



Manufacturing and materials week

The green recovery

30 November-3 December 2020

Report



Manufacturing
alumni awards and
lecture 2020

The fourth industrial revolution
and 21st century industries

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Contents

Manufacturing alumni awards and lecture 2020

3

Manufacturing and materials week closing remarks

7

Foreword



Professor Mark Jolly

Director of Manufacturing,
Cranfield University

Manufacturing and materials week included a mix of live debates, lectures, workshops and pre-recorded videos, looking at the challenges the industry faces right now, as well as how we must adapt and innovate to support future global challenges such as achieve a Net Zero manufacturing sector by 2050.

The inaugural week-long event that built upon long standing events such as the Manufacturing alumni awards, the National Manufacturing Debate and Manufacturing 2075 gave the opportunity explore the pivotal role of manufacturing in everyday life. Taking these events to the next level, the week showcased that society needs to accept manufacturing as part of our lives and how it can support our future. Our digital devices, tables and chairs, right down to our pots and pans – all part of manufacturing! But they use resources, materials and energy, and so as a population, we must be responsible custodians of our planet for the sake of future generations.

Through research and teaching, Cranfield University, alongside industry is working to solve problems of the future. Post Covid-19, manufacturing has the potential to address important psychological and social challenges.

Manufacturing alumni awards and lecture 2020

**The fourth industrial revolution
and 21st century industries**



Distinguished Manufacturing Alumni Lecture 2020

Welcome by Professor Sir Peter Gregson FEng, MRIA, DSc, Chief Executive and Vice-Chancellor, Cranfield University



Welcome

While a significantly different format to previous years, Sir Peter Gregson thanked the Alumni team for their work in delivering this landmark event online.

The focus for the event this year was to celebrate the achievements of Dr Ayotunde Coker (MSc Engineering and Management of Manufacturing Systems 1989), Managing Director/CEO, of Rack Centre Limited, with Sir Peter presenting him with the 2020 Distinguished Manufacturing Alumni Award.



Professor Sir Peter Gregson
FEng, MRIA, DSc, Chief Executive
and Vice-Chancellor, Cranfield
University

One of the greatest advantages and opportunities of using this virtual forum has been the ability to reach Cranfield University alumni around the world, bringing together the manufacturing and materials community who have been at the very heart of the University for many years.

As a materials scientist himself, Sir Peter has a deep-rooted belief that changes in manufacturing will be at heart of a green economic recovery. Over the past few months, he has considered the acute and extraordinary pressures people are all under. Sir Peter has had cause to use Cranfield's motto quite liberally in this time. It is one that resonates so much in the current climate: 'Post nubes lux' – 'Beyond the clouds light.' Sir Peter welcomed the celebration of Ayotunde's achievement as one of those 'flickers of light' sparkling on us.

In introducing Ayotunde, Sir Peter looked back at his illustrious career so far. In 1989 he completed an MSc in Engineering and Management of Manufacturing Systems at Cranfield. During his time at the University, Ayotunde won the Institute of Production Engineers Award, then going on to spend almost 20 years working for companies in the UK, before returning to Nigeria.

He was named IT Man of the Year in 2015 and IT Personality of the Year in Nigeria in 2019. His forward-thinking leadership as Managing Director and CEO of Rack Centre has built the company into one of Africa's leading data centres. His enablement of new and innovative business models to reduce the thresholds for access to emerging technology, has led to global recognition and numerous international awards for Ayotunde and Rack Centre.

Dr Ayotunde Coker

(MSc Engineering and Management of Manufacturing Systems 1989),
Managing Director/CEO, Rack Centre Limited

Ayotunde delivered an inspiring and cross-industry lecture on the Fourth Industrial Revolution and 21st Century industries, and the ongoing automation of traditional manufacturing and industrial practices using modern smart technology.

Acknowledging that today felt very special, Ayotunde confessed that he initially thought that receiving the award was a hoax, and went as far as to ask his cyber

team to confirm. In a 'pinch myself' moment, he was delighted with the accolade, and that the digital format of the day enabled his family and colleagues to join the occasion from Nigeria.

