Automated construction

Why manufacturing is the future of construction

LCI webinar
24th April 2019

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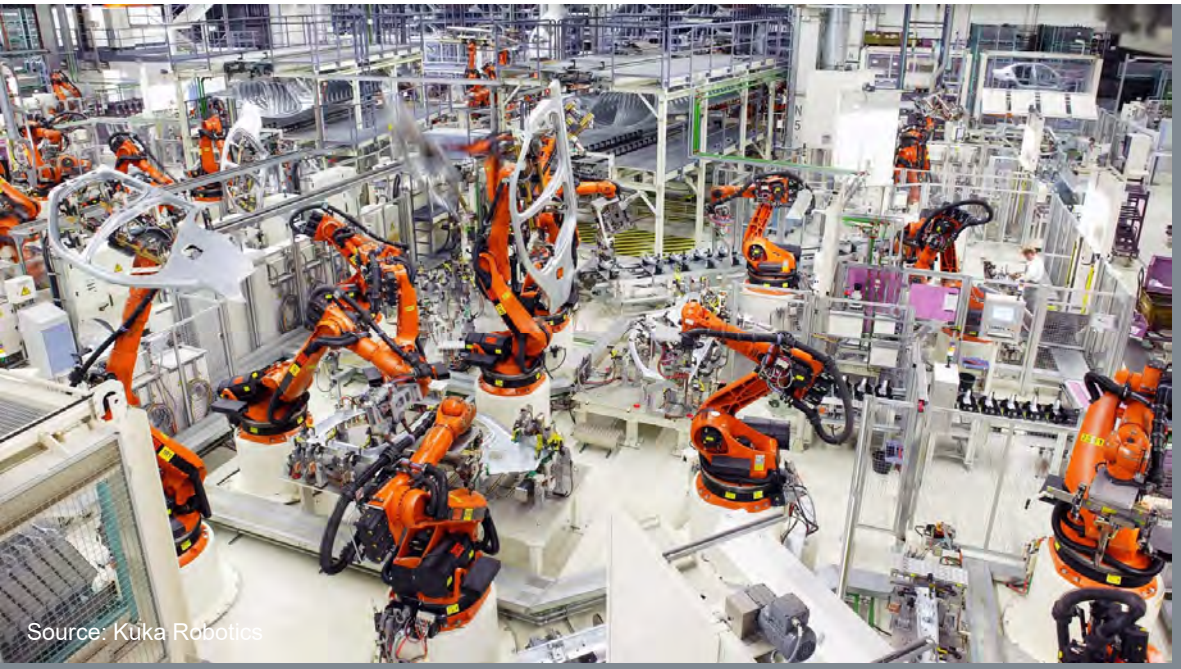


Source: Kuka Robotics

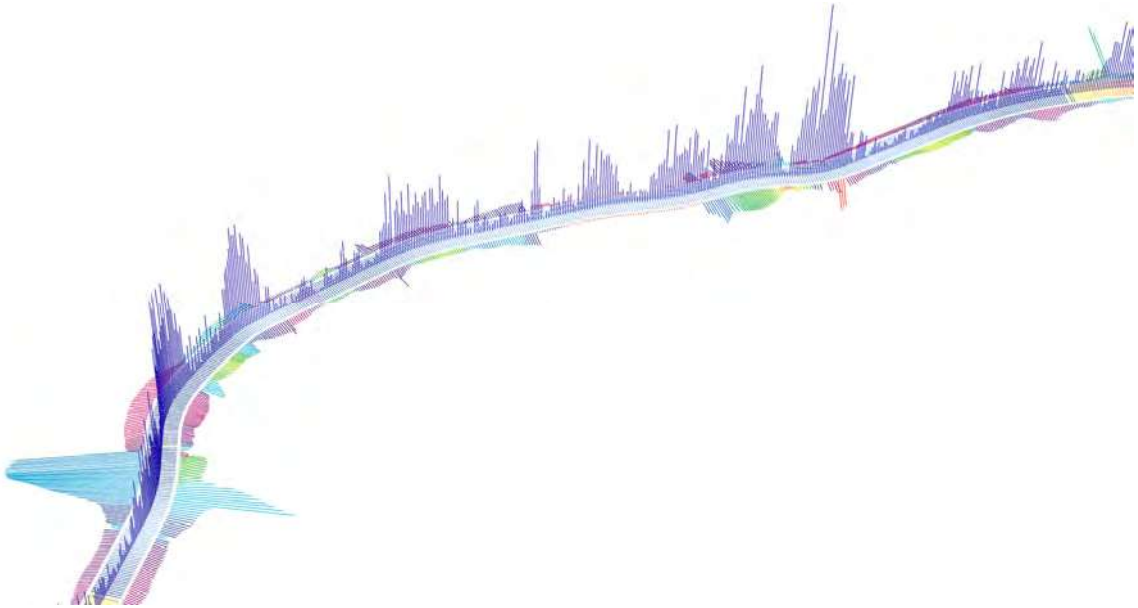
Source: Taylor Farms

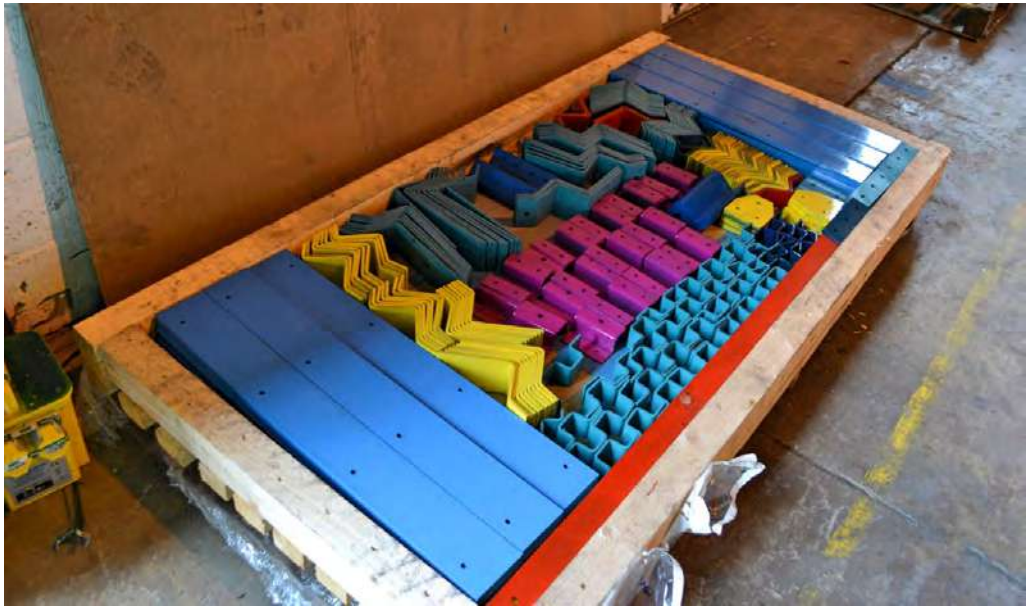
Source: MIT Technology Review

Source: MaRS Discovery District

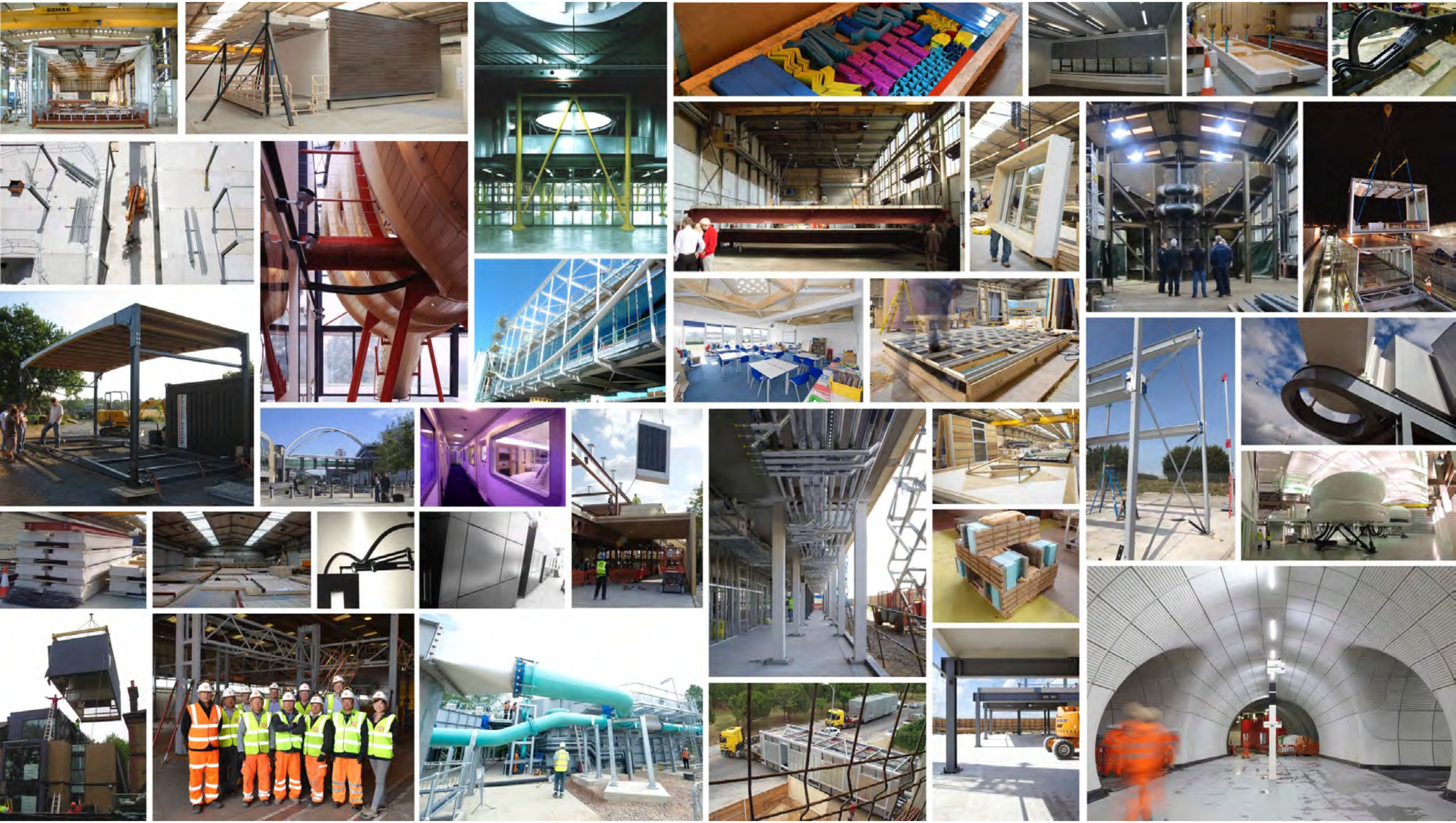
Source: Getty images


RB 30
COLAS






Vertical Modules:
Manufacturing
Volumetric Modules
Set G-Line
Custom G-Line
Generate
Refresh
Floors Panel
Add Floor
Brief Percentages:
Add Type


DEMAG

Why haven't any **systems or solutions** transformed the industry yet?

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1886

1913

Why has manufacturing **never** taken off for construction?

