

# IfM BRIEFING DAY

## THURSDAY 12 MAY 2016

IfM | CAMBRIDGE | UK

A day of interactive sessions for senior industrialists and policymakers presenting the latest research, approaches and practical applications from the Institute for Manufacturing

IfM BRIEFING DAY  
THURSDAY 12 MAY 2016

# PROGRAMME

**09:15** REGISTRATION

**09:45** WELCOME

**What's new at IfM**

Andy Neely

**SESSION 1 | PLENARY**

**10:00** **Global trends in the digitalisation of manufacturing**  
Eoin O'Sullivan

**10:20** **Digitalisation of the extended factory**  
Ajith Parlikad

**10:40** **Digital supply chains**  
Jag Srαι

**11:00** **Digitalisation of services**  
Andy Neely

**11:20** **Developing manufacturing talent in the digital age**  
Judith Shawcross

**11:30** REFRESHMENTS

**12.00** **SESSION 2 | FOUR PARALLEL WORKSHOP SESSIONS: PLEASE PICK ONE**

**1. Design for transformation - LR1**  
James Moultrie and Colin Haden

**2. Making the shift to service-based business models - LR2**  
Florian Urmetzer

**3. Transforming global manufacturing and supply networks - SR2**  
Jag Srαι, Paul Christodoulou and Don Fleet

**4. Industrial Resilience & Automation - SR3**  
Liz Salter, Alan Thorne, Ajith Parlikad and Phil Woodall



**13:00** LUNCH

**14.00** **SESSION 3 | FOUR PARALLEL WORKSHOP SESSIONS: PLEASE PICK ONE**

**1. Industrial strategies for national, regional and local policymakers - LR1**

Carlos López-Gómez and Andrew Gill

**2. Technology and innovation management - LR2**

David Probert, Rob Phaal, Mélanie Despeisse, Clare Farrukh, Frank Tietze, Tim Minshall, Imoh Ilevbare

**3. Industrial sustainability - SR2**

Steve Evans, Ian Bamford and Doroteya Vladimirova

**4. Measuring what matters - SR3**

Andy Neely, Andi Jones and Nick Sherwen

**15:00** REFRESHMENTS

**SESSION 4 | PLENARY**

**15.30** **NanoManufacturing**

Michael De Volder

**15.50** **Advancing digital manufacturing with fluids**

Ronan Daly

**16.10** **Energy beam processing and the drive for ultra-precision manufacturing**

Bill O'Neill

**16:30** **Your IfM**

Meet the team and find out how to get the most from the IfM

**17.00** CLOSE

# WELCOME



## WHAT'S NEW AT IfM

**Andy Neely**

**09:45**

Lecture Room 1

Andy Neely will highlight new developments at the IfM in research, education and engagement with industry and government.

## SESSION 1 PLENARY

### GLOBAL TRENDS IN THE DIGITALISATION OF MANUFACTURING

**10.00 | Eoin O'Sullivan**

Dr Eoin O'Sullivan, from the IfM's Centre for Science, Technology & Innovation Policy, will give an overview of international approaches to the digitalisation of manufacturing. In particular, he will review how the challenges and opportunities of digital manufacturing are being addressed by some advanced manufacturing strategies, major policy initiatives and public-private partnerships around the world.

Eoin will contrast different national perspectives on what digital manufacturing means and the different policy approaches designed to support it, including national digital manufacturing-related R&D priorities, but also efforts related to skills and standardisation. Eoin will illustrate some of the variations in emphasis and approach by describing some high profile international digital manufacturing innovation initiatives, new institutes and emerging clusters.

### DIGITALISATION OF THE EXTENDED FACTORY

**10.20 | Ajith Parlikad**

The Internet of Things refers to the integration of the physical world around us with the digital world. It envisions a variety of things and objects interacting and cooperating with each other to reach common goals. Through the Internet of Things we are creating and sharing vast amounts of information: IBM reports that every day we create 2.5 quintillion bytes of data. Manufacturing plants of the future will have to exploit the technological advances being made in the digital world to drive efficiency and better use of resources in the industrial world. This digitalisation of manufacturing is often called the 'fourth industrial revolution'. Dr Ajith Parlikad will introduce the cutting-edge research carried out at the IfM's Distributed Information and Automation Lab (DIAL) in exploiting emerging digital technologies to improve the resilience of manufacturing operations. DIAL examines ways in which companies can take advantage of this exciting digital era by applying smart technologies

in manufacturing, logistics and services; developing innovative data analytics techniques to drive enhanced operational decisions; and developing distributed automation solutions for the extended factory.

