The Productivity Leadership Group: Accelerating the Impact of Digitisation

Summary Report – June 2016

Phil Smith
Chief Executive, Cisco UK and Ireland and
Chair of the Tech Partnership

Chris Reeves
Cisco, Country Digitisation Director

Margaret Sambell
The Tech Partnership, Strategy
and Performance

CISCO

TECH PARTNERSHIP

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Executive Summary

The Impact of Digitisation is now widely being quoted as the "Fourth Industrial Revolution". Not only do companies need to have a view of how Digital can help them compete in a globalised market, but increasingly it is being recognised that Digitisation may also be the key to significant improvements in productivity.

The Productivity Leadership group formed and started work in the summer of 2015. The aim was to take a business led approach to addressing the UK's Productivity Challenge. Seven workstreams were formed. Our theme "Accelerating the Impact of Digitisation" focused on seeing how UK industry can apply Digital solutions to drive competitiveness and productivity.

Our group also investigated how Digital adoption will change the types of jobs we will do in the future. There will be an increasing shift towards automation and artificial intelligence; with many human tasks being replaced. New creative, design and engineering jobs will be created to utilise, support and work with the new technologies. The more dynamic nature of jobs will require people to retrain and reskill throughout their careers. The UK as a whole will need to be able to reshape its workforce to new value-add roles.

The opportunity is huge and has already been recognised by other countries around the world. Germany for example has rallied behind its widely reported Industrie 4.0 Strategy. The UK needs to act decisively and quickly.

Our work explores both the major challenge and the major opportunities Digitisation brings.

- The UK is behind global leaders in certain areas of business digitisation, and must urgently accelerate digitisation right across the economy.
- At the same time, the UK has the potential for global leadership in the application of disruptive technologies for economic gain.

As part of our work we formed cross-sector and sector specific (Retail and Manufacturing) Digital User groups. These groups were made up of different UK companies and they helped us identify the barriers to digital adoption and the opportunities for improved productivity. The main barriers we identified were:

- Cost
- Availability of Digital skills
- The barrier of legacy infrastructure and processes
- Fear of cyber security issues
- Confidence in change
- The availability of trusted advice
- Business leadership

The main recommendations are detailed in this document but to summarise they are:

For Business the importance of data and digital platforms was highlighted. The digitisation of the supply chain and the implementation of IOT were seen as key opportunities. The main recommendations for business were:

- Create a Digital Strategy for your business
- Understand the data that your business generates and how to extract value from this data
- Don't let Security concerns block your Digital plans – rather utilise cyber security solutions to protect your business.
- Implement a Digital Skills plan
- Understand the Digital start up eco-system in your industry

For Government there is also a significant role to play in the country's Digitisation journey. Both the Retail and Manufacturing sectors thought that there was a lack of trusted advice for Digital adoption and Government could assist with this. There have been discussions on a potential Digital Deal for Business and support for a more ongoing Productivity Council with a strong Digital support capability. The main recommendations for Government were:

- **A UK Digital brand and a coordinated approach.** The UK Digital ecosystem is complex and diffused. There is the potential to create an officially recognised and supported UK Digitisation brand and program.
- **Prepare for Digital Disruption.** Support and work with business to promote the Digital Skills agenda.
- **Continue to invest in the UK's wider Digital Infrastructure.** Expand the view of Digital infrastructure beyond broadband connectivity. Support the digitisation of transport networks, utilities, communities, towns and cities.

Proposed Next Steps

There is a desire to continue the work of the Productivity Leadership Group with the formation of an ongoing, business led, Productivity Council. This council would continue to promote the Digital adoption agenda and look to cooperate with Government to create a Digital Deal for Business.

The next phase will see the Productivity Council leverage the approach **"How Good Is Your Business Really?"** We would like to expand this to include "How Digital Is Your Business Really?" This would create a platform to allow the Group to engage with UK Businesses with the analysis of their current digital maturity. It could provide the trusted guidance, support and tools to help them on their Digitisation journeys.

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1　Introduction

In April 2015, Sir Charlie Mayfield and Sir Richard Lambert hosted a breakfast to bring together some of Britain's most senior business leaders to discuss what businesses could do about the productivity problem. The Productivity Leadership Group (PLG) started work in earnest in September 2015. The Government signalled its support for our work in the Budget that summer. Since then, the Group has been working with businesses, within seven leadership groups, to explore what practical action they could take to share learning and secure business improvements.

The work of the PLG is meant to be the first step on a much longer journey. The PLG have agreed the need to scale up the impact following this first phase and to establish the leadership needed to ensure the work gains traction beyond the initial one-year project.

Our theme within the PLG is "Accelerating the Impact of Digitisation". We investigated how the adoption of Digital can drive improved productivity. This group was led by Phil Smith, the Chief Executive of Cisco for UK and Ireland, and supported by the Tech Partnership.

1.1　Background and Context

Our Digital theme aims at addressing both a major problem and a major opportunity:

- The UK is significantly behind global leaders in certain areas of business digitisation, and must urgently accelerate digitisation right across the economy. This is one of the biggest levers the UK has for improved productivity. It is also essential for innovation and business competitiveness for individual organisations in every sector.

- At the same time, the UK has the potential for global leadership in the application of disruptive technologies for economic gain. Big Data Analytics and the Internet of Things are unleashing a new wave of opportunity which the UK is well placed to exploit, transforming current industries, creating new ones, and driving up both inward investment and exports.

It is clear that Digital will disrupt existing companies, create new innovative businesses and change the way we work and live.

As part of this work we created a number of digital user groups made up of leading UK companies. We engaged with these companies to understand the opportunities for leveraging Digital to improve productivity and to understand the barriers to adoption of Digital in the UK. This report has been written at the end of a yearlong business engagement process and is aimed at summarising our approach, conclusions and recommendations. It should also help to signal the next practical steps that companies can take to address the challenges of digitisation for productivity and competitiveness improvement.

Phil Smith, *Chief Executive of Cisco UK and Ireland and Chair of the Tech Partnership.*

2 Productivity

Productivity is a measure of efficiency of production. In its simplest form it is:

Productivity = Output / Input

Output is the value created by production and Input is the value of the materials and labour.

In this paper we will not dwell on the economic definition rather we will look at:

1. How can Digital drive efficiency by reducing the denominator i.e. reducing waste, reducing the effort spent creating the value.
2. How can Digital drive productivity by increasing the numerator i.e. increase the value of goods produced and create new offerings and value proposition.

If we focus purely on replacing manual tasks with automation without looking at improving the second category of creating more value through digital then we will miss a massive opportunity and we will create unwanted knock on problems to the economy.

Improving productivity can raise living standards because it increases real income which improves people's ability to purchase goods and services, enjoy leisure and improve housing and education. Productivity growth also helps businesses to be more profitable and competitive in an increasingly globalised market.

2.1   The UK Productivity Challenge

Since the economic crash in 2008 the UK economy has recovered in a number of key areas. Specifically employment recovered after 2008 much quicker than during the recessions of the early '80s and '90s. Growth has also started to recover: we went into recession in Q2 2008 and left recession in Q4 2009. In comparison to some equivalent countries the UK growth has been positive.

However productivity has remained flat. This leaves the UK economy behind our G7 neighbours when we compare value created per worker and value created per hour worked.

2014 Current Price GDP per worker
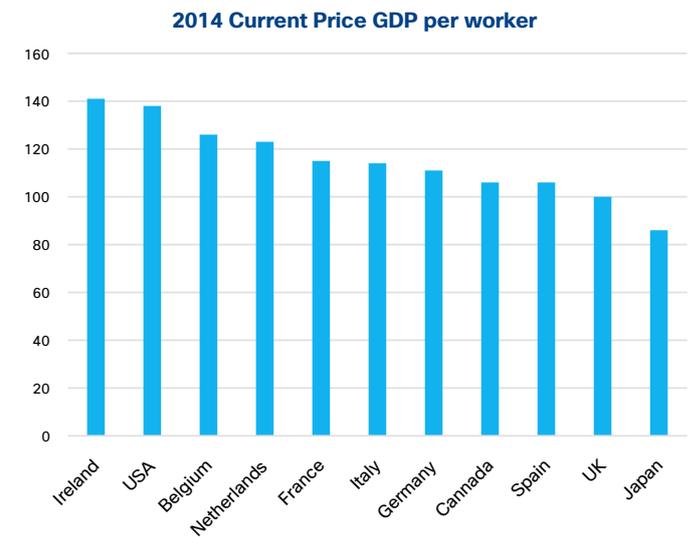
2.1.1   Sustained Employment and Growth

- The UK was the fastest growing major advanced economy in 2014, and the second-fastest in 2015 after the United States.
- Numbers of people in employment has consistently grown since the downturn to 31m in 2015. The employment rate reached a record high of 74.1% in 2015.
- GDP grew 2.9% in 2014 – the fastest pace since 2005 and 2.3% in 2015. GDP is now 7.3% above its pre-crisis peak.

