Closing the Housing Gap in Nigeria: An Exploration of Modern Methods of Construction

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by:

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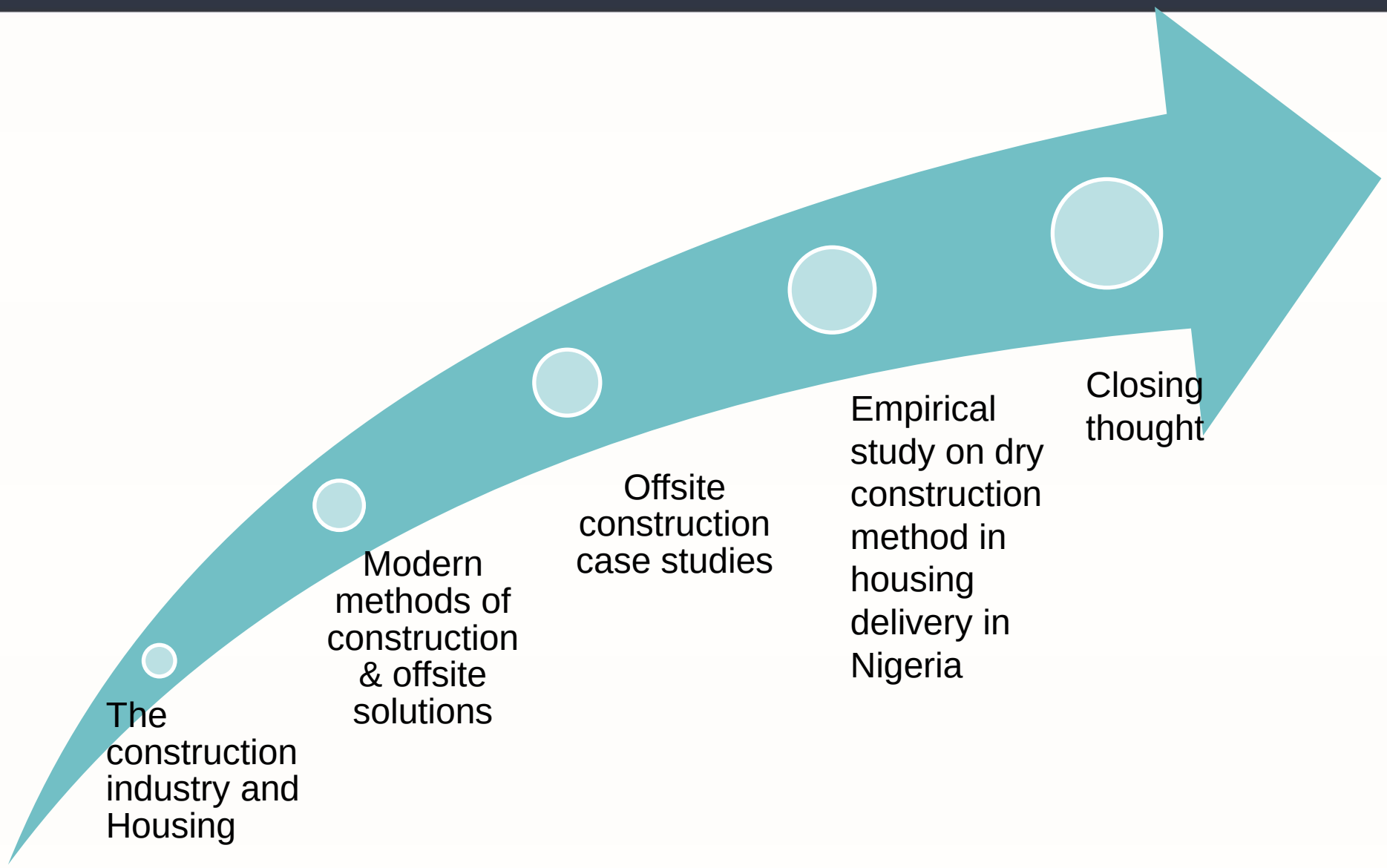
Presentation Structure



Quotes

"Innovation is the ability to see change as an opportunity- not a threat"

~Steve Jobs


BlackBerry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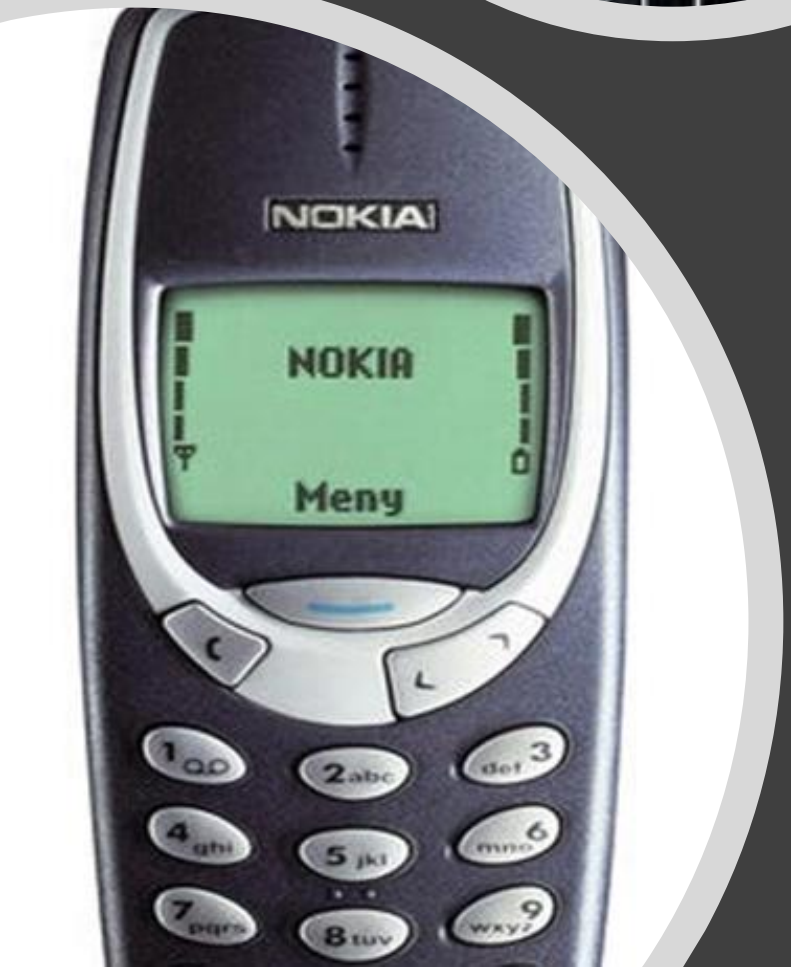
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Innovation


SAMSUNG

The Construction Industry

- Accounts for about 7% GDP in the UK (ONS, 2021)
- 4.1% in the US (Statista, 2021)
- 9% in Australia (Const. industry insight report, 2020).
- The Nigeria construction industry contribute 10.17% in 2021 to its nominal GDP(NBS,2021)
- Highly fragmented and inefficient (Egan, 1998)
- Sector productivity, 40-45% (Nasir et al, 2013).

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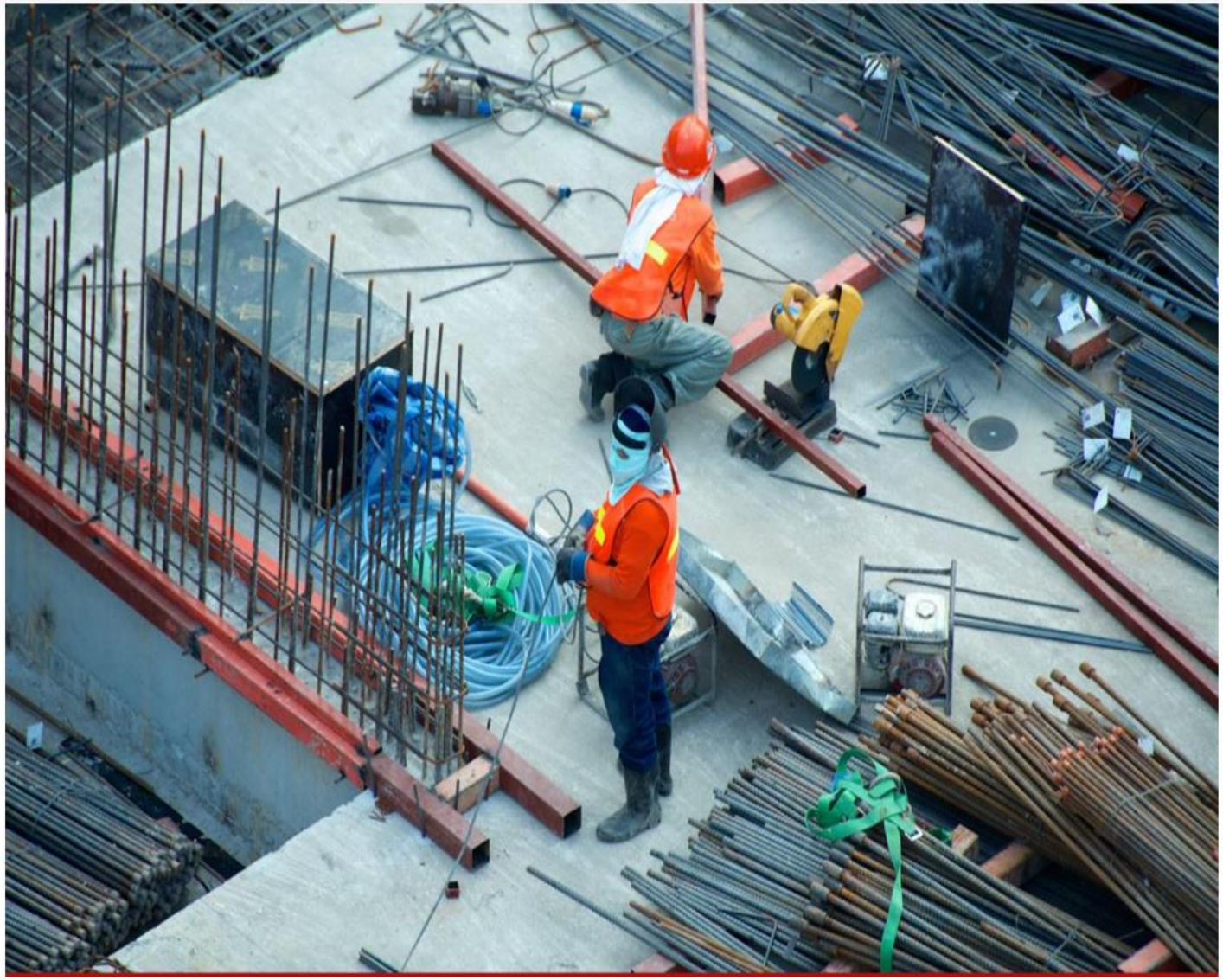
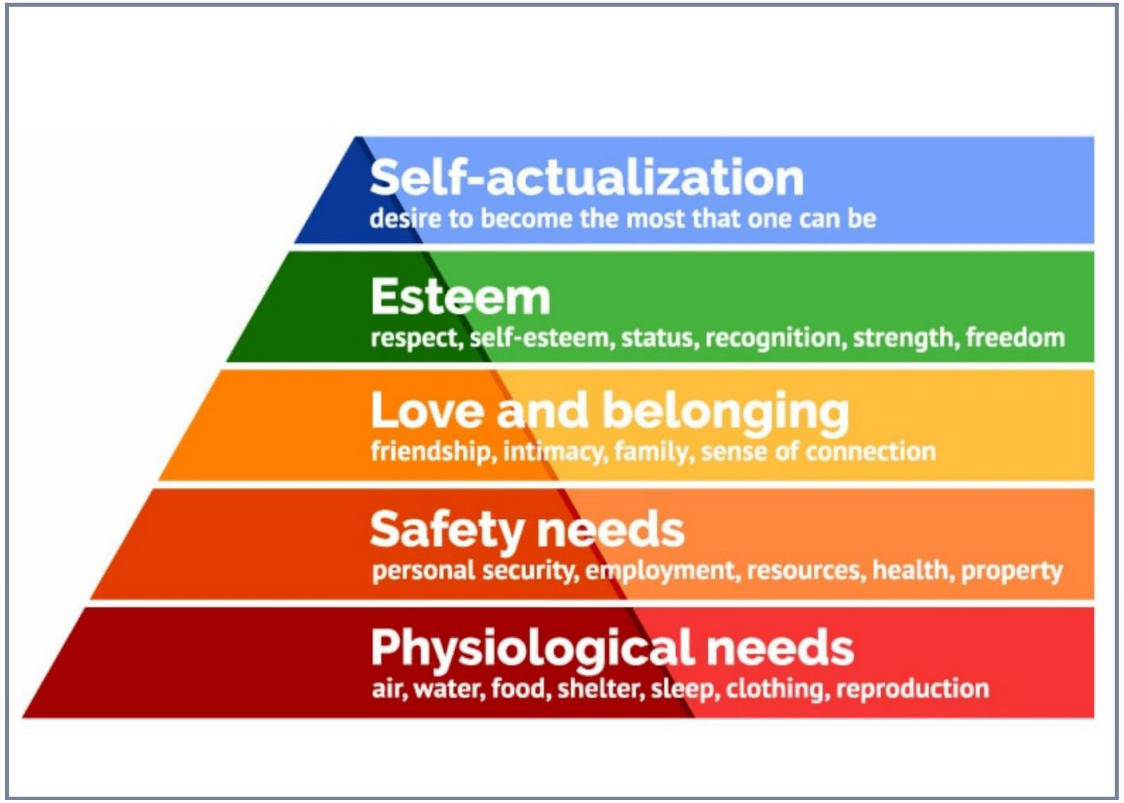
The Construction Industry



