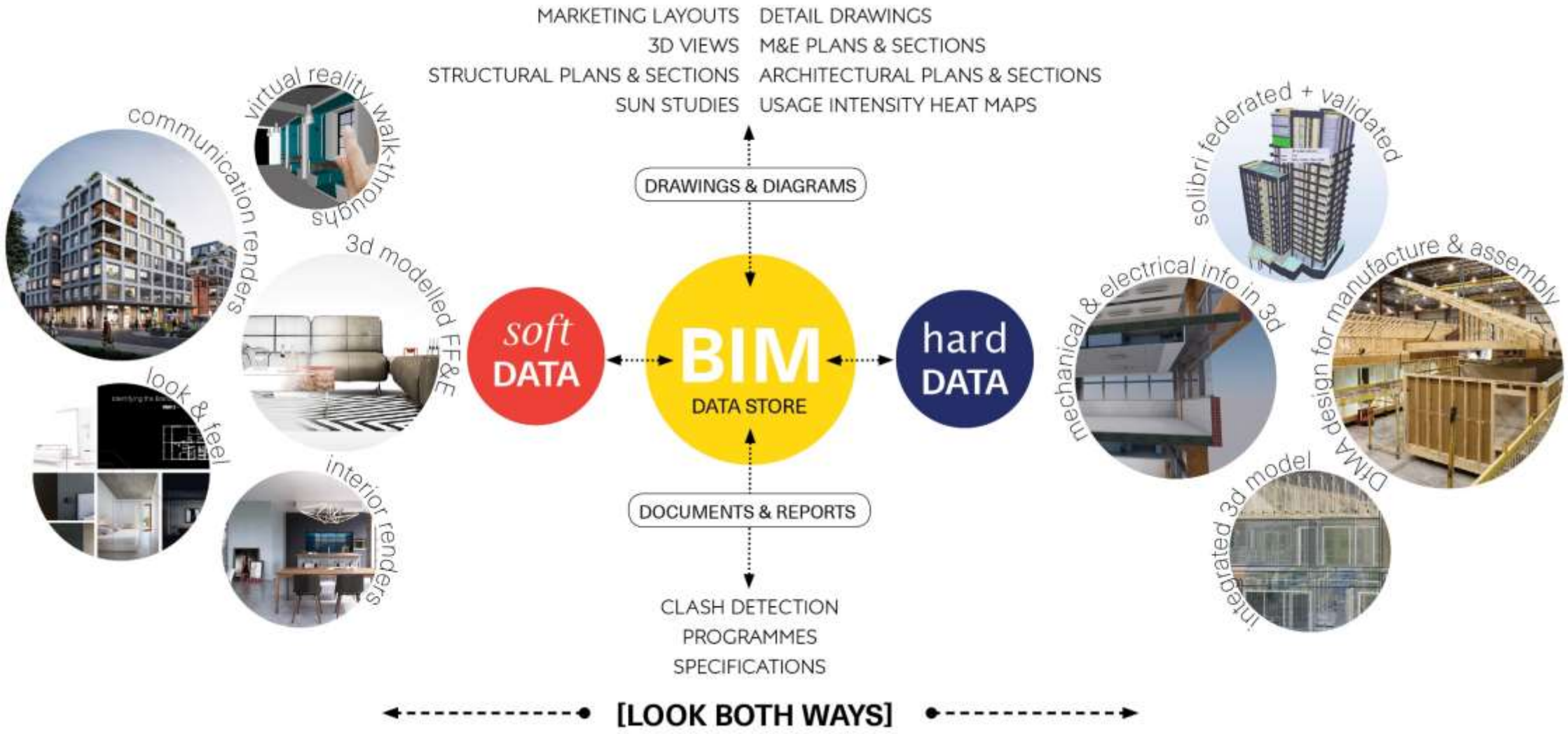


BIM UNTUK SIMPANAN DAN PERKONGSIAN DATA



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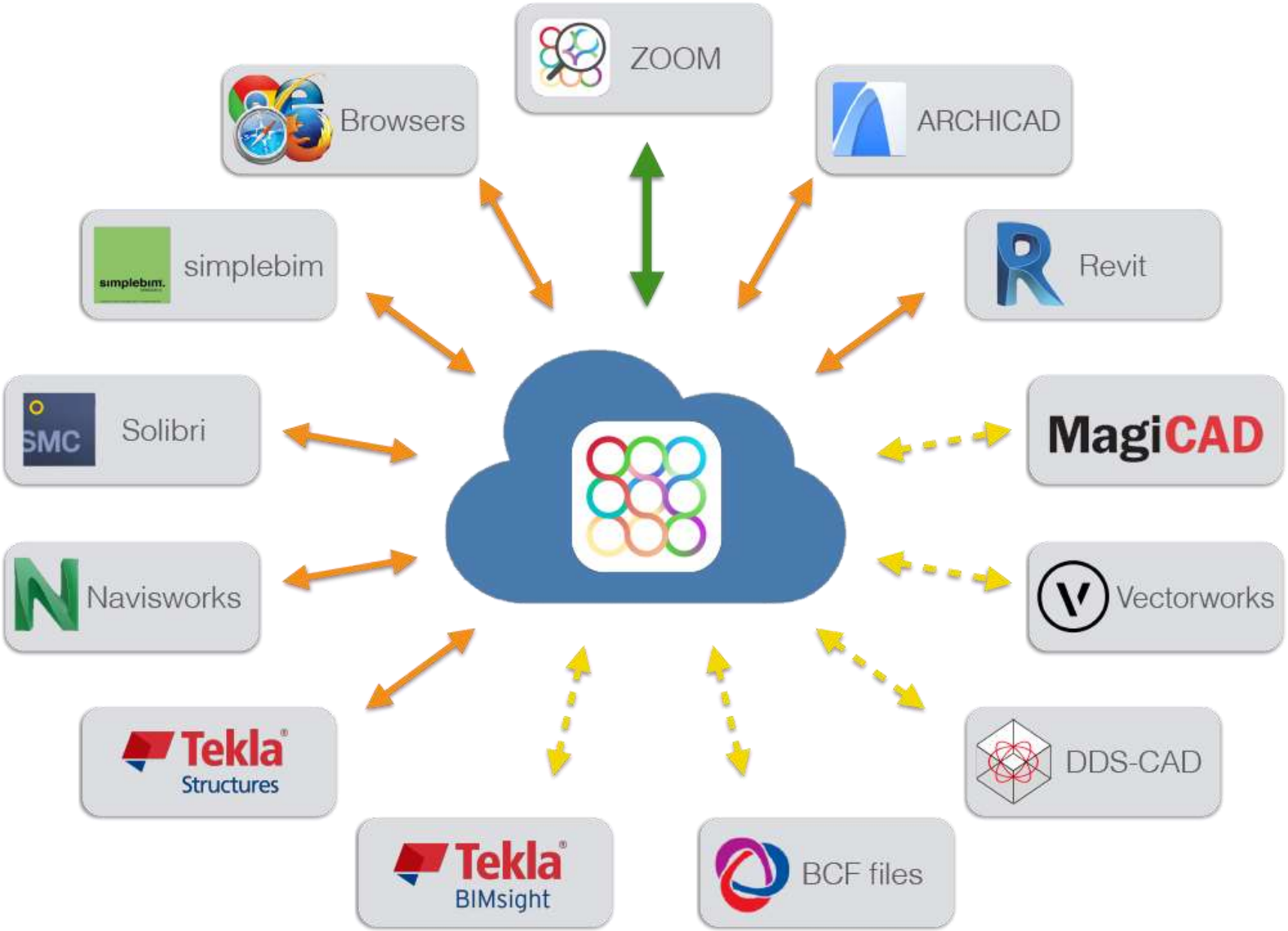


FAEDAH BIM

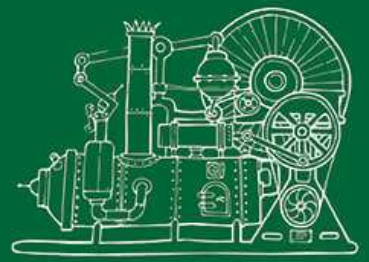

Better data quality
Lifecycle building management
Coordinated approach
Faster project delivery
No change orders
Budget reliability
Virtual simulation
Higher building quality
Collaborative design
Higher building functionality
Prefabrication
Fewer accidents on job sites
No data loss
Transparency from idea to rebuild
Virtual model
Earlier conflict and error detection

CONSTRUCTION 4.0

REVOLUSI PEMBINAAN

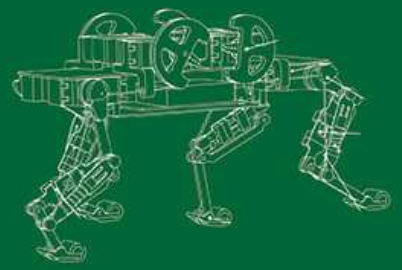
IR 1.0
Penggunaan peralatan asas – tenaga manusia dan haiwan

IR 2.0
Dipacu oleh penggunaan mesin seperti *cranes*, *loa*ders etc.



