

Brief

Digital Toolchains for MMC – the CIH example

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- “Getting BIM & Offsite working hand in hand”
- The specific example of the UK Construction Innovation Hub
- Consider the role of “configurators” play to unlock MMC

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Accelerating IC...

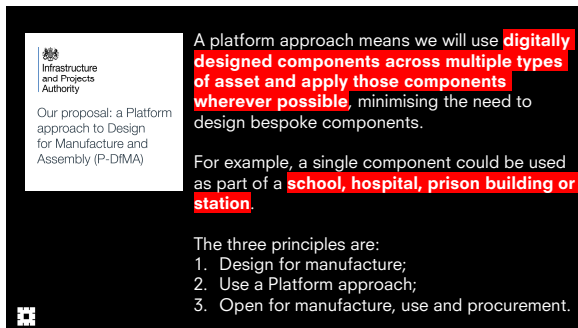
Digital Tool Chain to Unlock IC platforms

Quick recap from previous episodes...

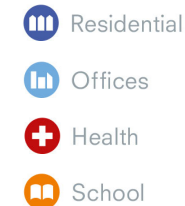
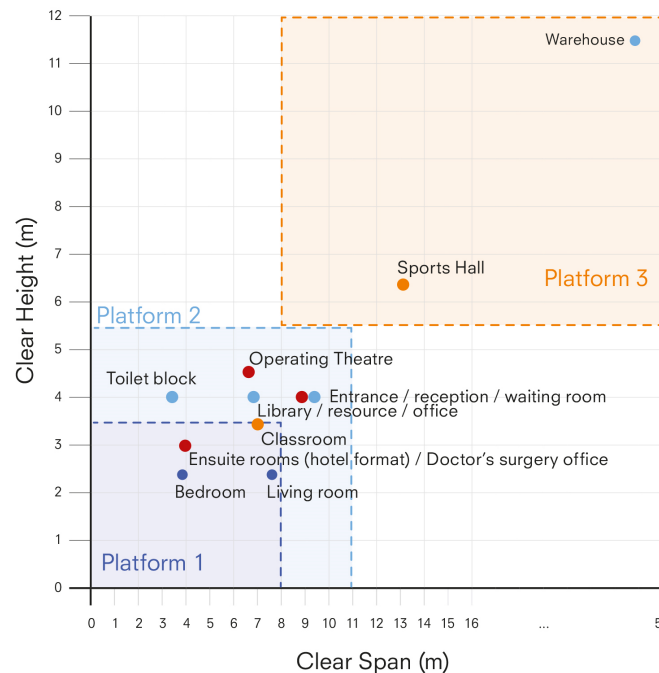
The hypothesis: **Platform Construction Systems** can transform the delivery of (social) Infrastructure, at **SCALE**



