More than making things
A new future for manufacturing in a service economy

A Knowledge Economy programme report

Andrew Sissons

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After decades of relative decline, British manufacturing is leading the economic recovery. This resurgence of the manufacturing industry is long overdue – Britain cannot return to balanced and sustainable prosperity without a thriving manufacturing base.

But the manufacturing industry has changed beyond all recognition. Images of smokestacks and assembly lines no longer reflect reality. Nor is manufacturing just about technology and advanced machines. The manufacturing industry has moved beyond simply making things – it is now a complex industry that engages with customers and other businesses in a range of ways.

The most important change is the rise of manu-services, whereby firms combine goods and services into packages. Many of Britain’s top manufacturers – the likes of Rolls Royce and BAE Systems – don’t just sell goods. They sell solutions, outcomes or experiences, which they provide through a combination of goods and services. Manu-services are already prevalent throughout the UK economy – from mobile phones to jet engines, many of the goods we buy are now provided through a combination of goods and services.

Manu-services are hugely important to the UK, because they play to Britain’s strategic strengths: a highly skilled workforce, a strong service sector and excellent universities and research institutions. Although the UK excels in a few high-tech sectors, we are already some way behind countries like Germany, Japan and France in terms of the size of our high- and high-medium-tech manufacturing base, and emerging economies are catching up at an alarming rate. If UK manufacturing is to thrive, we must lead the world in manu-services.

Manu-services are not so much a new idea as a whole new type of innovation. Whereas high-tech manufacturing is all about technology and R & D spending, manu-services are a new way of doing business, a strategy for firms to grow. Manu-services represent a vast area of soft, non-technological innovation. By developing new packages of goods and services, adopting new marketing strategies, or dealing with customers in different ways, manu-service firms have a whole range of new options for innovating and growing.

But manu-services are complicated activities, which require firms to coordinate fundamentally different skills. Manu-service firms – especially smaller firms – face a range of challenges and barriers to growth. If the UK is to take full advantage of its manu-services potential, it must do everything it can to help firms overcome these barriers.

To do this, the government must embed manu-services into its policy agenda. This policy agenda should have two parts:

1. Creating networks to support non-technological innovation in manu-services – the UK’s world class institutions – including universities, banks and intermediaries – must work together effectively to support the non-technological innovation on which manu-services depend;
2. **Overcoming unique barriers to growth** – the government must ensure that manu-service firms with the potential to grow are not held back by the risks, capital requirements and transitional problems posed by manu-services.

Table A sets out our specific recommendations for a manu-services policy agenda.

**Table A: Summary of policy recommendations**

<table>
<thead>
<tr>
<th>Policy recommendation</th>
<th>What it would achieve</th>
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<tr>
<td>1. Ensure that Technology and Innovation Centres engage in non-technological innovation, specifically designed to promote manu-services</td>
<td>This will provide a focal point for innovation in services and business models, which can drive growth among manu-service firms. This will also help to engage businesses, universities and other institutions in effective manu-service networks.</td>
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<td>2. Embed manu-services within government policy and public institutions, including LEPs, universities and UKTI</td>
<td>This will ensure that key institutions play a role in supporting the growth of manu-services. An explicit manu-services role for UKTI would boost export performance.</td>
</tr>
<tr>
<td>3. Develop a comprehensive evidence base for manu-services, by investing in targeted research. The ONS should provide statistics that allow proper analysis of manu-services</td>
<td>This will fill the policy gap on manu-services, and improve business understanding of manu-services.</td>
</tr>
<tr>
<td>4. Expand the capability of the Manufacturing Advisory Service, to allow it to provide comprehensive support on manu-services</td>
<td>This action would assist firms with overcoming transitional problems in moving towards manu-services. It would also provide a link between smaller manu-service firms and key institutions.</td>
</tr>
<tr>
<td>5. Provide integrated support to manu-service firms, that can tackle the joint barriers of risk, access to finance and transitional problems</td>
<td>The government should ensure that all manu-service firms with the potential to grow are not held back by any of the key barriers to growth affecting the area. Exploring a publicly-backed manu-service insurance fund may allow government to play a role in removing barriers imposed by risk.</td>
</tr>
<tr>
<td>6. Universities should work with manufacturers to provide skills for manu-services, which may include joint STEM and non-STEM degrees</td>
<td>This would ensure that manu-service firms have access to the skills and specialists needed to effectively combine goods and services.</td>
</tr>
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Introduction

The British manufacturing industry has changed beyond all recognition over the last 40 years. Images of towering smokestacks and huge assembly lines still dominate the popular perception of manufacturing, but they are a long way from reality. UK manufacturing is a sophisticated and complex industry, which occupies a place at the cutting edge of global innovation and at the heart of the knowledge economy.

Manufacturing has a crucial role to play in the UK’s economic future, and a vibrant manufacturing sector is a vital prerequisite for achieving a balanced knowledge economy by 2020. The UK has developed a strategic trade gap through its over-reliance on financial services and property-driven domestic demand, and it can only fill this gap by strengthening UK manufacturing. Britain’s manufacturers drive Britain’s exports, contribute hugely to innovation and R&D spending, and act as a productive anchor for the rest of the economy. The role of advanced manufacturing has rightly been recognised and championed in government policy for a number of years.

But modern manufacturing is about much more than making things. Manufacturing companies are home to a wide variety of specialised staff, from research scientists and designers to marketing executives and support engineers. They operate within large and complex supply chains, which include a wide range of different activities, and are often spread out around the world. And they no longer just sell mass-produced products – many manufacturers now make a significant proportion of their revenues from selling services that complement their goods.

This combination of goods and services – which we call manu-services – provides firms with a whole new area for innovation and competitive advantage. Manufacturers need no longer rely solely on their products to differentiate themselves. There is vast scope for them to innovate by combining their goods with complementary services, to better meet the needs of their customers. Rather than competing on a lowest-cost basis, manufacturers can develop lasting relationships with customers, based on collaboration and trust. Manu-services represent a major opportunity for UK manufacturing to set itself apart from the rest of the world, and to become a leader within the global economy.

But providing manu-services also presents a significant challenge for firms. Integrating goods and services is not straightforward; it involves adopting an entirely different business model. Manufacturing and services are fundamentally different activities, and combining them effectively can be challenging and costly. If the UK is to become a world-leader in manu-services, British firms must overcome these challenges.

This paper details how the UK manufacturing industry has changed, and traces the rise of manu-services as an important trend within manufacturing. It also examines the challenges involved in providing manu-services, and looks at how government policy could be designed to help firms overcome these challenges.

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1 A strategic trade gap is a long-term excess of imports over exports, caused by the structure of the UK economy. This strategic trade gap is forecast to reach 4.7% of UK GDP by 2020. See Coutts and Rowthorn (2009) Prospects for the UK Balance of Payments.
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What are manu-services?

The term “manu-services” describes a broad group of activities that involve combining manufactured goods with services. These activities range from fairly simple combinations of goods and complementary services (such as maintenance and installation) to complex integration of manufacturing and services (which may involve providing services such as development, design and after sales care in close integration with the production of a good).

It would be difficult and misleading to describe manu-services as a distinct sector of the economy; rather, the term relates to a broad group of activities that share similar characteristics. The diversity and complexity of these activities makes it hard to pin down an exact definition of manu-services, but we can identify a number of characteristics that often apply to such activities:

- An ownership model where the customer does not own a good, but pays a regular fee to rent it or derive a service from the good;
- A redistribution of risk between buyer and seller, with the producer bearing more of the risk associated with a product;
- Longer service contracts instead of a series of one-off transactions;
- Manufacturers develop relationships with customers, rather than interacting in a transactional style; and
- Increased customer involvement in designing and producing goods (such as bespoke manufacturing).

The latest evidence suggests that manufacturing firms generate 15% to 20% of their revenue from services. This would make manu-services responsible for around 2% of the UK’s GDP, roughly the same as all lawyers and accountants within the UK.

Why are manu-services becoming more important?

Manu-services represent a huge opportunity for UK manufacturing. The move into manu-services offers businesses the chance to boost their revenues while differentiating themselves from global competitors. In some markets, manu-services have become the standard, meaning that firms need to adapt to this new business model in order to compete. This development represents a major opportunity for British manufacturing, because it plays to the UK’s strategic strengths: a highly skilled workforce, a strong service sector and excellent universities and institutions.

2 Manu-service activities do not necessarily need to have all or any of these characteristics; nor are they exclusive to manu-service activities.
4 Work Foundation estimate based on data from the Annual Business Inquiry (2008)
Manu-services may also present an opportunity for the manufacturing sector to create jobs. Manufacturing is not a great creator of jobs, since it has undergone rapid productivity growth, and is relatively capital-intensive (as opposed to labour-intensive). However, service activities tend to be more labour-intensive, meaning that any new jobs that are created in manufacturing are more likely to be in service-oriented positions.

The rise of manu-services is being driven by two key trends:

1. Increasingly sophisticated consumers who demand improved experiences as well as products; and

2. The need for manufacturing firms to coordinate activities within long and complex supply chains.

Underpinning these drivers are a number of major structural changes in the global manufacturing industry. In recent decades, we have witnessed a gradual erosion of the dominance of large, vertically integrated manufacturing firms, which are increasingly being replaced by networks of smaller firms working together. The supply chains within which these firms operate have become more complex and more international, making them much harder for firms to coordinate. The rise of manu-services sits within this context, and is partly a response to the changing nature of global manufacturing.

**Structure of this paper**

The rest of this paper sets out an overview of how the manufacturing industry has changed, and how manu-services have grown in importance. It highlights both the opportunities and challenges provided by manu-services, and sets out an agenda for government policy to support manu-services.

