



Welcome to our Innovation Day

30 January 2023



with





Please scan the QR code for our full agenda and speaker biographies

Agenda



- 09:30** Welcome: Keith Waller, Programme Director Construction Innovation Hub
- 09:40** Session 1: A Spotlight on Product Platforms
- 11:00** Break
- 11:20** Session 2: Procurement using data that informs value-based decisions
- 12:30** Lunch
- 13:30** Tour: The Sandpits in action / Workshop session: The future of Platforms in Construction
- 15:00** Break
- 15:20** Workshop session: The future of Platforms in Construction /Tour: The Sandpits in action
- 16:45** Question Time
- 17:30** Closing remarks: Mike Pitts, Deputy Challenge Director, Transforming Construction
- 17:45** Drinks reception
- 19:00** Event Close

From R&D to Deployment



with





We will look to procure construction projects based on product platforms comprising of the kit of parts, production processes, knowledge, people and relationships required to deliver all or part of construction projects”

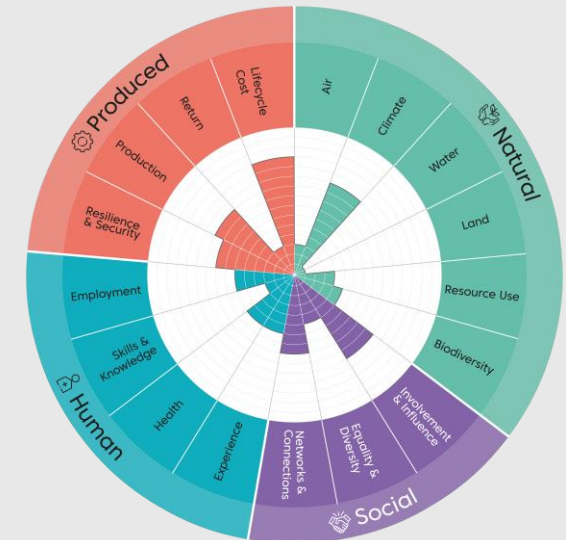
THE CONSTRUCTION PLAYBOOK



Construction Playbook (Dec 2020, updated 2022)



Transforming Infrastructure Performance (2017)



Value Toolkit (2022)



A Spotlight on Product Platforms

Chair: Keith Waller, Programme Director,
Construction Innovation Hub



Department
for Education

Construction Innovation Hub Innovation Day

Product Platforms in Education

January 2023

Standardisation in Education



Campsount Technology College - Schematic of Project underway

Review of Education Capital

Sebastian James

April 2011



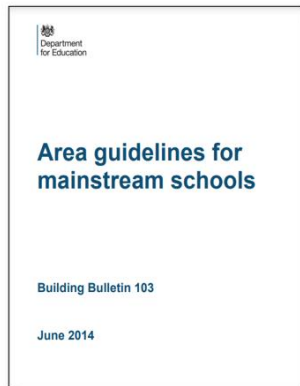
Government Policy & Industry Publications



Standardisation Journey



Design Standardisation



2013

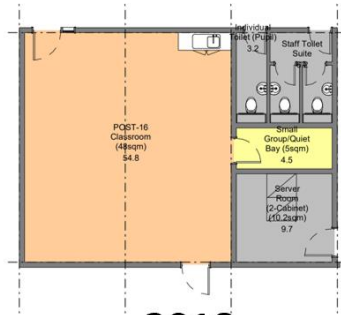
SoA tools and ADS uses standard sizes of teaching space in **BB103**, based on a construction grid



Baseline designs show how spaces can fit within a grid, within reduced GIFA and cost



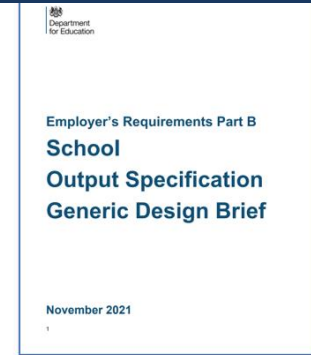
Gen 5 MMC design guide uses clusters of smaller spaces on simple grid



Gen7 MMC standardises SEN school sizes



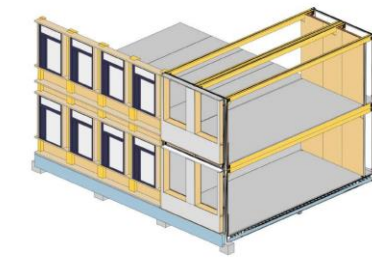
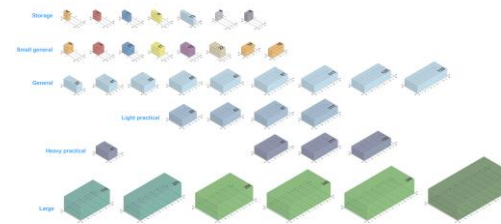
Gen Zero standardises large and commons space



2021

S21 uses standard space types

The Road to Platform



Current SoA and data sheets as basis

Gain feedback from the sustainability pods and the energy pod pilots

Launch the digital component library including FFE groups

Work with contractors/contractor groups to develop components and assemblies



2022

2023

2023

2024

2024/5

2025

2026/9

Develop standardised 'lite' for Alliance for Learning using basic grids and spaces

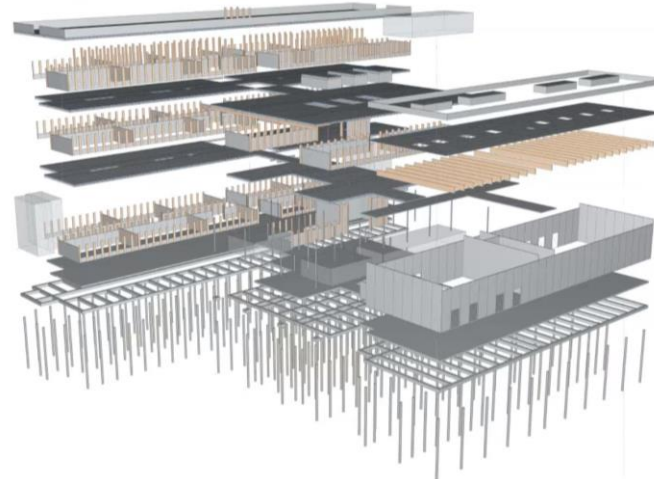
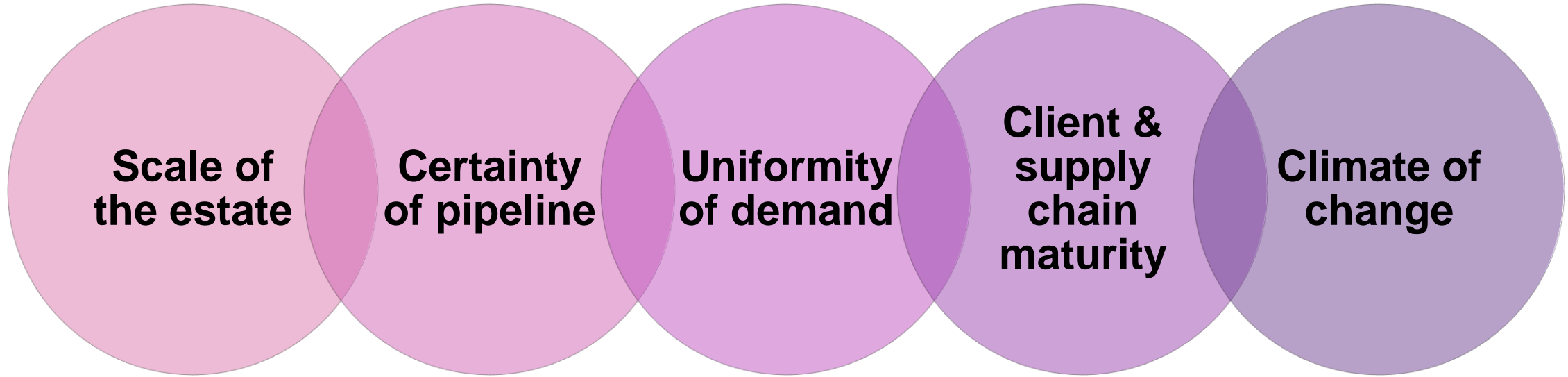
Develop wider standardised approach to all spaces and include attributes

Launch S25 including the requirement to comply with standard systems and require full compliance

Pilot Schools Procured and Built

Procurement vehicles based on platform principles

Platform Enablers in Education



pDfMA:

*“A platform approach to DfMA (P-DfMA) is the use a set of digitally designed components **across multiple types of built asset** that are then used wherever possible, minimising the need to design bespoke components for different types of asset. For example, the same component could be used in the construction of a school, hospital and prison..”*

Why is Platform so important



Better Faster Greener

Thank You



RM6184 Offsite Construction Solutions

30th January 2023

Power to your **procurement**



Crown
Commercial
Service

Powering efficient and cost effective buying

- The Crown Commercial Service (CCS) is a trading arm of the Cabinet Office providing procurement solutions to the UK public sector
- Ensuring services deliver value for money while being efficient, effective and focused on the needs of citizens
- Making considerable savings for the taxpayer on procurement
- A renewed focus on using digital technology to deliver services
- Supporting innovation and improved delivery models



What
do we
deliver?

The Buildings Pillar

The CCS Buildings Pillar supports our customers through the building, operation and management of the Built Asset.

We offer a full lifecycle service for property, construction, infrastructure consultancy projects across all RIBA stages.

Using our extensive knowledge of the market and suppliers, customers can access commercial agreements for all of their buildings needs, whilst being reassured that they are efficient, effective and compliant

Power to your **procurement**



Crown
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CCS Construction Integrated Solution

DESIGN

BUILD

OPERATE

MAINTAIN

SUSTAIN

Consultancy
Services

Construction
Works

Building
Materials and
Equipment

Modular
Building
Solutions

Energy
Decarbonisation

Offsite
Construction
Solutions

A person in a dark suit and patterned tie is holding a tablet computer. The screen of the tablet displays a bar chart with several vertical bars of varying heights. The person's hands are visible, and they are looking at the screen. The background is blurred, suggesting an office setting. The overall image has a professional and business-oriented feel.

RM6184 Offsite Construction Solutions

Power to your **procurement**



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Service

Lotting Structure

1. Built Estate including Education	2. Healthcare	3. Residential	4. Justice	5. Defence	6. Thermal Efficiency Upgrades
1.1 £0m > £15m Purchase and £0m> Hire 3D Turnkey Solutions Only	2.1 £0m > Purchase and £0m> Hire 3D Turnkey Solutions Only	3.0 Residential Properties	4.1 3D Turnkey Solutions	5.1 3D Turnkey Solutions	6.0 Thermal Efficiency Upgrades
1.2 £15m > 3D Turnkey Solutions Purchase Only					
1.3 £0m > 2D Turnkey Solutions Purchase Only	2.2 £0m > 2D Turnkey Solutions Purchase Only		4.2 2D Turnkey Solutions	5.2 2D Turnkey Solutions	

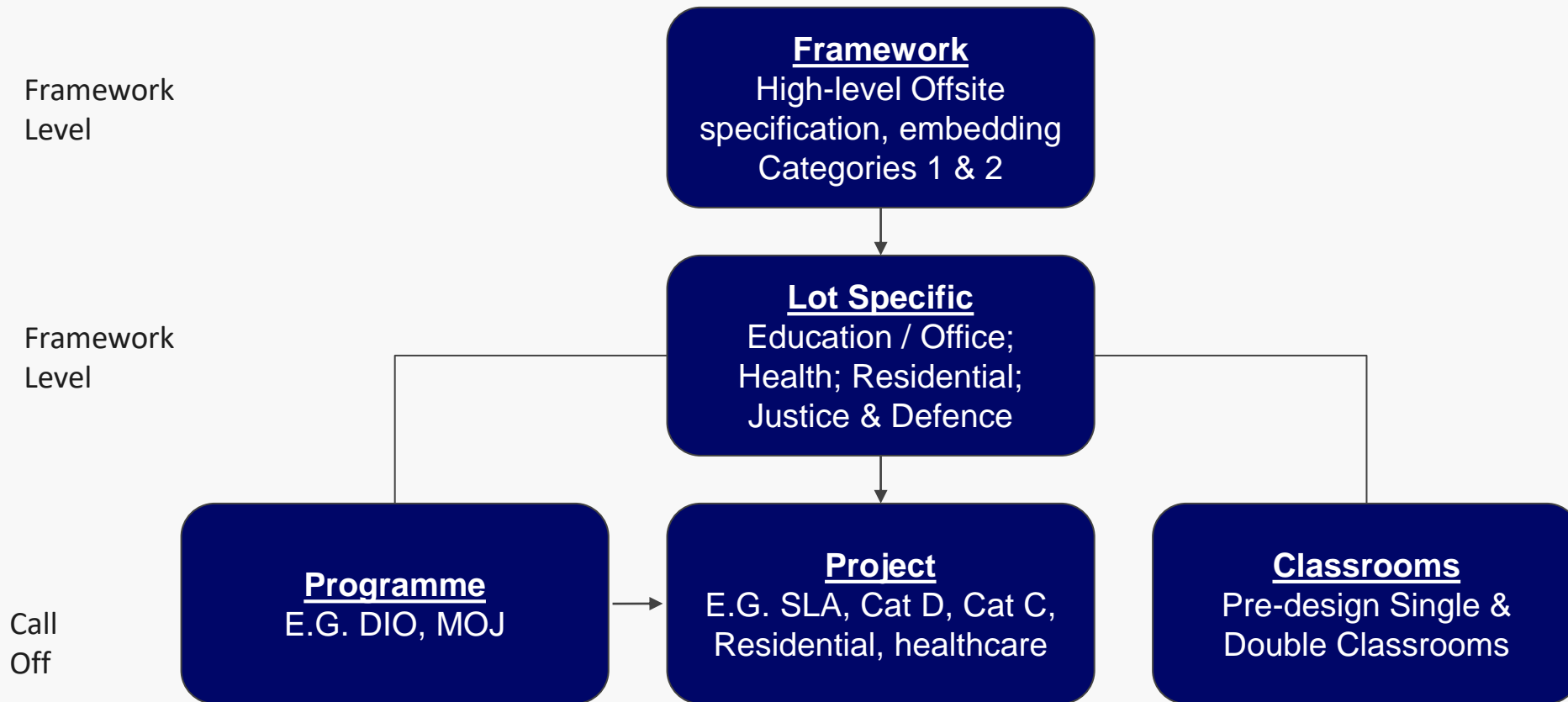
Key
3D Primary Structural System only
2D Primary Structural System only
Both 3D and 2D Primary Structural Systems
2D Non-structural System only



MMC Categories

	Category 1	Category 2	Category 3	Category 4	Category 5	Category 6	Category 7
Direct	Yes	Yes	No	No	Yes - Lot 6 only	No	No
Supply-Chain	No	No	Yes	Yes	Yes	No	No
Other Framework	No	No	No	No	No	Yes	Yes

Specification



Power to your **procurement**



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Commercial
Service

Pricing

	Building	Volumetric	Delivery / Collection	Installation	Removal
Unit	£/m2				
Description	Design, Manufacture & Fit-out (incl. ramps & steps access, doors, windows and small power)	0 > 500m2 500m2 > 1,500m2 1,500m2 >	Average cost per load across United Kingdom (Collection applies to Hire agreements only)	Based on building size and Lot specification	In Hire agreements only
Specification	Pricing based on a per Lot basis - baseline framework rate to refined at project level competition				
Pre-design Classrooms	As above scope, with fixed rates associated to specific design. Volumetric scalability applied on 1 > 5; 6 >10; 11> number of Classrooms.				

