“No manufacturer is an island…”

Why partnership and collaboration are essential to innovation and success

SLIDE ONE

Thank you.

As an honorary Brummie it’s a pleasure to be speaking at the Manufacturing Directors Conference.

I want to thank the Manufacturer for organising this great event, and for putting Manufacturing at the heart of our national debate as well as at the heart of the country.

I’ve been asked to discuss the importance of partnership to modern manufacturing.

I know I’m the only thing standing between you and a coffee break, so as a good partner, I will try to keep to time!

We’ve heard much since the crash about the need to re-balance the economy towards manufacturing.

As someone who has argued for years that a re-balancing is desperately needed because our reliance solely on the service sector put the economy at serious risk, this new emphasis on manufacturing is welcome.

Sadly, actual policy to back manufacturing, like bank lending, support for innovation, infrastructure and tax reform still lags far behind the rhetoric!

In truth, most manufacturers still have to secure the hard yards of growth by themselves.
As they do this, a digital, networked market is transforming every facet of global manufacturing, from design, validation and manufacturing, to personalisation and marketing.

If we are to re-balance successfully therefore, it is essential both government and business now adopt strategies that anticipate how manufacturing is evolving.

I believe the only way to do this is through creating networks of innovation that build partnerships between businesses, academics and innovators in very different markets.

**SLIDE TWO**

As a result of this changing marketplace it will be ever harder to define a business as being “manufacturing”.

After all, such sectors are simply our own definitions.

For a customer, there is no meaningful difference between sectors - there are only solutions that meet their needs and solutions that don’t.

Increasingly, finding the best solutions requires, even demands, collaborations between products, platforms and processes.

For example, a tablet requires both hardware excellence to be a successful platform. It also needs a galaxy of third party services and applications.

Further, what is useful for me is very different to what is useful to you.

This requires a manufacturer to build partnerships with many innovative software developers.

We’re working on mobile medical technology at WMG.

What is the best platform for us to use for monitoring depression, or risk of stroke?
The mobile phone and the smart watch running on Android.

So we need to collaborate with both manufacturers and software developers.

In the same way, modular housing can be built centrally and in the same factory be personalised: Meaning you manufacture at what you might call the “mass-individual” level.

This creates the chance for new collaborations with customers, introducing them into the manufacturing and design process ever earlier, requiring construction firms to understand bespoke design preferences.

Shifts in information and logistics also create new models for consumption and payment, and so create potential new markets for manufacturers.

Just as the first and second industrial revolutions produced entrepreneurial giants like Ford, Benz and Nuffield, so these changes will create new giants and transform old ones.

Behemoths new and old will be challenged by disruptive technologies and processes.

A valuable lesson comes to us from a giant of the industrial revolution, Henry Bessemer.

He said ‘I had no fixed ideas, derived from long-established practice, to control and bias my mind, and did not suffer from the general belief that whatever is, is right.’

Today, it is only by exposing ourselves to, and building links with, the different, the challenging and the innovative that we will succeed.

That requires a spirit of collaboration.
At WMG, we’re passionate about the innovative power of partnership.

I formed WMG to support Britain’s automotive sector in the early eighties.

Since then, new technologies and interconnectedness have transformed the way our partners work and innovate. The same goes for us.

Today, we are internationally focused. We have partnerships with over a thousand global businesses, from China to India to South Africa.

Our research expertise in CAD-CAM, materials science, 3D printing, cryptography and virtual reality now supports innovators in industries like healthcare, housing and imaging.

We now examine processes, services and collaboration networks alongside materials and engines advances.

I believe every manufacturing company, every industry, every innovator will be similarly affected by such transforming technologies.
SLIDE FOUR

This process is intensified further by connections between technologies. For example, you might put an RFID chip in a valuable silk shirt, which tells your washing machine not to run if it’s accidentally put onto a boil wash. But then the consumer needs to know the washing hasn't been done! So you need the washing machine to communicate with their phone to tell them to take the silk shirt out of the wash. You don't need to develop a new product for that, just develop new software. But you're still innovating; still producing, still creating value. Innovation is *never* finished.

There is a constant loop of data refining and developing products – from design, to validation, the making of products, to consumer feedback. Now that loop includes many more potential inputs.

SLIDE FIVE

Some say this will herald a shift back to “western” manufacturers. After all, western governments have been talking about focusing on “high value” manufacturing for decades. Further, western firms understand their wealthy, connected consumers and our markets have the networked and physical infrastructure to make data-rich products attractive. This depends on how much we innovate. As we've seen many times before, new technologies can quickly leapfrog existing networks. In a fast changing economy, those with innovative products will win.
Innovative products require engineers and decent R&D budgets.