The paper continues as follows:

- Section 1 sets out an overview of the importance of manufacturing to the UK economy, and of the structural changes the manufacturing industry has undergone;
- Section 2 looks at what manu-services are, and explores why they have grown;
- Section 3 examines the challenges firms face in providing manu-services;
- Section 4 looks at whether the size of a firm affects its ability to provide manu-services efficiently; and
- Section 5 concludes by setting out recommendations for policy makers.
1. The changing nature of British manufacturing

Contrary to popular perception, the UK manufacturing industry is not in terminal decline; it has just become less important relative to other areas of the economy. Manufacturing remains vital to the UK’s economic recovery and future prosperity. Following a sharp contraction during the recession, manufacturing has begun to recover strongly, and outperformed the UK economy during 2010\(^5\). Manufacturing is widely expected to play a key role in driving the UK’s economic recovery, and will also be central to efforts to rebalance the economy.

The UK manufacturing industry has also undergone major structural changes over the last few decades. These changes have not only altered the nature of enterprise and work in the manufacturing industry, they have also been a driving force behind the rise of manu-services.

Most of these changes have been well documented, but their implications for the future of manufacturing have not always been fully understood. The globalisation of manufacturing, the off-shoring of many low value production activities to lower wage economies, and the growing importance of technology and innovation in advanced manufacturing have been on both the front pages and the policy agenda for many years. However, some of the trends accompanying these developments – the rise of intangible inputs, the move away from large, vertically integrated manufacturing firms – have profound implications for the UK manufacturing industry that are not always reflected in government policy.

This section sets out the key structural changes that the manufacturing industry has undergone over recent decades, and explains how these changes have contributed to the rise of manu-services. It also highlights the important role manufacturing will play in supporting the re-balancing of the UK economy.

**The importance of manufacturing to the UK economy**

Despite manufacturing’s importance to the UK economy, it has seen a steady decline in jobs and relative share of economic activity since the 1970s. The number of jobs in manufacturing has fallen from over 6.6 million in 1979 to under 2.5 million in 2010\(^6\), such that it now accounts for less than 1 in 10 jobs in the UK. However, the UK’s manufacturing output is actually higher (by 9.5%) than in 1979\(^7\) (although manufacturing’s share of economic activity has fallen from 35% in 1970 to 11%\(^8\)). This reflects a rapid growth in labour productivity in manufacturing, which has outstripped productivity growth in the rest

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\(^5\) The manufacturing sector grew by 3.8% during 2010, compared to 1.4% in the economy overall. However, manufacturing output fell by 14.5% during the recession, and is still 8.8% below its peak level of output in Q1 2008. Source: ONS Preliminary GDP Estimate for Q4 2010.


\(^7\) Source: ONS Gross Value Added figures. Index (2006) shows 83.2 in 1979, with output rising to 87.2 by Q3 2010, a rise of 9.5%. Manufacturing output peaked in 2007 at 20.8% above the 1979 level, but has fallen back considerably during the recession.

\(^8\) Source: BIS.
The changing nature of British manufacturing

of the economy by 55% since 1993. Figure 1.1 shows how rapid growth in manufacturing productivity was accompanied by a similarly rapid fall in employment between 1993 and 2009, with output remaining flat.

**Figure 1.1: Productivity and Employment in manufacturing, 1993 – 2009**

![Graph showing productivity, jobs, and output over time]

Source: ONS. Index for Productivity and Employment: 2006 = 100. Index for Output: 1993 = 100

Many commentators have claimed that this fall in employment and productivity growth marks a shift towards high-tech manufacturing, as the UK’s low-tech manufacturing base is eroded by overseas competition. However, as Table 1.1 shows, high- and high-medium-tech manufacturing provides fewer jobs than low- and low-medium-tech manufacturing, and has lost jobs at a faster rate over the recession. The UK’s high-tech manufacturing base is in fact being eroded faster than the rest of the manufacturing sector.

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9 Source: ONS Productivity Time Series. Data shows that productivity per hour worked in manufacturing grew by 48.3% from 1993 to 2009, compared with 31.2% in the economy overall.
The changing nature of British manufacturing

### Table 1.1: Employment in high-tech and low-tech manufacturing over the recession

<table>
<thead>
<tr>
<th></th>
<th>High- and high-medium-tech manufacturing&lt;sup&gt;10&lt;/sup&gt;</th>
<th>Low- and low-medium-tech manufacturing</th>
<th>High- and high-medium-tech manufacturing as a share of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Q3</td>
<td>1,409,295</td>
<td>1,904,624</td>
<td>42.5%</td>
</tr>
<tr>
<td>2008 Q3</td>
<td>1,309,622</td>
<td>1,805,159</td>
<td>42.0%</td>
</tr>
<tr>
<td>2009 Q3</td>
<td>1,035,420</td>
<td>1,576,353</td>
<td>39.6%</td>
</tr>
<tr>
<td>2010 Q3</td>
<td>1,054,300</td>
<td>1,626,820</td>
<td>39.3%</td>
</tr>
<tr>
<td>% change, 2007 – 2010</td>
<td>33.7%</td>
<td>17.1%</td>
<td>-</td>
</tr>
</tbody>
</table>


Besides its contribution to employment and output, the manufacturing industry also benefits the wider UK economy in a number of important ways. Our 2009 paper *Manufacturing and the Knowledge Economy*<sup>11</sup> clearly demonstrated that manufacturing is an integral part of the knowledge economy, which drives much of the UK’s economic growth.

The manufacturing industry plays a number of vital roles in the economy, including:

- **Exports** – manufacturing is responsible for a significant proportion of UK exports, which gives the sector a key role in combating the UK’s serious trade deficit;

- **Research and Development (R & D) spending** – manufacturing makes a disproportionately large contribution to R & D spending, which helps to create ideas and technologies to support the knowledge economy; and

- **Stimulating demand for other activities** – the manufacturing sector is a major consumer of services, including knowledge-intensive services.

Each of these roles is central to creating a balanced and vibrant UK economy; a strong manufacturing sector is one of the key platforms that must be in place to create sustainable long term prosperity.

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<sup>10</sup> High-and high-medium-tech manufacturing classification based on Eurostat definition. This area includes the following sectors: chemicals; pharmaceuticals; computer, electronic and optical equipment; electrical equipment; machinery n.e.c.; vehicles and trailers; and other transport.

<sup>11</sup> The Work Foundation: Brinkley (2009) *Manufacturing and the Knowledge Economy*
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Manufacturing and exports

The UK has run a trade deficit in goods and services in every year since 1997\textsuperscript{12}. Despite a sharp devaluation in the pound during the financial crisis (the exchange rate was 23.2% lower at the end of 2010 than in early 2007\textsuperscript{13}), the UK deficit worsened considerably during 2010, averaging over £4 billion a month over the second half of 2010. This trade deficit acts as a drain on the UK economy, and reducing it is a key part of rebalancing the economy.

The importance of the manufacturing industry to the UK’s trade position is often overlooked, because the UK is a big net importer of goods, and a net exporter of services (see Table 1.2). However, manufacturing also makes a disproportionately large contribution to exports; in 2009, 58% of UK exports were goods\textsuperscript{14}, primarily manufactures. Because manufacturing is more export-facing than other parts of the economy, a strong manufacturing sector is needed if the UK’s trade balance is to improve.

Table 1.2: The UK’s Balance of Payments current account for trade in goods and services (2009)

<table>
<thead>
<tr>
<th></th>
<th>Exports</th>
<th>Imports</th>
<th>Trade balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goods</td>
<td>227.5</td>
<td>309.4</td>
<td>-81.9</td>
</tr>
<tr>
<td>Services</td>
<td>159.1</td>
<td>109.3</td>
<td>49.9</td>
</tr>
<tr>
<td>Total</td>
<td>386.6</td>
<td>418.7</td>
<td>-32.0</td>
</tr>
</tbody>
</table>

Source: ONS Pink Book 2010. All figures in £billions.

Box 1 – The UK’s strategic trade gap

According to Coutts and Rowthorn (2010)\textsuperscript{15}, the UK’s trade deficit is not just a temporary phenomenon; it is a permanent trend caused by the structure of the UK economy. Their analysis suggests that, without fundamental changes to the foundations of the economy, the UK will have a strategic trade deficit equivalent to 4.7% of GDP by 2020.

Closing this strategic trade gap must be a top priority for the UK economy over the coming decade; the economy cannot be fully rebalanced until such a large structural trade deficit is overcome. The most effective way to tackle this deficit is to develop a stronger manufacturing sector, as manufacturing is the most export-facing sector of the economy.

\textsuperscript{12} Source: ONS Pink Book Time Series Data
\textsuperscript{13} Source: Bank of England. Effective exchange rate for sterling between Q1 2007 and Q4 2010
\textsuperscript{14} Source: ONS Pink Book.
\textsuperscript{15} Coutts and Rowthorn (2010) Prospects for the UK Balance of Payments
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*Investment in intangibles and innovation*

The manufacturing industry is a major investor in intangible assets, such as R & D, design and brand equity. Traditional views of manufacturing focus on large scale investment in physical capital, such as factories and machines; however, today’s manufacturers invest far more heavily in intangible assets. This shift demonstrates how the UK’s manufacturing industry increasingly relies on knowledge and technology to differentiate itself, and means that manufacturing plays a key role in supporting the growth of the knowledge economy.

According to recent research by NESTA, UK manufacturing companies invest 20% of their value-added in intangibles, over £35 billion each year. By contrast, the sector spends £12 billion on tangible assets giving a ratio of intangible to tangible investment of 3 to 1. In the wider economy, this ratio is 1.6 to 1. This ratio increased steadily for manufacturing firms between 1997 and 2007.

In particular, manufacturing is a major investor in R & D and design (as Figure 1.2 shows). R & D spending is an important driver of technological innovation. Of the top 25 companies by R & D spending, 16 are from the manufacturing sector, including six companies from the pharmaceutical industry, in which R & D spending is particularly high.

*Figure 1.2: Investment in intangibles in manufacturing compared with the whole economy (2004)*

As a result of this significant investment in intangibles, manufacturing is responsible for 42% of innovation in the UK’s market sector. This underlines the importance of manufacturing to the knowledge economy.

