Results of Competition: Increase Productivity, Performance and Quality in UK Construction

Competition Code: 1807_ISCF_IPPQUKC

Total available funding is £13.3million

Participant organisation names	Project title	Proposed project costs	Proposed project grant
GLOBALHOM LIMITED	Increasing Productivity and Quality in Mass House Building	£756,899	£529,829
BOUYGUES (U.K.) LIMITED		£102,328	£0
ENVIRON AUDIO LIMITED		£25,862	£0
MCCORMACK TECHNOLOGIES LIMITED		£14,456	£0
University of Surrey		£98,966	£98,966

Project description - provided by applicants

GlobalHOM is a research-led proptech startup with over 10,000 hours of engineering time invested in developing a new approach to home production. We have designed a home as a user focused, high quality and sustainable product by reimagining the value-chain in mass home construction. Our first product is a 1,200 sqft 2 bed residential unit called the GlobalHOM Model TS1\.

The Model TS1 is designed by award winning British product designer Lee McCormack whose portfolio includes working with McLaren of F1 developing high tech immersive environments. GlobalHOM's Lead designer is Frank Stephenson, a world renowned automotive designer responsible for the Mini Cooper, the Ferrari FXX and until 2017 was the design director at McLaren Automotive.

The Model-TS1 technology was developed over a four-year period. The outcome is a new approach to home production with the potential to achieve the highest possible carbon credentials by employing best-in-class energy optimisation hardware and software

The Model-TS1 is a connected home, made from an interchangeable kit of parts enabling the homedweller to adapt their own space according to their needs. No complex management of traditional trades is required. The Model TS1 can be assembled with a small team of assembly technicians 75% faster than the current construction supply chain is able to build.

The homedweller will be able to easily modify, upgrade, repurpose and change their home environment as their lifestyle needs evolve. There are plug-in modules to add a home office, a guest bed or a nursery for example. An installed sensor array collects data continuously and through our innovative business model and ethical data brokering platform, homedwellers are able to realise the value of this. The Model-TS1 is a connected home in every way and enables homedwellers to engage with their personal and local environments in ways that were only available to the wealthy in luxury homes.

Working with a consortium of partners including the University of Surrey, Bouygues and KPMG, GlobalHOM are reimagining the future where the home adapts to the needs of the user to support life's evolving needs.

This project funding award will see the development of the current TS1 engineering to be production ready in collaboration with industry and academic partners. It will also see the deployment of a full scale prototype on the grounds of the University of Surrey to serve as a proof-of-concept, enabling us to take it closer to our first UK connected community development.

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CONTILIO LIMITED	Increase construction productivity using 3D computer vision & BIM to automate project progress and quality reporting.	£365,527	£255,869
University College London		£116,314	£116,314

Project description - provided by applicants

The $12Tn construction industry contributes to 15% global GDP, but is one of the least productive and digitized sectors. This makes billion-dollar cost overruns and delays the industry norm and results in trillions getting wasted every year. One of the key drivers is the broken progress and quality reporting process. Currently, it takes 4 to 8 weeks for critical information to reach key stakeholders. This results in major rework and low productivity, adding significantly to project schedule, cost and scope risks.

This project aims to develop an AI-enabled solution to measure construction progress for large property and infrastructure projects. Based on high-quality 3D Reality Capture data and using advanced machine learning techniques, the prototype will give real-time insights on project performance as well on productivity and risks. This will enable project owners, contractors and investors to improve short term planning and make timely and accurate decisions, transforming productivity, schedule and cost performance. Automated & reliable reporting will also establish "one source of truth" for all project stakeholders, enabling a range of other applications.

This project is conducted by Contilio, a London-based deeptech startup, the Department of Civil, Environmental and Geomatic Engineering, University College London together with 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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EASI-SPACE LTD	Automated Construction	£899,999	£629,999
LAND SECURITIES P L C		£99,655	£49,828

Project description - provided by applicants

We will be researching, developing and prototyping a new construction system to aid in the development of automated and continuous construction. We work closely with our pool of UK based manufacturers to help streamline the construction process bringing it more in line with car production techniques which help to deliver a more efficient building process.

It is widely recognised that there is a shortage of skilled construction labour and that productivity levels are low in the UK. The solution lies in altering the way in which buildings are built by designing and developing new on-site machines and on site 'fabrication factories' which are run by smaller teams of semi-skilled labour. This concept has been trialled on previous projects, and now we will be working with Landsec who are one of the largest Office developers in the Country.

This is a unique combination of a small and innovative engineering Company working with Industry leading sub-contractors to provide new construction solutions to the most respected Developer in the Country who will provide the Industry insight and a clear route to market for the new innovations.

The on-site machinery is a combination of new equipment designed from scratch and adaptions of current construction technology to optimise the flow of work. It is important that the batch and silo work style on site is moved towards a continuous flow -- along the lines of a manufacturing site.

With automated construction, the refined measured work is carried out at the manufacturing stage in a controlled environment and a kit of parts is delivered to site which is then put together using our bespoke install machines or Sub Assembly Work Stations (SAWS). A level of standard stock items are kept in storage off site and delivered when needed in order to keep the site flowing.

BIM will be used to design of the buildings and sequence the construction. A walk through building using virtual reality head sets will be utilised, checking for clashes and potential improvements.

Construction tolerances will be tight for all the off-site sub assemblies and therefore the whole building prototype will provide proof of concept that construction accuracy levels can be improved dramatically, using multi-skilled labour teams, opening the door to automated and robotic assembly methods on site.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
GEARBUDDY LIMITED	Optimising equipment use in construction with BIM, IoT and data analytics	£59,669	£41,768
BIM ACADEMY (ENTERPRISES) LIMITED		£63,175	£44,222
COSTAIN LIMITED		£62,400	£31,200
Northumbria University		£57,559	£57,559

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 project, by targeting the productivity gap caused by construction equipment fleet - which represents major cost elements in most construction projects- is entirely aligned with the ISCF, in particular with the main theme of improving performance through digitally enabled solutions. The proposed solution is scalable and adaptable across the industry (building, rail, transport, highways, and utilities).

The aim of the project is to explore the feasibility of improving productivity on site by 15% or more by increasing plant and equipment utilisation throughout the construction phase. This will be done by monitoring equipment output via on board IoT sensors; identifying patterns in equipment usage data to enable optimal planning; linking equipment output to the 4D BIM model; and visualising the data through and intuitive dashboard that will provide critical analytical information to contractors and the supply chain out on site.