Who is doing this research now?

Global R&D spend is at an all-time high, driven by an increase in Asian economies.

This chart shows the R&D world last year.

The further right, the bigger research as share of GDP.

The higher you get the more scientist and engineers per million citizens.

The bigger the circle, the larger the total R&D spend.

The big bubbles in the top right are the US, Japan, South Korea and Germany.

The big bubble at the bottom is China.

Hopefully you can pick out Britain, hidden in the middle!

Look at this chart, and then ask yourself who is going to develop the new products and systems that will transform markets?

Further, how do firms in one nation, whose markets are all around the world, position themselves to take advantage of this global tide of innovation?

Certainly not by looking inwards.

They need to build alliances with companies that understand growing markets.
The scale of this technological and digital transformation is huge.

I want to pick out just two trends.

The Financial Times journalist Peter Marsh argues we will see a new relationship between consumers and producers. He argues that makers will use a digitally driven, in depth understanding of individual consumers to create tailored solutions to their specific needs, much as doctors ‘prescribe’ a medical solution.

In some cases, like the 3D printing of hip replacements we are working on at WMG, this is literally, not just metaphorically, true!

Such ‘tailored’ manufacturing links neatly with another trend. This is distributed manufacturing, which will make it easier for entrepreneurs to innovate and get their products to market.

As Chris Anderson, author of the Long Tail, says:

“Anyone with an invention or good design can upload files to a service to have that product made, in small batches or large, or make it themselves with increasingly powerful digital desktop fabrication tools such as 3-D printers. Would-be entrepreneurs and inventors are no longer at the mercy of large companies”

These innovations will even create whole new markets, from personalised hip replacements to remote controlled garden management.

These trends may seem to affect smaller producers today, but it is manufacturers with market pull and global scale who will be affected most, and who must put the greatest effort into anticipating technological, political and economic changes.
Why? Because in a competitive world, the biggest manufacturers have to be at the leading edge.

One simple mistake can ruin them.

The days of high volume, low cost manufacturing, with very low margins are numbered, as even minor changes in regulation, wages or economic climate affects such business models severely.

All countries, including developing countries, are struggling with this issue, and so seek to create and develop new intellectual property.

This means internationalisation of both your business and your innovation is essential.

If you want to export to a country, you have to be prepared to not just manufacture, but to do research and develop products in that market.

So it’s not simple to just ‘grow exports’.

You have to create new fronts of collaborative innovation in new markets, to develop your next product.

Many industries are facing such challenges from Automotive, to Aerospace and even White Goods and Product Design.
SLIDE SEVEN

How does this sort of collaboration work in practice?

At WMG, we’re helping a local manufacturer develop virtual prototypes for the next generation of first class air and train seats in global markets.

You can also see Ratan Tata, using WMGs 3D digital design studio to inspect the body design of a new Jaguar.

He is, of course, both a consumer and a producer!

Such digital systems can be used to allow the personalisation and refinement of consumer experience.

For example, you might develop ten separate car finish systems, based on international consumer preferences identified at the pre-prototype stage.

SLIDE EIGHT

Next smarter, more connected products will provide huge amounts of information to innovators, which could create significant improvement in meeting consumer needs.

These smarter products will become part of the Internet of things, communicating their usage patterns to the consumer, the manufacturer and other products.

Connected products create a huge range of possibilities for new applications for existing technologies - imagine being able to download an engine mapping system tailored to your driving style, or for a specific journey, or one that updates engine settings depending on expected traffic.
Innovation will be built on connected technologies as well as connected products.

For example, one company in Singapore is turning discarded PET bottles into bricks with integrated solar panels, which powers LED lighting, making it possible to turn the very bricks of buildings into self-powering living displays. At the same time, the UK national synchrotron is being used to develop a synthetic vaccine for hand, foot and mouth disease.

Another area is ‘artificial skin’ with built in ‘self-healing’ properties.

These nano-composites are exciting enough in medical technology, but they will also be applicable to more ‘traditional’ engineering industries.

This could be through building lighter, smarter cars with functional composites, or by improving electrical cable safety by developing ‘self-healing’ materials.