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*NESTA (2011) Driving economic growth: Innovation, knowledge spending and productivity growth in the UK*

*Source: BERR (2008)*
Stimulating demand in other areas of the economy

The manufacturing industry stimulates demand in other areas of the UK economy, helping to support businesses in the service sector. According to Supply and Use tables, the manufacturing industry spent around £75 billion on goods and services from other parts of the economy, equivalent to around 5% of total UK GDP\(^{19}\).

Of this spending, around half (£38 billion) is on Knowledge Intensive Business Services\(^{20}\), businesses that primarily sell intangible assets. This finding supports the evidence that manufacturing firms invest heavily in intangible assets, demonstrating the important role manufacturing plays in supporting the knowledge economy.

The growing complexity of global value chains in manufacturing

As the global manufacturing industry has become more advanced, and more dependent on intangible assets, manufacturing supply chains have become more complex. Modern manufacturing is about far more than production and assembly activities; knowledge-intensive processes, such as product development, design and branding, are becoming increasingly important as sources of value to manufacturers.

Figure 1.3 sets out a typical supply chain for a manufactured product. This supply chain includes a range of inputs both before and after the actual production of a good, from design to after sales support. The supply chain also combines intangible inputs, such as R & D and design, with tangible elements including production, distribution and retail. In addition to the core supply chain, there are a number of other inputs that add value to the manufacturing process: IT, software and technology platforms combined with process innovation help to boost productivity, while marketing, branding and finance help to improve demand for products.

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\(^{19}\) Source: ONS Supply and Use Tables (2008). GDP figure from ONS National Quarterly Accounts. Both figures measured at current market prices.

\(^{20}\) This is defined in the Supply and Use tables by categories 105 to 113 inclusive; this definition is the best available approximation of the Knowledge Intensive Business Services sector. The Work Foundation will publish detailed research on this sector later this year.
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Figure 1.3: The manufacturing value chain

![Diagram of the manufacturing value chain]

Source: The Work Foundation. Intangible parts of the value chain are shown in blue, with tangible and financial parts in purple.

While this model will not apply to all manufacturing supply chains, it illustrates the complexity involved in advanced manufacturing. This complexity has a number of important implications for the manufacturing industry, and is a key driving force behind the rise of manu-services (as Section 3 explains).

Globalisation of the value chain

As well as becoming more complex, manufacturing supply chains have also become increasingly dispersed around the world. It is now common for manufacturers to house different parts of their supply chain in different countries. Many companies have moved lower value parts of their supply chain (such as production and assembly) to lower-wage economies, while retaining higher value activities (such as R & D, design and branding) in advanced economies. This trend can partly explain why the UK has lost so many traditional production jobs over the last 30 years.

The embedded value of intangible inputs in manufactured goods

The increasing investment in intangibles by the manufacturing industry is reflected in the embedded value within manufactured goods. For many advanced products, such as pharmaceuticals, electronics and aircraft, the majority of value is made up of intangible assets. This is significant, because it means that intangible, knowledge-intensive elements of manufacturing are now responsible for a large proportion of its value-added.

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21 This linear model does not reflect the dynamic interactions between different parts of the supply chain; however, it is designed to illustrate the different processes involved in manufacturing value chains.

22 See Brinkley (2009) Manufacturing in the Knowledge Economy (The Work Foundation). This report estimated that 30% of job losses in UK manufacturing were due to offshoring.
Kraemer, Dedrick and Linden (2007) provide a useful example of this embedded value, by considering the value of different inputs within an Apple iPod (shown in Figure 1.4). Most of the physical components for the iPod are built outside the USA, with the products assembled in China. Despite this, China’s inputs account for less than 5% of the product’s value, with the rest of the components accounting for just over 10%. In fact, most of the value embedded in the iPod is captured by Apple’s US operations, through the design, brand and distribution, as well as the margin this enables Apple to make. It is also worth noting that Apple’s margin is considerably larger than some of its competitors (such as HP and Lenovo), on account of Apple’s design and brand equity.

**Figure 1.4: Value captured in an Apple iPod**

While the proportion of intangible value in this example may be unusually high, the principle applies to all manufactured goods to some extent. A substantial and growing proportion of the value of manufactured goods comes from intangible inputs, from research, development and design to branding, process management and software programming. This reflects the fact that modern manufacturing is about more than making things; successful manufacturers must bring together a range of workers, expertise and technology, and make them work together effectively.

**The demise of production jobs in manufacturing**

The growing share of intangible assets in manufacturing is reflected in the types of jobs that exist within the manufacturing sector. In today’s manufacturing sector, only 42% of

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jobs (around 1.15 million in total) are classed as production jobs. A further 9% of jobs are in unskilled occupations not related to production.24

By contrast, almost half of all jobs in manufacturing are in management or service occupations. However, only 2% of these jobs are in personal or customer service roles; the vast majority of non-production jobs are concentrated in higher-skilled areas, such as management, professional and administrative occupations.

Figure 1.5 illustrates the breakdown of occupation types within the manufacturing industry.

**Figure 1.5: Main occupational groups within the manufacturing sector**

![Figure 1.5: Main occupational groups within the manufacturing sector](image)

Source: ONS Annual Population Survey – Workplace Analysis

**There is more to advanced manufacturing than technology**

To reflect the growing importance of intangible assets within manufacturing, and the demise of production jobs, many economists have distinguished between high-tech and low-tech manufacturing.26 Policy on advanced manufacturing has tended to focus on promoting high-tech manufacturing, on the basis that these sectors are most likely to reflect the UK’s areas of competitive advantage.

But advanced manufacturing is about more than technologically advanced products; it is also about advanced production techniques, high productivity and sophisticated business models. Despite competition from low-wage economies, the UK retains a strong base in low-tech and medium- to low-tech manufacturing – these industries make up 57% of employment and value-added in UK manufacturing.27 These industries differentiate themselves in a number of ways, including efficient production, rapid and reliable delivery,

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24 Source: ONS Annual Population Survey – Workplace Analysis
26 The OECD definitions of high-tech manufacturing are based on the industry’s R&D spending as a proportion of turnover. Under this definition, high-tech industries include: pharmaceuticals; office machinery and computers; communication equipment; instruments; and aerospace.
27 See Brinkley (2009) *Manufacturing and the Knowledge Economy*
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and adding services to their products. The binary distinction between high-tech and low-tech manufacturing does not reflect the diversity of the UK’s broad advanced manufacturing base.

**Structural changes in the manufacturing industry - a move away from vertical integration**

Traditionally, the manufacturing industry has been dominated by large, vertically integrated firms that benefit from significant economies of scale. These large firms were able to drive down the costs of their production processes by increasing their scale, and by retaining much of their supply chain within the firm. These economies of scale – including access to capital and the ability to spread fixed costs over more units – enabled companies to drive down costs and raise productivity, while ensuring their products were of sufficient quality.

However, as the processes involved in manufacturing have become more complex, the dominance of these huge manufacturing firms has become less assured. Manufacturing firms have been getting smaller over the past decade, as firms have begun to choose outsourcing over vertical integration.

The average size of manufacturing firms in the UK has fallen since 1998, falling from 26.1 employees per enterprise in 1998 to 21.2 in 2008. Equally, only 43.5% of manufacturing jobs are now provided by large firms (those with more than 250 employees), compared to almost 50% in 1994 (see Table 1.3). This suggests that large manufacturers are subcontracting more and more of their supply chain to smaller firms, or that smaller firms are thriving within networks. A typical manufacturing supply chain, especially for advanced goods, may feature a large number of firms working together on the same product.

**Table 1.3 – Distribution of manufacturing employment by firm size in, 1994 - 2009**

<table>
<thead>
<tr>
<th>Firm size band (number of employees)</th>
<th>Proportion of employment 1994</th>
<th>Proportion of employment 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6.8%</td>
<td>7.9%</td>
</tr>
<tr>
<td>1 - 49</td>
<td>22.6%</td>
<td>27.1%</td>
</tr>
<tr>
<td>50 – 249</td>
<td>21.5%</td>
<td>21.5%</td>
</tr>
<tr>
<td>250 +</td>
<td>49%</td>
<td>43.5%</td>
</tr>
</tbody>
</table>

Source: ONS Annual Population Survey – Workplace analysis

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28 See Johnston and Lawrence (1999): *Beyond vertical integration – the rise of the value-adding partnership*

29 Source: Annual Business Inquiry; time series data from 1998 to 2008

Box 2 – Boeing's supply chain experiment

The development of Boeing's 787 Dreamliner provides a current example of the extent to which manufacturing supply chains have been outsourced. Boeing has outsourced 60 per cent of the production and design for its latest aircraft to more than 50 suppliers, 28 of which are outside of the United States. These Tier One suppliers include wings from Mitsubishi in Japan, electrical motors from Saab in Sweden and sections of the fuselage from Italian company Alenia.

Although Boeing hoped that this approach would reduce costs, by reducing inventories, tooling costs and spreading risk, problems soon began to arise with suppliers unable to meet early production demands. The aircraft is now 3 years behind schedule, and the firm continues to struggle with new materials, parts shortages, redesign work and a greater reliance on suppliers.

While there is no single definitive reason for this move away from vertical integration, there are two theories in the literature that may help to explain this trend:

1. **Specialising for competitive advantage** – There has been a school of thought among management theorists (led by Michael Porter\(^\text{31}\)) that firms should focus on developing their core business functions, while outsourcing all other requirements. Under such a model, all businesses would outsource a range of functions, from legal and human resources departments to IT systems and facilities and fleet management. For manufacturing businesses, this might involve outsourcing general business functions, as well as specific parts of their supply chain.