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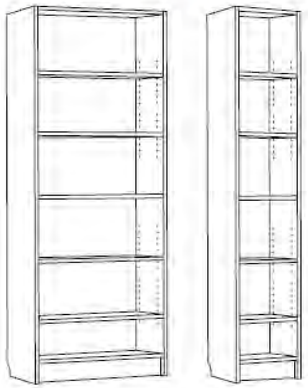
BILLY



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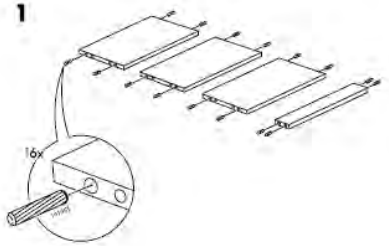

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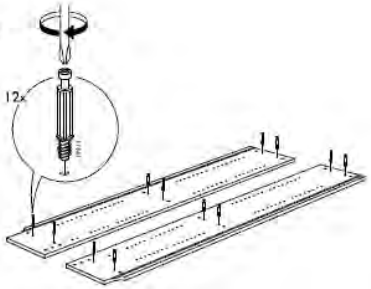

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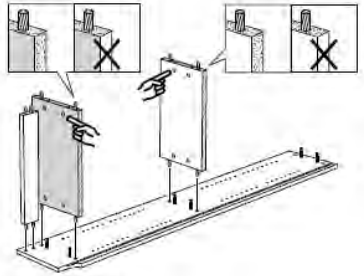

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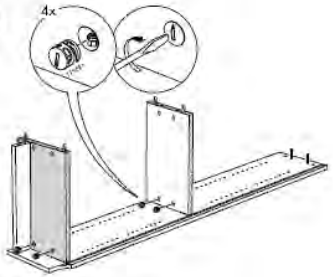

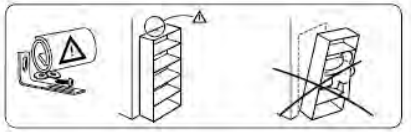

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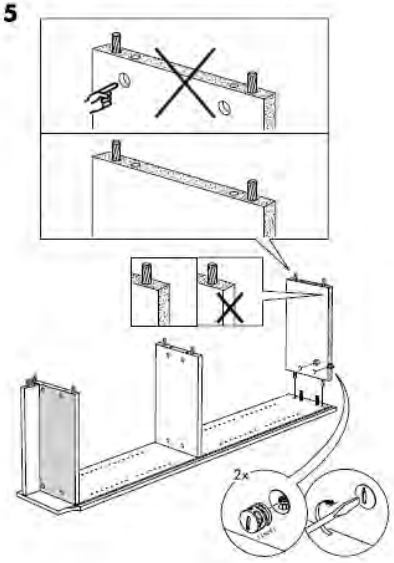

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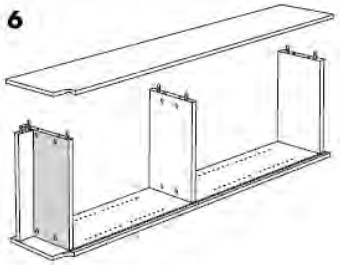

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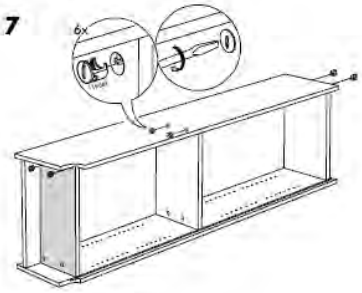

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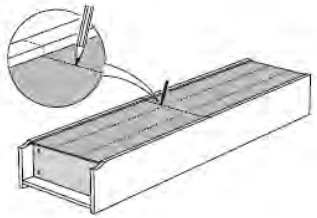

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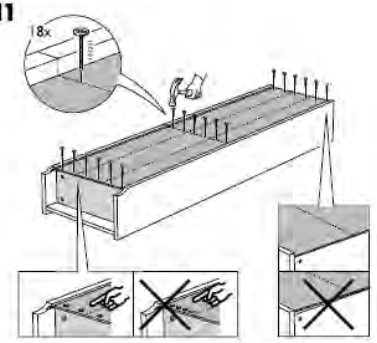

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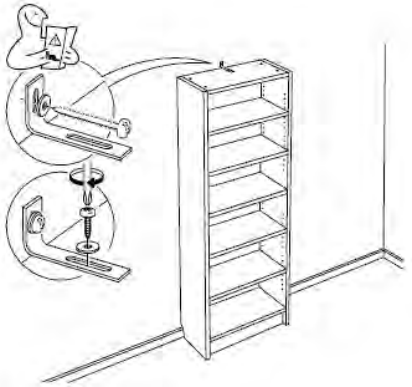

Platforms bridge the gap between manufacturing and construction

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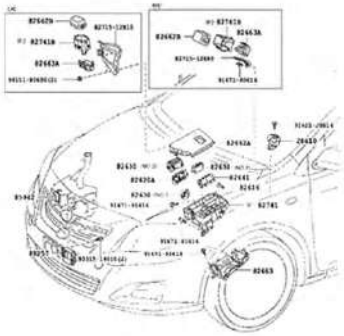
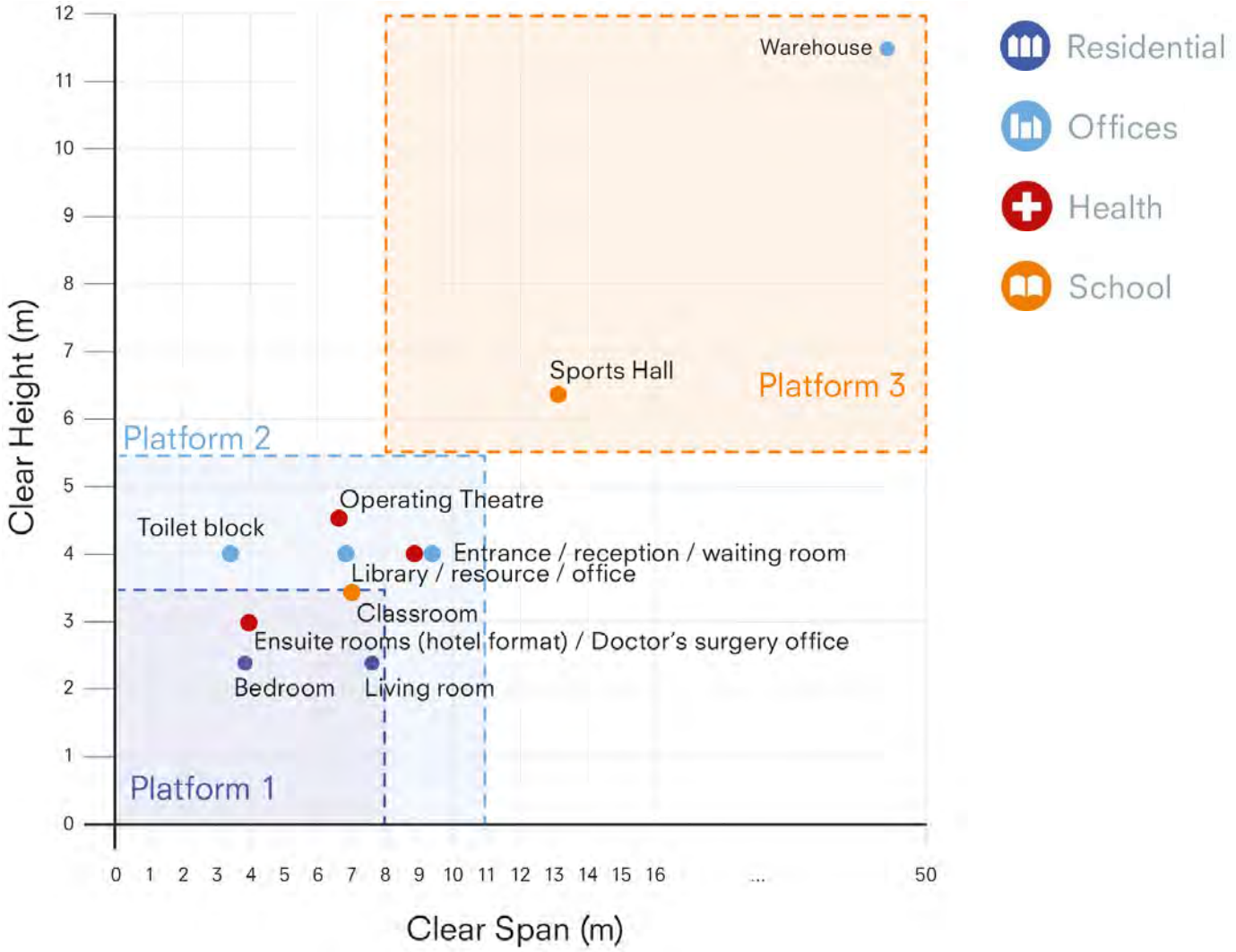
Component	Platform	Outcome
 Engine block	 Chassis	 Car
 Shipping container	 Global freight infrastructure	Low cost, reliable global trade + supply chains
Uber	iPhone	Peer-to-peer ride sharing, food delivery and transportation network

A Platform-based approach to construction



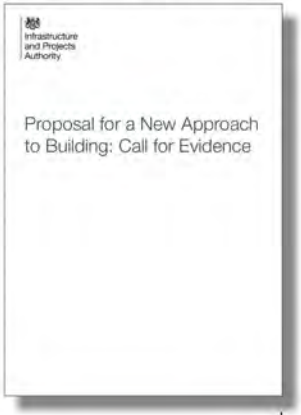
Delivery Platforms for Government Assets

Autumn Statement
'The government will use its purchasing power to drive adoption of modern methods of construction...'

Funding competition: Establishing a Core Innovation Hub to transform UK construction

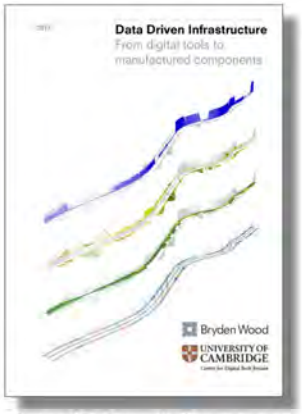
Off-site manufacture for construction: Building for change

Proposal for a New Approach to Building



May | June | July | August | September | October | November | December | January | February | March | April | May | June | July | August | September | October | November

2017 **2018**



Data Driven Infrastructure

Transforming Infrastructure Performance

Platforms: Bridging the gap between construction + manufacturing

Construction Sector Deal

CONSTRUCTION INNOVATION HUB

Construction Innovation Hub awarded £72 million to drive innovation + technological advances in the UK construction and infrastructure sectors.

Infrastructure and Projects Authority

Our proposal: a Platform approach to Design for Manufacture and Assembly (P-DfMA)

A platform approach means we will use **digitally designed components across multiple types of asset and apply those components wherever possible**, minimising the need to design bespoke components.

For example, a single component could be used as part of a **school, hospital, prison building or station**.

The three principles are:

1. Design for manufacture;
2. Use a Platform approach;
3. Open for manufacture, use and procurement.

What **will** we all get out of it?