For Hire: Initial costs and weekly hire costs have been separated

Thank you - Questions?

0345 410 2222

www.crowncommercial.gov.uk

Power to your **procurement**

 @gov_procurement

 Crown Commercial Service



Crown
Commercial
Service



Sandpits in Action

Transforming construction through a modular approach

31 January 2023



with



Balfour Beatty



What do we mean by “sandpits”?

Sandpits provide a safe space to develop, test and refine innovative solutions, products and approaches to:

- de-risk their application on live projects;
- build understanding and capability amongst industry and clients;
- test interoperability and scalability, and;
- measure how these approaches add value and support the broader objectives.



What did we seek to demonstrate through the sandpits?

1. Would this approach boost productivity and provide opportunities for growth?
2. How could we use the sandpits to prove that the platform approach would accelerate delivery and reduce waste?
3. How did we demonstrate collaboration and flexibility - not just on projects but across sectors?
4. Could we prove safer ways of working, better quality and better services?
5. How do we create the right space for innovation to come forward and de-risk it for the future?



1. Would this approach boost productivity and provide opportunities for growth?

Developing MEP (mechanical, electrical and plumbing) cassettes to enhance **repeatability** and **standardisation**

Enabling **interchangeability** and form part of a wider **pre-manufactured system for buildings**

'Flexible modules' may take longer to initially install, but are **completely reconfigurable and adaptable**, unlike standard modular services, so give great advantages over whole life of the building

Balfour Beatty
Kilpatrick



	A	B	C	D
1	Sprinklers	Ductwork	Ductwork	Gases
2	Containment	Ductwork	Ductwork	Pipework
3	Crossover	Access / Crossover	Access / Crossover	Crossover
4	Containment	Access	Access	Pipework

2. How could we use the sandpits to prove that the platform approach would accelerate delivery and reduce waste?

Education Sandpit

Traditional

30 days

Panelised timber hall

20 panels:

- 14 wall panels
- 4 roof panels
- 2 parapets

5-Day total assembly

with 3 operatives
(with 10 day fitout)

3 deliveries

total – ‘just in time’



135 man hours from finished foundations to assembled hall (80%) completed

Panellised Modules – Installation Assembly Sequence

<p>UNLOADING LOCATION SITE ACCESS VOLUMETRIC UNIT HEALTHCARE BUILDING ZONE INSTALLATION ZONE PANEL TILTING ZONE CRANE ZONE</p>	<h3>1.0.1</h3> <p>CLT panel nr. 1</p> <p>Attach hornet to all four lifting points. (only 2 lifting points on panels 2 & 13)</p>	<h3>1.0.2</h3> <p>PIVOTING BASE</p> <p>Once a wall panel is lowered carefully onto a pivoting base, remove the bottom lifting point anchor screws.</p>
<h3>1.0.4</h3> <p>Once the two-point hornet is attached and secured, carefully hoist the panel vertically. Once the panel is hanging vertically, start maneuvering and guiding the panel to its final marked location.</p>	<h3>1.1 CLT wall panels install sequence</h3> <p>12 assembly-ready CLT wall panels 20 new vertical supports (shown right) 2 small panels (shown left, not part of this project)</p> <p>Please follow specific health and safety protocols that is set up for this project.</p> <p>Before you start unloading and installing works, make sure you have read the install guide thoroughly.</p> <p>Panels are loaded on a trailer so that lifting procedure follows the sequence demonstrated in this perspective view (1-12).</p> <p>All panels are labelled to follow this install sequence.</p> <p>NOTE: that top of the smallest panels and panels with holes from loading scheme. These panels are labelled 2, 10 and 11.</p> <p>Panel 2, 10 and 11 are pre-assembled assemblies (PANEL 01 & PANEL 02) and CLT 4 & CLT 5. Do not do the final fit out and a side for the final fit out.</p> <p>Please, see further instructions on page 31 & 32</p>	<h3>1.2 CLT wall panels install plan</h3> <ol style="list-style-type: none"> Using base on a trailer over. Mark spots where the wall panel is going to be installed (marked the positions where each panel is installed). Capitally move CLT wall panel on the existing base and remove the lifting screws from the bottom. Attach a suitable two-point hornet to the two remaining lifting screws. Observe the width of the panel. It is a little with your previously marked spot? Place markers to level the concrete floor where the panel is going to be installed. Remove the supporting base from the sides of the panel if there is space. The new 10 beams to the wall section are removed. Mount panel to vertical position and level with the neighbouring walls in clear and gables are in place. When ready, fit and remove the hornet to its final position. Remove the anchor screws. Final stage: inspect how along side positions then install the panel in place using provided angle brackets. <p>Before installing any wall panels please read page 32 for more information.</p> <p>Please, see further instructions on page 31 & 32</p>
<h3>2.0 GLT beam install sequence</h3> <ol style="list-style-type: none"> Attach GLT beam to lifting equipment by the lifting device attached to the top end of beam. Lift and carefully manoeuvre GLT beam into initial location using crane. Sliding into steel shoe connections at either end of beam. Fit GLT beam to CLT beams via Steel Shoe Connector (Sobel). Detach lifting equipment and remove lifting screws from the top of GLT. <p>Please, see further instructions on page 31 & 32</p>	<h3>3 CLT Roof Panel Lifting Plan</h3> <ol style="list-style-type: none"> Attach lifting equipment to the pre-formed truss per panel. Remove Truss used to secure expanding form top rebar. This side per CLT panel. Lift and carefully manoeuvre CLT roof panel into position. Fit roof panel to GLT beams and CLT wall panels at either end of CLT roof panel. Remove Form Equipment. <p>Please, see further instructions on page 31 & 32</p>	<h3>3 CLT Roof Panel Lifting Sequence</h3> <ol style="list-style-type: none"> Attach lifting equipment to the pre-formed truss per panel. Remove Truss used to secure expanding form top rebar. This side per CLT panel. Lift and carefully manoeuvre CLT roof panel into position. Fit roof panel to GLT beams and CLT wall panels at either end of CLT roof panel. Remove Form Equipment. <p>Please, see further instructions on page 31 & 32</p>

Volumetric Modules - Installation

Traditional

30 days

Modules

2 hours per module
Total: 4 hours per building

Toilet module

Volumetric module unwrapped, lifted and installed in
under 2 hours

Module 100% complete in factory

On site work completed with
3 operatives over 1 week

seismic



Healthcare Sandpit

Laser cut reinforcement (LCR)

Installation Time		
Traditional	LCR	166% time saving on-site (with tolerance issues)
4 hours to build and place 2 cages	1 hour to place 4 cages, plus 2 hours to cut and adjust	
2 hours per cage	45 minutes per cage	Potential 700% saving without tolerance issues (15 mins per cage)

Weight		
Traditional	LCR	Weight saving of 8% for LCR
24kg	22kg	



MetLase
A JOINT VENTURE BETWEEN ROLLS-ROYCE AND UNIPART



Installation Time - Concrete pre-cast frame

Traditional (in-situ)

30 days

(curing included) with

3 specialist trades

Formwork,
reinforcement,
concrete)

Sandpits

Top of foundations to
completed frame:

5-day installation

(including mobilisation & demobilisation)

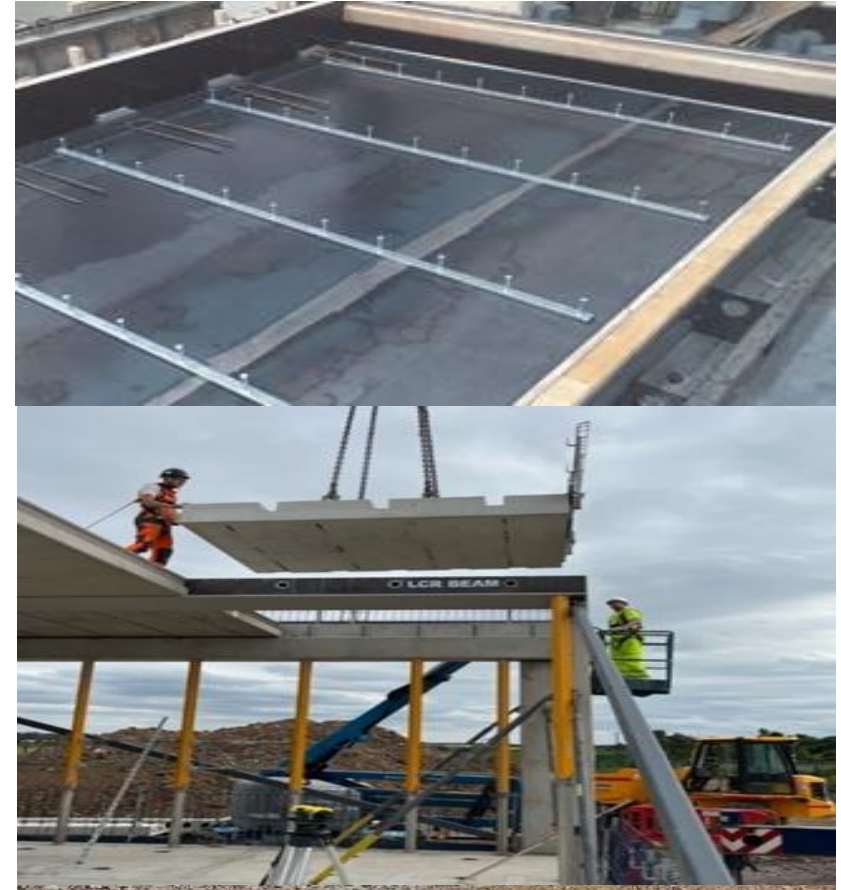
5 operatives

260 total hours in 5 days

**20
crane lifts:**

- 6 beams
- 6 columns
- 12 slabs

**27
components**
7 'just in time'
deliveries



Installation Time – Partition walls



Traditional

4 days

Dekowall

1.5 days
(without finishes)

2 operatives
(28 hours total)

30 components
1 delivery

95% less site waste
than traditional

Installation Time – Roof cassettes



Traditional

13 days

(including parapet)

MTC/BMI 'Active Roof' cassettes

10 days

4 operatives

6 cassettes

Lifting 6 cassettes into place:

6 hours total on-site (with rain delays)

Sealing roof on-site:

1 operative for 5 days (not including parapet)

Sealing parapet and roof details:

1 operative for 10 days

6.25m² per day

Total install & sealing duration roof & parapet = 16 days (100m² roof)

4. How did we demonstrate collaboration and flexibility - not just on projects but across sectors?

We've worked across the Sandpits to demonstrate the use of the Product Platform Rulebook or where different technical solutions could work together to support a platform approach in the future

Volumetric and panellised solutions were provided by three different systems/suppliers:

Panelised - Hall space
Ecosystems
(home grown engineered timber)



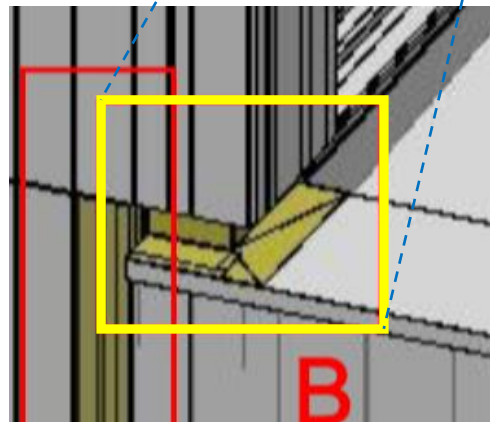
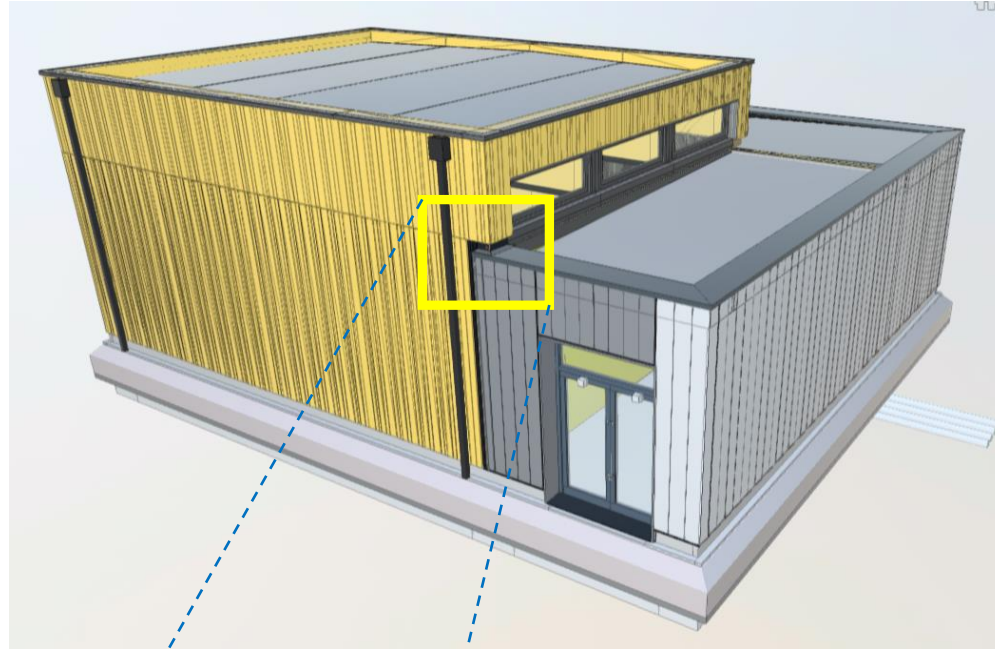
Volumetric - toilet podule
Seismic platform
(delivered by McAvoy)



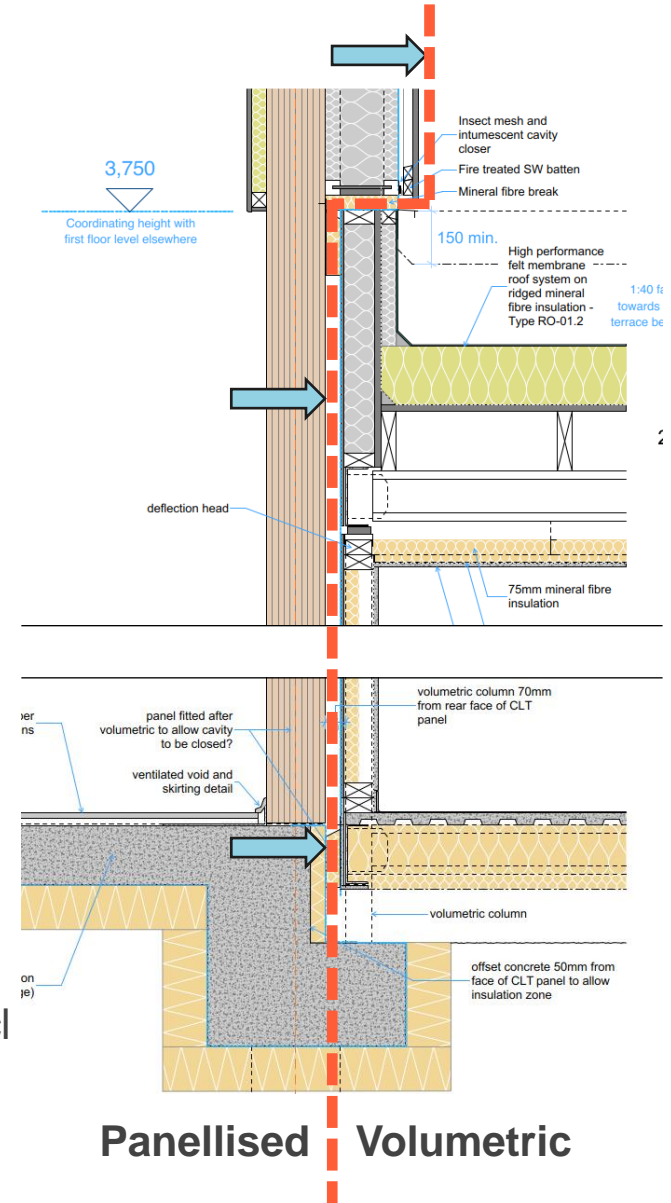
Volumetric - corridor
McAvoy smart space system