2. **Using market transactions to allocate resources** – Another explanation, which has been discussed less widely in the literature, is that outsourcing allows firms to use market forces to coordinate their different functions, rather than relying on internal management processes. This theory, which builds on work by Gary Becker and Kevin Murphy\(^\text{32}\), stems from the observation that as a firm's activities get more complex and knowledge-intensive, and individual staff become more specialised, coordination costs rise rapidly – in other words, it becomes harder and more costly for firms to coordinate their many different specialists effectively. If coordination costs are sufficiently high, firms may find it more efficient to avoid internal coordination costs by outsourcing specialised functions to other companies, rather than managing them in-house. This theory is developed more fully in Section 4, which discusses the role of smaller businesses in manu-services.

Both trends have been accelerated by the growing complexity of manufacturing. As value chains become longer and more advanced, the need to specialise, or to allocate resources more effectively, becomes more important. The process of outsourcing has also been

\(^{31}\) See Porter (1990) The Competitive Advantage of Nations

\(^{32}\) Becker and Murphy (1992) *The Division of Labor, Coordination Costs and Knowledge*
enabled by advances in IT, which enable firms to manage relationships and interact with suppliers more easily.\footnote{See Dedrick and Kraemer (2010) \textit{Impacts of internal and interorganizational information systems on the outsourcing of manufacturing}}

**Box 3 – Clustering in the manufacturing industry**

The supply chains and networks formed by manufacturing companies can be seen in the way particular industries are clustered in certain places. This is especially prevalent in high-tech manufacturing, where companies exchange skills and expertise with each other regularly. Many of the most important parts of the UK manufacturing industry are clustered around a few sites. The best examples of this clustering include:

- Aerospace – 55% of aerospace jobs are located in 6 Local Authorities;
- Engines and turbines – 53% of jobs in the manufacture of engines and turbines are located in 4 Local Authorities;
- Automobiles – 58% of jobs in motor vehicle manufacturing are located in 9 Local Authorities;
- Weapons and ammunition – 57% of weapons and ammunition manufacturing jobs are located in 3 Local Authorities; and
- Pharmaceuticals – 44% of jobs in pharmaceuticals are located in 9 Local Authorities.

These clusters within particular industries are often anchored by a large, international company, with a number of suppliers located in the vicinity. These clusters allow firms and public institutions to develop networks, which help to drive innovation and commercial success. In particular, clusters can have close links to universities or research facilities that specialise in certain industries.
Summary – a new look manufacturing industry

As this chapter makes clear, a strong UK manufacturing sector is vital to supporting the economic recovery, and achieving a balanced knowledge economy by 2020. Manufacturing’s role in the economy transcends the sector itself; it plays a pivotal role in driving exports, investing in innovation and anchoring the rest of the economy.

The UK manufacturing industry may have declined in relative terms, but it has not been fatally weakened. The parts of the manufacturing industry that have survived the recession are strong and advanced – and they have undergone major structural changes over the past 40 years.

Manufacturing is now a diverse and knowledge-intensive industry. The value of products is increasingly in their intangible components, such as design and branding, rather than physical materials. This is reflected in the fact that only 42% of UK manufacturing jobs are in production occupations. The manufacturing industry has also become globalised and fragmented, with complex supply chains stretching around the world. Manufacturing is no longer dominated by large vertically integrated firms. The challenges of coordinating these complex, global, knowledge-intensive supply chains are one of the key factors driving the growth of manu-services.
2. The rise of manu-services

The manufacturing industry has moved beyond simply *making things* – it is now a complex industry that engages with customers and other businesses in a range of ways. Manufacturers no longer need to rely solely on their products to compete; there are a whole range of services they can sell to complement their products, and generate a significant amount of revenue. Firms are increasingly turning to this manu-services business model, in which they combine their goods with services to meet their customers’ needs.

These manu-services vary enormously, from simple consumer goods that come with warranties, to advanced technological systems that take years to design and build. There may be few obvious similarities between selling a boiler along with a repair and maintenance guarantee and designing, building and operating a fleet of stealth fighters, but the principles underlying these activities are the same. By combining goods and services, manufacturers can meet the needs of their customers more closely, while generating an extra stream of revenue. In the process, manufacturing ceases to be about mass production of standardised products at the lowest cost. It becomes about developing relationships with customers, coordinating different types of activity and focusing on the outcome for the customer.

The UK’s manu-service firms range from internationally renowned companies, such as Rolls-Royce and BAE Systems, to niche companies that offer innovative technological and service solutions. At the latest estimate, around 28% of UK manufacturers consider themselves manu-service firms – and anecdotal evidence suggests that many manufacturers provide services without even realising it.

Manu-services are important to the UK economy for a number of reasons:

- Manu-services are becoming the standard in markets for some manufactured goods, and this is likely to spread into other markets. If UK businesses are to compete in these markets, they must be able to combine services with manufacturing effectively;
- Manu-services help to support the long and complex supply chains involved in manufacturing advanced goods;
- Manu-services provide new opportunities for firms to innovate and capture extra value, by creating new packages of goods and services and introducing new business models;
- Manu-services fit in closely with the UK’s strategic strengths, and could be a significant area of competitive advantage for the UK; and
- Manu-services may have more potential to create jobs in manufacturing than traditional production activities, because service activities tend to be more labour-intensive, and less easily replaced by technology.

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34 This observation was made to us by The Design Council, based on their experience of working with designers within the manufacturing sector.
The rise of manu-services

Despite the importance of these activities, manu-services is not well defined or widely recognised as an area of economic activity – this is partly due to the diversity of activities that fall into the manu-services bracket. To this end, this section sets out a profile of manu-services, including a definition, an overview of the key features of manu-services, and a review of evidence on the value of manu-services.

Exploring different types of manu-service

The concept of manu-services is not easy to grasp, because it covers a wide range of activities. These activities are characterised by combining goods and services, but this can be done in a wide variety of ways.

The areas in which manu-services vary include:

- The type of service that is offered – types of service can range from design and development to installation, maintenance or consultancy. A manu-service package can include many different types of complementary service;

- The degree of integration between good and service – some manu-services are wholly integrated, so that the good and service cannot be separated (such as mobile phone services), whereas others are relatively separate (such as repairs for a car); and

- Whether the service is carried out before or after the product is completed – some manu-services, such as design or development, are carried out before the good is produced, whereas others, including after sales care, are provided using the manufactured good. Many manu-service packages include services both before and after production.
Types of service

Neely identified 12 different types of service that manufacturers can combine with their goods, as shown in Figure 2.1. Of these services, the most important are design and development, systems and solutions, and various types of after-sales care.

Figure 2.1: 12 types of manu-service

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and development</td>
<td>22%</td>
</tr>
<tr>
<td>Systems and solutions</td>
<td>16%</td>
</tr>
<tr>
<td>Maintenance and support</td>
<td>12%</td>
</tr>
<tr>
<td>Retail and distribution</td>
<td>12%</td>
</tr>
<tr>
<td>Installation and implementation</td>
<td>5%</td>
</tr>
<tr>
<td>Financial services</td>
<td>4%</td>
</tr>
<tr>
<td>Property and real estate</td>
<td>4%</td>
</tr>
<tr>
<td>Consulting</td>
<td>3%</td>
</tr>
<tr>
<td>Outsourcing and operating</td>
<td>2%</td>
</tr>
<tr>
<td>Procurement</td>
<td>1%</td>
</tr>
<tr>
<td>Leasing</td>
<td>1%</td>
</tr>
<tr>
<td>Transportation</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

Source: Neely (2009)\textsuperscript{35} Percentages refer to the proportion of manufacturing firms offering these services.

Degree of integration between goods and services

Some manu-services involve goods and services that are loosely connected. For instance, a car maker providing finance to a customer is a manu-service, but the good and service are not closely connected – either could be provided independently of the other. By contrast, many manu-services involve closely integrated goods and services. For example, a custom designed vehicle involves a closely integrated good (the vehicle) and service (design); the design is of little use without the vehicle being produced, while the vehicle cannot be produced without first being designed.

\textsuperscript{35} Neely (2009) *Exploring the Financial Consequences of Servitization*
Manu-services as a new business model

Manu-services are not just new products – they represent a new way for firms and customers to do business. Manu-services often involve a shift in the relationship between buyer and seller, which can be more important than just the combination of goods and services.

There are a number of ways in which manu-services can vary from typical business models – although these are by no means common to all manu-services:

Customers don’t own the goods they “buy”

In many types of manu-service, customers do not take on ownership of the products they pay to use. Customers pay a fee to use goods, but the ownership of them remains with the manu-service firm. This can have significant advantages for customers; they do not have to take on the responsibility of owning goods, and can use them without having to buy, sell and maintain them. It may also benefit firms, as they may be able to sell the same product to more than one customer. This ownership model can be used across a range of manu-services, from leasing cars (car manufacturers often lease fleets of company cars) to providing IT systems or jet engines.

The manufacturer adopts the risk on their products

Under a manu-service business model, the manufacturer often bears the risk on the products it sells; if there is a problem with the product, the manufacturer is liable for it. This transfer of risk is often a key part of the manu-service offer – it may be a significant factor in a customer’s decision to buy a manu-service. In some respects, the transfer of risk is similar to a customer buying insurance along with the product. It is more efficient for the producer to retain the risk on their own products, because they have the expertise and resources to replace or repair it more easily.

This transfer of risk is fairly widespread across manu-services, ranging from warranties being offered on consumer products, to entire fleets of vehicles being maintained and operated at the manufacturer’s risk.

This transfer of risk also has significant implications for manu-service firms. While businesses may be able to make a profit by effectively selling insurance on their products at a profit, they may also find it difficult to manage the high levels of risk involved in manu-services. Recent high-profile product failures, such as those affecting BP and Toyota, highlight the costs that can accrue to firms as a result of product-related risks.

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36 See Slack (2005) Patterns of Servitization: Beyond products and services
The rise of manu-services

Longer contracts

Pure manufacturing is normally associated with one-off transactions, where manufacturers simply sell their goods to customers. By contrast, manu-services are usually associated with longer term service contracts, with services provided over a period of months or years. Longer contracts provide firms with a more consistent stream of revenue than transactional sales, and may also affect competition within markets, as firms interact less frequently.

