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Newsletter: Issue 4: Summer 2018

Introduction

Connected Everything has enjoyed a busy and productive Spring 2018. All eleven feasibility studies are now underway. A set of information sheets reporting their details provided a focal point for the Connected Everything stand at the Industry 4.0 Summit in Manchester on 28th February 2018.

Work has continued on identifying key research challenges, using input from the thematic areas work, the Executive Group, the D4I industry forum and other key stakeholders. This work has informed the development of an Industrial Strategy Challenge Fund (ISCF) Wave 3 digital manufacturing bid.

We are now looking ahead in anticipation of Connected Everything's second annual conference which will take place on 26th and 27th June 2018, in Newcastle, and bring together people from the digital manufacturing community. Both the identified key research challenges and the ISCF roadmap will be discussed as part of this year's conference programme.

It is fortuitous that the conference overlaps with the Great Exhibition of the North; the Conference drinks reception and dinner will be held close to Stephenson's Rocket. On account of this however an early visit to delegate registration and accommodation booking is advisable. Please spread the word through your networks of colleagues, whether they are working in industry or academic settings.

Details of how to book a place at the conference can be found below.

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Please click on the links given throughout the newsletter for further details.

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Connected Everything Conference 2018

Manufacturing a brave new world, Newcastle University, 26-27 June 2018

At this year's conference, we will bring together people from both academic and industry settings with an interest in digital manufacturing. We invite you all to come along and bravely consider the opportunities and challenges presented by the wealth of new digital technologies which are bringing about a step change in manufacturing.

Whether from an academic or industry perspective, whatever the discipline or sector, no matter how small or large a company, if you are engaged in work of relevance, then we encourage your involvement and contributions.

We are delighted to announce that there will be keynote talks from Professor Thomas Kurfess, Georgia Institute of Technology, and Professor Steve Benford, University of Nottingham.

Links to conference information, including delegate registration and how to book accommodation, are available here. Early bird delegate registration is available until 18th May 2018.

We are particularly keen to receive abstracts from PhD students and Early Career Researchers. The Call for Abstracts remains open until 11th May 2018.

A forthcoming I4MS workshop on data visualisation, 25th June 2018, University of Portsmouth

Data, decision-making & Industry 5.0

The University of Portsmouth Institute of Industrial Research (IIR), led by Professor David Brown, is hosting a workshop on Monday 25th June 2018, immediately preceding the Connected Everything Conference. This day long event will showcase the culmination of the IIR's recent I4MS applied research projects which draw to a close this Autumn. Both projects are working with UK manufacturers and involve the analysis of complex data sets to enable an increase in productivity not only for the machines themselves through a predictive maintenance model, but also through the use of High Performance Computing.

Big data analytics is therefore a key aspect to both projects but more than this, the projects have illustrated how data visualisation for effective decision-making becomes an essential element of these kinds of new ways of digitising the manufacturing process. Why? Because it enables humans to work better and more effectively leading to efficiencies, the broadening of the scope of what the machinery can achieve and ultimately a boost in productivity by motivating workers through salient, useful and credible evidence based information. Without a 360 degree insight into the production process a co-operative relationship between man and machine will not be fully possible.

This approach to enabling the co-existence of humans and machines, sits well within the newly defined Industry 5.0, which was discussed in a recent article by Phill Cartwright, Executive Chairman of the Centre for Modelling & Simulation. Beyond 4.0 is the fifth revolution where human intelligence works in harmony with cognitive computing and where you have "seamless data between the field, the manufacturing process and the design". 5.0 goes one step further than 4.0 by "taking humans out of the manufacturing route" however, as Phill states "they'll be more involved in how the product is being used and how it can be designed because they have more information." Data visualisation then, we foresee, will be a key part of enabling Industry 5.0 and will ultimately enable not only increased productivity but also other outcomes such as mass customisation and personalisation for customers.

