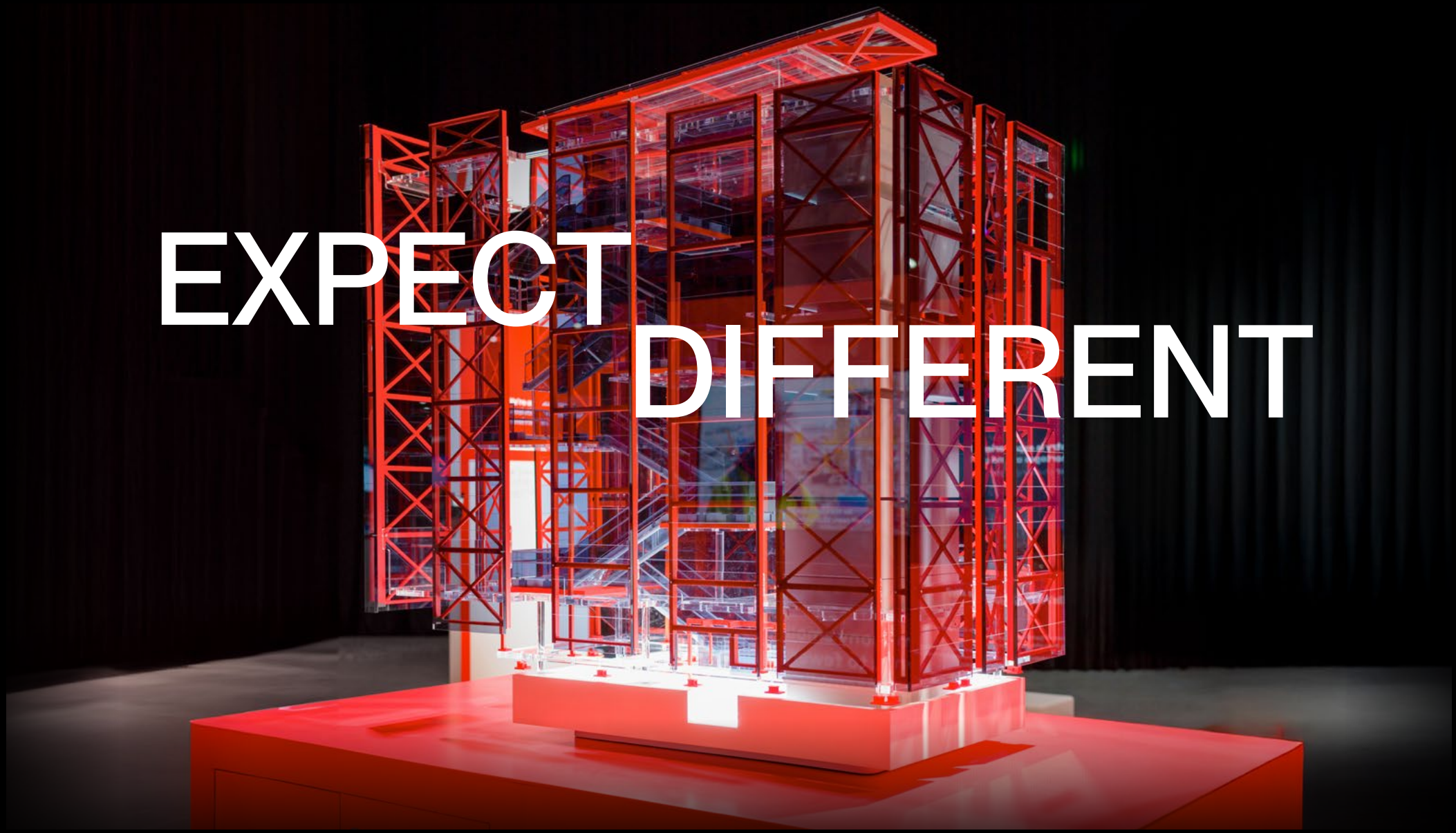
How our kit-of-parts approach
is transforming construction