IR 3.0
Dipacu oleh penggunaan teknologi maklumat – perisian BIM

IR 4.0
Pendigitalan industri pembinaan – IoT, RFID, LiDAR, *drones*, *3D printing* etc.



CONSTRUCTION 4.0

Terminologi yang merujuk kepada digitalisasi industri pembinaan (*European Construction Industry Federation*, *FIEC*)

Merupakan satu kerangka transformasi yang diinspirasikan dari IR 4.0 yang melibatkan satu anjakan yang besar kepada industri pembinaan dalam memanipulasi data secara digital dan disokong oleh teknologi dalam pelaksanaan rekabentuk, pembinaan dan operasi sesebuah projek.

Kerangka transformasi ini antaranya melibatkan :

+ Produk Industri pembuatan (contoh prefabrication, 3D printing

+ *Cyber-physical systems* (sensors/RFID, IoT, sistem robotik)

+ Teknologi pengkomputeran dan digital (BIM, video dan laser scanning, AI, cloud computing, big data dan data analytics, simulasi, virtual reality)

CONSTRUCTION 4.0

TIMBALAN Menteri Kerja Raya, Mohd Anuar Mohd Tahir berucap pada majlis perasmian "Forum Statistic, Indices in Construction and Automation (SICA) di Kuala Lumpur, hari ini. - Foto BERNAMA

Manfaat teknologi terkini industri binaan

KUALA LUMPUR: Kementerian Kerja Raya menggesa peserta industri pembinaan menggunakan teknologi terkini seperti analisis data raya bagi meneruskan kemampanan prestasi dan produktiviti serta menyumbang kepada ekonomi negara.

Timbalan Menterinya, Mohd Anuar Mohd Tahir, berkata peningkatan tahap produktiviti industri pembinaan adalah keutamaan kerajaan, sejajar dengan Program Transformasi Industri Pembinaan (CITP) 2016-2020.

Mohd Anuar berkata, kaedah dan amalan digital, integrasi dan automasi adalah fokus utama di bawah teras strategi produktiviti CITP yang bertujuan menggandakan tahap produktiviti sektor pembinaan dengan menyesuaikan gaji yang lebih tinggi menjelang 2020.

Katanya, industri pembinaan memerlukan perubahan besar dalam meningkatkan tahap produktiviti dan berdasarkan Laporan Produktiviti terkini yang dihasilkan oleh Perbadanan Produktiviti Malaysia (MPC) pada 2017, industri pembinaan mencatatkan tahap produktiviti terendah iaitu RM40,242 setiap pekerja.

"Ia jauh berbeza berbanding sektor pertanian pada RM51,988, sektor perkhidmatan pada RM73,030, manakala perlombongan kekal sebagai sektor dengan tahap produktiviti tertinggi pada RM1,210,832.

"Sektor pembinaan adalah komponen utama dalam memacu pertumbuhan ekonomi negara, secara konsisten merekodkan pertumbuhan Keluaran Dalam negara Kasar (KDNK) yang lebih tinggi dari tahun ke tahun berbanding dengan KDNK negara sejak 2012, melebihi prestasi sektor ekonomi yang lain.

"Jadi sebagai komponen utama ekonomi negara, industri ini perlu berdaya tahan terhadap cabaran mendatang, khususnya ketika menghadapi Revolusi Industri 4.0.

"Oleh itu, pihak berkepentingan industri perlu mengguna pakai teknologi dan proses moden, seperti analisis data raya, untuk memastikan kemampanan berterusan sektor pembinaan," katanya selepas merasmikan "Forum Statistic, Indices in Construction and Automation (SICA) di sini, hari ini.

Mohd Anuar berkata, analisis data raya sudah terbukti keberkesanannya dalam industri lain dan tidak ada alasan untuk industri pembinaan tidak mengguna pakai kaedah yang sama.

Beliau berkata, jika negara mahu berdaya maju dalam menghadapi Revolusi Industri 4.0, adalah penting untuk menerima pakai pendigitalan dan teknologi dalam peralihan daripada menjadi industri yang berdaya maju.

Sumber : Berita Harian 14 Ogos 2018

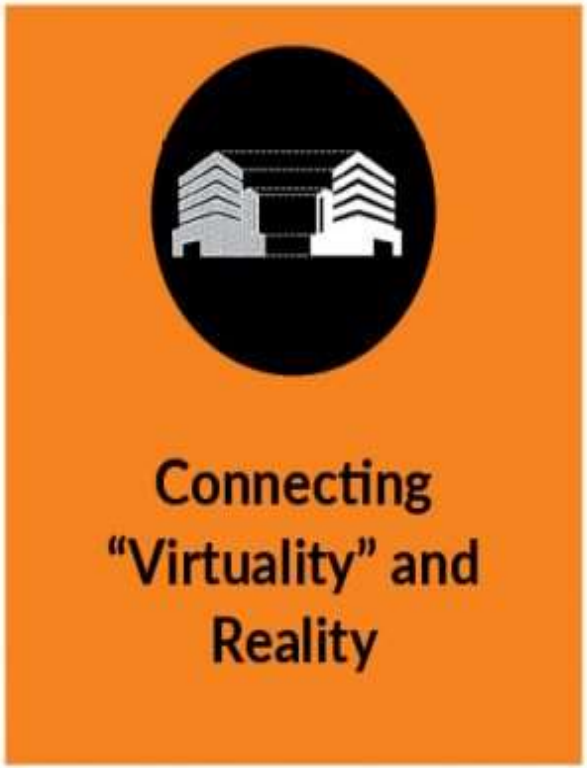
DI MANAKAH KITA?

QUALITY, SAFETY & PROFESSIONALISM	ENVIRONMENTAL SUSTAINABILITY	PRODUCTIVITY	INTERNATIONALISATION
Q1 Increase emphasis on quality and implement quality assessments	E1 Drive innovation in sustainable construction	P1 Continue investment in human capital development in construction	I1 Internationalise construction practices and standards
Q2 Improve workplace safety and workers' amenities	E2 Drive compliance to environmental sustainability ratings and requirements	P2 Enhance control and balance of workforce supply	I2 Strengthen access to financing for Malaysian champions going abroad
Q3 Improve ease of doing business by addressing regulatory constraints	E3 Focus on public projects to lead the charge on sustainable practices	P3 Accelerate adoption of IBS, mechanisation and modern practices	I3 Support consortia formation and strengthen overseas market intelligence
	E4 Facilitate industry adoption of sustainable practices	P4 Roll out technology advantage across project life-cycle	
	E5 Reduce irresponsible waste during construction	P5 Enhance availability of strategic information via National Construction Industry Information Centre (NCIIC)	
		P6 Advance SME/ Bumiputera capacity and capability-building	

Q4 Promote and raise awareness of CITP initiatives

BIM DAN *CONSTRUCTION 4.0*

BIM sebagai *central repository* bagi penyimpanan dan perkongsian data



BIM DAN *CONSTRUCTION 4.0* - PERKEMBANGAN SEMASA

BIM Model

Mobile apps

Virtual Reality

Augmented Reality

Computer aided manufacturing

BIM DAN *CONSTRUCTION 4.0*

- … is the process of designing a building collaboratively using one coherent system of computer models rather than as separate sets of drawings

3D Modeling

- … is the process that delivers an integrated set of geometric model data and documentation that builds over the life of a project capturing all knowledge related to a particular asset during the design manufacturing construction and the asset management phases

Digital Engineering

- … is the combination of real and virtual worlds that produces new environment and visualization. In a reality mesh, physical and digital objects meet and interact in real time to help professionals plan, design, construct and operate projects better.