<https://cife.stanford.edu/ICF2020>

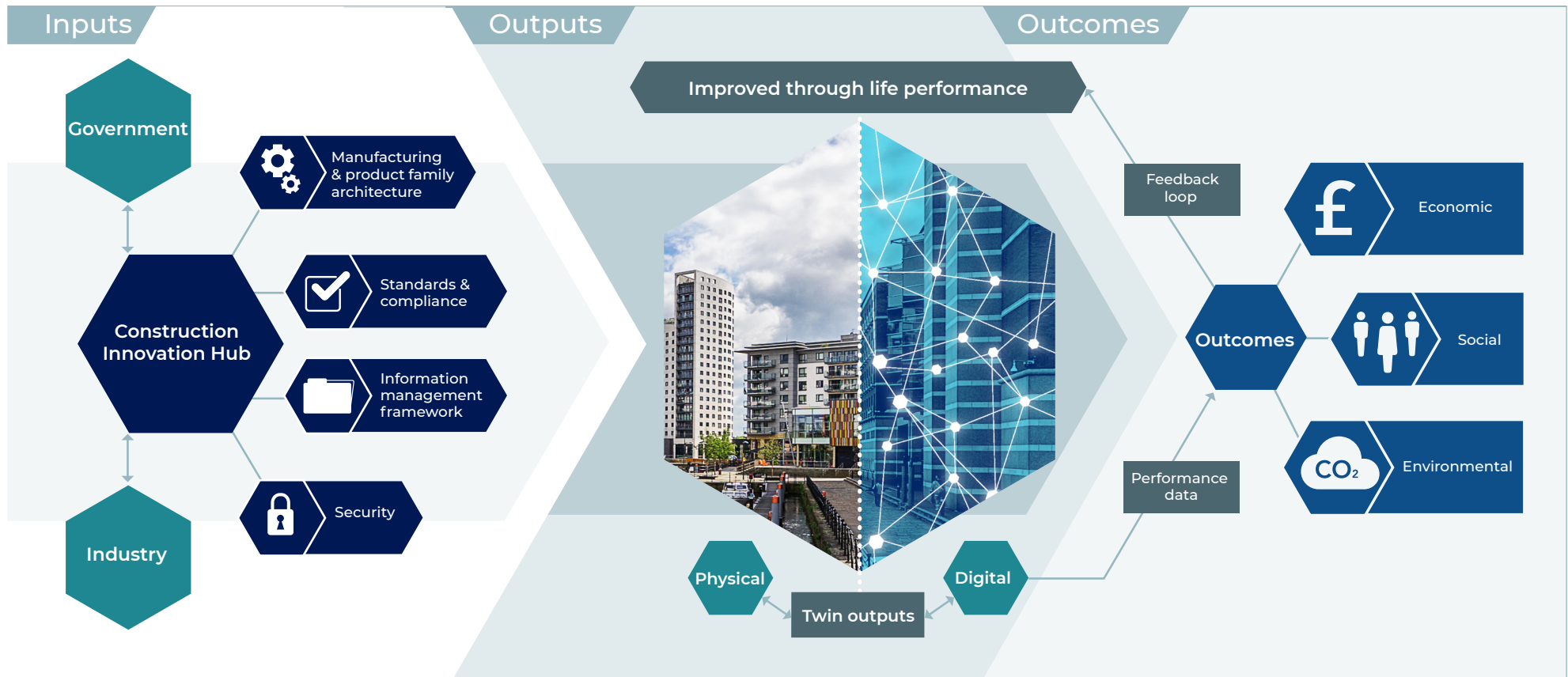


Construction pipeline £35b

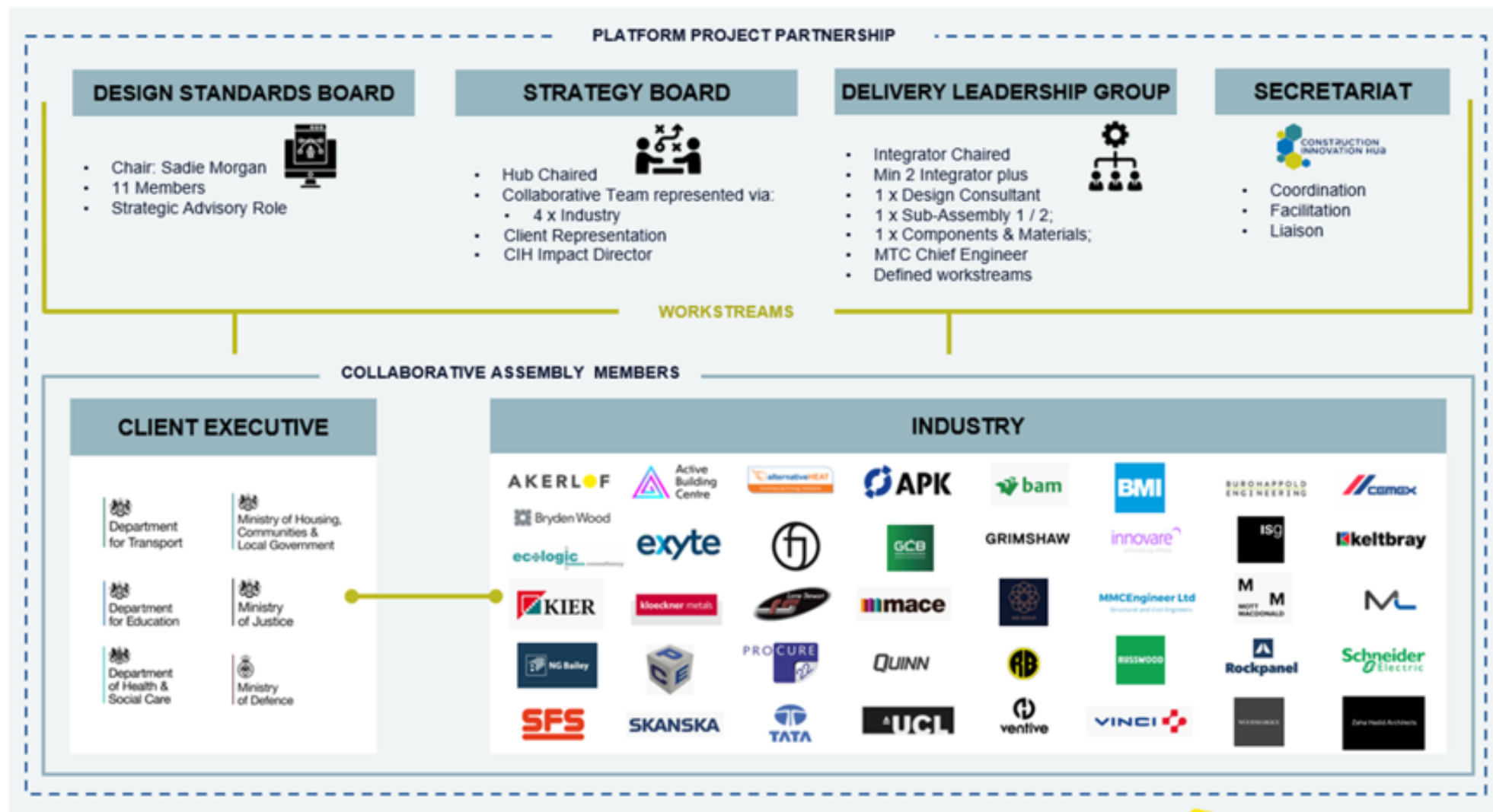


Government funded Market Acceleration Programme

£72m over 3 years



<https://constructioninnovationhub.org.uk/>



5 year pipeline for the Platform Construction System: £13b

c£35bn

the estimated value of the pipeline that could be delivered with a defined range of mid-span (~8m) platform construction systems, based on geometry alone.

50%

More than 50 percent of space types across the pipeline are not department specific — hallways, bathrooms and storage areas could be delivered with a standardised platform solution.

c£13bn

the estimated value of the pipeline that could be delivered with the Hub's Platform Construction System.