Importance of Housing

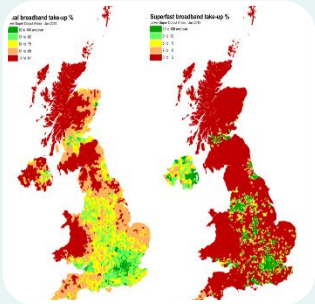
Abraham Maslow identified housing as a key human need…….



Importance of Housing

Financial investment

Merit goods



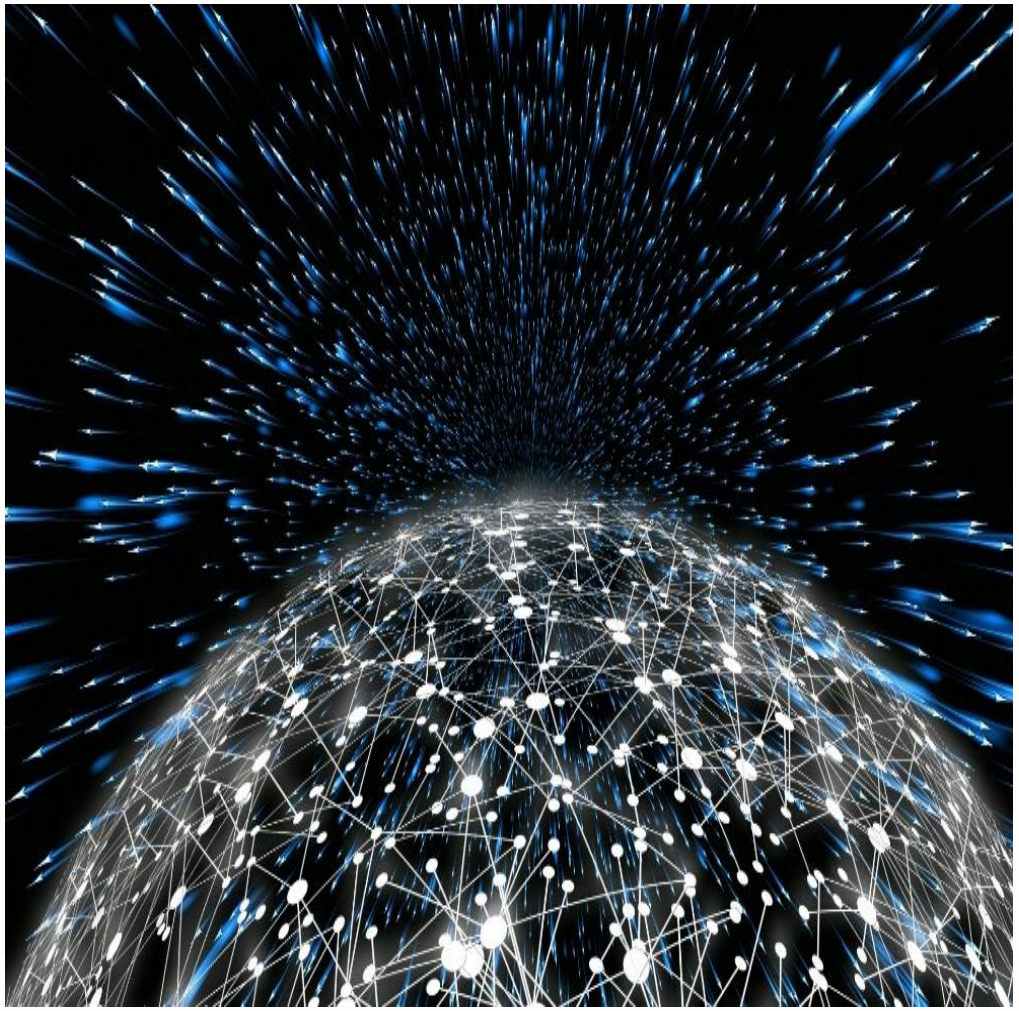
Component of local, regional and national economy

Social priority- US Congress 1949 declaration

Health and well-being of the people

Housing Crisis: Global Perspective

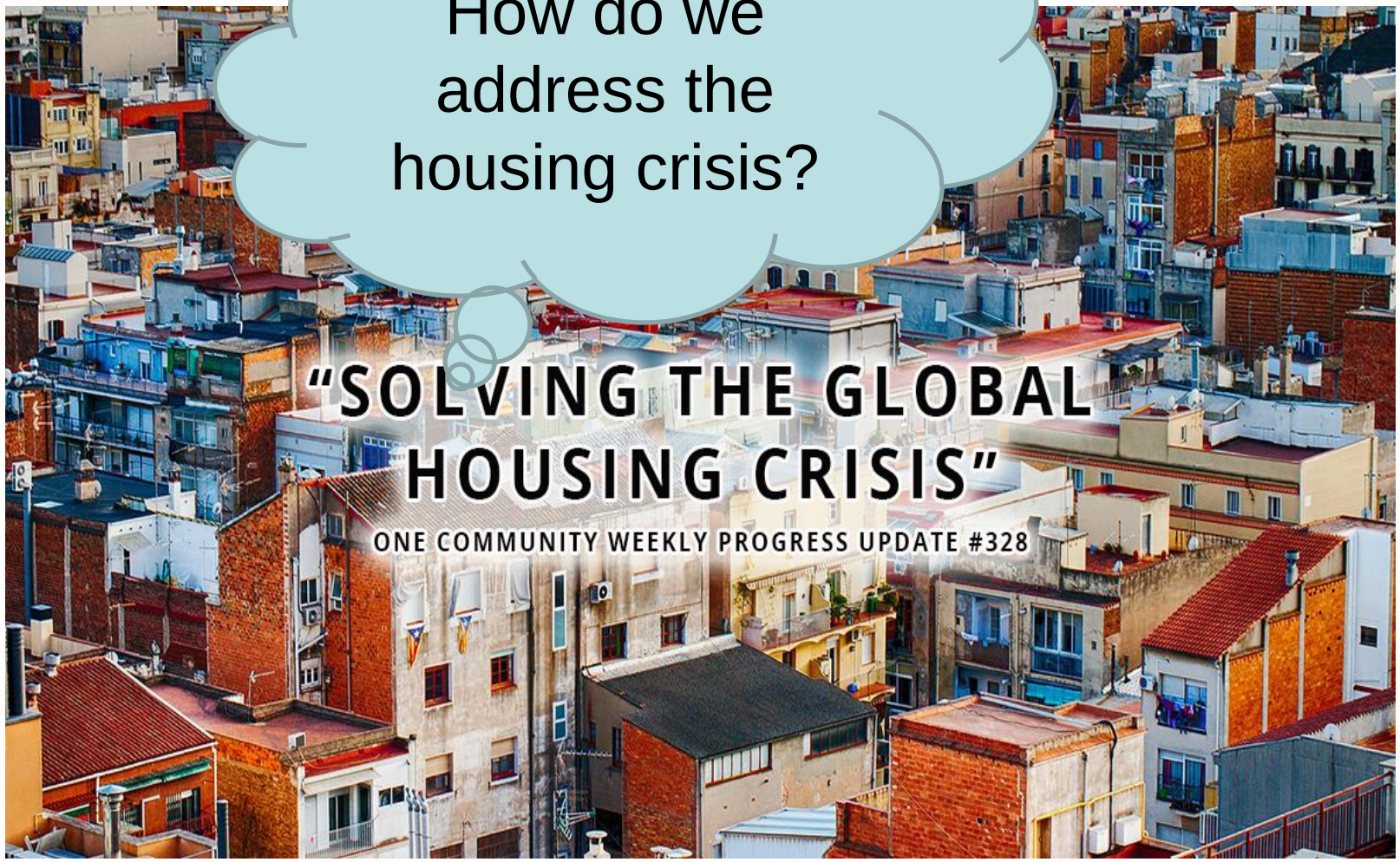
Housing shortage is a global problem.