Reality Mesh

REAL TIME INFORMATION

1 SMART CRANE

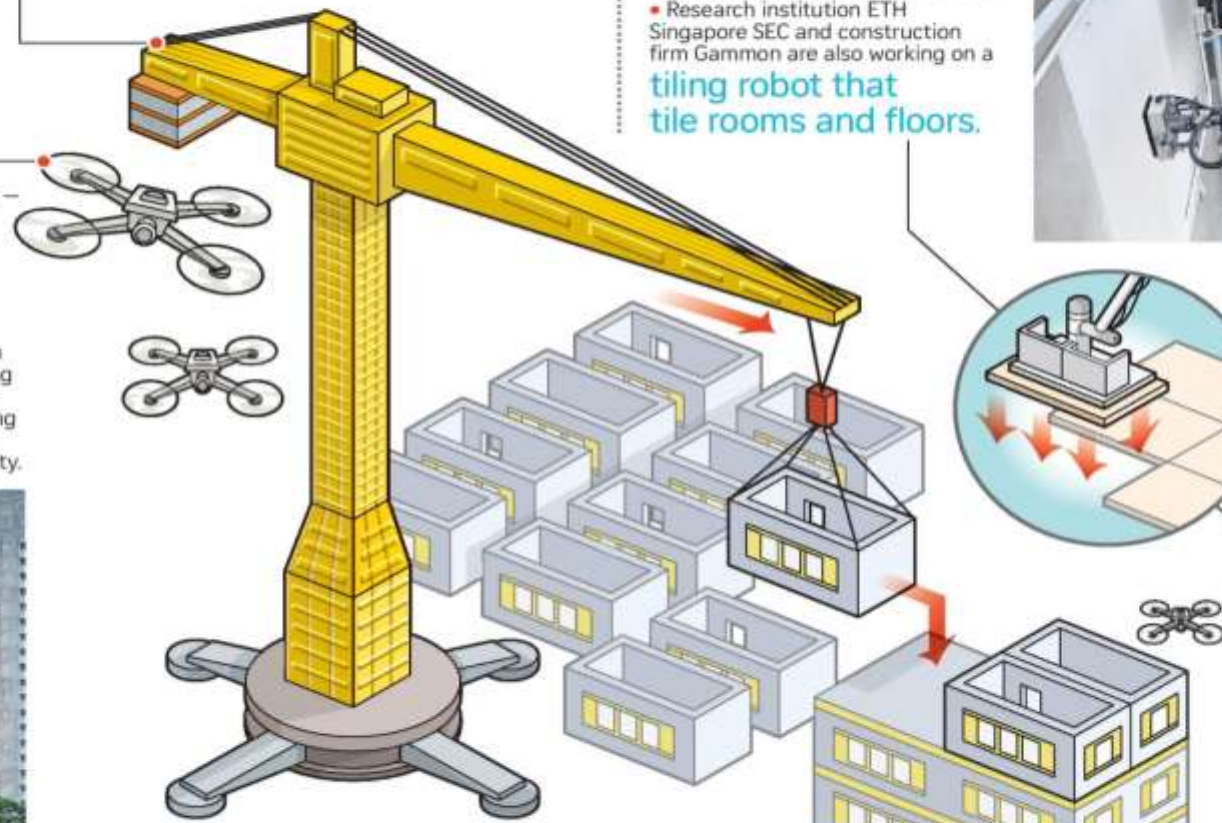
- With more prefab components on the way, the Nanyang Technological University (NTU) and Kimly Construction are looking at improving a remote-controlled smart crane capable of tracking and stacking units from the time of their creation to when they arrive on site.
- These will rely on each component having its own **Radio Frequency Identification tag,** as well as a host of cameras, satellite tracking and microchips.
- Among other things, it will **improve safety by reducing "blind lifting" situations** that those in traditional cranes often come across.
- It will also result in **10 to 20 per cent** productivity gain for those in site logistics, and shave off a third of the time needed for inventory checking.

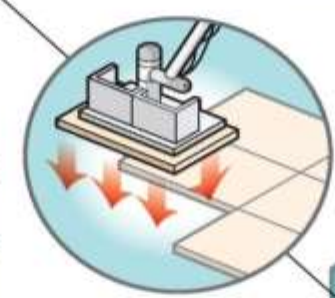
2 DRONES

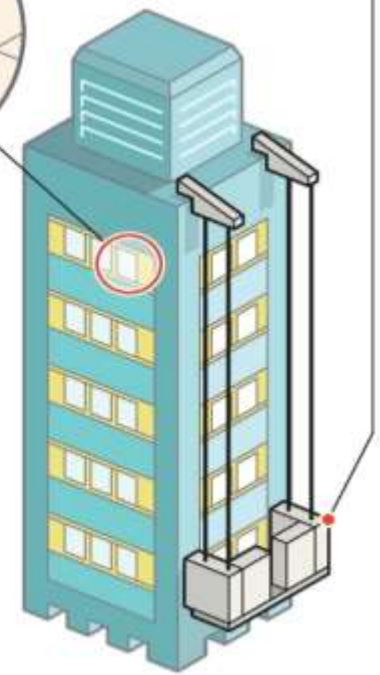
- Construction firms, developers — and research institutions are using commercial drones and modifying them to **monitor and inspect buildings as they are being built.**
- A property firm, for example, takes photos of its sites during construction to carry out photogrammetry — or the use of photography to survey and map — to ascertain measurements between objects. The process of giving real-time updates is being tried out at the Paya Lebar Quarter.
- Meanwhile, the National University of Singapore and tech firm Tectus Dreamlab are working on a drone that does not rely on satellites or the global positioning system, so that it can travel indoors to inspect building quality.

3 ROBOTICS

- The use of robotics to reduce manpower needs and safety risks, speed up tasks and ensure more consistent quality is in the works.
- For example, Singapore electronics company Elid Technology worked with NTU to create an **automated gondola system** that can clean and paint high-rise buildings (far right). It not only cuts the number of workers needed to wash or paint a building facade from five to two, but it also ensures that both of them do not have to be on the gondola.
- Engineering firm Pod Structures is also working on an **intelligent lifting system** that can automatically — instead of manually — adjust the balance for heavier prefab units as they are being stacked. This is especially useful for tall buildings, where wind may affect the balance of the units.
- Research institution ETH Singapore SEC and construction firm Gammon are also working on a **tiling robot that tile rooms and floors.**





