Introduction

Connected Everything is looking forward to continuing its work in 2019, supporting and strengthening the Digital Manufacturing community. We are now an inclusive network, engaging representatives from over 90 organisations, with nearly 250 registered members, from both academia and industry. This newsletter includes news of projects and events contributed from the wider community and also gives a flavour of Connected Everything’s recent activities and details of our future events.

A recent highlight was the Connected Everything Winter Workshop. This successful event took place earlier this month. It was hosted by Nottingham Trent University, from 9-11 January, and attended by 30 enthusiastic PhD and early career researchers who shared a common interest in Industrial Digitalisation, Automation and Robotics. Our Early Career Researcher Placement Scheme is underway and we have just opened a second call for applications for two further placements – please do pass on information about this scheme to any potential candidates whom you think may benefit from this opportunity. Our next event, in February, will be a Shared Learning Workshop. We are bringing together the network’s leadership, representatives from our feasibility study teams and the Early Career Researchers who are benefiting from our Placement Scheme. We hope to learn from their experiences and tease out lessons for the future.

We were also invited to submit an application to EPSRC for renewal of the Network Plus in late 2018. A new team of Co-Investigators, alongside our existing management and leadership teams, came together to deliver a refreshed vision for the Network Plus which we hope will enable our work to be developed for a further three years. We will hear whether this funding application has been successful later this year. Members of our leadership team have also been closely involved in working with the Made Smarter bid to the Industrial Strategy Challenge Fund, which we hope will stimulate further investment in research and innovation in Digital Manufacturing.

It is with a sense of anticipation that we now look ahead to our third annual conference ‘Designing a Connected Future’. New themes, including ‘Creativity and Design’, will be given centre-stage to reflect their growing significance to key issues in Digital Manufacturing. This time, the conference will be hosted in Nottingham at the University’s Jubilee Conference Centre, with an evening dinner at the city’s Council House. Delegate registration for the event, on 25 and 26 June 2019, is now open. We invite you all to join us and make the most of another opportunity to begin new collaborative ventures. In the meantime, please keep an eye on the
Connected Everything website where we will be publicising outputs from the Connected Everything feasibility studies, as these are completed, between now and the summer

Contents

- Early Career Researcher Placement Scheme - second funding call
- Feasibility studies
- Connected Everything events 2019
- Spotlight on Connected Everything's Early Career Researchers

**News from the Digital Manufacturing community**

- Internet of Food Things (IoFT) NetworkPlus - call for pilot projects
- Digitally Enhanced Advanced Services (DEAS), Digital Economy NetworkPlus
- Transforming Construction Network Plus
- Smart Manufacturing Accelerator launch, with 'Factory in a box' demonstration, Manufacturing Technology Centre
- Digitalising Manufacturing Conference 2019, Manufacturing Technology Centre
- Digital Manufacturing on a Shoestring, University of Cambridge & University of Nottingham
- A case study of 'Connect 4:0' from the Virtual Engineering Centre, University of Liverpool
- RoboClean: Human Robot Collaboration for Allergen-Aware Factory Cleaning, University of Nottingham

Please click on the links given throughout the newsletter for further details.
Early Career Researcher Placement Scheme - second funding call now open

As part of its activities relating to people movement and skills, Connected Everything is pleased to announce a second call for its Early Career Researcher (ECR) Placement Scheme. The scheme aims to facilitate cross disciplinary research in the area of digital manufacturing.

Following the first call for applications, 6 placements were funded. We expect to fund a further 2 placements. Applications from women are particularly encouraged.

Further details and the application form are available on our website

The closing date is 15 February 2019

Feasibility studies

Results from all eleven feasibility studies will become available on our website. Five studies are now complete and the rest are due to finish by June 2019. Each team is submitting an end of project report and their main achievements will be highlighted in an accompanying Case Study report.

Some Case Study reports are available now

Towards additive manufacturing process control using semi-supervised machine learning

University of Liverpool

BREWNET: Intelligent cloud-connected sensors for economic small-scale process optimisation

University of Nottingham and University of Leeds
Circular 4:0: Digital intelligence to enable a circular economy

Cranfield University and University of Sheffield

Feasibility of capturing crafts-based knowledge in an AI system for future precision surface manufacturing

University of Huddersfield and University of Nottingham

Other news from our feasibility study teams...