## DIGITAL SUPPLY CHAINS

### 10.40 | Jag Srani

Dr Jag Srani will present recent work undertaken in the IfM's Centre for International Manufacturing on the progressive digitalisation of supply chains, including:

- ▶ How the conceptualisation of digital supply chains is being used to inform new requirements for digital infrastructures and standards and the potential for connecting App & Device-aware consumers with their product manufacturing supply chains.
- ▶ A cross-sector industry study of digital supply chain initiatives, providing insights on how leading firms are adopting digital technologies and a digital attitude to supporting supply chain transformation.
- ▶ Current experimentation led by the Centre within the UK pharmaceutical and healthcare sector around the use of continuous production technologies within the digital factory, smart packs using printed electronics to enable informed logistics and products that support patient adherence to treatment regimes.
- ▶ The latest global developments in e-commerce and last-mile logistics and how the UK is leading the adoption of online retailing.

Critical questions and emerging value propositions include: how do we enable data integration across the supply chain for more responsive or adaptive supply? How do we improve end-to-end inventory management? How do we monitor product quality and delivery performance, ensuring high product visibility, traceability, and environmental compliance? How do we monitor product efficacy in-use, and capture end-user patient/customer feedback? What is the role of regulators and standards agencies to facilitate the benefits that digital supply chains might offer?

## DIGITALISATION OF SERVICES

### 11.00 | Andy Neely

A key research theme at the IfM is the digitalisation of services. Many manufacturing businesses are innovating their business models, seeking to provide services and solutions their customers value, rather than just products. This trend, also known as servitization, is enabled by data that can be harvested from products and sensors connected to the Internet of Things. In real time products can feed back information to original equipment manufacturers so they can seek to optimise the services they provide. In this session, Andy Neely will explore innovations in service business models, illustrate how these are enabled through new technology platforms and identify the key questions you should ask yourself as you think about the role that services will play in the future of your competitive strategy.

## DEVELOPING MANUFACTURING TALENT IN THE DIGITAL AGE

### 11.20 | Judith Shawcross

Judith Shawcross will describe the range of IfM's educational activities with a focus on

- ▶ 50 years of manufacturing education at Cambridge
- ▶ Our collaborations with industry to provide short industrial placements for students
- ▶ Developing talent through our undergraduate and postgraduate courses
- ▶ Growing your digitally-enabled manufacturing business: how IfM ECS can help you grow your people and capability.

## SESSION 2

### PARALLEL : PLEASE SELECT

#### DESIGN FOR TRANSFORMATION

**James Moultrie and Colin Haden**

12:00

Lecture Room 1

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Great design sells and great design management helps sustain sales and generate strong margins. For that you need to focus on customer experience from the initial sell, through opening the box to delivering reliable performance and great experience day after day. You also need to ensure products can be produced efficiently and cost effectively.

The IfM's Design Management Group will introduce their experience-based and academically-underpinned tools which aim to transform the product range, deliver sustainable growth and produce improvements to productivity. Starting with user observation we will illustrate how to construct the product offer, design the product platform and how to reach different segments. Our proven design for assembly methodology takes a hands-on approach to increase throughput and reach ambitious cost or production targets. Our approach to managing the outsourcing of design has benefit to companies who are starting this journey and are less familiar with using external partners for either creative or technological (e.g. digital) input.

In this session, we will introduce these tools and techniques and illustrate with case studies.

#### MAKING THE SHIFT TO SERVICE-BASED BUSINESS MODELS

**Florian Urmetzer**

12:00

Lecture Room 2

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Increasingly firms are shifting from product-oriented to service-oriented business models: services now represent over 70% of the Gross Domestic Product across the UK and Europe. Many manufacturing firms are deciding to make the shift to services for a whole range of reasons, which include: retaining their leadership position in the markets, exploring new sources of revenue, de-risking their competitive positions, developing new revenue streams, using their capacity more effectively and deepening their customer relationships.

However, while many firms recognise the potential benefits of making the shift to services, many struggle to make a successful and sustainable transition and to capture value from these service business models. This session looks at three things:

- ▶ Examples of manufacturing companies that have made the shift to services
- ▶ The critical success factors which enable the shift to services
- ▶ How to visualise your wider ecosystem focusing on capability and value.

## TRANSFORMING GLOBAL MANUFACTURING AND SUPPLY NETWORKS

**Jag Srjai, Paul Christodoulou and Don Fleet**

12:00  
Seminar Room 2

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### **Centre for International Manufacturing (CIM)**

CIM is one of the IfM's main research centres. It focuses on strategic and operations management research in close collaboration with industrial partners. The Centre has developed a strong industrial-policy-making-academic community and provides expertise and support in the area of international manufacturing and global value networks, with particular focus on capability development and strategic network design.

