Results of Competition: Transforming UK Construction Round 2: MMC, Digital and Whole-Life Performance

Competition Code: 1908_ISCF_CRD_TRANSF_CONSTRUCT

Total available funding is £10,411,467

Participant organisation names	Project title	Proposed project costs	Proposed project grant
ALL DESIGN LONDON LIMITED	DMOC: Distributed Manufacturing for Off-site Construction	£203,042	£121,825
HAL ROBOTICS LTD		£228,720	£160,104
HOARE LEA LLP		£113,852	£56,926
KONICA MINOLTA BUSINESS SOLUTIONS (UK) LIMITED		£203,942	£101,971

Project description - provided by applicants

Distributed Manufacturing for Off-site Construction (DMOC) proposes a system to extract manufacturing information from an enhanced Building Information Model (BIM) and automatically dispatch production tasks to multiple facilities based on, among other factors, process capabilities, capacity and geographic location.

DMOC enhances existing Design for Manufacturing and Assembly (DfMA) approaches, including those for Platforms, by embedding manufacturing process data in digitally designed components and assemblies. This data can be converted directly to machine toolpaths, effectively automatically programming robots. This removal of manual programming is critical to enabling automation for small batch production typical of the construction supply chain.

The DMOC solution will include a hybrid-cloud orchestrator which will communicate with connected production cells to efficiently distribute all authorised workloads which have been submitted to it. The orchestrator will also handle reassigning tasks should any faults occur at a production facility adding supply-chain robustness, guaranteeing business continuity, increasing manufacturing efficiency and improving planning for just-in-time (JIT) delivery.

DMOC production cells will each include an embedded edge-compute device which will handle communication between the orchestrator and robotic hardware controllers, simulate tasks to ensure safe execution and prepare machine code for that specific cell's mechanical configuration.

Successful execution of the project will lower the barrier to entry of automation by simplifying programming, increasing utilisation of machinery and reduce the requirement for capital investment by leveraging existing facilities. It will also grow automated MMC capacity, improve building performance through tighter tolerances and increase productivity in construction processes by up to 40% supporting the goals of the _Construction Sector Deal_.

The project consortium will bring together experts in a number of fields to deliver a solution that would not be feasible without their combined skillsets. aLL Design has expertise in DfMA and have developed modular housing designs using a Platforms approach. Hoare Lea has significant experience with modular construction, BIM and off-site manufacturing. Together they provide the construction experience required to successfully deliver the project. Robotic software SME, HAL Robotics will provide the integration of manufacturing processes with BIM, machine simulation and procedure validation, and communication with industrial machines. Konica Minolta will build upon previous work on their Distributed Cloud Intelligence (DCI) platform to integrate hardware and production process requirements into its orchestration capabilities creating the automated link between BIM and manufacturing cells.

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DAEDALUS ENVIRONMENTAL LIMITED	FutureProof	£575,658	£402,961
Haven Gateway Partnership		£32,488	£32,488
HOMES ENGLAND		£6,395	£0
SWAN NEW HOMES LIMITED		£37,380	£18,690

Project description - provided by applicants

'FutureProof' is a new business model designed to increase the quality, variety, sustainability and speed of delivery of new homes in the UK starting in the south east. It is a whole lifecycle based, housing tenure and delivery model, an alternative to the business-as-usual housing developer approach with the specific aim of accelerating the delivery of zero carbon new homes at scale and overcoming traditionally perceived barriers to the supply of sustainable new homes including low absorption rates.

By redistributing the value created through homebuilding (that would normally be extracted as development profit to shareholders, and acting as a constraint on increased supply), creating new value by reducing waste, increasing speed and productivity, and adopting innovative technologies and construction methods, a genuine, viable route to the acceleration of very high quality, zero carbon development will result.

In FutureProof the value in home construction will be redistributed across the supply chain and used to directly incentivise quality focused outcomes rather than a transactional, lowest cost approach. FutureProof is then financed by introducing an institutional investor whose primary interest is securing a long term, low risk investment return.

From a demand side perspective, FutureProof uses a new ultra-flexible tenure model designed to increase affordability and maximise market reach, ensuring homes are occupied expediently upon completion.