Ayotunde acknowledged his time at Cranfield as a defining time in his career, inspiring him (and his fellow students at the time) to be transformational, visionary, and never constrained by someone else's view of what is possible. He concluded his thanks, dedicating the award to his parents for the values that they instilled in him.

Lecture: The Fourth Industrial Revolution and 21st Century Industries

While Ayotunde decided the subject for his lecture before the lockdown earlier this year, the events of 2020 have served to reinforce the subject's importance - finding new ways of doing business and democratising the manufacturing industry.

Ayotunde began by looking back at the three industrial revolutions prior to this, looking at how the time between each has been ever-shrinking. More than 110 years between the first industrial revolution in around 1760 (the age of steam engines, rail and telegraphy) to the second in 1870; yet from the third (1969, the advent of the microchip and main frame computing), to the start of the fourth industrial revolution (broadband, cloud computing, big data, AI, social media, 4G LTE, blockchain, VR) around 2005, is a mere 36 years. The question he posed: how short a time period before Industry 5?

The baby boomers and Generation X have lived through the third and fourth revolutions and may yet see the fifth. This is not a jump from one to the next, rather innovation that is happening in waves. In this fourth industrial revolution, we are seeing the creation of a global enabling infrastructure through undersea cables that connect across the world. This massive connection capability - carrier neutral mega data centres including those delivered by Ayotunde's Rack Centre, the leading carrier neutral data centre in Africa - ensures a broad range of services across the globe.

Cloud computing is a fundamental infrastructure which allows new technology to be accessible on demand. The infrastructure is now remarkably less elastic, with big data changing significantly over the years. Just a few years ago 1 TB of data cost \$100,000, and is now just a few dollars. We now have a whole range of industries and ecosystems that interconnect.

Covid-19 itself has created new possibilities. In manufacturing we now have the technology to facilitate unattended manufacturing. People can monitor sites remotely, even from the comfort of their home. These interconnected platforms allow cross-industry capability. By looking at global internet growth trends, we see a growing number of internet users, more devices, faster broadband speed, and more video viewing. By 2022 non-PC devices will drive 81% of global internet traffic. The pattern of devices is also changing, with smartphones increasing over time, tablets growing in terms of access, increasing machine-to-machine devices, as well as TV devices increasing. The average number of devices and connections per capita and per household will increase from 2.4 in 2017 to 3.6 in 2022 (average no of devices and connections per capita). By 2022 the Content Delivery Network will deliver 72% internet traffic, with the use of VR/AR increasing twelvefold.

The key is how to apply these technological possibilities in industry scenarios. Ayotunde pointed to a range of examples, including:

- In healthcare the scale of bandwidth means that experts can provide VR enabled support for keyhole surgery, helping to reduce medical tourism around the world.
- Back in 2006 Ayotunde was CTO for Criminal Justice in the UK, where he initiated pilots for virtual courts, creating the ability to prosecute guilty pleas with secure document management systems. Now with Microsoft Teams, Google and Amazon solutions, the use of technology to serve the justice system has been significantly expanded.



What about the impact of job automation?

In a review of the largest companies in 2018 versus 2008, the top five are now technology companies. The world's largest companies by market capital, you will find Microsoft, Apple, Amazon and Facebook. The technology companies are the basis for transforming other industries. We should not be alarmed by the increase in job automation. In fact, research from PwC has shown that it will actually result in higher quality job creation as well as increased choice and a better work/life balance. With technological advancement comes greater efficiency and more output. Transforming through technology to achieve a more efficient manufacturing process has always been the end goal. If we can't demonstrate efficiency in the UK, it is guaranteed someone else in the world will! It is better to be at forefront and embrace automation rather than fear it.

Industry 5 - what and when?

Ayotunde predicts that we will start to transition to Industry 5 in the next five to ten years - that is just 20 years since Industry 4. His assertion is that AI, blockchain will start the transition to the fifth industrial revolution in around 2025. Ayotunde outlined a few of the elements he believes Industry 5 will bring forward:

- Heuristic tech - human interplay,
- AI and blockchain - the perfect partners,
- Hyper-speed interconnectivity - 5G - with the interconnected ecosystem, at Rack Centre, every single mast in Nigeria is connected directly to them,
- Gargantuan data becomes big data.