Dr Phillip Stanley-Marbell - publication in the pipeline

Dr Phillip Stanley-Marbell, University of Cambridge, reports that a technical highlight from their feasibility study ‘Continuous In-Situ Microstructure and Composition Analysis within 3D-Printed Structures Using In-Chamber Sensors’ is a custom construction of a nylon selective laser sintering (SLS) additive manufacturing system which is being instrumented with a custom-designed sensor platform. They have an article in the pipeline which will discuss the sensor platform component of the system.


Dr Peter Green - taking data science to paper production

Dr Peter Green has teamed up with James Cropper PLC, a 174 years old British paper manufacturer, and won a Knowledge Exchange Voucher from the University of Liverpool to apply data science to derive insights, and potentially efficiency improvements, between the inputs to the paper making process and measures of paper quality.

James Cropper is a paper manufacturer in the Lake District who specialise in creating some of the world’s most distinctive and technically advanced non-woven paper products, using materials from cotton and wood to carbon fibre.
They approached the University of Liverpool's Business Gateway to express an interest in working with researchers with the expertise to help them future proof their business. Paul Edmondson, Technology Manager for James Croppers PLC, was impressed with Peter's presentation on the feasibility study "Towards additive manufacturing process control using semi-supervised machine learning" and a new partnership has begun.

Connected Everything Events 2019

Winter Workshop
A Winter Workshop took place from 9-11 January 2019 at Nottingham Trent University. The Smart Industry Workshop was organised by Professor Ahmad Lotfi and Mr. Pedro Machado and took place from 9-11 January at Nottingham Trent University.

The workshop featured 15 keynote talks by established researchers and provided an opportunity for PhD and early career researchers to share their research experiences. All 30 participants were invited to give a short 3-minute presentation, in addition to a poster presented during the workshop. Two panel discussions were organised in which participants had the opportunity to discuss the presented talks in great detail. The Computational Intelligence and Cognitive Robotic laboratory facilities at Nottingham Trent University were demonstrated to all participants. A hands-on session was also organised in which participants experienced FPGA and Embedded SoC design training using the Sundance VCS-1.

The workshop was successful in achieving its aim of presenting recent advances in industrial digitalisation, robotics and automation to PhD students and early career researchers working in related fields. Participants had a great opportunity for learning, discussion and networking with fellow researchers from other institutes. The event triggered some follow-up meetings between speakers and participants for preparing proposals targeting UK funding opportunities.

Smart Industry Workshop Programme
Connected Everything Conference - "Designing a Connected Future" University of Nottingham, 25-26 June 2019

Connected Everything's third annual conference will be held at the Jubilee Conference Centre, University of Nottingham, on Tuesday 25 and Wednesday 26 June 2019. Delegate registration is now open. The early bird rate of £75 includes 2 days at the conference and an evening dinner at the city's Council House. We are currently inviting submissions of abstracts for a poster presentation.

Spotlight on Connected Everything’s Early Career Researchers (ECRs)

Dr Aikaterini Chatzivasileiadi, Dr Nicholas Wardhana and Dr Alejandro Veliz Reyes, from the feasibility study ‘Computing craft: Manufacturing cob structures using robotically controlled 3D printing’.