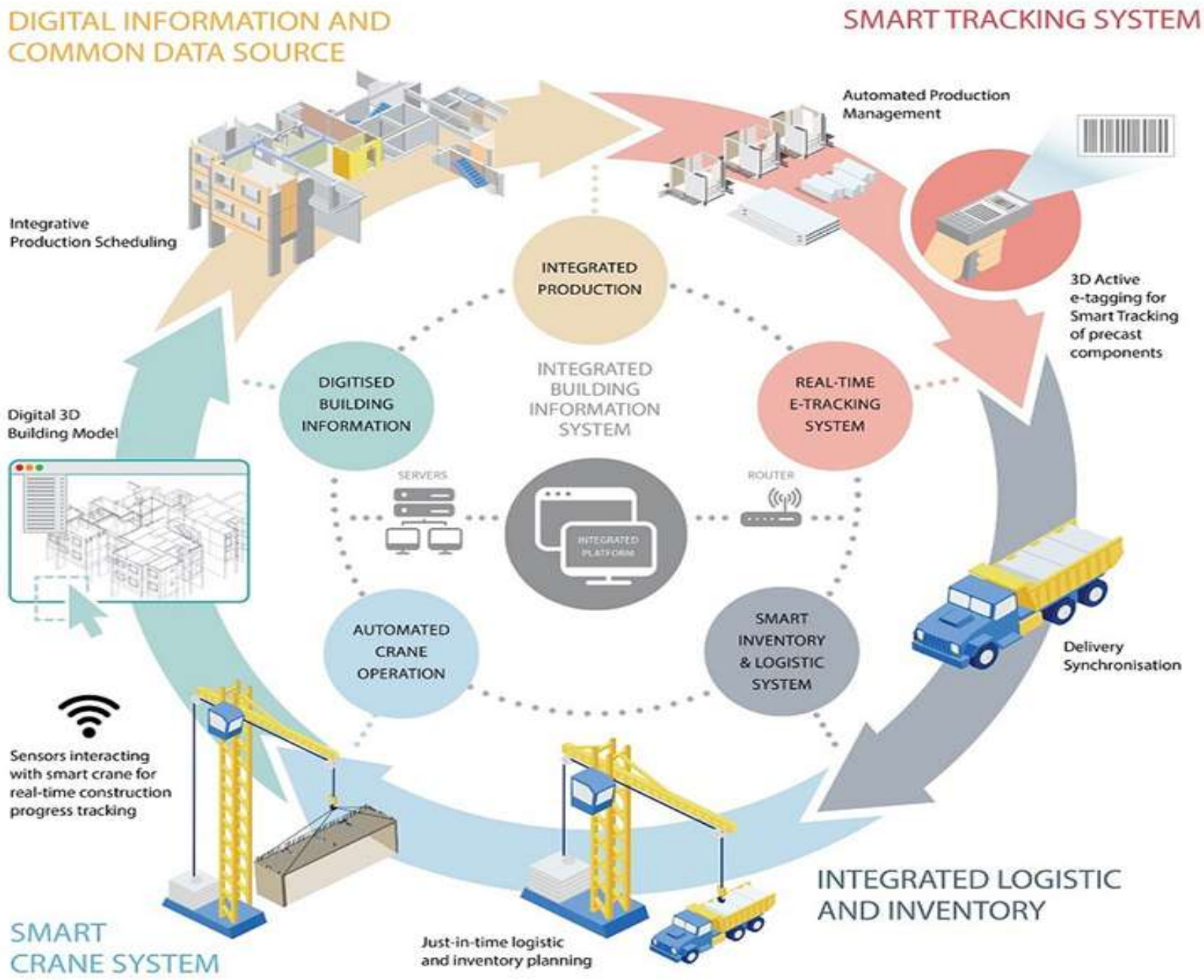


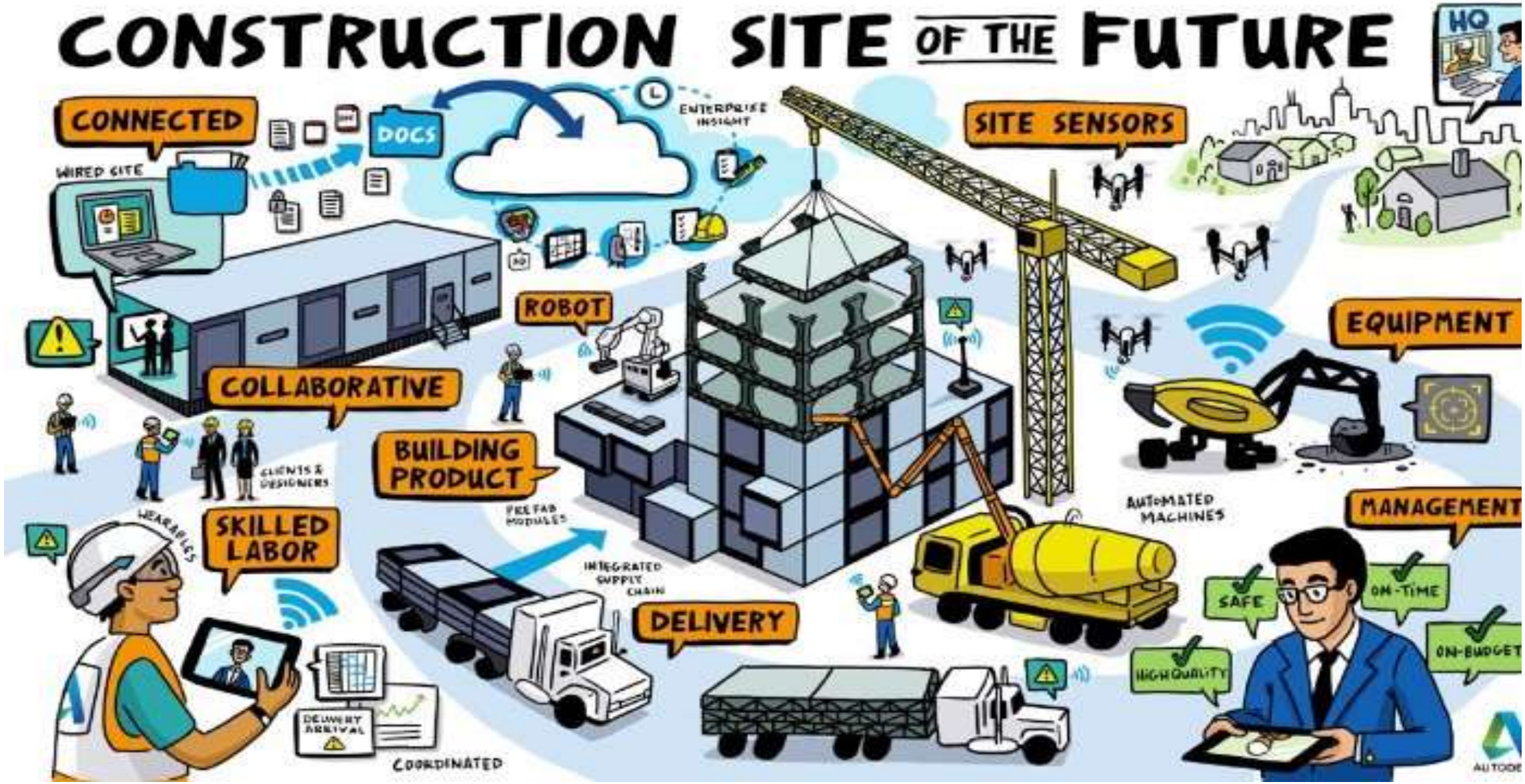
4 VIRTUAL REALITY (VR) COMMUNICATION

- The use of VR tech will take group meetings beyond Skype or Google Hangouts.
- Software firm VRcollab has worked with ID Architects to create a **live, virtual tour of a project,** so that everyone can provide feedback in an easy-to-digest model.
- It also allows architects who have a wealth of experience but may not have 3D know how to give their input.