### **Achieving competitive advantage through network transformation**

Designing and operating effective global networks is a fundamental source of competitive advantage for manufacturers. As networks have become increasingly complex and fragmented, it is more important than ever that international manufacturers are able to 'make the right things in the right places', have agile and resilient supply chains, and the right people and processes to run them. Optimising such complex networks so that they deliver the manufacturer's strategic aims is challenging, particularly as each network partner has its own goals and business models.

### **Practical approaches based on leading research**

We have worked with more than fifty leading companies on network projects and have developed a set of structured approaches which support organisations through strategic and operational change. We can work with companies to address specific challenges or opportunities, or we can take a 'whole system' approach to achieve maximum competitive advantage from network optimisation. We also provide executive and professional development to improve companies' network capabilities.

The team will provide an overview of the strategic approaches developed over the last 15 years, particularly in the areas of manufacturing footprint strategy and end-to-end supply chain configuration and capability development (illustrated with real-world case studies). This will be followed by an update on latest research, with particular attention to the future impact of digitalisation on global supply chains.

## INDUSTRIAL RESILIENCE & AUTOMATION

**Liz Salter, Alan Thorne, Ajith Parlikad and Phil Woodall**

12:00  
Seminar Room 3

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This session will provide an overview of the work the Distributed Information and Automation Lab (DIAL) is doing to enhance extended factory operations. It will provide examples of how both IoT and Cyber Physical Systems have been used to improve the resilience of shop floor, supply chain and asset management operations. The talk will be concluded with an overview of the Industrial Resilience Tool, the Information Quality Risk Assessment Tool and the Automation Assessment Tool.

The toolkits will be illustrated with recent applications and will show how the companies have embedded these approaches within their strategy processes, driving significant business benefits. These benefits include:

- ▶ integrating automatic identification (auto-Id) into existing business systems
- ▶ developing distributed automated solutions for manufacturing and logistics
- ▶ quantifying the value of improved information for better decision making
- ▶ improving whole-life management of industrial assets.

## SESSION 3

### PARALLEL : PLEASE SELECT

#### INDUSTRIAL STRATEGIES FOR NATIONAL, REGIONAL AND LOCAL POLICYMAKERS

**Carlos López-Gómez and Andrew Gill**

14:00  
Lecture Room 1

##### **Manufacturing economic growth: IfM's work supporting policy development**

The Centre for Science, Technology & Innovation Policy (CSTI) is an applied policy research unit exploring what makes national innovation systems effective at translating new science and engineering ideas into novel technologies and emerging industries.

In this presentation Carlos López Gómez will introduce CSTI's work supporting sector, manufacturing and technology strategies both in the UK and internationally. Examples of the range of research tools and approaches deployed by CSTI to support policymaking will be drawn from recent collaborations with the Department for Business, Innovation and Skills on the topic of 'smart specialisation' and with the state of Yucatan, Mexico.

##### **A landscape for High Value Manufacturing**

IfM are working with Innovate UK and other institutions to further support the development of the UK High Value Manufacturing strategy through a 'landscaping' study. The objective of the study is to:

- ▶ Outline High Value Manufacturing opportunities which can inform the HVM Catapult Operating Strategy and TSB HVM CR&D calls.
- ▶ Refine the analyses in the context of the BIS 'Industrial sector strategies' and other studies such as the Manufacturing Foresight report.
- ▶ Support the development of plans for UK manufacturing industrial capabilities and competencies.

During this session, which follows on from a session at last year's Briefing Day, Andrew Gill will outline some of the findings and give delegates the opportunity to input their thoughts and priorities.

#### TECHNOLOGY AND INNOVATION MANAGEMENT

**David Probert, Rob Phaal, Mélanie Despeisse, Clare Farrukh, Frank Tietze, Tim Minshall, Imoh Ilevbare**

14:00  
Lecture Room 2

Technologies lie at the heart of any manufacturing company – whether used in the manufacturing process or forming an integral part of the products themselves. Successfully assimilating existing technologies into the business and anticipating the impact of emerging new technologies are critically important tasks for companies under pressure to bring new products to market as quickly as possible. Close collaboration with industrial partners is a characteristic of our research and practice at the Centre for Technology Management (CTM), and this session reviews some current opportunities to get involved. These include:

##### **The Strategic Technology & Innovation Management (STIM)**

**Consortium** is a practice-oriented research and networking collaboration, delivering a combination of practical and academic outputs. The 2016 research portfolio covers a range of topics, including:

- ▶ Toolkit for resource efficiency in manufacturing companies
- ▶ Roadmapping for strategy and innovation - embedding the process

##### **Intellectual property challenges for management**

Introduces the different projects currently run by the Innovation and IP Management (IIPM) research group. With a particular focus on IP strategies, the talk also addresses the IP challenges in multi-partner collaborations (e.g. the Catapults, Scale-up centres) where different actors, sometimes even competitors, jointly develop new emerging technologies.