Dr Aikaterini Chatzivasileiadi is a Research Associate at the Welsh School of Architecture, Cardiff University. She earned her MArch from the Aristotle University of Thessaloniki and both her MSc in Environmental Design of Buildings and PhD in Architectural Science from Cardiff University. In her PhD research she investigated the integration of battery storage technologies in buildings. Sitting on the Technical Committee of the Institution of Engineering and Technology, she contributed to the development of a Code of Practice for Electrical Energy Storage Systems, which was published in 2017. She has also secured funding from the British Council to participate in international workshops on renewable energy and energy security in the built environment. Her previous roles include working as an architectural assistant on sustainable building design.
Dr Nicholas Mario Wardhana is a Research Associate at the Welsh School of Architecture, Cardiff University. He received his Sarjana Teknik degree in Electrical Engineering from Universitas Gadjah Mada (UGM), Yogyakarta, Indonesia. He was awarded his PhD in 2016 from the School of Computer Science and Engineering, Nanyang Technological University (NTU), Singapore. His PhD research involves the analysis of 3D meshes to automatically create path planning map structures in very large virtual urban environments. He was also previously a Project Officer at Multi-plAtform Game Innovation Centre (MAGIC), NTU, leading the development of serious games as platforms for various humanities studies, including empathy building towards migrant workers and elderly people. He is currently involved in two research projects: the enhancement of architectural space in 3D modelling environments, funded by the Leverhulme Trust and a study on the digital fabrication of cob structures, funded by Connected Everything.

Dr Alejandro Veliz Reyes is a Lecturer in Digital Design (Architecture) at the School of Art, Design and Architecture, University of Plymouth. Previous academic roles and guest lectures include Nottingham Trent University, University of Salford, Polytechnic of Turin and UTFSM (Chile). After becoming a qualified architect in Chile in 2007, his PhD work focused on the role of digital technologies (AR/VR) in design studio communication. His PhD was awarded by the University of Liverpool in 2015. He joined the University of Plymouth in 2014, and is currently Award Leader for the BA (Hons) Architecture (years 2 and 3) and is developing the new courses BA/BSc Digital Design Innovation and MA/MSc Integrated Design Innovation, with a focus on producing highly skilled professionals in the field of multidisciplinary design, manufacturing and digital fabrication. In previous research, he has received funding from the Chartered Institute of Building, Higher Education Innovation Fund and the Technology Development Corporation (Chile).
News from the Digital Manufacturing community

Internet of Food Things (IoFT) NetworkPlus - call for pilot projects

The Internet of Food Things Network Plus, led by the University of Lincoln, aims to expand the UK's digital food economy by stimulating and coordinating inter-disciplinary research into the digital transformation of the food production and supply chain through the application of new technologies such as IoT, AI, smart packaging, blockchain, new business models, and other forms of innovation.

A key instrument in achieving this is our pilot projects funding calls. The priority areas for applications are as follows:
1. New business models, applications of new technologies (including Internet of Things(IoT), distributed ledger technology (DLT)), to underpin traceability and optimal transfer flows throughout the food chain. This could include regulations, standards, cyber/physical security and other aspects of resilience.
2. Wide scale application of the internet of things (IoT) for the service community, for example, the secure deployment and use of IoT by commercial and domestic users (refrigerators, cooking devices, etc) to improve efficiency and reduce health hazards or waste.
3. The development of new digital labelling and packaging protocols that assist with consumer understanding and use of food, as well as the management of the supply chain.
4. The use of novel digital technologies (e.g. machine learning, artificial intelligence and vision) to reduce food waste by optimising whole supply chains from producer to consumer.

Further information and details on the application process
Deadline for applications 15 February 2019

Forthcoming events and news from the IoFT....

The first Internet of Food Things Conference will be held at the University of Lincoln from 17-19 September 2019.

Details of this and other events will appear on the website - https://foodchain.ac.uk.
More news available on the Twitter feed: @IoFTnetworkplus

Digitally Enhanced Advanced Services (DEAS), Digital Economy NetworkPlus, led by the University of Exeter

Digitally Enhanced Advanced Services (DEAS) project is an EPSRC Digital Economy NetworkPlus grant focusing on how a product or service is used. Fewer people are buying conventional products and services, instead buying the 'outcomes' that these enable[i] (e.g. rather than 'buying an engine' customers want to buy 'thrust', rather than 'buying insurance' they
want ‘reassurance’). The world of ‘selling things’ is giving way to the provision of ‘outcomes’; paving the way for new and innovative business models that exploit digital innovations known as Digitally Enhanced Advanced Services. This represents a major change in how firms earn money (e.g: payment-per-use, availability or outcome) and is an area where the UK has the potential to excel.