38%

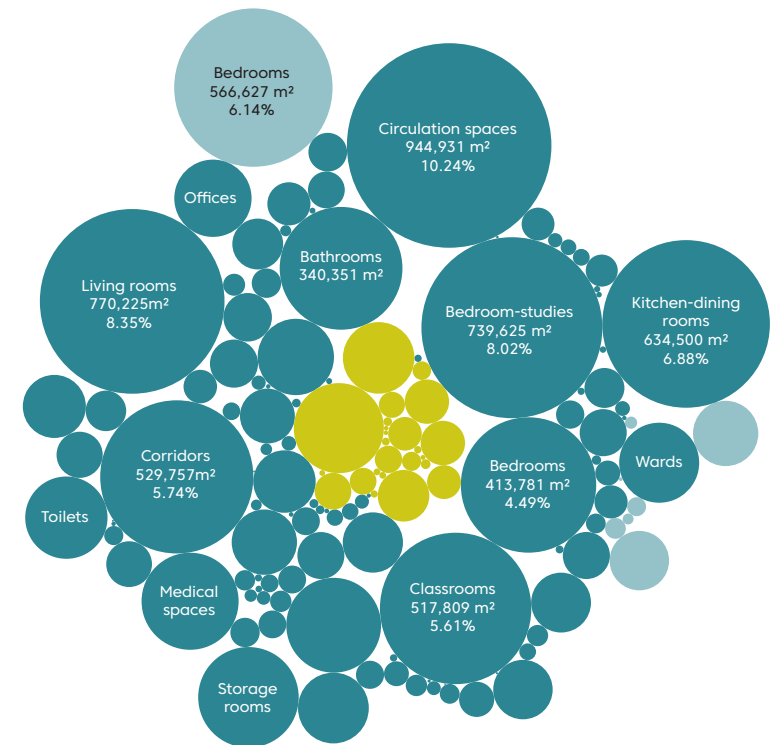
of spaces across the new build pipeline will be 'Residential Spaces', presenting a secondary market for the private sector. If the Hub's Platform Construction System demonstrates how it can be used to deliver 'more beautiful, more sustainable, better quality homes in all parts of the country', it could potentially be used to deliver private sector homes, student accommodation, and hotels domestically and internationally.

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different names for toilet spaces across the estate. This highlights the need for a common, machine-readable, way of naming spaces to accurately analyse and harmonise future demand.

?

The majority of departmental specifications are open to interpretation. Units can vary across departments — . dB or NR are both used for acoustic performance. Improved standardisation of requirements — not least nomenclature — is needed to unlock the potential for solutions that deliver pan-government.





CONSTRUCTION
INNOVATION HUB

Platform Construction System



INDUSTRIAL
STRATEGY

UK Research
and Innovation

What is the Platform Design Hypothesis?

We are developing a platform construction system, consisting of a standardised kit of parts, (sub-assemblies), that we believe will be able to deliver a large proportion of social infrastructure buildings procured by government departments. It will offer significant benefits in quality, cost, delivery time and whole life value.

As part of the Construction Innovation Hub Platform project, we're working in partnership with government departments, industry and end-users to determine the needs for these buildings and feeding these into the Platform specification and design development. As part of this requirements capture phase of the project, we'd love to hear your opinions on this hypothesis, or where you think any gaps exist.

Please feel free to comment on the assumptions listed or email your feedback and comments to construction@the-mtc.org so we can consider them in our analysis.

Platform system sub-assemblies may include:

- Ground Floors
- Incoming Services
- Internal Walls
- Plant Room
- Risers
- Structural Frame
- Volumetric Pods
- Active Roof
- Building Control System
- Ceiling Cassette
- Cores Incl. Vertical Circulation
- External Walls
- Foundation System

Greenfield /
Brownfield
Compatibility
Flat Site Only

Up to
4 Storeys

Flexible Room Length

Working Layouts

Social Spaces

Max Span 9-12m

Floor to ceiling heights up to 3m

Not suitable for wide single span areas
e.g. Warehouses and Sports Halls

Suitable for Schools, Offices, Apartments
And many more...

Benefits

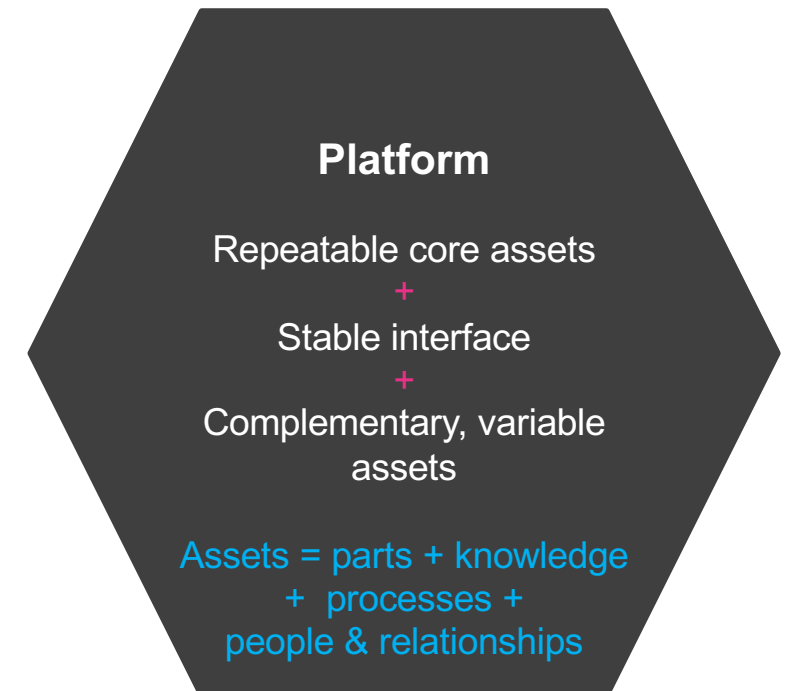
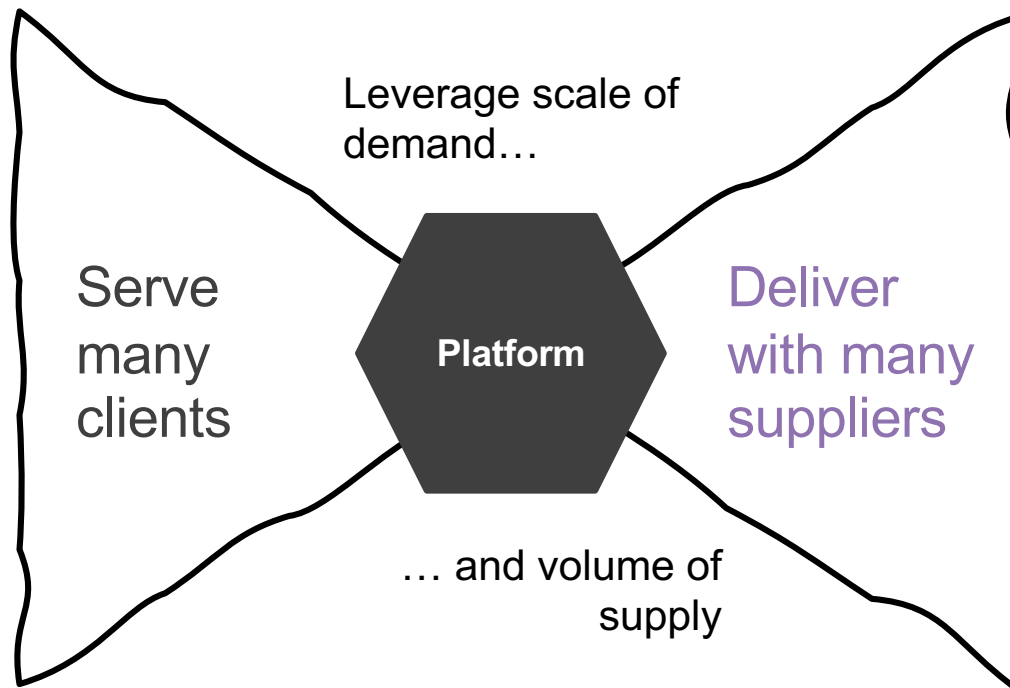
- Improved assurance of buildings
- Reduction in delivery time
- Reduced whole life costs
- Reduced greenhouse gas emissions
- Improved Health and Safety
- Higher level of lifetime build performance