Employment (000)

UK GDP Growth %
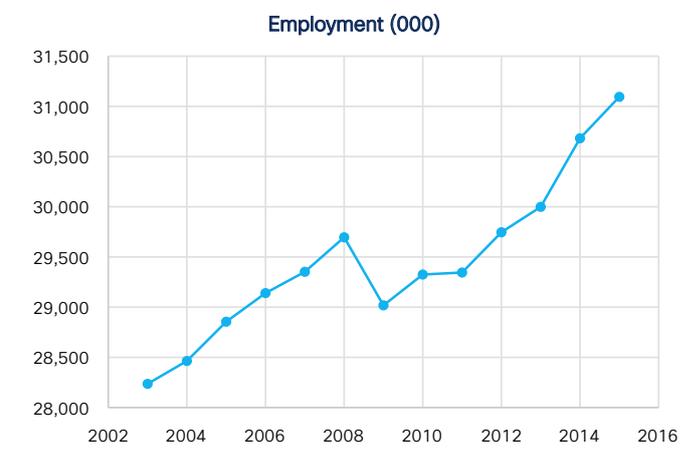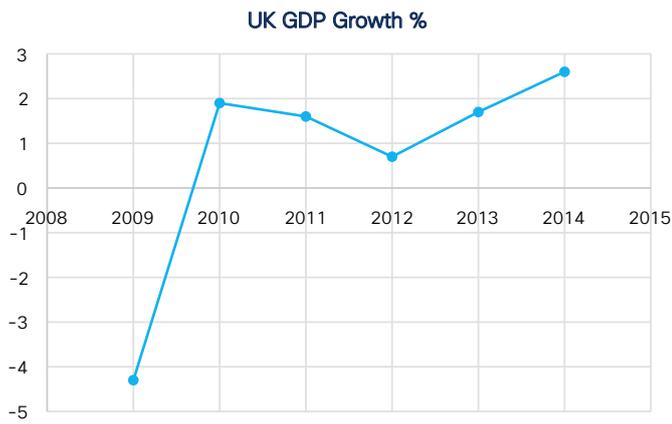
2.1.2   Lagging Productivity

However productivity remains stagnant and is a significant limiting factor on the overall economic performance. The UK economy output per hour remains around 13.1% below the level implied by its pre-crisis trend.
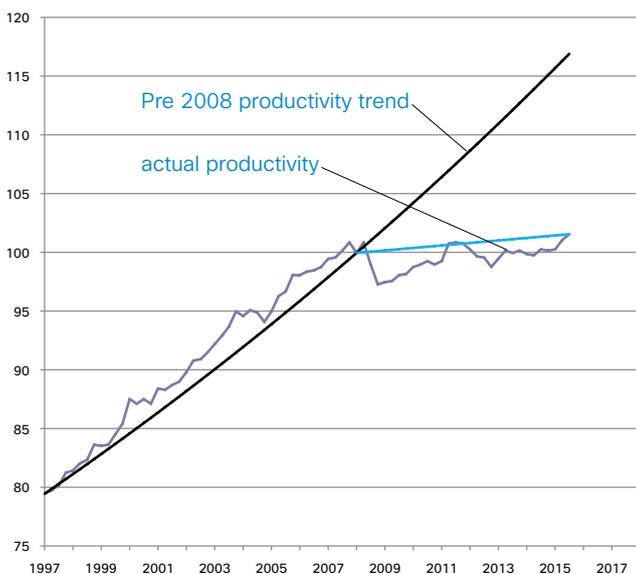
George Osborne has called the poor rate of productivity among the UK's workforce as "the challenge of our time".

2.2 Drivers for Productivity

Typical drivers of Productivity are:

1. Investment
2. Innovation
3. Skills
4. Enterprise
5. Competition

In the UK we have well-regulated Competitive markets and good Enterprise environment with trade organisations and start-up incubators. In this paper we will explain why Digital needs to be at the centre of the UKs Investments, Innovation and Skills agenda.

2.2.1   The impact of Digital on Productivity

Accenture and Oxford Economics (2015) indicate that for the UK a 10 point improvement to digital density (higher business investment in and uptake of digital technologies) could add around £40bn to GDP in 2020. In particular, the Accenture report found that those countries adopting IoT could increase GDP by an additional 1% by 2030, increasing to 1.5% if absorptive capacity was also improved.

3 Digital and Digitisation

3.1 What is Digital and Digitisation?

For our work we have taken a general meaning of the term "Digital". We have used it to describe the use of technology in transforming the way a business works.

Initially a Digital strategy can use technology to enable existing business processes or interactions. Companies can allow their workforce, customers or business partners to sign on to a portal and have all their services available plus access to all knowledge sharing and training. The sales pipeline can be managed with web based tools, updated and reviewed by mobile devices. Operational teams can get real time readouts from their mobile devices. This initial phase of digitisation is really just making existing processes more user friendly and data more accessible and content rich.

As well as enabling existing processes Digital is now having a much more transformational impact on businesses. Companies are moving Digital from being a business support function run by the IT department to a function that is central to everything the business does. Digital is defining the strategy and direction the company will take. As incumbent companies react to disruptive start-ups that have had Digital built in from their inception, they understand that they need a Digital strategy to compete in a market with rapidly changing user behaviour.

Companies are appointing Chief Digitisation Officers (CDOs) to drive their Digital agendas at an executive level. These leaders are tasked with driving internal efficiencies and also use technology to improve business to business operations, change the Go to Market model and drive customer engagement. They are using Technology to drive their business decision making.

The real break though in Productivity will come when we use Technology to create new value. The advancement of Technology will bring significant new value creation opportunities. The capability of sensors, battery technology, robotics, nano technology and other advances will bring new opportunities. If we add universal connectivity to this with cheaper and more powerful computing power we will see a multiplying effect.

In the UK we have traditionally tried to drive productivity by taking a cost reduction and efficiency approach to business but this is now resulting in diminishing returns. We need to make sure we are at the front of the 4th Industrial revolution and grasp the value creation opportunity that Digital brings. However it is clear from our interactions with our Digital User groups that companies need help in forming and executing their digital strategies.

3.2 Digital Disruption: The Impact of Digitisation

Technology continues to offer a wealth of opportunity but it is vital that we also acknowledge and understand the level of disruption that it will bring.

3.2.1 The impact on jobs

Technology is playing an increasing role on the working landscape in the UK. The traditional cycle of an Education phase followed by Work phase, followed by Retirement is changing. The aging baby boomers will impact the average age of the workforce as people are required to retire later. Also the more dynamic nature of jobs will require people to retrain and reskill at certain times throughout their careers. The UK workforce is increasingly diverse in terms of age and gender and will need to be more flexible as the dynamism

of the job market increases. Technology will be a key driver of this change but it can also provide many of the solutions that the UK workforce needs.

The challenge on the UK workforce is easy to understand but difficult to quantify. As computing power becomes more advanced and less expensive some middle skill jobs will also be at risk. Some jobs that were previously thought to be too complex to digitise due to the requirement for human nuances and interpretation are now being automated. Language translation, medical diagnosis and the interpretation of images can all be significantly aided by computerisation. As Artificial Intelligence expands into aiding more knowledge based jobs then middle skill opportunities may be reduced.

Less skilled, repeatable jobs will be replaced by Robotics and Automation. Automated production lines are becoming more flexible and they can understand changes in the presented materials and react accordingly. Some analysts estimate that 35% of roles within the UK workforce are at risk of automation over the next 20 years. Others estimate that 800,000 UK jobs could be lost to Automation over the next 20 years.

New economy companies are employing less people than traditional economy companies. WhatsApp for example was acquired by Facebook for $19Bn and connects over 1 billion users on a range of operating systems employed less than 100 people. So the level of job replacement through new companies needs to be high. Throughout history Technology has always created more jobs than it has destroyed but we need to be nimble in the skilling and reskilling of our workforce in order to react and meet the demand for Digital jobs.

3.2.2   The impact on business

In 2015 Cisco and the IMD Business School cooperated on a survey (Digital Vortex, How Digital Disruption Is Redefining Industries). The purpose of the study was to understand the disruption that would occur to businesses as a result of market changes coming from increased digitisation.

Survey respondents believe an average of roughly four of today's top 10 incumbents (in terms of market share) in each industry will be displaced by digital disruption in the next five years. Despite this only 25 percent of respondents describe their approach to digital disruption as proactive—willing to disrupt themselves in order to compete.

3.2.3   The impact on our environment

As well as business, the government and the individual Digital can also have an effect on our environment. This in turn can have a positive impact on UK productivity. As the number of connected devices increases so the possibilities of the Internet of Things increases. We will see the emergence of truly smart and connected communities, driverless vehicles, smart factories and buildings. Connected agriculture is improving food production and IOT is providing traceability of goods.

The connected environment can make our lives as a whole more productive. We can reduce wasted time lost to travel and reduce wasted resources from the implementation of smart environments. Both time and resource cost are on the denominator of our Productivity equation. By reducing waste and the recovery of lost time we can be redirect effort to value creating activities.

3.3   Embracing and responding to the Impact of Digitisation

One model, which is used by Cisco, categorises the digital adoption process into three main stages:

1. Enable: This is the substitution of existing manual or paper based processes with digital systems. This phase can significantly increase agility and productivity. Its impact on the performance of a company is typically on

reduced cost and time to market rather than create new revenue streams.

2. **Differentiate:** In this phase a company will create new user experiences, products or services. It will generate new revenues and drive business innovation. It uses Digital to generate economic value and gain a competitive advantage.

3. **Define:** In this phase Digital is placed at the heart of the business, rather than in a supporting role. It can create new business models and drive industry transformation. It disrupts existing industry ecosystems to create new areas of growth and innovation.

