



**Materials
Processing
Institute**

MEETING THE CHALLENGE OF THE 4th INDUSTRIAL REVOLUTION

A Speech Given at the Annual Dinner of the Sheffield Metallurgical and Engineering Association, Cutlers' Hall, Sheffield.

9th November 2018



Introduction

Thank you to the President, Committee and members of the Sheffield Metallurgical and Engineering Association for the kind invitation to join you at your annual dinner.

It is an honour for me to be speaking here in Cutlers' Hall. Having first attended the SMEA conference as a school leaver in the mid-1990s. I later became a member of the conference organising committee, attended lectures, delivered lectures, attended this dinner on many occasions and here I am now, doing what so many people have done before me, speaking at this dinner.

Through all of that time I have found this to be an extremely welcoming Association, dedicated to the continued education and enlightenment of its members, young and old alike and it is this purpose of the Association, that of continuing education, on which I will speak this evening.

The 4th Industrial Revolution

First though, I want to turn to the greatest challenge facing Britain today. A challenge that is causing and will cause tremendous upheaval in business, industry and society. A challenge which, if handled properly, presents a great opportunity to transform and improve lives for the better. I am speaking of the 4th Industrial Revolution.

This industrial revolution is founded on an explosion of new digital technologies, it is happening around us right now and it is already having a profound impact on our economy, our politics and our society. In some areas the wholesale reconfiguration of a supply chain can be predicted.

Additive manufacturing for instance, has the potential to render redundant, capabilities such as, machining, joining and fabrication. As this technology opens doors to new, as yet unimagined products, the value chain will collapse to simply materials and design. An opportunity that is set to benefit innovative companies working in this area, such as powder producer MetalYSIS, but what if your business relies on machining or welding, how will you survive as your market begins to disappear?

Innovation

The speed of this disruption and the decline of existing markets is increasing. I was in Japan recently and the after dinner entertainment was not someone giving a speech like me, it was a synchronised drone display. It was the first time I had seen anything like that. It was the first time any of the delegates at the dinner had seen anything like that, and yet I can guarantee that within a couple of years the idea of a group of people at a dinner being entertained by a display of drones will seem as outdated as a magic lantern show at the Company of Cutlers, such is the pace of technological change through which we are living.

There is only one answer to this and it is innovation. An argument that was clearly and succinctly put at this dinner in 2015, when I recall Sir George Buckley, former Chairman and CEO of 3M stating that 'innovation is the key to competitive success'. He described the need to invest in innovation at a faster rate than core business decline, which for 3M he stated 'was at least 3.5% per year'.

The UK Government is currently trying to raise UK innovation investment from less than 2% of GDP to 2.4% though this still falls short of the OECD average. Yet, how many companies in this room can even claim to be investing at 1% of turnover?

Investing in innovation at levels greater than 1% of turnover, in new products, process technology and customer service, is now no longer a choice, it is a matter of survival. Companies that do not do this are simply waiting to be overtaken by the competition, or else to be rendered obsolete by a major technology shift.

But greater investment in innovation need not be driven by competitive fear alone. Having the opportunity to live through and participate in this industrial revolution gives us all a chance to shape the world around us, to capture the joy, excitement and optimism that the potential for new technology brings and the challenging and rewarding jobs that it can provide.

Skills

This 4th Industrial Revolution is potentially the most significant technology shift in human history. If any of you doubt this, I think back to my own children aged 7 and 10 and to the many products, devices and services, that are common place to them and yet were invented during, or shortly before their birth. Their generation will become accustomed not only to these new innovations, but to the constant churn of invention.

What affect will this have though, on jobs, skills and their prospects for employment? We can be sure that whatever jobs they will be doing in ten years' time have probably not even been thought of yet and so how do we train our young people to be ready to enter the job market and perhaps even more pressingly, how do we retrain those already in employment to make the leap from jobs that are vanishing to the jobs that are needed for the new economy.

By way of example, you may have read in recent weeks of the £10M investment by Liberty Powder Metals in a new research and development pilot plant at the campus of my own Institute in Teesside. To develop and operate this facility, ourselves and Liberty will be advertising roles that are amongst some the first of their kind in the UK.

What I find most disconcerting is how little our mainstream political debate has to say on this subject. With domestic politics overshadowed by Brexit, there is little airtime to discuss this revolution in technology, skills and work.

I have listened carefully to the different sides of this debate and what I have heard is that there are those on one side who believe that there will be a new utopia of the three day working week and those of the other side who acknowledge there will be hardship and upheaval, but that such is the price for rapid technological change.

I do not accept either of these arguments.

As an entrepreneur and an innovator, if you give me Thursday off, I will think of a new business idea by Friday. I also believe that there is an intrinsic value in work, giving purpose, direction and a sense of self-worth. Equally, as a humanitarian, with a strong social conscience, I cannot accept that technological change must inevitably be accompanied by leaving behind swathes of our society, or by creating fear and uncertainty in people's lives. Yet this technology cannot be resisted, it must be adopted and we must understand how to do this.