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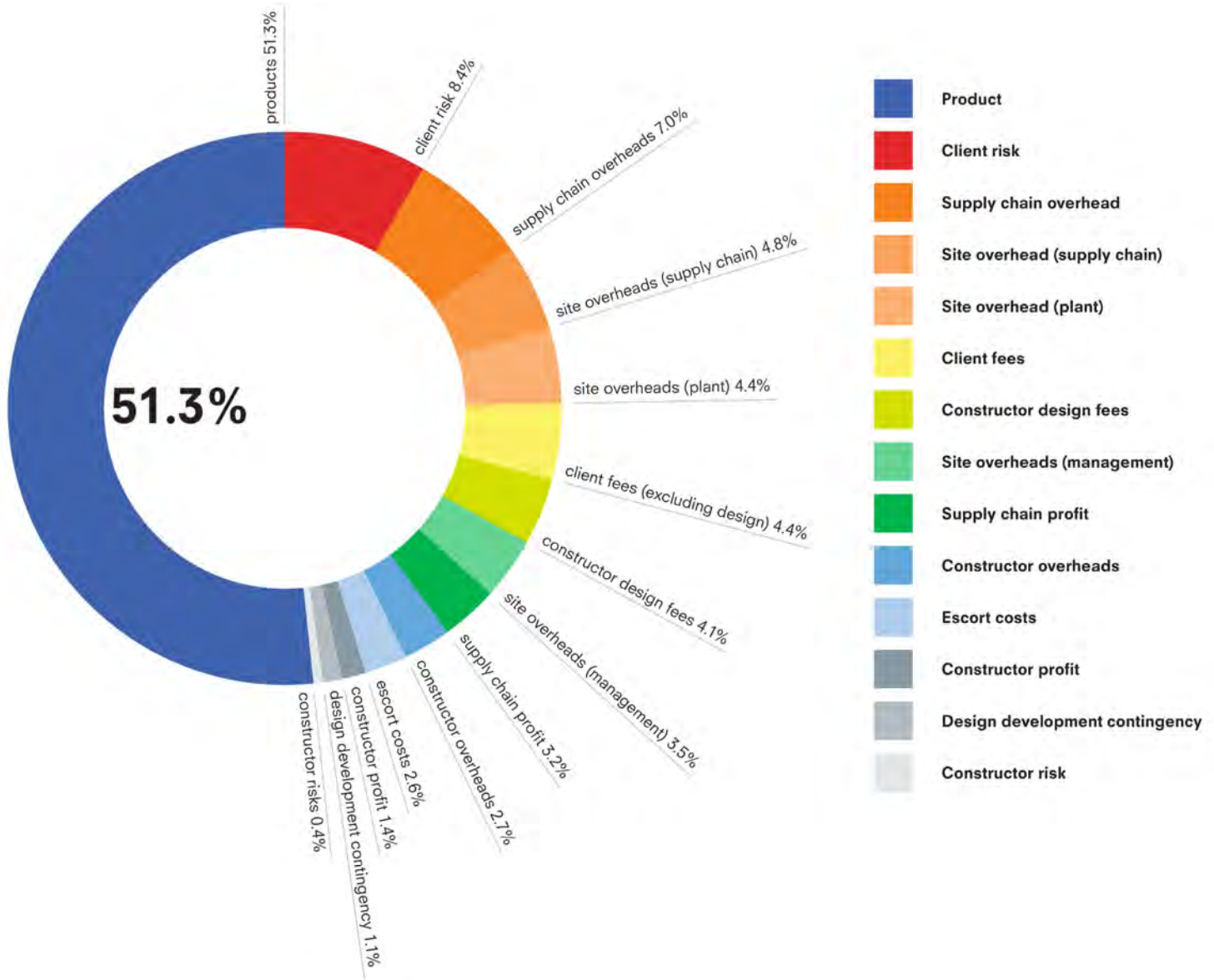
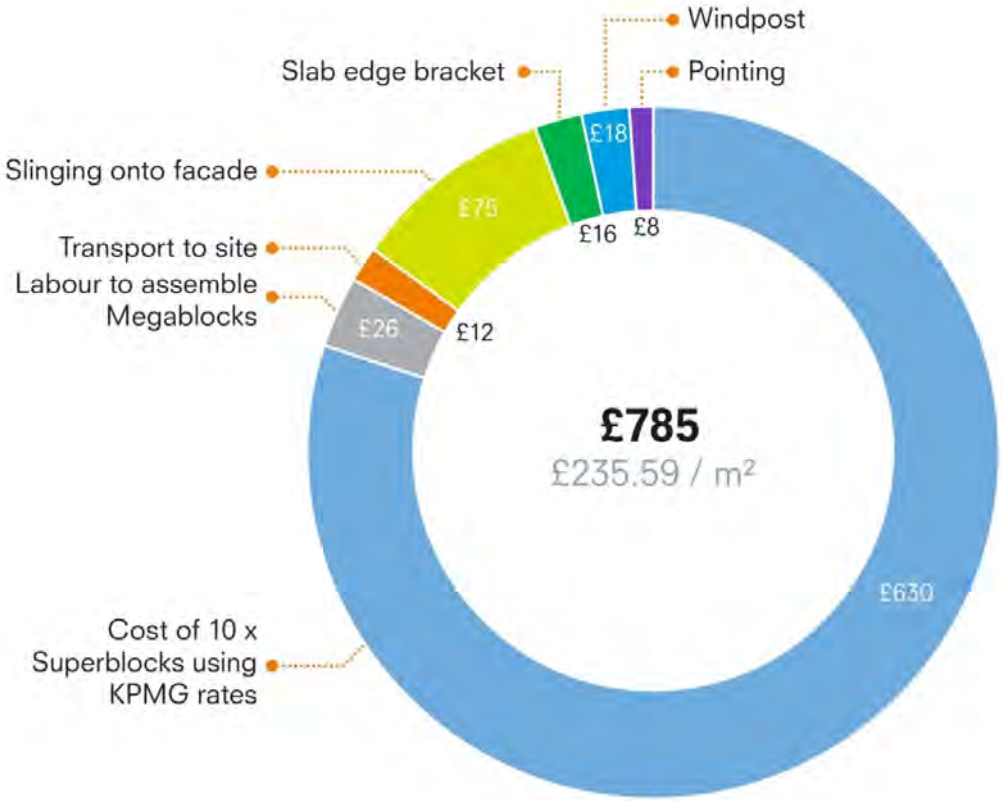
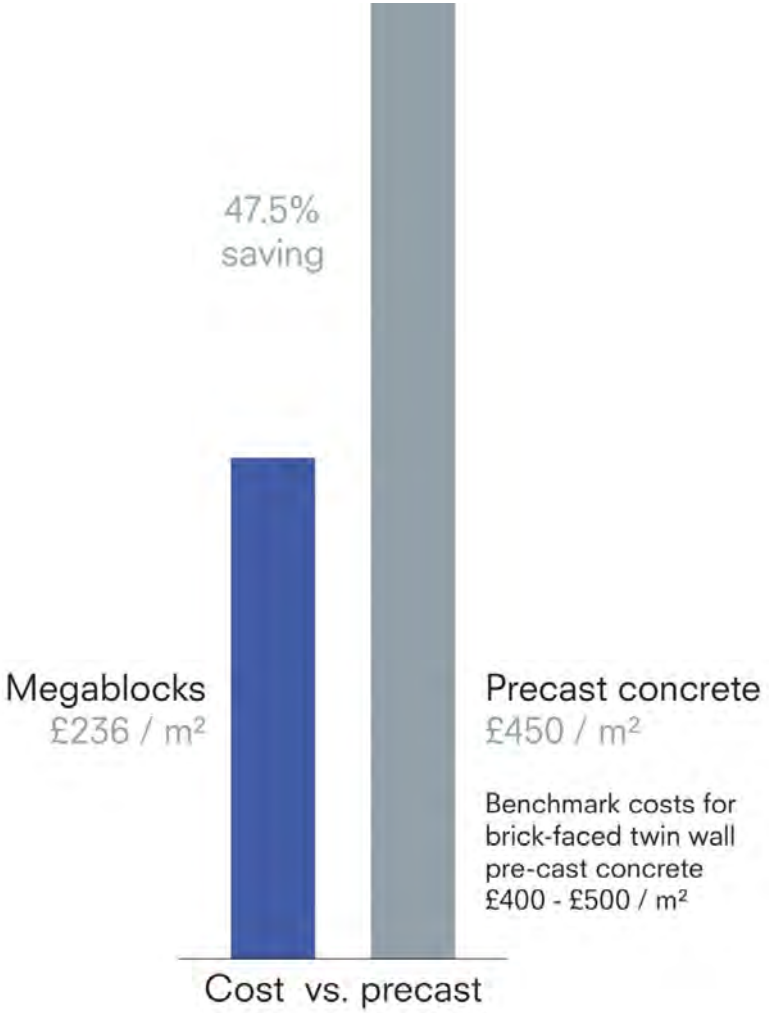

products 51.3%
client risk 8.4%
supply chain overheads 7.0%
site overheads (supply chain) 4.8%
site overheads (plant) 4.4%
client fees (excluding design) 4.4%
constructor design fees 4.1%
site overheads (management) 3.5%
supply chain profit 3.2%
constructor overheads 2.7%
escort costs 2.6%
constructor profit 1.4%
design development contingency 1.1%
constructor risks 0.4%
51.3%
Product
Client risk
Supply chain overhead
Site overhead (supply chain)
Site overhead (plant)
Client fees
Constructor design fees
Site overheads (management)
Supply chain profit
Constructor overheads
Escort costs
Constructor profit
Design development contingency
Constructor risk

“Platforms could achieve a **33% reduction** in capital cost”

Turner & Townsend


Windpost
Slab edge bracket
Pointing
Slinging onto facade
Transport to site
Labour to assemble Megablocks
Cost of 10 x Superblocks using KPMG rates
£18
£75
£16
£8
£26
£12
£630
£785
£235.59 / m²


47.5% saving
Megablocks
£236 / m²
Precast concrete
£450 / m²
Benchmark costs for brick-faced twin wall pre-cast concrete £400 - £500 / m²
Cost vs. precast

How do we achieve this?