Typically incumbent businesses, with a customer base and revenue stream to protect, will move through the phases in turn. The challenge comes from new entrants who have Digital at the core of their business from day one. We can think of examples like Uber and Amazon that have entered the market with digital pure plays and taken market share from the incumbents as well as creating more value in the market as a whole.

The impact can be empowering, in terms of providing information and insight, it can also drive collaboration and flexibility at work. However there are some changes to workers' daily activities that could be perceived as threats to employment and this could form barriers to adoption that would need to be understood and carefully managed. A pro-active approach to understanding the concerns of the individual and driving the benefits to workers will be important in rolling out new digitised processes. In the globalised market it is vital that the UK has a workforce that has the appropriate Digital skills to compete and drive innovation. The speed of adoption of digital processes and the use of digital platforms will be central to driving increased productivity and expanding existing markets. The role of the individual will be central to maximising the benefit of new digital capabilities driving the required process changes that will go hand in hand with new digital capabilities.

Despite these challenges to date the UK has managed to embrace technology and continue to maintain high employment rates, recovering quickly since the 2008 downturn and create new jobs much faster than other economic recoveries. The key will be to ensure we are at the forefront of new technology adoption and that we invest in digital technologies that create new value.

4 Digital Adoption in the UK

In many ways the UK is at the forefront of Digitisation. The UK is a world leader in consumer e-commerce. British shoppers spend almost £1 in every £5 over the internet. In 2015 online sales in the UK were over £50Bn. This is far is ahead of larger advanced economies. However online consumer shopping is just one small element of Digital and there is a vast untapped potential in the UK.

There is significant room for improvement in digital adoption by business. In a joint study, Accenture and Oxford Economics show the link between increased use of digital technologies and greater levels of productivity growth through the "Digital Density Index" (DDI). The report concludes that although UK consumers have been quick to embrace digital, UK firms need to do more to adapt their organizational structures and management styles to take advantage of digital technologies.

The study highlights two areas where the UK performs relatively poorly:

1. Running Enterprises – the extent to which firms are embracing digital technologies. There is limited use of crowd-sourcing techniques, in technology enabled processes and business models, cloud computing and RFID devices. Data analytics is also seen as a key enabler.
2. Sourcing Inputs - the extent to which business use digital technology to source and deploy factors of production. There is limited use of digital platforms, Internet of Things and use of technology in the labour market.

These findings have been backed up by our cross industry consultation sessions and highlight the opportunity digital adoption by business in the UK.

4.1   Adoption by company size

The ONS show larger firms are consistently more likely to adopt many forms of digital technology. For example, almost all businesses with 50 or more employees had a company website in 2014, compared to 78% of firms with 10–49 employees and 44% for the smallest firms (less than 10 employees).

Figure 1 Proportion of businesses using digital technologies (by business size) 2014
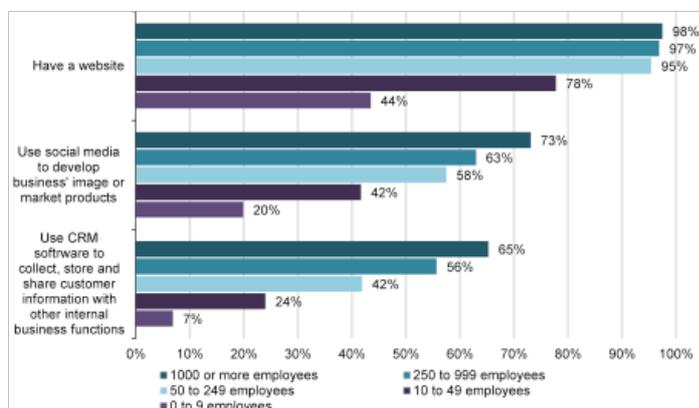
Source: ONS, E-Commerce and ICT Activity of UK Businesses, 2014

Similarly, use of social media and Customer Relationship Management (CRM) systems is now widespread amongst the largest firms (with 73% of firms with 1,000+ employees using social media to develop their business' image or market products, and 65% using CRM systems to collect, store and share customer information), but still very low for the smallest businesses (with only 20% of businesses with 0-9 employees using social media and 7% using CRM systems).

When we look further than basic website and CRM technologies we see adoption is low in some digital technologies across all UK company sizes. According to a survey conducted for Ofcom (Figure 2) we can see that there is significant potential to increase the adoption of productivity driving solutions such as Taking Orders and Payments

Online, Online Marketing, Cloud Services, remote working, video conferencing and intranets. As well as these more obvious Digital solutions that are underutilised there are many more advanced, and industry specific, digital solutions that can significantly drive productivity. We will cover these capabilities and use cases in sections 5, 6 and 7.

Figure 2 Proportion of SMEs using internet applications (for business with 1 to 249 employees) 2014

Source: Jigsaw/Ofcom, SME Experience of Communications Services, 2014

4.2   Adoption by sector

As well as variance over size of company we also see variance of adoption across UK sectors. As we might expect the Information and Communications sector is itself at the leading edge of the adoption of basic Digital solutions. For Manufacturing and Construction adoption is lower however in these sectors there is also a significant opportunity for more advanced Digital solutions such as Automation, Digital Simulation, Additive Technologies and Collaboration. We will cover these in Section 7.

Figure 3 Proportion of businesses (including micro-businesses) using various digital technologies (by sector) 2014.
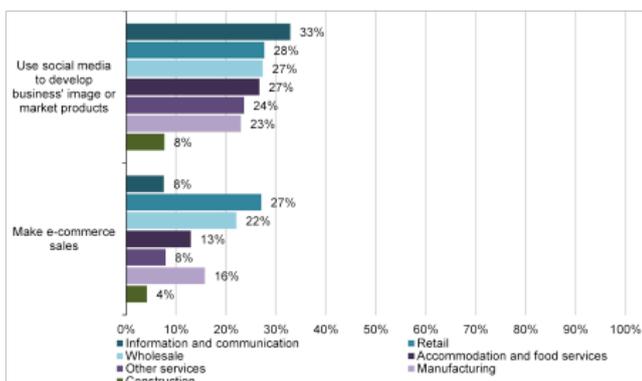
Source: ONS, E-Commerce and ICT Activity of UK Businesses, 2014

4.3   UK Comparison of Digital Adoption with European Leaders

Information from Eurostat covering businesses with at least 10 employees finds that digitisation across UK businesses follows the average Figure 4. There is a clear opportunity to increase digital adoption in a number of areas.

Figure 4 Percentage of enterprises adopting different technologies (for businesses with 10 or more employees, excluding financial sector)
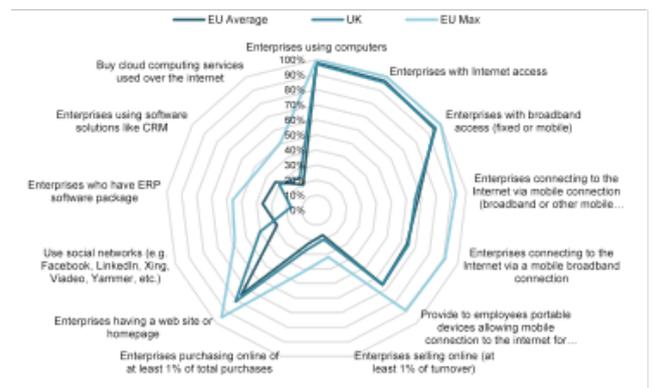
Source: Eurostat, Information Society Statistics, 2015

Note: All figures shown are for 2015 with the exception of social networks (2013); mobile internet connection (2014); mobile broadband connection (2014); portable devices (2014) and cloud computing (2014) (latest available data)

Digitisation amongst UK businesses is generally in-line with the EU average and we lead in some areas. The UK leads in the use of social networks, where UK adoption was higher than average in 2013 (40% versus 28% across the EU). However some European countries have embraced certain technologies more fully. By 2014, 93% of Finnish businesses were connecting to the internet via a mobile connection (versus 66% in the UK), with 91% using a mobile broadband connection (65% in the UK). The adoption of cloud computing was also high in Finland (51% of businesses), while being at an early stage in the UK (24%). Similarly, whilst the adoption of ERP systems by UK businesses was still low in 2015 (17%), more than half of German businesses are now using such solutions (56%).

5 Digital Capabilities to Drive Productivity

In this section we outline some of the enabling technologies that are under-utilised or just emerging. In Sections 6 and 7 we will outline the application of some of these technologies in sector specific use cases.

5.1   General ICT applications

5.1.1   Description

For the purposes of this high level overview we have grouped a number of Information and Communications Technologies (ICT) together. These range from simple email, website adoption, and video conferencing through to packaged software solutions and middleware.

5.1.2   Productivity Opportunity

This is a wide topic and in many cases the impact is large. Over the years email, instant messaging and video conferencing usage has become commonly accepted and changed the way we work and communicate. Enterprise messaging is improving the speed and level of collaboration across business. The use of ERP (Enterprise Resource Planning) software by large companies is mature and drives many of the back office functions. External and internal company portals offer common access to information and transactions.

5.2   E-commerce, Electronic payments and Transactions

5.2.1   Description

We have all seen the rise of e-commerce and online banking from personal consumer transactions. Typically Business to Business (B2B) transactions use more diverse payment processes and channels. There is an opportunity to deploy e-Invoicing or more consumer focused payment methods into the B2B environment. In Denmark there was a government led initiative to enforce e-Invoicing for public sector procurement that was also widely adopted in the private sector by small and medium enterprises.