Our teams have been developing a platform to support the decision-making process in data visualisation which will be showcased on the day, but we warmly welcome submissions of other Abstracts for Presentations, Posters and Demos from academics and industry across the UK and Europe. Topics could include harmonisation of operator & machine interaction and proximity; the monetisation of manufacturing data; self-service analytics for 360 degrees insight; mobile and remote manufacturing through visualisation; virtual and augmented reality for design and customisation; visualising qualitative data; storytelling and data visualisations.

As part of the event, we will also be hosting an Industry Panel discussion so if you would like to be a part of the panel and talk about your data challenges in your business, then please do get in touch. For more information and to submit your abstracts please visit https://www.eventbrite.co.uk/e/data-visualisation-and-decision-making-in-the-manufacturing-sector-tickets-45414255260 or email shuai.li@port.ac.uk. We look forward to seeing you there!

Thematic areas and research challenges

Last year, Connected Everything's six Thematic Area champions were asked to draft reports to provide a definition of each thematic area, outline its importance/value to Industrial Systems in the Digital Age and identify current research, including specifying areas of excellence, as well as possible gaps where funding could be directed.

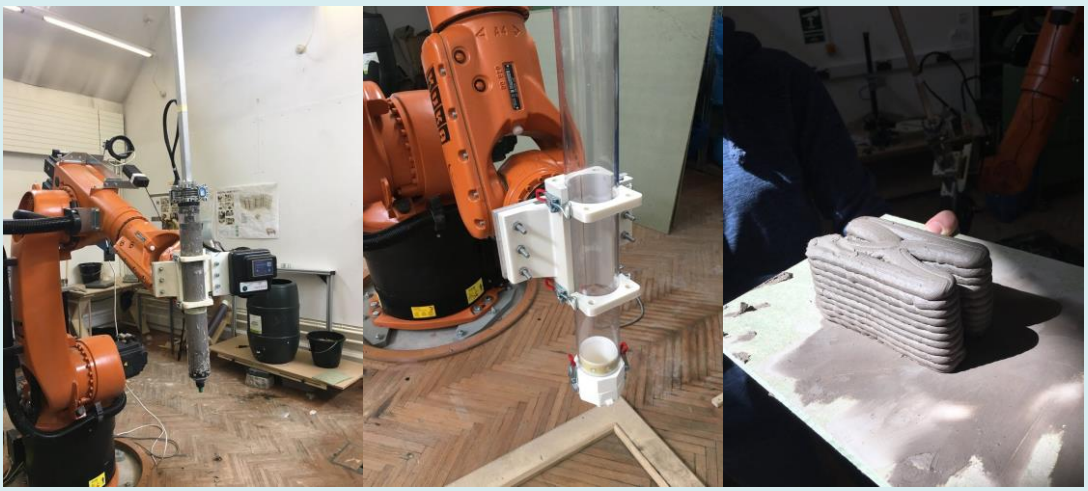
Six draft reports were discussed in detail at the January 2018 Connected Everything Executive Board meeting. A number of potential research challenges were identified and subsequently mapped against the thematic areas. Further work was undertaken to refine and consolidate this mapping, which led to the identification of four key research challenges. We are currently formatting the six thematic area reports along with an overarching report on the four research challenges. The aim is to have these documents ready for circulation before the end of May 2018.

Feasibility studies

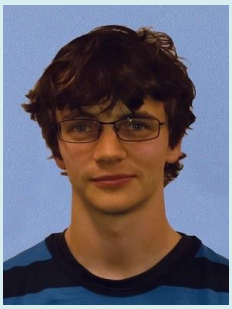
The five feasibility studies funded through the second funding call are now underway and most of those funded through the first funding call are reaching their conclusion. The information sheets reporting their details are available on the Connected Everything website.