Illustrations designed using elements from Freepik.com

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What's a platform?

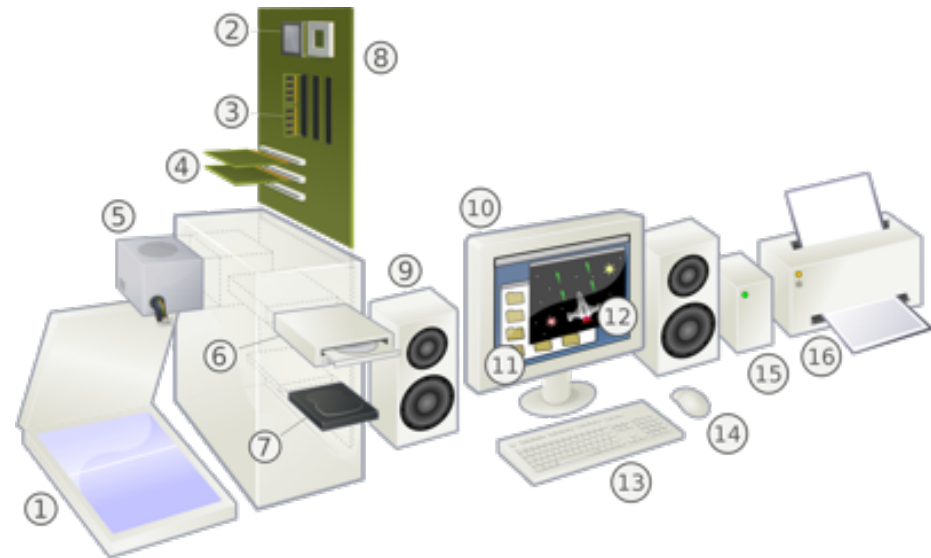


A Product Platform

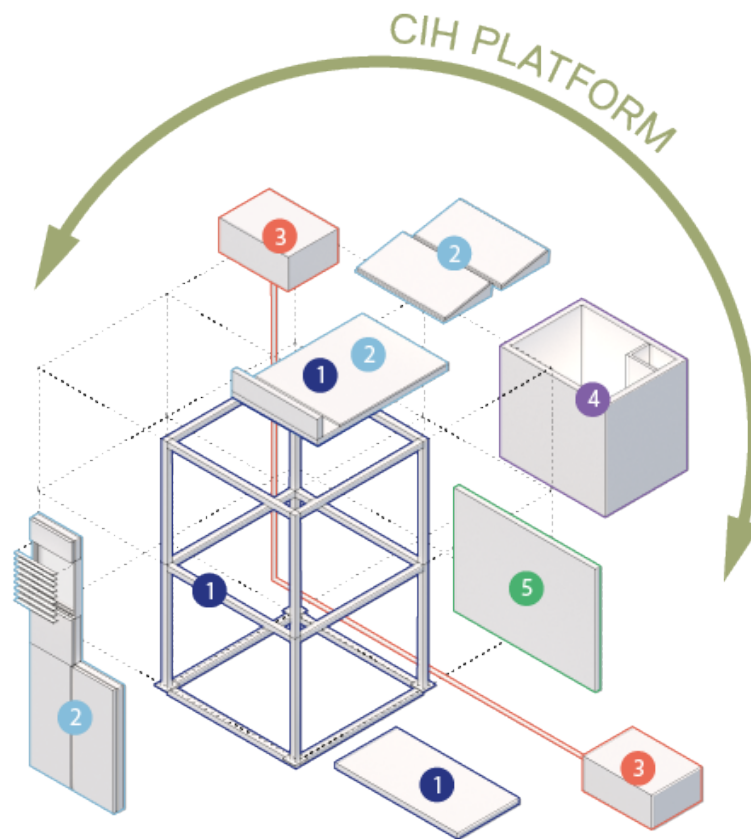
Supply Chain Platforms : ex. Cars



Industry Platform : ex – the PC



Platform Construction System





SUB-ASSEMBLY SA-05
STRUCTURAL FRAME
Type: Beam Zone
Material: Steel

ZONE

Type: EXTERNAL WALL
Property: Orientation
Value: South_Facing

SUB-ASSEMBLY SA-01

Specification Details

114 External Wall: South Facing
Check: Orientation is within 10%
Reference to Part L, Clauses 3 requirements