As well as existing B2B electronic payment mechanisms there are also new advanced systems that may fundamentally change the way we financially transact. Bitcoin and Blockchain are based on peer to peer transactions that take place between users without an intermediary. In terms of adoption these solutions are in their infancy but may have a transformational affect in the future.

5.2.2   Productivity Opportunity

Electronic B2B transactions can significantly streamline the operations within a company's supply chain. Financial transactions can be completed with minimal human intervention, reducing payment delays and errors. Large companies can implement e-commerce standards and run B2B platforms with their supply chains. As mentioned with the Denmark example Governments are also introducing e-invoicing standards that are being more widely adopted and driving productivity gains. Chile mandated e-invoicing and estimated that it would save the country $600 million annually and help reduce tax fraud. The U.S. Department of the Treasury implemented an e-invoicing requirement in 2011, resulting in a savings of $450 million every year.

5.3   Supply Chain Digitisation

5.3.1   Description

In our industry engagement work with different

business sectors one of the universally identified opportunities for increased productivity was the digitisation of supply chain. This was an output of our cross-sector forum, retail forum and manufacturing forum. There are a number of digital technologies such as RFID tracking, inventory management, real time analytics and Enterprise Resource Planning (ERP) systems that can be combined to provide a digitally joined up operation. Another powerful enabler is the use of Digital Platforms that can be accessed across the supply chain.

Traditionally digital solutions in the back office were deployed as silos. ERP systems have been adopted by large companies to provide a more cross functional approach to the back office. Customer Relationship Management (CRM) systems tackled the front office management and warehouse and fleet management systems were deployed for logistics.

These systems have driven productivity but have also introduced issues in that multiple, often contradictory databases have been created within silos of the end to end process. Legacy platforms are often driven by batch processing with little connectivity between the front office, back office and logistics.

The next generation of solutions have a more joined up approach around a single dataset. Joined up data strategies are vital to successful Digitisation. In future systems data will be updated and analysed in real time and business decisions made with minimal need of human intervention.

The supply chain element of businesses is where a number of our sectors interact, for example Manufacturing, Transport and Retail. If we can reduce waste in terms of under-utilised transport capacity and by dynamically linking demand-supply we will increase productivity. As well as joining up back offices and front offices there is also a significant opportunity to open up these platforms to suppliers, partners and customers.

5.3.2 Productivity Opportunity

Digitally linking the end to end supply chain across business functions and across companies will provide a range of productivity improvements. If the data is held in a common store and updated in real time then systems can interrogate this single source of the truth and automatically adjust operational transactions. The productivity improvements realised will be predominately around the removal of waste in terms of time, resources, inventory and logistics. There will also be significant productivity improvements from time to market and opportunity management.

5.4 Data and Digital Platforms

5.4.1 Description

In an Economist article "Does Deutschland do digital?" from November 2015 they reference an established German manufacturing company, Trumpf. The company has grown since 1923 to have annual sales of $3.2billion dollars from traditional manufacturing but is now looking to digital platforms to provide their future growth. They are building a new business leveraging their online offering, called Axoom. Axoom digitally connects machines built by Trumpf and others, and uses the data it collects from them to help customers organise their production. This digital platform links companies in their Eco-system and automatically drives their supply chain. Axoom will be an "open" platform and be able to run "apps" from other providers, such as software to schedule workloads, or to predict when machines will need a spare part.

5.4.2 Productivity Opportunity

The Economist article argues that the rules in many industries are changing in that making things matters less and knowing things more. It says that the successful companies will be the ones that gather the best data and offer the best digital services. And the biggest winners of all may be those that control a "platform", a layer of software

that combines different kinds of devices, data and services, on top of which other firms can build their own offerings.

For manufacturers making factories "smart" is only the first stage in the digitisation journey. The next is to use the data generated by connected devices and other information to offer services, and make money with new business models. Firms that cannot create such offerings may quickly lose their ability to compete.

5.5   IOT

5.5.1   Description

The "internet of things" describes how devices, sensors and machines are connected together via wireless or fixed networks.

It was some time ago now that the number of connected devices exceeded the number of people using the internet. IOT is typically a Digital solution that will drive productivity and new business models in a company's core business rather than back office.

Rolls Royce is an example of a company that has leveraged IOT to create a new high growth business model. IOT has enabled RR to connect with their airline customers through data sharing and engine analytics from connected sensors in the engines. From the collected data they have been able to build service based business models with their customers rather than the traditional one time procurement of the engine. Through predictive analytics and pro-active maintenance they have also improved the performance and lifespan of their engines.

Rolls Royce is just one example of IOT at work. Insurance companies are another example of IOT adoption where they are offering remote monitoring services to reduce their customer's premiums and manage their risk by tracking the activity of the insured assets. Also after the initial hype smart cities, smart factories, smart buildings, driverless cars etc. are all now starting to become a reality.

5.5.2   Productivity Opportunity

The productivity opportunities from IOT are wide and numerous. They range from tracking assets to completely connected cities. As well as automation and control huge value can be derived from the collection and analysis of data made possible by IOT.

6 Digitisation in UK Retail

6.1   Introduction

Having previously identified Retail as one of the top two UK industry sectors most in need of digitisation in order to raise productivity, a Retail industry forum was created. The forum consists of representatives from large and small UK retailers, retail bodies and related Government entities. Cisco & The Tech Partnership developed digital intervention use cases that were tested with the group to discover which were seen as having the most value and also what were the barriers to adoption. There has been ongoing collaboration with various members to distil the findings in this section.

6.2   The UK Retail Landscape

In the Retail industry profit margins are under increasing pressure caused by a number of factors. Firstly the cost of labour and the introduction of the National Living Wage. Secondly due to the costs associated with running an online business, which has become a basic requirement for large retailers and thirdly due to pricing pressure from competitors, some of which operate with an online marketplace and from customers who expect deals. Some large national retailers have failed to survive in this environment. It is not only large retailers that are under pressure though, entire high streets made up of all kinds of retailers continue to fight for the attention of customers whose numbers are still in decline due to competition from online and a change in shopper behaviour.

6.3   The Digital Disruption of UK Retail

Retailers can be classified by the channels they make available for customers; in-store only, online and in-store or online only. The latter is seen as the largest threat to the other types due to these retailers having a lower cost base and the potential to attract customers worldwide to achieve high sales volume. Currently Amazon has a 25% value share of the UK internet retailing market and can be seen as the most impactful retail disrupter.

EBay is another online only player that continues to disrupt the retail landscape. At any given time an average of 800 million listings make up its marketplace on the site. EBay helped lead the mobile shopping revolution with its app (registering 90m downloads in a single quarter at its peak) and safer payment solutions.

6.4   Digital Driving Productivity in UK Retail

Net a porter, an online only, fashion retailer setup an automated warehouse equipped with robot pickers in London in 2012. Barcode tracking and complete automation of the stock picking process has yielded a 'pick rate' that is over 500% faster. This has been achieved through the connectivity of automated robots to real-time data management. Human activity can be reallocated from menial tasks to more skilled engineering, oversight and problem resolution roles.

At the other end of the spectrum smaller retailers are adopting social media to engage with their customer base and drive loyalty and personalisation.

Small and Mid-sized retailers can use packaged software solutions to drive universal back office tasks that increase productivity. For example applications can make scheduling staff hours easier. Shifts can be coordinated online and notifications via text message and email can be sent so employees never show up for a cancelled shift. Online email marketing solutions make it faster to send email campaigns and the ease with which many of the websites can be used means very few skills are required by the retailer. Credit

card payment systems can easily be used in conjunction with existing cash registers and some systems provide monthly sales data and help inform decisions about the best date to run a sale.

6.5   UK Retail Digital Use Cases

Below is a list of retail specific use cases with examples we explored with our group:

Table: UK Retail Digital Use Cases

Use Case & Description	Digital Examples
Omni channel Using a variety of channels (store, web, contact centre, mail etc.) to manage a customer's shopping experience in a consistent, seamless & coordinated manner.	• Buy online, collect in store. • Single view of the customer. • Self-serve online across multiple channels. • Social Media integration on all digital touch points. • Interactive, transactional touch screens in store.
Logistics & Inventory Management The use of technology to optimise inventory and the logistics of managing it. Using platforms for information sharing and IOT to track items in real time to match inventory to warehouses, stores, shelves etc.	• Digitised warehouses. • RFID tracking of inventory. • Fleet tracking and optimisation. • Ecosystem data sharing on open platforms. • Fleet and warehouse sharing with partners. • Last mile optimisation. • Smart lockers / collection lockers.
Digital High Street Many of the digital use cases presented are most relevant or cost effective for large retailers. To support smaller retailers it is important to make the high street a desirable, logistically easy, digitised location.	• Websites with store addresses and opening hours etc. • Appear on Google maps / online-Presence. • Pop up / street trading / markets Wi-Fi & ePOS. • Smart parking / Smart public transport. • Collective Marketing. • Security infrastructure. • Shared logistics. • Click and collect – online last mile solutions. • Digital platforms for collaboration & data sharing.
Store Digital Infrastructure Equipping the store with digital infrastructure for automation of manual tasks, connectivity and customer/staff monitoring.	• ePOS and bar codes. • Customer self-checkouts. • Digital shelf edge pricing. • Digital signage. • Wi-Fi in store for staff and customers. • Customer / staff location analytics. • Mobile payments. • Smart buildings / Environment Management. • Instore navigation apps (V. Large / Large footprint stores).
Communication and Collaboration This is the use of communication and collaboration software for meetings, training and information/ best practice sharing Adoption is high for basic tech like email and intranets. Bring your own device and collaboration tools could be used more.	• Email. • Intranet and internet. • eLearning. • Online Chat between staff and customers. • Bring your own device – mobile. • Open internal data and systems. • Digital marketing. • In store or on line Remote Video Expert. • Video conferencing / virtual meetings.

