Digital Construction

Towards Embracing Construction 4.0 Strategic Plan

Organized by malaysiaGBC

Establish Member of WORLD GREEN BUILDING COUNCIL

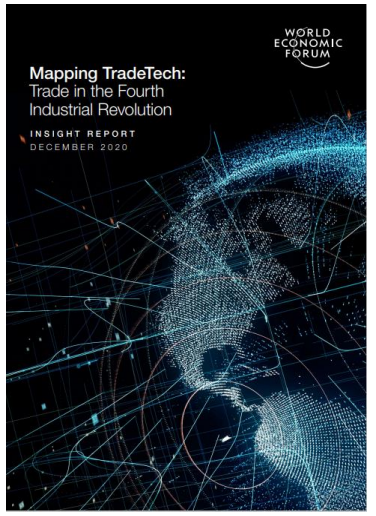
malaysiaGBC Platinum Partner 2021/2022 AJIYA

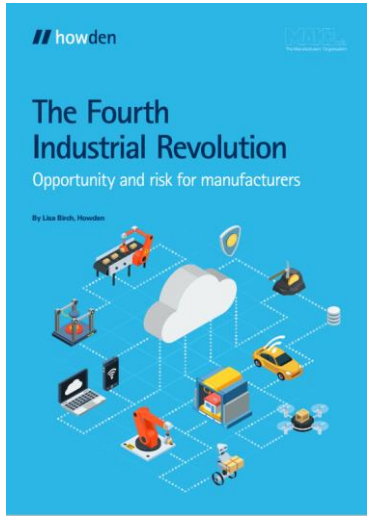
malaysiaGBC Silver Partner 2021/2022 EBARA

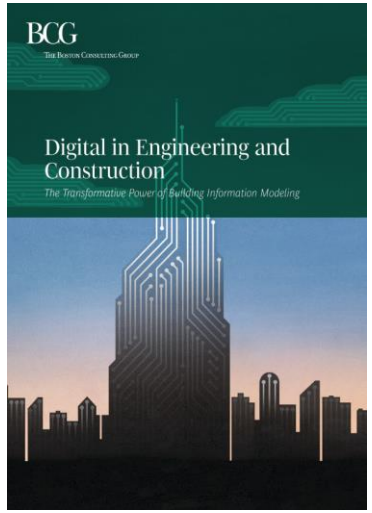
Presented by CREAM CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA

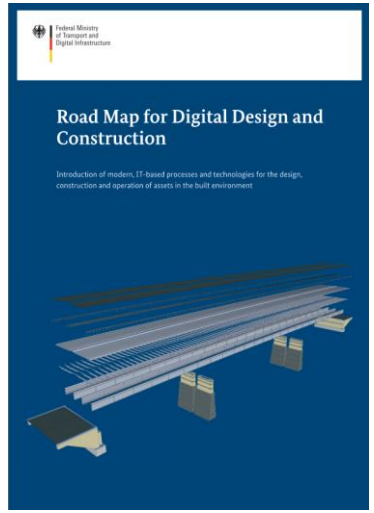
Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

The Fourth Industrial Revolution (4IR)









Organized by malaysiaGBC

Establish Member of WORLD GREEN BUILDING COUNCIL

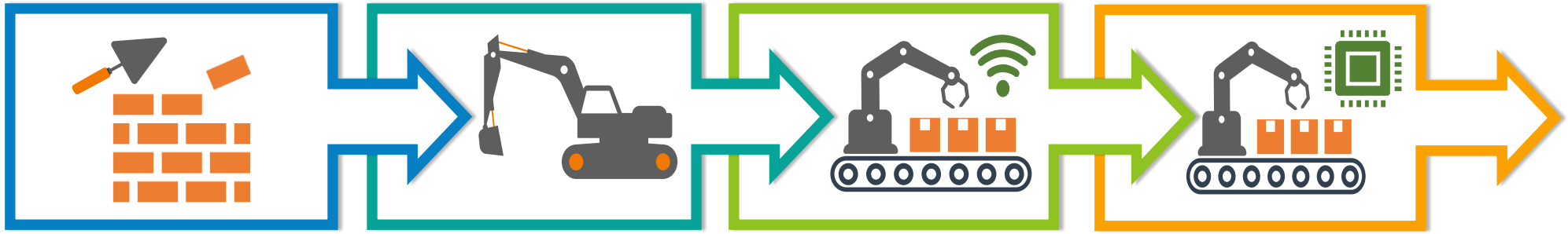
malaysiaGBC Platinum Partner 2021/2022 AJIYA®

malaysiaGBC Silver Partner 2021/2022 EBARA

Presented by CREAM CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA

Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Industrial Revolutions difference