DEAS is led by the University of Exeter’s Professor Roger Maull in collaboration with the universities of Aston, Nottingham, Cranfield and Greenwich. NetworkPlus creates a community of researchers and practitioners working [Grab your reader’s attention with a great quote from the document or use this space to emphasize a key point. To place this text box anywhere on the page, just drag it.] collectively across disciplines (computer science, engineering and business) and sectors (manufacturing, transport and finance services) to accelerate the innovation of Digitally Enhanced Advanced Services. The activities of the network will be guided by the principal research question of how can transformative digital technologies accelerate the innovation of Digitally Enhanced Advanced Services.

The first DEAS workshop took place in November 2018 at Aston University. Industry keynotes from six manufacturing companies illustrated how they have developed/are developing business models, and the underlying processes, in their respective organisations. 37 academics, including ECRs, from the three disciplines representing over 20 universities attended the workshop to co-create a comprehensive research agenda. Our first project commissioning workshop will be in April.

Email f.lumbers@exeter.ac.uk or visit www.deas.ac.uk or subscribe to our mailing list www.jiscmail.ac.uk/DEAS

Transforming Construction Network Plus, led by UCL

A new network of academics, industry professionals and policy makers has been launched to inform future construction policy and practice.

Call for small projects opens 1 Feb 2019

The N+ aims to distribute £1m of funding for small academic-led, user-inspired projects to deliver research that enables innovation as a pathway to real impact for the UK’s built environment.

Key dates
- Friday 1 February 2019 – call opens for applications for small projects
- Tuesday 12 February 2019 – briefing workshop (London)
- Wednesday 13 February 2019 – briefing workshop (Manchester)
- Friday 29 March 2019 – closing date for applications
- Live webcast of the London briefing workshop | 12 February 2019. If you can't come to London in person, register to join the live webcast.
- Briefing workshop: round 1 funding call | 13 February 2019 | Manchester. Find out more and book.

The briefing workshops are designed to give you more information about the funding call, stimulate ideas and develop collaborative relationships, and to answer questions about applying for N+ project funding.

Smart Manufacturing Accelerator launch, with 'Factory in a box' demonstration, Manufacturing Technology Centre, 13 March 2019

The MTC, in collaboration with partners in industry and academia, have built demonstrators to showcase how Factory in a box (FIAB) manufacture and industrial digital technologies will transform your manufacturing and supply chain in the future.

The project has designed and built a “Factory in a Box” (FIAB); a rapidly deployable, remotely managed modular manufacturing solution for the energy sector enabled by industrial digital technologies.
The FIAB, is a fully automated factory which cuts, brazes and bends copper pipes to produce pipe assemblies that have been geometrically checked and pressured tested. It also fits into a 40ft shipping container so that it can be shipped around the world. The embedded industrial digital technologies mean that it can be monitored and operated remotely.

The FIAB is an industrial-scale demonstrator which practically exemplifies how the application of digital tools can be employed to add value or address challenges in manufacturing businesses. The demonstrator is based on a use case for a thermal energy SME. The output of the Smart Manufacturing Accelerator is a framework and service which can be used to deliver digital manufacturing solutions.

Register for the launch event on Wednesday 13th March at the MTC

Digitalising Manufacturing Conference 2019, Manufacturing Technology Centre

Join the MTC, industry and expert speakers on the 4-5 November 2019 for the fifth annual Digitalising Manufacturing Conference, and gain the know-how you need from worldwide leading experts.

The conference will address international collaboration opportunities, national policy as well as practical knowledge to drive industrial digitalisation from within UK value chains. The packed two-day programme will also feature insightful panel discussions; interactive workshops; innovation pitches and digital manufacturing demonstrators - making this the ‘must-attend’ conference on this topic in the UK.

Register your interest today for priority access to tickets when they go on sale.

Couldn't make it to last year's conference?

Digitalising Manufacturing 2018 brought together one of the most authoritative gatherings of international experts on digital factories ever assembled. Delegates heard that international cooperation has never been more important if the UK is to stay competitive, and that many nations around the world were embarking on the same digital journey.
One year on from Professor Juergen Maier’s launch of the Made Smarter review at the conference, Professor Maier returned to the MTC as keynote speaker to update delegates on how the Made Smarter vision is becoming a reality. Delegates learnt that the initiative has moved to the implementation stage and was looking to create an innovation eco-system to support the implementation of digital programmes, with a National Adoption Programme being piloted in the North West.