Interface between Modules from different suppliers

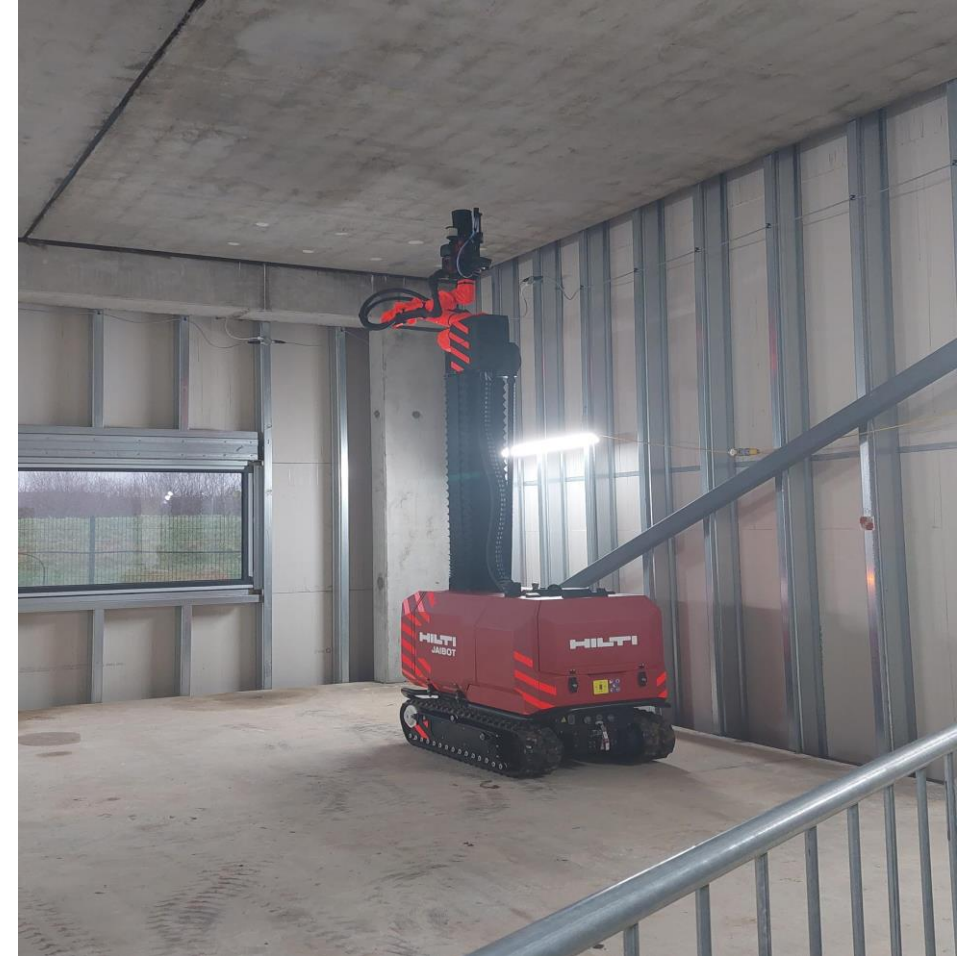


- Timber Panellised units against large steel-framed Volumetric modules
- Bridging elements/seals to be carefully considered – incl tolerances
- Seals are inaccessible once fitted - 'Right First Time'



5. Could we prove safer ways of working, better quality and better services?

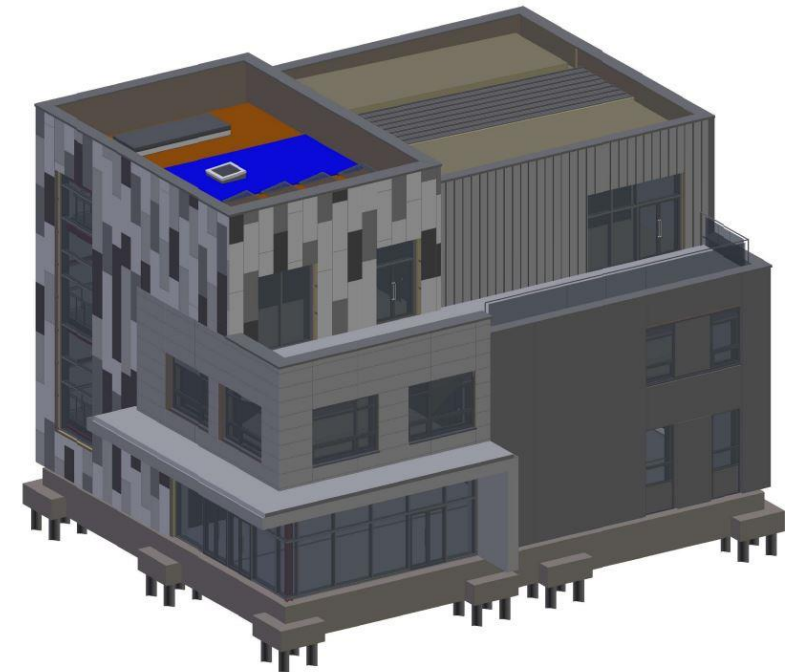
- Through the use robots such as the Hilti Jaibot, we were able to remove the requirements for working at height to drill hole series into underside of slab
- Enhancing accuracy, safety, timesaving from setting out and removal of working at height
- Use of Q-bot to spray insulation to underside of slab
- By moving traditional jobs to a more controlled environment we can build a more inclusive and diverse workforce



6. How do we create the right space for innovation to come forward and de-risk it for the future?



Safe physical space to fail/succeed



and a digital space to test and learn

For more information please contact:

Balfour Beatty:

Tom.Yates@balfourbeatty.com or Paul.Harkin@balfourbeatty.com

Construction Innovation Hub/MTC:

abbie.romano@the-mtc.org or sandpits@the-mtc.org



with



Balfour Beatty



CONSTRUCTION
INNOVATION HUB



UK Research
and Innovation



THE PRODUCT PLATFORM RULEBOOK

Ron Lang

Technical Director – Atkins

Technical Author – Product Platform Rulebook



Introduction

Where did this all begin?

(When I looked considerably less troubled)

Policy Landscape: 'Modern' Methods of Construction (MMC)

"Building on progress made to date, the Department for Transport, the Department of Health, the Department for Education, the Ministry of Justice, and the Ministry of Defence will adopt a **presumption in favour of offsite construction** by 2019 across suitable capital programmes..."

Autumn Budget (2017)

"[Government] will use its substantial pipeline of construction projects to drive innovation and increase the adoption of modern methods of construction...this currently represents a **potential pipeline for modern methods of construction of around £20 billion a year.**"

Transforming Infrastructure Performance (Dec 2017)

"Building on the presumption in favour of offsite construction, we are committed to creating a dynamic market for innovative technologies in the UK...There is a new **expectation for departments and ALBs to set targets for the level of use of MMC** in the delivery of projects and programmes."

Construction Playbook (Dec 2020)

"This pipeline outlines the extent to which new work will incorporate delivery through MMC. 170 of the contracts in procurements, totalling an estimated capital value ranging between **£15.4 billion and £22.4 billion**, are planned to include elements delivered by making **best use of MMC.**"

Analysis of the National Infrastructure and Construction Pipeline (Aug 2021)



Policy Landscape: The Emergence of 'Platform'



"We will look to procure construction projects based on product platforms comprising of standardised and interoperable components and assemblies..."

Construction Playbook (Dec 2020)

"...in the next two years the government will set out a requirement for platform approaches to be adopted for social infrastructure with a repeatable design"

TIP: Roadmap to 2030 (Sept 2021)

...note the shift in language from platform, to platforms, to product platforms



NEWS

Government launches Core Innovation Hub for construction

03 December 2018

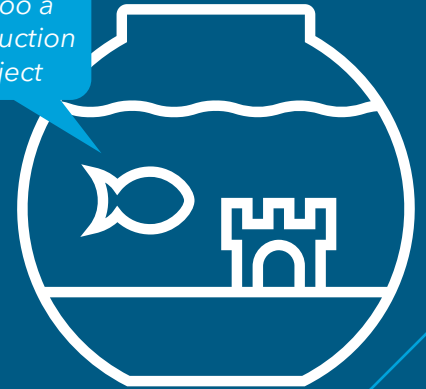
The Fundamentals

Contextualising Product Platforms within
the broader transformation agenda

The Underlying Problem

- We build a lot of 'stuff' every year (~£65bn in social infrastructure alone)...
- ...but we do it rather **differently** every time, with **different** products and systems being put together in slightly **different** ways, to suit slightly **different** designs, by **different** groups of people, in **different** locations.
- We must look across all the 'stuff' we build and ask where such high levels of variety and customisation are genuinely adding **value** (to the end client/user) and where we could be more rational about what we build and how we build it.

Ooooo a construction project



Caveat: This paints a rather bleak and not wholly representative picture (what about the role of frameworks for example?).

The Theory

Product Platforms are an *enabler* for greater use of MME manufactured solutions and the associated benefits they bring.

Too subtle, Ron...

*Technical
Solutions*



Product Platforms \neq MMC



*An approach /
philosophy*



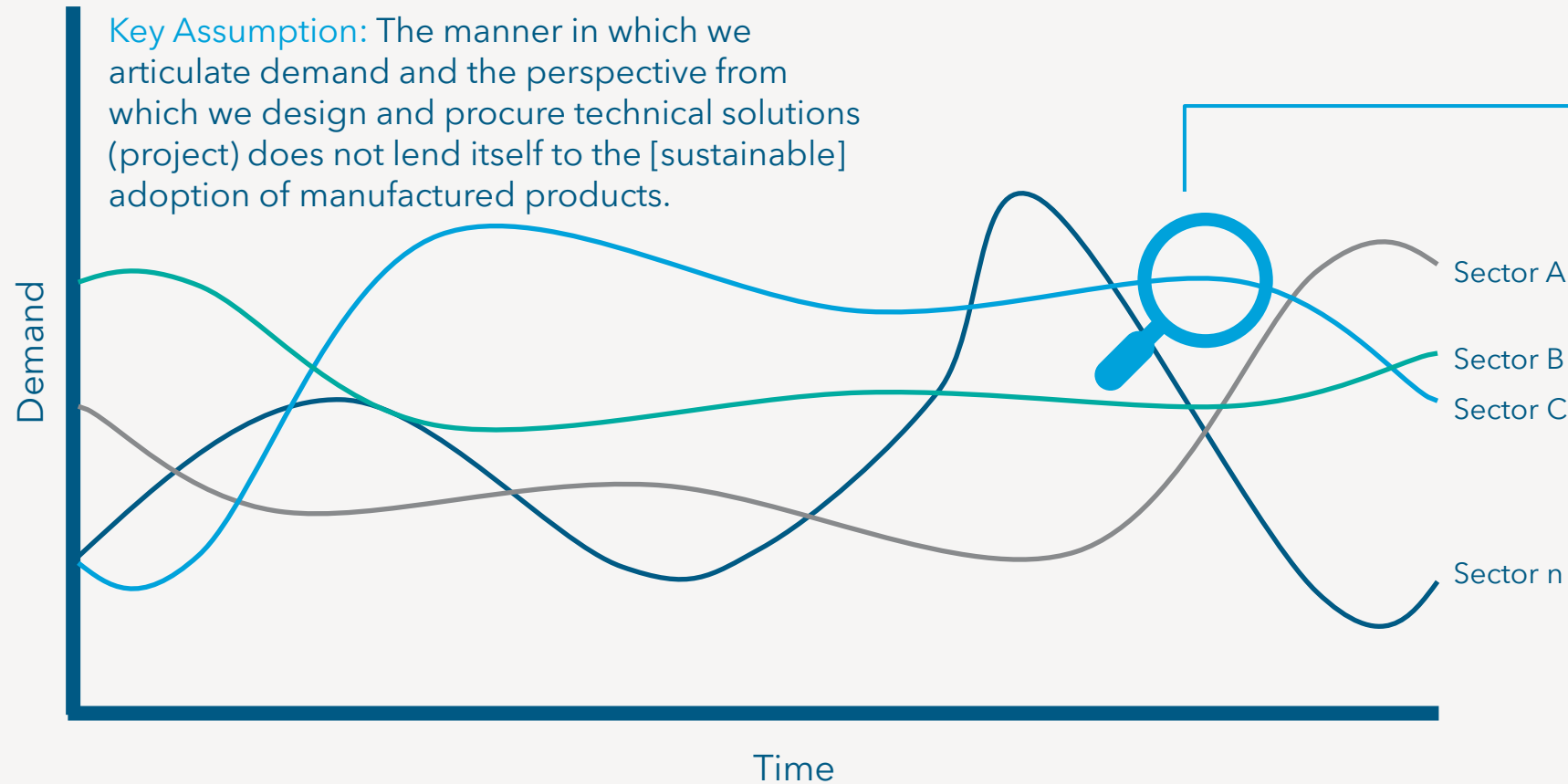
...Less so.

The Theory

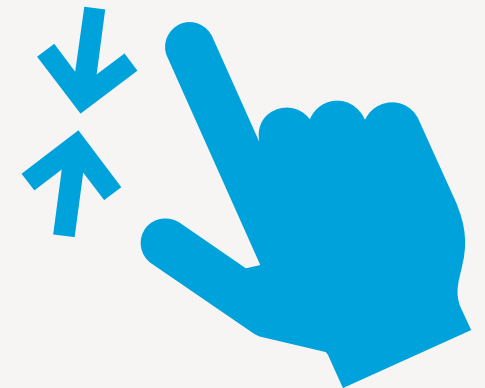
Product Platforms are an *enabler* for greater use of MMC manufactured solutions and the associated benefits they bring.

MMC and Product Platforms: The Perfect Marriage?

Key Assumption: The manner in which we articulate demand and the perspective from which we design and procure technical solutions (project) does not lend itself to the [sustainable] adoption of manufactured products.

