GLOBAL DISTINCTIVENESS
Governments all around the world have invested in Digital Manufacturing R&D centres to advance the scientific and engineering fields of manufacturing and to support Industry in the advancement and adoption of digital technologies to stimulate economic, societal and environmental impact during production of millions of products we use in our everyday lives. Given its digital nature Manufacturing research knows no boundaries or boarders, and so it is imperative that manufacturing R&D centres are distinctive, but also collaborate around common international challenges such as the future of manufacturing work, mass-customisation, manufacturing education and public engagement and synergistic key enabling technologies development.

At Confirm Centre we have embarked on a mission to understand and map the international manufacturing R&D landscape and to articulate our global distinctiveness on our drive to become a world-leading centre in Cyber-Physical manufacturing systems and digital supply chain research. To do this we utilised an appreciative enquiry framework, where we consulted far and deep, to arrive at what we consider to be our true distinctiveness, and this document presents our main findings. We look forward to hearing your views on our signature profile, and to collaborate with you on smart manufacturing research.

Prof. Conor McCarthy, Confirm Director
VALUES DEFINE WHO WE ARE

EXCELLENCE AND AMBITION
We strive to excel in research in cyber-physical manufacturing systems and digital supply chain, and place a strong emphasis on high quality research outputs in high quality journals and conferences.

CREATIVITY AND INNOVATION
At all levels of our organisation we promote Creativity and Innovation and believe that by fostering these values across the team, we will enhance our capacity to deliver novel, impactful and world-leading research.

IMPACT
Through outcomes created as a result of our high quality research outputs, we strive to support manufacturing competitiveness and sustainability while delivering strong societal, economic and environmental impact.

ENGAGEMENT
Confirm believes that we achieve more by working together with all of our stakeholders and the wider community. We place Industry at the core of our research activity and work closely with the public to help promote manufacturing as an exciting and impactful career globally.

DIVERSITY AND INTEGRITY
We value all aspects of diversity in order to build a research culture that impacts on all facets of society. We act with integrity and respect and adhere to strong moral and ethical principles.

KEY OBJECTIVES TO DELIVER OUR MISSION

1. WORLD-LEADING RESEARCH
   To develop future smart manufacturing technologies

2. TALENT & ENGAGED PUBLIC
   Positive perception of Irish manufacturing globally

3. INCLUSIVE & DIVERSE COMMUNITY OF PRACTICE
   To embrace the 4th Industrial revolution together

4. INTERNATIONALISATION
   Internationalisation as part of our growth strategy
Smart manufacturing employs computer-integrated production, high levels of adaptability and rapid design changes, digital information technology, and more flexible technical workforce training. It includes fast changes in production levels based on demand, optimisation of the supply chain, efficient production and high levels of digital technology. The future smart factory will employ interoperable systems, multi-scale dynamic modelling and simulation, intelligent automation, strong cybersecurity, and networked sensors. The broad definition of smart manufacturing covers many different key enabling technologies including big data processing capabilities, industrial connectivity devices and services, and advanced robotics. Confirm Centre is dedicated to fundamentally transform industry to a smart manufacturing ecosystem by integrating intelligence within products, machines, production systems and supply chains.
CONFIRM is a world-leading SFI Research Centre in Smart Manufacturing.

SPOKE 1
Smart Products

SPOKE 2
Smart Machines

SPOKE 3
Smart Production Systems

SPOKE 4
Smart Supply Chains

CONFIRM's Hub research programme has a centre of gravity generally spanning TRL 1 to 5 and is designed to address fundamental research questions in Virtual Industrialisation, Cyber-physical Manufacturing Systems, and Self-aware Manufacturing Systems, with the research outputs demonstrated through our Digital-physical Testbeds and Prototype lines. This fundamental research underpins our industrially applied Spoke research programme in Smart Products, Smart Machines, Smart Production Systems, and Smart Supply Chains.

OUR RESEARCH PROGRAMME

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Within these 4 spokes, there are key research areas, which include: Data Analytics, Enterprise Modelling & Simulation, Material Processing, Networking Systems & IoT, Product & Process Modelling, Robotics & Control, Sensors and Software Systems.

We have multiple projects that bring together MNC’s, SME’s, and Researchers, only achievable through our unique blend of Investigators’ Key Enabling Technologies domain expertise.
Confirm’s ambition is to become a global centre of excellence for Education & Public Engagement (EPE) in manufacturing research through development of and contribution to, best-practice.

The EPE Programme at Confirm aims to address misconceptions around modern manufacturing and highlight it as a valuable and exciting field of STEM. The broad portfolio of activity is categorised into four key pillars: Education & Careers, Public Engagement, Capacity Building, & Government & Policy, each of which targets a specific stakeholder group. The EPE programme is the main vehicle through which Confirm’s research community engage with stakeholders external to academia, enhancing awareness of, and engagement with, STEM research both in Ireland and Internationally.

The EPE programme is designed to incorporate elements from each of our key research areas and aims to inspire critical thought and discussion around topics such as the Future of Work and the societal impacts of STEM research and technological advancement.