- 2.5 million units housing deficit in the USA.
- About 250,000 housing deficit in Australia.
- 2.1 million housing deficit in South Africa
- 29 million housing deficit in India.
- UK govt. target of delivering 300,000 has not been meet too.
- 28 Million housing unit shortage in Nigeria (Federal Mortgage Bank, 2023).

Housing Crisis

How do we address the housing crisis?



The Housing Crisis: The Future

- The UK Government has concluded that the current traditional approach will not deliver the 300,000 per year housing target
- The Farmer Review of the UK Construction Labour Model in 2016 recommends the use of MMC to keep the industry relevant
- The UK Parliament Housing committee report of 2019 also identified MMC as the antidote to close the housing shortage gap

Modern Methods of Construction

Modern methods of construction (MMC) are all the approaches that aim to optimise the construction process to obtain better products in less time

- Business efficiency
- Quality
- Customer satisfaction
- Environmental performance sustainability
- Predictability of delivery timescale

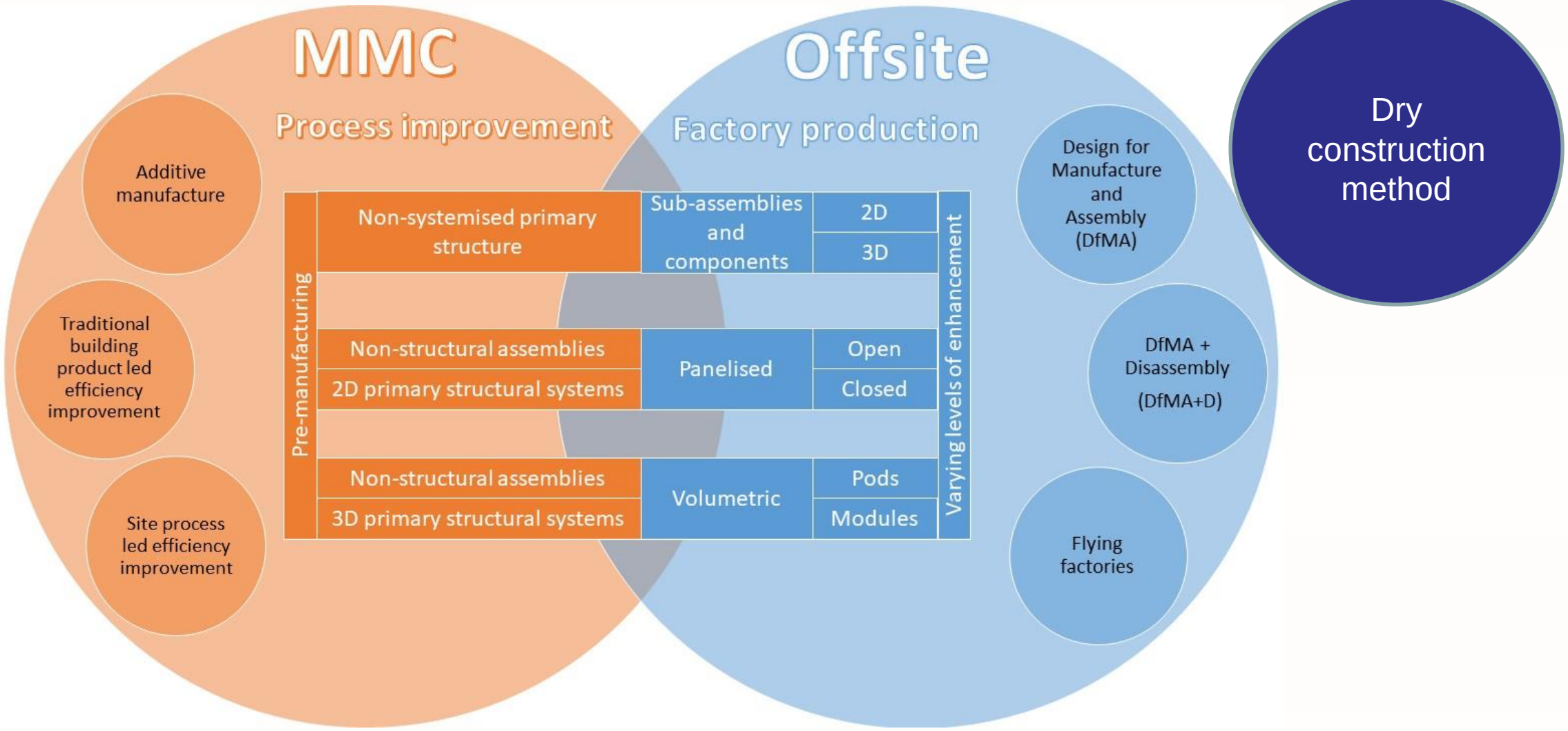
MMC includes but not limited to offsite construction

MMC and Offsite Construction

- Modern method of construction & Offsite –UK
- Modular and Prefabrication- USA
- Modular integrated construction-Hong Kong

Image courtesy of CCG OSM

MMC and Offsite

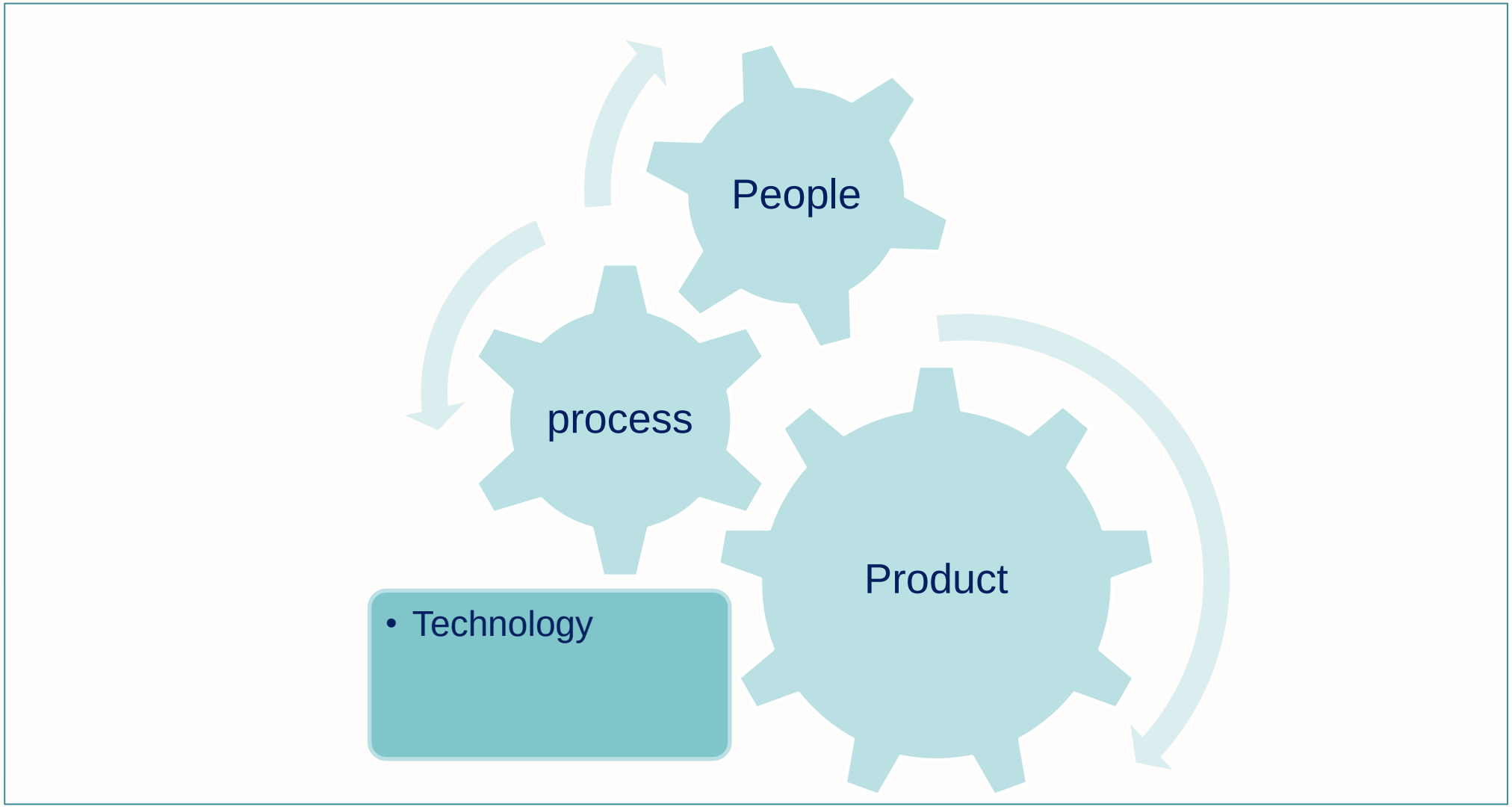


Offsite construction

Offsite is a construction method that adds substantial value to a product via the manufacture and pre-assembly of components, elements or modules in a factory, before installation into their final location.