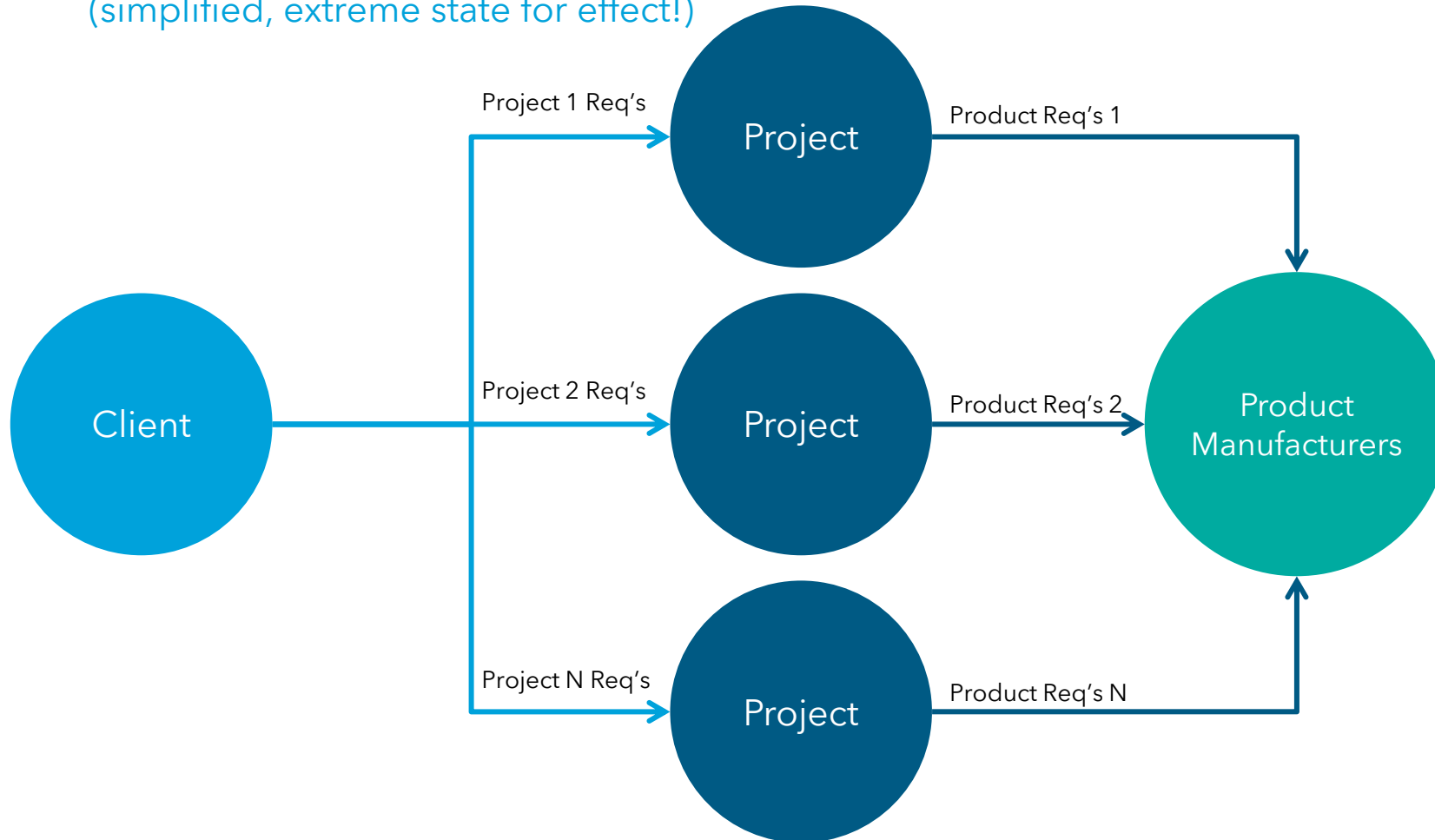


- Client 1 Requirements
 - Project 1a Requirements
 - Project 1b Requirements
 - Project 1n Requirements
- Client 2 Requirements
 - Project 2a Requirements
 - Project 2b Requirements
 - Project 2n Requirements
- Client n Requirements
 - ...



Current State

(simplified, extreme state for effect!)



Outcomes:

Failure to realise the economies of scale, expensive delivery costs and lack of continuous improvement across projects and assets

Poor view of the products available from, and poor understanding of challenges faced by, the supply chain

Whether contractually or not, the client always takes the risk of bespoke projects

Every project designed from first principles and insufficient feedback to support continuous improvement

Increased risk associated with bespoke design solutions and 'new' combinations of products

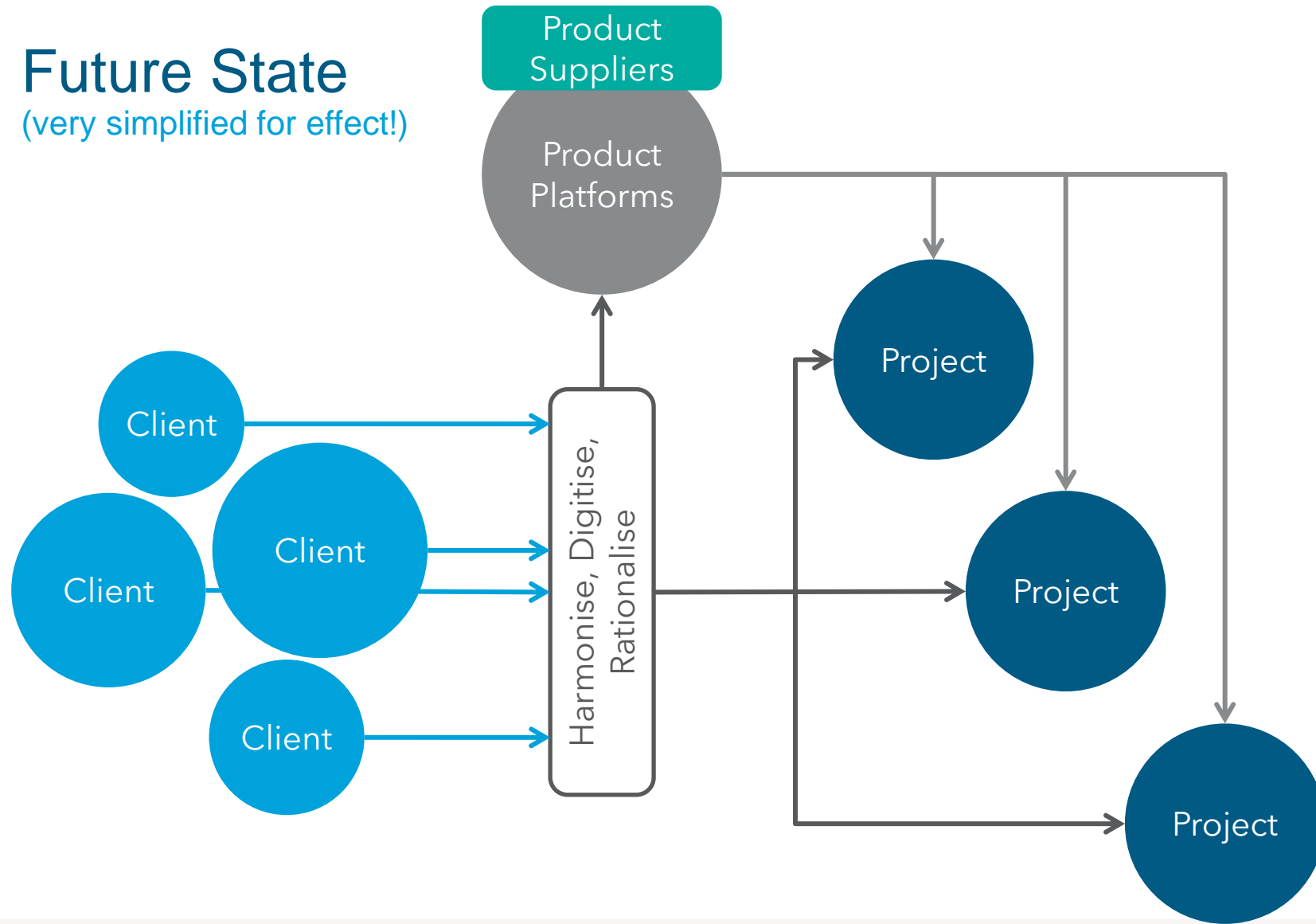
Poor view of the pipeline (affecting confidence to invest) and need to bespoke products for individual projects

Limited feedback on product performance in delivery and in use



Future State

(very simplified for effect!)



Outcomes:

Clients provide and continuously update demand pipeline along with harmonised, digitised and rationalised requirements

With clear sight of client requirements and associated pipelines, the market can develop product platforms for deployment on multiple projects

Project teams move towards configuration and optimisation rather than design from first principles

The use of repeatable components, processes and relationships reduces risk from project to project and feeds continuous improvement

UTOPIA WARNING: There will always be a proportion of projects requiring bespoke design and products

Note the colourless boxes...

And...

Could such an approach solve one of the greatest barriers to MMC?

The client or design team needs to choose early on in a project to adopt a particular solution - which are usually manufacturer specific...



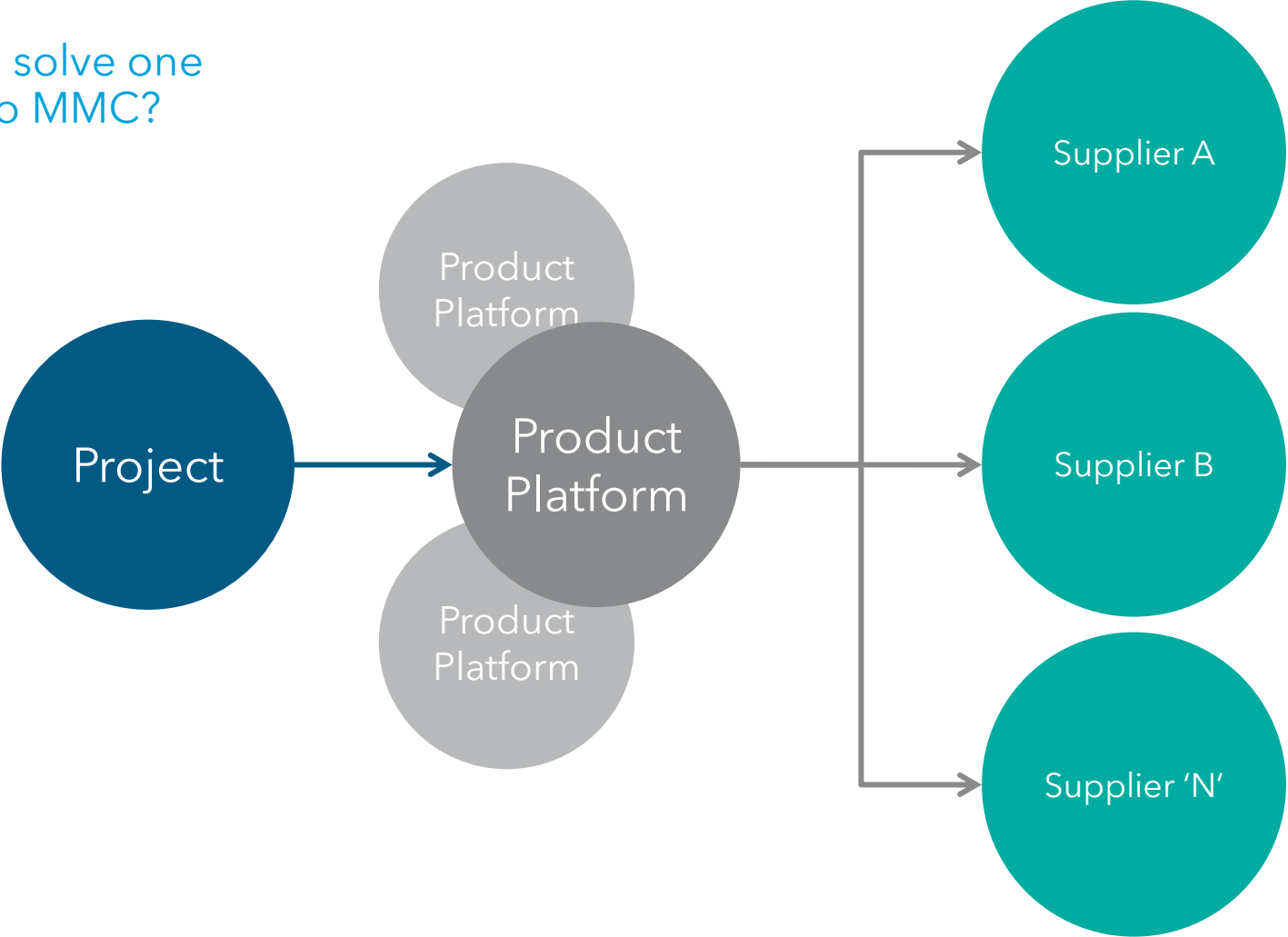
...but what happens if the manufacturer of system A goes out of business or has insufficient capacity?



And...

Could such an approach solve one of the greatest barriers to MMC?

What if the client or design team could specify a product platform, for which there were multiple supply options?



What Next

(Let's see who picked up on my colour scheme)

The Theory

[Recap]

Product Platforms are an *enabler* for greater use of MMC manufactured solutions and the associated benefits they bring.



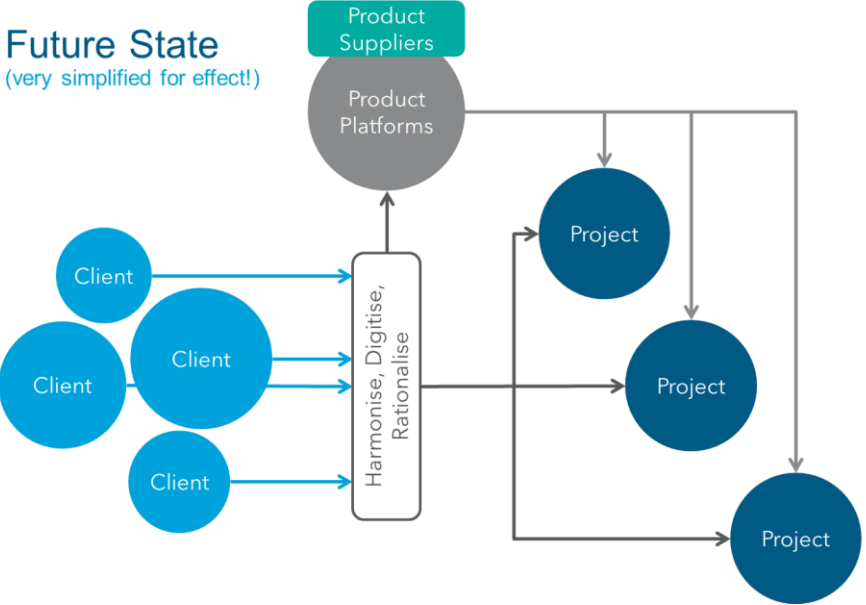
What needs to happen to support their adoption?
Who needs to do what?

What would it do to the structure and operating model of the sector?
What might the social, environmental and economic outcomes be?

Tackling the 'Grey'

We don't have all the answers yet...let's keep going!