Our EPE programme includes public event and showcases, workshops with schools, teacher continuous professional development and work placement and bursary schemes. Most recently, we have created the “CONFIRM i4 Experience”. Housed at our headquarters in Limerick, this initiative aims to contextualise Industry 4.0 for participants through enhancing understanding of the evolution of industry over time, from the steam engine up to modern digital manufacturing technology. Participants in this initiative engage with immersive VR educational content in our state-of-the-art VR Cave facility, directly observe some Industry 4.0 technology in action in our test-bed area, before finally completing a hands-on workshop with our researchers. Our vision is to expand this initiative to become Ireland’s first, fully interactive “Manufacturing Museum”.

EDUCATION AND PUBLIC ENGAGEMENT
Confirm’s Smart Manufacturing facility is the centre piece of our research network and through our community of practice area will critically link our researchers, industry partners, and the general public, and will enable best practice research in cyber-physical manufacturing systems and digital supply chain research.

Confirm has identified our global distinctiveness using an Appreciative Inquiry Framework coupled with an international benchmark. Confirm’s distinctive capabilities are a combination of three scientific pillars. Confirm will be known for:

1. DIGITAL-PHYSICAL INTERFACE AND CYBER-PHYSICAL MANUFACTURING SYSTEMS ENGINEERING
   - Multidisciplinary systems approach and vertical integration of domains
   - Modelling of manufacturing
   - Industrial decision-making
   - Advanced sensors, controls and robotics

2. ICT-FOCUSED AND SECTOR AGNOSTIC DISTRIBUTED TESTBEDS
   - Research infrastructure to ‘test & pilot’
   - Interface/bridge between upstream research and industrialisation
   - Access to partner’s manufacturing facilities

3. COMPLETE DIGITAL FUTURE FACTORY APPROACH
   - Full supply chain and value chain perspectives
   - Cybersecurity in manufacturing systems and supply chains
   - Business model innovation and technology adoption
   - Future of work
   - Sustainable production
   - User-centric design and engineering
We have identified 16 international Manufacturing Research Centres of Excellence that align to our scientific remit. Of these centres, we have identified Singapore’s SIMTech, Denmark’s MADE and Germany’s Fraunhofer IFF as the top three that most closely align to our scientific remit.

**Confirm**
- Virtual industrialisation
- Cyber-physical systems
- Self-aware manufacturing systems
- Testbeds & prototype lines

**CESMII**
- Advanced sensors
- Real-time data analytics and control systems
- Standardized open software and communication platforms
- Advanced modelling
- Application toolkits for smart manufacturing

**IMR**
- Industry 4.0 & smart factory
- Data analytics
- Additive manufacturing
- Energy efficiency
- Augmented reality
- Collaborative robotics

**iAMS**
- Virtual sensing, prognostics & simulation
- Autonomous & intelligent decision-making
- Flexible automation & cobotics

**IFF**
- Smart work systems
- Resource-efficient production & logistics
- Convergent infrastructures
- Digital engineering & industry 4.0

**IPA**
- Manufacturing systems and lightweight engineering
- Resource-efficiency & energy storage
- AI in automation
- Digital transformation & industry 4.0
- Cleanliness

**IMCRC**
- Additive manufacturing processes
- Automated & assistive technologies
- High-value product development
- Industrial transformation

**SIM Tech**
- Manufacturing processes
- Manufacturing automation
- Manufacturing systems
- Emerging applications

**I-Form**
- Additive manufacturing (AM)
- AM process & product modelling
- AM material development & characterisation

**IMR**
- Industry 4.0 & smart factory
- Data analytics
- Additive manufacturing
- Energy efficiency
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- AI in automation
- Digital transformation & industry 4.0
- Cleanliness

**AMRI**
- Material and additive processing
- Model-based design and manufacturing
- Sensor & system engineering

**SIAIT**
- Medical robotics and rehabilitation engineering
- Human-machine interactions and control
- Intelligent manufacturing and energy materials

**SIAIT**
- Medical robotics and rehabilitation engineering
- Human-machine interactions and control
- Intelligent manufacturing and energy materials

**SIM Tech**
- Manufacturing processes
- Manufacturing automation
- Manufacturing systems
- Emerging applications
Using the field weighted citation impact of our research outputs from our strong investigator pool over a 5 year rolling average we are performing alongside best-in-class, and have the ambition, talent, and resources to become a globally leading centre for cyber-physical manufacturing systems and digital supply chain research.

**Output in Top 10% Citation Percentiles vs FWCI**
(Bubble: % Publications in Top 25% Journal Percentiles)
2015-2019

**Note:** Benchmarking of scientific publication data (Data is compiled using Elsevier SciVal tool) in 2019.
Confirm’s strong Investigator pool with over 130 researchers draws expertise from nine collaborating research performing organisations at the University of Limerick (Confirm Centre Host), Tyndall National Institute, University College Cork, National University of Ireland Galway, Maynooth University, and Institutes of Technology at Athlone, Cork, Tralee and Limerick. Our unique blend of expertise are drawn from the following key enabling technology domains.
Confirm has identified the following areas of Emerging Research domains within and outside our investigator pool with a high potential for Impact:

- Ethics in AI & Robotics
- Emerging Tech e.g. 5G, Digital Twins
- Predictive Maintenance
- Green Manufacture - Waste/Sustainability, Lifecycle Analysis, CO2, Cost of Manufacture
- Future Factory
- Cyber Security/Privacy
- Deterministic Network & Production Systems