Image courtesy of Offsite Awards - Mott MacDonald

Key Aspects of Offsite

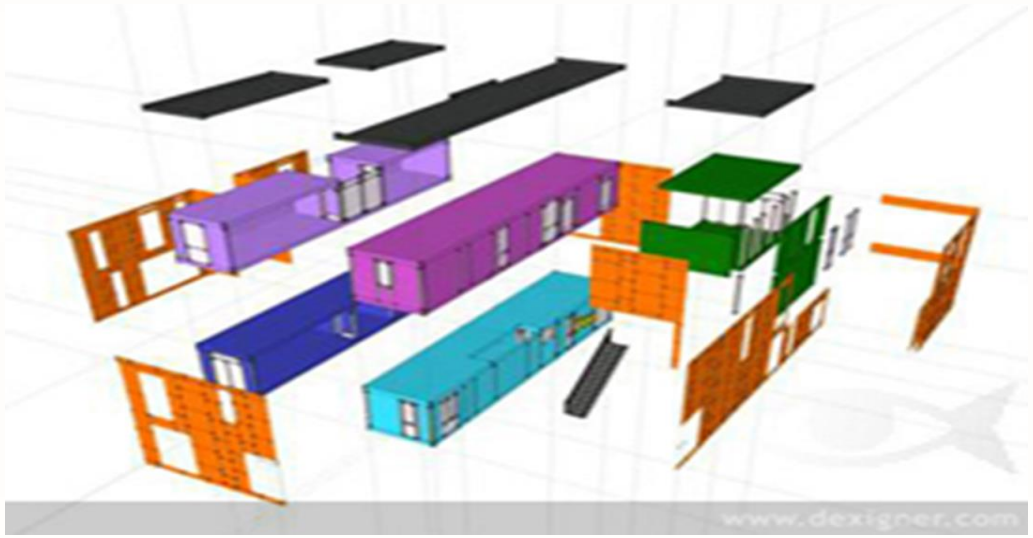


Offsite Solutions

Panelised system

Modular system

Sub-Assemblies and Components

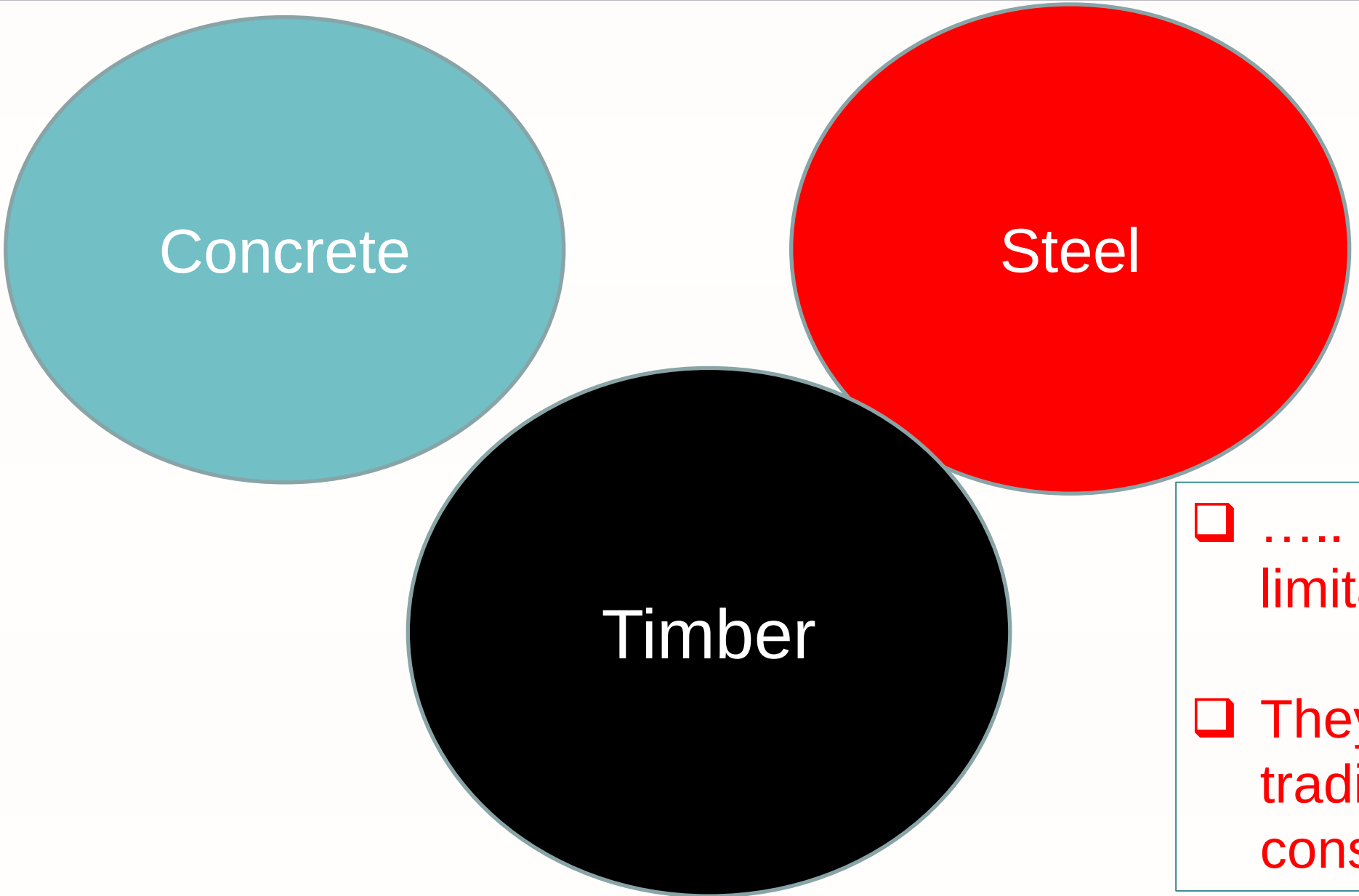


Hybrid system

Offsite Solutions

Volumetric Unit

Materials for Offsite



- ….. They all have their limitations
- They are from traditional construction materials

Volumetric Modular Solution

https://www.youtube.com/watch?v=b0TN4ylgI1Q

- Modular construction refers to the production of 3D building blocks within a factory environment and assembled on a construction site.
- Building blocks can be transported to the construction site in different shapes.
- All service are fitted in a factory condition.
- They could be transported complete including all internal fittings and services to site.

Panelised Solution

Panellised Units

Flat panel units built in a factory and transported to site for assembly into a three-dimensional (3D) structure or to fit within an existing structure.

https://www.youtube.com/watch?v=HGI-FcjGtbc&t=14s

Sub-assemblies and Components

- This refers to simplified components like stairs, doors and windows which are manufactured in factories.

- Sub-assemblies are major building elements that are manufactured offsite but do not form the primary structure of the building.

Volumetric Unit

- Volumetric units are sometimes referred to as pods.
- Volumetric units can be combined with other construction methods to create a hybrid construction.
- Pods are often used for highly serviced areas such as kitchens and bathrooms, so that services can be undertaken and tested in factory conditions.

Kitchen Pod


Bathroom Pod

Hybrid System

Hybrid system combines both the ***panelised*** and the ***volumetric*** systems. Volumetric units are normally used in the construction of highly serviced and more repeated areas, e.g. kitchens and bathrooms while the rest of the structure is formed using panels. Benefiting from the advantages of both techniques, hybrid system, offers leveraged production speed, assured quality, reduced cost, better economy and more sustainable process.

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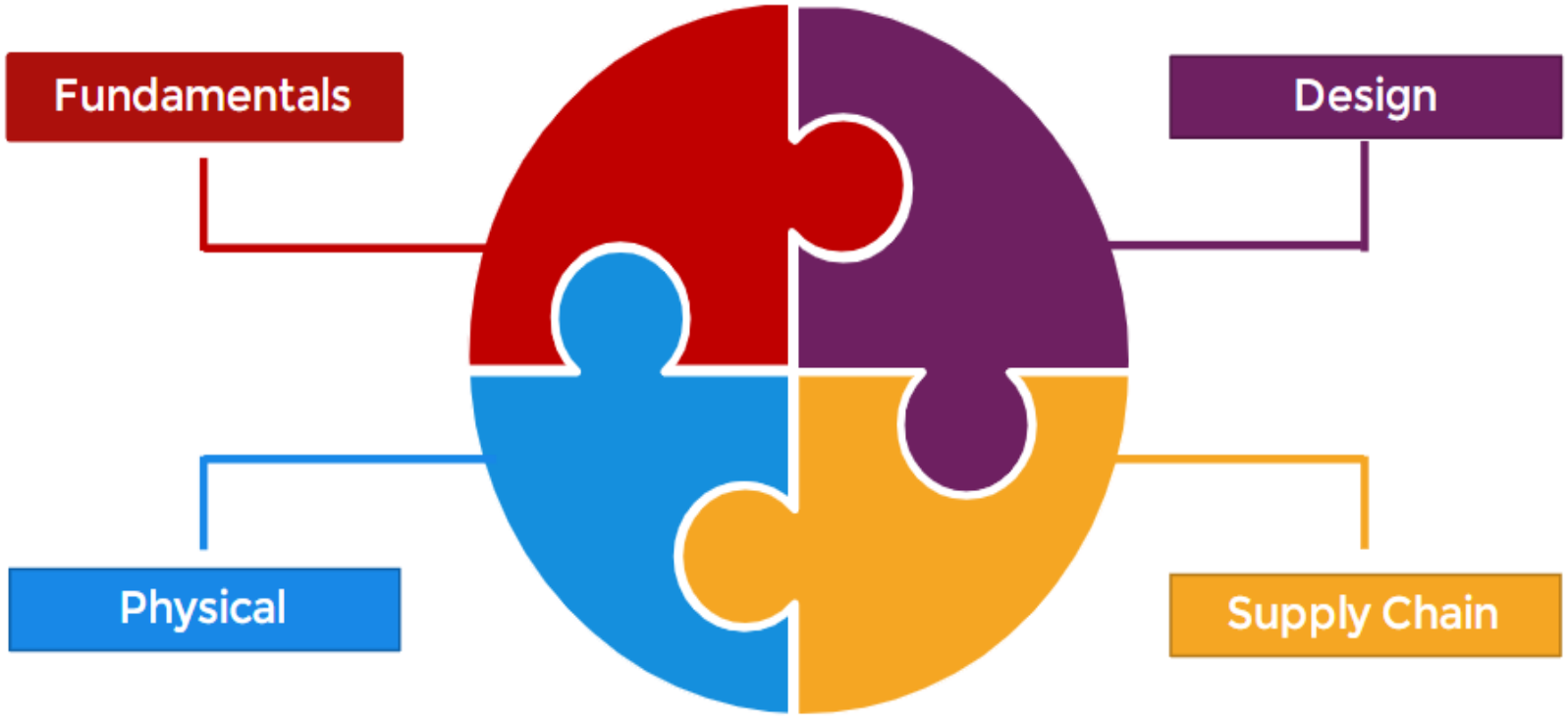
Offsite Solution Consideration