Computing Craft: Manufacturing cob structures using robotically controlled 3D printing - an update on progress

The Computing Craft team has been working hard on developing a new 3D printed quick release bracket and nozzle for their extruder. The first test extrusion was tried this week. Progress indeed! To check the ongoing work of the team, follow the Project Lead, Dr Wassim Jabi (Cardiff University) at https://twitter.com/wassimj



Impact Accelerator Accounts awarded to feasibility studies' Principal Investigators



Peter aims to use the results of the feasibility study in software to be deployed at Renishaw PLC. The software will have two functions. Firstly, it will extract statistically significant indicators of AM build quality from (very!) large sets of process measurements. Secondly, using machine learning, it will efficiently identify the quality of future AM builds based on process measurements alone. The work will be carried out from August to November. The IAA account is £12K.

Nik aims to develop the BREWNET project's impact as originally envisaged by the BREWNET team. He will develop a product design specification for the commercial prototype Ultrasonic Sensor which has been developed in partnership both with the craft brewery, Totally Brewed, and the University of Leeds. He will go on to devise Intellectual Property and Commercialisation strategies. This work is to be carried out in summer 2018. The IAA account is £11k.

Summer School, Nottingham Trent University, 12 – 14 September 2018

Smart Industry - Recent Advances in Industrial Digitalisation, Robotics and Automation, 12th - 14th September 2018, Nottingham Trent University

Research students and early career researchers in computer science, engineering and manufacturing must keep up to date with how computational intelligence, machine learning and connected devices are shaping the future of our smart industries.

The aim of this summer school is to present rigorous scientific advances, accompanied by real world applications, in the areas of Industrial Digitalisation, Robotics and Automation. There will be speakers from Aston University, Bournemouth University, Sheffield Hallam University and the University of Ulster, as well as from industry partners including Shadow Robot, Sundance Microprocessor technology, SoftBank, ABurnet and Siemens UK.

Further information and details on applying for a place can be found at the Smart4industry website or by contacting the organiser Professor Ahmad Lotfi directly at ahmad.lotfi@ntu.ac.uk

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

Dr Hongjie Ma and Dr Ruby Hughes, from the feasibility study team 'Pathway to autonomy for an SME factory'.

Hongjie Ma is a Senior Research Fellow at the Institute of Industrial Research, University of Portsmouth. Hongjie was awarded two BScs in 2009 in '*Thermal Energy and Power Engineering'* and '*Computer Science and Technology'* and, in 2015, he completed a PhD in '*Power Machinery and Engineering'* from Tianjin University, China. His PhD research focused on the electronic control system and artificial intelligence-based diagnosis and optimisation.
Hongjie has published 5 journal papers over the past two years. One of these papers has an impact factor of 7.18 and the average across all 5 papers is 4.08. He has participated in 6 projects funded by EPSRC, Innovate UK, DSTL and the EU. Hongjie attributes his innovative ideas for industrial applications to the breadth of experience and knowledge that he's gained from his cross-disciplinary background. Hongjie is taking a leading role, as Principal Investigator, in the feasibility study 'Pathway to autonomy for an SME factory'.

Ruby Hughes was awarded a PhD in Operational Research at Sheffield Hallam University in 2011. She then joined the Advanced Manufacturing Research Centre (AMRC), University of Sheffield, as a Project Engineer, where she worked primarily on the development of discrete event simulation modelling under a European funded project - COPERNICO. In 2013, Ruby was awarded Chartered Engineer status by the Institution of Mechanical Engineers (IMechE). In 2016, Ruby became a Technical Fellow within the AMRC and began to lead a team of project engineers working on both research and industrial projects within the area of numerical modelling.
Ruby's research interests are primarily focused on the development of discrete event simulation and optimisation modelling for supporting UK manufacturers in the area of factory planning and operational management. Ruby has worked with a range of industrial partners including Boeing, Rolls-Royce, Spirit Aerospace System, MBDA Missile systems, McLaren Automotive, Berkeley Modular and a number of SMEs within the UK. She is excited by the opportunities to link her research capabilities with the evolving technologies within the context of Industry 4.0.