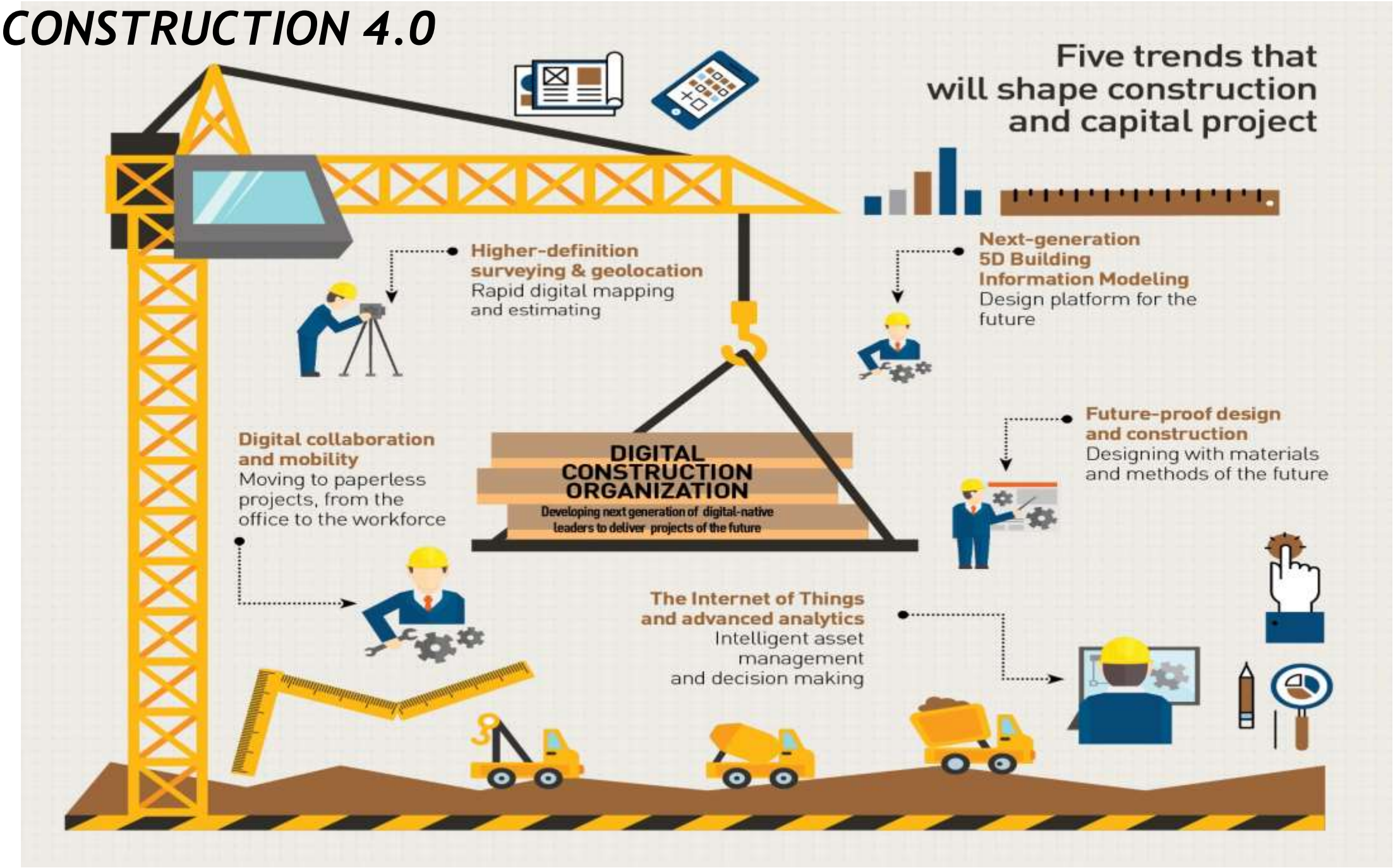
TEXT: RACHEL AU-YONG PHOTOS: KEVIN LIM, KUA CHEE SIONG STRAITS TIMES GRAPHICS

BIM UNTUK PENGURUSAN PEMBINAAN MASA HADAPAN




CONSTRUCTION SITE OF THE FUTURE
CONNECTED
WIRED SITE
DOCS
ENTERPRISE INSIGHT
HQ
SITE SENSORS
ROBOT
COLLABORATIVE
CLIENTS & DESIGNERS
BUILDING PRODUCT
PRE FAB MODULES
EQUIPMENT
AUTOMATED MACHINES
MANAGEMENT
SKILLED LABOR
WEARABLES
INTEGRATED SUPPLY CHAIN
DELIVERY
SAFE
ON-TIME
ON-BUDGET
HIGH QUALITY
DELIVERY ARRIVAL
COORDINATED

CONSTRUCTION 4.0



BIM UNTUK IR 4.0

BIM USE
3D Coordination
Design Reviews
Design Authoring
Construction System Design
Existing Conditions Modeling
3D Control and Planning
Programming
Phase Planning (4D Modeling)
Record Modeling
Site Utilization Planning
Site Analysis
Structural Analysis
Energy Analysis
Cost Estimation
Sustainability LEED Evaluation
Building System Analysis
Space Management / Tracking
Mechanical Analysis
Code Validation
Lighting Analysis
Other Eng. Analysis
Digital Fabrication
Asset Management
Building Maint. Scheduling
Disaster Planning

Building in a virtual world

In an era where people are immersed in virtual reality in all aspects of life, intelligent systems and robots run the construction industry

Factories run the world

A corporate-dominated society uses prefabrication and modularization to create cost-efficient structures

A green reboot

A world with increasing conflicts over scarce resources and climate change rebuilds using environmental-friendly construction methods and sustainable materials

Sumber : Penn State University dan World Economic Forum, Boston Consulting Group

POTENSI BIM – CABARAN DAN CADANGAN

STATUS PELAKSANAAN BIM – UKUR BAHAN

POLICY

1) Melantik seorang (1) *BIM Coordinator* bagi setiap unit kerja - pemudahcara bagi setiap perkembangan terkini BIM (memo bertarikh 9 April 2018)

2) Panduan Penyediaan Model BIM untuk Tujuan Pengukuran Kuantiti (Kerja Bangunan)

PEOPLE

1) Module Pengukuran kuantiti menggunakan model BIM diperkenalkan dalam tahap 4 Pensijilan Pengukuran Kerja Bangunan

2) Kursus BIM & 3D Measurement (4 sesi telah dibuat sepanjang tahun 2018.71 orang telah dilatih

3) Program Fasilitasi BIM bagi 6 projek

PROCESS

1) Pelaksanaan PAP BIM 2.3 - 30 projek

2) Pembangunan Template BIM CostX

3) Pembangunan dokumen Panduan Penyediaan Model BIM untuk Tujuan Pengukuran Kuantiti (Kerja Bangunan)

TECHNOLOGY

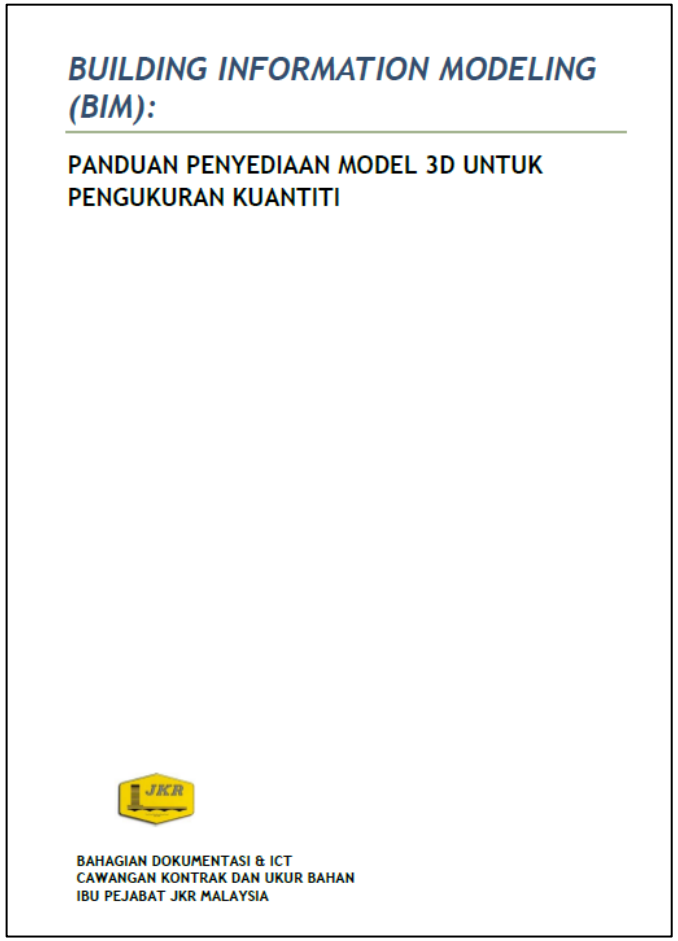
1) *Software, hardware & infrastructure*

2) Program gunasama lesen perisian CostX di CREATE sebanyak enam belas (16) lesen bagi menampung lima belas (15) lesen CostX sedia ada di HQ

PROGRAM BIM CKUB 2018

BIL	AKTIVITI	TARIKH	JUMLAH PESERTA
1	KURSUS BIM & 3D MEASUREMENT (BASIC & INTERMEDIATE) SIRI 1	23-24 Mac 2018	16
2	KURSUS BIM & 3D MEASUREMENT (BASIC & INTERMEDIATE) SIRI 2	23-24 Julai 2018	20
3	KURSUS BIM & 3D MEASUREMENT (BASIC & INTERMEDIATE) SIRI 3	1-2 Ogos 2018	17
4	KURSUS BIM & 3D MEASUREMENT (BASIC & INTERMEDIATE) SIRI 4	5-6 September 2018	18
5	Program PAP BIM 2.3 (rekabentuk PAP sedia ada di'BIM'kan)	Kemaskini BQ sedia ada sedang dilaksanakan – Model 3D BIM sebagai rujukan	Unit Dokumentasi dan ICT (BDI) - Melibatkan Pegawai dari seksyen Dokumentasi dan BIM
6	Sesi Knowledge Sharing on BIM 3D Measurement		Terbuka CKUB
7	Program Fasilitasi BIM untuk pegawai dan penyelia (Ukur Bahan) – 1) Projek Balai Cerap Instun Perak 2) Projek Pembinaan Blok Asrama dan Akademik Darul Quran JAKIM 3) Projek Pembangunan Hotel Wakaf Fasa 2, Taiping 4) Projek Bangunan Baru Pejabat Pendidikan Daerah Sabak Bernam, Selangor 5) Projek Hospital Sri Iskandar, Perak 6) Projek Hospital Maran, Pahang	15-17 Ogos 2018 **Jumlah yang telah dilatih adalah 71 (2018)**	16 (terdiri dari J41/J44/J48 dan J52)