In short, FutureProof:

* Facilitates very high quality, zero carbon homes by providing a mechanism for institutional investment in strategic housing sites at scale
* Delivers a new, ultra-flexible tenure model to increase affordability and enable easier access to home ownership for a wide spectrum of potential occupiers thus overcoming market absorption barriers to the acceleration of housing delivery. It establishes a long term relationship between the occupier and the investor
* Will solely use modern methods of construction to significantly enhance productivity, efficiency and construction standards on site
* Ensures open market land value to landowners and is therefore competitive in the housing market. It has the flexibility to either offer quicker landowner returns or the option to take an equity stake in the development and receive long term investment income
* Offers a real alternative to current methods of delivery to help to overcome the shortage of new homes

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
MONOLITE UK LIMITED	Power ultraSound to strengthen Digital Concrete structures (SounDCon)	£324,984	£227,489
BASF PUBLIC LIMITED COMPANY		£41,771	£20,886
Brunel University London		£138,762	£138,762

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Project description - provided by applicants

The UK construction sector accounts for 9% of UK economy, with a turnover of £386bn in 2017\. However, it is held back by productivity (on average 21% lower than the wider economy since 1997), as it is still mostly a manual industry (with the exception of the design phase) with a labour intensive business model and repercussions in terms of quality, safety, costs, environment.

The UK construction needs to bring the production phase more in line with automated processes already used in other industries (e.g. automotive, manufacturing).

The aim of SounDCon is to develop and optimise a 3D-printing system and process enabling pre-manufacturing of 3D-printed primary structures. This will have different benefits on the UK construction sector, it will improve efficiency, thus productivity, addressing the requirements of the Construction Sector deal and supporting the objectives of TIP strategy and TIES by decreasing:

* Construction time (75% faster);
* Costs (50% cheaper);
* Embodied carbon (about 18% less) through decreasing site deliveries by 70%;
* Waste and defects by 80%.

SounDCon project is based on different previous R&D works of its consortium's members, mainly focused on the development and fabrication of a particle-bed 3D printer and on 3D-printing processes and on the application of power ultrasound excitation to materials structure enhancement. The key technologies are at high TRL, but their integration is new and will need further development and testing in order to be suitable for the construction market.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CLOUD CYCLE LTD.	Digital Sensor Technology for Concrete Monitoring and Surplus Concrete Redistribution	£221,000	£154,700
SUSTAINABLE VENTURE DEVELOPMENT PARTNERS LTD		£30,065	£21,046

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants

Waste concrete has become a global construction problem, with over 500M tonnes of surplus concrete being sent to landfill every year. The CO2 produced for the manufacture of structural concrete (using ~14% cement) is estimated at 176 kg/tonne (This is Concrete, 2017), meaning that 88M tonnes of CO2 is unnecessarily released into the atmosphere every year. To bring the concrete sector in line with the Paris Agreement, its annual emissions will need to fall by at least 16% by 2030 (Energy Technology Perspectives, 2017). There is therefore a strong need to find valorisation in surplus concrete by creating a circular economy for concrete, in turn reducing the carbon footprint of this industry.

In response, Cloud Cycle has developed an innovative solution that combines digital sensor technology in concrete trucks with intelligent analytics to calculate the quality, volume & time remaining before the concrete load sets. Cloud Cycle's online platform enables concrete companies to manage wet concrete loads more efficiently, reducing waste and connecting surplus concrete with buyers, directly reducing surplus concrete from going to landfill, therefore reducing the carbon footprint of concrete production. Cloud Cycle, in partnership with Sustainable Ventures, will work with Sheffield University, London Concrete, Keltbray and CEMEX to develop the digital sensor technology, improving the logistics of their wet-concrete redistribution platform.

Cloud Cycle aligns with the TIP Strategy to 'improve both delivery and operation through technology and modern methods' and in turn aligns with the TIES strategy objectives to increase efficiency, boost the supply chain productivity and adopt new methods of construction to reduce project delivery time and reduce carbon emissions. By managing wet concrete loads in real time & matching supply and demand of surplus concrete, Cloud Cycle is directly improving the supply chain productivity in the construction sector by reducing the amount of concrete going to landfill and associated costs of this, whilst also improving the carbon footprint of concrete by valorising a waste material.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
SKANSKA TECHNOLOGY LIMITED	Ci-iT: Change impact intelligence Tool	£259,431	£129,716
Manufacturing Technology Centre		£295,661	£295,661
MOBIBIZ LTD		£247,350	£173,145
UNIT 9 LIMITED		£213,196	£127,918

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants

Changes can be necessary at any stage in an infrastructure or building project. As well as yielding direct and indirect rework costs and programme disruption, the increased material wastage and knock-on effects causing further errors and reworks make the post-project approval and apportionment of change-related costs complex and highly contentious.

As well as contributing to low industry productivity and profit margins, this challenge presents a primary risk to collaborative project delivery.