EXPECT DIFFERENT



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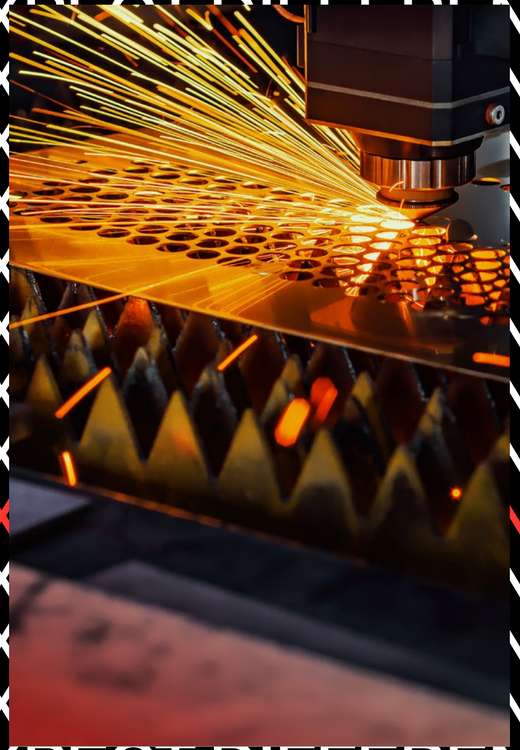


Why hasn't construction achieved the same efficiency, quality control, health & safety, and certainty as manufacturing?

IT'S TIME FOR CHANGE

Our kit-of-parts approach combines advanced manufacturing, digital design and program-level thinking to reshape the building process for a leaner, greener, safer future.

It's flexible, creative and market-leading, and it's already delivering tangible results for our clients.

We're applying it on projects around the world to help accelerate delivery, increase productivity, manage costs and achieve improvements in quality and sustainability.

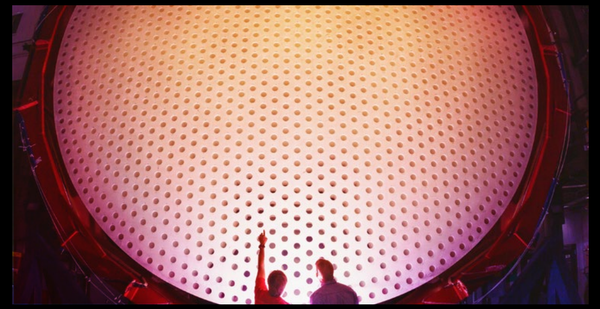
Read on to find out more.

RETHINK CONSTRUCTION
because the future demands better

At WSP, we believe the kit-of-parts is the future of construction, and we're already making it a reality.

"Design for Manufacture and Assembly requires a completely different approach to designing for construction. We are leveraging insights from our latest projects and programs, and applying new skill-sets and game-changing digital tools to deliver the next generation of buildings."

Dale Sinclair, Head of Digital Innovation, WSP, UK



Designing a building has always meant starting from scratch every time, making hundreds of thousands of tiny decisions, which the project team have often made before.

Construction can be just as inefficient: millions of components delivered to site by hundreds of trucks, to be put together by thousands of people.

We can't afford to keep wasting time and resources.

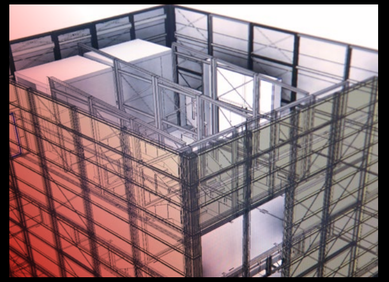
The built environment is responsible for one-third of global carbon emissions, and the world is on a journey to net zero. Buildings are becoming more complex as we design them to perform better, consume less and be delivered more quickly. At the same time, there are fewer workers entering the construction industry, and many new skills for them to learn.

The race is on to build the infrastructure of the green transition and the fourth Industrial Revolution, and to create resilient communities for growing populations. All of this is possible, but traditional design and construction processes won't deliver the change we need.

With our kit-of-parts approach, we aim to achieve the radical transformation of the built environment, and reap many other benefits in terms of time, cost, quality, sustainability, and economic and social value, for clients.