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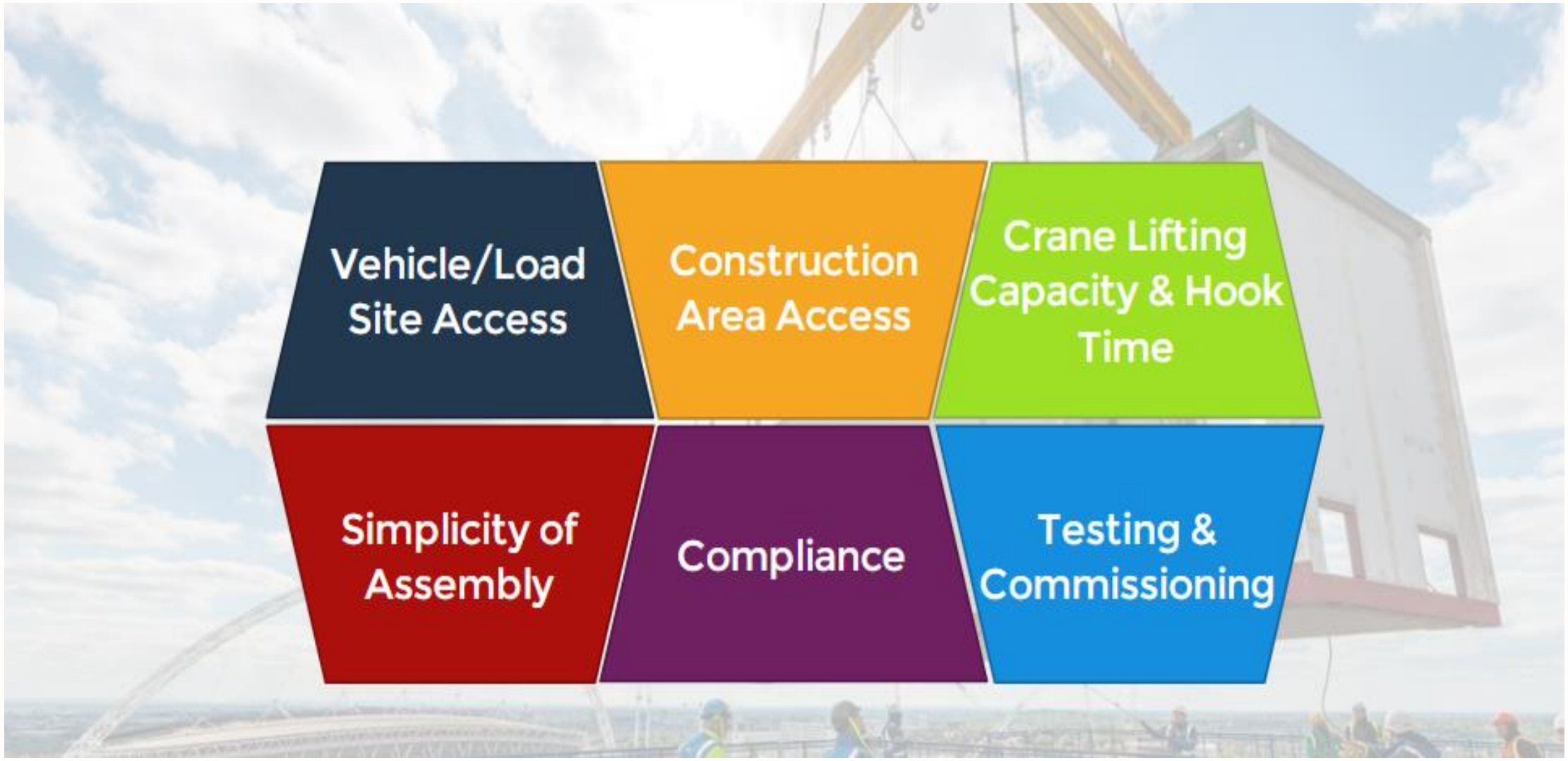
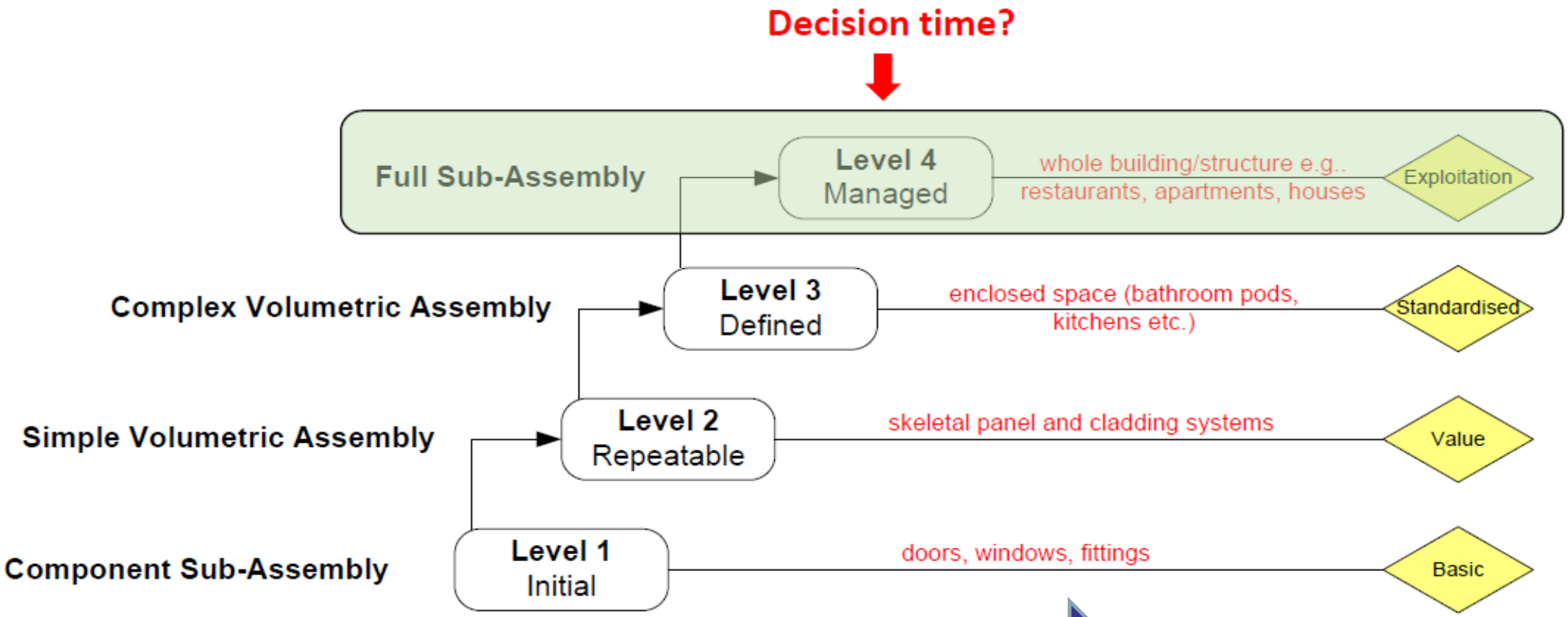
Offsite Solution Consideration



Offsite Solution Consideration



The offsite outlook in the UK is looking good

Goulding, 2021

Offsite Construction Outlook

Halton Housing has joined the Board of 'Building Better' modern methods of constructions

The HALTON Housing has joined the Board of Building

Design for MMC to help the circular economy, council developer tells architects

A council-owned development company wants

A quarter of affordable homes must be MMC

By Joey Gardiner | 11 September 2020

Homes England to use deals signed under new £11.5bn Affordable Housing Programme to promote off-site build

The outlook for modular and offsite post-Covid

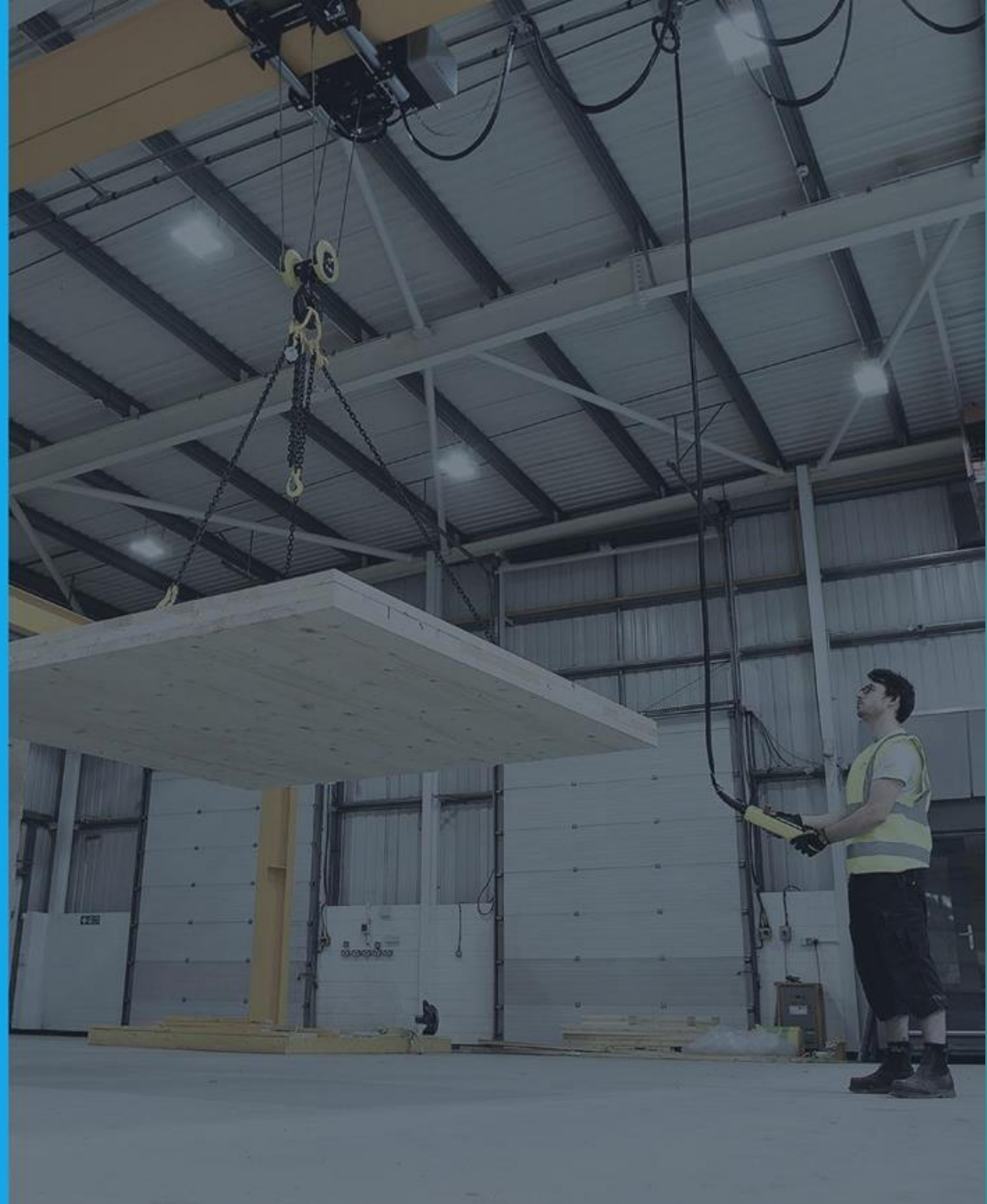
Studies by AMA Research have pinpointed the sectors