A shift from transactional to relational marketing

As manu-service firms replace one-off transactions with longer term contracts, they tend to move towards “relational marketing”. Relational marketing involves building long-term relationships with customers, based on reputation, brand, customer service and experiences, rather than competing on price and quality alone. This is particularly relevant for services; whereas customers can easily differentiate between manufactured goods, it is harder for them to identify the value they get from services. In moving towards relational marketing, manu-service firms must invest resources in developing strong, lasting relationships with customers. This trend towards relational marketing is widespread within manufacturing, with firms such as Hyundai building up their brand based on offering long-term warranties on cars.

The customer plays a greater role in designing products

Some types of manu-service – particularly bespoke manufacturing – allow the customer to play a role in designing or specifying the features of their products. This type of relationship is seen in a wide range of manu-services, from customised toys to complex defence systems built to specification. This allows manu-service firms to match the demands of their customers, while also generating extra revenue from the design service provided. However, it also means that firms cannot easily mass produce goods, as each one is custom made.

Howells (2003) argues that customers are the driving force behind the increasing range of manu-services. According to Howells, customers are an active part of the process of development and innovation within manu-services. By demanding better combinations of goods and services, and feeding back their needs to firms, customers force firms to keep improving their offers. He argues that the move towards manu-services requires firms to innovate in different ways (many of them non-technological) in order to respond to consumer demands.

In advanced forms of bespoke manufacturing – particularly within the defence sector – manu-service contracts may be signed before any details of the final product are known. This normally applies to complex projects, where customer and supplier collaborate closely to design and produce a product that meets the customer’s needs. In such cases,

37 For examples of the important role of design within manufacturing, see http://www.designcouncil.org.uk/
The rise of manu-services

customers choose their suppliers on the basis of capability, rather than the quality of any finished goods or services. This type of relationship throws up a range of challenges, including designing ex-ante contracts effectively, and managing interaction between customer and supplier effectively.

Defining manu-services

Although we can say a lot about what manu-services are like, providing an exact definition is more problematic. One clear message from our research has been that it is not helpful to describe manu-services as a sector. Rather, manu-services are best described as a broad grouping of different activities that involve integrating manufacturing with services. Thus, the definition of manu-services used in this paper is:

**Activities that involve combining or integrating services with manufactured goods, or the manufacturing process, where services are directly related to the goods sold**

This definition of manu-services depends on an understanding of the relationship between the manufactured good and the service in question. For an activity to be a manu-service, the services offered must be *directly related to the manufactured good (or manufacturing process) offered*. This relationship can take a range of forms, from basic packages involving a single good and service, to complex offerings that involve services being provided in tandem with different parts of the supply chain.

The manufacturing and service elements of a manu-service do not necessarily have to be provided by the same company; within a fragmented supply chain it is possible for different firms to work together to provide a manu-service. The key feature of manu-services is not who provides the services, but how the services are related to manufacturing.

Manu-services should not be confused with the more general blurring of boundaries between manufacturing and services across the economy as a whole. Manufacturers use a range of services (such as consultancy, branding and advertising) as inputs to the manufacturing process, while service companies also rely on manufactured goods (from computers to coffee). These interactions between services and manufacturing are an inevitable part of an advanced economy, and do not reflect any particular trends or developments. Similarly, the fact that a supermarket (a service provider) sells manufactured goods does not make it a manu-services provider, as the services are not related to any particular product.
Box 4 – The difficulty of calculating the value of manu-services

Manu-services are not just hard to define; identifying the size and value of manu-services to the economy is equally difficult. Part of the problem lies in the way that manufacturing firms and service firms are treated as completely separate entities in official statistics, without reflecting the overlap between the two areas. But even if statistics did attempt to reflect the size of manu-services as an area of economic activity, it would be almost impossible to calculate its value accurately. This is because manu-services can cross company boundaries, such that the same activities may or may not be classified as manu-services depending on whether they reside within a manufacturing firm.

The example in Figure 2.2 – drawn from the smartphone industry – illustrates how attempts to account for manu-services can be distorted by different business models. The logic is as follows.

Apple can be considered a manu-services company, as it supplies a product and also provides after-sales services.

It may be tempting to classify Orange within manu-services, because some customers have monthly contracts with Orange that involve receiving a phone and a service through that phone. However, because Orange is not involved in manufacturing phones, it is open to debate whether this would count as a manu-service.

Changing the ownership models in this example would affect which parts of the supply chain are classed as manu-services. For instance, if Apple’s after-sales care were provided by a separate company, Apple would no longer seem to be a manu-services firm, even if the services provided were identical to under the previous model. This could easily lead to an inconsistent definition of the range of services falling under manu-services.

Figure 2.2: Simplified example of a possible manu-services supply chain

<table>
<thead>
<tr>
<th>Production of phone</th>
<th>Many components produced by upstream suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of network</td>
<td>Contracts often combine phone with network</td>
</tr>
<tr>
<td>Content sales and support</td>
<td>Content producers develop content, Apple take a cut</td>
</tr>
</tbody>
</table>
The rise of manu-services

How much do manu-services contribute to the economy?

Due to the issues associated with defining manu-services as a sector, it is difficult to provide an exact figure for the size or value of manu-services. However, there are a number of empirical studies that provide useful indicators of the size of manu-services as an area of economic activity.

A 2009 survey carried out by EEF, the manufacturing trade group, estimated that UK manufacturers generate between 15% and 20% of their revenue from services. This would suggest that manu-services contribute around 2% of the UK’s GDP, or between £24 billion and £32 billion in 2009 prices. However, this estimate would exclude any manu-service activities undertaken by firms with non-manufacturing SIC codes.

This evidence on the scale of manu-service activities is backed up by data on the proportion of service exports that are undertaken by manufacturing firms. According to a study by Kneller et al., manufacturing firms are responsible for over 14% of services exported by the UK. This is striking, given that manufacturing’s share of employment is around 8%, and that services are not the sector’s primary outputs. However, this largely reflects the greater propensity to export among manufacturers. When compared to the value of goods exported by manufacturers, this result suggests that services make up roughly 7.5% of exports by the manufacturing industry.

Neely (2009) provides a different perspective on the scale of manu-service activities, by looking at the proportion of manufacturing firms that offer manu-services. Neely’s analysis showed that around 28% of UK manufacturing firms had “servitized”, with the remaining 72% classed as “pure” manufacturing firms. This compares with around 55% of firms that have servitized in the USA, the most advanced country in terms of servitization. In Neely’s 2007 sample, less than 2% of Chinese manufacturers had servitized, compared to over 20% in his 2009 sample. This marks an extremely rapid move towards servitization in China, a trend that Neely also observes in countries such as Vietnam, Israel, Greece, Italy and Russia.

30 This figure assumes that proportion of turnover generated from services is equal to the proportion of GVA from services.
31 Based on 2009 figures for GDP at current market prices. Source: ONS Blue Book
33 The data used to derive this result is from 2005.
34 This result is derived from Kneller et al.’s analysis, as well as data from the Pink Book from 2006.
35 Neely (2009) Exploring the Financial Consequences of Servitization
36 Neely’s sample included only publicly listed manufacturing companies with over 100 employees.
37 This result marks a surprisingly large shift over a short period of time. It may be that some of the rapid growth in servitization can be partly explained by changes in the way that firms brand or market their products.
The rise of manu-services

Why are manu-services growing?

While it is difficult to establish the exact size of manu-services as a group of activities, and the rate at which it has grown, there are a number of key economic trends that underpin the growth of manu-services. There are three key drivers behind the rise of manu-services, each of which is derived from the rise of the knowledge economy:

1. **Changing customer demands** – consumers in the knowledge economy are becoming more sophisticated, and increasingly buy solutions or outcomes that best fulfil their needs;

2. **Coordination within manufacturing supply chains** – the growing length and complexity of manufacturing supply chains means that manufacturers need to transfer knowledge, information and expertise between them, normally through manu-service activities; and

3. **Outsourcing of non-core functions** – businesses are increasingly outsourcing functions that do not form part of their core capability; where these functions involve manufactured goods, manu-service contracts are an effective way to supply them.

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Besides these three drivers, there is also a considerable body of management literature on the benefits to firms of adopting manu-service business models (see Box 5).

This section explains how each of these drivers has contributed to the rise of manu-services.

**Changing customer demands – a shift from transactions to experiences**

One of the driving forces behind the knowledge economy has been the rise of increasingly sophisticated and discerning consumers. Consumer demand for knowledge-intensive products and services has increased steadily, as consumers become better off, and seek to fulfill their needs more effectively. Businesses have responded to these demands by improving both their products and the way they interact with their customers. The development of manu-services is part of this response.

One of the features of manu-services is that they offer the customer an outcome, a solution or an experience, rather than a series of separate goods and services. These experiences can often be tailored to a customer’s needs, so that they are more valuable to customers than the goods and services would be individually. By putting together complementary packages of goods and services – from offering central heating systems along with installation, maintenance and operation services, to designing and building specialised products on demand – firms can create extra value for themselves and the customer.

Voss has developed the concept of “experiential services”, which derive part of their value from improving the customer’s experience. According to Voss, experiential services involve a “customer journey”, with multiple “touchpoints” between provider and customer. Firms can increase the value of these services if they optimise the customer’s experience, providing them with an alternative means of innovating. This idea can be applied to some types of manu-services: by combining goods and services around the customer’s needs, manufacturers can boost their sales.

**Coordination within supply chains – manu-services as a form of “intangible logistics”**

As manufacturing becomes more advanced and knowledge-intensive, firms within supply chains have become more interdependent and reliant on one another. In integrated supply chains, downstream firms rely heavily on their suppliers to provide reliable products on time. Equally, upstream firms need their downstream customers to remain competitive in order to protect their market share. As a result of this interdependence, manufacturing firms often operate in closely integrated networks, with different firms working together closely to reduce costs and drive innovation.