Effective equipment fleet-management provides opportunities for productivity gains for client, contractors, subcontractors, plant hire companies and the public (pollution/noise). Research by the consortium partners with HS2 at London Bridge and Crossrail show: utilisation rates are as low as 30%; 5x equipment duplication; crossover of equipment requirements between work packages, and site congestion resulting in H&S risks. Despite this significant impact on productivity, environment and safety, equipment fleets are still a major blind spot within construction because of the lack of data and adequate digital ecosystems.

Earlier work by the consortium in HS2 confirmed demand by the construction supply chain for systems for equipment fleet-management (i.e. estimation/selection, deployment, coordination, and visualisation) pending key limitations being resolved. The project seeks to establish our position as one of the first and leading tech platforms combining IoT, BIM and data analytics.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
THE BRITISH CONSTRUCTIONAL STEELWORK ASSOCIATION LIMITED	Increasing Construction Sector Productivity Through the Use of Integrated Offsite Steel Modules	£18,353	£12,847
SEVERFIELD PLC		£6,912	£3,456
STEEL CONSTRUCTION INSTITUTE(THE)		£119,689	£83,782
TRIMBLE SOLUTIONS (UK) LTD		£0	£0
WSP UK LIMITED		£11,400	£5,700

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 aims to improve construction sector productivity through the use of offsite manufactured integrated steel modules and will help meet government objectives to reduce onsite construction time, increase construction productivity, improve safety on construction sites and address onsite skills shortages. Steel is the original offsite framing material with up to 90% of structural steelwork already manufactured offsite. This project will provide the steel construction supply chain with the knowledge, confidence and incentives to take the transformational step of including integrated offsite steel modules into the design, manufacture and construction of mainstream steel framed buildings. The project will develop and publish, in a free online guide, design prototypes that can be used by engineers, main contractors, steelwork contractors, M&E contractors and others to design, manufacture and construct mainstream steel framed buildings that include integrated offsite steel modules. This will drive the rapid take up of integrated offsite steel modules and increase the rate of offsite manufacturing and assembly in the mainstream steel building market.

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PROFESSIONAL CONSTRUCTION STRATEGIES GROUP LIMITED	Digitally Connected Supply Chains	£215,081	£150,557
CONSTRUCTION PRODUCTS ASSOCIATION		£28,724	£20,107
MK9 DEVELOPMENT LIMITED		£229,148	£160,404

Project description - provided by applicants

The purpose of the project is to provide a methodology and platform to digitally connect the construction manufacturing and built environment supply chains, to:

*Deliver outcome-driven, optimised supply chains;

*Increase productivity through the supply chain;

*Increase auditability of construction delivery and asset quality, the 'golden thread';

*Provide services and products through the lifecycle of an asset, including recovery and re-use;

*Improve client visibility of what is being procured, what the product or service should entail, and what they should expect to pay;

*Enable a circular construction economy.

Project outputs will include:

*Outcomes-based digital procurement platform - an MVP capable of demonstrating the desired capability, and to clearly identify future development needs;

*Servitisation benefits measurement methodology -- a clearly defined and published benefits measurement methodology for manufacturers to assess the opportunities for Servitisation, linked to the outputs and dynamic bench-marking of the procurement platform and supported by a Servitisation assessment tool;

* Defined data requirements to support Servitisation and a digitally connected supply chain

*Desktop case studies of both the outcomes-based platform and Servitisation methodology applied to real projects;

*A detailed business case to bring the technologies to market.

Project partners are:

PCSG (Professional Construction Strategies Group) - specialists in construction strategy and digital transformation

Construction Products Association (CPA) - trade association who's members represent over 80% of construction products by value

MK9 Development - provider of outcomes-based procurement platforms in the care, housing, transport and health industries

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CNC ROBOTICS LIMITED	MARTF (Modular Automated Roof Tile Factory)	£117,846	£82,492
SUNSCAPE SYSTEMS LIMITED		£74,642	£52,249

Project description - provided by applicants

UK construction is in the midst of a continued period of growth, which is largely stimulated by an ongoing government policy to build an additional 300,000 houses per year beyond 2025\. Construction relies on the skills and volume of its manpower more than most, but an ageing workforce plus cultural shifts that disfavour manual trades has led to a 7% labour deficit in the roofing industry, which irrespectively continues to grow exponentially each year. Furthermore, recent FMB reports have revealed severe building material shortages, resulting in waiting times for up to six months for roof tiles. This, in-part can be attributed to antiquated production facilities and the reluctance of large manufacturers to invest in new equipment and infrastructure in an industry which is commonly perceived to be historically conservative and averse to change.

To address these issues, SunScape Systems Ltd (SSL) has designed Carapace Slate, a patent-protected, bio-composite snap-fit roof tile system designed to essentially deskill the roof installation process which is installed 90% quicker than the current state-of-the-art; increasing build speed and contributing to the growth of construction.

Given the scale of the UK roofing market, a suitable manufacturing infrastructure is required to produce Carapace at volume if it is to address the deficit between construction output and available labour. Traditional and now antiquated methods of production employed by the industry has led to an alarming supply deficit which is challenging government policy to alleviate the housing crisis. As the next logical step in manufacturing technology, SSL will form a new Joint Venture with CNC Robotics (CNCR) - one of the UK's leading machining Robotics integrator to develop a system compliant with the industry 4.0 standard and develop a revolutionary commercial infrastructure that can intelligently and readily react to the demands of an ever-changing market.

Using the robotic integration expertise of CNCR, the joint venture will implement a dynamic and repeatable 'SMART' /Industry 4.0 aligned manufacturing solution, hereby named as "MARTF" - the Modular Automated Roof Tile Factory. Essentially, the production facility will be a literal plug-and-play 'factory in a box', specifically built and calibrated offsite to manufacture the Carapace Innovation and then made ready to be deployed to any/multiple locations capable of housing its footprint. Monitored and operated through advanced cloud-based and IoT technology, MARTF will satisfy SSL's first customer order and provide a distributed manufacturing array capable of responding to an ever-demanding market.