002 Steel Beam
Geometry of the object must be within Zone of name
Boundary: Steel

Object Hierarchy



SUB-ASSEMBLY SA-02
STRUCTURAL FRAME
Type: Column Zone
Material: Timber

OBJECT

INSULATED PANEL
Type: 114 Insulated
Property: 50 R-value
Value: Right
Reference: 1000
Installation: 1000 (Right)

SUB-ASSEMBLY SA-01

Verification Status

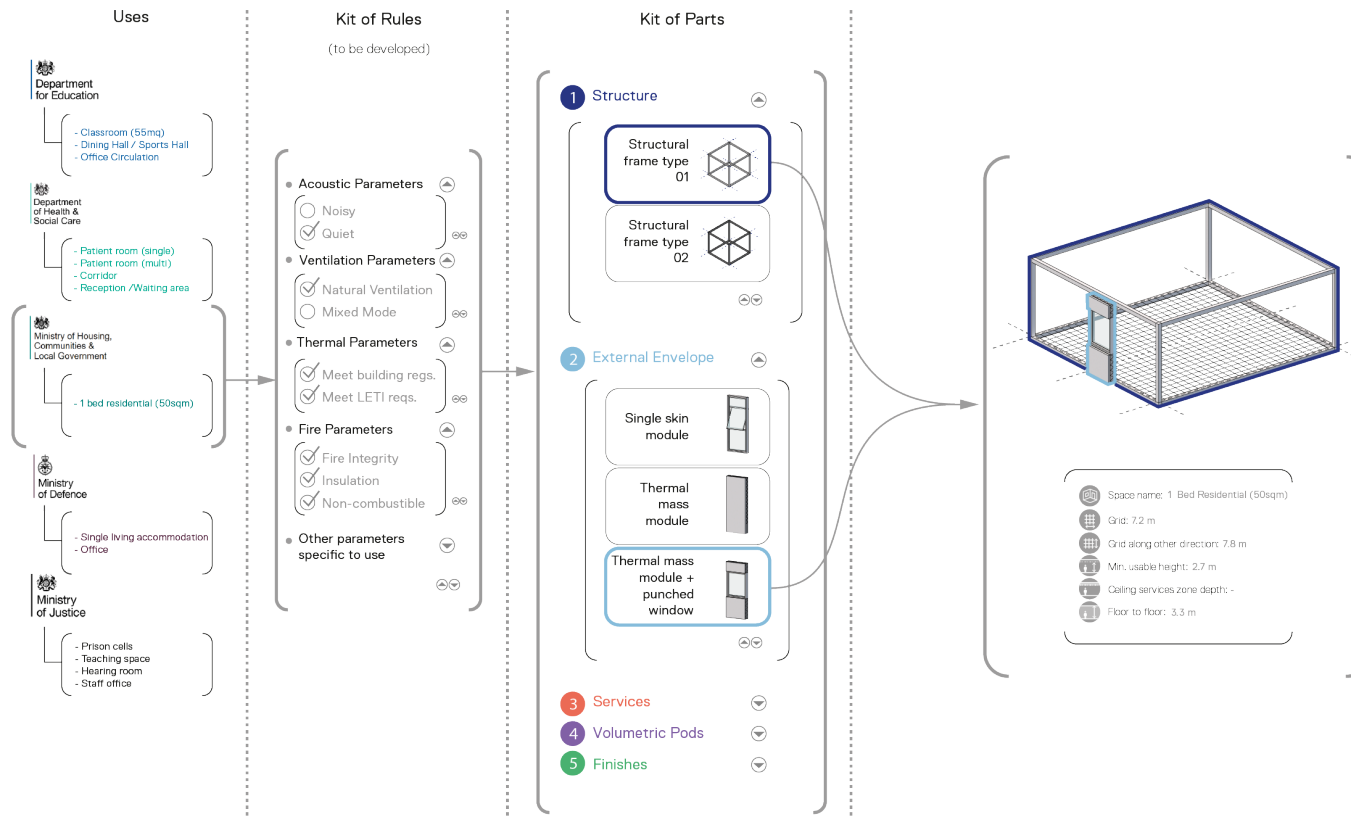
Timber Column: PASSED (all checks)
Timber Column: PASSED (all checks)
Timber Column: PASSED (all checks)

Insulated Panel: PASSED (all checks)
Insulated Panel: PASSED (all checks)
Operable Window: FAILED (at least one)