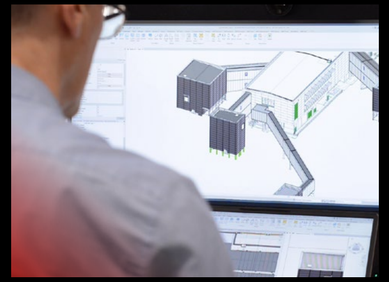
By harnessing the power of digital tools and industrialized construction, and shifting focus from project to program, our expert teams are simplifying decision-making, streamlining design, moving from construction to manufacturing, and applying learning in real time.

REDEFINE POTENTIAL
a new way to design and construct buildings



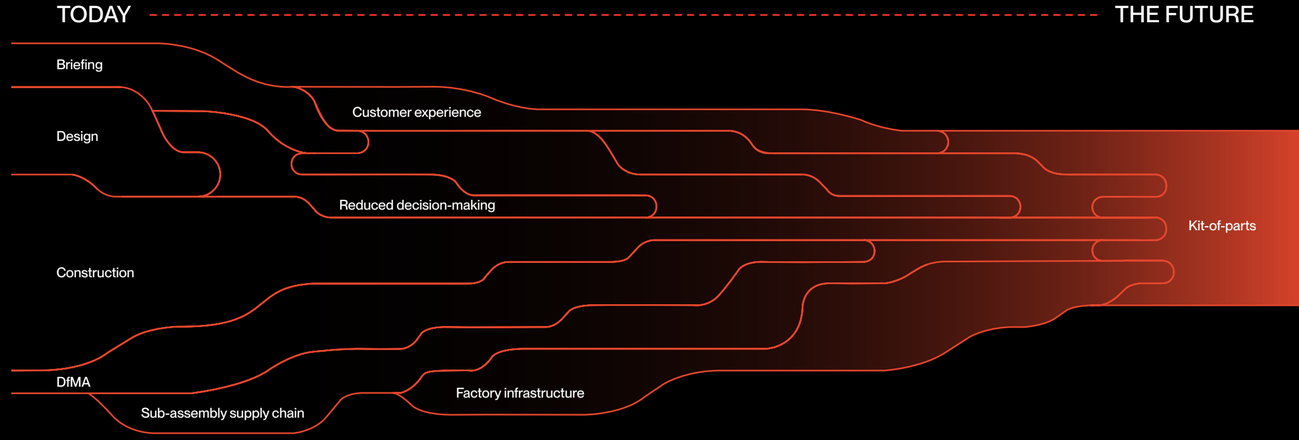
Our kit-of-parts approach enables us to combine customized offsite manufacturing solutions using a Design for Manufacturing and Assembly (DfMA) workflow, and to scale up the benefits across programs.

We determine the optimal balance of innovative construction approaches. Buildings are broken down into large components that can be precision-manufactured and transported to site for rapid assembly.



Capturing data about both the components and the decision-making process allows continuous optimization within and between projects. We can also set program-level policies to deliver client-specific goals.

TRANSFORMING THE PROCESS



Although our kit-of-parts approach can transform the outcomes for a single project, it is about more than that. It is aligned to a vision for the future of construction that our Digital Innovation team is working towards, with every project bringing exciting insights, knowledge and experiences as well as the new skills and digital tools required to take on the next challenge.

HOW DOES OUR KIT-OF-PARTS APPROACH WORK?

We are rethinking design from the ground up, based on six key principles.

OPTIMIZE

Rigorous optioneering and analysis at concept stage identifies the optimal offsite manufacturing technologies and balances them with the most appropriate onsite approaches.

OUTCOME – Design is tailored to offsite manufacturing early in the process; the right onsite methods are integrated into the bespoke solution.

DECIDE

Currently decisions are made intuitively or by groups of stakeholders in a room. With our kit-of-parts approach decisions are captured and recorded in the project database as part of the design process, with an emphasis on "why". They are then able to be mobilized for reuse.

OUTCOME – Effort is not wasted on making the same decisions repeatedly. Greater scrutiny can be placed on program decisions and change control, while project decisions focus on specific challenges and design solutions.

DESIGN

Creating offsite manufacture-ready content and aligning it to replicable decisions, simplifies the design process. Catalogues and configurators streamline manufacturing processes and generate economies of scale.