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SALVESEN INSULATED FRAMES LIMITED	Creation of a Hybrid Insulated Structural System to Enable Delivery of a Disruptive High Volume House Building Model – Hyb-ISS	£131,466	£78,880
AGGREGATE INDUSTRIES LIMITED		£55,104	£27,552
CREST NICHOLSON PLC		£20,008	£10,004

Project description - provided by applicants

Traditional site-based construction methods are a major negative contributory factor to the UK's housebuilding industry's famously low productivity and the sector is increasingly struggling to attract the skills it needs.

Offsite construction in the housebuilding industry promises hugely improved productivity, performance and consistently high standards, supported by full implementation of digital technology. Yet, less than 10% of construction currently occurs offsite.

Growing demand, coupled with less-than-optimal build quality and a reducing skills base, has created a dilemma that will not be resolved without a 'step change' in productivity and quality of build. Offsite construction benefits include consistency, quality assurance (including a 'Golden Thread' of traceability from specification to installation, as recommended by the Hackitt Review), faster construction times, reduced waste, minimised defects and less hazardous working conditions.

In its 2017 White Paper, the Government outlined a range of initiatives, and a target for the industry to build at least 250,0000 new affordable houses year on year to 2039\.

Fusion Building Systems (trading name of Salvesen Insulated Frames Limited), Aggregate Industries (part of the LafargeHolcim group) and Crest Nicholson will collaborate in the Hyb-ISS project to develop materials, and a factory-based process, for production of finished, non-combustible, pre-insulated structural panels for house walls, roofs and floors. A range of products will be fully compliant with the latest digital technologies under Building Information Management (BIM) protocols. For the first time in a reduced-weight panel, advantages of offsite manufacture, zero combustibility and improved and fully traceable build quality will be available to the industry. A 10% -- 15% build cost reduction, and build lead-times shortened by ~30% compared to onsite construction will be targeted in support of the government's goal to build 250,000 houses year on year to 2039\.

The project will provide prototype materials and process, and prototype pre-insulated panels for preliminary fire, thermal, acoustic and structural testing and evaluation (initially in exterior and separating wall applications) in field trials with major housebuilder, Crest.

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WIND FARM ANALYTICS LTD	Project FAIRCOP - Feasibility of Converging Beam LIDAR for Improving Crane Operational Productivity	£34,800	£24,360
FRAUNHOFER UK RESEARCH LIMITED		£14,861	£14,861

Project description - provided by applicants

It is proposed that the construction industry may be made more efficient and also more safe when crane operations are scheduled to stop and start according to accurate wind measurements from new laser based wind LIDAR devices designed for cranes. Wind LIDAR is a remote wind profiling technique that measures the laser backscatter from airborne particles to obtain line of sight wind speed. Intersecting beam LIDAR uses three lasers trained onto one point and obtains the true 3D wind vector.

Time is money. However, cranes are depending on rudimentary anemometers which give no look ahead advance warning and they also give no indication of the variation of the wind field across large crane structures. Meanwhile coarse wind conditions forecasting is employed to enable scheduling on a day-ahead and hours ahead basis but this forecasting is subject to wind speed estimation uncertainty. By designing new LIDAR systems for the construction industry these difficulties can be overcome.

The project will confirm the technical and economic feasibility of applying converging beam LIDAR to the construction industry and crane applications in particular. The project partners are already working together for commercialising converging beam LIDAR products and processes for the wind industry planning and operation (but not including wind farm construction) and it is envisaged that the knowledge gained can be re-applied in new ways for other commercial applications for the construction industry.

The team have designed, built and tested beam steering LIDARs for the wind industry. They have also engaged with the wind industry previously. This provides relevant skills and experience for engaging with the construction industry and designing LIDAR products for use in the construction industry.

The feasibility study will include detailed assessment of the market sizes of various construction sub-sectors such as offshore wind farm construction, onshore wind farm construction, skyscraper construction, bridge construction and other sub-sectors.

The route to market can be through direct high value manufacturing, or through technology licensing.

In addition to the improvement in crane operations and efficient definition of operational weather windows there are significant benefits to improve safety for workers and the public. Up to around a quarter of crane accidents can be directly attributed to extreme wind whilst problems due to non-wind faults are often exacerbated by the wind. The main problem is that forecasts and existing devices do not accurately warn of extreme gusts or sudden changes. Converging beam LIDAR can do much better.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CARTOCONSULT LIMITED	Live Automated Materials Plan (LAMP)	£199,731	£139,812
BUILDING RESEARCH ESTABLISHMENT LIMITED		£79,891	£79,891
SKANSKA TECHNOLOGY LIMITED		£110,222	£55,111
VINCI CONSTRUCTION UK LIMITED		£76,033	£38,016

Project description - provided by applicants

Traditional construction is a low-tech but flexible manufacturing process. It is carried out 'on-site' using pre-manufactured components (windows, doors, bricks, blocks etc) and the manufacture of basic elements such as concrete, plaster etc. Whilst their flexibility has much to commend them (given the bespoke nature of buildings and their geographic distribution) traditional construction methods are inefficient in time and costs; construction has not benefitted from the significant efficiency improvements that have been seen in other manufacturing sectors over the last 20 years.

The industry is seeking to address these inefficiencies via initiatives such as off-site manufacture and greater use of automation, and improved communication/component tracking through complex supply chains. However, work is needed to improve the efficiency of the necessarily site-based stages of the construction process.

Skanska and Vinci have been working to digitise and integrate data from across their organisation and operations (e.g. business/process data, asset management, construction supply chain etc). However, on-site data across the whole of the construction sector remains predominantly paper-based, with only very basic data analysis carried out to support process planning and management.

State-of-the-art data capture and analysis techniques have huge potential in improving on-site process planning and scheduling, for example, a system which uses real-time sensor and historical performance data to enable project planners to optimise bulk materials movements to and from site (e.g. correct numbers/timing of vehicles for the removal of excavation material, timely delivery of construction materials) could lead to efficiency savings of about 18%. Such planning could also be integrated with off-site traffic management solutions in order to minimise the impact of construction on the wider urban environment. However, challenges remain in effectively collating and integrating data from across large construction sites, with internal systems and relevant 3rd party data, developing predictive algorithms and providing outputs in a format that is beneficial to users.