Bristol Offsite Housing Scheme Set For Green Light

A development in Bristol being brought forward by

Govt. short-term home building fund extension to include SMEs firms using MMC

Drivers for Offsite



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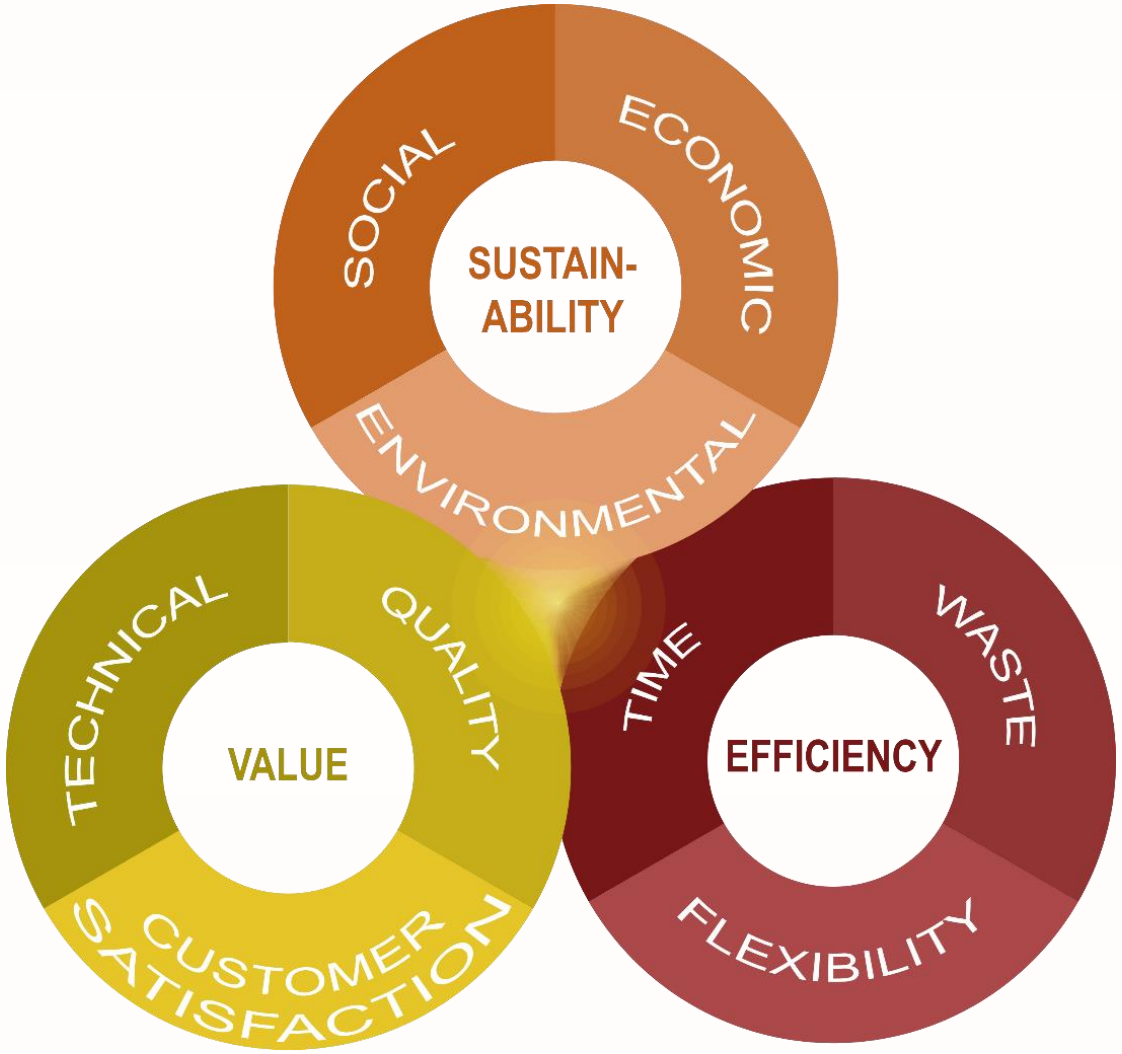
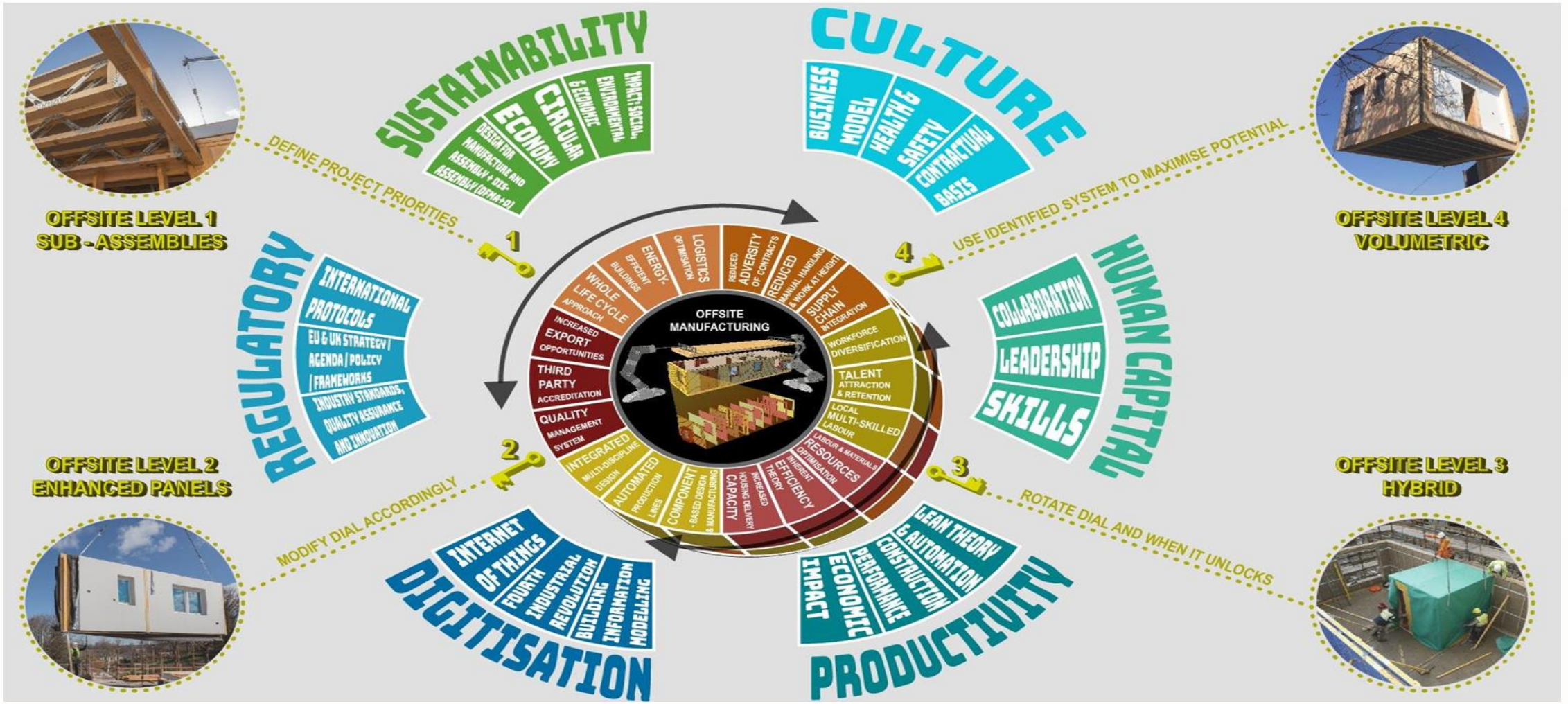
Drivers for Offsite



Drivers for Offsite

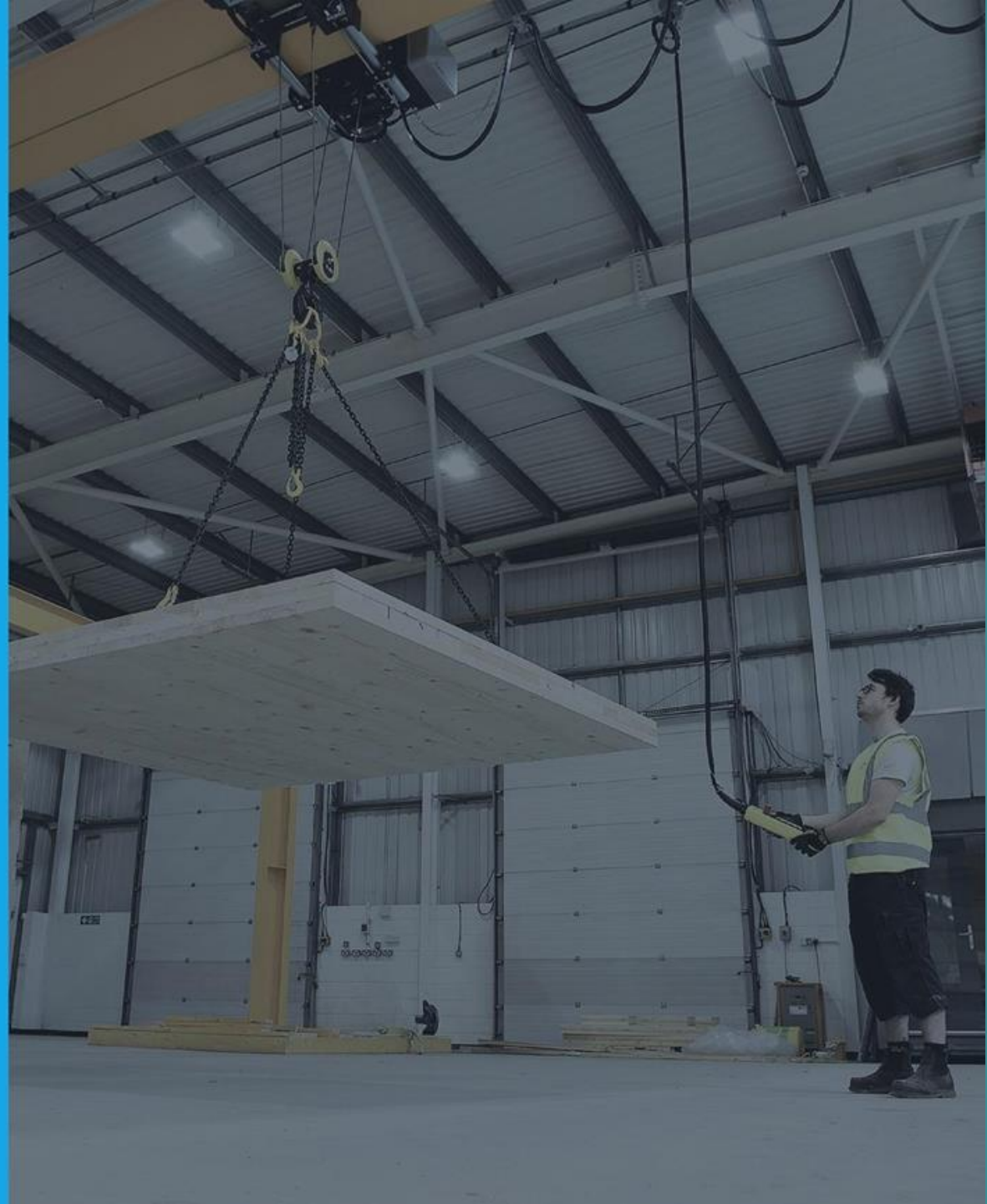


Source: Offsiteready and CITB, 2020.