In the context of the UK construction sector transformation programme, seeking increased pre-manufacture and technical complexity of buildings to meet performance standards, the requirements to manage impacts, risks and complexity of changes are further increased.

Preventing introduction of construction innovations into live projects, the opportunity to realise disruptive construction-phase improvements and optimise full lifecycle performance is restricted, undermining potential long-term contractual arrangements targeting increased collaboration.

The need for a solution for assessing the impact of change effectively (by having the right information) and quickly (by automating aspects of the process) remains unmet, with fundamental technical and cultural boundaries between existing digital solutions and the intended communities of practice.

In response, Skanska and collaborators -- the Manufacturing Technology Centre, plus SME's Enable My Team and UNIT9 -- have a vision to create the first AI-enabled digital construction platform for data-driven change impact intelligence and management: Ci-iT.

Underpinned by a core knowledge management platform to integrate, virtualise and analyse unstructured data from multiple tools across the construction management workflow, Ci-iT will leverage machine learning, impact models and a novel change envisioning layer to allow near real-time change impact intelligence and visualisation. Facilitating open discussions with clients to enable rapid, optimally informed decision-making in collaboration, Ci-iT therefore targets an increase in productivity, resource efficiency and overall innovation capacity across the construction industry.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
FUTURE JOINERY SYSTEMS LTD	Building Information Manufacturing - Configurable BIM tools to drive efficient fabrication.	£180,584	£126,409
FOURTH DIMENSION ROUTING LTD.		£4,800	£3,360
MARK WRAY ARCHITECTS LIMITED		£2,634	£1,844
ROCKETMAKERS LIMITED		£28,568	£0

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants
This project looks to implement systems and tools for designers to enable greater and easier access to digital fabrication processes for the manufacture of joinery items in construction. The approach is applicable to joinery work at all stages of a build, from complex concrete formwork, timber frame cassettes, general 1st and 2nd fix joinery, staircases, cabinetry and kitchens. These digital manufacturing processes become economically viable in any situation where a high level of accuracy, superb finishing or complex geometry is required. The tools developed are intended to operate directly from CAD and BIM software. They allow for a streamlined BIM to Manufacturing workflow that greatly improves the speed and effectiveness of information exchange, and by embracing digital manufacturing processes, significantly improves the speed and efficiency of capententry work undertaken on site. The proposed system provides a designer with a library of smart adaptable and configurable BIM objects and enable a designer not just to press print, but to press _**make**_.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CONTILIO LIMITED	Smart control room for construction industry, powered by 3D AI	£465,590	£325,913
Imperial College London		£196,838	£196,838

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants
Construction is a $12Tn industry suffering from very low productivity and digitization. This results in major delays and cost-overruns to be the norm, wasting $5Tn annually. In 2018, we identified the lack of real-time visibility on construction progress and performance to be a key problem. The manual reporting process means decisions made based on intuition as opposed to actionable insights and risks/issues managed with significant delay, resulting in major rework, low productivity and compounding risks. Last year, the Contilio and Imperial College London (ICL) partnership was awarded a significant Innovate UK R&D grant through the "transforming construction" challenge to tackle this key problem. Through application of cutting-edge technology, we have successfully developed an AI-based software for automating the broken construction progress and performance, thus, helping deliver construction and infrastructure projects on-time, on-budget and with significantly enhanced productivity and reliability. We have also conducted state of the art research into computer vision and deep learning methods for the Built environment. Building on the successful momentum of last year's grant, this project will further advance Contilio's 3D deep learning technology, conduct state-of-the-art research, and develop a complementary software module. We will develop a scalable and automated data labelling approach for 3D deep learning applications in the built environment and create an AI-based software prototype that fully automates the construction quality and certification processes. We will compare different data collection technology to evaluate whether low cost camera outputs could be used to collect reliable quality site data. We also will investigate the use of Scan-to-BIM methods, contributing significantly to the creation of smart and structured digital twins. This project is conducted by Contilio, a fast-growing construction tech startup based out of London and Imperial College London's Department of Computing and Department of Civil and Environmental Engineering with the support of multiple industry partners. It is aligned with the objectives of the UK Government Construction Strategy and ties into the overall BIM process.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
IES LIMITED	evolving Digital Twins to optimize whole Life performance of new buildings – eDigiT2Life	£553,834	£332,300
HLMAD LIMITED		£85,598	£51,359
MULTIPLEX CONSTRUCTION EUROPE LIMITED		£123,027	£61,514
SCIENCESCOPE LIMITED		£154,362	£108,053
University of Glasgow		£307,431	£307,431

Project description - provided by applicants

The project's ambition is to develop a methodology for improving the modelling process during design stage of buildings fulfilling a twofold goal:

1. Make compliance models (used for building energy and environmental rating) more accurate in predicting a building's real operational performance, thus minimising the performance gap between predicted and actual energy consumption of buildings.
2. Make the compliance models useful beyond the design/compliance stage of new constructions by enabling them to become the basis of an operational Digital Twin (DT) of a building that can be used to optimise its energy, comfort and flexibility performance and additionally, provide a multitude of other energy and non energy services (e.g. electric vehicles charging, space optimisation).