PANDUAN PEMODELAN UNTUK RUJUKAN PEREKA BENTUK



- Dokumen menerangkan keperluan yang perlu dipatuhi oleh *Designer* semasa penyediaan model 3D BIM merangkumi:

- Pengisian parameter WAJIB dalam template BIM JKR untuk arkitektural dan struktur;

- Amalan terbaik dalam permodelan bagi item-item '*system assemblies*' iaitu *ceiling* dan *floor*;

- *Naming convention* yang jelas untuk semua komponen yang dibangunkan bagi tujuan memudahkan mengenalpasti jenis komponen dan kedudukan/lokasi komponen; dan

- Kaedah pemodelan kemasan dinding berdasarkan fungsi, lokasi dan jenis bahan kemasan.

BUILDING INFORMATION MODELING (BIM):

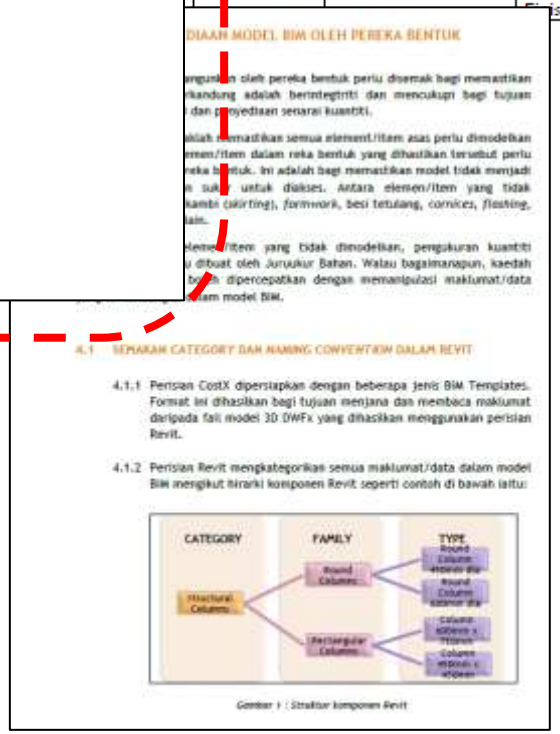
PANDUAN PENYEDIAAN MODEL 3D UNTUK PENGUKURAN KUANTITI

BAHAGIAN DOKUMENTASI & ICT
CAWANGAN KONTRAK DAN UKUR BAHAN
IBU PEJABAT JKR MALAYSIA

REVIT CATEGORY	FAMILY	TYPE	DIMENSI	PARAMETER REVIT
ROOFS	*Roof Structure*	*Type of Roof Structure*	*Area*	SPESIFIKASI : Nyatakan kecerunan dan jenis material bumbung
	Roof Finishes	*Type of Roof Finishes*	*Area*	SPESIFIKASI : Nyatakan kecerunan dalam Spesifikasi DESCRIPTION : • Nyatakan saiz jenis bahan • Nyatakan maklumat bagi *r* yang lain - *insulation, chic mesh etc.*
	Rainwater good	*Type of pipes or gutter*	*Length*	
		Type of accessories	*Size*	
STAIRS	*Staircase*	*Type of Landing Slabs*	*Area, Thick, Perimeter*	DESCRIPTION : Nyatakan seb *slab'*
		Type of Landing Beams	*Volume, Length, Width, Height*	DESCRIPTION : Nyatakan seb *beams'*
		Type of Staircase	*Area, Thick, Perimeter*	
		Type of Finishes	*Area, Perimeter*	DESCRIPTION : Nyatakan saiz material untuk kemasan tan
WALLS	Walls	Type of External Walls	Area	DESCRIPTION / SPESIFIKASI : *sebagai* Dinding Luar
		Type of Internal Walls	Area	DESCRIPTION / SPESIFIKASI : *sebagai* Dinding Dalam
		Type of railing	Length	DESCRIPTION / SPESIFIKASI : *sebagai* wall railing, stair rai
	Walls Finishes	Type of External Walls Finishes	Area	DESCRIPTION : Nyatakan saiz material Kemasan Dinding Lu
		Type of Internal Walls	Area	DESCRIPTION : Nyatakan saiz material Kemasan Dinding Da

3.0 KAEDAH PEMODELAN DALAM REVIT UNTUK TUJUAN PENGUKURAN KUANTITI

REVIT CATEGORY	PANDUAN PEMODELAN	CATATAN
Structural Foundations	• Dimodelkan dengan menggunakan *Structure Foundations category* dalam Revit.	• Komponen *structural Foundations* perlu diasingkan mengikut Kategori dan Fungsi; sebagaimana dalam tajuk 2.
Structural Columns	• Dimodelkan dengan menggunakan *Structural Columns category* dalam Revit. • Dimodelkan mengikut aras - dari aras lantai ke aras lantai atas • Bagi *Column Stumps*, nyatakan sebagai *Column Stumps* dalam parameter Description	• Komponen *structural columns* perlu diasingkan mengikut Kategori dan Fungsi; sebagaimana dalam tajuk 2.
Structural Framing	• Dimodelkan dengan menggunakan *Structural Framing category* dalam Revit. • Dimodel mengikut aras	• Komponen *structural framing* perlu diasingkan mengikut Kategori dan Fungsi; sebagaimana dalam tajuk 2.
Roofs	• Dimodelkan dengan menggunakan *Roofs category* dalam Revit.	• Komponen *structural hotroll* atau *potal frame* hendaklah dimodel berasingan
Walls	• Dimodelkan dengan menggunakan *Walls category* dalam Revit. • Dimodelkan mengikut aras - dari aras lantai ke aras lantai atas • Dinding yang berketinggian melangkaui aras pelbagai *(spans across multiple stories)*, dimodelkan secara berasingan mengikut aras yang dikehendaki. • Kemasan Dinding hendaklah dimodelkan sebagai satu lapisan berasingan dari binaan struktur dinding, di mana ianya dimodelkan sehingga ke aras siling atau *side and soffits* elemen struktur yang bersambung dengannya seperti rasuk dan lantai atas dan termasuk *columns*.	• Nyatakan sama ada dinding dalam atau dinding luar serta jenis bahan kemasan yang digunakan semasa proses membuat konvensyen penamaan *(naming convention)* komponen terlibat. • Jika terdapat item dinding digunakan selain elemen dinding hendaklah di asingkan dibawah *category* dalam *Revit* yang mana sesuai seperti *planter box, box up, etc.*


DIAAN MODEL BIM OLEH PEREKA BENTUK

engunakan oleh pereka bentuk perlu disemak bagi memastikan ikandung adalah berintegriti dan mencukupi bagi tujuan dan penyediaan senarai kuantiti.

aklah memastikan semua elemen/item asas perlu dimodelkan emen/item dalam reka bentuk yang dihasilkan tersebut perlu eka bentuk. Ini adalah bagi memastikan model tidak menjadi sukar untuk diakses. Antara elemen/item yang tidak kambi (skirting), formwork, besi tetulang, cornices, flashing, lain.

lemen/item yang tidak dimodelkan, pengukuran kuantiti dibuat oleh Juruukur Bahan. Walau bagaimanapun, kaedah boleh dipercepatkan dengan memanipulasi maklumat/data dalam model BIM.