LAMP will address this issue. Led by CartoConsult, a UK SME with expertise in data capture and analysis in the context of construction and the built environment, it will develop a POC tool that enables project planners to better predict on-site materials and logistics parameters. It will utilise innovative enabling digital technologies (LoRa, data analytics) to capture, collate and analyse data from real construction programmes, with proactive involvement of project planners working on Vinci and Skanska-led construction programmes, enabling the solution to be tailored to meet the needs of users across the wider construction industry.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
TR CONTROL SOLUTIONS LIMITED	Adaptive Learning for Zero Defects in Building Construction	£184,780	£129,346
Anglia Ruskin University		£63,301	£63,301

Project description - provided by applicants

According to the industry-led, Get It Right Initiative, the total cost of avoidable errors in the UK construction industry is £10-£25Bn per annum (or 10%-25% of project cost).

If these errors could be reduced, then buildings could be built at lower cost and more buildings could be constructed with the same labour and materials, thus increasing productivity.

Sometimes defects (caused by errors) are not detected when the building is completed and handed over to the occupants, and they persist for many months or even years. So by reducing these defects, the quality of the environment in which people live and work will be improved. An undiscovered defect may also endanger the occupants of a building.

Buildings may also use more energy and water than they were designed to because of defects, leading to higher bills, energy waste and unnecessary carbon dioxide emissions to the atmosphere.

Defects often occur due to insufficient site supervision and poor communication with site operatives. Sometimes operatives are reluctant to ask for clarification because they are concerned about appearing ignorant or inadequate. This can result in tasks being performed incorrectly leading to defects.

Defects (sometimes called 'snags') are often discovered during an inspection. When a defect is discovered it can be a time-consuming and costly process to correct the problem.

The aim of this project it to achieve the construction of buildings with zero defects. The zero defects philosophy was promoted in the automotive manufacturing sector more than 30 years ago and we now have better quality cars, that cost less (relatively) than those made in the 1970s.

Our project aims to achieve fewer defects by preventing their occurrence, rather than by detecting and fixing them. This is far preferable because it will lower the overall cost of construction and also prevent delays.

Our proposed innovation (to be based upon this feasibility study) will use computer technology (mobile and cloud) and Artificial Intelligence (AI) to check that a site operative understands the task that they are being asked to perform. If they don't, it will attempt to explain it to them in a way that they can understand. If the system is not satisfied that the instructions have been understood it will alert a supervisor.

In this way it will prevent defects that might have occurred because of a lack of understanding. As the system is used it will learn more about defects and defect prevention.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
L & B CARE SERVICES LTD	Intelligent DEsign for Manufacture and Assembly of built assets (IDEMA)	£59,424	£41,597
DG CITIES LIMITED		£66,900	£66,900
I3D ROBOTICS LTD		£85,690	£59,983
MILLS POWER LIMITED		£60,924	£42,647

Project description - provided by applicants
The key business need and market opportunity are linked as all UK political parties are committed to building 1.5 million homes by 2022 or more than 300,000 homes per annum compared to 160,000 homes currently being built. To achieve this new approaches to construction need to be embraced This ISCF call recognises the need for change by requiring fresh approaches to design for manufacturing and assembly and the use of active energy technologies with a target of increasing the pre-manufactured value of built assets. IDEMA's meets the key challenge from ISCF by embracing PMB and industry's adoption of new methods of construction through streamlining the design process, concentrating on the ease of manufacture that results in simpler, more secure on-site assembly. IDEMA targets PMB starting with the innovative design of a thermal efficient building with many active energy components to generate electricity. It will design in all services (water, electricity, digital services etc) as part of the PMB process. The ultimate aim is to complete a 3000 sq.foot building within 10 days

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
BAM Nuttall	The Learning Camera	£103,626	£51,813
Cranfield University		£63,707	£63,707
IOTIC LABS LIMITED		£106,741	£74,719

Project description - provided by applicants

The construction industry has poor productivity compared to other sectors in part as a result of the diverse and changing project environments. Often it is constrained by the reluctance to explore and adopt technology that is more accepted and mature in other sectors.

However recently there is increasing focus on thinking of construction as a manufacturing industry and part of this approach it to take tasks off-site so that they can be undertaken in a controlled factory environment. However there is an ongoing need to have a construction site as being the place where the output from the construction industry is delivered. It is in this site environment that we are proposing to improve productivity by increasing the effectiveness of the people employed there.

UK Construction sites are highly regulated in terms of health, safety and environmental matters and this has introduced additional resources to monitor and manage these aspects. The advancement of technology in respect of increasing capacity and decreasing cost coupled with greater awareness of the potential internet connected devices has created perfect conditions for us to explore how this can bring benefit to the construction industry and drive safer sites, and higher quality and productivity. There is pressure on the availability of skilled experienced construction professionals caused by an aging workforce so therefore we must ensure that they are supported with appropriate tools in order to make the best use of their time and skills.

On construction sites, human resources are often engaged in activities that do not add value and they should therefore be freed from these low value tasks which are more suited to automation through the application of appropriate technology.

The Learning Camera is a flexible solution that allows users to train a standard web camera attached to a ruggedised edge computer which is linked to an online dashboard. The device is programmed to recognise a scenario on site and when the content of that view differs then an alert or action is automatically issued so that someone can attend to the situation.

It is intended that this tool is a collaborative innovation solution that can be readily applied to new use cases identified by users on construction sites. It will be designed to be resilient and low cost, and able to operate in a typical construction environment in variable weather and environmental conditions.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
NPLAN LIMITED	AI-Optimised Pathways for Schedule Execution	£464,243	£324,970
KIER INFRASTRUCTURE AND OVERSEAS LIMITED		£132,726	£66,363
University of Cambridge		£249,785	£249,785

Project description - provided by applicants

77% of all megaprojects are at least 40% late, and 98% suffer cost overruns of over 30%. Unrealistic and poor planning is acknowledged as a major contributor, accounting for up to 30% of failures for two key reasons: \[1\] limitations in the ability to transfer knowledge and extrapolate experience between projects; \[2\] the complexity of projects themselves. Project performance is critically limited by the knowledge and experience of the project team responsible for building schedules -- and there is a significant cost burden carried due to unverified and subjective allocation of risk. _There is a recognised_ _unmet market need for data driven solutions that can enable improved project planning and scheduling to increase certainty of budgets and timings, increase productivity and reduce costs._

The proposed project seeks to develop a novel automated 'schedule learning platform' that applies data science and machine learning to thousands of previous project schedules, offering a unique scalable solution for improved certainty and confidence in project planning for future projects. The solution is based on thousands of previous construction projects, allowing the platform to learn across projects what was planned to happen and what actually happened, thus reducing the effect of human bias, subjectivity and inaccuracy. Schedule data is analysed, similar tasks and relationships are automatically grouped, with patterns drawn using Artificial Intelligence, enabling the platform to predict the most likely outcome for every task and provide optimal paths/recommendations to mitigate risks/delays.