1.0

1st Industrial Revolution

Powered by the steam engine, dramatically spurred production and urbnisation

2.0

2nd Industrial Revolution

Mass production and new forms of energy such as electricity

3.0

3rd Industrial Revolution

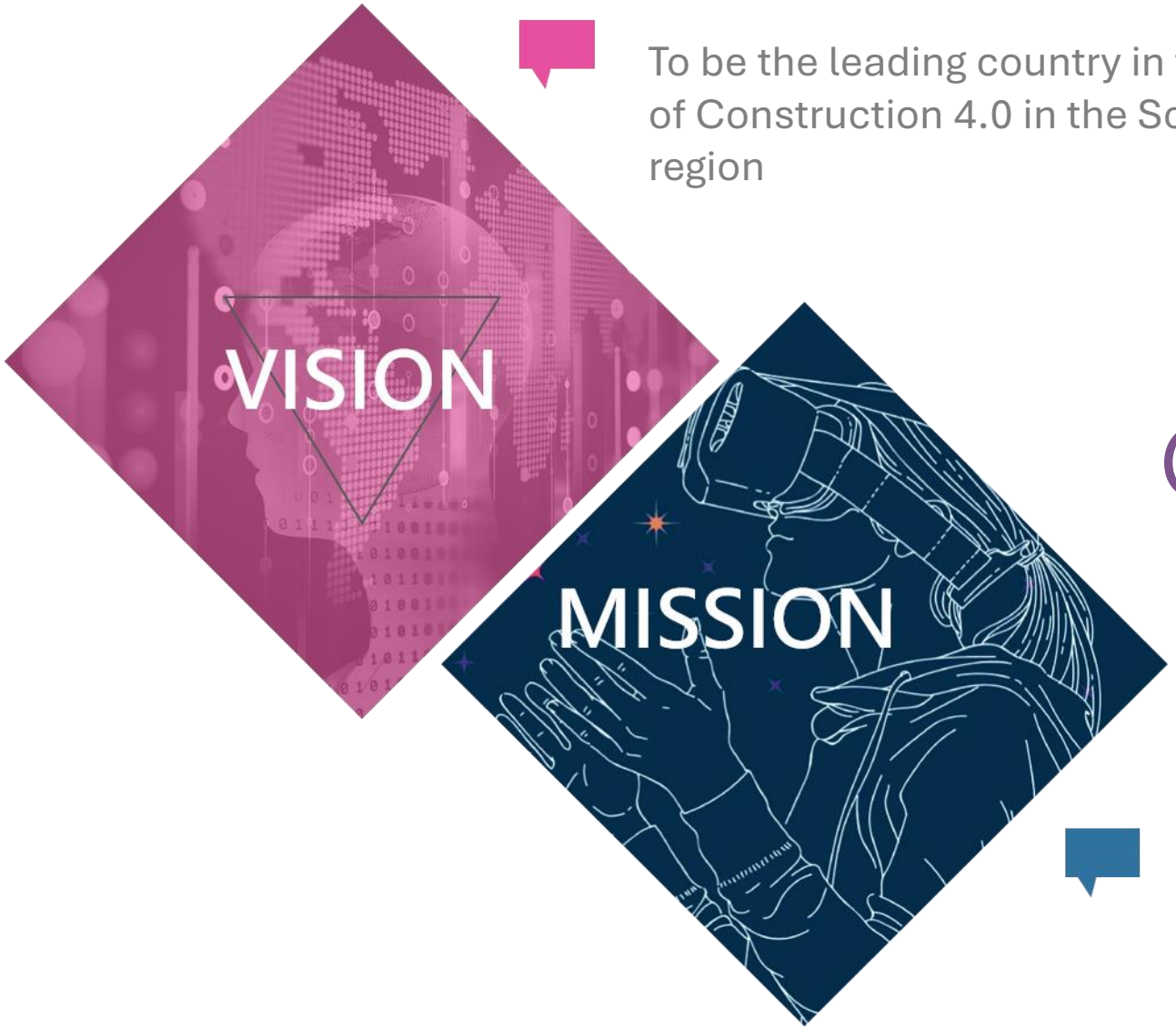
Introduction of digital technologies such as computers, cell phones, and the internet

4.0

4th Industrial Revolution

Next generation of cyber-physical systems (CPS) through technologies such as artificial intelligence, robotics, and nanotechnology

Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia



To be the leading country in the implementation of Construction 4.0 in the Southeast Asian region

CONSTRUCTION 4.0
VISION & MISSION

Transform the Malaysian construction industry by empowering smart construction for future society

Organized by malaysiaGBC

Establish Member of World Green Building Council

malaysiaGBC Platinum Partner 2021/2022 AJIYA

malaysiaGBC Silver Partner 2021/2022 EBARA

Presented by CREAM Construction Research Institute of Malaysia

Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

LAUNCH OF CONSTRUCTION 4.0 STRATEGIC PLAN

The document was launched during International Construction Week (ICW) 2020 on the **17 November 2020** by the Senior Works Minister **YB Dato' Sri Haji Fadillah Haji Yusof**