4.1 SEMAKAN CATEGORY DAN NAMING CONVENTION DALAM REVIT

4.1.1 Perisian CostX dipersiapkan dengan beberapa jenis BIM Templates. Format ini dihasilkan bagi tujuan menjana dan membaca maklumat daripada fail model 3D DWFx yang dihasilkan menggunakan perisian Revit.

4.1.2 Perisian Revit mengkategorikan semua maklumat/data dalam model BIM mengikut hirarki komponen Revit seperti contoh di bawah iaitu:

Gambar 1 : Struktur komponen Revit


4.4 BIM DELIVERABLES UNTUK TUJUAN PENGUKURAN KUANTITI

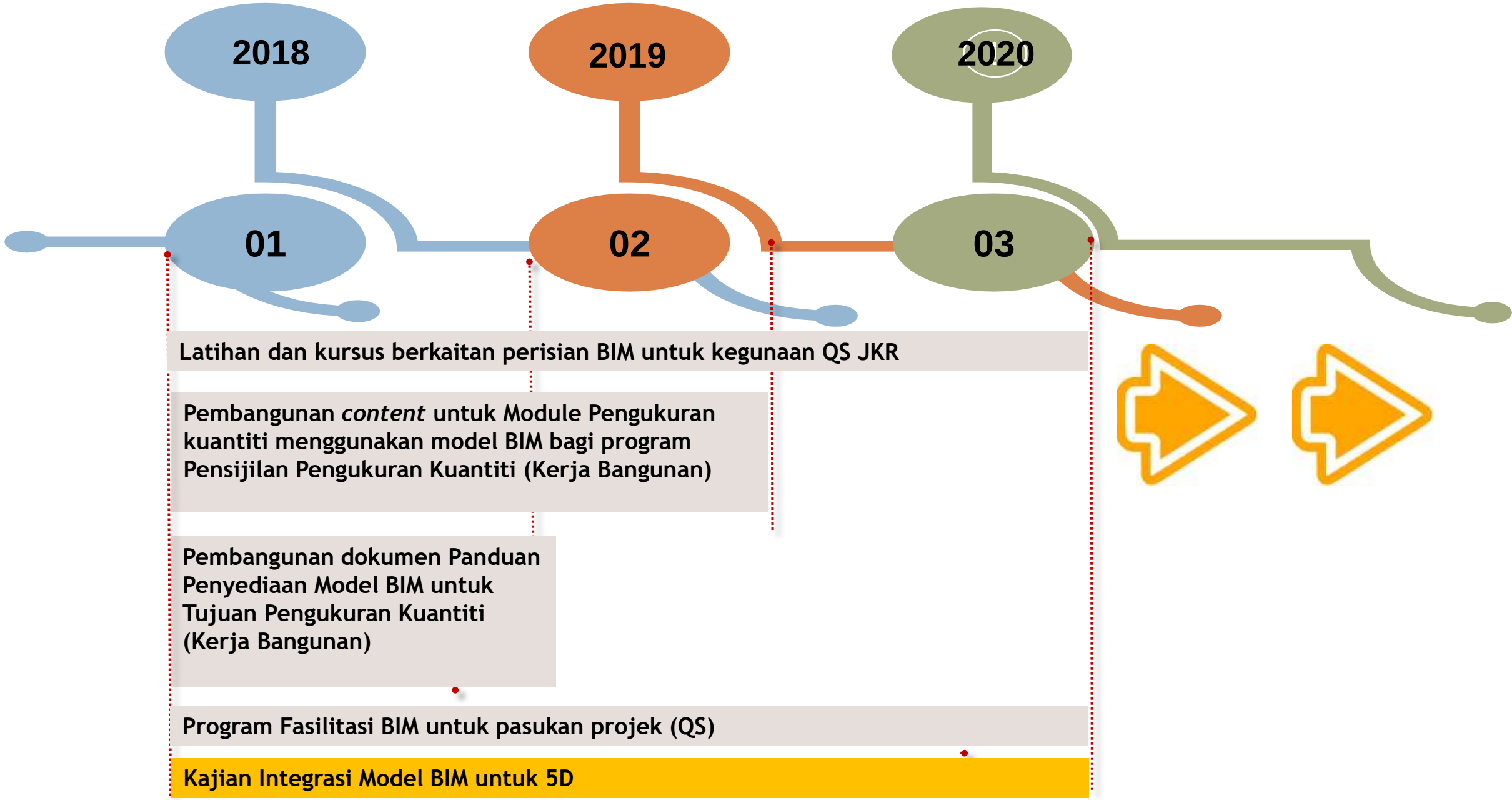
4.4.2 *BIM Deliverables* berikut perlu dibekalkan oleh pereka bentuk kepada Juruukur Bahan untuk tujuan pengukuran kuantiti bagi sesebuah projek yang dilaksanakan dengan adaptasi BIM:

BIM Deliverables yang perlu dikemukakan oleh pereka bentuk	Format yang diperlukan oleh Juruukur Bahan
Model BIM Arkitek LOD 300 Model BIM Struktur LOD 300	Design Web Format (DWFx)
Lukisan Tender yang dijana dari model BIM	Design Web Format (DWFx) dan .dwg
Jadual Kuantiti kerja struktur untuk rujukan: - Jadual Konkrit - Jadual *Formwork* - Jadual Tetulang Besi	.xlsx

Jadual 1 : Senarai BIM Deliverables serta Format

4.4.3 Model BIM tersebut akan digunakan untuk tujuan janaan kuantiti dan lukisan 2D pula digunakan bagi tujuan penambahan kuantiti bagi item-item yang tidak dimodelkan serta bagi tujuan semakan.

ROLL OUT PLAN BIM UKUR BAHAN



CABARAN

Most architecture firms that were modelling in 3D were only taking their models to a level of detail equivalent to 1:100. Construction detailing to a greater level than this was being done in 2D. The architectural firm interviewed reported that whilst they sometimes did the preliminary design using a BIM authoring tool they started a new model at the commencement of developed design and did not flow through the model from preliminary design. Some architects within the firm did the preliminary design using Google's SketchUp before moving to a BIM authoring tool at the commencement of developed design.

In all instances covered by the interviews the contract documents were 2D drawings not the 3D model. Where a 3D model was provided to the contractor it was on the basis of "information only".

The industry has not established modelling protocols, these are therefore negotiated on a project by project basis. Tensions exist between how the design consultants can efficiently produce models that meet their purposes and the additional level of detail that can be required to enable location based scheduling and estimating information to be developed. Whether columns and lift shafts should be modelled as a single object which extends the full height of the building or be modelled on a floor by floor basis is a typical example of this tension. Coding or description protocols for objects in the models have not been agreed. Each organisation therefore has its own practices which are not always followed consistently.

CABARAN

POLICY

1) Isu integriti data - semakan data sebelum dimuatnaik

2) Isu keselamatan data - Penggunaan *Cloud* untuk perkongsian fail

2) Praktis dan protokol BIM yang tidak konsisten

PEOPLE

1) Kekurangan pegawai yang kompeten BIM

2) Perubahan kepada budaya kerja 'silo' dan '*attitude*'

3) Perubahan kepada proses pelaksanaan kerja

PROCESS

1) Koordinasi projek secara berintegrasi perlu dilaksanakan di peringkat awal

2) Kolaborasi model BIM (Perkongsian, pertukaran dan pemindahan data)

3) Kurangnya rujukan BIM - Template/ manual/ garis panduan/ standard

TECHNOLOGY

1) *Software, hardware & infrastructure*

2) Keupayaan rangkaian ICT

3) Lokasi & ruang penyimpanan data yang selamat dan berkapasiti tinggi

4) Isu kebolehoperasian perisian dan keserasian platform

CABARAN

- Amalan industri pembinaan yang masih lagi berpandukan kaedah konvensional *(paper-based)* – Isu '*black data*' di mana data masih lagi dalam format *non-digital* atau data digital yang tidak mengandungi metadata untuk tujuan pemprosesan (AI).