To fulfill that ambition eDigiT2Life will develop a methodology to inform initial compliance modelling on the future sensing and metering infrastructure based on Internet of Things (IoT) devices (stationary, mobile and wearable) that are anticipated to proliferate in future indoor built environments. The combination of that digital infrastructure with the advanced modelling and visualisation capabilities of dynamic simulation models enables the development of representative, reliable, accurate and powerful operational Digital Twins of buildings. The modelling engine of the DT enables the provision of multiple energy services to buildings. The inherent 3D visual representation of the building in the dynamic simulation model allows the development of immersive and insightful interfaces of the DT that can be used to inform but also motivate and inspireoccupants and users.

The eDigiT2Life innovative methodology includes evolving and fortifying the initial compliance model created at the design stage of the building to a calibrated model at the handover and commissioning stage all way through to a fully blown digital twin of the building for its operational lifecycle.

In that way the initial compliance model, which is not being used beyond the design and constructional stage of a building although is a not an insignificant cost, can organically evolve with limited additional cost to an operational Digital Twin of the building, regaining value that can be further commoditised during the lifecycle of the building. The functionalities of the DT allow the building owners to optimise their building energy assets and increase their value while the building occupants can enjoy a more comfortable and flexible indoor built environment.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
MORTA TECHNOLOGY LTD	A disruptive data-centric end-to-end requirements planning and automated verification platform	£336,150	£235,305
MOTT MACDONALD LIMITED		£51,841	£25,920

Project description - provided by applicants

Construction projects are notorious for being critically delayed and going over budget - 98% of all megaprojects ($1billion+) suffer cost overruns of \>30%, 77% are at least 40% late (Mckinsey). The safety and quality of buildings are under increasing scrutiny following the Grenfell Tower tragedy and the Hackitt Report. It is globally recognised within the construction industry that a 'golden thread of information' is key to overcoming these issues. Currently, requirements of all types (information/functional/performance/regulatory, etc.) are fragmented and locked up in documents, making them difficult to apply consistently and uniformly. Over-burdened project management teams, therefore, must manage project requirements manually, configure and change manually, using disconnected, disjointed, complex paper-based processes. This approach is subject to major human error and results in significant mistakes, delays, waste and poor audit trails. There is a recognised _unmet market need for data-driven solutions that can enable improved information management to increase the certainty of project outcomes, increase productivity and reduce costs, and provide better audibility and transparency._

The proposed project seeks to develop a novel automated requirements management platform where data-rich and machine-executable requirements can be collaboratively and progressively defined, planned and agreed upon, and deliverables automatically verified against specified requirements, thus offering a unique scalable solution for improved requirements, drastically reducing risk and costly rework, and improving quality and certainty of projects.

The project builds on Morta's existing information requirements planning and management platform (MVP). To meet expressed industry need, government priorities, and to become a fully viable commercial offering with market-disrupting potential, it is critical that the platform is technically advanced to enable end-to-end requirements management for requirements across the lifecycle of a project. This project focuses on proving the feasibility of this technically complex approach through the development of a proof of concept prototype (TRL5) and testing in the field to provide initial validation. Significant benefits are foreseen, e.g. Increased certainty of project outcomes; shorter project execution times and cost reductions through reduced project rework and waste; increased efficiencies and productivity; improved safety, quality, auditability and transparency. The project will deliver ambitious growth and increased knowledge for both project partners, with further opportunity for R&D investment.

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CITY SCIENCE CORPORATION LIMITED	From RIBA to Reality – Deep Digital Twin to enable Human-Centric Buildings for a Carbon Neutral Future	£786,261	£550,383
University of Exeter		£335,912	£335,912

Project description - provided by applicants

"RIBA to Reality" is a transformative industrial research project to support the RIBA design process right through to delivery and operations of the next generation of Carbon Neutral Buildings. Using digital twining technology the programme will deliver a hollistic approach to proactive energy control, by elevating Building Information Models (BIM) so it is capable of tracking live or simulating both human building usage and energy demands. The project will also explore new methods of simulating and monitoring transport to and from the site to minimise and monitor its impact on external travel demand.