Ayotunde also championed the role of technology in driving sustainability. The Covid era has seen us travel less, increasing our use of video conferencing, and using less fossil fuels. It is clear that the net impact of increasing our use of digital infrastructure has been resoundingly positive and we must continue to harness this.

Africa - set to de-risk global supply chains

There is a desire to de-risk global supply chains away from Asia to other parts of world. In doing so, we are going to see more digital supply chains move to Africa. With five of the major undersea cables linking every African country on the Atlantic coast, the infrastructure is in place to support this. Ayotunde predicts that we will see increased business process outsourcing move to Africa, with the continent acting as a digital anchor point as supply chains redistribute around the world. Yet he concluded, we will not build the world on data centres alone - there is more technology coming and we all need to be ready to embrace it.

Q&A

How ready are emerging markets, such as Nigeria and sub Saharan Africa, ready to embrace the Fourth Industrial Revolution?

Recent investments from companies such as Facebook and Google into Africa, committing to key cable landing points across continent, is a clear indicator of the likely digital infrastructure that is set to emerge in the next few years. Nigeria is an anchor point in the West, Kenya in the East, with Egypt and Morocco to the North and South Africa already a major player. The building blocks have been taking shape over the last five years and the demographics of sub-Saharan countries, with high proportion of population aged 19-22, means Africa is well placed to leapfrog other global players.

Governments often require data to be hosted locally. Is this a thing of past with cloud computing?

No, it is very much an issue of the present. Sovereign data rules need to be enforced. Nigerian data protection is modelled on the UK's GDPR. It all brings data closer to point of use albeit it can be less efficient. What we need is scalability to provide and support data requirements, with global cloud providers requiring a footprint across critical locations throughout Africa.

Mark Jolly asked a question of Ayotunde: I have heard that a Google search generates as much energy as boiling a kettle. Is this correct? Are we actually reducing CO₂ by going digital?

The impact of Covid has certainly reduced emissions. We have already seen a shift that has saved on carbon footprint and created a net benefit to the environment. Yes, data centres are power hungry, however the efficiency of data centres has increased over the years. At Rack Centre we are also looking at what power sources are used.

Closing remarks: Professor Helen Atkinson CBE, FEng, Pro-Vice-Chancellor - Aerospace, Transport, Manufacturing

This lecture has been a tour de force in pulling together Industry 4.0 and look towards 5.0. Ayotunde also succeeded in making the subject matter accessible to so many different audiences within the manufacturing world. The increasing rate at which change is happening is phenomenal, continually halving the phases of the industrial revolutions.

It is clear that we need to evolve quickly. This is something we have had to do as a result of the pandemic. Cranfield's manufacturing theme has been intimately involved in confronting key challenges of recent months, including the Ventilator Challenge and the research on natural protein-free surgical latex gloves. Across the board, digitalisation is a recurring theme, contributing to a vision that the future of manufacturing can be smart, clean and green.

Manufacturing and Materials Week closing remarks



Professor Mark Jolly
Director of Manufacturing,
Cranfield University

No one could have envisaged that in postponing our National Manufacturing Debate we would still be in lockdown in December 2020. A concept that grew out of a forced hand has opened up tremendous possibilities and led to a week of events with international speakers and audience that has benefited from the online format.

Twice this event, we heard reference to Industry 5, first by Dr Ayotunde Coker, winner of our Distinguished Manufacturing Alumni 2020, and during Manufacturing 2075 by Dr Abigail Hird of KTN. The reality is that 2075 will come around very quickly - some of you in this week's audience will be around to see and be part of it we hope! It really is up to you!

Save the dates

Manufacturing and materials week 2021
29 November–2 December 2021

National Manufacturing Debate
1 December 2021

Manufacturing 2075
2 December 2021

www.cranfield.ac.uk/manufacturingweek

Graphene commercialisation conference
15 March 2022

www.cranfield.ac.uk/grapheneconference



Cranfield University
Cranfield
MK43 0AL, UK

E: manufacturingweek@cranfield.ac.uk

 @cranfield_MFG

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