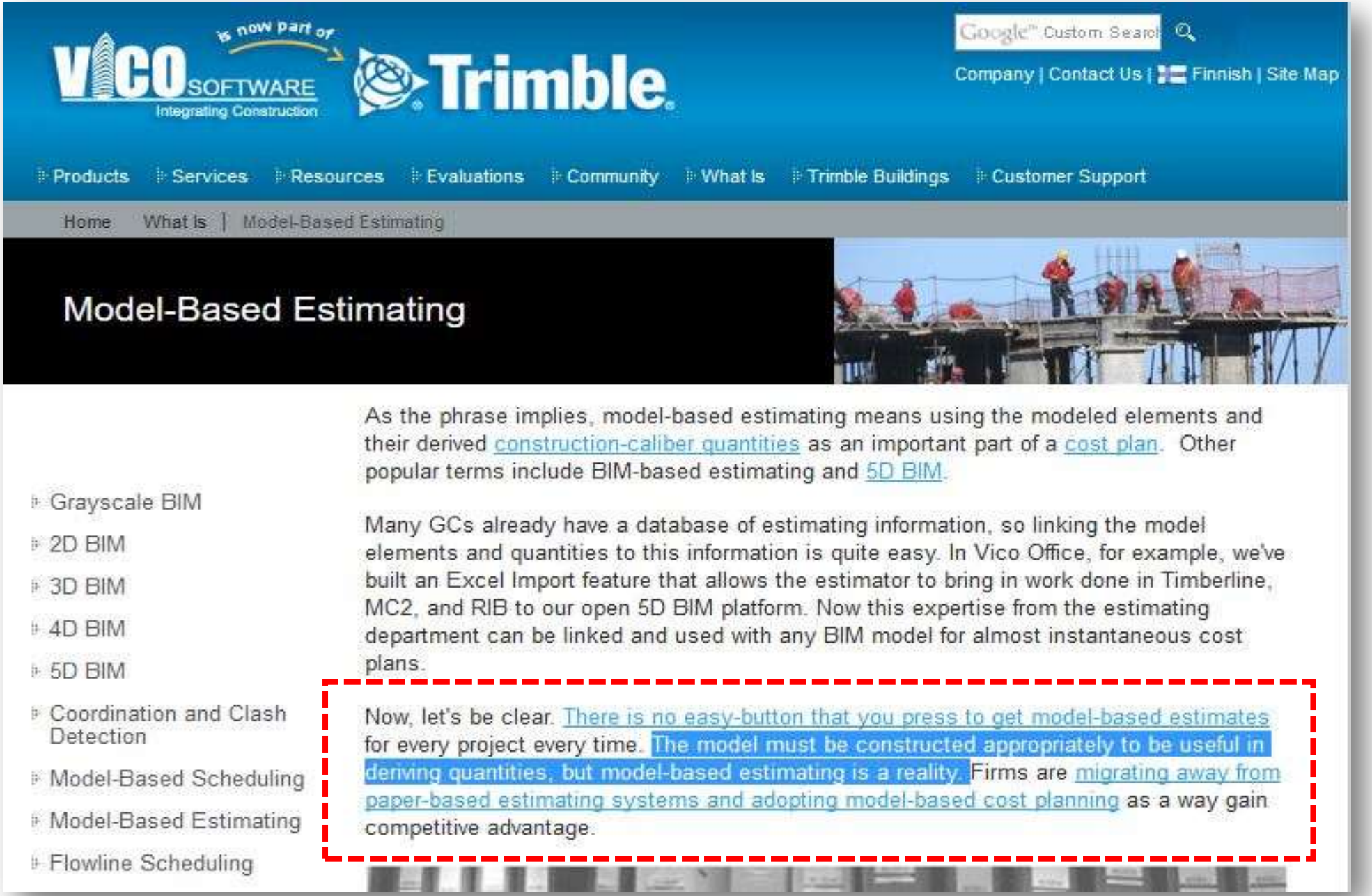
- Keupayaan dan potensi BIM masih belum digunakan sepenuhnya

- 5D BIM - Model BIM + Work Program + Kos memerlukan kolaborasi dan BIM protokol yang konsisten, masa dan tahap keperincian yang sangat tinggi.

- Kekangan dalam perpindahan data – akan berlaku kecicirán maklumat bagi setiap perpindahan data. Perlu mitigasi khusus oleh setiap perisian.

- Tidak semua element projek adalah praktikal untuk dimodelkan – *formwork, rebars, finishes, skirting, fascia bard, ridge cap, gutter*

CABARAN


is now part of
VICO SOFTWARE
Integrating Construction
Trimble
Google™ Custom Search
Company | Contact Us | Finnish | Site Map
Products
Services
Resources
Evaluations
Community
What Is
Trimble Buildings
Customer Support
Home
What Is | Model-Based Estimating
Model-Based Estimating
Grayscale BIM
2D BIM
3D BIM
4D BIM
5D BIM
Coordination and Clash Detection
Model-Based Scheduling
Model-Based Estimating
Flowline Scheduling
As the phrase implies, model-based estimating means using the modeled elements and their derived construction-caliber quantities as an important part of a cost plan. Other popular terms include BIM-based estimating and 5D BIM.
Many GCs already have a database of estimating information, so linking the model elements and quantities to this information is quite easy. In Vico Office, for example, we've built an Excel Import feature that allows the estimator to bring in work done in Timberline, MC2, and RIB to our open 5D BIM platform. Now this expertise from the estimating department can be linked and used with any BIM model for almost instantaneous cost plans.
Now, let's be clear. There is no easy-button that you press to get model-based estimates for every project every time. The model must be constructed appropriately to be useful in deriving quantities, but model-based estimating is a reality. Firms are migrating away from paper-based estimating systems and adopting model-based cost planning as a way gain competitive advantage.

KAJIAN POTENSI BIM

BIM CAPABILITIES IN QUANTITY SURVEYING PRACTICE

Tag	Capability
C1	Cost appraisal can be prepared quickly at the feasibility stage
C2	Preliminary cost plan can be prepared by extracting quantities directly from the model
C3	Easily update cost plans with more detail as design is developed
C4	Easily generate accurate cost estimates for various design alternatives
C5	Design changes reflected consistently in all drawing views
C6	Cost implication of design changes can be generated easily without manually re-measurement
C7	Clash detection reduces design errors and cost estimate revisions
C8	Cost checking performs quickly to ensure all items are captured.
C9	Improved visualization for better understanding of designs
C10	Automatically quantification for BQ preparation
C11	Intelligent information management system allows data to be stored in a central coordinated model.

Clash detection (C7) is a key capability of BIM that can reduce the cost estimate revisions [8]. BIM has the ability to integrate and merge multiple design models (architectural, structural, mechanical, engineering and plumbing) to identify clashes and analyze for interferences. This in turn reduces design errors and discrepancies that often occur by using traditional methods which consequently reduces the workloads of quantity surveyors preparing revised cost estimates.

The Relationship of Building Information Modeling (BIM) Capability in Quantity Surveying Practice and Project Performance
P. F. Wong, H. Salleh, F. A. Rahim
World Academy of Science, Engineering and Technology International Journal of Civil and Environmental Engineering; 2014

BAGAIMANA QS DAPAT MEMANFAATKAN POTENSI BIM

Lukisan Tender, Lukisan Kontrak, Lukisan Pembinaan dan Lukisan Siap Bina yang lebih cepat, efektif dan berintegriti

Kajian pembangunan sistem kod dan konvensyen penamaan yang seragam melibatkan perekabentuk dan pengurusan fasiliti - penyediaan pengukuran kuantiti secara automatik dan data kos

Kajian integrasi model BIM + Program Kerja (CPM) + Kos (5D) - rujukan aliran kos projek, penyediaan anggaran kos untuk perubahan kerja

“…..the existence of BIM is not a threat to QS profession, instead BIM will ease and improve the quality and professionalism of QS works…”

- Sr Dr Kherun Nita binti Ali, Sharifah Noraini Noreen binti Syed Ibrahim Al-Jamalullail, Tan Choon Boon

***** ***Sumber :*** Building Information Modelling Awareness and Readiness (UTM)
- Dr. Kherun Nita binti Ali, Sharifah Noraini Noreen binti Syed Ibrahim Al-Jamalullail, Tan Choon Boon

धन्यवाद shukran terima kasih 谢谢 tak תודה asante 감사합니다

dhan'yavāda gracias Xièxiè toda dziękuję gamsahabnida

merci **Thank You...** danke istutiy

ありがとう kiitos

arigato salamat po obrigado takk grazie ta spasibo doh je