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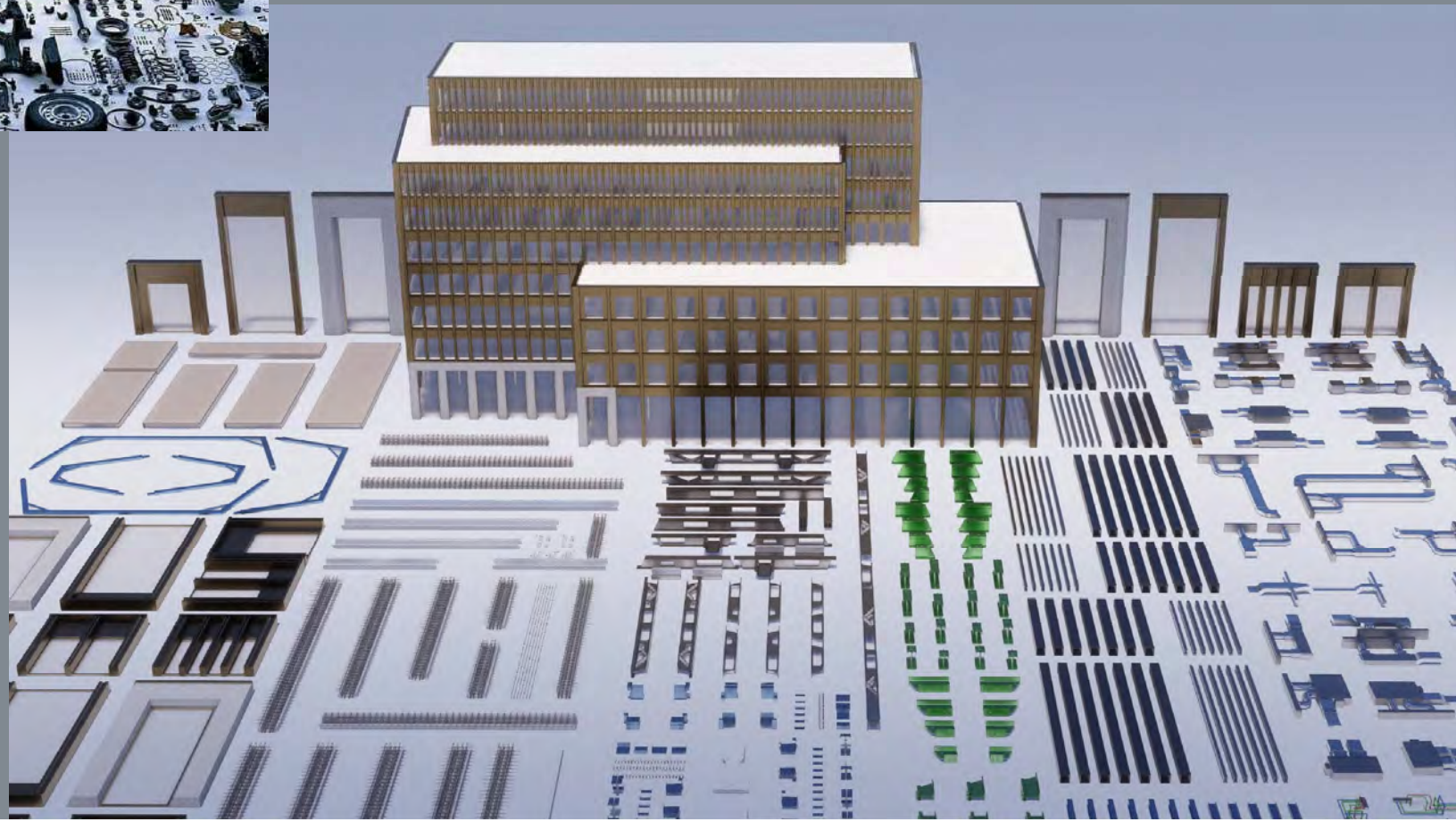
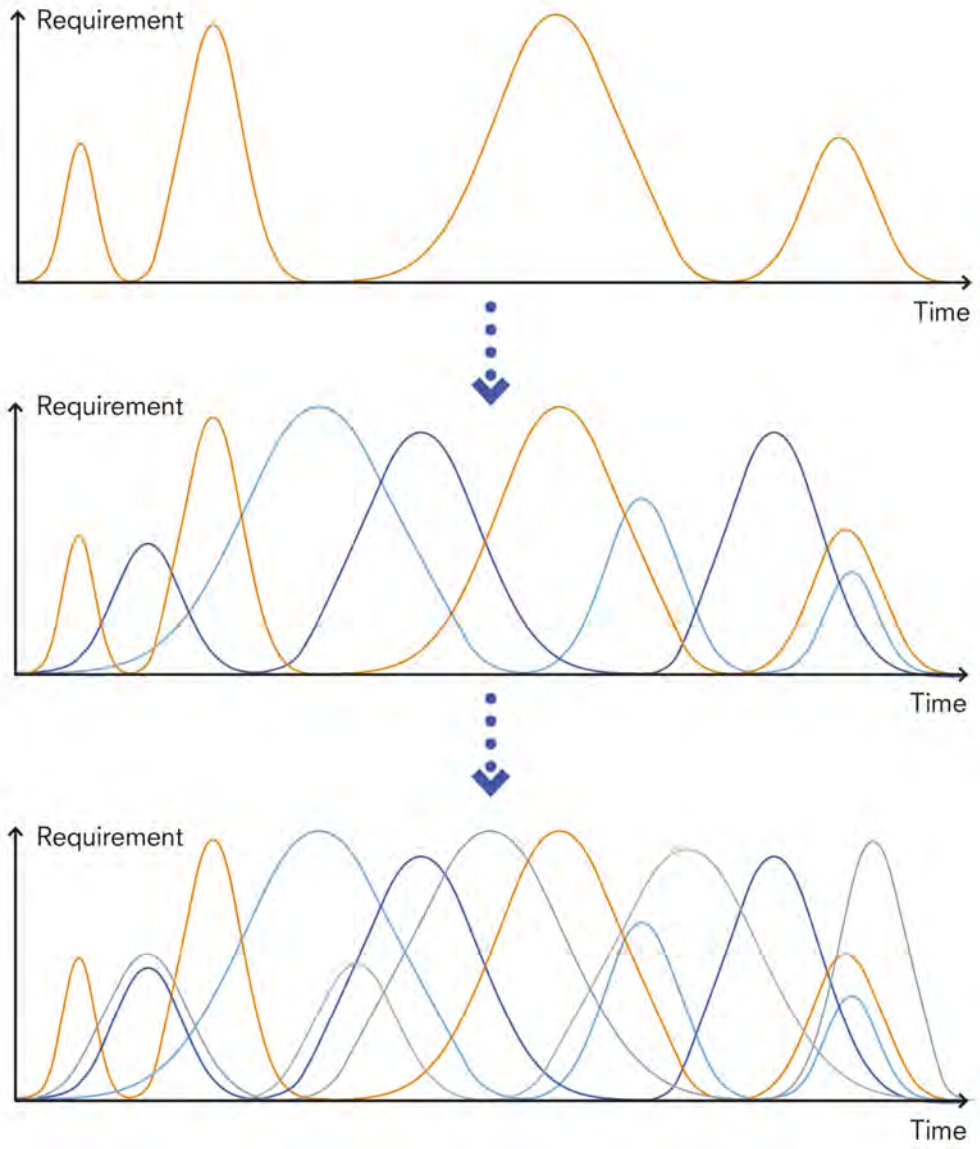
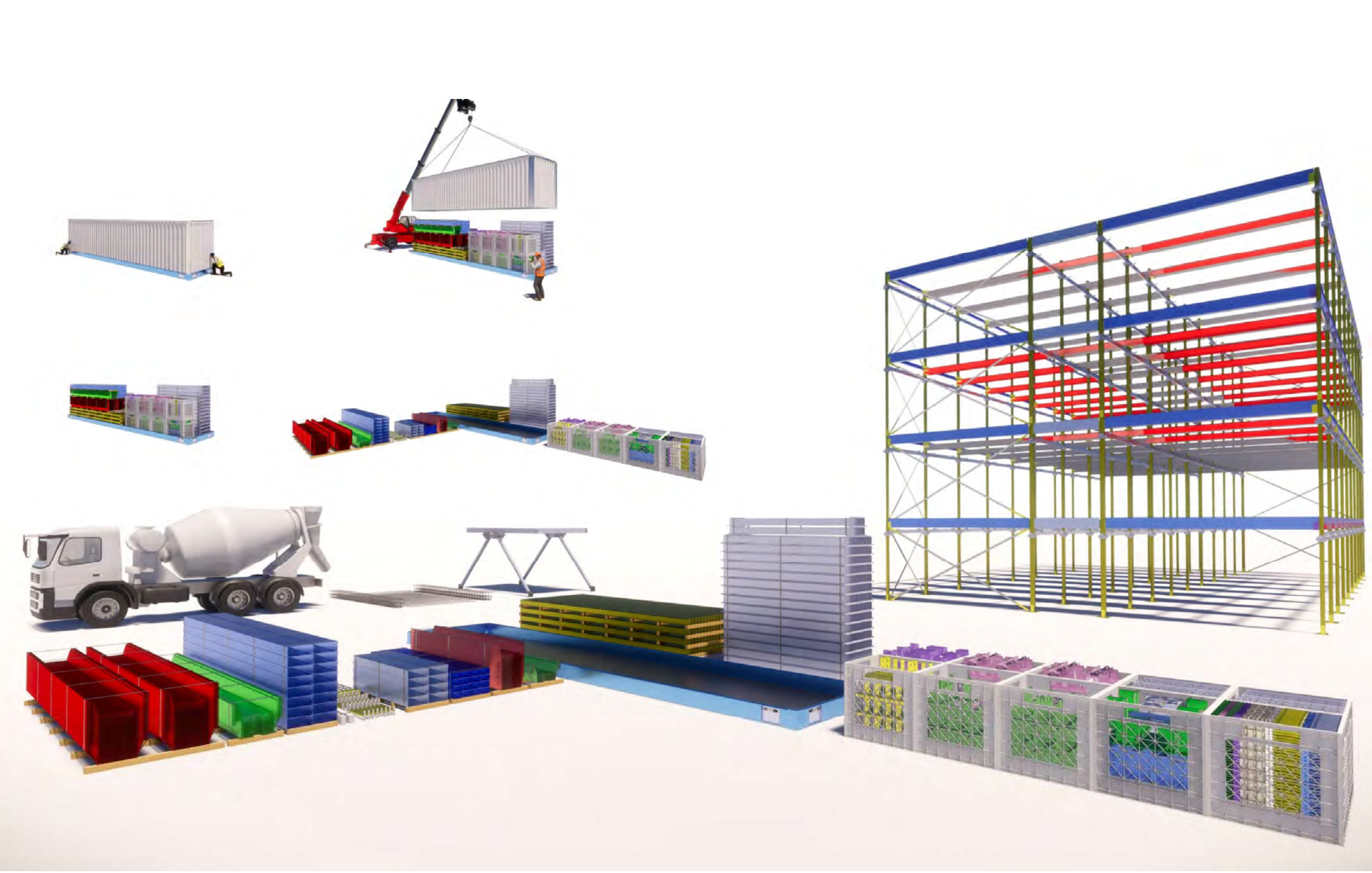


Requirements for single programme - often currently served by one factory

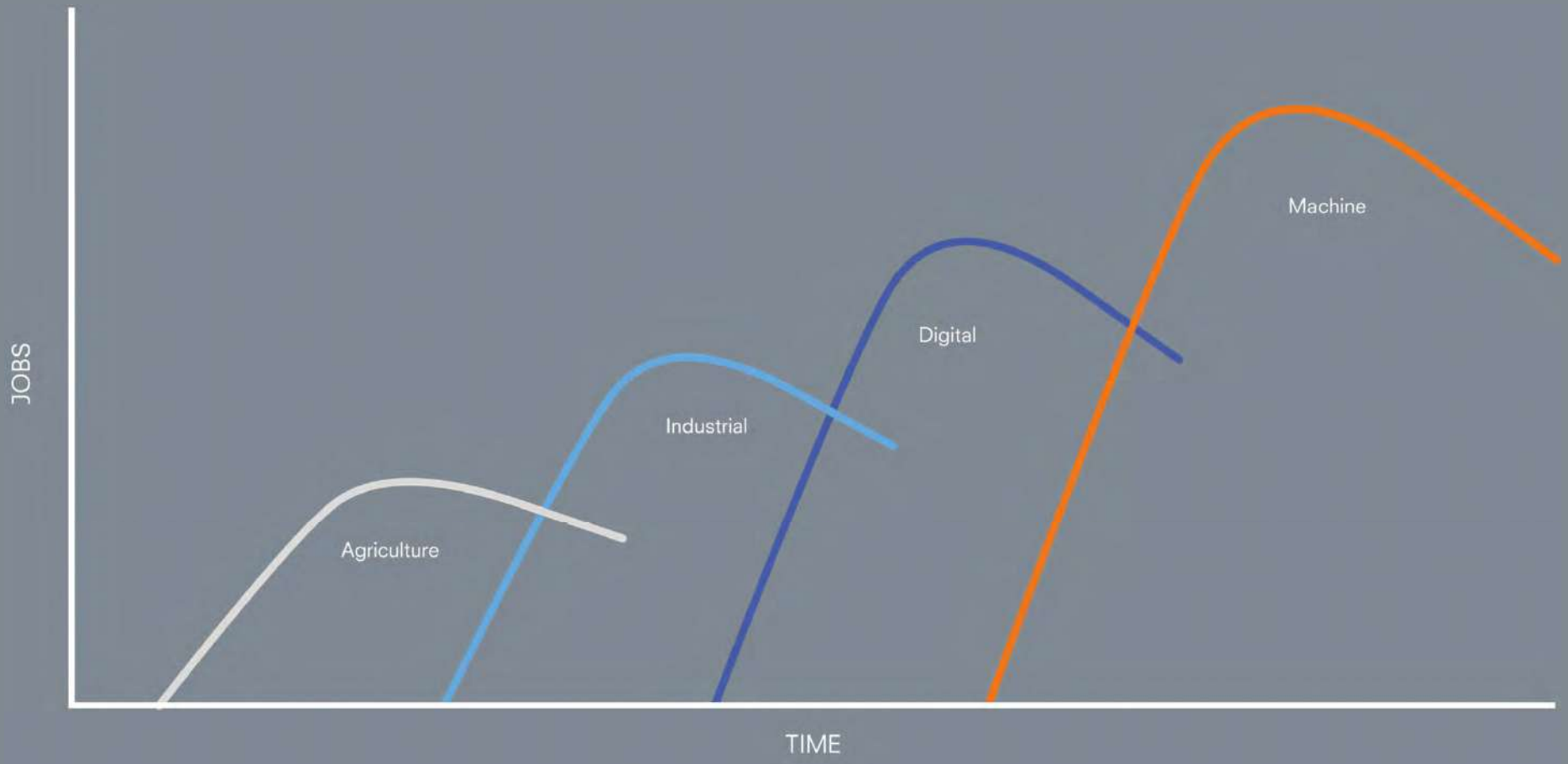
Aggregating the requirements for multiple programmes (through the use of shared components) starts to create a consistent pipeline