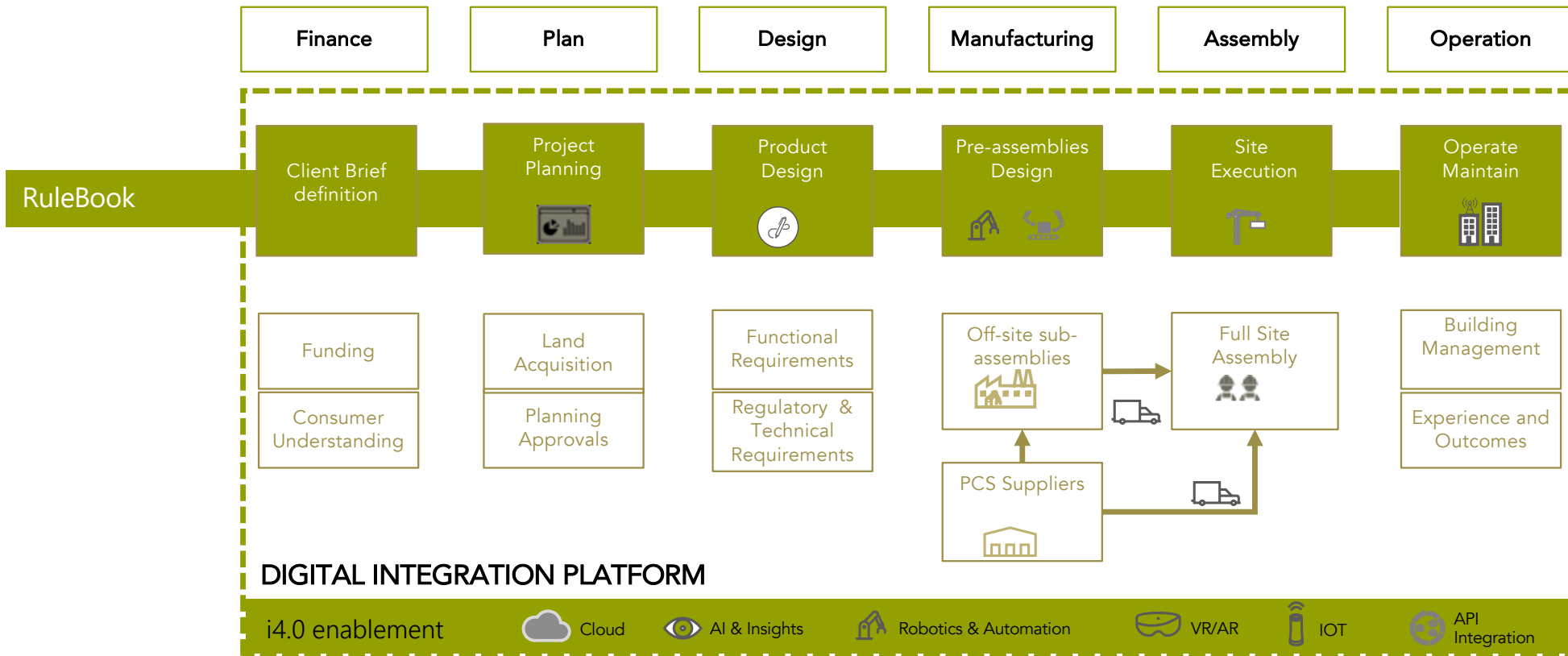
Object Hierarchy



A new IC supply chain governed by the “PCS RuleBook”



A new IC supply chain enabled by a new digital ecosystem




Use of Configurator

TESLA

For fast and touchless delivery, [view our inventory vehicles](#)

Model X

Est. Delivery: End of 2022



360mi 155mph 3.8sec
Range (est.) Top Speed 0-60 mph

Dual Motor All-Wheel Drive

Long Range £90,980

Tri Motor All-Wheel Drive

Plaid £110,980

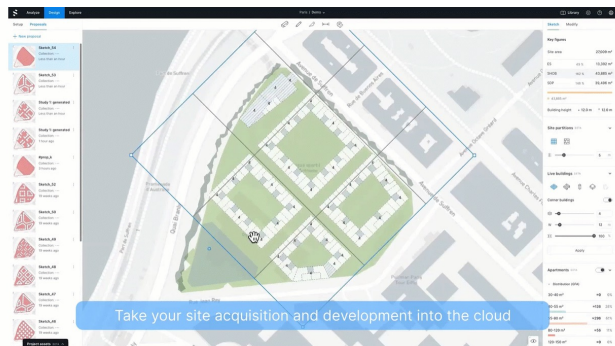
£97,780 before savings | £88,380 After Est. Savings
[Calculate Financing](#)

Specs displayed are US values

Tesla Model X Configurator

In AEC, one Single Configurator cannot satisfy all user requirements

a growing diversity of AEC configurators...



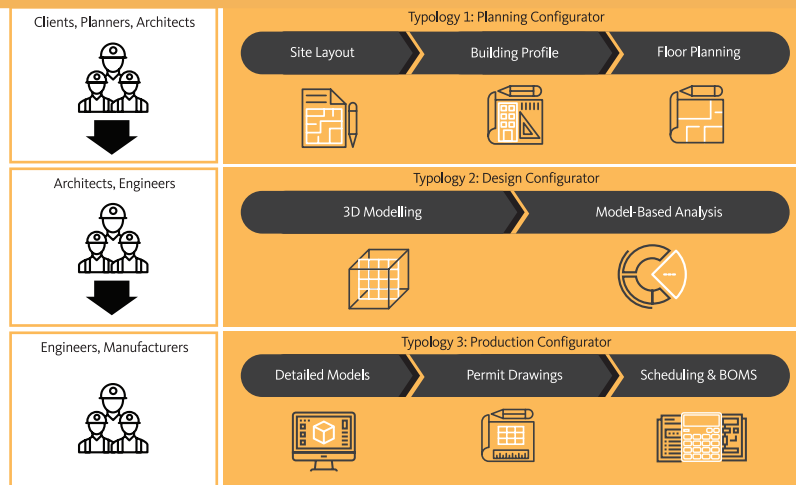
...lack of downstream integration (i.e. supply chain)
...products don't talk to each other