The project builds on nPlan's existing risk prediction platform and their extensive dataset of construction schedules. 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 the capability to recommend optimised pathways for schedule execution to allow informed decisions to be made based on intelligent predictive data-driven planning; and build benchmarking capability to enable sharing of best practice and improved overall performance. 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 schedules (budgets and timings); shorter project execution times and cost reductions (over 30%); reduction of reactive and wasteful work leading to increased productivity. The project will deliver ambitious growth and increased knowledge for all three partners, with further opportunity for R&D investment.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
BALFOUR BEATTY PLC	Big Data and Machine Learning-enabled Automated BIM for Projects (Auto-BIM): A Common Data Collaborative System for Improved Project Performance	£469,160	£234,580
Coventry University		£19,993	£19,993
Leeds Beckett University		£229,342	£229,342
WHITE FROG PUBLISHING LIMITED		£178,440	£124,908

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

BIM is touted as an effective way of addressing issues affecting the productivity of the construction industry. The task-force on BIM hypothesises that with BIM-adoption, "significant improvement in cost, value and carbon-performance can be achieved through the use of open-sharable asset-information". To reinforce its benefits, the government Construction-2025 lists BIM as a key-element for achieving its goal of 33% lower-cost, 50% faster-delivery, 50% lower-emissions and 50% improvement in export.

Although there has been an increase in BIM-adoption, companies still find it difficult to implement the "real" BIM and realise the expected benefits. This is because of the naming convention in line with PAS-1192 and the need for adequate building-information to accompany 3D-representation of building materials/elements/products in a collaborative environment. For organisations that have surpassed the barrier to BIM-adoption, the main-challenge remains getting everyone involved in collaborative-projects to use CDE and to ascertain the exact-level of(and the specific) information required for different aspects and types of assets. Thus, some projects on which BIM is claimed to be used have only assembled digital information without providing useful information for construction, in the short-term, and data for asset-management in the long-term.

Notwithstanding these challenges, there is currently no tool to support organisational BIM-adoption and compliance with the standard, leverage previous project lessons/historic data, support automated Construction-Operations-Building-Information-Exchange-(COBie) and facilitate supply-chain integration with product-manufacturers. Based on these, the project adopts techniques in Machine-Learning-(ML) and Big-Data-Analytics to create an innovative tool-(Auto-BIM) as a plug-in to BIM-tools. It consists of four-elements as follows:

1\.**Automated-Naming-of-BIM-model-in-a-CDE-approach(Auto-BIMName)--**This helps project team to name their files in consistency/compliance with PAS-1192 and BS-EN-ISO-19650\. It would also help in automatically mapping the title-block, which is currently being done manually between collaborating companies/originators and roles.

2\.**Automated-Population-of-Building-Information(Auto-BIMPopulate)--**This will prepopulate the 3D-representation of products/elements with relevant metadata including the Omniclass classification, model number, service information, materials, etc. This will facilitate a conventional approach to project communication/collaboration, and accelerate BIM-adoption and benefit-realisation.

3\. **Automated-Sharing-of-BIM-Objects-and-Model-Data****(Auto-BIMShare)--**The Auto-BIMShare provides a unique platform for sharing reusable object library and associated information to facilitate common-language across software boundaries. It will also provide opportunities for manufacturers to make their products/materials available for potential specifiers and buyers. The Auto-BIMShare would facilitate co-creation/sharing of information between the design, procurement, and maintenance/operation team within/across projects

4\.**Automated-BIM-learning-Platform(Auto-BIMLearn)--**BIM currently has no capacity for diagnosing projects. The Auto-BIMLearn would leverage on historical data, tacit knowledge(lesson-learnt) and asset management-information to support design, construction and asset management decisions.

Results of Competition: Increase Productivity, Performance and Quality in UK Construction

Competition Code: 1807_ISCF_IPPQUKC

Total available funding is £13.3million

Participant organisation names	Project title	Proposed project costs	Proposed project grant
KELTBRAY GROUP LIMITED	HIPER Pile	£417,695	£208,848
City University London		£227,011	£227,011
DAVID BALL GROUP LIMITED		£128,944	£90,261
OCTAGON I/O LTD		£126,054	£88,238

Project description - provided by applicants

This collaboration is designed to develop the HIPER pile, a cutting-edge Keltbray Piling development that has the potential to revolutionise the piling industry. It combines a series of new, emerging technologies and "around the corner" innovations to create larger benefits applied to foundation solutions. The project is perfectly aligned with Construction 2025 objectives and the UK Industrial Strategy. A game changing development with wide-ranging benefits that has the potential to enhance the standing and reputation of the collaborating parties involved, and to drive larger industry change in the UK and beyond.

* Improved Productivity
* Enhanced capacity
* Environmental benefits
* 100% Re-use
* Reduced embodied CO2

Future research:

The project is focused on the combined deployment of a suite of highly innovative technologies. Further research includes, but is not limited to:

* HIPER pile solutions applied to deep embedded retaining walls
* Fully building integrated hybrid environmental control systems that combine ground source heat pumps and geothermal systems with rain water collection, solar thermal arrays, as well as solar PV and wind generated renewable energy to operate the system
* Following this first step, the longer term vision is that hollow deep foundations can become more than a structural component in support of the development of (near) zero carbon and energy plus buildings and districts

Results of Competition: Increase Productivity, Performance and Quality in UK Construction

Competition Code: 1807_ISCF_IPPQUKC

Total available funding is £13.3million

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
WHG TRADING COMPANY LIMITED	Collaborative knowledge-based DfMA approach to build cost-efficient, low-impact and high performance houses	£454,240	£317,968
Birmingham City University		£185,595	£185,595
HADLEY INDUSTRIES HOLDINGS LIMITED		£49,847	£24,924
NORTHMILL ASSOCIATES LIMITED		£134,138	£80,483
QM SYSTEMS LIMITED		£100,147	£70,103
The Energy Systems Catapult		£48,851	£48,851

Project description - provided by applicants

Construction practice has hardly evolved in 40 years, and nor has productivity. Houses as a product have been criticised as cost-inefficient and failing to meet the market demand. Innovation market failures have been caused by 1) lack of continuity of business cycles, 2) presence of discipline silos, 3) lack of evidence-based benchmarks for modern construction methods and 4) fragmented available knowledge. The proposed project - to be led by the commercial arm of Walsall Housing Group and delivered by a consortium of experts from various sectors and disciplines - attempts to address these issues by adopting an innovative cross-disciplinary collaborative approach to design, manufacture and assemble market-proof, environmentally-friendly and scalable affordable houses to meet demand. **The collaboration includes 1) development of know-how for i) design for manufacture; ii) design for assembly; iii) design for high performance and low impact and iv) design for houses with minimal life cycle costs and CO2 emissions (i.e. DfMA houses); 2) evaluation of automation potential of design for manufacture; 3) development of evidence-based production and life-cycle benchmarks for DfMA houses; and 4) development of knowledge-based engineering tools to estimate life-cycle costs and carbon emissions**.