The stakes are high for our future generations. Turning again to my own children, my son has a favourite book. It lists many jobs and occupations and is called: 'What do people do all day?'. He loves to read this book and imagine himself doing these jobs, but so many, from train driver to coal miner, from shop keeper to postal worker, are jobs that are either vanishing from our workforce, or else are changing radically with the introduction of new technology.

I grew up hearing the amazing tales of my uncle, a ship's captain turned harbour master, who went to sea as a boy and ended his career piloting oil tankers across the oceans. An inspiring tale, but one shortly to be consigned to the history books, as the development of autonomous ships turn the legend of the Marie Celeste from the exceptional to the everyday.

So much is changing. What will be the jobs that will inspire our children in the future?

Call to Invest

The question we need to ask ourselves, as manufacturers, as industrialists, as technologists and business people, is how to we respond? The short answer to this is invest.

Despite the uncertainty of current times, we must be ready to invest all we have in innovation and in skills. We must accept that the machine we purchased only recently is now obsolete, that the business model which served us well is outdated, that the skills we have taken decades to hone are not needed.

We must accept that the technology we may not understand and can barely afford is essential to the survival of our business. For if we do not do this then our businesses will be disrupted and destroyed by new entrants. If we are lucky these new entrants will be in places such as Sheffield and Teesside. More likely they will be in Shenzhen and Taipei. Why leave this to chance? Why not take action ourselves?

Does your company invest 1% of turnover in innovation? Do you understand the innovation landscape, risk appetite and technology strategy? Do you even have a Chief Technology Officer?

Most of us will be unable to answer "yes" to all of these questions and yet unless we have made a commitment to invest at least at the crucial 1% of turnover level, can we be sure that our businesses will not become a casualty of the 4th Industrial Revolution, rather than one of the great success stories of the future.

Key Messages

We owe it to ourselves, to those who have gone before and to our future generations, to embrace this revolution and to invest in the innovation needed to create the skilled jobs and high quality work of the future.

Though some of the way ahead may seem uncertain, we can be sure that whatever the future brings we will need metallurgists, we will need engineers and we will desperately need organisations such as the Sheffield Metallurgical and Engineering Association, that are dedicated to the education of the next generation and also the life-long learning and retraining of those in employment.

For this reason, it gives me the greatest and most sincere pleasure to propose a toast to the Association.

The Sheffield Metallurgical and Engineering Association.

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Chris McDonald is the Chief Executive Officer of the Materials Processing Institute. The Institute carries out industrial research and innovation in advanced materials, low carbon energy and the circular economy. Chris's background is in industrial research and manufacturing, where he has worked internationally. He led the divestment and return to independent, not-for-profit ownership of the Institute in 2014, the year the organisation celebrated its 70th anniversary.

In addition to leading the Institute, Chris provides expert consultancy support to companies, Governments and public bodies, in technology strategy and the technical due diligence aspects of mergers and acquisitions. He is prominent in the development of public policy, around innovation, steel and SMEs, where he works to support growth and inward investment. He is the policy chair for Innovation and Enterprise for the Federation of Small Businesses, a member of the CBI Regional Council for the North East and is the Innovation Lead for the UK Metals Council. Chris is also a member of the Steel Advisory Board for UK Steel (EEF).

A graduate of Cambridge University, Chris is a Fellow the Institute of Chemical Engineers and of the Institute of Materials, Minerals and Mining. He sits on industrial advisory boards at a number of universities, including Oxford and Sheffield.

He is often called to commentate in the media on innovation leadership and the steel industry.

“Chris provides expert consultancy support to companies, Governments and public bodies in materials, technology and innovation strategy”



Chris McDonald
Chief Executive Officer
Materials Processing Institute

Materials Processing Institute

The Materials Processing Institute is an independent, open access and not-for-profit technology and innovation centre working with industry, government and academia worldwide. Support ranges from small scale, site based investigations, through to long term collaborative research programmes.

The Materials Processing Institute is expert in advanced materials, low carbon energy and the circular economy, specialising in challenging processes, particularly those involving high specification materials, high temperatures and difficult operating conditions.

The Institute has over 70 years' experience as a leading UK technology provider. Extensive materials processing knowledge is supported by state-of-the-art facilities with a broad range of equipment, from laboratories through to demonstration, scale-up and production plant.

Scientists and engineers work with industry and apply their expertise to develop and implement robust solutions to research and development and improvements for products and processes.

Expertise is spread across a wide range of disciplines, including:

- > Materials Characterisation, Research and Development
- > Simulation and Design
- > Monitoring, Measurement and Control in Hostile Environments
- > Process Development and Upscaling
- > Specialist Melting and Steel / Alloy Production
- > Engineering / Asset Management
- > Materials Handling
- > Minerals and Ores

Research and project management teams deliver support across a wide range of industrial and manufacturing sectors including:

- > Metals and Metals Manufacture
- > Chemicals and Process
- > Nuclear
- > Oil & Gas
- > Energy
- > Aerospace and Defence
- > Mining and Quarrying





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