Need for a Digital Toolchain and (many) Configurators

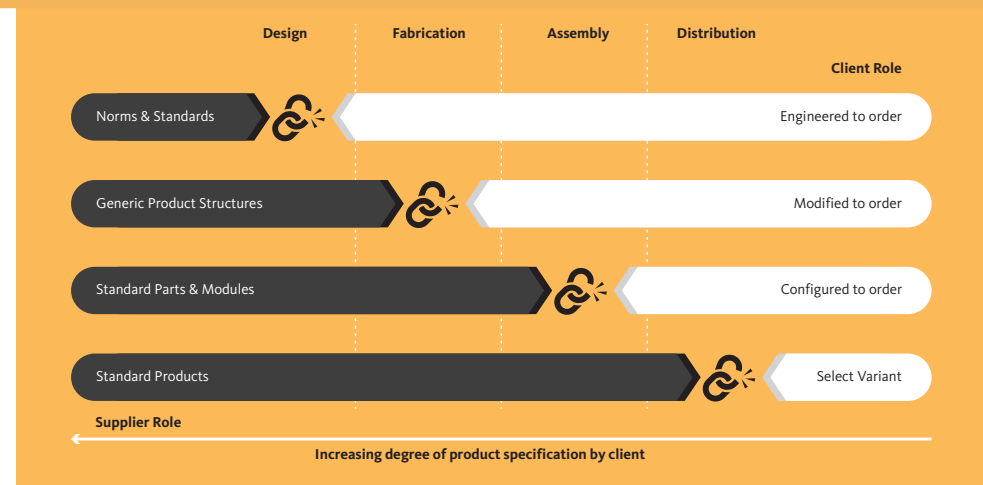
Different user journeys

Different engineering de-coupling points

RuleBook



Cross-phase product configurator for modular buildings using kit-of-parts
Jianpeng Cao , David F. Bucher , Daniel M. Hall , Jerker Lessing

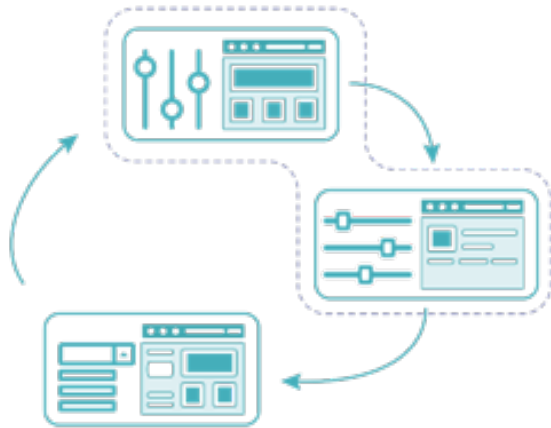


Strategies for Engineer-to-order Supply Chains: Lessons from Manufacturing and Construction
Dr Jon Gosling, Prof Mo Naim – Cardiff University

Composable Digital Configurators

Towards a Common Configurator Framework (CCF)

Two primary aims for the framework:



Principle A

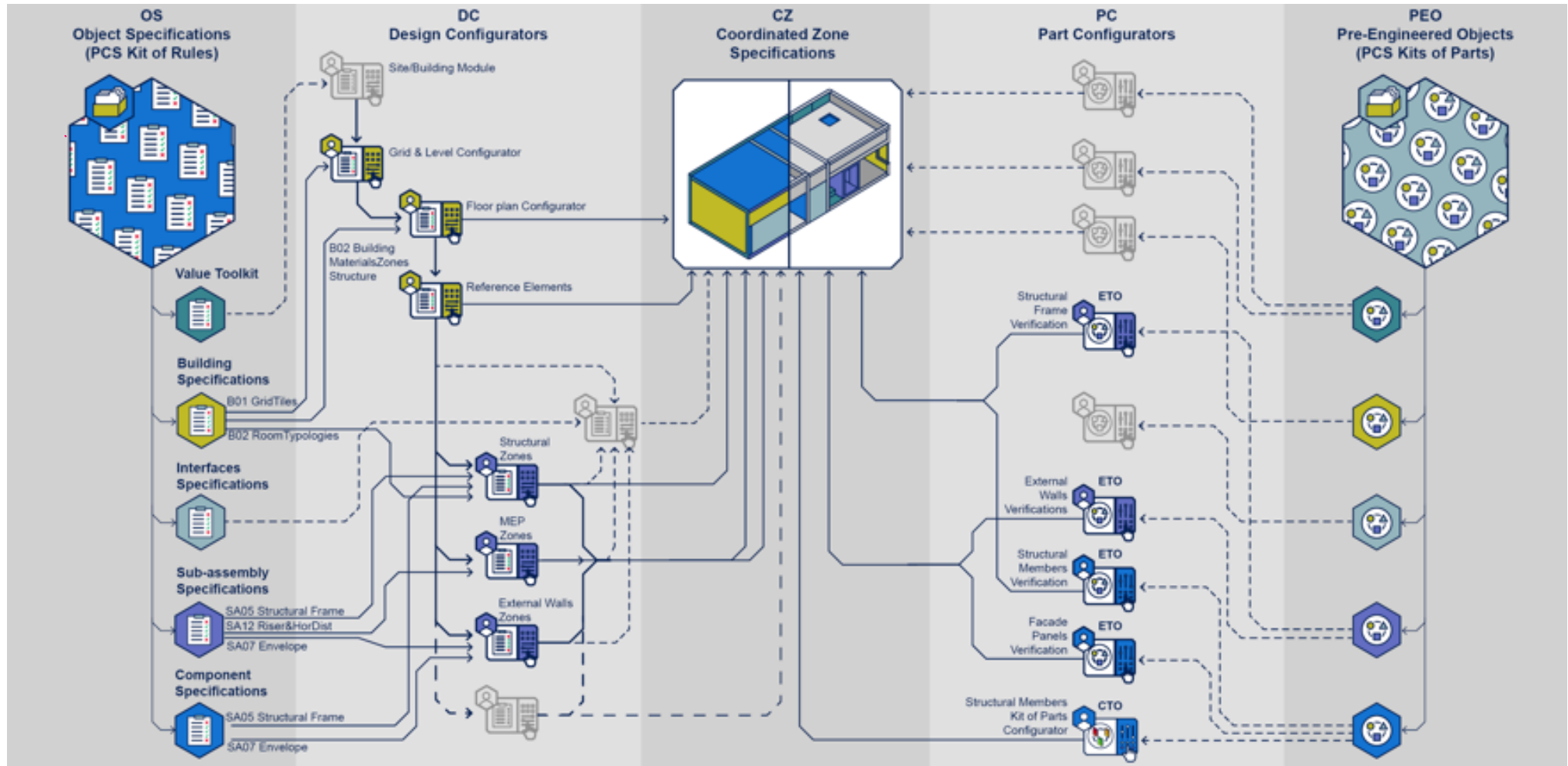
To allow communication between, and combining of, multiple discrete configurators.