DfMA houses proposed in the project will directly contribute to reducing 33% life-cycle costs including 10% build cost, 50% design and construction time, 30% household energy consumption and 50% carbon intensity, and increasing 20% construction productivity. This will **impact and expand the Group's 1,365 house delivery programme by 2021, as well as regional and national programmes**.

The anticipated economic benefits for the project include: 1) reducing tenant householders' energy bills; 2) creating new business opportunity for suppliers; 3) reducing regional construction costs and speeding up delivery to meet the completions targeted; 4) allowing other registered providers to replicate the business model through partnerships with the Group, which will create a multiplier effect; 5) a reduced labour requirement per home will improve the industry resilience to labour shortage -- an existing problem likely to worsen over time.

Other social impacts include: 1) improving quality of life by creating more disposable income and more comfortable living environment; 2) quicker access to social or affordable housing; 3) creating new roles and skills for the future; 4) creating a safer work environment for production than the traditional production onsite.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
BURO HAPPOLD ENGINEERS LIMITED	AEC Delta Mobility	£385,493	£192,746
3D REPO LTD		£375,746	£263,022
Rhomberg Sersa Rail Group (UK)		£108,476	£54,238
University College London		£215,875	£215,875

Project description - provided by applicants

Our project will define a new open-source ecosystem developed in collaboration with internationally recognised engineering practices and construction firms, and standardisation support from the UK BIM Alliance and Building Smart International.

The project will deliver an open specification and an open-source reference implementation for data exchange in Architecture, Engineering and Construction (AEC) but also support further development of paid for services to drive adoption, commercialisation and long-term support of this technology. Our unique approach is expected to streamline the design process for manufacturing, reduce delays and thus directly increase productivity on a wide variety of multidisciplinary projects. This solution will help engage manufacturers in the early design stages and result in the increased pre-manufactured value of build assets across the construction sector.

We aim to iron out the manufacturing process at the earliest possible stages of the design phase by streamlining the data workflow so that everyone involved from the consultants to the manufacturers can access the same data from a single source.

Accessing required data is currently difficult due different parties involved in a single project using different file formats. Companies also depend on a single supplier for products and services which can lead to financial losses, especially if something is no longer needed over the course of a construction lifecycle. Open standard Industry Foundation Classes aimed for interoperability, but that is not suitable for manufacturing or large-scale architectural and infrastructure projects.

To address the above issues, we propose a novel open-source micro-services online framework that will enable the industry to exchange individual object-level changes across various applications, regardless of data format. Instead of exporting a whole file over and over again, our aim is to stream individual design changes to whichever application is conformant with our newly proposed _"AEC Delta Mobility"_ specification.

To achieve this, we will:

1. Define a new common interchange schema that is open and shared across various systems;
2. Specify a new technology so that different architecture, engineering and construction applications can communicate easily over the Internet;
3. Validate the proposed specification by creating a working reference implementation that connects open-source Speckle Works and 3D Repo with proprietary systems.

This will create an ecosystem with in-built security specification to ensure encrypted data transmission and authorship verification. The entire system will be tested on three live construction projects in the UK with project partners BuroHappold, Rhomberg Sersa, HOK and Atkins.

Results of Competition: Increase Productivity, Performance and Quality in UK Construction

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
OCTAGON I/O LTD	CORE (Concrete curing prediction and schedule Optimisation for Resource Efficiency)	£492,193	£344,535
BAM Nuttall		£210,259	£105,130

Project description - provided by applicants
Challenge - Understanding and accurately predicting concrete curing time is critical to construction projects as curing dictates subsequent build and fitting activity. But concrete curing time cannot be predicted given site-specific complex variables and human error. This results in time wastage, fines and poor productivity. **Project** -- CORE will allow Converge and BAM Nuttall to develop technology to improve construction productivity.

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Competition Code: 1807_ISCF_IPPQUKC

Total available funding is £13.3million

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
VINCI CONSTRUCTION UK LIMITED	Digital planning and supply chain management toolbox for productive project delivery (PLASMA)	£150,197	£75,098
ASSENTIAN LIMITED		£255,931	£179,152
BUILDING RESEARCH ESTABLISHMENT LIMITED		£126,292	£126,292
NPLAN LIMITED		£191,666	£134,166
SKANSKA TECHNOLOGY LIMITED		£151,665	£75,832

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Project description - provided by applicants

Industrial productivity has improved over recent decades across most sectors due to process and technology innovation. However, construction has not shown such gains (value added per worker is 60% of that in wider manufacture). Without improvements housing and infrastructure demand will not be met. Conversely, productivity improvements will add significantly to the economy (construction represents c.9% of UK GDP).

The size and nature of the sector suggest many opportunities for process and technology innovation. Techniques such as Design for Manufacture and Assembly and off-site construction could significantly improve construction productivity. However, uptake has been slow due to bespoke projects, supply chain complexity and fluctuating demand leading to a risk-averse approach to capital investment through supply chains.

Effective planning, and supply chain collaboration are key to ensuring that productivity gains are consistently achieved. We will therefore develop, test and assess an integrated process planning and supply chain management toolkit for the efficient delivery of construction projects. It will improve construction productivity (potential cost and time savings of 25% and 28% respectively) via:

* Better project planning; enabling project planners to identify optimum project delivery plans based on context-specific restrictions and supply chain 'pinch-points' where increased capacity/automation could improve overall productivity.
* Improved supply chain collaboration; enabling supply chain businesses to securely collect, share and store information, such as task status/completion, component location, and in-use data. The use of 'blockchain' technology will enable smart contracts and timely payments to subcontractors, reducing their financial risk.