VISION

To be the leading country in the implementation of Construction 4.0 in the Southeast Asian region

MISSION

Transform the Malaysian construction industry by empowering smart construction for future society

STRATEGIC THRUST 1

BUILDING CAPACITY

STRATEGIC THRUST 2

RESEARCH, INNOVATION, COMMERCIALISATION & ENTREPRENEURSHIP (RICE)

STRATEGIC THRUST 3

SMART INTEGRATED TECHNOLOGY, INNOVATION & INFRASTRUCTURE

STRATEGIC THRUST 4

ENHANCED BUSINESS ENVIRONMENT

STRATEGIC OBJECTIVES

Preparing future workforce for Construction 4.0	Strengthen Quadruple Helix partnership	Improve government policy intervention in applying specific technology	Enhance stakeholders' local and international partnerships to increase the business growth of the construction industry
Create mechanisms to support innovators and technology adopters	Driving research and innovation in Construction 4.0	Enhance collaboration of disruptive technology and data centre repository	Creating collaborative governance ecosystems through government intervention
			Promote the role of foreign direct investment or collaboration

ENABLERS

- Economy
- Integrated Technology
- People
- Governance

STRATEGIC THRUST

FOR CONSTRUCTION 4.0






Prefabrication & Modular Construction

Building Information Modeling (BIM)

Autonomous Construction

Augmented Reality & Virtualisation

Cloud and Realtime Collaboration

3D Scanning & Photogrammetry

Construction 4.0
12 Emerging Technologies

Big Data and Predictive Analytic

Internet of Things

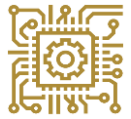
3D Printing & Additive Manufacturing

Advanced Building Materials

Blockchain

Artificial Intelligence



CONSTRUCTION 4.0 EMERGING TECHNOLOGIES

IMPLEMENTATION PHASE

SHORT TERM IMPLEMENTATION (<1 YEAR)

- Prefabrication & Modular Construction
- Autonomous Construction
- Cloud & Realtime Collaboration
- Building Information Modelling
- Augmented Reality & Virtualisation
- 3D Scanning & Photogrammetry

MEDIUM TERM IMPLEMENTATION (<3 YEAR)

- Big Data & Predictive Analytics
- Internet of Things

LONG TERM IMPLEMENTATION (>5 YEAR)

- Advanced Construction Materials
- Blockchain
- Artificial Intelligence
- 3D Printing & Additive Manufacturing

Organized by malaysiaGBC

Establish Member of WORLD GREEN BUILDING COUNCIL

malaysiaGBC Platinum Partner 2021/2022 AJIYA

malaysiaGBC Silver Partner 2021/2022 EBARA

Presented by CREAM CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA

Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Among contractors

Level of Adoption	Adopted	Don't and won't adopt
1. Internet of Things	20%	56%
2. Cloud and Realtime Collaboration	17%	63%
3. Prefabrication and Modular Construction	16%	65%
4. Advanced Building Materials	15%	61%
5. Building Information Modelling (BIM)	14%	67%
6. Big Data and Predictive Analytic	12%	70%
7. Blockchain	11%	71%
8. Artificial Intelligence	10%	71%
8. 3D Scanning and Photogrammetry	10%	75%
9. 3D Printing and Additive Manufacturing	8%	77%
9. Autonomous Construction	8%	77%
10. Augmented Reality and Virtualisation	7%	78%

Among professionals

Level of Adoption	BEM	MIP	PAM	BQSM
1. Internet of Things			/	/
2. Cloud and Realtime Collaboration	/	/	/	/
3. Prefabrication and Modular Construction				
4. Advanced Building Materials				
5. Building Information Modelling (BIM)	/		/	
6. Big Data and Predictive Analytic	/			/
7. Blockchain				
8. Artificial Intelligence			/	
8. 3D Scanning and Photogrammetry	/			
9. 3D Printing and Additive Manufacturing				
9. Autonomous Construction	/	/		
10. Augmented Reality and Virtualisation		/	/	/

Organized by malaysiaGBC

Establish Member of WORLD GREEN BUILDING COUNCIL

malaysiaGBC Platinum Partner 2021/2022 AJIYA

malaysiaGBC Silver Partner 2021/2022 EBARA

Presented by CREAM CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA

Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Design for Manufacturing Assembly

The Way Forward to

Construction 4.0

Organized by

malaysiaGBC

Establish Member of

WORLD GREEN BUILDING COUNCIL

malaysiaGBC
Platinum Partner 2021/2022

AJIYA®

malaysiaGBC
Silver Partner 2021/2022

EBARA

Presented by

CREAM
CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA

Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

DfMA is a design led activity that involves designing for the ease of manufacture and assembly of buildings. Converging design and make. It is concerned with promoting productization, reducing costs, minimizing complexity and leveraging repeatable process. (Autodesk, 2022)