Drivers for Offsite

Application of Offsite: Some Case Studies

Some of these case studies are from the work done by Offsiteready and CITB.



Residential

Building Types

- The market **demand for housing** encourages the use of offsite construction for faster and more efficient delivery.
- Due to the **different form** that residential buildings can assume, from **single-family** homes to **apartment blocks**, **different offsite systems** can be applied depending on the **size** and **environmental** performance that needs to be obtained.
- For example, **volumetric systems** are best suited when a high level of **repeatability** is required. They can be also used as **service pods**.

Residential: Low Rise

Riverford Gardens

- CCG + MAST Architects
- Glasgow
- Panelised system
- Enhanced environmental and energy performance
- 156 homes:
  - 10 one-bedroom flats
  - 94 two-bedroom flats
  - 12 three-bedroom semi-detached homes
  - 40 four-bedroom terraced villas

Image courtesy of CCG (Scotland) Ltd

Residential Mid Rise

Yoker

- CCG + MAST Architects
- Glasgow
- CLT
- Tallest timber building in Scotland
- Structural timber award winner 2018
- 42 apartments
- Reduced erection/construction time, reduced material wastage, inherent air tightness and thermal properties

Image courtesy of CCG (Scotland) Ltd

Residential High Rise

Wood Wharf

Canary Wharf's new district, Wood Wharf, has been designed to provide a new residential led, mixed use, waterside community defined by the quality of its public spaces, the diversity of its land uses and activities, and its exemplary architecture.

Image Courtesy of Canary Wharf Contractors

Residential High Rise

The masterplan, designed by Allies and Morrison Architects, creates a strong and complementary mix of uses, providing over 3,300 new homes, nearly 2 million sq ft of high-quality commercial office space, and a further 490,000 sq ft of shops, restaurants and community uses.

The buildings use a combination of precast panels by Laing O'Rourke and volumetric steel bathroom pods.

Completion of the project is expected in 2023.

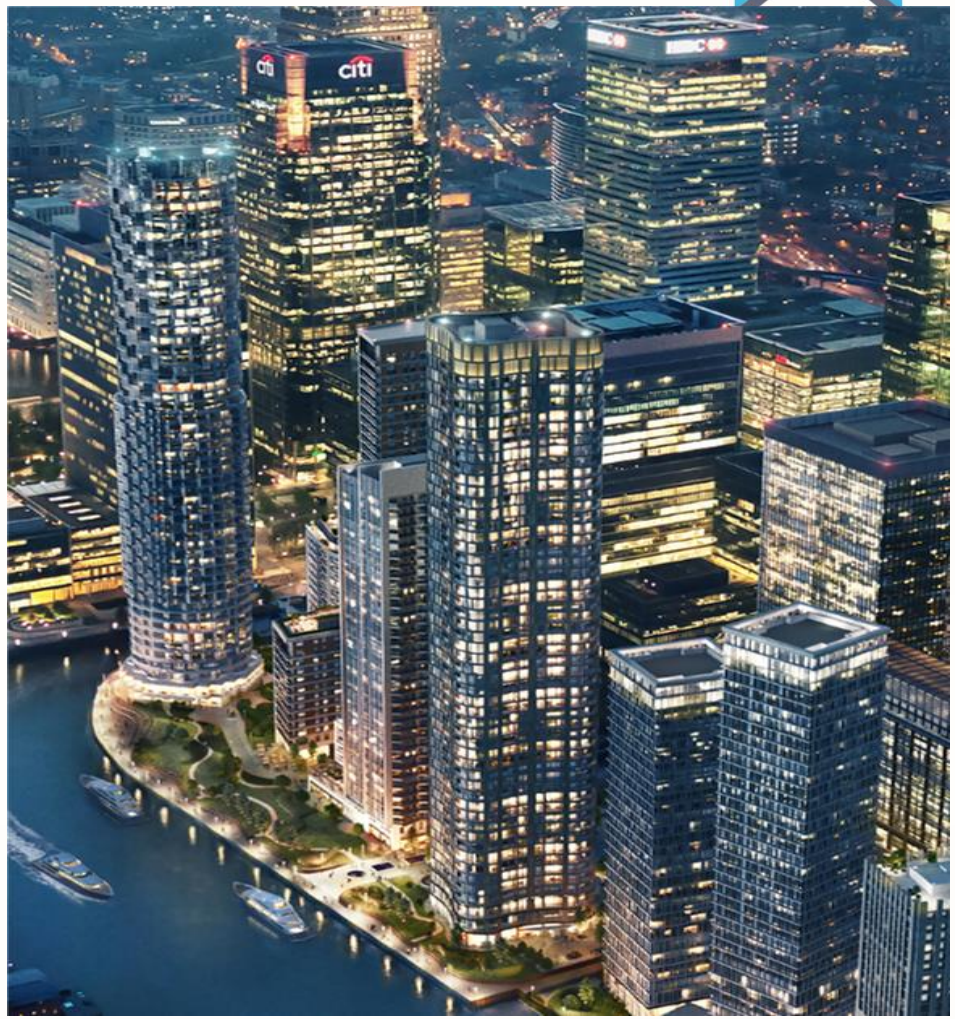


Image Courtesy of Canary Wharf Contractors

Non-Residential

Non-residential buildings include offices, prisons, hospitals, and educational facilities, and typically have a high degree of repeatability ideal for offsite.

Additionally, the necessity for reduced time onsite frequently leads to the application of systems with higher levels of enhancement.

Offsite MEP systems are frequently applied, especially in hospitals, and can be easily integrated into existing buildings as well.

Non-Residential

University of Nottingham Building

Image Courtesy of Offsite Awards - SIP Build UK

Infrastructure

A variety of offsite solutions can be applied in infrastructure, more frequently with the creation of bespoke systems and hybrid forms, due to the size of the construction.

As with every method, offsite has its own risks.

HS2's modular bridge installed in 45 minutes!

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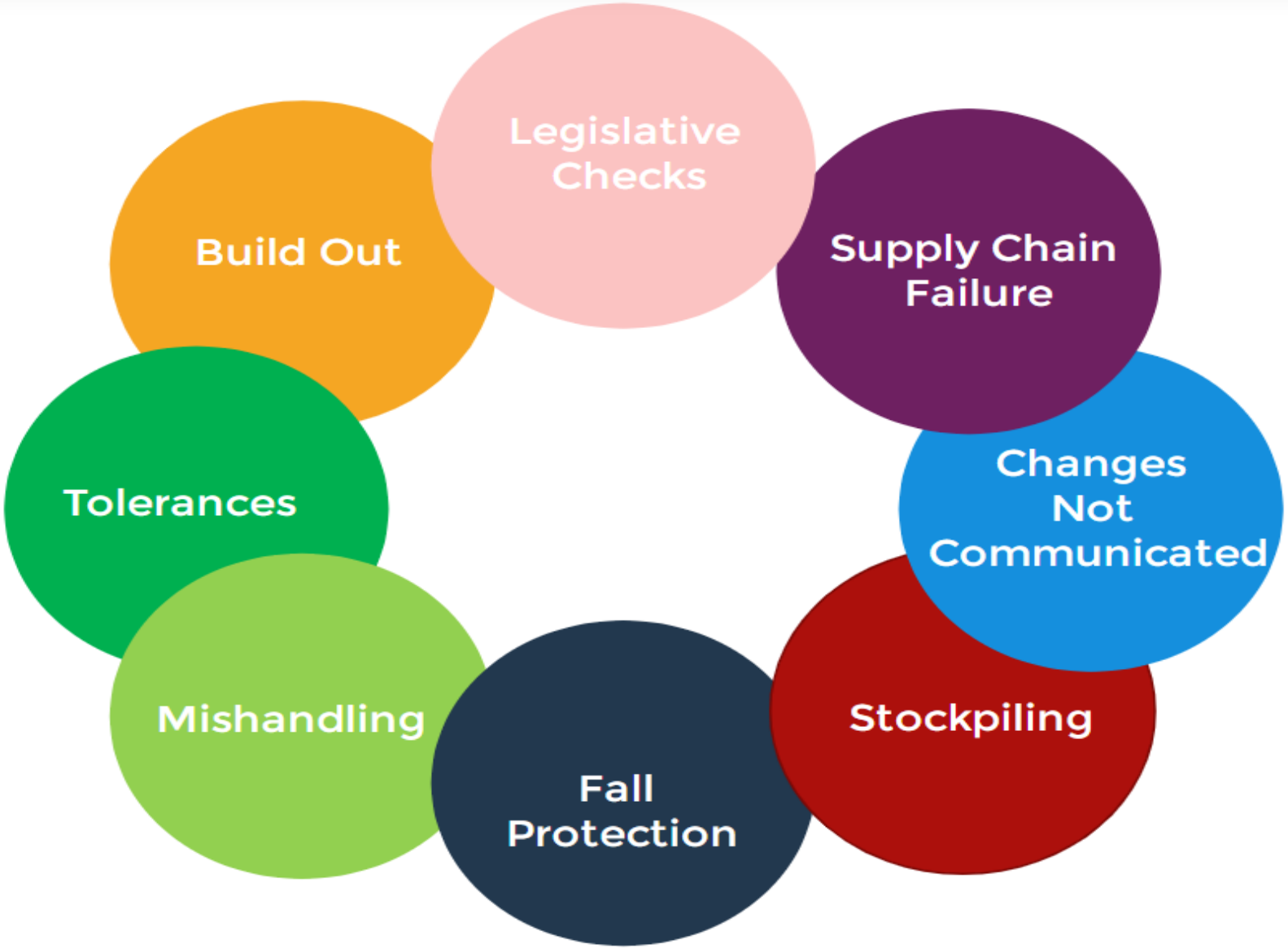
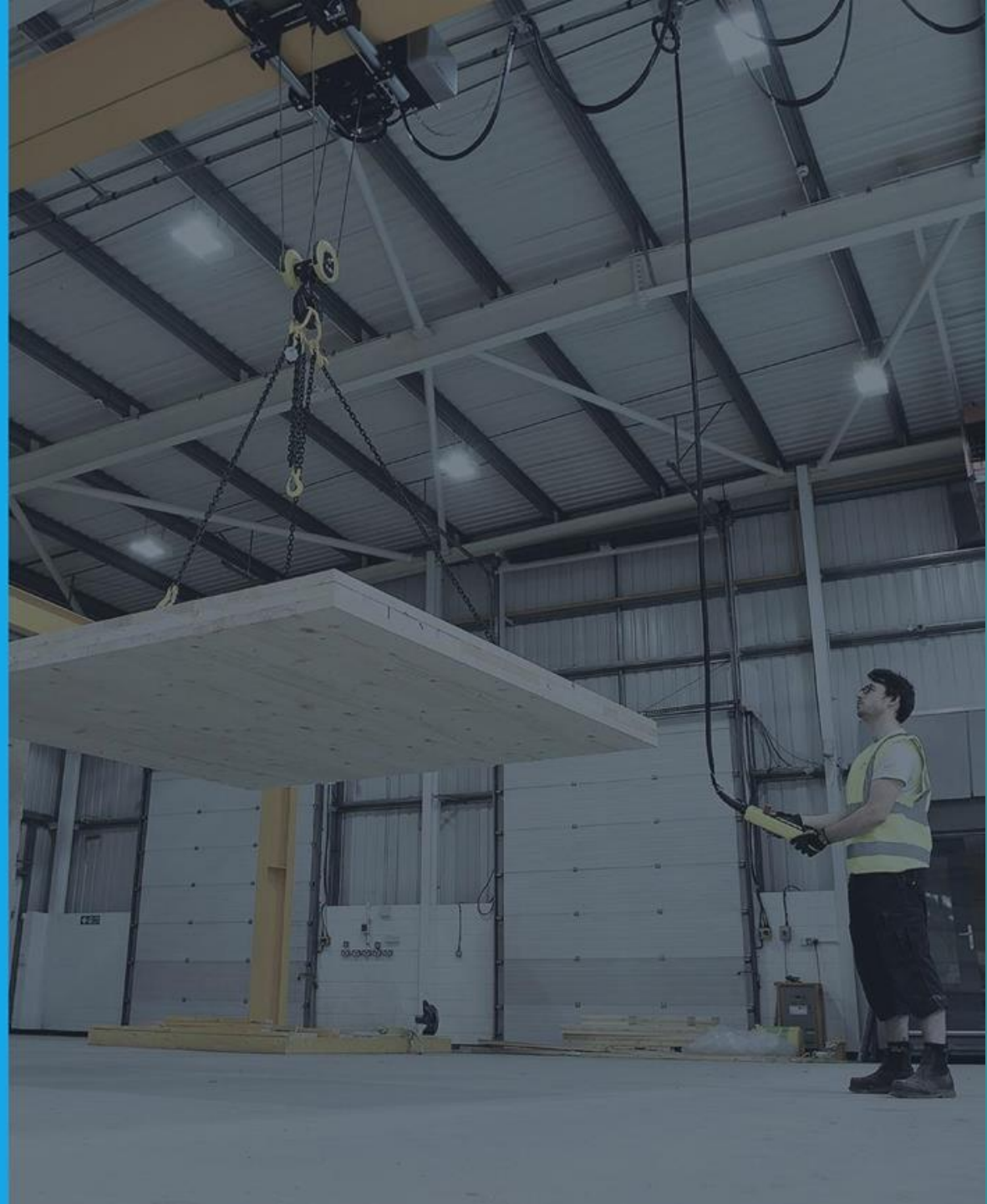
Risk Associated with Offsite