OUTCOME – Subsequent project design, manufacture and assembly timescales become faster; reduced decision-making allows for a laser focus on project-specific challenges.

MANUFACTURE

The shift away from construction to manufacturing is a significant transformation. The kit-of-parts approach makes the transition from current ways of working as smooth as possible.

OUTCOME – Industrialized construction is faster, cleaner, safer and more efficient. Quality is improved, waste is reduced and economies of scale can be mobilized. Clients can change the way they work at their own pace.

CAPTURE

Information on everything from decision-making to sub-assembly designs is captured in the appropriate digital technology; emphasis is on mobilizing DfMA initiatives at scale.

OUTCOME – The substantial information that exists at the end of every project is set up to be exploited and reused on future projects.

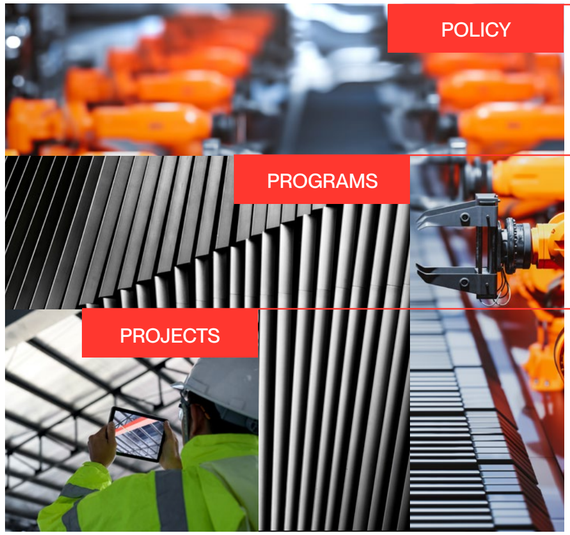
REPEAT

After project one, a stable way of working is determined, aligned to client-specific program goals, catalogues and decisions. For one-off projects, clients can draw on the knowledge, skills and real-time insights from other kit-of-parts projects.

OUTCOME – A program-level approach reaps the benefits of faster, leaner DfMA approaches linked to new procurement and manufacturing models. Creativity is empowered at the project level.

FROM PROJECTS TO PROGRAMS, POLICY AND BEYOND

Our kit-of-parts approach accelerates delivery from the first project onwards, but it's at program level that the full benefits become clear. By streamlining decision-making, enabling mass customization, and shifting construction from site to factory, it could unlock a much broader range of benefits, for clients, societies and economies.



Shifting effort from site to factories opens up a wealth of social value opportunities for our clients. Aggregation enables robotics and automation.

Once created, the kit-of-parts uses catalogues and configurators to balance reuse and repetition with customization. The inherent data capture and standardization opens up the potential for knowledge databases and an AI-driven decision engine to bring greater focus to decision-making at a project and program level.

Redefined project process supports the selection of the most efficient offsite manufacturing solutions, and the fabrication of large sub-assemblies that accelerate delivery.

Our kit-of-parts approach can make design for manufacture more efficient, remove friction and improve productivity.

It can deliver tangible benefits from the first project onwards, and these are amplified at a program level.

It also creates a platform through which emerging innovations in modelling, analysis, materials and manufacturing methods can be readily deployed, and improved in real time to drive further efficiencies.

WHAT BENEFITS CAN A KIT-OF-PARTS APPROACH BRING?

01 FASTER DELIVERY

The first project is designed within standard timescales but with less time spent on site. Subsequent projects become faster and faster, in both design and assembly, as they leverage the kit-of-parts components, models and new workflow. Real-time feedback loops improve the process every day.

By setting key policies at a program level, we streamline the design process and reduce the number of iterations required.

Detailed information on fabrication, logistics and sequencing is produced at early design stage, enabling input from manufacturers, the assemblers and logistics experts, reducing duplication of effort, and cutting lead-in times and handover periods.

Offsite manufacturing with rapid onsite assembly can reduce program risks.

02 MANAGING COSTS

We determine the optimum kit-of-parts at an early stage, from a range of innovative industrialized approaches. This means designs are tailored to cost-effective manufacturing processes with standardization and repetition unlocking the savings offered by offsite manufacturing.