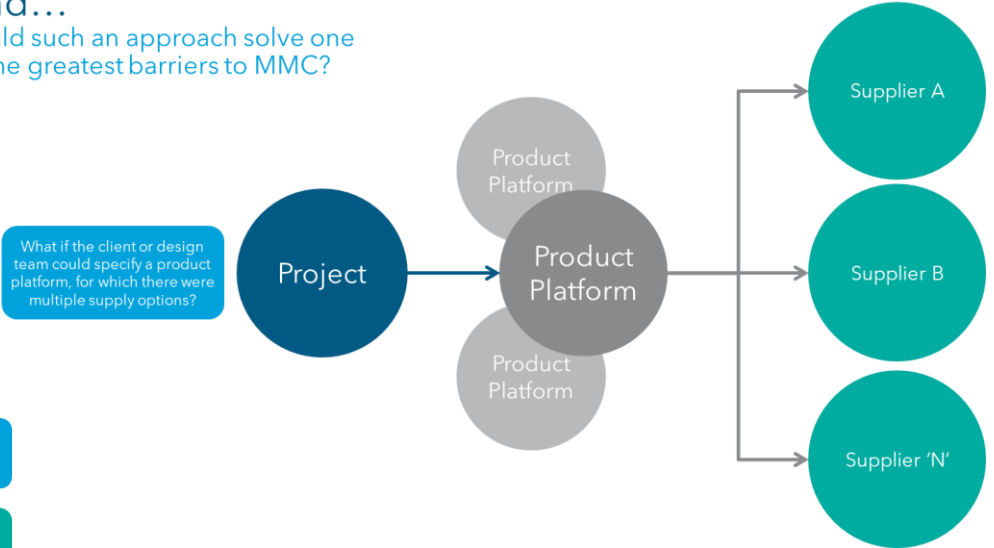
Future State (very simplified for effect!)



Outcomes:

- Clients provide and continuously update demand pipeline along with harmonised, digitised and rationalised requirements
- With clear sight of client requirements and associated pipelines, the market can develop product platforms for deployment on multiple projects
- Project teams move towards configuration and optimisation rather than design from first principles
- The use of repeatable components, processes and relationships reduces risk from project to project and feeds continuous improvement

And...
Could such an approach solve one of the greatest barriers to MMC?



What if the client or design team could specify a product platform, for which there were multiple supply options?

- Key:**
- What needs to happen to support their adoption?
 - Who needs to do what?
 - What would it do to the structure and operating model of the sector?
 - What might the social, environmental and economic outcomes be?



A Spotlight on Product Platforms

Chair: Keith Waller, Programme Director,
Construction Innovation Hub

BREAK

**Next session will begin at
11.20am**

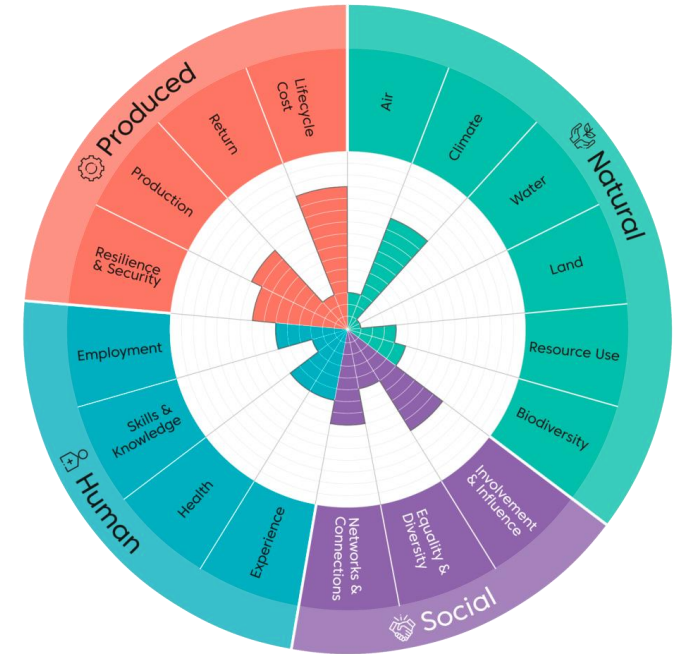
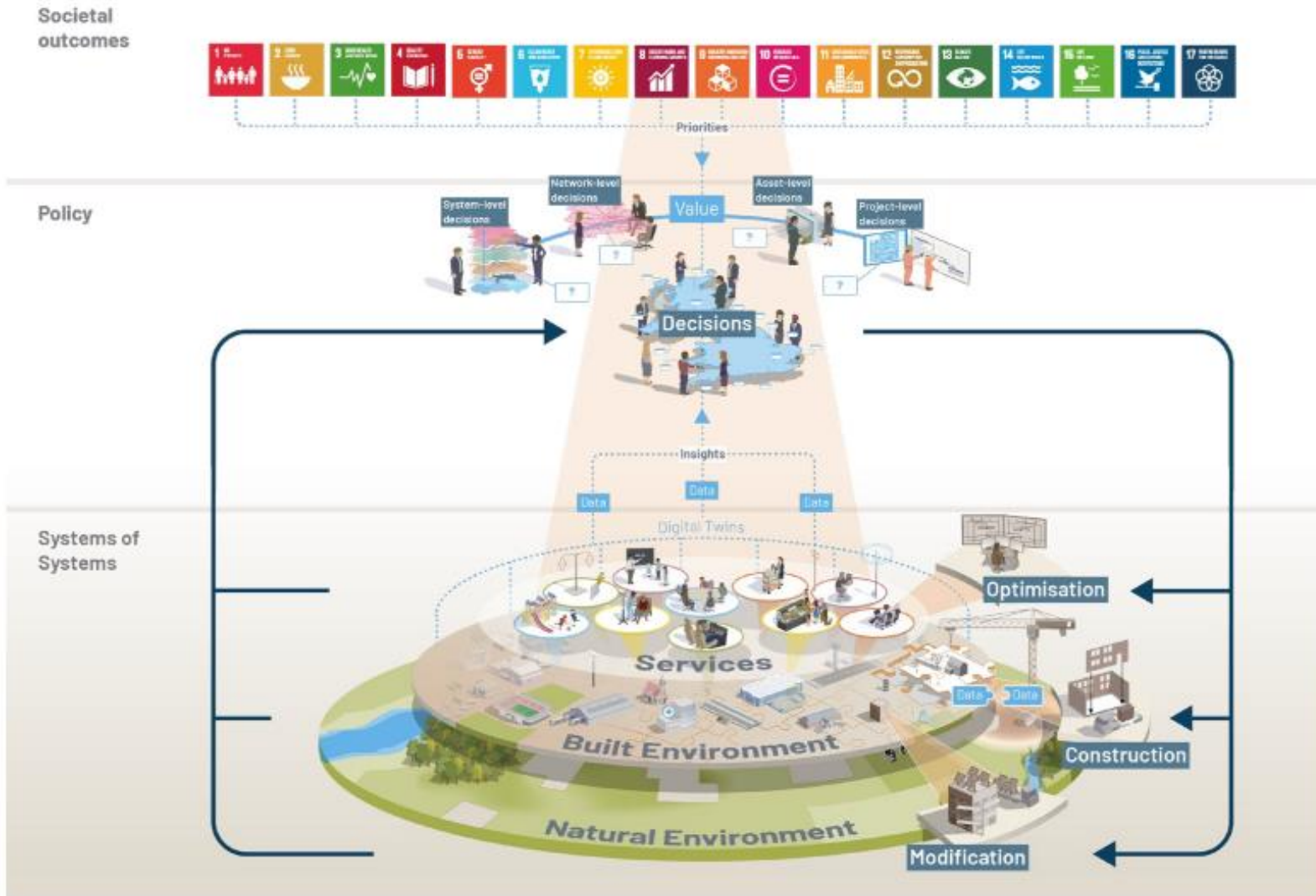


Please scan the QR code for our full agenda and speaker biographies

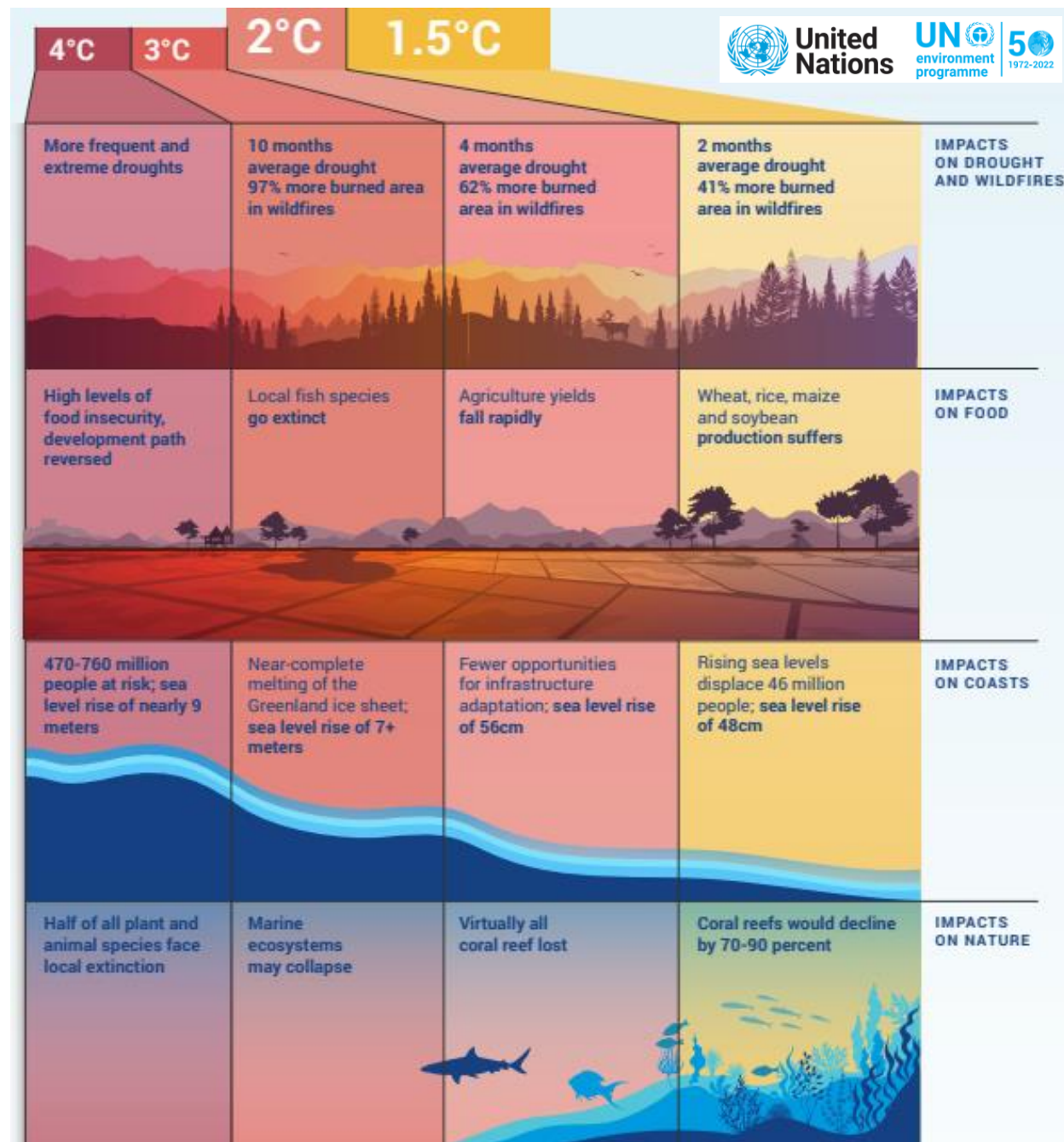
Procurement using data that informs value- based decisions

Chair: Kay Tor, Environment & Sustainability Lead, IPA

Transforming Infrastructure Performance



The Climate Emergency...



Built Environment — Smarter Transformation



Innovation, Procurement, Value Based
Decision Making, Data, & the Deployment
of Platform Systems in Scotland

Stephen Good, CEO

sgood@be-st.build / www.be-st.build

BE-ST

Who we are



Built Environment
—
Smarter Transformation

Our Identity

BE-ST is Scotland's national innovation centre for construction & the built environment and a UN international centre of excellence for High Performing Buildings

Our Vision

A better built environment that delivers inclusive and sustainable economic, social and environmental impact

Our Strategy

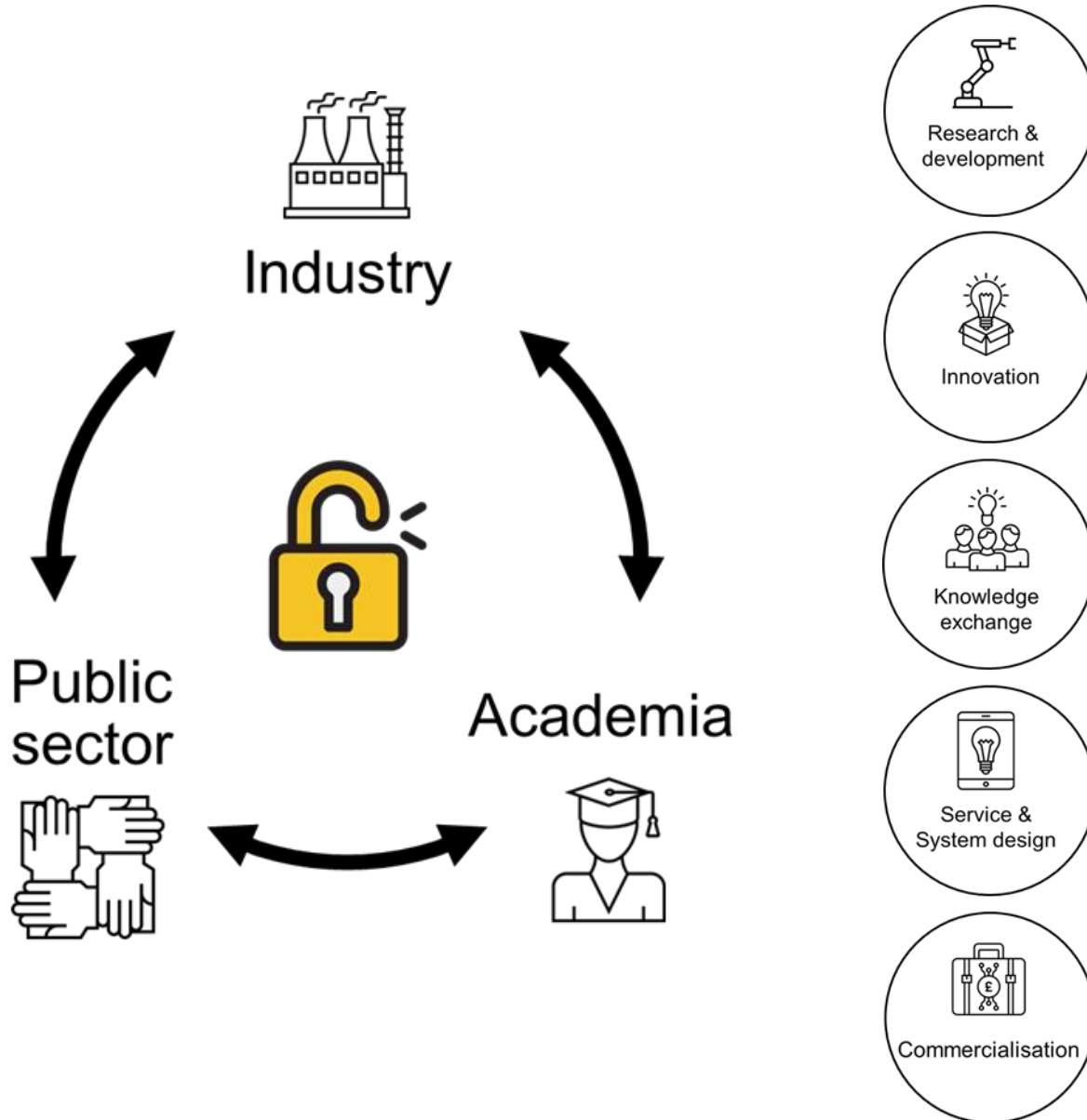
Support innovative collaboration programmes across industry, academia & public sector stakeholders that enables transformational change