Eventually a level workload is created, which can be split across multiple facilities working at a known and predefined level of output





Each Industrial Revolution results in an increase in jobs



Automated design

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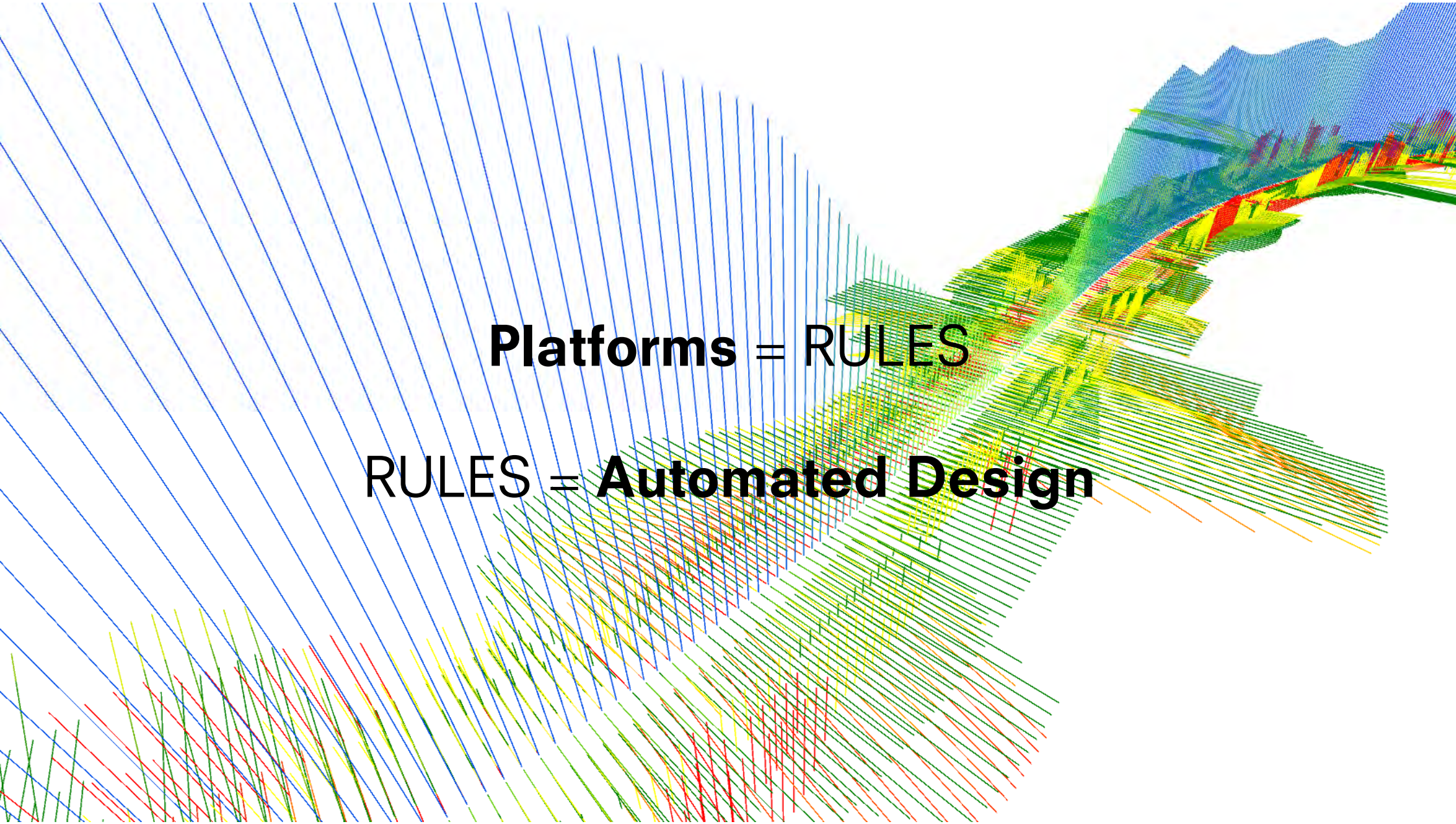
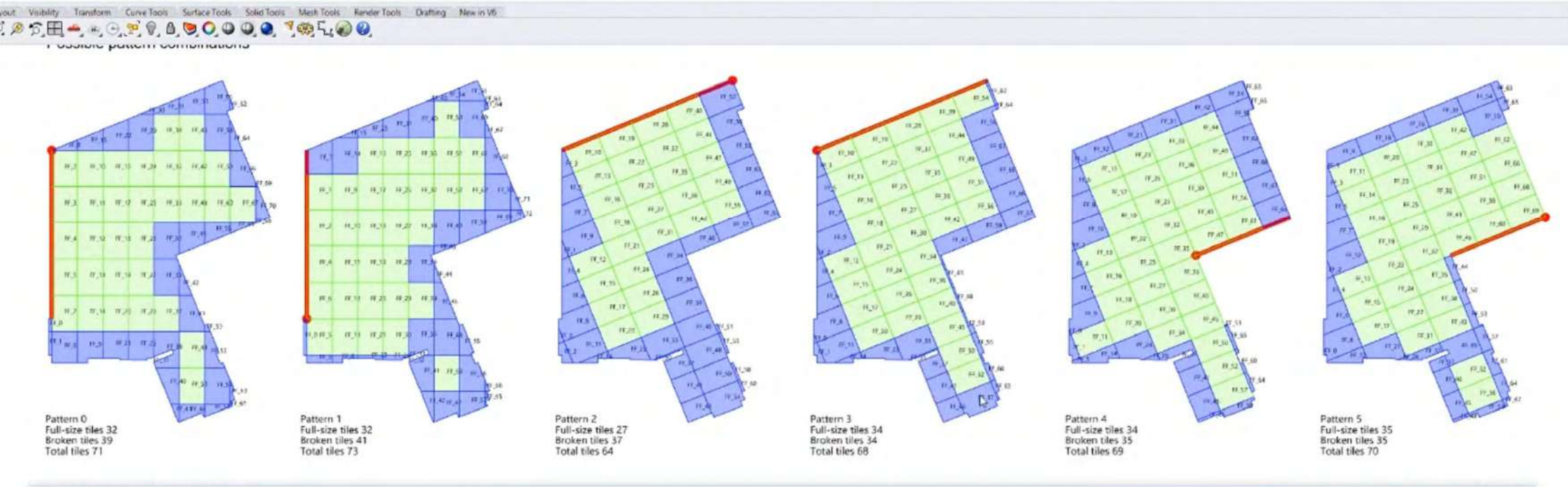
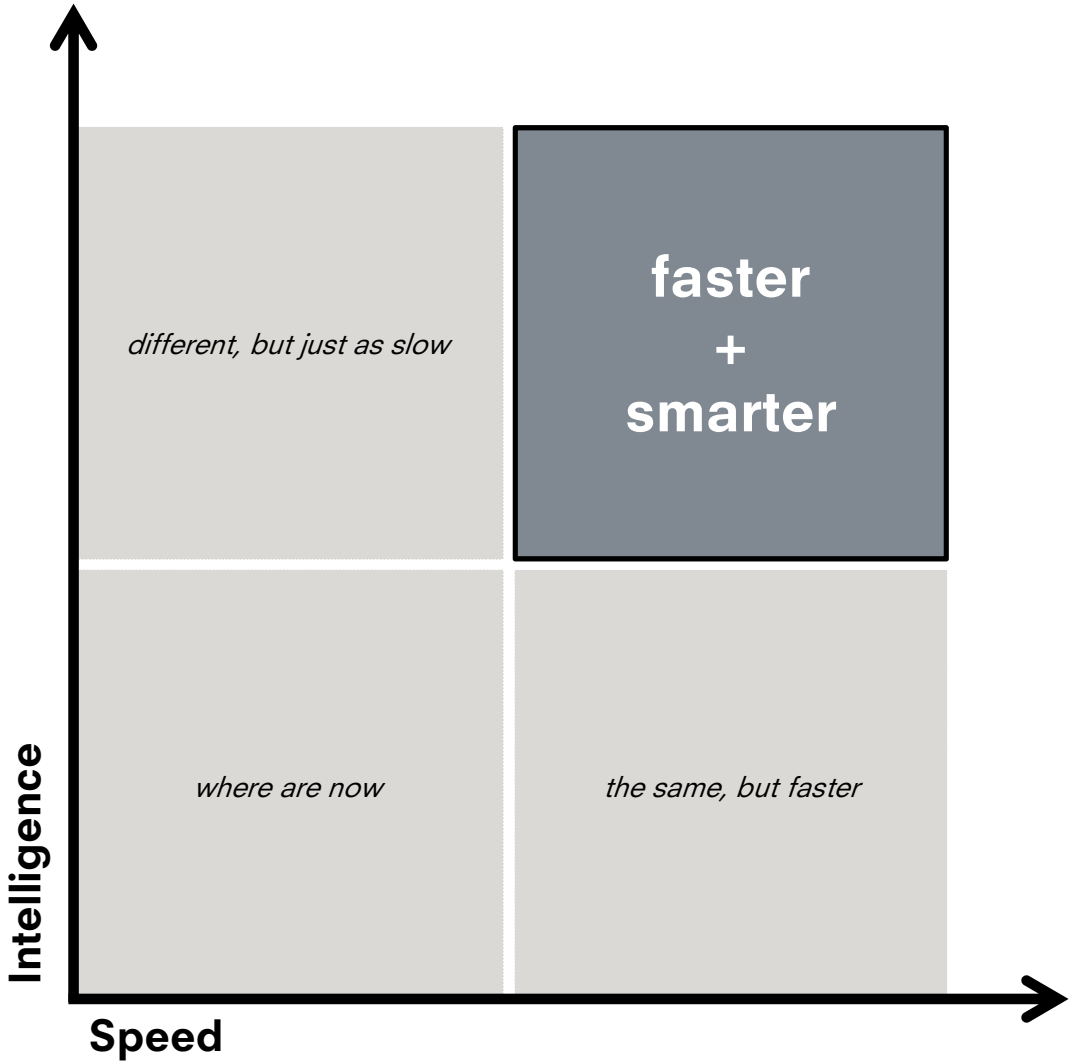