Organized by malaysiaGBC

Establish Member of World Green Building Council

malaysiaGBC Platinum Partner 2021/2022 AJIYA

malaysiaGBC Silver Partner 2021/2022 EBARA

Presented by CREAM Construction Research Institute of Malaysia

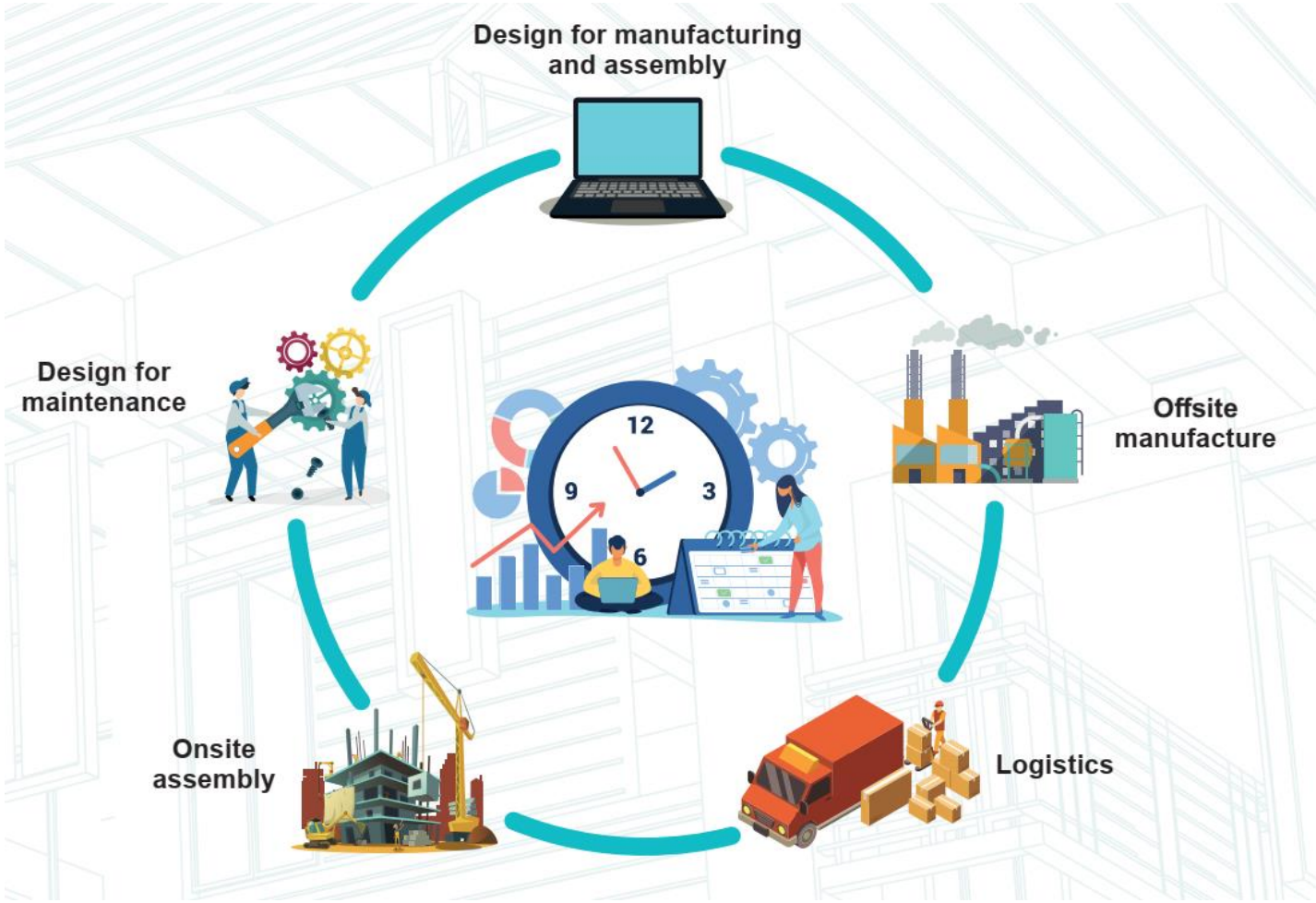
Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Why adopt DfMA?

DfMA approach necessitates a **smooth transition between design and construction**

The design should concentrate on **utilising off-site manufactured components** whenever possible and **arranging for effective logistics** and **assembly** of these components on-site

Client / owner could oversee all the processes and **collaboratively involve** with all the actors.



Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

How to adopt DfMA?