\`RIBA to Reality' is uniquely centred around two university buildings as real world test-bed. 1) The Living Systems Institute ([https://www.exeter.ac.uk/livingsystems/][0]) which is built and in operation will provide real world data to trial and test the new technology and methods proposed, showing how digital planning assets can be aggregated to create an operational digital twin. 2) Project North Park ([https://www.exeter.ac.uk/about/vision/capitalstrategy/featuredprojects/projectnorthpark/][1]) , a £70M visionary capital investment, with the ambition to be carbon neutral over it's life time, is in early stages of design. This programme will explore, how the new technology can then be used to support design decisions at critical stages, in particular looking at how the building could exceed it's already ambitious energy targets by taking into account its wider footprint.

[0]: https://www.exeter.ac.uk/livingsystems/

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TATA STEEL UK LIMITED	Fabrication Automation for Steel Lattice Trusses (FASTtruss)	£214,441	£107,220
BRYDEN WOOD TECHNOLOGY LIMITED		£136,500	£81,900
University of Sheffield		£150,001	£150,001

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants

The FASTtruss project is focused on developing a Design for Manufacture and Assembly (DfMA) solution for off-site automated production of steel tube lattice-truss fabrications. This innovation will potentially unlock major opportunities for both the UK and export markets.

Currently, lattice trusses are manufactured in a bespoke manner where extensive labour input, manual-handling and limited repeatability present challenges to increasing efficiency. The project will use DfMA to design a suite of standardised steel lattice truss systems which are parameterised for mass-customisation. Furthermore, it will establish the economic viability of creating a fully-automated production facility and a physical proof-of-concept demonstrator that incorporates automated assembly and robotic welding processes.

The technologies developed in this project will initially be used for the development of major structural components for warehouses for both domestic and export markets. However, the technologies are scalable for a very wide range of long span buildings in the public and private sectors, including schools, sports halls, airport terminals, industrial buildings. The project will lead to a streamlined one stop shop process for clients and will demonstrate reductions in costs and delays, together with improvements in productivity and outputs, as well as addressing some of the current skills-shortage in construction.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
EHABITATION LTD	Using IoT & DLT to automate the collection and operation of weather related clauses in standard NEC construction contracts: The Weather Ledger	£173,590	£121,513
BAM Nuttall		£112,588	£56,294
CLYDE & CO LLP		£69,828	£34,914
CONNECTED PLACES CATAPULT		£80,192	£80,192
DIGITAL CATAPULT		£89,715	£89,715
Ferrovial Corporation UK		£62,819	£31,410

Project description - provided by applicants
It may be annoying for you when it rains, you get your brolly out and move on, but for the construction industry it raises a whole host of questions. Is this above or below the 10 year average? Is it disrupting work, by how long and what's the cost? As it stands today weather related disputes in contracts last up to and over 12 months and can have millions of pounds hanging in the balance. It's a wasteful and stressful process that creates friction and reduces productivity. That's where the EHAB Weather Ledger (EWL) comes in, we deploy Internet of Things devices on construction sites to take hyper-localised weather readings, record this to a blockchain that all parties agree is the digital 'source of truth' and we provide self-executing smart contract clauses which calculate the outputs and compensation requirements, only needing human input if a complication arises. Bad weather is annoying for everyone and it's about time to take this outdated process off the plate of public and private contractors.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
NPLAN LIMITED	A new paradigm in managing risk and execution contracts through the use of AI	£375,968	£263,178
WS ATKINS LIMITED		£117,530	£58,765

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects

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Project description - provided by applicants

Major infrastructure projects have the potential to transform communities who benefit from them, but the way the construction industry manages risk and executes contracts today has been outgrown by the immensely ambitious, complex, and demanding modern major projects of today.

nPlan and Atkins have a vision for an industry with new business models, where risk is distributed fairly between parties, where projects are delivered in line with expectations, and where waste is reduced. To deliver this, these business models have to be underpinned by data and emerging techniques for learning from this data, like artificial intelligence. Recent advances in these computational methods and the reducing cost of computing power means that the ambition to transform the way we deliver complex projects is here, today.

nPlan's patent-pending technology applies data science and machine learning to thousands of previous construction project timelines, the largest dataset of programmes in the world, offering a unique scalable solution for improved certainty and confidence in project planning for future projects. This approach means the platform can learn about what was planned to happen and what transpired on projects, enabling a future with reduced human bias, subjectivity and inaccuracy.