##### **Understanding the potential and actual impact of 3D printing**

3D printing technologies continue to attract high levels of interest from governments, companies and universities. CTM is examining three aspects of the diffusion of these technologies: potential business model disruptions; linkages between the use of these technologies and the location of manufacturing activities; and the role of national strategies in supporting their adoption.

##### **Delivering and sustaining growth**

Developing successful new products, services and technologies is key to profitable and sustainable growth. Our portfolio of flexible yet coherent innovation and technology management approaches and tools - based on extensive and robust research - is able to address your company's innovation and technology management needs.



## INDUSTRIAL SUSTAINABILITY

**Steve Evans, Ian Bamford and  
Doroteya Vladimirova**

14:00  
Seminar Room 2

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Leading organisations recognize that sustainability is no longer a problem to be minimised but an opportunity for value creation. The IfM's Centre for Industrial Sustainability have developed tools to identify these opportunities and to facilitate the design of a comprehensive action plan to implement sustainable change in your business. More than 100 companies have used our tools to identify where they are failing to capture value and how they can create new economic, social and environmental benefits for their business.

Join us for a fast and furious interactive session in which you get to try out our tools and we see if we can find some value opportunities for you.

## MEASURING WHAT MATTERS

**Andy Neely, Andi Jones and Nick Sherwen**

14:00  
Seminar Room 3

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Getting the right KPIs (key performance indicators) is an enduring challenge for all businesses. For over twenty-five years researchers at the IfM have been exploring questions such as how do you select the right KPIs? How do you make sure your KPIs align to your strategy? How do you make sure they drive the right behaviour? In this session we will introduce some of the tools and techniques developed by the IfM over the years to enhance your KPIs. We'll also explore some of the latest thinking in strategic performance measurement, including the opportunities being opened up by big data.

A combination of a presentation and a practical exercise will make sure you take away something you can use tomorrow, as well as some inspiration for the future.

## SESSION 4 PLENARY

### NANOMANUFACTURING

**15.30 | Michael De Volder**

The IfM's Nanomanufacturing group focuses on the development of new methods for processing nanoparticles such as carbon nanotubes, graphene and hybrid materials. It is particularly interested in processes that make nanoscale chemistry and microscale morphology compatible with large scale production. These materials may find application in sensors, catalysis, energy storage and water purification.

### ADVANCING DIGITAL MANUFACTURING WITH FLUIDS

**15.50 | Ronan Daly**

The Fluids in Advanced Manufacturing (FIAM) group, together with the Inkjet Research Centre, is building on more than 10 years of research excellence at the IfM.

The two groups are working with industrial partners and across academic disciplines to examine chemical and physical phenomena of colloidal, polymeric, biological and nanoparticulate materials when exposed to advanced fluid-based manufacturing techniques.

Our goal is to link emerging materials and technologies with novel process routes to incorporation into devices. This needs a detailed knowledge of the underpinning science of scale up as well as downstream manufacturing risk factors.

# YOUR IfM

## ENERGY BEAM PROCESSING AND THE DRIVE FOR ULTRA-PRECISION MANUFACTURING

**16.10 | Bill O'Neill**

Modern manufacturing enterprises face the relentless task of advancing the capability of their production systems in order to realise the next generation of products. The increasing demands for nanometre level tolerances, complex device architectures, large-scale production volumes, flexible production systems, and high yield, are pushing current manufacturing capabilities to their limit.

This presentation will review the latest technological research outputs that focus on the application of lasers and ion beam technologies in next generation production systems.

16.30 | NETWORKING

Meet the team and find out how to get the most from the IfM.

## INSTITUTE FOR MANUFACTURING (IfM)

The IfM is part of the University of Cambridge. It brings together expertise in management, technology and policy to address the full spectrum of issues which can help industry and governments create sustainable economic growth.

**Management:** covering a wide range of topics including the development of sustainable industrial practice, capturing value from innovation, optimising global operations networks and moving from product to service-based models. The IfM is an international centre of excellence for roadmapping, a powerful technique for aligning technology and business objectives.

**Technology:** inkjet and laser-based manufacturing process technologies, carbon nanomaterials, advanced information systems and automated identification technologies, all with a wide range of industrial applications.

**Policy:** programmes, processes and practices for translating publicly-funded R&D (in particular science and engineering research) into new technologies, industries and economic wealth.

In each of these areas of expertise, the IfM carries out:

**Research:** bringing together specialists in management, technology and policy to provide a unique perspective on the challenges facing manufacturers of all sizes, from start-ups to multinationals.

**Education:** giving the next generation of manufacturing leaders a thorough grounding in management and manufacturing technology, based on real industrial experience.

**Practice:** applying IfM research to help organisations achieve their strategic goals. Findings from these projects directly inform future research.