Strategic Definition	Preparation and Brief	Concept Design	Developed Design	Technical Design
Are the elements of past projects could be **re-used or modified and improved**	The initial project brief should be included requirements that **encourage the design team to adopt DfMA approach**	The stage where **key decisions will be made** around the assembly of the final building	Use of **multi-functional components** which mean elements can be duplicated and therefore costs reduced	Compile the generation of design intent information and the follow-on development of fabrication drawings and model objects for approval
Potential to design for **standardized design** to be used across **multiple projects**	The use of DfMA may be **compulsory depending on projects**	The design team should develop a **DfMA strategy as part of the construction strategy** & incorporate the advantages of a DfMA based approach into overall project delivery	Early procurement of factory **manufactured prototypes** allows the design to be refined **before mass production**	When the design team, contractor and specialist subcontractors have worked together previously, shorts-cuts may be feasible

Presented by CREAM CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA
Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Evolution of DfMA

Offsite
prefabrication

Multi-Trade
modular assembly

Multi-Trade
volumetric

DfMA

Construction & safety driven construction → Schedule driven construction → Optimisation driven design & construction → Outcome driven design & construction

Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Benefits of DfMA

1. **Productivity improvement**
2. **Less labour at construction site**
3. **Controlled construction environment**
4. **Better quality control**
5. **Reduced construction waste**
6. **Lean construction**

Organized by malaysiaGBC

Establish Member of WORLD GREEN BUILDING COUNCIL

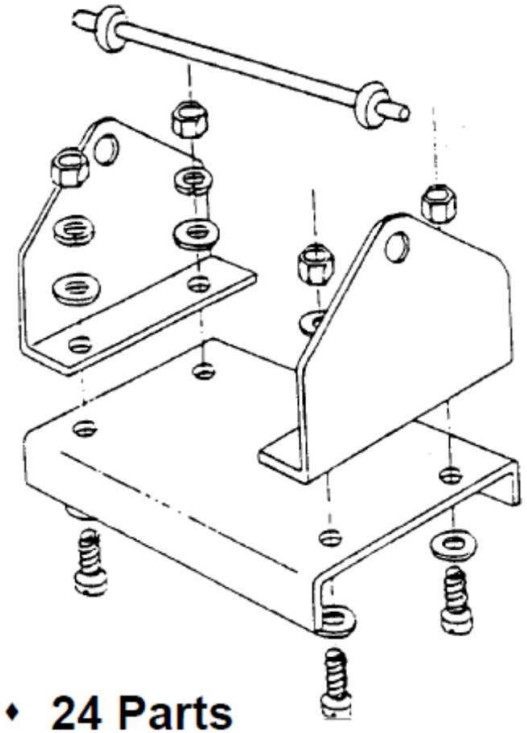
malaysiaGBC Platinum Partner 2021/2022 AJIYA

malaysiaGBC Silver Partner 2021/2022 EBARA

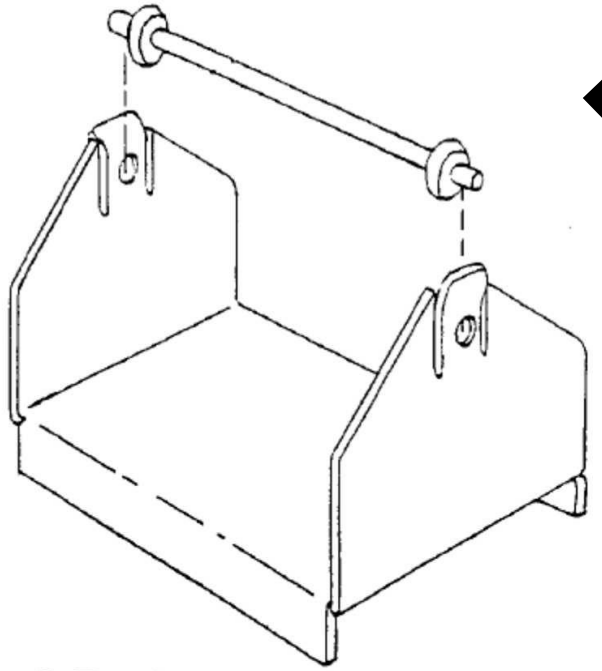
Presented by CREAM CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA

Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Design for simple part



- 24 Parts



- 2 Parts

Reduces time and costs by eliminating complex fixture and tooling

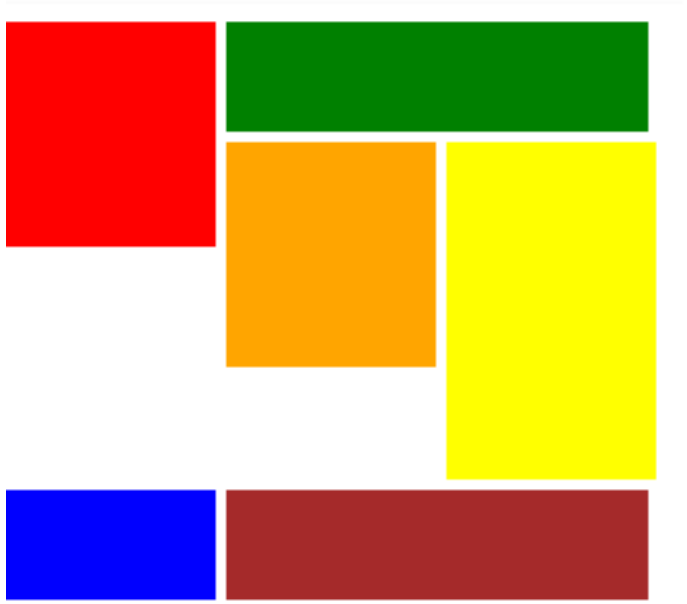
Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