Fixing detailed designs at a much earlier stage enables program-level procurement and more robust negotiations.

Taking a program-level approach unlocks economies of scale, potentially reducing the cost of each subsequent project.

By relocating construction work from dispersed sites to strategically located factories, we can take advantage of local labour markets, offer better working conditions, and avoid paying premiums for scarcity, travel or high-risk environments.

03 HIGHER QUALITY

Building components are precision-made in a controlled factory environment, and assembled onsite to manufacturing tolerances.

By setting program-level policies and removing repetitive, low-value decisions, project teams are laser-focused on adding value, solving unique challenges, and continually improving the product and the process.

Manufacturing delivers higher standards of health and safety, with improved lighting, access and dust extraction, providing a better quality of life for locally based workers.

04 IMPROVED SUSTAINABILITY

Sustainability goals can be set at a program level, with targets for continuous improvement.

Designs can be optimized to use materials efficiently, and to reduce embodied and operational carbon.

Shifting construction from site to factory reduces waste, facilitates circular economy principles, and means fewer deliveries, with lower transport emissions and pollution.

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Our expert teams are helping clients to leverage the benefits of a kit-of-parts approach, from strategy to implementation.

CREATING

proof-of-concept
kit-of-parts solutions

DELIVERING

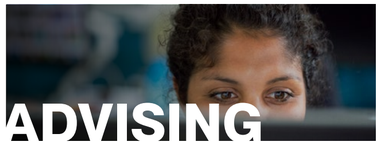
projects using a
kit-of-parts approach

DESIGNING

program-level kit-of-parts
policies, including catalogues
and configurators

DEVELOPING

digital tools to optimize
project briefs for a
kit-of-parts approach



ADVISING

on Design for Manufacture
and Assembly (DfMA)

MODELLING

demand and devising country-level
manufacturing strategies

OUR PROJECTS
OUTS
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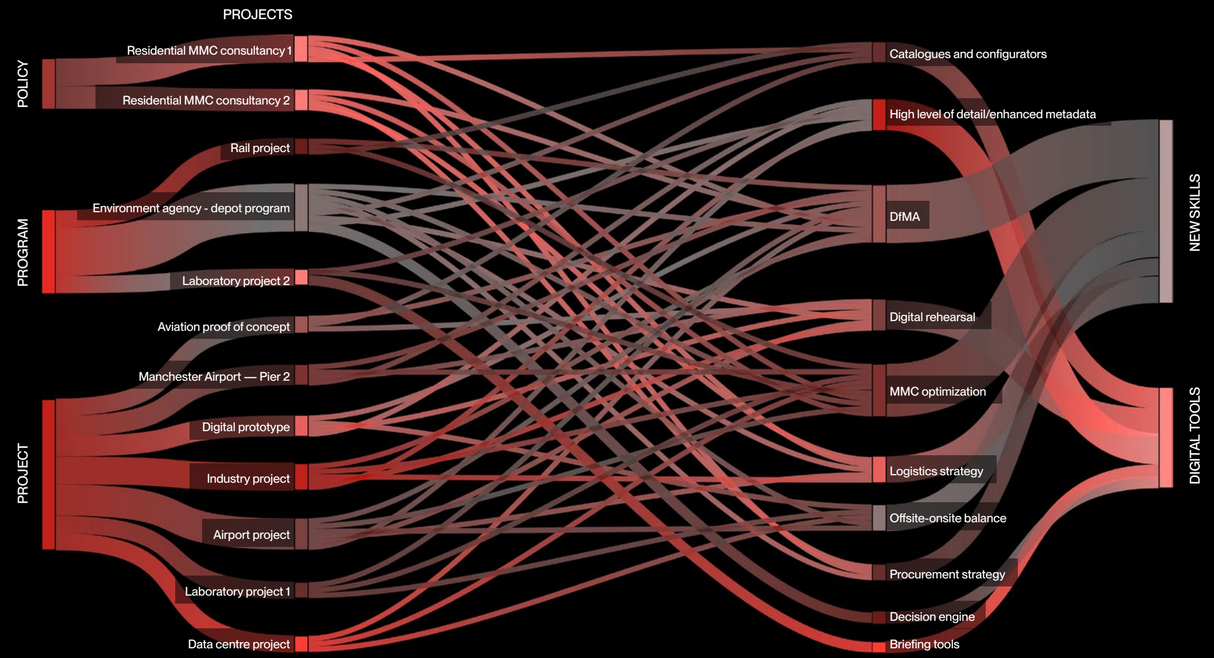
OUTS
OUR PROJECTS

OUR APPROACH IN ACTION

We are applying our kit-of-parts approach in the aviation, rail, industrial, life sciences, defence, data centre and residential sectors.