Our Mission

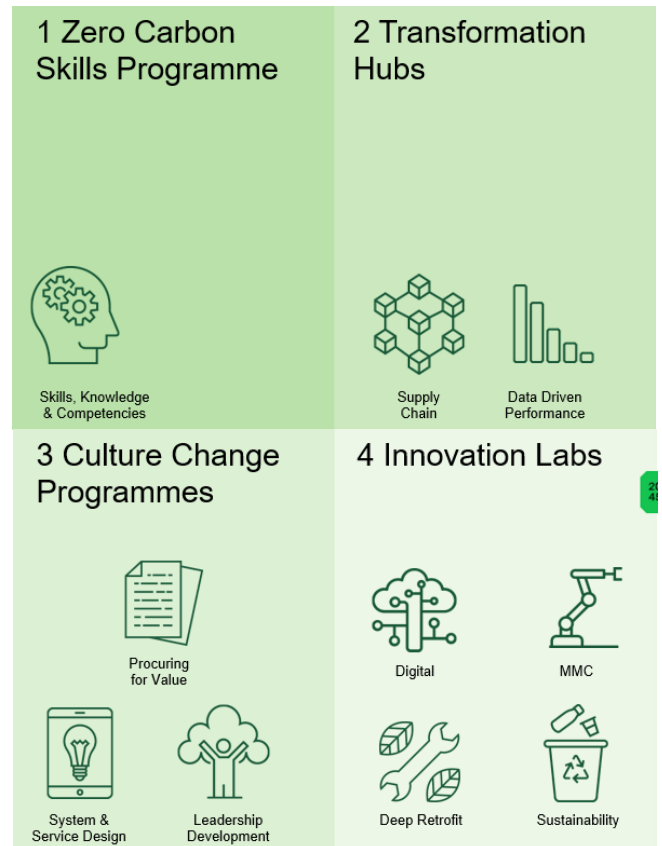
To accelerate the built environment's transition to zero carbon



What we do



Accelerate to ——— Zero

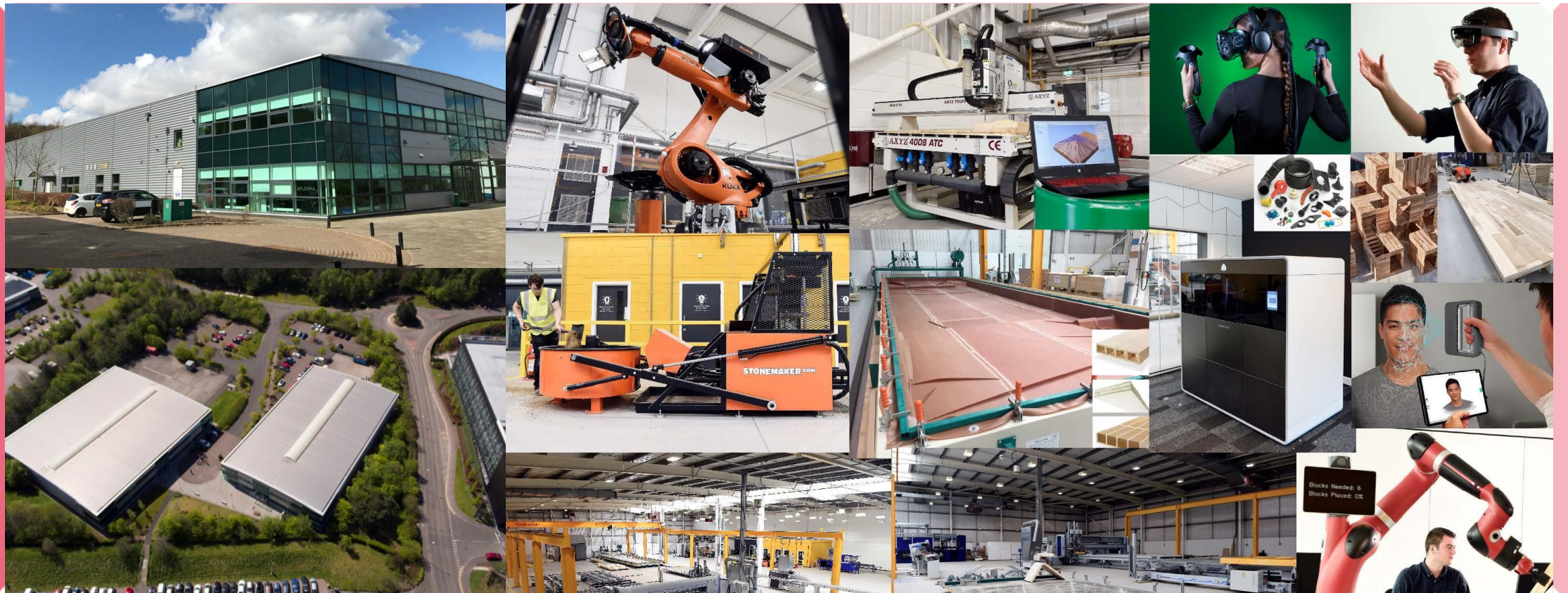


A-Z Lab's @ the Innovation Campus

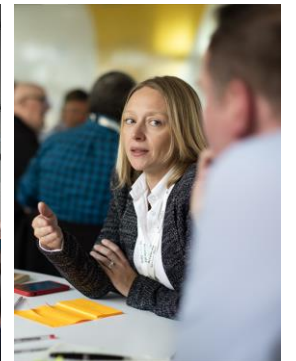
An international Centre of Excellence for built environment, zero carbon transformation

A zero-carbon living lab providing clients, industry and academia with a safe space to collaborate, innovate, prototype, test & train

A unique asset, connected to a network of regional, national and international partner organisations



#BE-STFEST: An annual celebration of built environment innovation, collaboration & impact



Programmes & Projects

Decarbonisation of heavy duty construction vehicles

Road to zero on construction sites.

[Visit website](#)



As part of BE-ST's sustainability programme strategy, and as part of the Scottish Government's strategy to reduce carbon emissions, decarbonisation of sites has been identified as a key focus. This is also in alignment with the CLC Construct Zero policy. The decarbonisation of construction sites can cover off a number of areas from portacabins, on site energy generation to vehicles, plant and even processes.

To maintain focus, initial work in this area will focus on scope 1 emissions and specifically on onsite Heavy-Duty Vehicles and plant equipment. To support any future projects, BE-ST and Scottish Enterprise (partnered with Transport Scotland) collaborated on a research study to establish the current landscape of sustainable low carbon construction sites.

Partners:
BE-ST, Scottish Enterprise, Transport Scotland

K-briq

The world's first 90% recycled brick

[Visit website](#)



The K-briq® is made from 90% reused materials such as brick, stone and plasterboard. There is no equivalent to this on the market.

The brick itself is unfired and uses no cement, creating 1/10th of the emissions of a traditional fired brick. The brick is stronger, more durable and lighter than standard bricks as well as being cheaper to make.

The K-briq® is on its way to scaling up production and mainstreaming its use. On the back of BE-ST's support, Kenoteq won nearly £1million of funding in May 2021 from the Circular Economy Investment Fund, administered by Zero Waste Scotland and funded through Scottish Government and the European Regional Investment Fund. The first commercial production facility is under commission in East Lothian to deliver certified bricks by the end of 2022.

Partners:
Kenoteq, Heriot Watt University, Hamilton Waste and Recycling, BE-ST

Sustainable insulation hub

Finding the right fit for circular insulation.

[Visit website](#)



The UK home insulation market alone is huge and worth over £800 million per year. Of this, a staggeringly small amount is made up of natural insulation products – probably less than 1%. The opportunity to support the growth of more sustainable insulations is therefore huge. BE-ST and University of Edinburgh are looking into the Scottish natural insulation / circular insulations that deliver environmental outcomes, create local jobs and make best use of materials in a local context.

The research will help answer questions surrounding the drivers needed to support the growth of this sector, the types of circular and sustainable insulation which are a potential for use in Scotland and the barriers for sustainable insulation and how these can be overcome. The research is helping inform the direction of other projects which are seeking to advance support in the insulation space.

Partners:
Construction Leadership Forum, University of Edinburgh Institute for Infrastructure and Environment (IIE), Zero Waste Scotland, BE-ST

Zero carbon timber concrete composites (TCC)

Decarbonised concrete in use.

[Visit website](#)



Following on from proof-of-concept timber concrete composites manufactured at BE-ST for a live build at Laing O'Rourke, Laing O'Rourke are now looking to decarbonise the concrete used in this system and in all of their projects. The system will use cem-free concrete and cement replacements (geopolymers) and is looking to replace as much concrete with timber as possible and support Scottish mass timber initiative.

Workshops are taking place to scope out:
– Benefits of each type of mass timber for TCCs
– Shear connections
– Membrane
– Cost and availability
– Fire performance
The product will then be manufactured with potential to decarbonise concrete across other projects.

Partners:
Laing O'Rourke, NMITE, BE-ST

HeatSource

Scotland's low carbon heating network.



[Visit website](#)

Only 11% of homes in Scotland use zero emissions heating systems. To help companies involved in manufacturing, installation, training and the wider supply chain deliver the vast demand, BE-ST launched HeatSource, a collaborative knowledge hub funded by Scotland's enterprise agencies which explores opportunities in low carbon heat.

At a glance:

- £300,000 project value
- Only 278,000 homes in Scotland use zero carbon heating systems
- 1.8k website visitors
- 500 newsletter subscribers and growing

Partners:
BE-ST, Highlands and Islands Enterprise, Scottish Enterprise, South of Scotland Enterprise



Accelerating the adoption of exoskeletons.

[Visit website](#)

As many as 44 million workers in the European Union (EU) are affected by workplace-related musculoskeletal disorders (MSDs), at a total annual cost in excess of €240 billion to the European economy. Exoskeletons have the capacity to decrease the number of musculoskeletal injuries and increase quality of life at work, thereby reducing costs for a company in the long run.



The overall objective of EXSKALLERATE is to accelerate the adoption of exoskeletons into construction and industrial manufacturing SMEs, where heavy physical work leads to severe health issues, and thereby, strengthen SME competitiveness in the North Sea Region.

Partners:
Interreg North Sea Region, BE-ST, University of Strathclyde, National Manufacturing Institute Scotland

Digital Twin Inspection & Monitoring

Detecting defects digitally

Building facades influence by wind effects and temperature fluctuations. They deteriorate over the years, leads to progressive loss of performance that can decrease the energy efficiency of building and occupants' comfort, and failures that can involve deaths and injuries. The ability to accurately detect errors and defects in remote and hard-to-access buildings has significant value.



Researchers from the University of Strathclyde and Robert Gordon University have developed an online platform for remote building inspection, backed by the Scottish Government's Building Standards Division, Ecosystems Technologies, BDP and Balfour Beatty Construction. The platform was trialed on the University of Strathclyde's new Learning & Teaching building.

The team have created a 3D immersive environment of a building. This platform minimises the need for quantity surveyors and health and safety inspectors to be physically present at a site. Ultimately, the project proposes a framework for integration of methodologies and tools, including VR and digital photogrammetry to collect real-time data that support automated decision-making.

Partners
Ecosystems, University of Strathclyde, Robert Gordon University, Scottish Government, BDP, Balfour Beatty



Local opportunities supported by nationwide expertise.

[Visit website](#)

The Make It Smart Hub is an innovation one-stop-shop for construction and manufacturing in the Highlands & Islands. It offers free support to introduce and enable innovation in businesses.

The programme is part-funded by the 2014-2020 European Regional Development Fund.



The platform has already given value to hundreds of people through free informational events, and helps SMEs upgrade their manufacturing processes by allowing them to undergo R&D without the time or the risk that companies of this size face. The project is currently working with a micro-sized construction company to scope out the feasibility of automation in their business.

Partners
BE-ST, Scottish Enterprise, Scottish Government, Highlands & Islands Enterprise, University of the Highlands and Islands

Building from England's woodlands

Tapping into the use of English hardwood forest products.



[Visit website](#)

For the first time, researchers will examine the suitability of certain species of English homegrown trees for their use in construction, looking at sawn, engineered, and mass timber products including cross-laminated timber (CLT) and glue-laminated timber (glulam). The species will be chosen according to future availability, and timber potential based on existing data, including more common species such as oak, beech and sweet chestnut.

Focussing on the use of timber in modern methods of construction, partners will collate data on the potential strength grading of each species while also assessing the use of homegrown co-products such as wood fibre insulation. The three-year project could help to reduce the UK's reliance on imported construction materials, as well as providing low-carbon alternatives to concrete and steel.

Partners:
New Model Institute for Technology and Engineering (NMITE), dRMM Architects, Ecosystems Technologies, Edinburgh Napier University, BE-ST

Near Home

Getting to work on retrofit.



[Visit website](#)

Originating as a challenge set by Transport Scotland to facilitate the creation of 20-minute neighbourhoods, BE-ST was brought into discussions to start working on what would become NearHome.

The NearHome project is reimagining how people live and workplaces work, by creating high quality offices closer to home. It centres around a blueprint based on sustainable and smart design, a kit-of-parts structure that can be installed quickly and with minimal interference for the building's external fabric.

Partners:
Transport Scotland, BE-ST, South Lanarkshire Council, Scottish Futures Trust, Eco Systems Technologies, Smart Sustainable East Kilbride

GenZero

Designed with Nature.



[Visit website](#)

GenZero is creating new, improved design standards for school buildings with the aim of making them net zero, primarily through utilising homegrown timber and a pre-defined kit of parts. A GenZero prototype was manufactured at BE-ST using Cross Laminated Timber (CLT) and Glulam from our vacuum press, and displayed at COP26.

At a glance:
- The GenZero classroom prototype contains 10t (20m³) of timber
- 7t CO₂e sequestered in prototype
- Enough timber to produce the GenZero prototype is grown every 64s in the UK.

Partners:
Department for Education (DfE), BE-ST, Manufacturing Technology Centre (MTC), Active Building Centre, Construction, Innovation Hub, Smith and Wallwork, Mott Macdonald, Lyall Bills & Young, Eco Systems Technologies, Innovate UK.

T Transforming ↑ Timber

Re-engineering the future of the UK construction industry.



[Visit website](#)

This aim of this project was to manufacture the UK's first two-storey, two-bedroom homegrown mass timber home for demonstration during Glasgow's COP26, whilst delivering the business case for the UK's first mass timber manufacturing facility. This identified the opportunity for an advanced bio-based manufacturing sub-sector, built on circular economy principles, and delivering social, economic and environmental

benefits throughout the associated supply chains.