Customer Insight The collection of customer data from multiple sources to create insight about behaviour in all channels. Insight is used to improve the overall customer experience and can aid the retailer in the personalisation of the experience to individual customers.	• Customer profiling. • Loyalty cards. • CRM systems. • Store layout optimisation / location data. • Data sharing with suppliers / open platforms. • Democratisation of data: sharing with employees. • Local area loyalty cards for small retailers.
The Digitisation of Standard Business Processes This is the use of packaged software to drive standard business processes	• HR systems. • Finance and Accounts systems. • Customer Relationship Management. • Procurement and inventory. • eInvoicing (Small business). • Staff management – staff allocation. • Staff real time command and control. • Real-time inventory. • Marketing – social media campaigns.

6.5.1   Use Case 1: Omni- Channel

Impact on Productivity: This is contentious from a purely productivity point of view but Omni-channel is becoming a necessity to support an ever increasing on-line customer base. Fully integrated omni-channel solutions are probably most suited to large retailers however small retailers are developing their on-line presence and connected customer databases. It could be argued that the additional channels that an omni or multi-channel approach requires merely cannibalise sales from existing channels and therefore they create a productivity decline as more input in terms of the creation and maintenance of these additional channels is required to maintain existing sales. However this argument ignores the value creation opportunity that omni-channel brings. Closer customer engagement can bring cross-selling opportunities and targeted service propositions.

Retailers are increasingly required to offer customers the option to buy however, wherever and whenever they want, it has become a table stake and this demands a mobile (mobile website or mobile application) and online (a transactional website) channel as a minimum. 'Buy online, collect in store' propositions can raise productivity because they can be a largely customer self-service model and this is a very popular way of purchasing in the UK. Cracking the "Returns" process for on-line shopping was seen as our group as a real customer winner. Some retailers have as many as 8 different ways to be able to return products that are joined up and easy for the customer

Barriers to adoption: The technical, cultural and behavioural changes can be disruptive and pose an unacceptable level of risk to current operations. The complexity of legacy IT solutions that have been implemented in silos is a significant barrier for large incumbent retailers. Also existing distributed and duplicated databases across the business provide a challenge to implement a joined up solution. New complex customer journeys need to be understood and mapped as part of the design.

6.5.2   Use Case 2: Logistics & Inventory Management

Impact on Productivity: It was viewed that this use case offers excellent productivity opportunities and is most suited to medium and large size retailers. See the Net a Porter digitised warehouse. Larger retailers should also consider the tracking of inventory with RFID, aligned to analytics. Fleet tracking, route optimisation and sharing of logistics with other parties for the reduction of half full loads is feasible. We are starting to see how retailers and suppliers are using collaboration platforms to share and optimize logistics assets and processes. Specifically for small retailers there is the potential for collaboration on logistics – with each other or with larger retailers for mutual benefit. We could imagine Uber type operations applied to logistics.

Barriers to adoption: Not knowing where to obtain impartial advice that can be trusted is a common obstacle here. Retailers are also looking for end to end rather than point solutions to minimise disruption. Finally the high cost and upfront investment required to adopt these solutions is seen as a challenge. Certain specific technologies such as RFID have been trialled and lessons have been learned from early implementations.

6.5.3   Use Case 3: Digital High Street

Impact on Productivity: The opportunity to digitise the High Street is seen as a hugely transformational opportunity, not just for Retail but for our communities and environment. It is applicable to every business with a high street presence but is most suitable for smaller retailers on the high street. The premise of this use case is about a group of retailers jointly leveraging digital connectivity, social media and applications to drive engagement with their customers and transform their location into a desirable leisure location. . A retailer acting alone will normally be far less impactful on driving productivity than an entire high street working together. The digital high street can do much more by offering greater convenience to shoppers with things like Wi-Fi, smart parking, smart public transport. There is the potential to share marketing, logistics and security. Knowledge about digital can be shared to bring all retailers up to a minimum standard, such as having an online presence.

Barriers to adoption: There is an existing Digital High Street initiative in the UK but sourcing funding has been a challenge. Local councils struggle to find funds for digital campaigns. Funding for Digital infrastructure and smart community applications is a challenge even when the business case is compelling. Some small retailers will struggle to advance on their own without significant support. A barrier appears to be confidence of the small business owners/ managers to engage with digital. Also there is a lack of awareness of the digital options available, their potential impact on competitiveness & productivity and the urgency with which they should be applied. It was felt that the lack of digital skills is an issue along with the lack of or perceived lack of a support network.

6.5.4   Use Case 4: Store Digital Infrastructure

Impact on Productivity: The productivity opportunity here was seen to be high but mainly suitable for Medium and Large size retailers. The application of digital solutions in pricing and payment is the largest opportunity for the UK. Digital shelf edge pricing is far more popular in the rest of Europe than it is in the UK. Many large retailers still have to resource heavily around sale periods to get prices lowered across their stores and then raised again after the sale ends. This creates many hours of low value work which a digital solution would replace with a system that could update prices in store and online simultaneously.

Barriers to adoption: Previously the cost of labour was cheap enough not to pressurise businesses into digitising signage, prices and payments but National Living Wage rises may make the business case viable in the UK.

6.5.5   Use Case 5: Communication and Collaboration

Impact on Productivity: Communication and collaboration systems are the essential enablers supporting the growth in working from home/ remote working. This has been proven to raise productivity but often requires a cultural change to reduce physical travelling and adopt new working behaviours.

These systems also enable more productive ways to learn and access data.

6.5.6   Use Case 6: Customer Insight

Impact on Productivity: By driving a greater understanding of customer behaviour productivity can improve. Customer data analysis can raise engagement and drives up the spend per transaction. In the process of doing so, it can improve customer loyalty. Sharing business data with suppliers and more broadly with employees allows the power of the insight the data provides to be used widely across and beyond the retailer's boundaries. Giving a supplier real time sales data can ensure that popular products do not sell out and order volumes and delivery schedules are adjusted accordingly.

Barriers to adoption: Data privacy and security are important topics here. Wishing to protect the brand image by not invading customers' privacy in collecting certain data from them. Unwillingness to share data with suppliers that they could share with competitors thereby undermining a form of competitive advantage. The management and organisation of data is also a barrier to extracting the value from it.

7 Digitisation in UK Manufacturing

It was back in the late 18th Century,[1] the famous economist and philosopher Adam Smith identified the role of increasing specialisation within manufacturing as being an important driver of productivity growth.

This trend of specialisation and innovation has continued since. Global manufacturing supply chains have led to unprecedented levels of complexity that need to be managed.

Digital technologies are being used to accelerate the rate at which global supply chains specialise,[2] and so their development and adoption is an essential element in remaining competitive in the global manufacturing market place.

It is essential that the UK is a leader in the adoption of digital technologies to remain a significant global player in manufacturing.

Digital adoption will upskill manufacturing jobs and make the industry more attractive as a career target. Also Digital has a role in preventing off-shoring (automation reduces the need for low-cost off-shore labour and increases the need for new higher skilled jobs).

Industry 4.0 heralds the increasing connectivity between computers and the IOT. The UK was the leader in the first industrial revolution and a participant in the second and third. The UK needs to take a leadership role in the 4th industrial revolution. Industry 4.0 leverages the connectivity of machines and the real time analysis of data to drive the customization of products under through highly flexible, intelligent production.

7.1   The UK Manufacturing Landscape

The UK has some of the most productive and advanced manufacturing companies in the world. The UK's automotive and aerospace industries are highly automated, computerised and flexible. The High Value Manufacturing Catapult, and its Manufacturing Technology Centre, have played an important role in supporting innovation and digital adoption within these sectors.

There is however a significant tail of less productive manufacturers in the UK who are struggling to adopt Digital within their existing processes. These companies will be increasingly exposed to global competitors.

To some extent the introduction of the National Living Wage may have a positive effect on Digital adoption. Companies will not be able to rely on cheap local labour. Rather they will need to automate and innovate. The UK's workforce will increasingly need to apply Digital skills in their jobs as their roles move from manual tasks to more high value system and data engineering tasks. This can also have a positive knock on effect of making the UK manufacturing industry more desirable to the new generation of workers.

7.2   The Digital Disruption of UK Manufacturing

As on-line retailers are disrupting the UK Retail sector so Digital will have an increasingly disruptive effect on the Manufacturing sector. Globalisation within manufacturing will be driven from the adoption of Digital collaboration tools and B2B platforms that operate perfectly well over national boundaries. This will open up new markets and opportunities to UK companies as well as competition. The offshoring of manual production will become less of a decisive factor as companies automate. Rather innovation, design, creativity and the application of technology will be the drivers of growth. IOT and connected systems will allow 24/7 operations, remote monitoring and maintenance and new service models to be created. New products will become possible. In

[1] Smith, Adam (1776). An Inquiry into the Nature and Causes of the Wealth of Nations
[2] "Digital Supply Chains", presentation by Dr Jagjit Singh Srai 12th May 2016, Centre for International Manufacturing, Institute for Manufacturing, Department of Engineering, University of Cambridge,

the pharmaceutical and food industries Digital will allow the traceability and authentication of products throughout the lifecycle of the end to end supply chain.

