# Report for EPSRC's Connected Everything II Sandpit Workshop

University of Nottingham, 27th September 2023

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The Sandpit Workshop hosted by Connected Everything (EPSRC Digital Manufacturing network+) was a melting pot of ideas and expertise. Researchers from diverse fields gathered to brainstorm on the future thematic focus and activities for a new EPSRC digital manufacturing network.

The purpose of the Sandpit is to develop the concept of CE3 or another network within digital manufacturing. It aims to bring together researchers with a diverse range of expertise. Additionally, it intends to outline the CE prize fund that groups can apply for in order to develop a network proposal. Furthermore, the Sandpit serves as a platform for discussing the themes and activities required for a new EPSRC digital manufacturing network. It also provides guidance on the application process, with current CE investigators mentoring the new leadership and assisting them through the process.

**Question 1:** What should be the key thematic areas for a new EPSRC digital manufacturing network?

- Are any of the current CE thematic areas still relevant?
- What should be new themes
- How would these themes align with the EPSRC Manufacturing and Circular Economy priorities?

**Question 2:** What should be the key activities of the new digital manufacturing network?

- How can the network support researchers (especially ECR) in the new post-covid world
- How does the network align with other UK and International digital manufacturing activities?
- How can the network attract researchers from a more diverse range of disciplines?

- Are the current CE activities still the most suitable?
- How can the network foster a diverse and inclusive manufacturing research community?

One of the resounding themes was the critical need for "**Real-World Data**." The group recognised that a more nuanced understanding of global supply chain changes could be facilitated by shifting from lab-based to real-world data. This shift is seen as vital in strengthening "**Resilience into Supply Chains**," another significant theme. Here, the opportunity to use digital twins became apparent.

"**Sustainable Manufacturing and Digitisation**" also emerged as a dominant theme. In the wake of global issues like the war in Ukraine, the necessity for sustainable practices in manufacturing and digitising production was keenly felt. This theme seamlessly tied in with the focus on reducing uncertainties and risks, especially concerning the pathways to successful digital manufacturing.

Bioengineering presented a multidisciplinary challenge. Themes of sustainability continued here, discussing bio-waste and a world aiming for zero waste. The "**Human and Physical**" elements were not overlooked. The psychology behind technology adoption, the human element in digital manufacturing and, interestingly, the language and terminologies of system interaction all became points of discussion.

**Retuning Current Activities for a new network**: The general mood was one of maintaining the existing framework but updating it to fit evolving needs. Participants were broadly in favour of existing network activities and saw no need for an overhaul. Instead, a more nuanced approach was suggested—tweaking activities for greater efficacy.

**Interdisciplinary Modelling**: The concept of interdisciplinary modelling found favour, inspired by existing models like C-DICE (Centre for Postdoctoral Development in Infrastructure, Cities, and Energy). This approach could provide a rich cross-pollination of ideas and techniques among researchers from different areas.

**Building Confidence**: Participants noted the potential intimidation factor of events, advocating for a more inclusive atmosphere. Here, efforts could be focused on training sessions aimed at boosting presentation and communication skills, particularly for Early Career Researchers (ECRs) who may find large network gatherings daunting.

**Speed Networking:** A suggestion of "speed networking" was proposed, similar to speed dating but for professional connections. This could be a quick and engaging way to ensure that network members get to know each other on a deeper level.

**Focused Support for ECRs:** Significant emphasis was put on the need to create specific activities aimed at ECRs. One suggestion was to bring ECRs together more frequently in less formal settings, to foster greater collaboration and provide a platform for idea exchange.

**Academic-Led Workshops for Proposal Writing:** Responding to the need for more directed guidance, it was recommended to invite experienced academics to host workshops on proposal writing. These sessions would demystify the grant application process and provide tangible skills that researchers can apply immediately.

To summarise, the workshop helped set a trajectory for a new, more dynamic EPSRC digital manufacturing network. The focus is on blending innovative technological solutions with real-world practicality while ensuring that both human and technological elements are in harmony.

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## Themes Identified

**Real-World Data**

- Lab-based and real-world data to assess supply chain changes globally.

**Resilience to Supply Chains**

- Explore autonomous processes and data sources to increase resilience.

**Sustainable Manufacturing and Digitisation**

- Emphasis on net-zero manufacturing and digitising production with a sustainable focus.

**Reduce Uncertainties to Pathways**

- Assess risk and uncertainty, particularly in adopting digital manufacturing techniques.

**Bioengineering**

- Aligning with circular economy priorities, bio-manufacturing and system thinking were discussed.

**Human and Physical**

- Importance of humans in the loop and the psychology of technology use. Also, health-conscious manufacturing and multi-scale production approaches.

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## Suggested Activities

**Retain Existing Activities**

- Delegates were broadly in favour of existing network activities but suggested slight modifications.

**Interdisciplinary Modelling**

- E.g., C-DICE - centre for postdoctoral development in infrastructure, cities and energy.

**Confidence Building in Events**

- Make events less intimidating; help people communicate and present confidently.

**Delegate Packs**

- Create comprehensive packs to assist delegates during and after events.

**Speed Networking**

- Incorporate "speed networking" similar to speed dating to facilitate interactions.

**Dissemination and Impact**

- Look for non-traditional ways to disseminate results and make an impact on a broad scale.

**Policy Development**

- Align activities more closely with government priorities.

**Virtual Groups Efficiency**

- Improve the efficiency of virtual networking to improve the experience for members.

**Real-World Problem Input**

- Encourage input from real-world problems to ensure research is application-focused.

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## Ideas for next steps

Based on the workshop findings, the following next steps could be considered for a future digital manufacturing network proposal:

1. **Data Strategy Development**: Initiate a sub-committee to focus on transitioning from lab-based to real-world data. This will involve creating partnerships with industry players who can provide relevant data and expertise.
2. **Thematic Focus Groups**: Form dedicated teams to delve deeper into each of the identified themes. Each group can work on developing whitepapers or feasibility studies to guide future research and activities.
3. **Review Current Activities**: As the delegates were largely in favour of existing network activities, a review should be conducted to identify specific areas for improvement or "tweaking."
4. **Interdisciplinary Modelling Initiative**: Engage with centres like C-DICE to develop a blueprint for interdisciplinary research that can be rolled out network-wide.
5. **Confidence-Building Measures**: Develop a short training programme aimed at improving presentation and communication skills among network members. Consider hosting a "soft skills" workshop as a precursor to future networking events.
6. **Speed Networking Pilot**: Trial a "speed networking" event at the next workshop or conference to gauge its effectiveness in fostering connections among members.
7. **Impact and Policy Alignment**: Form a task force that focuses on aligning network activities with government policies and circular economy priorities, ensuring that research is both impactful and relevant.

8. **Virtual Network Efficiency**: Research and implement tools and best practices for improving the efficiency and experience of virtual networking within the network.
9. **External Engagement**: Begin outreach activities aimed at SMEs and other organisations that could benefit from, or contribute to, the network's research. This could involve guest talks, joint research, or consultancy.