So from recycled bottles to billboard buildings, from particle accelerators to animal vaccines, from bio-medicine to underwater cables, it is essential for companies to have links to new developments in apparently unrelated fields.
SLIDE TEN

This shows why collaboration is utterly essential: no company or nation is big enough to have expertise in all of these fields!

We all need to be part of a bigger innovation eco-system, creating partnerships that bring together research, commercial challenges and new technologies, all in the service of better meeting consumer needs.

For example, WMG is a partner in the High Value Manufacturing Catapult focusing on low carbon mobility.

We are working with industry and research laboratories to examine every aspect of reducing carbon in travel, from batteries to light-weighting to consumer acceptance of hybrid vehicles.

Such sustained University-Business partnerships, like the famous examples of Cal Tech and MIT, are vital to bridging the “valley of death” between exciting research ideas and deliverable products.

These networks can now be global and increasingly, virtual – such as the innovative materials programmes we at WMG are developing with the IITs in Bhubaneswar, Kharagpur and Guwahati.

This brings global research expertise in advanced materials to local mining businesses in Bengal, Odisha and Assam, who can than share mining and materials expertise and knowledge of fast growing markets with our partners.
SLIDE ELEVEN

To take this partnership based innovation further, we’re creating the National Automotive Innovation Campus at WMG.

This hundred million pound facility will develop new technologies for low carbon mobility, working with partners from OEMs to components makers to create a critical mass of research capability.

We’ll work with supply chain partners, computing partners and the UK automotive council, and research laboratories in the US, India, Japan and China.

The campus will also address the shortage of skilled R&D staff in the automotive supply chain, creating a pipeline of people into companies nationwide.

Why do I emphasise innovation and skills in the supply chain?

Because eighty per cent of a car’s performance depends on the quality of supplier’s products.

SLIDE TWELVE

One example demonstrates these connections.

Multi-materials and composites - like the steel-polymer ‘sandwich’ you see here, are already reducing material weight and cost - performing as well under stress conditions as high end aluminium, but at two-third of the mass.

Looking ahead, nano-composites will enable materials engineers to do much more than simply reduce weight while increasing strength. There is also the potential for functional materials, in areas as significant as energy storage or integrated electrical circuits.

That will require integrated innovation throughout the automotive sector.
The more we find ways to functionalise and cost-effectively produce nano-composites, the further the potential of these materials multiplies.

It’s for this reason that WMG is launching an international institute of nano-composite manufacturing.

We can foresee the development of lightweight composite materials with several different functional properties, from car bodies that can transfer energy or information to tissue engineered bio-scaffolds that safely contain medical implants and devices.

So the apparently separate fields of vehicle light-weighting, energy management and smarter materials, suddenly themselves become connected through collaborative innovation.

This is leading edge science with breakthroughs being made around the world, so our teams will be international from first principles.

I firmly believe that only innovative companies that engage in these partnerships and collaborations will gain the ever more important ‘first mover advantage’ in these new markets.
There is one last resource essential to all of the above. The people who will develop these technologies. A major problem facing economies around the world is a lack of skilled engineers. Companies need to take responsibility for securing this essential resource! We need integrated education programmes to create a stream of highly skilled young people. At WMG this starts with our Academy for Young Engineers, educating 14 to 19 year olds. However, there is a chronic and growing shortage of graduate engineers throughout engineering and advanced manufacturing. Without a graduate-level skilled workforce, innovative companies cannot grow, adopt new technologies or create new products. We can only address this through new industry funded undergraduate programmes. These courses need to exploit the latest technologies to impart research-driven knowledge and be taken by individuals part time at their workplace. We're doing this at WMG, applying the unique customer focused approach of WMG’s postgraduate programmes at undergraduate level. But business too needs to invest in education, before the gap grows too great.
SLIDE SIXTEEN

The networked, connected economy is with us already.

In every field, we're seeing new business models and new ways of developing, simulating and validating products.

We're seeing new markets that integrate physicality, software, systems and processes.

We're seeing new methods of manufacturing, new resource pressures, new supply chains and supply networks.

The effects of this cannot be avoided, but they can be anticipated and profited from.

What manufacturing once was, it can never be again.

The new Manufacturing - connected, distributed, collaborative and global - is taking its place.

A long term commitment to backing innovative partnerships, networks and people is the only way to expose yourself to all the developments that will impact each industry.

If we follow through on that commitment we will be able to build a new manufacturing in Britain, a manufacturing based on innovation, collaboration and long-termism.

Do this, and we will find new solutions to old problems, and so profit from the creation of new products and new markets.

Thank You.