Technology will enable the prototyping and modelling of factories, processes and products in advance of manufacture. The sophistication of Computer Aided Design has advanced to include virtual reality, computer modelling, the creation of Digital Twins and 3D printing. Initially Digital Twins were limited to objects but now they are being extended to cover entire factories and supply chains. This will drive productivity from the removal of errors, the shortening of the design process and the creation of whole new services and products. The Manufacturing Technology Centre in the UK is focusing on a number of these areas but we must make sure that the accessibility and relevance of this technology is there for the whole spectrum of UK industry and not just the leaders.

7.3 Digital Driving Productivity in UK Manufacturing

From our engagement with the UK Manufacturing Digital User Group we identified a number of use cases that drive productivity in the sector. Obviously the automation of manual tasks can reduce labour costs but rather than focus on cost reduction we wanted to identify areas of value creation. The Rolls Royce example we outlined in the IOT section shows how this is possible. New

products will emerge and existing products will become increasingly customised to individual requirements.

In May 2016 the Financial Times reported how there has been a surge in investment in Robots in the US driven from advances in artificial intelligence and automation. It reported on forecasts that show investment in Robots double and on how the US and China were looking to join Japan and Germany in leading in this area. It is vital that the UK catches up. Some estimates say that Germany has 7 times more robots per 10,000 employees than we do in UK.

Japan's Fanuc company has announced plans to connect its 400,000 installed machines by the end of 2016 to collect information about their operation and improve their performance. The combination of advances in sensors, AI and connectivity will transform the Manufacturing industry. The Digital use cases that we investigated for the UK range from Logistics to automation to Digital collaboration tools. We can digitise the way our businesses operate and collaborate as well as digitising the production line.

7.4 UK Manufacturing Digital Use Cases

Below is the list of manufacturing-specific use cases with examples we explored with our group at the forum:

Table: UK Manufacturing Digital Use Cases

Use Case & Description	Digital Examples
Automation & Flexible Robotics An estimation was made of how much Manufacturing productivity would increase if all industries in a country had the highest found level of robot intensity. The results showed that the country with the largest potential increase would be the UK with 22%.	• Single activity robots • Routing & Machine Flexibility - Multi-Functional Robots – flexible production lines • Human robot collaboration – speeding up manual tasks • Connected / networked machines • Real-time yield optimisation – robotics linked to sensors on the production line • Proactive maintenance

Logistics & Inventory Management
The use of technology to optimise inventory and the logistics of managing it. Using platforms for information sharing and IOT to track items in real time to match inventory to warehouses, factories, locations etc.

- Digitised warehouses
- RFID tracking of inventory
- Fleet tracking and optimisation
- Ecosystem data sharing on open platforms
- Fleet and warehouse sharing with partners
- Real-time supply chain optimisation
- Replacement of paper documentation / customs optimisation

Open platforms, communication & collaboration
Sharing of manufacturing data with the extended supply chain and wider ecosystem. The use of communication and collaboration software for meetings, training and information/ best practice sharing.

- Email, Intranet and internet
- eLearning
- Open data and systems
- Digital marketing
- Remote Video Expert
- Video conferencing / virtual meetings
- Digital performance management
- Data driven demand prediction
- Customer co-creation / open innovation

Smart Environments
Equipping buildings with digital infrastructure for automation of manual tasks, connectivity and sensors for real time monitoring.

- In building Wi-Fi – (bring your own device)
- Smart Energy consumption
- Smart buildings / Environment Management
- Remote monitoring & control
- Augmented reality for maintenance & repair
- Remote Maintenance

Digital design and knowledge work –
Applications and tools to improve and assist design and knowledge work rather than repetitive manual tasks. Use of computers to perform tasks that rely on complex analyses and creative problem solving. Virtual modelling was identified as being key – potentially most important to encourage take up adoption and investment.

- CAD & digital modelling
- Digital Social Innovation – Crowd
- Automation of knowledge work
- Data driven design to value
- Concurrent engineering
- Rapid experimentation & simulation
- Digital Twin
- 3D printing / modelling

Process Control
Automatic optimisation of processes using sensors and feedback loops. Process modeling and virtualisation. Guided operators. Real time control for performance management.

- Digitally monitored processes
- Advanced process control
- Statistical process control
- Digital quality management
- Virtually guided operators, warehouse staff, logistics staff etc. (text to speech or smart glasses)

Analytics & Business Information
Real time collection and use of data. Mass collection of data from all parts of the business process. Analysis of trends and exceptions for optimisation. Making data insight available to all parts of the business and the wider ecosystem.

- Batch offline feedback of production data into the development process
- Democratisation of analytics to all workers
- Big data – mass collection and processing of data from systems, sensors, mobile devices and workers.
- Predictive Maintenance
- Analysis of the end to end process

7.4.1 Use Case 1: Automation & Flexible Robotics

Impact on Productivity: The potential productivity impact is huge. Automation and flexibility of production can be a creator of additional value where companies can charge a premium for customised products.

Smart production lines, advanced robots connected to real time analytical data with Artificial Intelligence (AI) and flexible multi-functional production lines are all driving real value creation. Typically these drivers of productivity have been adopted by advanced large manufacturers with significant investment budgets. For small businesses, single activity high specification robotics and robotics with sensors for proactive maintenance will increasingly drive productivity improvements too. Small manufacturers will need to leverage automation and robotics to specialise in product areas and share data to connect to a wider supply chain.

Barriers to adoption: Cost of automation is a universal barrier however falling cost of technology makes business cases to implement digital show a higher return on investment than seen previously. Also the risk of initial implementation is also seen as a barrier. This can be addressed through modelling and proof of concepts. Technology suppliers can play a role by offering solutions as a service.

7.4.2 Use Case 2: Logistics & Inventory Management

Impact on Productivity: For large businesses RFID (or an alternative method) tracking of inventory aligned to analytics. Fleet tracking, route optimisation and sharing with other parties to maximise capacity utilisation. For small businesses there is the potential to collaborate on logistics with each other or with larger manufacturers for mutual benefit. Sharing vehicles, management systems and data to make productivity gains.

Barriers to adoption: The belief in technology and the increasing complexity of the supply chain seem to be the biggest barriers here. Some early implementations of RFID were not universally successful but it was seen that this was largely down to execution and process issues rather than the potential productivity saving from the solution. Fear of sharing data with other parts of the supply chain was also seen as a barrier to collaboration. A lack of understanding of the data within an organisation is also an issue.

7.4.3 Use Case 3: Open platforms, communication & collaboration

Impact on Productivity: Productivity improvements can be unlocked from digital collaboration within a business and across a supply chain. It can positively impact how every person goes about their work within an organisation and within a wider ecosystem. For large manufacturers data can be collected from machines and shared to help linked businesses align their production. Digital platforms can connect companies and automatically drive their supply chains. For small manufacturers, digital marketing, collaboration with the wider eco system and data driven demand prediction are likely to be the most impactful applications.

Barriers to adoption: More innovative manufacturers are already starting to deploy open digital platforms to share, and extract value, from their data. Some advanced equipment manufacturers are deploying connected sensors in their products to support remote maintenance and service management. A fear of the security implications of making data public is the biggest barrier here. It is important that there is a good understanding of data to decide what to make public and how to protect it. Rather than avoid connecting devices to minimise security implications companies should use advanced digital security solutions to manage access to data and systems.

7.4.4   Use Case 4: Smart Environments

Impact on Productivity: Remote maintenance and management of facilities is now viable. Sensors connected to monitoring applications to ensure quality standards and prevent machinery down time are becoming more common. There is potential for more cutting-edge virtualisation solutions for maintenance and repair. Shared operations centres across multiple sites are becoming more common. Reduction of waste is a key component of improving productivity. Digital environmental management systems can reduce the cost of some of utility overheads.

Barriers to adoption: The initial cost of implementation is seen as a barrier here plus a lack of understanding and quantification of the returns. Legacy facilities and infrastructure are also seen as a significant barrier to the implementation of smart environment solutions.

7.4.5   Use Case 5: Digital design and knowledge work

Impact on Productivity: Rapid prototyping and testing and tools facilitating an agile development lifecycle with concurrent engineering will reduce time to market for medium and large manufacturers. For Small businesses the use of digital social innovation e.g. crowd sourcing to access a larger pool of resources and the ability to specialise in a wider market will boost productivity. Manufacturers of all sizes should see a high impact on productivity.

Barriers to adoption: By using Digital modelling techniques we can de-risk technology introduction and process changes in advance of implementation. Digital Twins can identify issues and mitigate risks. Digital simulations can prove business cases and reduce the unknowns for the worksforce.

The group felt that there could be more shared access to some of the facilities provided by the High Value Manufacturing Catapult and the Manufacturing Technology Centre. These groups have an excellent capability that can be used to increase knowledge and understanding of this use case.

7.4.6   Use Case 6: Process control

Impact on Productivity: The use of data collection and analytics to automatically adjust the process in real time to ensure consistent quality is one example of applying this use case. Process modelling and testing before entering production is another way to ensure productivity is maximised.

Small and medium sized businesses should use software to improve system performance, volume management, change management, manufacturing processes and business support processes.