The project highlighted the opportunity for a new collaborative model linking forestry, manufacturing, construction and the public sector to increase both the use and value of the UK's productive woodland resources.

Key stakeholders:
Innovate UK, Edinburgh Napier University, The University of Edinburgh, ECOSystems Technologies, BSW Timber Group, SNRG powered by Centrica and BE-ST.

Scottish Building Standards – Energy Standards

Raising the bar on building standards.

[Visit website](#)

In collaboration with the University of Strathclyde, BE-ST have been working directly with members of industry and Scottish Government building standards to:

- Deliver a state of Industry & Route Map.
- Facilitate the delivery of workshops with industry, policy experts, academic and BS working group members
- Create a proposal for a Virtual Energy Hub.



At a glance

- In-person event: Preparing for 2024: Scottish Building Standards – 9th November, with XX attendees
- Low carbon construction bulletin with 200+ sign ups

Partners:

University of Strathclyde, Scottish Government, BE-ST

Scottish Government Procurement Reform

Work shopping procurement.

[Visit website](#)

The Scottish Government recognise that there is an industry desire for reform in the procurement of construction contracts. The Construction Procurement Reform Steering Group will provide oversight and guidance to a series of facilitated workshops in 2023 following on from the Scottish Government's Construction Procurement Survey in May 2022.



The group is bringing together industry representatives and Scottish Government in a series of workshops run by Glasgow School of Art's Innovation School. It will report back to the Construction Leadership Forum's Construction Accord.

Partners:

Scottish Government Property & Construction Division, Procurement & Property Directorate, GSA, Transport Scotland, SFT (Scottish Futures Trust), Aberdeenshire Council, CICV, RIAS, RICS, ACE, BE-ST

Building Standards Division (BSD) – Digital Programme

£0.5m investment into digital processes

Digital transformation of the building standards system in Scotland has generated substantial interest from stakeholders within industry, and recent inclusion of building standards within the scope of the Digital Planning Programme has accelerated the need for discovery work around needs and requirements.

Data continues to be an area which requires attention as BSD look to build solid foundations for their transformation in all areas, particularly around compliance, where a digital golden thread remains a universal objective. Building Standards Division in collaboration with BE-ST funded a series of work packages across 2 phases to take forward the BSD digital strategy. Phase 1 of the Digital Programme delivered scoping of 2 core research streams:



1. Mobile Applications, supported by Glasgow School of Art
2. Pathway for Digital Transformation of the Building Standards System, supported by Edinburgh Napier University

An industry steering group was also established to steer the project direction across both phases. Phase 2 is currently at planning stage.

Partners:
Scottish Government – Building, Standards Division, BE-ST, Edinburgh Napier University, Glasgow School of Art

Building Standards Division

Live remote inspection

This project was delivered collaboratively by BSD, BE-ST and Edinburgh Napier University (ENU). The project supported the use of remote verification to deliver the building standards verification service, using live stream video technology.

As a result of the COVID-19 pandemic and the national and local lockdowns, BSD has had to adapt and change the way in which it undertakes verification services.

The aim of the study was to investigate and assess the potential of remote video inspection (RVI) to satisfy reasonable enquiries in line with the requirements of Building Standards legislation (Scotland) for domestic properties.

During the construction stage, Local Authorities require that construction works are inspected to ensure they meet specified criteria in accordance with legislative standards.



These inspections would traditionally be undertaken by an employee of the Local Authority who would carry out this work in person, often requiring a physical visit to the site. Remote video inspection (RVI) offers an opportunity to re-evaluate current practices.

Key stakeholders:
Building Standards Division (Scotland), BE-ST, Edinburgh Napier University

Creating a more diverse and inclusive sector.

Visit website



The project's aim is to help create a more diverse and inclusive construction sector in Scotland to make it a fair and attractive sector to work in, and so ultimately meet the demand for skills needed to deliver zero carbon. The project, now in its second phase, is based on wide industry training and engagement designed to give it the tools needed to develop and embed impactful diversity and inclusion programmes.

At a glance:

- 735 people from industry been trained through webinars and YouTube videos
- 50+ industry leaders will be trained in phase 2 of the project
- We have engaged with equity and inclusion champions to help share knowledge with others across our 50k+ audience

Key stakeholders:
Balfour Beatty, Equate and funded by the Workplace Equality Fund



Scotland's first national green construction skills training programme.

Visit website



Low Carbon Learning safeguards and creates green jobs by developing green skills and working towards a zero carbon built environment.

The programme provides free practical and immersive training on Passivhaus retrofit standards from general awareness to certified training for contractors, professionals, educators and anyone who wants to transition into low carbon skills within the sector.

At a glance:

- 2500+ people trained online and in person
- 65% stated that their job had been created or safeguarded due to participating in the programme
- 63% said that their knowledge and confidence of low carbon construction standards for Passivhaus and retrofit has increased
- Funded by the Scottish Funding Council through the National Transition Training Fund (NTTF)

Partners:
Scottish Funding Council, Skills Development Scotland, BE-ST, AECB, Digitalnauts, Warm: Low Energy Building Practice, John Gilbert Architects, Passivhaus Trust, Retrofit Academy CIC, BRE, Ecological Building Systems, Oberlanders, Glasgow City Council, Morrison Construction, City of Glasgow College, Glasgow School of Art, Multivista, East Ayrshire Council, Paul Heat Recovery, Stewart and Shields, Supply Chain Sustainability School

The Construction Pipeline Forecast Tool.

Visit website



Pipeline of over 1,660 projects valued at over £11.6bn

In October 2020 and in response to the COVID-19 pandemic, the CLF published the Construction Industry Recovery Plan that included a short term action to deliver a forecast construction pipeline database extending to the wider public sector.

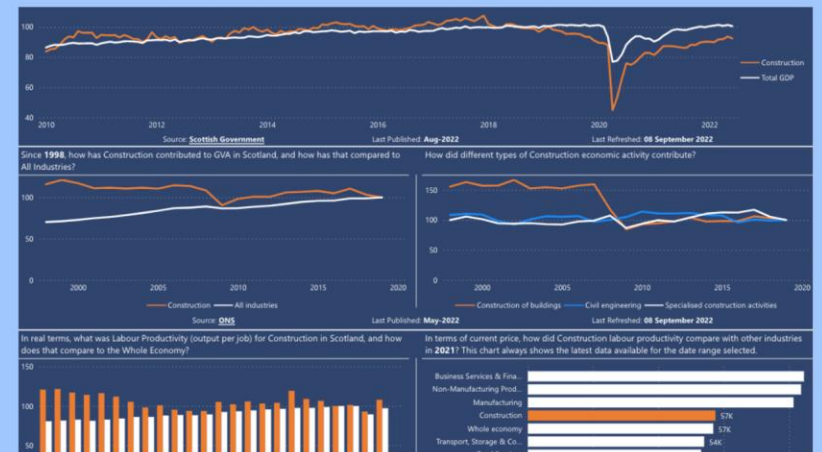
In response to this recommendation, infrastructure body, the [Scottish Futures Trust](#) in partnership with the public sector and industry, developed and published the [Construction Pipeline Forecast Tool for Scotland](#).

Partners:
Scottish Futures Trust
Construction Leadership Forum
Scottish Government
CS-ILG
CICV Forum
BE-ST

Scottish Construction Industry Data Dashboard

Data at your fingertips.

Visit website



A lot of data is available on the construction industry, but the quality and frequency of updates varies across different sources. As part of the Construction Leadership Forum (CLF)'s roadmap to improvement and recovery, BE-ST and Bellrock Technology joined forces to develop a new free-to-use Data Dashboard. Available online, the data dashboard combines various publicly available datasets into this free-to-access Scottish Construction Data Dashboard website.

"The introduction of this dashboard by the CLF is a big step towards providing the industry with the right tools it needs to make informed business decisions. It will significantly improve business insight and be of real benefit to smaller or medium sized businesses which may not have the resources to obtain this data by themselves."


Ivan McKee
Minister for Business, Trade, Tourism and Enterprise

Partners:
BE-ST, CLF, Bellrock Technology

Deploying Platform Solutions

From Forest Floor to Finished Buildings.

OUR EXPERTISE



We manufacture Timber Products
Using the UK's only sawmills, which is owned and operated by Ecosystems, we produce high quality timber products from sustainable sources.

We design innovative Timber Systems
Combining the use of design, engineering and manufacturing expertise, we create innovative timber systems for a wide range of applications.

We deliver beautiful Timber Buildings
Our buildings are designed to enhance the beauty of the natural world, while providing a high quality and sustainable environment.

Our Process

WHAT WE DO




1. Materials → 2. Products → 3. Components → 4. Systems → 5. Projects

6. Digital Thread

Our Materials

OUR PROCESS



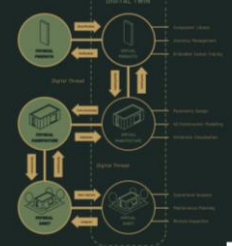
We source our timber from the Forest Floor in the heart of Scotland. We use primarily One Source and Scots Pine, both of which are readily available and high quality.

Our growing partners with close scientific, local businesses and working together on innovative approaches, we have a long history of high quality and highly sustainable supply chains.

FSC®
PEFC™

Our Digital Thread

WHAT WE DO



Our design and manufacturing processes are underpinned by a digital approach that allows us to work efficiently without compromise on quality.

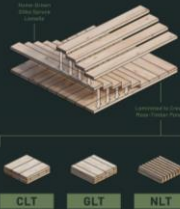
Central to this approach is a digital thread that connects the entire project lifecycle from design through to construction and operation. This enables us to track and manage the entire project lifecycle, from design through to construction and operation.

By using our digital thread, we can track and manage the entire project lifecycle, from design through to construction and operation. This enables us to track and manage the entire project lifecycle, from design through to construction and operation.

Our Products

OUR PROCESS


Delivering the UK's First Homegrown Mass-Timber



CLT
GLT
NLT


Our Components

OUR PROCESS



Our Build Systems

OUR PROCESS



ATOMS *
BUILDUP *
BLOCK *

Sustainability Impacts (V2) Ecosystems Option vs Standard Building


Sustainable option	Standard building
0.15 kWh/m²	0.30 kWh/m²
Min 60 yrs with minimal upgrade	Best case 80 yrs with significant upgrades
-30%kg CO₂-eq/m² Standard -80% CO₂ -35 Tones (Based on Volume)	+25%kg CO₂-eq/m² +35 Tones (Based on Volume)
Low and potentially zero carbon in use	High operational carbon and associated financial burden

Overall carbon saving: 75.5 T

Our Projects | Fettes College - 6x Study Rooms



Our Projects | Off Grid Travel - Holiday Cabins




Our Projects | COP26 - SNRG Demonstrator



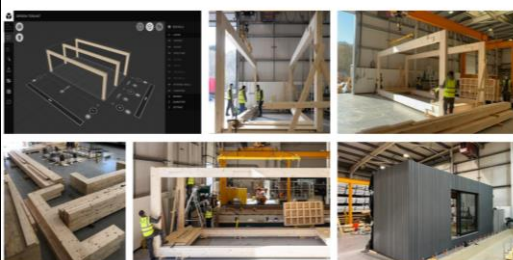
Our Projects | GenZero Classroom



Our Projects | NearHome - Retrofit Kit of Parts



Our Projects | NearHome - New Build Kit of Parts



Our Projects | Scottish Power Training Centre




Built
Environment
—
Smarter
Transformation

Thank you

Stephen Good, CEO

sgood@be-st.build / www.be-st.build

BE—ST

Value Profiling

Price \neq value

Ben Carlisle, Mott MacDonald

30 January 2023



What do **you** value?

The built environment affects all corners of our lives.

What we value must be reflected in
whether, what and how we build.

Shifting focus

Value for Money

“Evaluation – and evaluation criteria – should focus on **value** over **cost**”

*Value for money is defined as securing the **best mix of quality, performance, sustainability and social value** for the **least outlay** over the life of a project or programme. **It is not about minimising initial capital costs.** When considering ‘outlay’ the key factor is **whole life cost, not lowest purchase price.**”*

-The Construction Playbook, Version 1.1, September 2022

High quality buildings¹ can:



10%

improvement in learning in schools



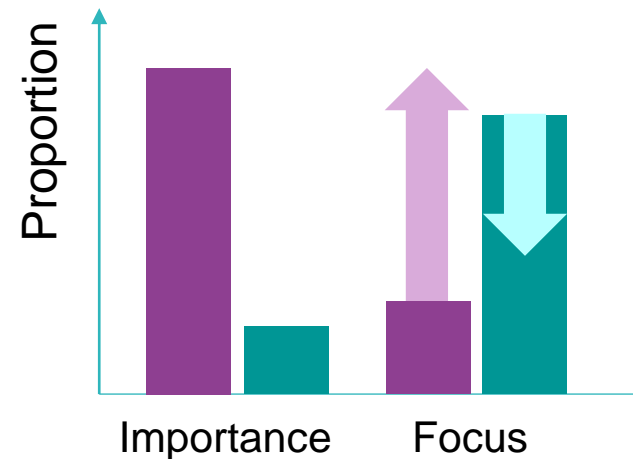
27%

faster recovery in hospital



67%

reduction in crime rates



¹ The value of good design: how buildings and spaces create economic value (CABE)

Value from how, as well as what

Getting better at defining and measuring

We get value from **what** is made, as well as **how** it is made.

But first we need to agree what we want, how we know we've got it and how to deal with inevitable trade offs.

We can do this through **Value profiling**: the process of establishing:

- what is important (**strategic value drivers**)
- how success will be judged (**outcome statements**)
- the **relative importance** of these success criteria

This drives definition of metrics and performance targets, which are used to guide solutions, decisions, and performance monitoring.

This ensures a demonstrable link between values and solutions, which is a key aim of the **Value Toolkit**.



Value profiling

Getting better at defining – “no pain no gain”

Identify strategic value drivers

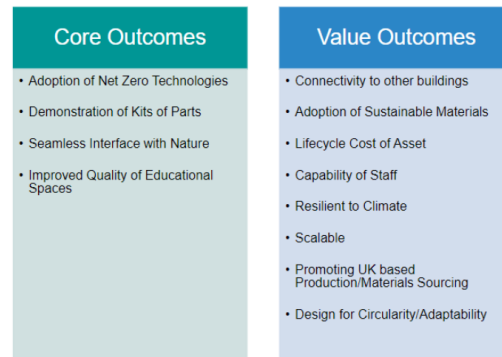
“What are we committed to?”
“What is important to us?”



This can be tricky and there may be tension between national and regional policies, or a lack of visibility.

Develop outcome statements

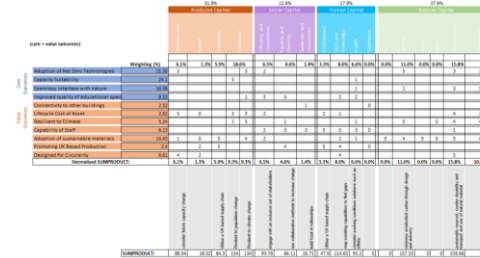
“How do these value drivers translate to this application?”