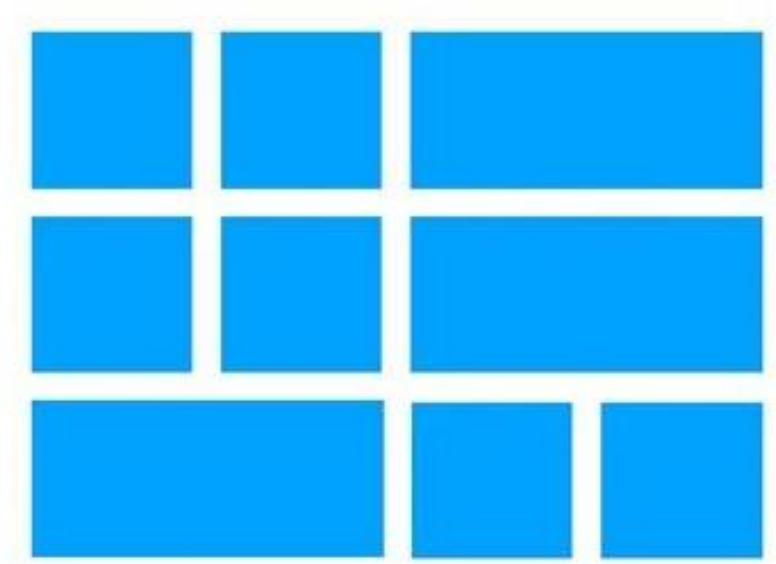
Design for standardisation

Reduces time with fewer manufacturing processes

Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Consider modular designs