As a global leader in engineering consulting and programme management, Atkins hold the knowledge and status to make meaningful change in the industry. They are well position to analyse the status quo, identify opportunities for improvement, and the execute on these ideas on their own projects.Together, nPlan and Atkins will leverage our technology, expertise and networks to shape the way modern construction projects are delivered.

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QUADRANT CONSTRUCTION SERVICES LIMITED	DfMA + Business Intelligence Toolkit	£286,129	£71,532
HAWKINS BROWN DESIGN LIMITED		£24,740	£6,185
HTA DESIGN LLP		£39,724	£13,903
VIRTUAL VIEWING LIMITED		£114,211	£51,395

Project description - provided by applicants

This Experimental Development project is a 15-month development programme for a Design for Manufacture & Assembly (DfMA) and Business Intelligence Toolkit. In responding to this competition call and the Transforming Construction ISCF objectives to transform the construction sector, the project will develop a ground-breaking digital solution that addresses the key themes of:

* digital information management, tools, systems and standards
* modern methods of construction (MMC) and platform based approaches
* business models, procurement, analytics, benchmarking and metrics

In alignment with the Construction Sector Deal strategic ambitions, this project will develop a digital design & construction Toolkit that enables organisations to significantly improve construction productivity through effective implementation of DfMA, Offsite Manufacturing technologies and products, alongside business intelligence systems using digital techniques. It will enable and encourage much needed platform-thinking right across the sector and its supply chain, supporting and complementing the aims of the Construction Innovation Hub.

Whilst the project team is largely experienced in housing delivery, this toolkit will be developed to enable other asset owner-operator organisations to adopt it and configure it to their specific requirements, irrespective of sector.

The project is led by L&Q, one of the largest Housing Association Developers in the UK. The business has recently committed to a 10-year roadmap to adopt and integrate a series of offsite solutions and digital processes into its delivery operations. The bid brings together a collaborative team of Client, consultants and supply chain members to push the boundaries of digital design technology and respond to the construction industry's need to increase sector productivity, as well as the quality and performance of buildings.

The project team partners include:

* L&Q (Quadrant Construction Services Ltd) - Housing Association Developer
* HTA Design Ltd - UK housing DfMA specialists
* Hawkins Brown - UK offsite design and BIM specialists
* Virtual Viewing - Advanced construction modelling, animations and applications software developer
* Business Intelligence, Data Analytics Collaborators (Various - TBC)

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
AECOM LIMITED	Modular Electrics	£334,833	£167,416
BRUCOM DISTRIBUTION LIMITED		£303,197	£212,238
CLARION HOUSING GROUP LIMITED		£109,284	£54,642

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Project description - provided by applicants
This project shall revolutionise the speed and safety of electrical installation in new build homes by employing Modern Methods of Construction. An enterprise formed of AECOM (a multinational engineering firm), Clarion Housing Group (the UK's largest social housing association with a programme of 50,000 homes in the next 10 years) and Brucom (UK manufacturer and supplier of electrical and electronics systems) has been established. This enterprise will collaboratively develop a modular solution for wiring electrical components in a new build home, simultaneously reducing the cost, time and waste produced while increasing the productivity in the construction industry and allowing a full digital design before implementation.

Results of Competition: Transforming UK Construction Round 2: MMC, Digital and Whole-Life Performance

Competition Code: 1908_ISCF_CRD_TRANSF_CONSTRUCT

Total available funding is £10,411,467

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
PLACES FOR PEOPLE GROUP LIMITED	IGNITE (Integrated Intelligent Digital Tendering System)	£141,649	£70,824
LYNQ LIMITED		£311,448	£218,014
MODULARWISE LIMITED		£211,018	£126,611
MTC OPERATIONS LIMITED		£413,674	£413,674
NORTHMILL ASSOCIATES LIMITED		£33,022	£23,115
PROJECT ETOPIA UK LIMITED		£191,000	£133,700
TOTALLY MODULAR LIMITED		£193,281	£135,297

Project description - provided by applicants

IGNITE is a integrated software solution that will transform housing design, costing, tendering and manufacturing for MMC. It will create a transparent procurement process for housing developers and MMC suppliers, and give certainty of specification back to housing providers and asset managers. It will act as the basis of the 'Golden Thread of Information', and allow landlords to respond proactively to changes in regulation throughout their supply chain.

The aim of this project is to develop a digital process to reflect the roles of Architects and designers, and Quantity-surveyors into Manufacturing Supply-chain System (AQMSS) to support and enable a more dynamic and agile supply chain for modular housing. The AQMSS will deliver transparency of product design and costs and provide a full and complete digital record of procured houses to better enable and support whole life asset management.