7.4.7   Use Case 7: Analytics & Business Information

Impact on Productivity: The aggregation and analysis of data from multiple data sources is increasing driving business decisions and real time process actions across all industries.

Data is already collected by many manufacturers to some extent; but accessed, managed and used to drive insight by only a few. Even when it is leveraged then the business intelligence gained often only in the hands of a few employees. It was thought that democratising access to data to a wider group will ensure the insights it provides are applied to decisions throughout the business.

The ability to flexibly use computing resources and digital storage through cloud services and use of crowd sourcing is making deep learning capabilities available to the smallest of companies. To some extent larger companies will need to match their level of business agility.

8 Summarising Barriers to Digital Adoption

One of the key objectives of the work was to engage with industry to understand the exiting barriers to digitisation amongst UK businesses. We investigated this topic with our three Digital User Groups – Cross Sector, Retail and Manufacturing. The descriptions of the main barriers to adoption are included in this section:

8.1   Cost

Cost of technology and its implementation was seen a universal barrier to digital adoption in the UK. However there are a number of market dynamics that will reduce this specific barrier over the coming years:

1. **The cost of technology is falling.** Following Moore's Law we can see that the power of technology continues to increase and the cost continues to fall. This is not just in computing power but in associated technologies such as batteries, networks, sensors etc.
2. **Cloud computing and software as a service avoids initial capital investment.** As infrastructure is increasingly being deployed in the cloud and solutions delivered as a service so the size of the initial capital outlay is being reduced.
3. **The national living wage.** One of the potential reasons for low productivity in the UK is that since the downturn of 2008 UK wages have remained flat. The availability of low cost resources has meant that often investment in automation and productivity improvements can be avoided. The introduction of the national living wage will to some extent reduce low cost labour as an option and technology business cases may be more viable.

8.2   Availability of Digital Skills to Implement and Operate

The availability of Digital skills is consistently sited as one of the major blockers to Digital adoption by businesses in the UK. It is important to clarify that this is not just amongst the junior levels of organisations or the IT department but also amongst the management and executive teams of the core business. It was felt that shortage of key Digital skills will continue to prove a bottleneck for Digital adoption by UK firms.

At a time when automation and online self-service will displace significant numbers of existing roles so new roles will open up in technical and creative areas. The rapid reskilling and reallocation of a flexible workforce from automated roles to more highly skilled creative roles will be key to the UKs success. Technology replacing manual labour is not a new phenomenon and technology has always created more jobs that it has destroyed but they will be different jobs and they will require different skills.

It is important that industry plays an active role in the reskilling of its workforce and Government provides a supporting role in the reallocation of labour. Digitisation can also provide many of the answers to the Digital Skills shortage. Online courses are improving the access to training. The promise of Massive Open Online Courses (MOOCs) is huge but initial completion rates of courses has been low. Still Digital will play an important role in democratising access to Digital skills in the future.

8.3   The Barrier of Legacy Infrastructure and Processes

Many UK companies have already been through multiple cycles of IT investment. Typically these assets drive large companies back office, front office and logistic operations. This presents a number of barriers:

- Multiple datasets: Often legacy IT systems have been built in silos and databases representing the same information in different forms have been replicated around the business. Consolidating this data in a single place will avoid duplication and data errors but is often a significant undertaking.
- Not full depreciated costs: The previous investments on existing IT systems will depreciate over time. Investment in replacement new generation solutions will often not be financially viable until the previous investment is fully depreciated.
- Disruption to the existing business: The existing IT system often drive a company's day to day business and transforming this can risk disruption if not managed carefully.

8.4   Fear of Cyber Security Issues

Some companies voiced resistance from their internal IT functions to providing connectivity to core systems due to security concerns. In an increasingly connected world it was felt that companies should implement the latest Cyber-security solutions to protect infrastructure and data rather than avoid connectivity completely. Getting trusted advice and support on Cyber Security was seen as important to accelerating Digital adoption.

8.5   Confidence in change

At a basic level, the complexity and rapid change of digital technology can deter investment by business leaders without digital expertise. So-called FUD – fear, uncertainty, doubt – creeps in and prevents businesses from identifying and implementing investments; it's especially the case in smaller businesses. Part of this is the recognition that the initial investment in new computing equipment or software is only half the story; realising the full return on digital investment often requires rethinking organisation, process and skills to take advantage of the capabilities on offer. This complexity provides a barrier to change.

Digital itself can provide solutions to this challenge. As we saw with our Manufacturing user group Digital Twins and Models are being used to simulate technology implementations in order to de-risk and prove business cases in advance of major investments.

8.6   The availability of trusted advice

Across all of our Digital User Groups it was felt that there was lack of understanding by business of where to go for trusted, impartial advice on how to digitise.

In the UK the Digital landscape was felt to be complex and difficult to penetrate. There are a number of innovation initiatives and bodies but the UK has a relatively confusing digital landscape. There was a feeling that other countries have a clearer "brand" on innovation at a sector and industry level. Industrie 4.0 in Germany for example seems to provide a clear direction which is universally recognised now and for which German manufacturing is famous. There is an opportunity for the UK to align some of the existing capabilities and initiatives in digital around a single campaign and brand.

8.7   Business Leadership

Leadership was taken up as the main focus of the separate Manufacturing workstream within the Productivity Leadership Group. That team focused on improving business leadership and process efficiency. They felt that business leadership was a major challenge to improving productivity in manufacturing – this includes visioning and investment in technology. Ongoing support for leaders in Manufacturing, Retail and other sectors of the UK economy will be vital for the creation and implementation of Digital strategies.

9 Summary and Conclusions

9.1   Summary

Our approach to this work was to initially engage with a wide cross sector Digital User Group and then focus in on two specific sectors that we believe are strategically important for UK Productivity. We have had excellent support from the UK Retail and Manufacturing sectors in identifying areas were digital can drive increased business performance in their businesses. We have jointly formulated a number of recommendations for UK enterprise and the economy as a whole. There is real optimism and ambition from UK Retailers and Manufacturers in grasping the opportunity that Digitisation brings. Our leading companies are displaying innovation, resilience, adaptability and an increased focus on succeeding in a digital world.

It is clear from our work that the opportunity to embrace Digital is compelling and immediate. Technology is already significantly disrupting businesses and business models in the UK. It is vital that we take a positive, pro-active approach by putting Digital at the heart of our country and business strategies. We must disrupt our existing businesses to create new value and improve productivity. We must create an environment to encourage the adoption of Digital techniques and look to remove barriers to innovation. Technology will free us from manual mundane tasks and amplify our creative processes.

Technology will continue to drive a more global ecosystem and it is vital that UK companies embrace this opportunity for access to wider markets and business partners. Technology will drive communication and collaboration between companies, customers and partners. New physical technologies such as nano technologies, robotics, additive technologies and artificial intelligence will open up new opportunities for value creation. The UK needs to be at the forefront of the business

exploitation of the technologies to make sure that we are increasing the size of the numerator in the productivity equation.

9.2   Digital Recommendations from our Industry Engagement

From our Digital User groups we captured a number of recommendations for UK businesses:

9.2.1   Recommendations for UK Business

- Put the digital agenda at the heart of your business
  - Large businesses should have a Chief Digital Officer (CDO) who is empowered to ensure the company's strategies are cognisant of challenges and opportunities that Digital disruption will bring. Digital should be at the centre of UK businesses rather than as an adjacent IT support function.
  - Small companies need to consider a digital adoption plan and roadmap that is relevant for their business. This can follow a roadmap from Digital communications and collaboration to front office and back office software packages that drive productivity.

- Have a Roadmap of how Digital can Enable, Differentiate then Define your business
  - Enable – look at how Digital can enable existing processes to make them more efficient and productive.
  - Differentiate – investigate how Digital can be used to differentiate your business. This can be via digital marketing or using digital to increase product quality, reduce time to market, creation of new products and predictive analytics.
  - Define – have a vision of how Digital can define your business in the future. New digitally disruptive competitors have this vision from day one with no legacy to manage.

- Understand the value and application of your business data
  - Establish a view of the data that can be collected from your business operations and your eco-system. Understand how this data can be used to create value internally and externally to your business.
  - Have a view on Digital Platforms. Should your business launch a digital platform for B2B collaboration or should you connect to someone else's platform in your supply chain? Should you open up your data to collaborators or keep it private?

- Understand the Digital Security of your business
  - Understand the value and nature of the data that you store
  - Understand the security of your network and your Digital infrastructure
  - Understand the actions you will take if/when you have a digital security breach

- Engage the wider Digital eco-system
  - Digital Start-ups are a growing presence within our eco-systems. Awareness of the start-up environment in your industry area will open up opportunities to collaborate, partner and innovate.

- Digitise your supply chain
  - In our work the end to end supply chain was identified as one of the areas where Digital can help realise productivity gains. This can improve all sectors and industries. It covers B2B communications and transactions, logistics, inventory management and many more. The cross company productivity improvement opportunities here are large. Understand and map your supply chain first, then digitise.

- Have a digital skills plan
  - The focus of digital skills should not just be for the IT department. A key area to increasing digital skills is amongst the management team that are planning the business. Understanding the use of digital within all areas of your business will help drive innovation.