Platforms = RULES
RULES = **Automated Design**

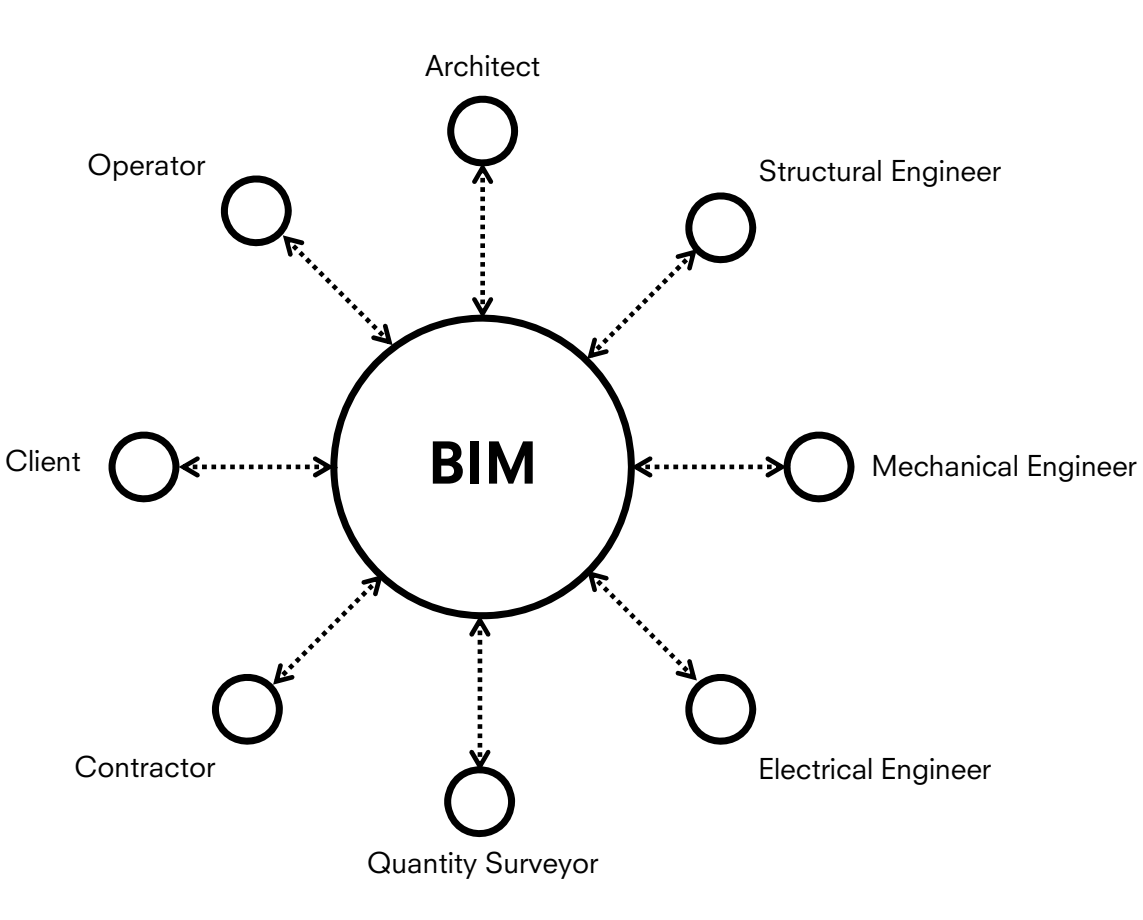


What do we mean by automated design?

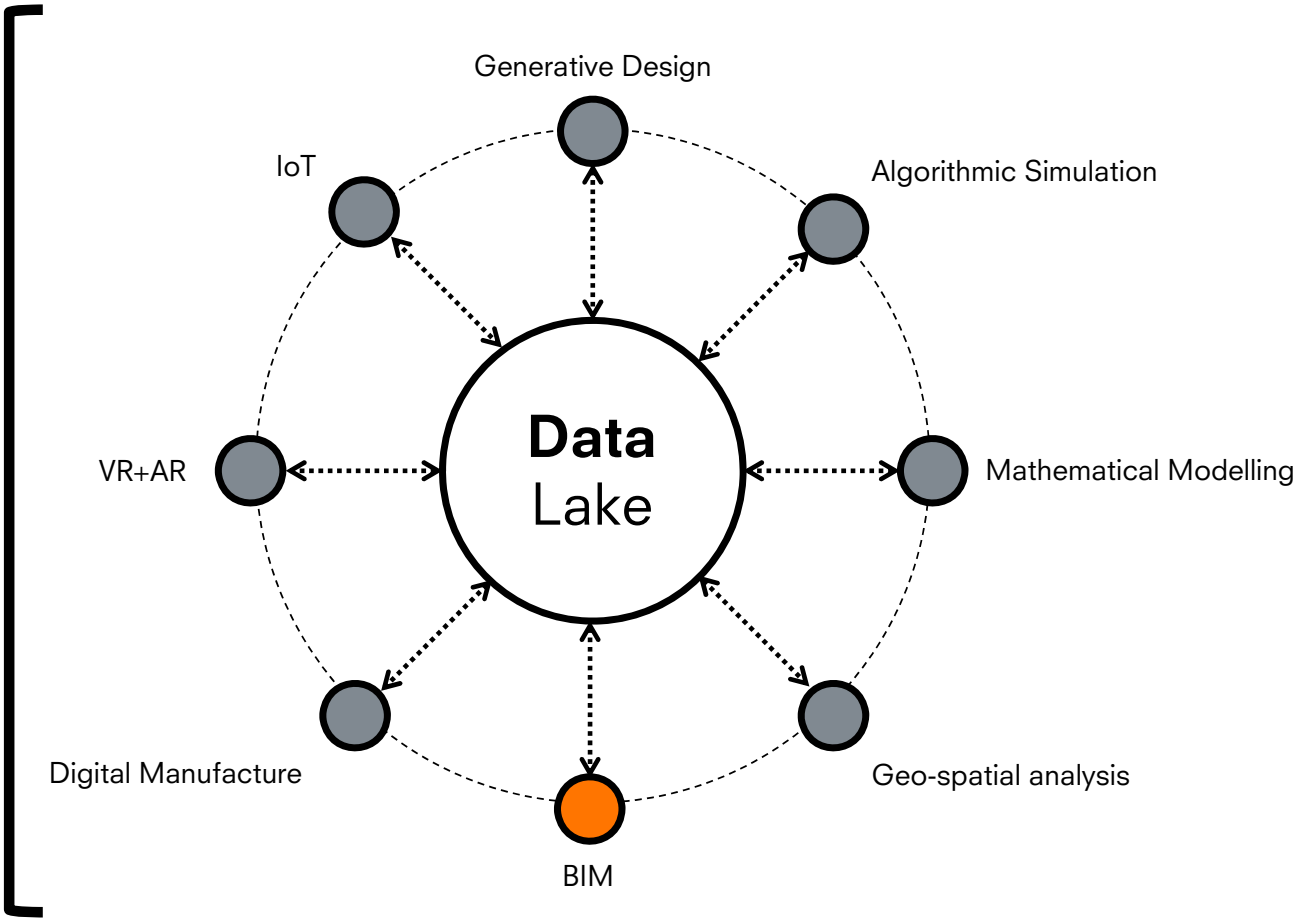
Automated Design =



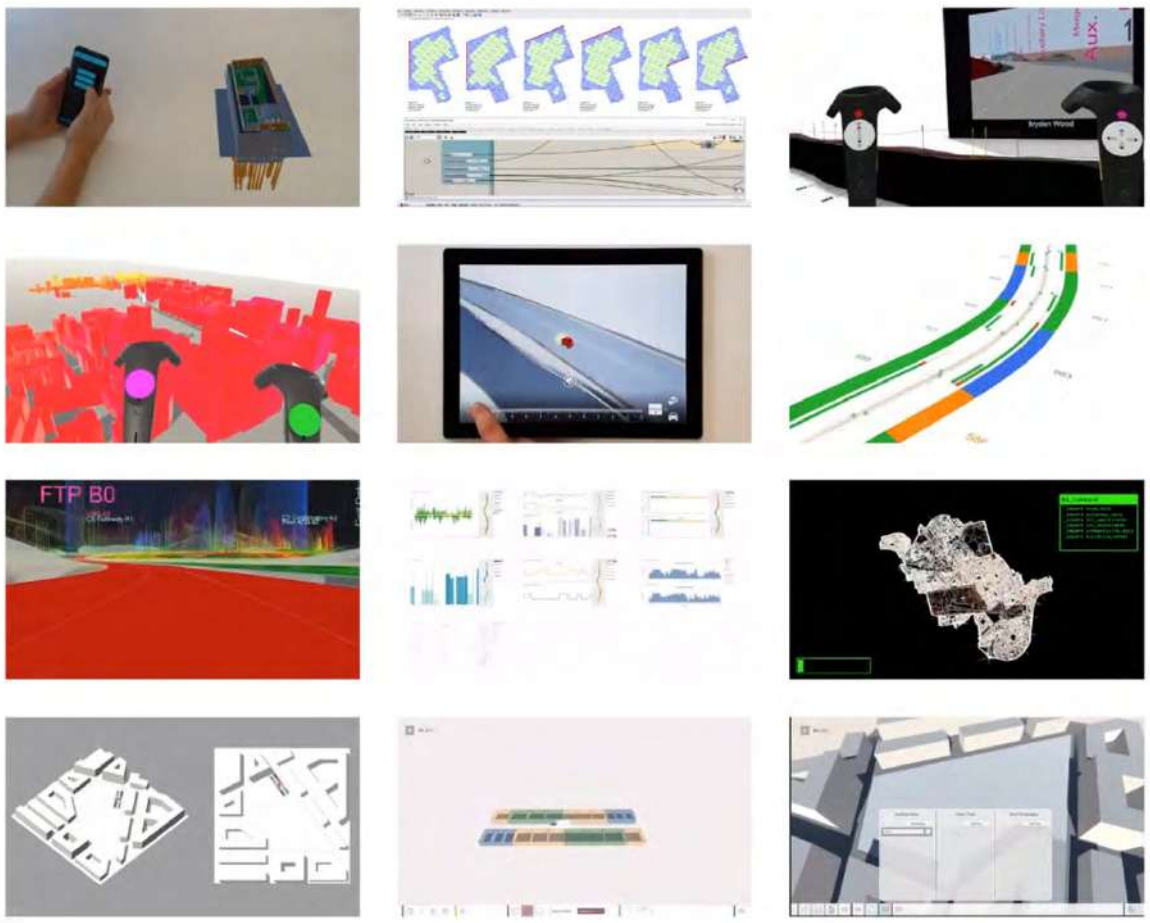
Today =


Architect
Operator
Structural Engineer
Client
BIM
Mechanical Engineer
Contractor
Electrical Engineer
Quantity Surveyor