Connected Everything at the Industry 4.0 Summit, *28th February and 1st March 2018*

The View from the Connected Everything stand

Connected Everything braved the blizzards to be an exhibitor at the Industry 4.0 Summit. We met many enthusiastic people, keen to find out more about our objectives and hear about the feasibility studies which were both the centre-piece of our exhibit and which are at the heart of the network. We were also able to attend a number of talks at the Summit and its associated Academia event, which was organised in conjunction with the University of Manchester.

View the 2018 Industry 4.0 Summit speaker videos

Next year's Industry 4.0 Summit will take place in Manchester on 10 - 11 April 2019.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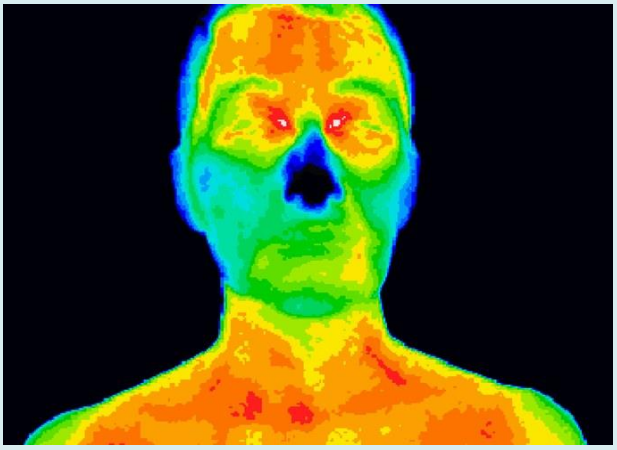
DigiTOP project

A Digital Toolkit for optimisation of operators and technology in manufacturing partnerships (DigiTOP)

The overall goal of the DigiTOP project is to produce a toolkit that will enable industry to increase productivity, support Digital Manufacturing Technology adoption and de-risk the implementation of future Digital Manufacturing Technologies through the consideration of human requirements and capabilities.

Led by Professor Sarah Sharples, University of Nottingham, the DigiTOP project brings together a team with expertise in manufacturing, human factors, robotics and human computer interaction, to develop new methods to capture and predict the impact of Digital Manufacturing on future work. This project will work closely with a range of industry partners, including Jaguar Land Rover, BAE Systems, Babcock International and the High Value Manufacturing Catapult to co-create industry-specified use cases to examine.

The manufacturing industry, with the drive towards 'Industrie 4.0', is experiencing a significant shift towards Digital Manufacturing. This increased digitisation and interconnectivity of manufacturing processes is inevitably going to bring substantial change to worker roles and manual tasks by introducing new digital manufacturing technologies (DMT) to shop floor processes. At the same time, the manufacturing workforce is itself also changing - globally and nationally - comprising of an older, more mobile, more culturally diverse and less specialist / skilled labour pool.



The recently funded DigiTOP project will develop the new fundamental knowledge required to reliably and validly capture and predict the performance of a digital manufacturing workplace, integrating the actions and decision of people and technology. The approach consists of using embedded sensor technologies to capture workplace performance (including using facial thermography), machine learning and data analytics to synthesise and analyse these data, and new methods of visualisation to support decisions made, potentially in real-time, as to how digital manufacturing workplaces should function. This project will kick off in July 2018.

Professor Sarah Sharples, Connected Everything's Principal Investigator, has been appointed to the Council of the Engineering and Physical Sciences Research Council

Professor Sarah Sharples joins the 12-strong board, following the establishment on 1 April 2018 of UK Research and Innovation (UKRI), which is bringing together the seven Research Councils, Innovate UK and a new organisation, Research England.

Professor Sharples said
“EPSRC invests more than £800 million a year in research and training in engineering and the physical sciences and I’m honoured to take up this role. As a

member of the EPSRC Council, I will also be a 'critical friend' of our parent body, UK Research and Innovation, helping to ensure all the Research Councils work together and support our research-rich Universities in bold and imaginative ways."

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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.

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