Analysis of data from on-site sensor networks and through supply chain tagging/tracking systems will provide quantified metrics for planning scenario optimisation and industry-wide KPIs. These metrics will drive innovation, enabling planners to assess project-specific benefits of new digital and automation solutions. The mainstream implementation of such innovative approaches the project solution will help to leverage overall 55-70% savings in programme cost and time.

The PLASMA project will be led by construction contractor Vinci, with Skanska also participating. These organisations will provide date from, and access to, ongoing construction projects to ensure that the project solution (made available to the industry as a spin-out) meets industry needs. UK SMEs nPlan and Assentian building on expertise of project planners and in-house innovations from Vinci and Skanska. It will be applicable in other sectors (e.g. Facilities Management).

We anticipate revenues of \>30£M pa to the 'spin out" in 5 years, with the solution used by 10% of the UK sector.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Createanet	Automatic DfMA-with-AET Design Generator (ADAGE): An Internet of Things tool to instil adoption of DFMA and AET by Building Designers	£241,963	£169,374
AHR ARCHITECTS LIMITED		£222,282	£133,369
Coventry University		£177,952	£177,952
Leeds Beckett University		£14,962	£14,962

Project description - provided by applicants

DEFINITIONS

Concept-design: Design team's initial response to the project-brief.

Detailed-design (or developed-design**):** Process of developing approved concept-design in detail

SUMMARY

Current construction methods are slow, costly, of poor-quality and relatively unsafe. Compared to manufacturing-industry, construction-industry's poor-productivity has cost UK-economy £100billion over the past 20-years (Mace,2018) and extra £40bn in tax. Its poor work -quality cost £1bn--£2bn worth of reworks annually (RIBA,2008). Clearly, the current methods cannot help to achieve UK's national-infrastructure-programme, which is calling for £650-billion worth of projects by 2025\. To achieve similar gains to the manufacturing-industry, the construction-industry is attempting to switch to Design for Manufacture and Assembly (DfMA). DfMA trial-projects have led to a reduction of 60%, 44% and 70%+ in construction-programme-time, cost and onsite-labour respectively. They brought about 73% improvement in quality and 80% improvement in overall productivity-rate compared to 20% normally achieved with traditional-method (RIBA,2008).

Despite the many gains, efforts towards wider-adoption of DfMA-approach has been unsuccessful with less than 5% of building-designers employing the DfMA-approach. Research by Chartered-Institute-of-Building and AECOM show the lack of adoption to be because current designers were trained/taught to design-for-construction and have practised this method for long. Attempts to use CPD-trainings have met resistance due to lack of time. This project thus aims to use digital-means to encourage a wider-adoption of DfMA-approach and active-energy-technologies (AET) by developing a BIM-software-plugin that automatically generates DfMA-concept-designs with AET based on key building-design-parameters from client/project brief (e.g. material choice, building-use/purpose, etc.)

The proposed plugin will use Internet-of-Things, Blockchain-Technology, cloud-computing, artificial-intelligence and big-data-analytics and include the following:

1)**Automatic DfMA-with-AET concept-design-generator** which will generate multiple concept-designs based on the input-parameters. **It will be able to generate DfMA alone, or DfMA-with-AET, concept designs.** Designs will be editable to achieve 'detailed-design' to suit designers' preference. Designs will be generated using:

a) Parametric-modelling-artificial-intelligence-algorithms which will use historic-data of former DfMA-designs with AET to produce new-solutions

b)Generative-design-artificial-intelligence-algorithm improve new-solutions, producing many valid high-performance but cost-effective options.

2)**DfMA-and-AET-component-adviser** which will suggest components (e.g. lattice slab with special connectors, shell beams etc.) that can be used to edit

an adopted DfMA concept-design to achieve detailed-design that suits designers' preference.

3)**DfMA-and-AET-component-availability-and-price-checker** which can provide information on DfMA and AET components prices, delivery times, suppliers (location, reliability, etc), near real-time availability, stock-levels etc.

4)**DfMA-designs-comparison-tool** which can compare two or more generated/edited design based on total cost, estimated build duration, probable safety issues, quality of build, energy consumption, etc.

Results of Competition: Increase Productivity, Performance and Quality in UK Construction

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Total available funding is £13.3million

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Price & Myers	Digital design of building structures for optimised cost and carbon performance	£210,194	£126,116
University of Cambridge		£82,833	£82,833

Project description - provided by applicants

The construction sector has been identified as a major contributor to global environmental changes resulting from human activities. Recognising relationships between material use, carbon and cost efficiencies has been a major challenge for engineering practitioners and researchers since the link between carbon emissions and climate change was established. Whilst in use carbon emissions has been reduced through more stringent regulations embodied carbon assessment is in its infancy. Currently, structural engineering design practices focus primarily on cost minimisation, but with increasing concerns about the sustainability of buildings, structural engineers have also begun to investigate how the optimisation of structural systems at the design stage could influence the overall life-cycle performance of buildings.

This proposal builds on a prototype developed as part of a previous Innovate UK project. This prototype allows structural engineers to improve the material efficiency of steel-framed buildings, reducing their cost and embodied carbon emissions by 10-40% through a rigorous optimisation analysis and the selection of the best early design schemes. Using that prototype as the starting point, the current proposal aims to extend this new design practice to the optimisation of other commonly used structural typologies, in particular reinforced concrete frames, which could lead to similar improvements and allow comparison between the most common structural typologies.

The previous study identified that focusing efforts on gaining efficiencies at early scheme design offered the greatest potential for performance improvements, as well as minimising costs and the risks. To achieve this objective, the project will develop a novel technology solution into a software application that can quickly analyse different structural materials (concrete, steel, timber), construction technologies (floor types) and other design parameters such as applied loads or foundation types to find the most carbon efficient structural configuration - but without compromising total costs. In addition to the potential cost and embodied carbon savings that can be directly delivered by the new technology, significant productivity improvements in design generally are to be expected due to the automated nature of the proposed novel design and verification procedure.

Overall, this proposal aims to challenge current practice, enable better integration across disciplines, and deliver solutions optimised in terms of current and likely future drivers, particularly resource use, embodied carbon and cost.