The project will enable all of the consortium partners (and their sector equivalents throughout industry) to deliver their products and services more effectively, efficiently and collaboratively. This will increase opportunity and drive greater productivity for all involved. Consortia partners are key stakeholders in the current state process and will be direct beneficiaries of the outcomes.

Digital tendering will focus OSCs on improving their factory efficiency and adaptability. It will enable design and cost changes to be monitored in real time with transparency on both sides of the supply chain, providing mutual benefits.

MMC enabled home builders are expected to achieve a 30-50% increase in the effectiveness of their resources (employees and machines), helping to reduce the cost of manufacture and ultimately the price of OSC homes. This digitalisation and streamlining of the supply chain is expected to drive further efficiencies while allowing OSC home builders to react and respond to changes in regulation, local market demand, material specifications and other design changes. Having better visibility of the design and costing process, Registered Providers (RPs) can optimise supply chains and bulk procure components, materials, fixtures and systems more effectively, reducing capital and operational costs. We anticipate material cost reduction of up to 10%. Planning and forecasting project delivery from "decision to build" to placing an order could be reduced by as much as 8 weeks.

The project consortia includes a property developer, a number of Off-Site Construction (OSC) and modular building manufacturers, toolchain developers, and systems integrators, covering the entire product development cycle and supply chain for these products.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
BAM Nuttall	One Source of Truth: Using AI & Computer vision to reduce contract disputes, manage warranties in MMC building and measure productivity & safety	£201,385	£100,692
BUILDING RESEARCH ESTABLISHMENT LIMITED		£57,928	£57,928
Cranfield University		£136,826	£136,826
GLIDEOLOGY LIMITED		£221,541	£155,079
WERNER HOMES LTD		£36,000	£25,200

Project description - provided by applicants

Contract administration is one of the leading cause of construction disputes in the UK. There are many reasons, including the bespoke nature of much of construction, lack of standard productivity rates, objective records, and time lags between issues and communication with the delivery team/supply chain in order to effect mitigation. Such lags lead to productivity loss, delays in payment, erosion in collaboration and in worst case scenarios, costly legal cases that further erode productivity.

Such issues can impact on collaborative arrangements between client and contractors when delivering innovative solutions (such as housing delivered using modern methods of construction, MMCs). The true causes of delays or productivity issues may be incorrectly assigned to the innovation rather than other aspects of the construction programme. Additionally, warranty (and insurance, mortgages, assurances) providers need confidence that the manufacture and assembly of homes is consistent and that appropriate quality checks are applied to help minimise the risk of failures in use.

Our **'one-source'** solution will address these issues. It includes:

1.A system of work (including a pre-start service) that allow clients and contractors to identify key project risk areas and associated productivity and progress metrics in line with contract or warranty needs.

2.A framework of digital modules (including internet of things (IOT), computer vision (CV) and artificial intelligence (AI)) for monitoring asset availability and usage, man-hour and working type of staff, and work progress.

The main project outcome will be a Proof-of-concept version of the solution. We believe that a successful project will derisk the internal funding needed to produce and roll-out a full commercial-level version, enabling us to move quickly to market.

The project will be led by **BAM Nuttall**, who will address contractual requirements and provide access to infrastructure construction sites to enable the 'one-source' solution to be piloted and assessed in the context of contract administration. **Werner Homes** (an SME house builder) will provide access to MMC-based sites and provide the use case for the requirements of warranty provision and productivity measurement in the housebuilding context. UK SME **Glideology** will develop the integrally scalable software and hardware solution. **Cranfield University** will bring Computer Vision and Artifical Intelligence expertise. **BRE** will provide expertise on the needs of warranties for housing (building on the BPS 7014 standard) and coordination with the Construction Innovation Hub.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
BIM ACADEMY (ENTERPRISES) LIMITED	AI-driven and real-time command and control centre for site equipment in infrastructure projects	£163,300	£114,310
BUILDSTREAM LIMITED		£300,605	£210,424
Northumbria University		£178,985	£178,985
WALTERS PLANT HIRE LIMITED		£49,996	£24,998