Many of our kit-of-parts projects are confidential, but this graph illustrates the range of new skill-sets and digital tools that we are creating.

Image courtesy of Mace

ACCELERATE AIRPORT EXPANSION

We are working with contractor Mace at Manchester Airport to deliver the nodes and fixed links for a new pier that will add 12 new gates, significantly expanding capacity.

Taking a kit-of-parts approach, we designed a node that can be constructed from just 67 assemblies, instead of thousands of individual components, which would all have to be transported individually to site. By rationalizing the design into fewer, much larger assemblies, we dramatically reduced the construction time onsite, the pollution and emissions associated with deliveries, and the risks of working in a live airport environment.

Project Manchester Airport Pier 2
Location Manchester
Client MACE

12
new gates

125 tonnes
lower CO_2 emissions compared to traditional methods

5000 to just 67
reduction of individual components

TRANSFORM DEPOT DELIVERY

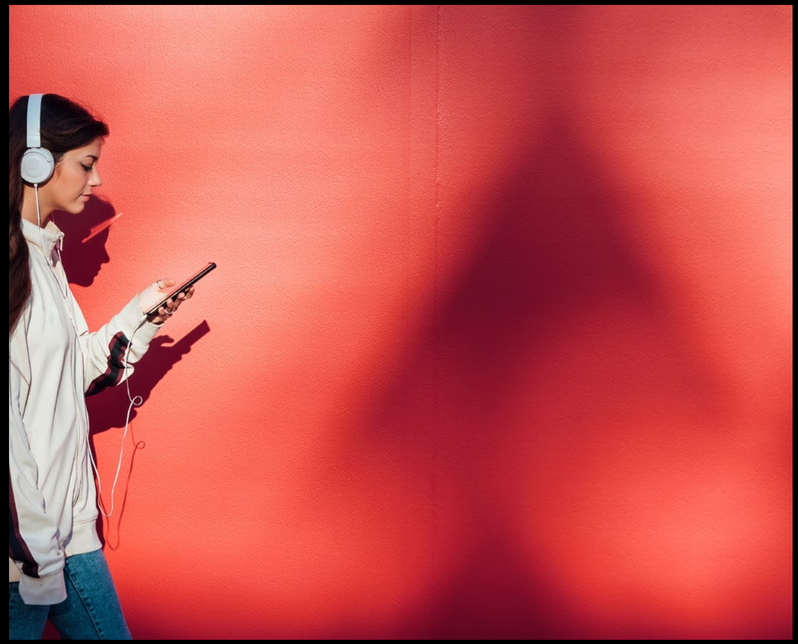
Our digital innovation specialists have been working with the Environment Agency in England to make its depot program faster, more cost-effective, and more predictable.

By applying customization at scale, and taking a program-level approach to sustainability and offsite manufacturing, we have reduced the projected time by 40% and enabled our client to take advantage of innovative procurement and fabrication methods. After the kit-of-parts was developed for the first depot, subsequent projects required 50% fewer documents. We are continuing to drive efficiencies by incorporating real-time feedback as the program progresses.

Project Depot program
Location England
Client Environment Agency

40%
predicted reduction of project duration

50%
fewer documents required on subsequent designs



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wsp

wsp.com/kit-of-parts

WSP is one of the world's leading professional services firms, uniting our engineering, advisory and science-based expertise to shape communities and advance humanity. From local beginnings to a globe-spanning presence today, we operate in over 50 countries and employ approximately 73,000 professionals, known as Visioneers. Together, we pioneer solutions and deliver innovative projects in the transportation, infrastructure, environment, building, energy, water, and mining and metals sectors.

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