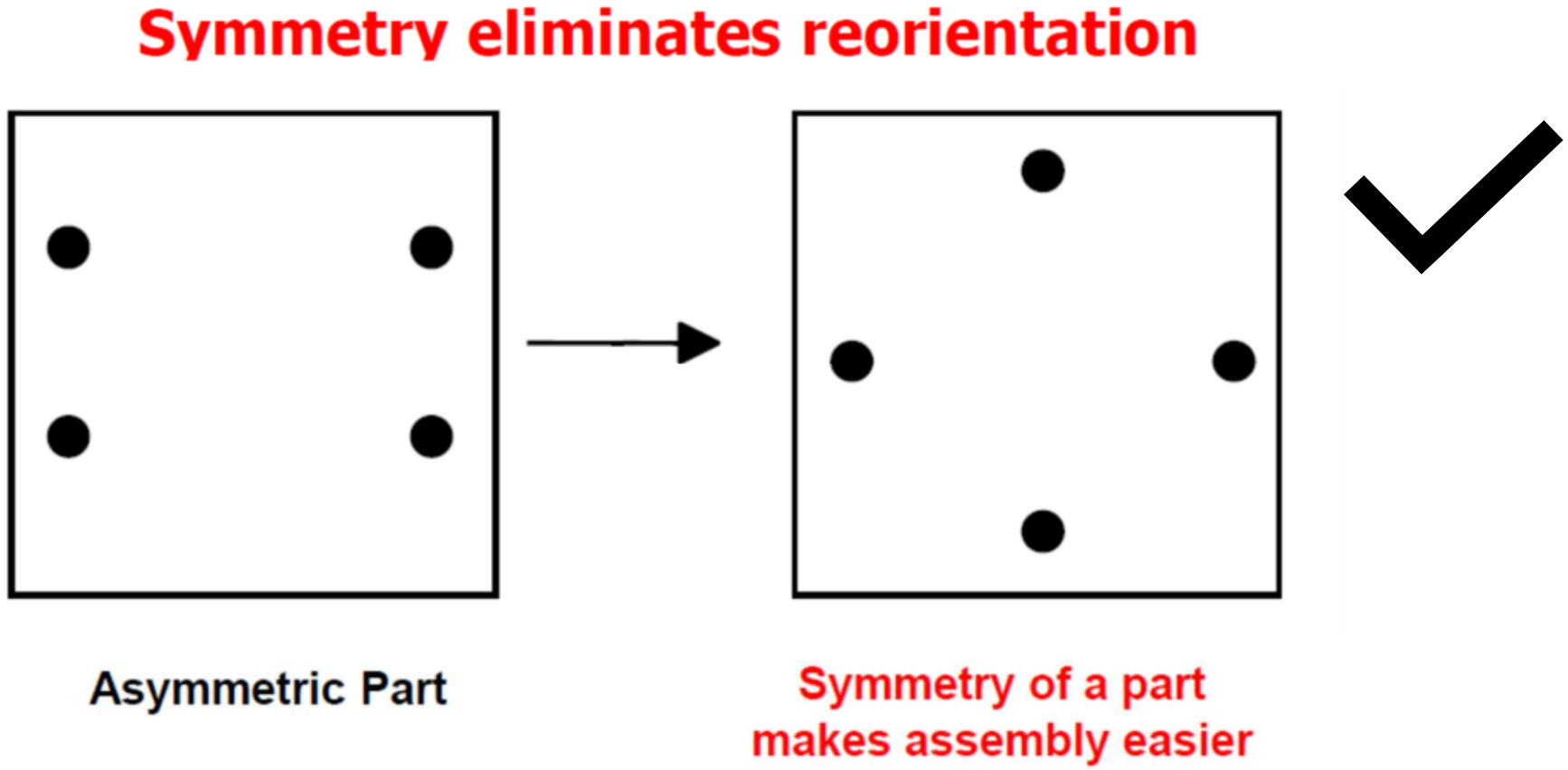




Reduces time and costs due to simplified design and assembly

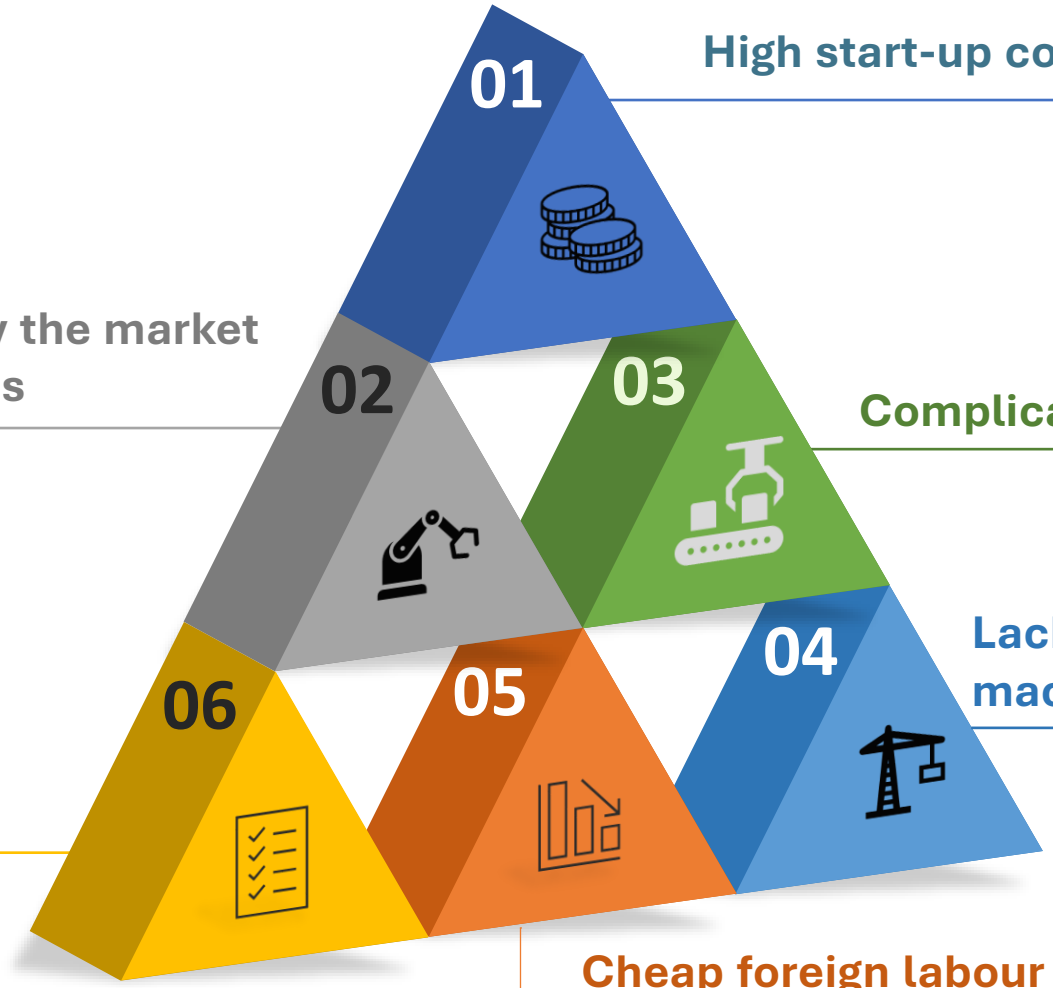
Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Design for ease installation



Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Challenges in adopting DfMA



High start-up cost

Slow acceptance by the market for new technologies

Complicated

Lack of heavy lifting machinery

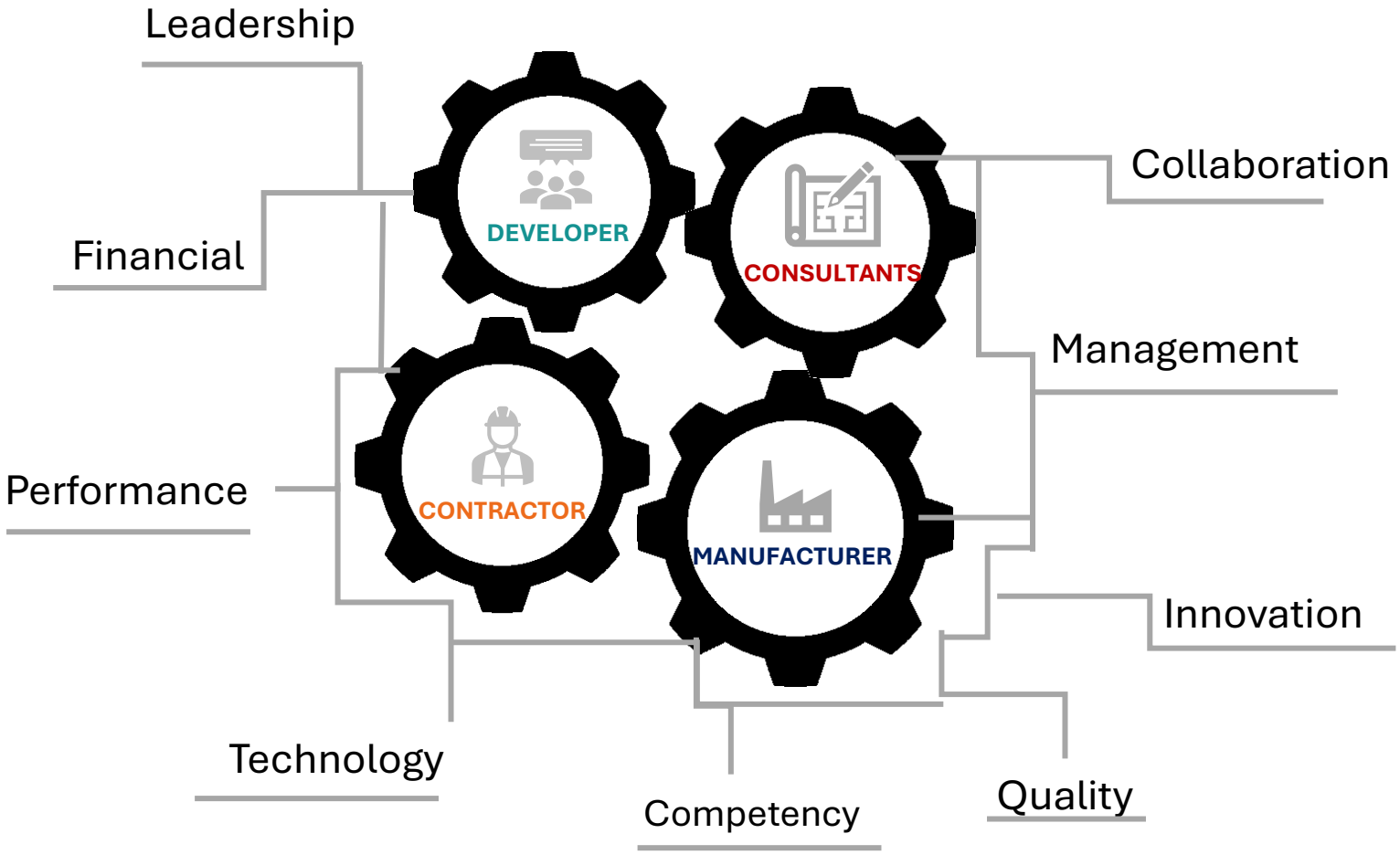
Government policy

Conventional procurement process discourages DfMA

Cheap foreign labour

Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Way forward – Roles & Responsibilities



Interactive Roles and Responsibilities of Construction Industry Stakeholders

The success of implementing DfMA, shall be the dynamic and holistic in its approach by all the stakeholder. The interactive action by all parties can optimize all these technologies through sharing of experience and process that will provide a higher benefit.

Presented by CREAM CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA
Dato' Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia

Thank You

- Dato’ Ts. Dr. Gerald Sundaraj
- gerald@cream.my
- www.cream.com

Organized by malaysiaGBC

Establish Member of WORLD GREEN BUILDING COUNCIL

malaysiaGBC Platinum Partner 2021/2022 AJIYA

malaysiaGBC Silver Partner 2021/2022 EBARA

Presented by CREAM CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA

Dato’ Ts. Dr. Gerald Sundaraj
Chief Executive Office
Construction Research Institute of Malaysia