Closing the housing gap in Nigeria via MMC: The Nigeria Study of DCM.



Problem Statement

- **In 2019**: Aule & Jusan (2019) established that housing provision in Nigeria is at a 20 million unit's shortage and an annual decline rate of additional 780,000 units.
- **As of January 2023**: Federal Mortgage Bank of Nigeria confirms that Nigeria has 28 million units' housing shortage(Centre for Affordable Housing in Africa,2023).

Proposal for Addressing Housing Shortage in Nigeria

- To address the shortage in housing provision in developing nations such as Nigeria, Andalib & Gharaati, (2012); Adegboye, (2015) propose the development and evaluation of a new way of building that is faster, technology efficient and cost-effective than the existing one.
- The dry Construction Method (DCM) was decided to be a beneficial and cognitive approach of obtaining industrialised housing provision in Nigeria.

Dry Construction Method(DCM)

- Dry construction refers to building technologies that employ minimal mortar or plaster to connect light-weight structural elements in terms of meeting design and building requirements (Andalib & Gharaati, 2012)
- Components are fabricated offsite.

Research Gap

- Notwithstanding experts advise that the building sector use DCM to address the housing need (Obinna-Esiowa, 2018; Adegboye, 2015; Andalib & Gharaati, 2012).

- Limited research has documented its application and impact in housing delivery in Nigeria (except Ashiru and Anifowose, 2021)

Research Questions

- RQ1: What are the factors that contribute to low housing provision in Nigeria?
- RQ2: How is the dry construction method currently implemented in Nigeria?
- RQ3: What are the barriers to the DCM in Nigeria?
- RQ4: What are the success factors for implementing DCM in housing construction?

METHODOLOGY

Approach: Qualitative research

Instrument: Semi-structured interviews with eleven participants

Selection: Non-probability sampling across the country's six geopolitical zones

Analysis: Thematic Analysis

Distribution of Research Participants

	Role	Years of Experience in Construction	Years of Experience in DCM	Organisational size	Location
P1	Construction manager	15	8	Medium	Lagos & Portharcourt Nigeria
P2	Project manager	15	8	Medium	Lagos & Calabar Nigeria
P3	Builder/Contractor	15	8	Small	Ogun and Kaduna, Nigeria
P4	Architect	12	12	Large	Abuja, & Lagos, Nigeria
P5	Civil engineer	10	5	Medium	Abuja & kano, Nigeria
P6	Mechanical engineer	10	5	Small	Lagos & Owerri, Nigeria
P7	Project manager	8	6	Large	Abuja and Lagos, Nigeria
P8	Technical Coordinator	7	7	Medium	Lagos & Yola, Nigeria
P9	Planner	5	5	Medium	Lagos, Nigeria
P10	Project Manager	5	5	Medium	Lagos & Ogun Nigeria
P11	Planner	5	5	Medium	Lagos & Kogi Nigeria

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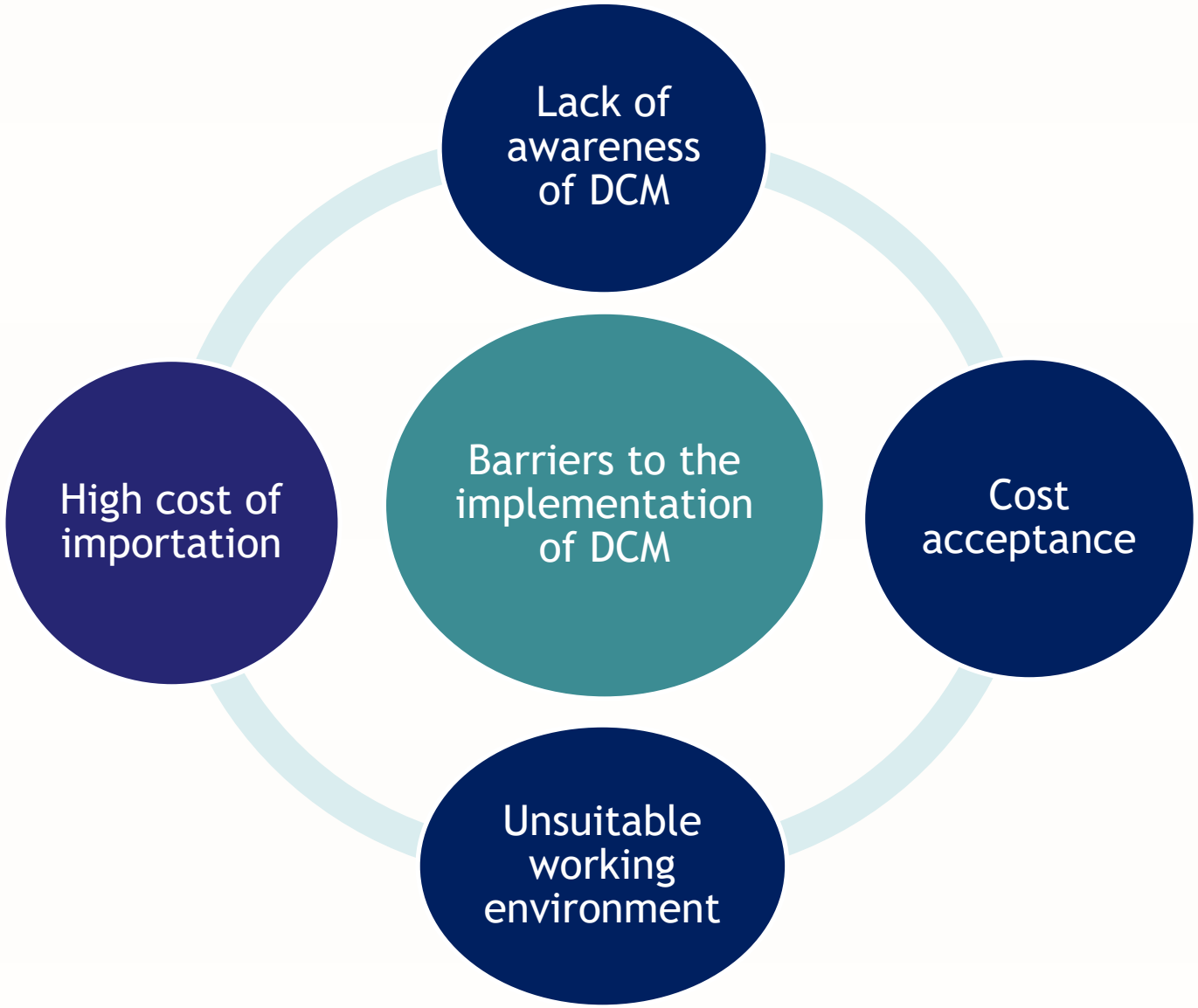
Challenges affecting housing delivery in Nigeria

- Legal framework compliance
- Insecurity
- Engagement of unqualified professional
- Inflation
- Lack of access to mortgage facilities
- Over-reliance on traditional construction method

Current DCM Practice in Nigeria

- DCM are most times prefabricated
- Component usually transported to site for assembly
- Mostly used from superstructure to roofing
- Occur in the form of integrated building system.
- Material are made of timber, steel, fibres, plasterboard etc.

Barriers to the Implementation DCM in Nigeria



Success factors for implementing DCM in Nigeria

- More awareness on the approach
- Provision of training
- Provision of mortgage facilities
- Government support
- Flexibility(combination with traditional method)

Concluding Thoughts

- The DCM practice is at the lower scale of an offsite adoption and could be liken to panelised and component approach.
- Training and government support is essential to move the DCM approach forward.
- The study confirm offsite construction practice exist and it supports housing delivery.
- The DCM could be a fulcrum for full integration of offsite approach for housing delivery in Nigeria.
- However, the study sample is too small to make any generalisation.
- Future study should use case study and questionnaire survey.

Concluding Thoughts

- The adoption of an offsite approach requires a change in culture and mindset.
- It has potential to transform the traditional approach to the delivery of construction project.
- However, investment decisions need to be more informed.
- Nevertheless, there is an increasing call for application of MMC for improved performance of the sector.

Thank you for your Attention

Any Question?

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Further Readings

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