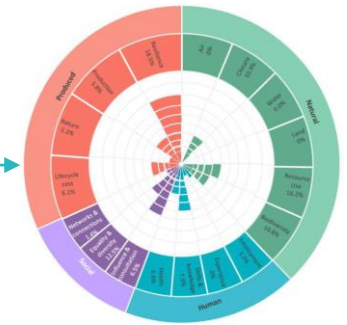
Focus on outcomes not outputs, and consider whole life and all capitals. Go slow here to go fast later.

Prioritise and rationalise

“What is the relative importance of these outcome statements?”



Rationalising and objectively prioritising competing drivers is tough, and needs an understanding of how they're related.

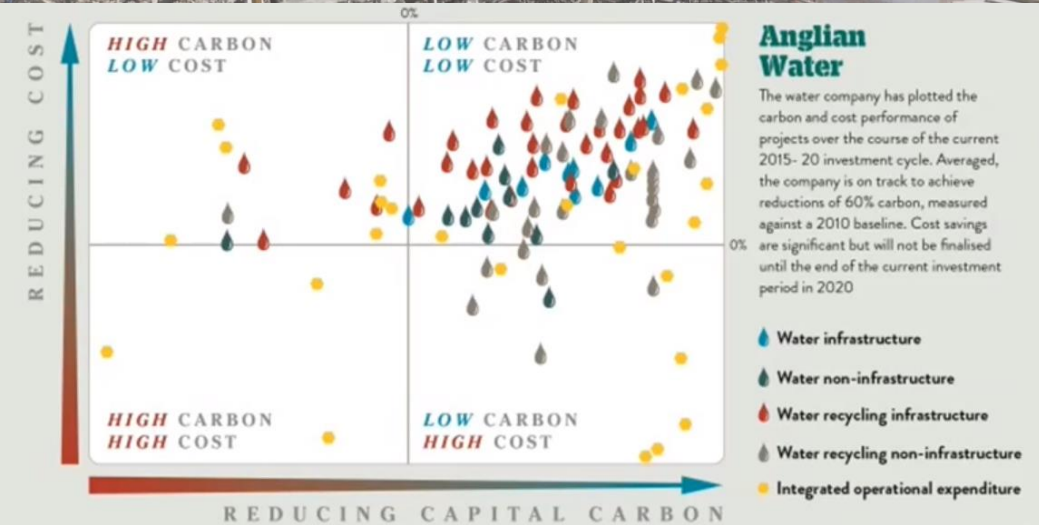


Develop metrics and targets, then enforce these through solution development

Value from how, as well as what

How this drives projects - GenZero

Outcome statements	Project response
Zero carbon and future proofed against climate change	An ultra low carbon, timber solution integrating passive cross ventilation, renewables and natural shading. Resilient to warming.
Designed for manufacture, standardisation and offsite	Standardised, simplified, adaptable spaces + designed for manufacture and assembly, kit of parts suitable for congested or open sites covering all systems.
User-centred, flexible and adaptable buildings Design for operation, ease of use and economy	Designed with a focus on the user, to be low maintenance, simple to maintain and adaptable with flexible furniture that is reconfigurable.
Healthy and productive whole site environments	Biophilic design connecting internal spaces to a biodiverse protective landscape, with rain gardens and outdoor learning.



Money is still important

We just need to use it better

- “Buy cheap, pay twice” - procurement on price leads to problems¹. Error alone makes up c.21% of project costs². These costs are often invisible, but definitely present.
- Putting value first can lead to lower cost (Anglian Water has documented this at a programme level³); we also get what we want, and knowingly make trade-offs. Treat cost as a constraint, rather than a driver.
- Manufactured solutions can improve productivity⁴ and certainty: a more lean process, avoiding error and reducing unplanned activities (improving safety). There’s also greater scope for data gathering and learning.
- Platform approaches allow us to leverage manufacturing, while still delivering bespoke aspects of projects – including value drivers.

¹ Construction Reports 1944-98; [CLC Procuring for Value 2018](#); [Construction Playbook 2022](#);

² [GIRI Improving value by eliminating error 2016](#)

³ [Carbon Infrastructure Review 2013](#);

⁴ [McKinsey Reinventing construction: a route to higher productivity 2017](#)

Practical steps

Define and align

Start by clearly defining project objectives and desired outcomes, and involve stakeholders so the team is aligned on what constitutes "value."

Prioritise or paralyse

Saying everything is important is the opposite of being able to do anything. Recognising and agreeing on trade offs is essential to avoid paralysis.

Don't treat cost as a goal

Ensure cost is treated as a constraint to affordability, rather than a goal or something to optimise directly, as this will typically lead to unwanted compromises.

Embed

Technical and commercial teams need to work together to identify key requirements and how to embed these in a contract deliberately.

Enforce

Ensure that evaluations don't default to price by accident, and embed benefits management via the contract, integrating it with assurance and approvals.

Measure

Measure based on priorities and make it as objective and automatic as possible (i.e. minimise the burden of doing new things where possible). Ensure measurements have owners.



Thank you



COLLABORATION IS KEY

HOW WORKING **TOGETHER**
CAN **CHANGE** THE FUTURE OF CONSTRUCTION

ABOUT THE **OFFSITE ALLIANCE...**

DRIVING A NEW ERA OF DEVELOPMENT,

growth, and productivity to enable the delivery of high quality precision engineered buildings for the future

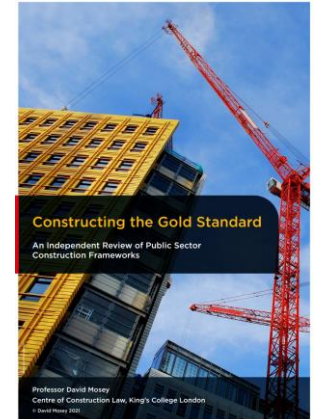
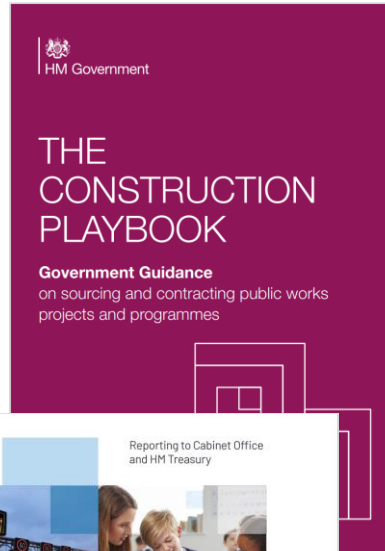
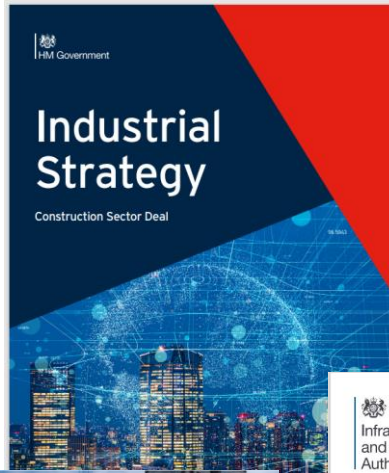
- We work to unite the industry - Collaboration
- To promote best practice, share innovation and insight
- Co-ordinate and present the views of the Offsite Alliance to government, planners and more
- Work with all our partners and members to join the dots, break down barriers and connect people and businesses



INDUSTRY OVERVIEW



GAME CHANGING



ENABLERS FOR SUCCESS



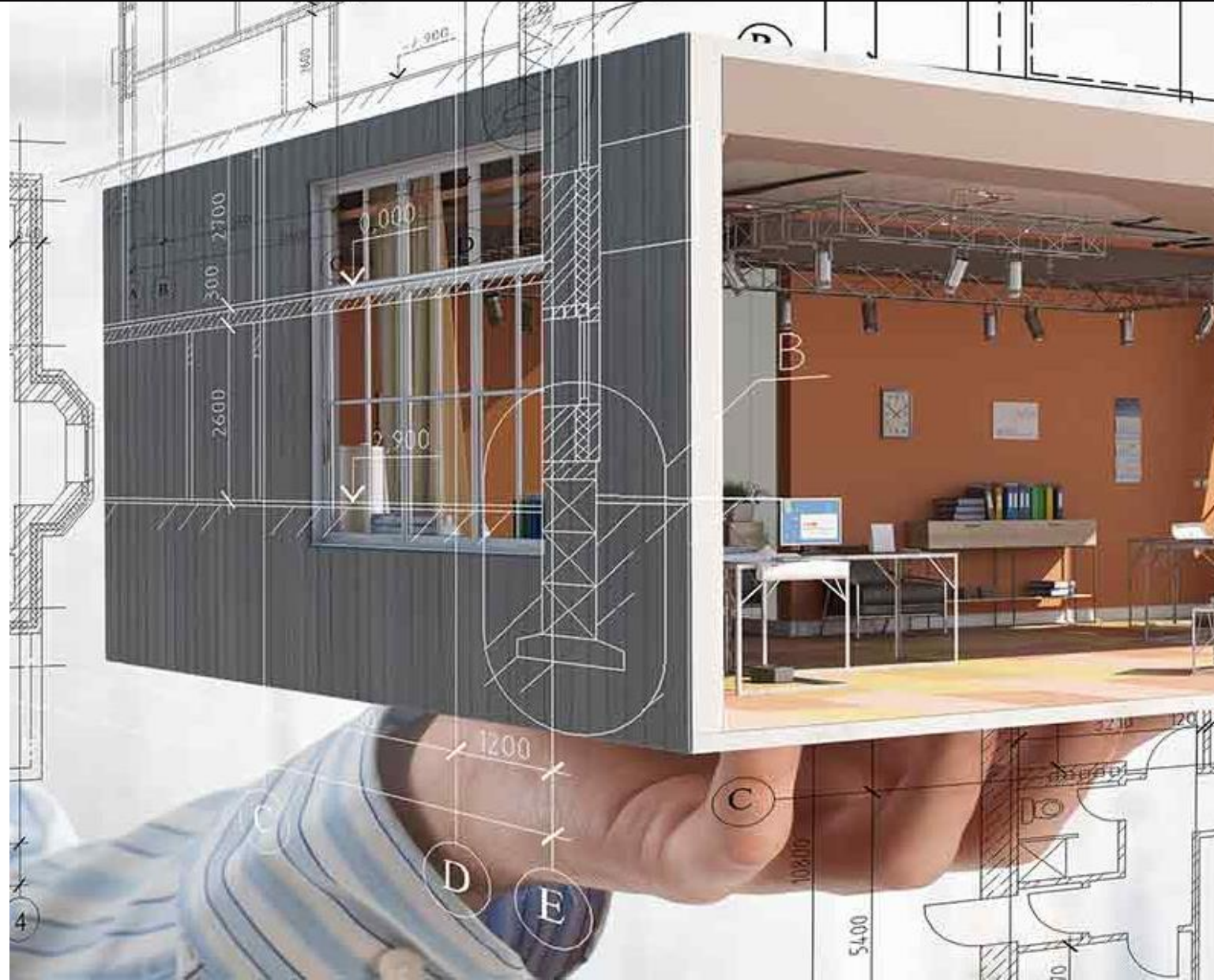
- Procure for Value
- Identify correct project partners from beginning
- Understanding offsite is not a product
- Digital Technology and data
- Measure outcomes and continuous improvement
- Collaboration and communication

DESIGNING FOR MANUFACTURE AND ASSEMBLY

DfMA

Quite simply

DfMA is all about how we can design a product to be consumed by the manufacturing process as quickly and with as little waste as possible.



PLATFORM SHARING



- Minimise development costs
- Less Components
- Economies of Scale
- Maximise product Value
- Improved Quality
- Drives Innovation
- Global Standardisation
- Larger Product Variety

WHAT DOES THE **FUTURE** LOOK LIKE?

“A **DIGITAL TWIN** (DT) - - is a digital representation of a physical asset. Linked to each other, the physical and digital twin **REGULARLY EXCHANGE DATA** throughout the product lifecycle and use phase.

Technology like **AI**, machine learning, **SENSORS** and **IOT** allow for dynamic data gathering and right-time data exchange to take place”



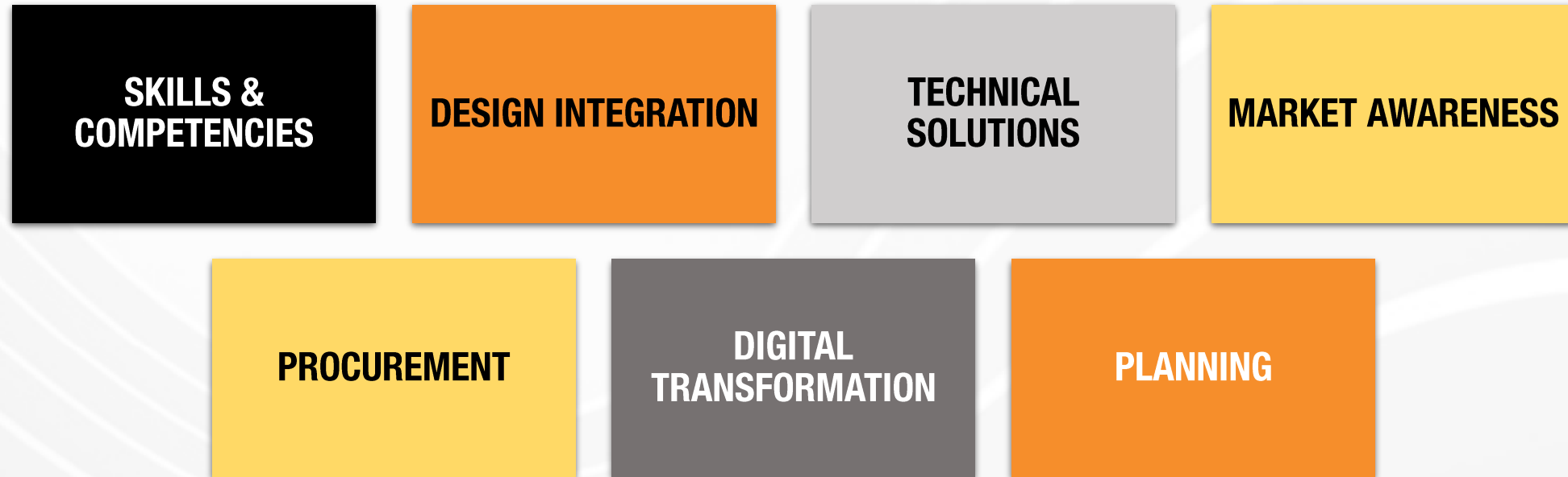
SAME
OLD
THINKING

SAME
OLD
RESULTS



STRATEGIC WORKSTREAMS

WHERE **CHANGE** HAPPENS



Do not **duplicate** often the **answer is out there!**



BE PART OF SOMETHING

BIG...

as we **revolutionise**
how we build!



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A view from government

Nour Sidawi, Commercial Lead, Ministry of Justice

Procurement using data that informs value- based decisions

Chair: Kay Tor, Environment & Sustainability Lead, IPA

LUNCH

Next sessions will begin at
1.30pm

Orange – head upstairs for workshop session

Blue – gather at reception for your tour

Purple – you have a job!



Please scan the QR code for our full agenda and speaker biographies

Question Time

Closing Remarks

Dr Mike Pitts, Deputy Challenge
Director, Innovate UK



Please scan the QR code for our full agenda and speaker biographies