Automated Design =

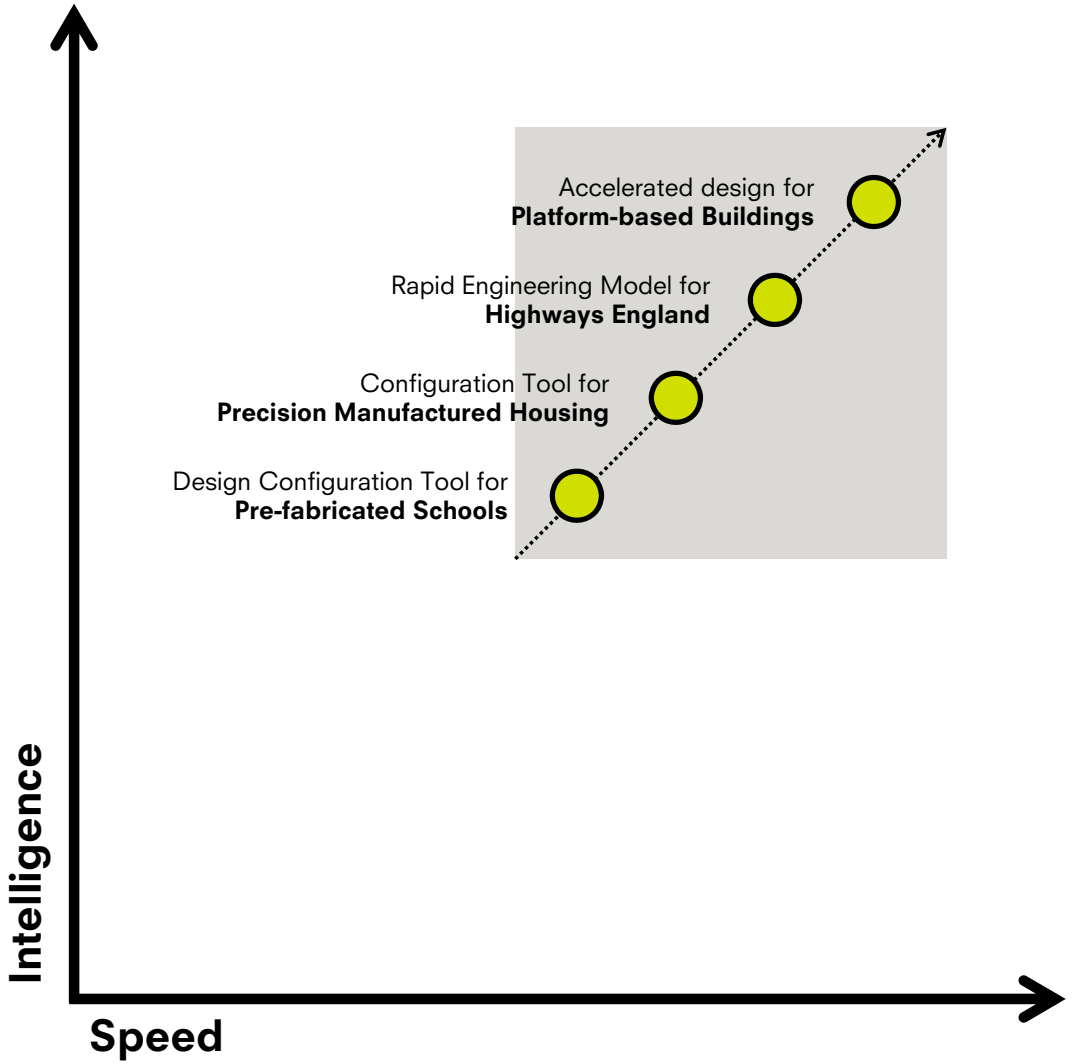


Automated Design =



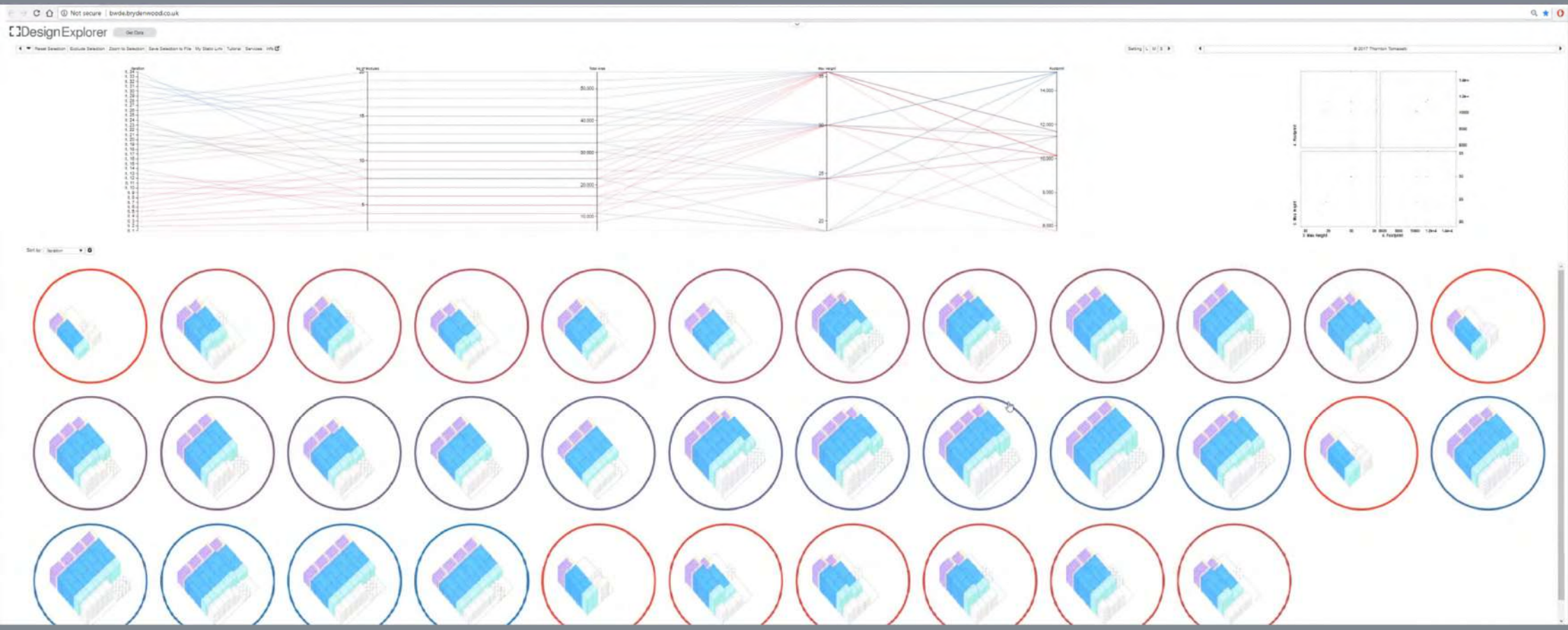
Automated design

Towards a platforms approach

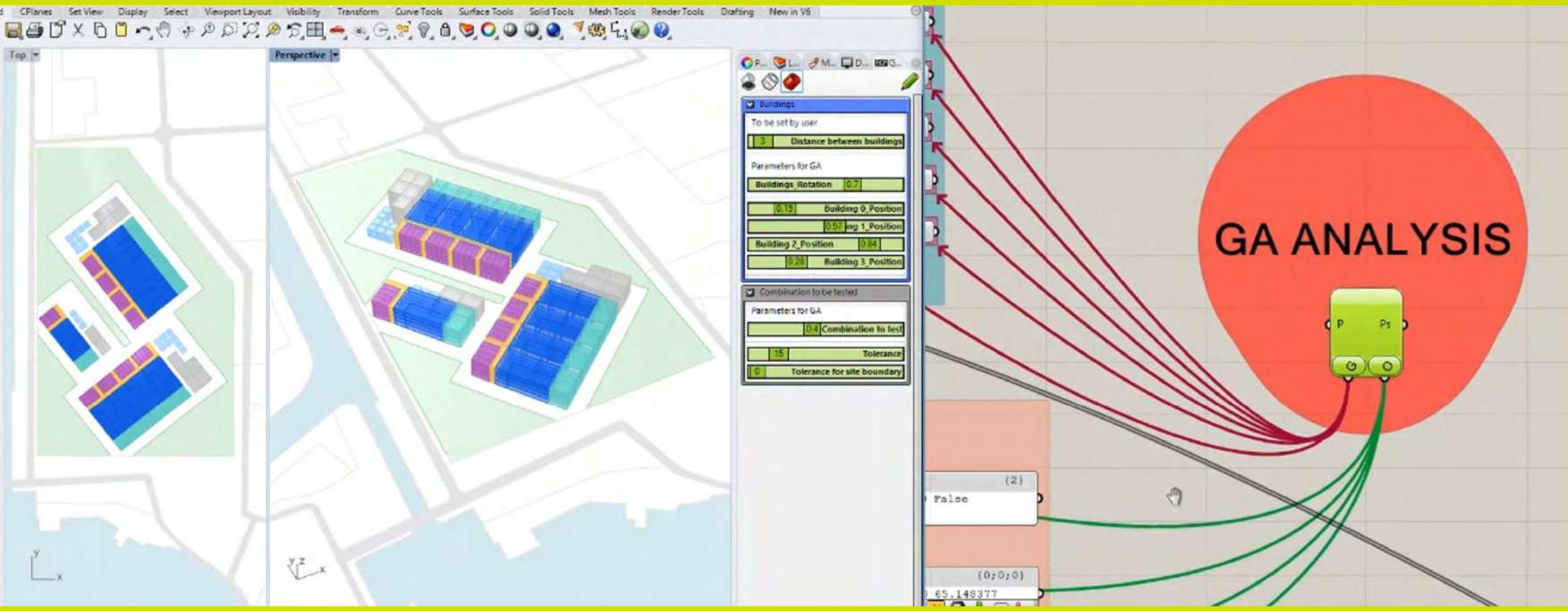


Rapid Engineering Model for **Highways England**

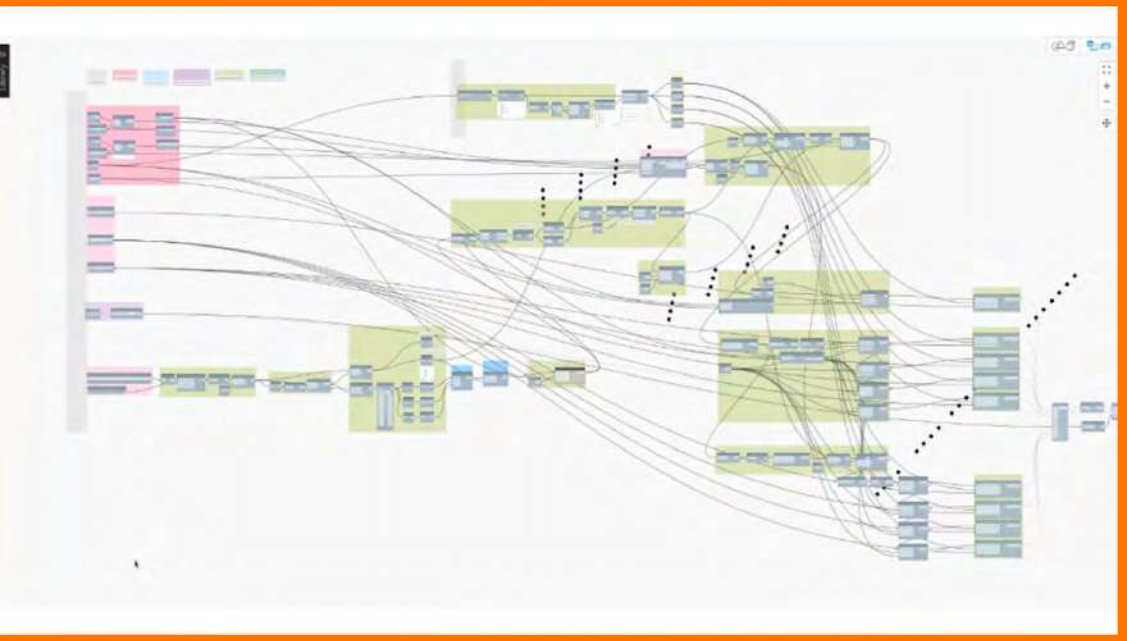
Accelerated design for **Platform-based Buildings**