Project description - provided by applicants
Site plant and equipment (P&E), particularly heavy earthmoving equipment such as excavators, bulldozers and trucks represent a major cost element in construction projects ranging from 10% in a commercial project up to 50% in major infrastructure projects such as highways, rail lines and energy projects. P&E are a critical resource that is often involved in project delays, and a major contributor to on/offsite congestion and air pollution (for example, they contribute up to 7% of London's NOx emissions). Previous research by the consortium within HS2 showed that utilisation rates are as low as 30%; crossover of equipment requirements between work packages causing three to five times equipment duplication/redundancy, and site congestion resulting in H&S risks and unnecessary overspend. Site P&E has been a major blind spot for a long time. With £600 billion of public and private infrastructure investment planned over the next 10 years (TIP, 2017), there is a significant opportunity to address this productivity issue and develop an internationally leading UK-based solution. Following the successful feasibility study where we have tested the collection of live data from site P&E and used machine learning to estimate productivity of site equipment, this project aims to advance our solution into the industrial research stage by developing and testing the first of its kind AI-driven and real-time command and control centre for site equipment in infrastructure projects. The project will contribute to the Transforming Construction ISCF Programme through the development of novel "digital information management, tools, systems and standards" (that is through our command and control dashboard supported with AI) and "analytics, benchmarking and metrics" (that is through the generation of construction earthwork benchmark data).

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
PROCESS INNOVATION FORUM LTD	Digital Compliance Platform for the Built Environment.	£220,440	£154,308
AEC3 UK LIMITED		£98,041	£68,629
Highways England		£0	£0
PASSIVSYSTEMS LIMITED		£75,528	£52,870
SERO ENERGY LIMITED		£74,653	£52,257
SOLIBRI UK LTD		£62,032	£43,422

Project description - provided by applicants

The project has been developed and will be delivered by the **Digital Compliance (D-COM)** network (inaugurated through the Centre for Digital Built Britain), who completed in-depth research that proved there was a clear appetite for the digitisation and automation of regulation and requirement checking. It also builds upon the concerns raised in the Hackitt review on the Grenfell Tower disaster on regulatory responsibility and the departures from ongoing compliance and monitoring that have become are a systemic problem in the construction industry.

This project will develop, and then demonstrate an open platform-based approach to the digitisation of compliance process in the construction sector. This platform will integrate the currently limited software vendor adoption together with the scattered development of ad-hoc approaches, into a cohesive ecosystem enabling the widespread adoption of digitised compliance processes across the construction industry.

This much-needed development and digitisation of compliance processes brings advantages of increased accuracy, improved productivity, and reduction in costs. This digitisation of compliance processes leads to a vision where continual assessment of a built assets compliance against requirements is automatically undertaken throughout its lifecycle. Providing for a systematic management of built assets with strong compliance processes, accountability and digitised record keeping and change control.

This will be achieved through the development of open standards for digitising regulatory/requirement clauses, along with standardised APIs to retrieve/modify and manage and execute checking processes based on these digitised clauses. A demonstration prototype will be constructed and current state of the art software currently in use will be modified to support the new draft standards.

These developments will be demonstrated in several example projects across a variety of case studies from multiple domains in the construction sector I.e. buildings and infrastructure. These demonstrations will allow both the technical feasibility as well as the productivity benefits and commercial potential to be proven. The standards developed in this project will be released publicly as draft standards, enabling a wide range of construction industry stakeholders to benefit, bringing the UK to the verge of the mass adoption of automated compliance processes.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
SPECWALL ALLIANCE LIMITED	'Specwall-LB '- A finish-ready offsite-manufactured composite panelling system for loadbearing wall applications to replace inefficient and costly traditional 'assembled-on-site' solutions.	£396,534	£277,574
Loughborough University		£169,551	£169,551

Project description - provided by applicants

The UK has much to do across sectors to compete better in global markets but domestically, the construction industry languishes as the least productive sector in the UK (more than 20% below the average output per hour for the whole economy in 2017). Whilst construction productivity grew by 3.8% between 2016 and 2017, the industry has a long way to go. As the industry looks to address the Government's challenge of building 300,000 new homes each year, amidst a multitude of commercial and market pressures, it needs to become much more productive.

For decades in the UK, housebuilders have relied on aged onsite construction methods using block or timber partitions/joists with infill insulation and plasterboard facings for internal walls. These methods are labour intensive and slow, require a relatively skilled workforce, perform poorly from a fire and acoustic perspective, involve hazardous activities and are extremely wasteful -- up to 25% waste is common when using these traditional methods. In all but the very highest specification builds, the finished result cannot approach the accuracy and precision possible with integrated 'engineered' factory-made solutions.

The 18-month Specwall-LB project (a collaboration between Specwall Alliance and Loughborough University is the first major step towards providing the UK's housebuilding sector with an offsite-manufactured loadbearing 'ready to paint' solution for internal and external walls.