The two-day conference brought together international authorities on digital manufacturing from Germany, France, Italy, Japan, Mexico and the UK, as well as other countries. Manufacturing leaders shared experiences with delegates, and underlined that the digital revolution opens up huge potential for UK manufacturers prepared to invest in skills and technology to reap the benefits.

Digital Manufacturing on a Shoestring, University of Cambridge & University of Nottingham

A short article in Connected Everything’s previous newsletter introduced ‘Digital Manufacturing on a Shoestring’. It is a project with a difference. It asks how existing and readily available digital technologies could be implemented on a low-cost basis to support growth and productivity in small and medium-sized enterprises (SMEs). Rather than implementing digital at all costs, the common concern that recent developments in digital manufacturing are unlikely to be affordable for SMEs is addressed.

The emphasis is on understanding the business challenges that organisations are trying to overcome, then creating appropriate digital solutions that demonstrate significant value. The project aims to deliver extensive impact across the SME community.

The project will seek to exploit very low cost commercially available technologies for mobile computing, sensing, AI and will tackle the challenges associated with integrating these safely and securely into a small-scale manufacturing environment.

For more information contact Professor Duncan McFarlane by emailing dcm@eng.cam.ac.uk
A case study of 'Connect 4:0' from the Virtual Engineering Centre, University of Liverpool

Connect 4.0 Limited is a new startup business based in Liverpool City Centre who develop digital supply chain platforms, which connect factories with CNC (computer numerical control) and additive manufacturing capabilities directly to clients who are looking for manufacturing partners to produce products based on designs. This enables clients to find the best possible manufacturing partner to suit their needs and budget, and bring their product to market quicker.

Connect 4.0 Limited have recently acquired the Co-Fabrico brand and IP. Co-Fabrico have previously worked with the LCR 4.0 project in supporting their development of an augmented reality interface for an integrated supply chain technology product. LCR 4.0 is a part ERDF funded project, which supports manufacturing SMEs within the Liverpool City Region.

The Virtual Engineering Centre (VEC), as lead partner for LCR 4.0, offered advice with the plans for an integrated solution, which could easily link a smart interface with factory facilities by becoming integrated with the Co-Fabrico software suite. This product would provide a new paradigm for the use of additive manufacturing within the automotive supply chain. The VEC identified barriers to adoption including machine disruptions and explored how to allow CNC machines and additive manufacturing machinery to shift towards their customer's needs by allowing customers to upload CAD models directly to a web portal for rapid quoting and production planning. The VEC supported by demonstrating a virtual ‘factory in a box’ model which allowed Connect 4.0 to interact with their theoretical product, identify strengths and weaknesses of their ideas whilst quickly and easily developing their concept and learning of the full potential of such technologies. Together the VEC and Connect 4.0 developed a working user friendly demonstration of an AR interface which could be showcased to investors.

“Working with the VEC has been a straightforward process that has produced valuable, practical results to help steady our technology development course. The VEC helped us validate our AR
RoboClean: Human Robot Collaboration for Allergen-Aware Factory Cleaning
University of Nottingham

This project will investigate and demonstrate the potential of human-robot collaboration, integrated with IoT sensors, for cleaning and allergen detection on a factory floor. The project is led by Dr Joel Fischer, Computer Science, and Dr Nicolas Watson, Engineering, both from the University of Nottingham. They are working with the Food and Drink Forum and industry partners. It is funded from November 2018 to April 2020 by the University of Nottingham's Smart Products Beacon and Horizon Digital Economy Research Institute.

The internal cleaning of processing equipment has become a fully automated process known as ‘Clean-in-Place’ and is beginning to take advantage of novel technologies such as in-line sensors, IoT and machine learning. Can the RoboClean team extend this approach to cleaning a factory floor?

Connected Everything

Connected Everything is led by Professor Sarah Sharples, University of Nottingham, and an Executive Group, with members from 18 organisations. The Executive Group provides guidance to the Network and links to other key strategic initiatives.