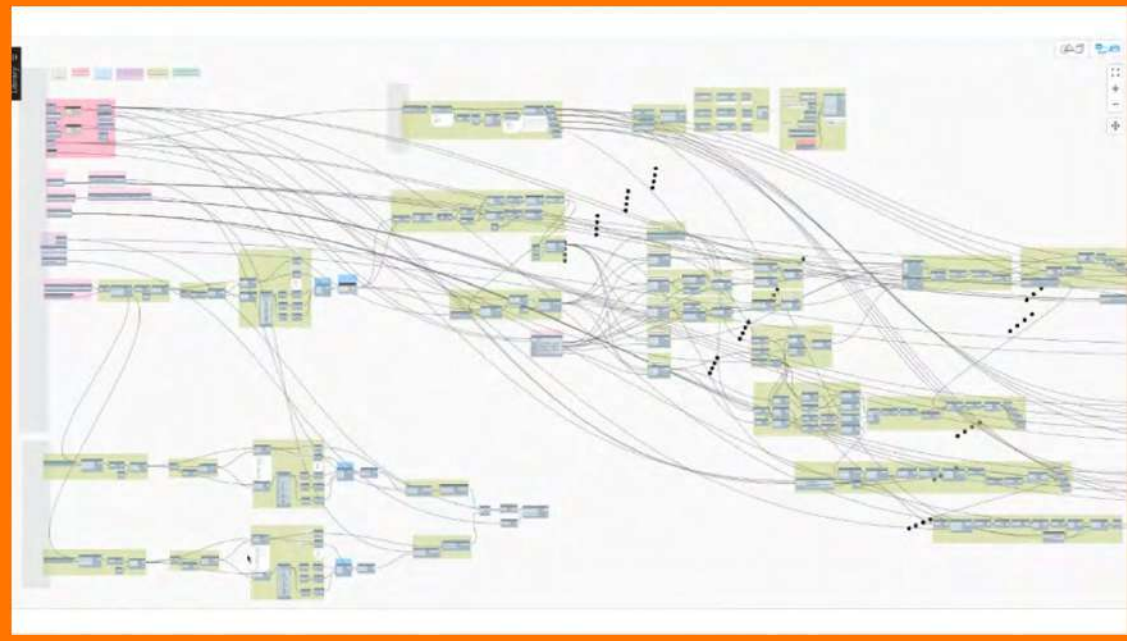


Select solutions rather than develop options



Optimise site layouts using a **genetic algorithm**





Digital assembly from a known **library of components**

The **architecture** of automated construction

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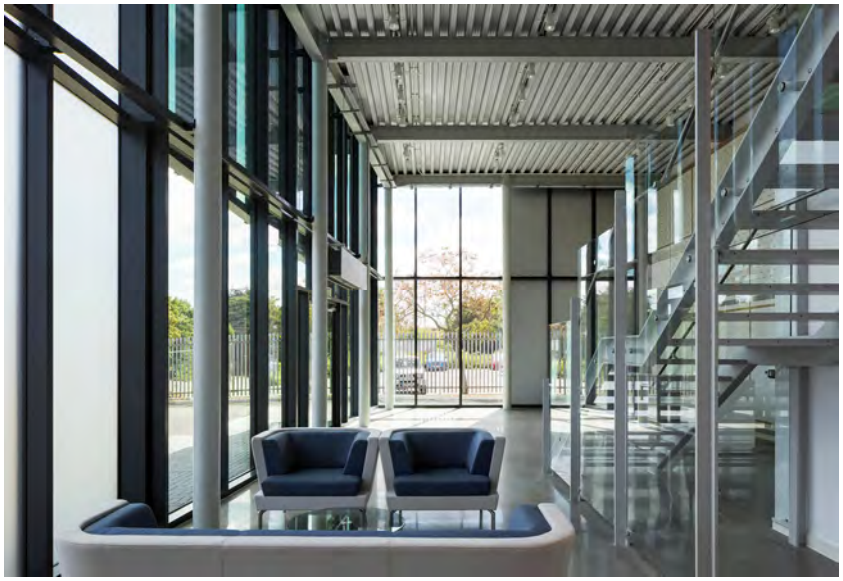
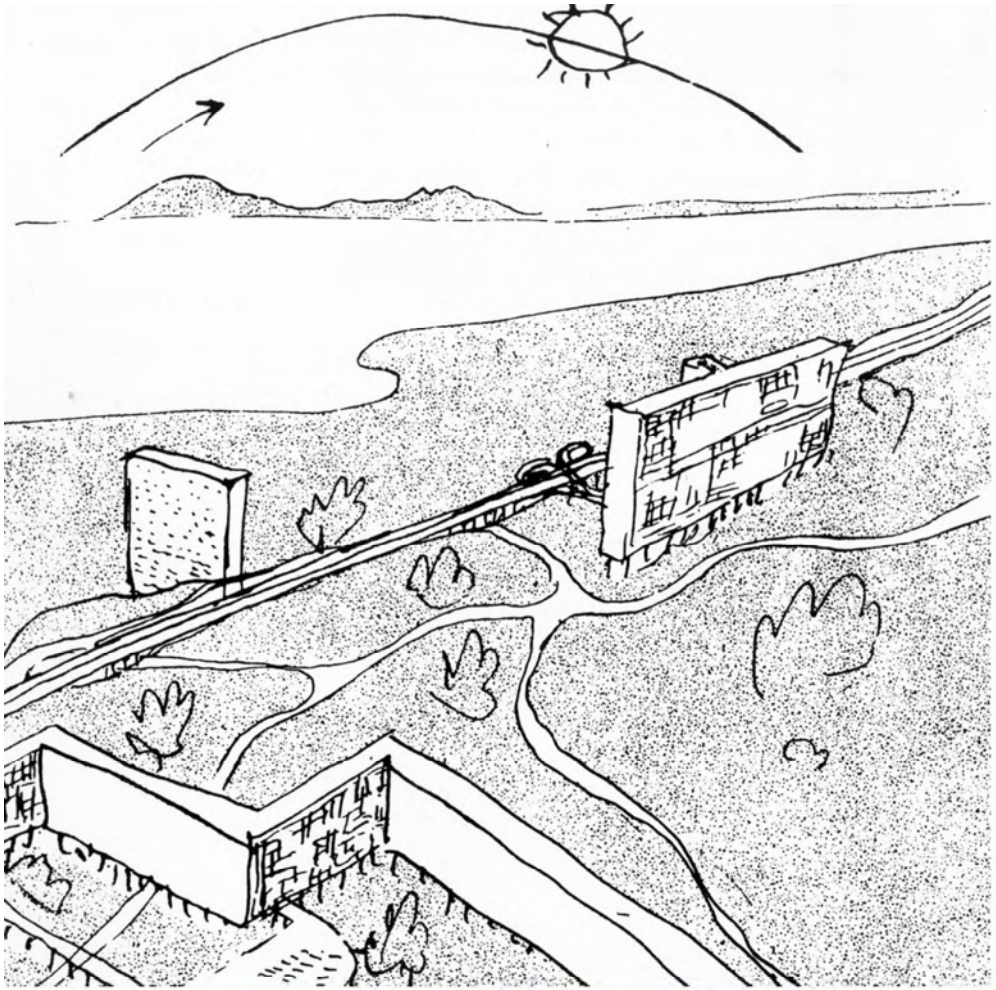
A **platforms approach** is an **enabler** of automated design and construction



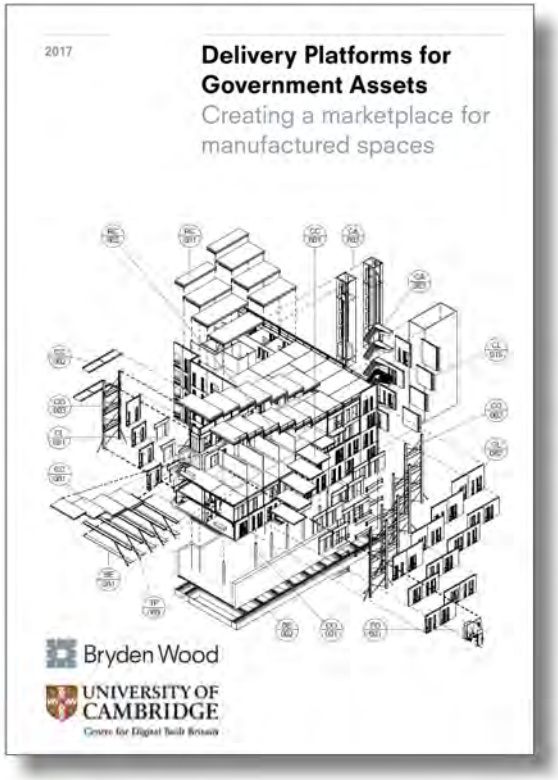
Design for Manufacture + Assembly

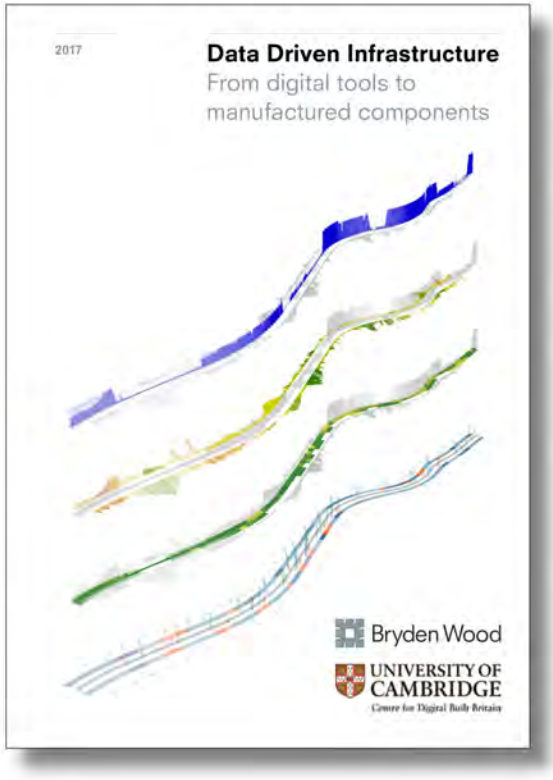


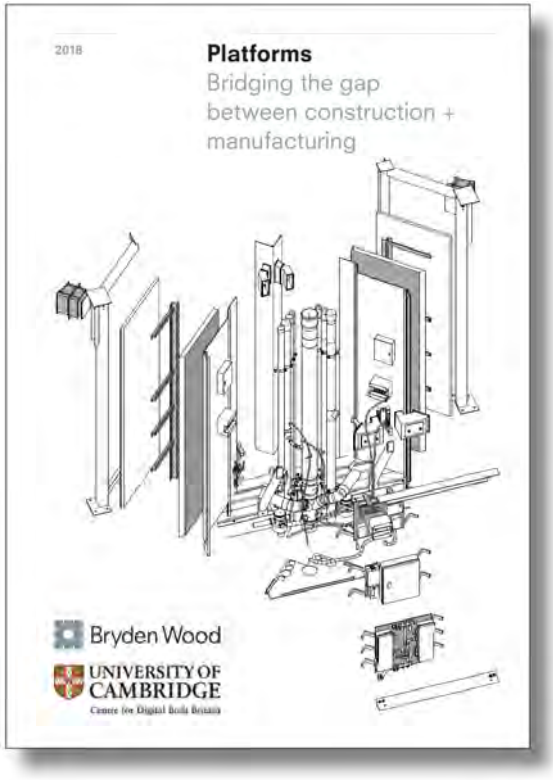
10% of the time
90% of the value

With thanks to
David Miller

90% of the time
10% of the value







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