Principle B

To enable compatibility between widest possible typologies of configurators (e.g. standalone and web-based tools, leveraging existing proprietary software etc)

Flexibility of non-linear workflows, enabled by multiple configurators and a common framework



Example: Module 01_B00 & Module 02_B02

Grids, levels and floor plan layout configurator

Inputs

Module 1
Objects
Footprint

Specification
Grid

User inputs
Elevation
Number of Storeys
Grid properties
Corridor centreline

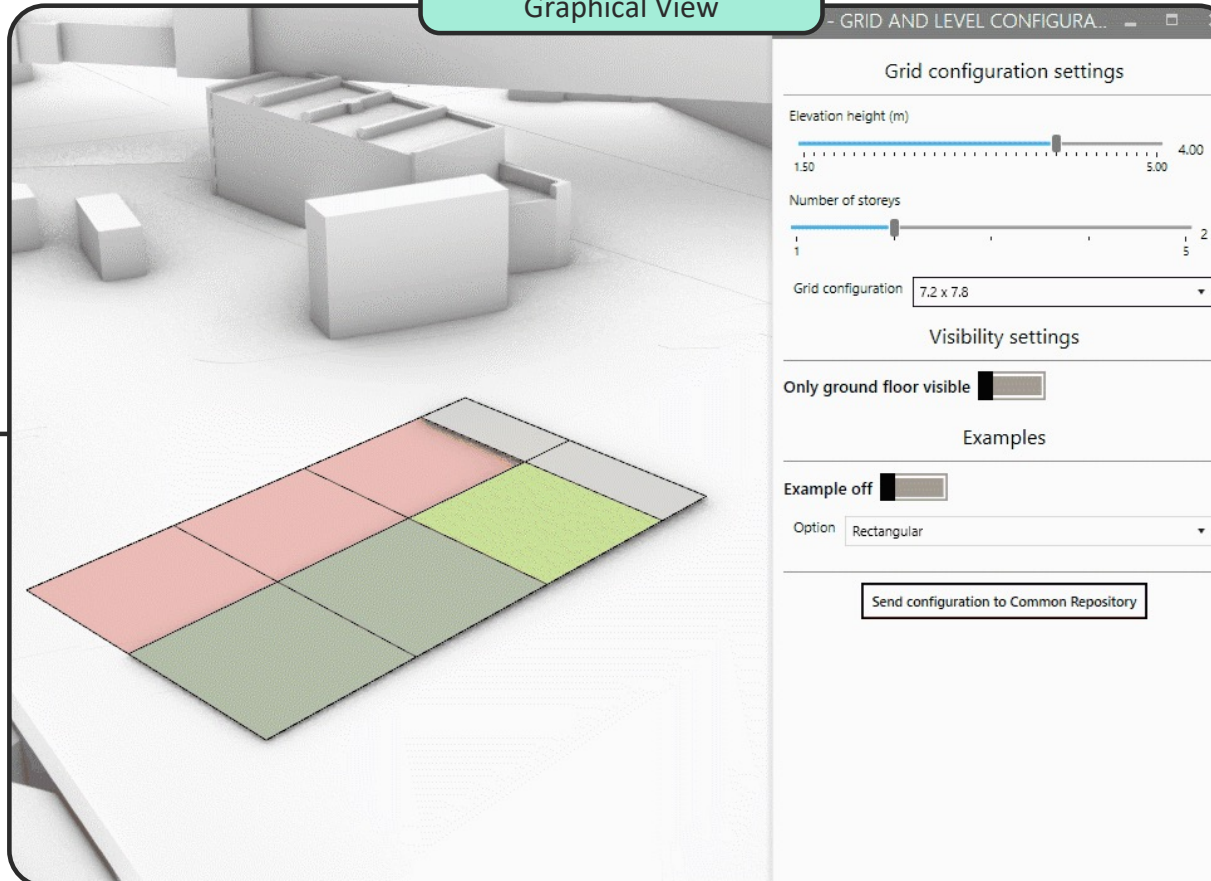
Module 2
Objects
Floor surfaces subdivided into
tiles grid tiles

Specification
Room Typologies

User inputs
Room types allocations to
clusters of tiles and
associated room names

External void locations

Graphical View



Outputs

Module 1
Objects
Floor surfaces subdivided
into grid tiles

UI outputs
Warnings log

Module 2
Objects
Room objects

UI outputs
Warnings log



GRIMSHAW
Design Technology





Buro Happold

Equity | Climate | Technology

questions to @AlainWanderings

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