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49 See Brinkley (2008) *The Knowledge Economy: How Knowledge is Reshaping the Economic Life of Nations*


51 See Johnston and Lawrence (1999): *Beyond vertical integration – the rise of the value-adding partnership*
The rise of manu-services

Manu-services offered from business to business can fulfil either or both of these roles; they allow firms to develop better products, and provide a means for the manufacturers of products to take on the risk associated with them. These services might include:

- Co-ordination in terms of design and compatibility of components, to improve quality and make them more suited to the needs of downstream firms;
- Support with installation, repairs and maintenance of components, helping to manage problems and risks in the most effective way possible;
- Support with adoption and implementation of new systems, to improve efficiency and mitigate risks; and
- Project management functions that coordinate different processes within the supply chain.

Business outsourcing of support functions

Businesses outside the manufacturing sector are increasingly outsourcing their support functions, as they seek to reduce costs and risks. Many of these functions, including IT networks and managing fleets of vehicles, are based on manufactured goods. This type of outsourcing is often best met through manu-service contracts, which involve fulfilling the client business' needs by supplying both goods and services.

Outsourcing business functions in this way can offer a number of significant advantages to firms:

- Reducing risks – outsourcing functions through manu-service contracts involves transferring risks to the supplier, as there is no need for the firm to own and maintain goods themselves;
- Reducing cost – manu-service firms are often able to provide goods and services at lower cost, as they possess the expertise associated with manufacturing goods, and can use their goods and staff flexibly between different clients;
- Specialising on core functions – outsourcing non-core functions allows businesses to focus on the activities in which they perform best, without having to manage support functions in-house.
Box 5 – What is the rationale for firms to adopt manu-services?

Since Vandermerwe and Rada (1988) first introduced the concept of “servitization”, a number of management theorists have highlighted the rewards that manufacturing firms can reap by extending their business into service markets. Most of these accounts are based on the logic that diversifying into manu-services allows firms to move up the value chain, increasing both the size and profitability of their businesses.

The literature on servitization has identified a wide range of potential benefits for businesses. The opportunity for firms to differentiate themselves by adding services is a consistent theme, which was originally cited by Vandermerwe and Rada (1988) themselves. Other themes include the installed base argument identified by Wise and Baumgartner (1999) and the opportunity for suppliers to adopt the risk on their products in return for increased revenues (Slack, 2005).

Most of these benefits can be summarised into three broad themes, as outlined by Gebauer et al. (2005):

Financial benefits – moving into manu-service markets allows firms to increase their output and revenues. In some accounts, it should also allow firms to increase profit margins, as servitization involves “moving up the value chain”; however, Gebauer et al. (2005) and Neely (2009) cast doubt on this;

Marketing benefits – moving into manu-services allows firms to sell more to their existing customers, which is easier than finding new customers; and

 Strategic benefits – adopting manu-service models may provide a more sustainable competitive advantage, particularly in the face of overseas competition. It may also enable firms to lock out competitors, or lock in clients.
The rise of manu-services

The UK’s comparative advantage in manu-services

There is little doubt that manu-services represents an important cross-cutting development within the manufacturing industry, and thus marks an important opportunity for the UK economy. This opportunity is made more significant by the fact that manu-services appear to play to the UK’s strategic advantages. The UK has a relatively stronger service sector and a relatively lower proportion of production jobs in manufacturing, than most other European countries. This sub-section provides evidence to support the idea that the UK is likely to enjoy a relative advantage in manu-services.

Manufacturing makes up a smaller proportion of the UK economy than many other European economies. Less than 10% of UK jobs are in manufacturing, compared to around 20% in countries such as Germany, Italy and Poland. Further, although the proportion of the UK manufacturing industry that is high-tech is comparable to other countries, the UK has a much smaller high-tech manufacturing base. Figure 2.4 shows that less than 5% of all jobs in the UK are in high- and high-medium-tech manufacturing, lower than in other major European economies.

Figure 2.4: Proportion of total employment in high- and high-medium-tech manufacturing (2008)

Source: Eurostat, data from 2008
The rise of manu-services

Figure 2.5 shows how the UK compares with other European countries in terms of its proportion of high-tech manufacturing and production jobs. Although the UK does not have a particularly high proportion of high-tech manufacturing firms, it has a much higher proportion of non-production jobs within manufacturing than most other countries. This suggests that the UK’s competitive advantage is more likely to lie in manu-services than in pure high-tech manufacturing.

Figure 2.5: Proportion of high- and high-medium-tech manufacturing by proportion of production jobs

Box 6 – Comparing the UK’s manufacturing industry with Germany’s

Germany has a much stronger and more high-tech manufacturing base than the UK. Almost 20% of German employment is in manufacturing, compared to less than 10% in the UK\(^57\). Around 50% of German manufacturing is in high- or high-medium-tech industries, compared to 43%\(^58\) in the UK – as a result, Germany’s high-tech manufacturing sector has over 4 million employees, compared with 1.25 million in the UK. However, the UK has a higher proportion of jobs in service occupations within manufacturing (as Figure 3.6 shows), suggesting that the UK’s comparative strength is more likely to lie in manu-services than in high-tech manufacturing.

\(^{57}\) Source: European Labour Force Survey, 2010. Note that employment in manufacturing figures differ from the workforce jobs figure used elsewhere in this report, as they include self-employment.

\(^{58}\) Source: Eurostat, proportion of jobs in high-tech and high-medium-tech manufacturing.
The rise of manu-services

The strength of Germany’s manufacturing base can partly explain why Germany’s economy grew at 3.6% during 2010, compared to 1.3% in the UK\(^\text{59}\). Given that both countries have seen devaluations in their currencies during the recession, their respective recoveries would be expected to depend on an export-led manufacturing boom, as the UK experienced following the recession of the early 1990s. Because Germany’s economy has a much stronger manufacturing base, it was able to grow more quickly than the UK economy during this part of the economic cycle.

By contrast, the relative strength of the UK’s service sector enabled the UK economy to grow at an annual average rate of 3% from 1994 to 2007, compared to 1.7% in Germany. As Figure 2.6 suggests, the UK has grown more quickly as a whole since 1994, but the German economy has proved more resilient to the most recent recession.

**Figure 2.6: Annual GDP growth rates in the UK and Germany, 1994 to 2010**

This analysis suggests that manu-services could represent a significant area of competitive advantage for the UK economy. While the UK is right to focus on high-tech manufacturing, especially in sectors (such as aerospace and pharmaceuticals) in which the UK remains strong, this alone will not be enough. The UK should aim to combine the strengths of its service sector with the strongest parts of its manufacturing base to close its strategic trade gap, and make future growth more balanced and resilient.

\(^{59}\) Source: Eurostat, GDP at market prices, volume measures.
Summary – a manu-service future

Manu-services are an innovative response to an increasingly advanced and complex manufacturing value chain, and to increasingly sophisticated consumer demands. By integrating services with manufactured goods, firms can sell outcomes or experiences that are worth more than the sum of their parts. Manu-services already represent an important part of the manufacturing industry’s turnover – around 15% to 20% – and the drivers behind their continuing growth are clear.

While there is little value in searching for an exact definition of manu-services, there is a multitude of developments that are broadly associated with manu-services. Traditional models of ownership and production often break down within manu-service markets. Customers no longer need to own their goods, or bear risk on them, and be closely involved in creating and designing their products. Firms can focus on developing relationships with their customers, rather than focusing on cost reduction alone. This gives manufacturing firms a whole new set of tools to innovate and set themselves apart within the global economy.

Manu-services represent a major opportunity for the UK’s manufacturing sector to lead the world. Manu-services align closely with many of the UK’s strategic strengths, and businesses and policy makers alike should aim to take full advantage. The rest of this paper looks at how the UK can improve its performance in manu-services.
3. Challenges for manu-service firms

Manu-services may be a huge opportunity for manufacturers and the UK economy, but they are also extremely challenging to deliver. Manufacturing and services are fundamentally different activities, and combining them effectively into a single package is not a straightforward task. If the UK is to become a world leader in manu-services as part of its 2020 knowledge economy, businesses need to overcome these challenges, and have the capacity to provide manu-services effectively.

There is a considerable body of literature on the process of “servitization”, whereby manufacturing firms move into offering services. This literature looks at servitization from the point of view of individual businesses, and sets out a range of benefits that firms can obtain by moving into manu-service markets. However, empirical research has highlighted a number of challenges that firms may face in moving towards manu-service business models.

This section looks at the challenges that firms face in becoming manu-service providers, and explores how these act as barriers to the growth of manu-services in the UK.

**Box 7 - What is the difference between manu-services and servitization?**

Servitization is the term used in the management literature to describe the strategy of moving into service markets. Servitization focuses on individual firms, and describes the process of moving from manufacturing to a combined manufacturing and service business model.

Manu-services refers to the same concept, but it considers it as a trend affecting the whole economy. Manu-services describes a type of activity – which may or may not be carried out by manufacturing firms – as opposed to the strategy described by servitization. Of course, the challenges of servitization are identical to the challenges faced by firms in offering manu-services; the difference is largely semantic.

**Evidence of a “paradox of servitization”**

Although the case for servitization appears irresistible, moving into manu-services creates a number of significant challenges for firms. There is some empirical evidence to suggest that servitized manufacturing firms often underperform compared to “pure” manufacturing firms, despite moving into supposedly higher value service activities.

A wide-ranging empirical study by Neely\(^{60}\) suggests that, despite making higher revenues, servitized manufacturing firms make lower profits and are more likely to go bankrupt than

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\(^{60}\) Neely (2009) *Exploring the Financial Consequences of the Servitization of Manufacturing*
pure manufacturing firms. This is a striking result, because it demonstrates that capturing more of the value within a manufacturing market may actually lower profit margins.

This research also looked into the reasons why manu-service firms might be less profitable. His analysis revealed three main explanatory factors:

- Servitized manufacturing firms pay significantly higher wages than pure manufacturing firms;
- Servitized firms have more assets per employee – in other words, they have to invest more in capital assets; and
- Servitized firms have a higher working capital – meaning that they get paid less promptly, and have a worse cashflow position.