9.2.2 Recommendations for the Digital Industry

If the adoption of Digital is key to driving UK productivity then the Digital Industry has a role to play. UK companies are unsure where to go for practical advice on Digital adoption. From our sector engagement sessions we received feedback as to how the Digital Industry can partner more with industry:

- Deliver business solutions rather than technology
  - The feedback we received was that technology companies are often focused on selling technologies rather than providing joined up business solutions. Understanding of the business and an appreciation of the legacy challenge is key to driving change and productivity gains from Digital.

- Everything as a service
  - Initial cost of technology was universally seen as a barrier to adoption. Innovative service pricing can remove the barrier of initial capital outlay and sharing of the risk of investment.

9.2.3 Recommendations UK Government

From our work it was felt that the UK Government had a vital role to play if the UK was to take a lead in the 4th industrial revolution:

- A UK Digital brand and a coordinated approach
  - The UK Digital ecosystem is complex and diffused. The catapults, Innovate UK and other organisations are doing fantastic work in digital but there is limited public recognition or coordination across initiatives. There is the potential to create an officially recognised and supported UK Digitisation brand and program.
  - There is a desire to continue the work of the Productivity Leadership Group with the formation of an ongoing, business led, Productivity Council. This council could continue to promote the Digital adoption agenda and look to cooperate with Government to create a Digital Deal for Business.

- Prepare for Digital Disruption
  - Large incumbent companies with many employees will be disrupted by purely Digital companies with fewer employees and lower legacy costs. New digitally driven industries will emerge with significant opportunities. The rapid reskilling and reallocation of a flexible workforce will be important for the UKs global competitiveness.

- Continue to invest in the UK's wider Digital Infrastructure
  - A wider view of Digital infrastructure is required. Local councils want to develop their smart city plans but do not have the funds to do it. Digital can optimise our transport networks, utility networks and communities. It can help regenerate our high streets. We need to have a wider view of what constitutes digital infrastructure beyond basic broadband connectivity.

9.3   Next Step of the project

There is the potential to form an ongoing, business led, Productivity Council. This council would continue to promote the Digital adoption agenda and look to cooperate with Government to create a Digital Deal for Business as mentioned in the Recommendation **"A UK Digital brand and a coordinated approach".**

A proposed next phase will see the Productivity Council leverage the approach **"How Good Is Your Business Really?"** We would like to expand this to include "How Digital Is Your Business Really?" This would create a platform to allow engagement with UK Businesses with the analysis of their current digital maturity. It could provide the trusted guidance, support and tools to help them on their Digitisation journeys.

Appendix I: Our Methodology and Approach

Our Engagement Objective

The objective of our theme "Accelerating the Impact of Digitisation" was to gain consensus of how UK industry can take action to drive productivity through digitisation. To do this we aimed to engage with UK Industry to identify digital interventions that could improve productivity and propose some recommendations to accelerate their introduction and adoption.

We wanted to identify barriers currently preventing the adoption of digital solutions and recommend methods of removing or mitigating these constraints.

High Level Approach

Cross sector productivity and digitisation are both very broad topics. Early on in our

work we decided that we would focus on the Digitisation of two sectors of the UK economy but follow a repeatable methodology that could be applied to all sectors by other groups and potential follow on work. We developed an approach that allowed us to gain real insight in some specific areas but also highlight general conclusions for the Digitisation of the UK economy.

Proposed Repeatable Methodology: The repeatable methodology we followed was an Analysis Led – Industry Consultation Process to identify target sectors, processes and Digital interventions to drive an uplift in UK productivity.

Figure 5: Methodology followed for the "Accelerating the Impact of Digitisation" productivity workstream.
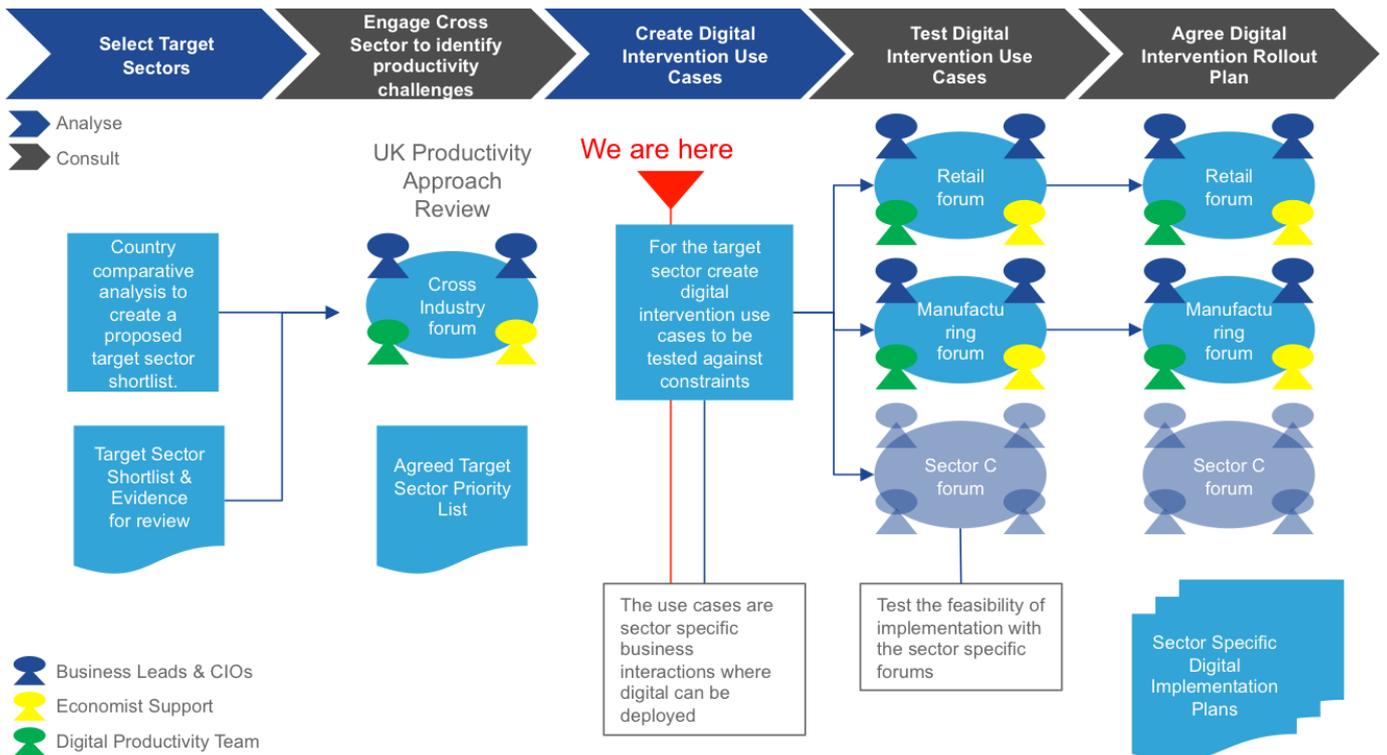
In our work we completed the following steps:

1. UK Sector Analysis
2. Engage Cross Sector Digital User Group
3. Create Digital Intervention Use Cases
4. Test Digital Use Cases with Sector Specific User Groups
5. Review Digital Acceleration Recommendations

1. UK Sector Analysis

Our first step was to conduct some economic analysis to see which the best initial sectors were to target for digitisation. We wanted to select sectors that had the following criteria:

1. Large enough to impact the UK economy
2. Were already being disrupted by Digital to some extent
3. Have low productivity compared to the same sectors in similar western economies.
4. Have a significant spread of productivity from the highest performing companies to the lowest performing companies.
5. Have potential for further Digitisation.

The results of this analysis were included in our interim report (December 2015). In summary our selected sectors were UK Retail and UK Manufacturing.

2. Engage Cross Sector Digital User Group

We presented our Analysis and sector selection to a Cross Sector Digital user group forum that was convened on November 12th 2015. At the forum we had 25 attendees representing different UK

business sectors and the IT industry. The group was formed with the assistance of the boards of the Tech Partnership and represented large and small companies from a range of UK sectors.

There was general agreement on the selection of Retail and Manufacturing to be target sectors for the next phase of work. There also a view that the wider business eco system should be analysed in that the Digitisation of end to end supply chains was a key opportunity and these spanned a number of traditional sectors. As described earlier in this report digital transactions and data sharing across B2B eco-systems such as manufacturing, transport, logistics, retail etc. was seen as a strong opportunity for improved productivity.

3. Create Digital Intervention Use Cases

In this phase of work we identified and created a number of Digital use cases for the two target sectors. We categorised them and identified their impact on productivity and potential barriers to adoption in the UK. These use cases are described in sections 6 and 7.

4. Test Digital Use Cases with sector Specific User Groups

We established two further digital user groups:

1. UK Retail Digital User Group made up of 25 representatives from the UK Retail Industry.
2. UK Manufacturing Digital User Group made up of 25 representatives from the UK Manufacturing Industry.

We ran two separate sessions with these user groups to test the impact on productivity of the use cases and to understand the barriers to adoption in the UK.

5. Review Digital Acceleration Recommendations

The final stage was to review the recommendations with the wider user groups and consolidate the findings in the final report.

6. Next Step of the project

There is the potential to form an ongoing, business led, Productivity Council. This council could continue to promote the Digital adoption agenda and look to cooperate with Government to create a Digital Deal for Business. A proposed next step under this organisation could be to create an online tool that will support UK businesses with the analysis of their digital maturity. It could provide trusted guidance and support on how to procced with their Digitisation journeys.

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