Results of Competition: Increase Productivity, Performance and Quality in UK Construction

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Total available funding is £13.3million

Participant organisation names	Project title	Proposed project costs	Proposed project grant
BUILD TEST SOLUTIONS LIMITED	Measurement and verification of built assets: a low cost scalable solution to in-situ measurement of thermal performance	£110,057	£77,040
ELECTRIC POCKET LIMITED		£104,499	£73,149
University of Salford		£64,271	£64,271

Project description - provided by applicants
Our innovation, Heat3D, is a new technology for quickly and cheaply measuring heat loss from buildings, enabling improvements in construction quality, performance and specification of insulation upgrades. Central to increasing both the quality and performance of UK construction is in establishing means of robust feedback loops. Visualising, measuring, quantifying and recording as-built performance characteristics and then ensuring these insights are captured and fed back into the repeated delivery of projects. Through the use of readily accessible technology, this project aims to develop a practical means of assessing the as-built in-situ thermal performance of critical building fabric elements such as floors, walls and roofs. The applications for this technology will cover residential and non-residential, both new build construction as well as both pre and post refurbishment; enabling U-values and other thermal characteristics to be viewed, quantified and reported. This digitally-enabled means of performance measurement, management and feedback will in turn contribute significantly to reduced costs for future projects on the grounds of better refined specifications, greater supply chain accountability as well as reduced whole-life costs and carbon intensity through better construction quality and performance.

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Competition Code: 1807_ISCF_IPPQUKC

Total available funding is £13.3million

Participant organisation names	Project title	Proposed project costs	Proposed project grant
STEWART MILNE GROUP LIMITED	AIMCH - Advanced Industrialised Methods for the Construction of Homes	£1,540,528	£770,264
BARRATT DEVELOPMENTS P L C		£1,567,805	£783,902
Construction Scotland Innovation Centre		£397,120	£397,120
FORSTER ROOFING SERVICES LIMITED		£458,073	£274,844
LONDON & QUADRANT HOUSING TRUST LIMITED		£1,045,966	£522,983
Manufacturing Technology Centre		£1,091,786	£1,091,786
TARMAC TRADING LIMITED		£199,864	£99,932

Project description - provided by applicants

AIMCH seeks to industrialise the housing sector, applying design for manufacture and assembly solutions to become a global housing leader. Digital working and offsite construction have not broken through as viable mainstream alternative's to paper based design and masonry methods. **AIMCH's ambition will transform how we build homes,** through industrialisation, solving these challenges for good. AIMCH will be a **sector catalyst** moving to housing delivery to become a **digitally integrated, manufacturing and assembly based sector**.

The UK needs an additional **120,000 homes each year**. Housing faces many challenges reduce construction skills, aging workforce and poor intake. Productivity is poor and output is low. Housing quality, customer satisfaction and building performance must improve. Affordability is low and costs too high. Housing is fragmented, risk adverse and cyclical limiting long term investment.

AIMCH goal is to deliver **offsite construction for the cost of masonry** and understand how future advanced offsite solutions can be applied. This **ambition has never been achieved**, creating business opportunity. AIMCH seeks **20% cost reduction, 30% productivity gain, 50% less defects, build 5,000 & impact 35,000 homes** across the sector. **AIMCH unique collaboration** will develop and commercialise digital design tools, develop new automated manufacturing systems, trial enhanced & advanced offsite systems, with new lean site processes.

AIMCH will be the **Henry Ford of housing**, catalysing sector transformation, becoming the game-changing project, for Industry and Government to showcase. AIMCH will make people's lives easier driving uptake because people want too.

AIMCH has the UK's largest private, rented and social housing providers, leading offsite manufacturers and UK researchers. **AIMCH provides scale** (35,000 homes or 16% of the market) high profile companies & innovation **capability**, with clear route to market exploitation. AIMCH will deliver **wider sector benefits** in jobs, investment, growth, younger and diverse workers, provide communities, accelerate technology adoption and become a world leading housing exemplar.

This **36 month £6.5m Innovation project** will develop **concepts, prototype and trial solutions** on 10-12 live projects. New methods will be commercialised & disseminated for wide market uptake. AIMCH are confident **we can deliver** this ambition.

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Total available funding is £13.3million

Participant organisation names	Project title	Proposed project costs	Proposed project grant
LAING O'ROURKE PLC.	AROPCQA – Augmented Reality for Operative Productivity & Continuous Quality Analysis	£250,001	£125,000
DESIGN TECHNOLOGY SOLUTIONS LIMITED		£99,316	£69,521
ESAY SOLUTIONS LTD		£69,466	£48,626
OFFSET SERVICES LIMITED		£144,792	£101,354
TRIMBLE SOLUTIONS (UK) LTD		£249,869	£124,934
University of Sheffield		£171,185	£171,185

Project description - provided by applicants

The construction industry's strategy is to improve productivity and meet the Government's Construction 2025 targets.The **Augmented Reality for Operative Productivity and Continuous Quality Analysis (AROPCQA)** project aims to improve productivity and quality by creating the common platform using digital technologies and process workflows to develop a user-focused practical system.

Construction operatives need to be provided with accurate information to support efficient installation, and also be able to demonstrate that the installation has been done correctly. Currently, these processes are mainly manual, time consuming, and error prone -- which leads to increase of cost. Errors and associated rework can have a significant impact on project profitability and can also affect quality in the longer term. Currently, the information loop to identify, report, and address issues at design stage is not systematically closed.

Vision and digital technologies such as augmented, virtual and mixed reality, laser scanning, computer vision, ubiquitous wireless communications and 3D digital design technologies are all being explored for application in this area. From these technologies, this project will create a common toolset that is able to address the requirements of multiple sectors through a requirements and demonstration process based on a range of use cases such as: nuclear reinforcement cage production, residential and commercial fit-out, and the manufacture of precast modules. The project will also deliver demonstrators for the use cases, together with documented process and guidance for the workflows and data structures, for capture and retrieval.

The project team is:

* **Laing O'Rourke (lead) --** a leading construction engineering enterprise experienced in the specific use cases
* **Trimble** -- a construction software and hardware technology company
* **Offset Services** -- an SME focused on as-built and quality control information processing
* **DesignTech** -- an SME focussed on design automation
* **Workmobile** -- an SME focussing on mobile work-face applications
* **AMRC** -- a Catapult centre that will bring extensive knowledge of augmented reality and digitally enabling production processes

Microsoft will provide technology support to the team and EDF NNB will represent the client owner operator aspects.