The key findings from the research are summarised in Table 3.1. It is also worth noting that, while striking, these results do not prove that servitization causes manufacturing firms to perform worse; it may be that manufacturers that are already struggling turn to servitization in an attempt to survive.

Table 3.1: Comparing the financial performance of servitized and pure manufacturing firms

<table>
<thead>
<tr>
<th></th>
<th>Pure manufacturing firms</th>
<th>Servitized firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenue</td>
<td>$1.12 billion</td>
<td>$2.93 billion</td>
</tr>
<tr>
<td>Net profit margin</td>
<td>6.4%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Average employment costs per worker</td>
<td>$32.5k</td>
<td>$41.2k</td>
</tr>
<tr>
<td>Working capital per employee</td>
<td>$59.8k</td>
<td>$69.8k</td>
</tr>
<tr>
<td>Total assets per employee</td>
<td>$382.3k</td>
<td>$430.8k</td>
</tr>
</tbody>
</table>

Source: Neely (2009)\(^{62}\). All figures are means for servitized and pure manufacturing firms

\(^{61}\) The analysis looked at over 10,000 manufacturing firms from 25 countries, all of which had more than 100 employees. Having split firms between servitized and pure manufacturing, Neely found that servitized firms had a significantly lower average profit margin than pure manufacturing firms.

\(^{62}\) Neely (2009) Exploring the Financial Consequences of the Servitization of Manufacturing
Challenges for manu-service firms

Taken together, these results tell an unexpected story: despite being larger, having higher revenues, paying staff more and investing more, servitized manufacturing firms cannot recoup the value from these investments. Neely refers to this phenomenon as the “paradox of servitization”, and provides a series of possible explanations for this observation (detailed below).

In fact, Neely was not the first to identify a paradox facing manufacturing firms that diversify into services. In 2005, Gebauer et al.\(^\text{63}\) identified a similar problem among manufacturing firms in Switzerland and Germany. This study identified a range of organisational and cultural problems that a manufacturing firm faces when it moves into the services market. The report suggested that firms can overcome each of these problems as part of a gradual transition towards a successful service business.

Clearly, this evidence raises a challenge for policy makers. If manu-service businesses do not perform as strongly as pure manufacturing firms, the UK may not be able to exploit its potential in this area.

Explaining the paradox of servitization – a transitional or permanent phenomenon?

Most explanations for the paradox of servitization begin from a common starting point: successfully integrating manufacturing and services is a complex and costly undertaking for firms. Manufacturing and service activities are fundamentally different activities – they require different skills and business processes, and involve producing and selling things in different ways.

However, there is unlikely to be a single explanation for the apparent paradox of servitization. There are a range of possible causes floated in the servitization literature, most of which focus on problems with the transition to manu-services, rather than any structural, long-term problems. This is an important question; if the challenges of servitization are more permanent than suggested in the literature, this raises further questions about how they can be overcome in the long term.

We have grouped the possible explanations for the paradox of servitization into four categories as follows:

1. **Transitional problems** – this covers a wide range of challenges that firms may face in moving from a pure manufacturing to a manu-services business model;

2. **High coordination costs** – this explanation is based on a theory that integrating manufacturing with service provision leads to rising coordination costs, which may increase costs and reduce productivity for manu-services firms.

3. **Inability to capture value from services** – manu-service firms may be unable to recapture the extra value of services, because customers value manu-service packages less highly than the goods and services cost to provide; and

\(^\text{63}\)Gebauer, Fleisch and Friedli: *Overcoming the Service Paradox in Manufacturing Companies* (2005)
4. **Trading lower profits for contract security** – manu-service firms may be prepared to accept lower profit margins in return for longer and more secure service contracts.

The case for each of these explanations is set out below.

1. **Transitional problems for firms moving towards manu-services**

Most of the challenges highlighted in the servitization literature are transitional problems; if firms can successfully overcome them, the authors imply, they stand to benefit from their move into manu-services.

Gebauer et al. (2005) highlighted several challenges facing businesses that combine manufacturing with services. The most salient of these challenges involved the different approaches required for providing goods and services. For instance, the work identified that sales teams within manufacturing firms often prioritise selling products over service contracts, on the grounds that product sales generate more immediate value. In some cases, sales teams may even offer services for free, to help secure deals on products.

According to Gebauer et al., firms can overcome the paradox of servitization by establishing separate service organisations, which specialise in providing and selling services. However, this approach may risk creating “silos” within firms – it may prevent the manufacturing and service parts of the business from working together effectively. Given that the defining feature of manu-services is the close integration between manufacturing and services, such silos could just as easily cause problems for firms.

This work highlights a tension in the way that firms integrate their manufacturing and service functions. On the one hand, the need to have different parts of the business specialise in particular activities – such as design, production and sales – provides an incentive to create skill silos. On the other hand, the need for coordination between different activities encourages firms to avoid specialising.

Neely’s explanation of the paradox of servitization provides 10 challenges for firms, summarised in Table 3.2. These challenges centre primarily on the operational and managerial complexity of moving to a manu-services business model.

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64 See Gulati (2007) *Silo Busting: How to Execute on the Promise of Customer Focus*
Table 3.2: Neely’s explanations for the paradox of servitization

<table>
<thead>
<tr>
<th>Shifting mindsets</th>
<th>Of marketing – from transactional to relational marketing</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Of sales – from selling multi-million dollar products to selling service contracts and capability</td>
</tr>
<tr>
<td></td>
<td>Of customers – from wanting to own the product to be happy with the service</td>
</tr>
<tr>
<td>Timescales</td>
<td>Managing and delivering multi-year partnerships</td>
</tr>
<tr>
<td></td>
<td>Managing and controlling long-term risk and exposure</td>
</tr>
<tr>
<td></td>
<td>Modelling and understanding the cost and profitability implications of long-term partnerships</td>
</tr>
<tr>
<td>Business model and customer offering</td>
<td>Understanding what value means to customers and consumers, not producers and suppliers</td>
</tr>
<tr>
<td></td>
<td>Developing the capability to design and deliver services rather than products</td>
</tr>
<tr>
<td></td>
<td>Developing a service culture</td>
</tr>
<tr>
<td></td>
<td>Embedding all of the above into a service organisation</td>
</tr>
</tbody>
</table>

Source: Neely (2009)\(^{65}\)

The literature also suggests that, to make this transition successfully, businesses need to make services an integral part of their business, not just an add-on to manufacturing activities.

Visnjic (2009)\(^{66}\) suggests that firms need to achieve a critical mass within their service businesses in order to benefit from servitization. She identifies three stages of servitization:

- Low-hanging fruit – manufacturing firms can initially profit from adding a few simple services to their manufacturing offer;

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\(^{65}\) Neely (2009) *Exploring the Financial Consequences of the Servitization of Manufacturing*

Challenges for manu-service firms

- Investment period – if firms seek to generate a significant proportion of their revenues from services, they undergo an investment period, in which the returns from servitization decrease until the firm can reach a critical mass; and

- Increasing returns – once the firm achieves a critical mass for its service business, its profit margins begin to increase.

Fang et al. (2008) estimate that the critical mass at which servitization begins to pay off occurs where service revenue reaches roughly 20% to 30% of total revenues.

Box 8 – The role of business advice in overcoming the transition to manu-services

Given the wide range of challenges facing firms making the transition towards manu-services, there is clearly a role for business advice to guide firms through these changes. The move towards manu-services requires firms to adopt an entirely new business model, which makes services a core part of the business.

The primary source of advice for manufacturers is the Manufacturing Advisory Service (MAS), which can provide specialist support in a range of areas. The service was previously provided by Regional Development Agencies, but will now become a national service. The MAS provides advice relating to supply chains and resource efficiency, but does not focus explicitly on manu-services. Developing such a capability should be an important consideration for the MAS.

Whereas most of the literature argues that the challenges of servitization are mainly associated with the transition to a new business model, there may also be permanent reasons why manu-service firms are less profitable. The remaining three points look at possible reasons why manu-service firms may be at a permanent disadvantage. Regardless of whether the problems are permanent or transitional, however, it is important that the UK can enable firms to overcome them effectively.

2. High coordination costs

The key challenge for manu-service firms is to coordinate numerous different business functions, including both manufacturing and services. A manu-services firm may be involved in activities right along the manufacturing value chain, from development and design to marketing and after sales care. To coordinate these activities effectively, firms need to transfer considerable amounts of knowledge, expertise and information along their supply chains. Failure to do this effectively may result in defective products, unsuitable services or weak marketing and sales offers. Because a manu-services firm bears an unusually high degree of responsibility for the standards of its products and services, the costs of these failures are particularly high. Therefore, effective coordination is a priority activity for manu-services firms.

Coordinating such a range of activities can be costly, especially where the information and expertise passed along the supply chain is complex, or where manufacturing and service
activities have very different characteristics. Firms generally have two options for facilitating this coordination: employing staff as coordinators (normally middle managers and administrators); or investing in sophisticated ICT systems and business processes. Both options involve significant costs. There is an alternative to this approach – outsourcing activities to different firms – which reduces the size of a manu-services firm.

The empirical evidence provided by Neely supports the hypothesis that manu-services firms have higher coordination costs. According to Neely’s analysis, servitized manufacturing firms invest significantly higher amounts in their asset bases, and pay significantly higher wages than pure manufacturing firms (although this latter finding may just be due to higher skill activities involved in service provision).

The costs of coordinating complex activities appear to have been neglected somewhat by the academic literature in recent years. However, there are some important articles that discuss the impact that coordination costs may have on industrial structures.

Becker and Murphy (1992)\(^{67}\) argued that coordination costs within firms are a key determinant of the degree of specialisation of labour. According to this view, firms should only allow different workers to specialise in knowledge-intensive activities to the point where gains in productivity from specialisation are cancelled out by the costs of coordinating the firm’s various specialists. In other words, the higher the coordination costs, the lesser the extent to which firms will create specialised divisions. In manu-services, which appear to have particularly high coordination costs, firms may be less able to keep specialist staff or units in house – instead, they may outsource specialist activities to other firms.

Hobday (1999)\(^{68}\) argues that for the most complex products and services, firms are organised around individual projects, rather than products or services. A significant amount of the cost of these projects is taken up by project management and coordination between different processes. In addition, these projects tend to be heavily influenced by state intervention and bureaucracy.

These papers both have important implications for manu-services: coordination costs have a significant impact on productivity and the performance of firms. If coordination costs are indeed higher for manu-service activities, individual firms may be less able to specialise in advanced areas of manufacturing, and may be much less efficient than pure manufacturing firms. This could prevent UK manu-services from reaching its full potential.

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\(^{67}\) Becker and Murphy (1992) *The Division of Labor, Coordination Costs and Knowledge*

\(^{68}\) Hobday (1999) *Product Complexity, Innovation and Industrial Organisation*
Challenges for manu-service firms

Box 9 – Skills for manu-services

Coordinating manufacturing and services is not just a question of business models; firms also need access to workers with the right skills for manu-services. Much of the recent debate around skills has focused on the importance of Science, Technology, Engineering and Mathematics (STEM) skills, which are crucial for manufacturers. However, given that manu-service firms need to combine and coordinate technical and non-technical activities, it is likely that they will need access to a combination of STEM and non-STEM graduates. Equally, manu-service firms may need workers that can combine both STEM and non-STEM skills, such as qualified engineers with business skills. This need for joint skills may increase the value of joint degrees, which combine STEM and non-STEM subjects.69

The manufacturing industry also faces a challenge in attracting workers from both STEM and non-STEM backgrounds. *Shaping Up For Innovation*, our research into skills in the knowledge economy, found that around half of STEM graduates do not enter STEM-related occupations. If manufacturing companies are to attract the right mix of skills from both STEM and non-STEM disciplines, they must improve their ability to attract talented staff.

3. Inability to capture value

It is no surprise that manu-services firms have higher costs than pure manufacturing firms70, given that they tend to operate in higher value areas. However, both Neely and Gebauer et al. point out that they seem unable to recoup the additional value they might expect from such investment.

A possible explanation for this is provided by Vargo and Lusch (2004)71, who state that the value of a service (or good) is determined by the customer, not the firm. According to Vargo and Lusch, many firms traditionally see the value of a product as being defined by the costs of the different inputs that go into it; however, in the marketplace, the value of something is determined by the value it gives to the consumer.

In some cases, this might work in favour of manu-service firms – if a new service complements a manufactured good effectively, the offer can be worth more than the sum of its parts to a customer. However, in other cases firms may fail to provide a good-service combination that is worth more to the customer than it costs to make. If this theory is right, some types of manu-service may be inherently unprofitable; the success of manu-service offers would depend on producing a package that is worth more than the sum of its parts. In some cases, this may act as a barrier to the success of manu-service firms.

69 See Levy and Hopkins (2010) *Shaping Up For Innovation*. This report identified a mis-match between STEM graduates and manufacturing firms, with manufacturers reporting skill shortages despite large numbers of STEM graduates not taking jobs in the sector. The need for combined skills for manu-services may be a possible explanation for this mis-match.

70 See Neely (2009) *Exploring the Financial Consequences of Servitization*

4. Trading lower profits for contract security

Manu-service activities tend to involve longer contracts than pure manufacturing activities, because they involve providing services over a period of time. This may affect the profit margin sought by manu-service firms. In some industries (most notably the water industry), firms are prepared to accept relatively low profit margins in exchange for the income security that is offered by long-term contracts. This may also be true in the manu-service sector. However, if manu-service contracts also require firms to bear greater levels of risk, we might expect this to counter any security gained from long-term contracts. This trade-off between contract security on the one hand, and the risks of product failure on the other, may lead to difficulties for many manu-service firms.

Summary – barriers to the growth of manu-services

While we cannot be certain about any one of these explanations, it is clear that manu-service firms can face a variety of challenges and barriers to growth. Most of these challenges stem from the problems firms face in coordinating different business functions into an effective and joined-up manu-service offer, while inducing customers to pay for the full value of these manu-services. However, it is not yet clear whether these challenges are purely transitional in nature, or whether they pose ongoing structural problems for manu-services firms.

These barriers may prevent the UK from fulfilling its potential; unless they are overcome, they will hold back the development of manu-services in the UK. If the UK is to have a vibrant manufacturing sector by 2020, it is important that policy makers seek to understand and tackle these challenges.

Policy makers can help firms to overcome these barriers by developing a clear understanding of which barriers are most significant, and how they can be overcome. Despite the success enjoyed by some British manu-service firms, we have a limited understanding of the business models needed to provide manu-services effectively. Where firms face problems with the transition to manu-services, an understanding of the processes and business models needed to overcome these problems may help UK firms to move into manu-services more successfully.

More broadly, the UK must develop effective networks to support manu-services. It is clear from the analysis within this paper that manu-service firms work within networks of closely related businesses and institutions. These networks play a key role in driving the non-technological innovations on which manu-services depend. They may also help firms to overcome any permanent problems associated with providing manu-services, such as coordination costs or an inability to capture value. If the UK is to build a sustained competitive advantage in manu-services in the 2020 knowledge economy, it must develop world-class networks that support manu-services. The first step in building these networks is to develop a thorough understanding of the challenges involved in manu-services.
Challenges for manu-service firms

Although progress is being made\textsuperscript{72}, this understanding remains a significant gap in the evidence base around manu-services. The government should seek to fund research into the challenges facing manu-service firms, to understand how businesses can overcome them.

\textsuperscript{72} See BIS (2011) \textit{Manufacturing in the UK: An Economic Analysis of the Sector}
4. Manu-services and smaller firms – a special cause for concern?

There are significant challenges facing manu-service firms, but it appears that these challenges mainly affect the largest firms. By contrast, smaller firms appear to perform more strongly within manu-services. However, these smaller firms are also much less likely to move into manu-services. They face significant barriers to entry, which prevent many of them from moving into manu-services.

This contrast presents a dilemma for policy makers; it appears that the best-performing manu-service firms are also the least likely to move into manu-services in the first place. Given such a scenario, it seems that government policy should look urgently at ways to help smaller firms overcome these barriers to entry. This section explores the role of smaller firms within manu-services, and examines the barriers to entry they face.

**Advantages for smaller manu-service firms**

There is evidence to suggest that smaller manu-service firms – those with less than 3,000 employees – perform considerably better than larger firms. This suggests that smaller firms are better able to overcome the various challenges of servitization outlined in the previous section. The two main potential advantages for smaller firms are:

- **Lower coordination costs** – manu-services appear to involve large coordination costs for firms, but it is possible that smaller firms can generally coordinate their activities more easily; and

- **Organisational agility** – smaller firms may tend to be more agile than larger firms, potentially allowing them to adapt more quickly to manu-service markets and to overcome the transitional problems of servitization more easily.

Neely’s analysis suggests that smaller firms – those with between 100 and 3,000 employees – perform better after servitization than the largest firms. Smaller firms had higher net profit margins after servitization, but this reversed for the largest firms that had servitized. Neely also found that, despite their superior performance, smaller firms are less likely to be servitized in the first place. In his sample, only 30% of the smallest decile of firms had servitized, compared to just over 50% among the largest decile of firms.

These results are particularly significant when considered alongside the headline finding, that servitized firms overall performed worse than pure manufacturing firms. This suggests that despite the strong performance of smaller servitized firms, the weaker performance of the largest servitized firms reduced the overall net profit margin for servitized firms.

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73 All results from Neely (2009) *Exploring the Financial Consequences of the Servitization of Manufacturing*
Manu-services and smaller firms – a special cause for concern?

Why might smaller firms be more successful at providing manu-services?

These results go against standard economic theory. We would normally expect larger firms to perform better within a complex, capital-intensive industry, due to the economies of scale they enjoy. However, there are two theories that may explain why smaller firms appear to enjoy more success within manu-service markets.

Lower coordination costs – can smaller manu-service firms coordinate their activities more efficiently?

The theory that manu-service firms find it particularly difficult to coordinate their activities has been developed through this paper (see Section 3). It seems plausible that these coordination costs are linked not only to the complexity of a firm’s activities, but also to the number of workers the firm has to coordinate.

Becker and Murphy’s 1992 paper set out a model of specialisation within knowledge-intensive firms. In their model, coordination costs increase as “teams” of workers get bigger, and this limits the degree to which workers specialise, and thus the size of the teams.

Becker and Murphy identified three reasons why coordination costs might increase as business units increase in size:

- **Principal-agent problems** – as firms and teams get larger, individual workers may have less incentive to work hard because they have a smaller role and stake in the success of the firm. Such problems mean that larger firms can face lower staff morale and productivity, and are hard for firms to overcome;

- **Hold-up problems** – as specialist business units become bigger, and more workers perform complementary tasks, each individual has a greater incentive to hold up other team members’ work to extract rents (normally increasing salary); and

- **Breakdowns in supply and communication** – Larger teams and more complex chains of production may lead to communication problems, which can delay a firm’s activities, or lead to faulty products and services.

The implication of this model is that smaller firms tend to have lower coordination costs, but are less able to benefit from specialisation of labour and economies of scale.

Unfortunately, there is little empirical evidence to test Becker and Murphy’s model.

Intuitively, Becker and Murphy’s notion that coordination costs increase as firms and business units get bigger seems appealing. Smaller manu-service firms may be able to transfer knowledge and information along their supply chains through face-to-face contact, with employees able to develop stronger working relationships with one another. By contrast, larger firms may rely on middle management and formal processes to coordinate
their supply chains, which may be both expensive and less efficient. However, larger firms may also be able to invest in better IT systems and processes to assist in coordination, which may lower coordination costs.

The only evidence on this comes from Barnet’s 2009\(^{75}\) assessment of business spending on intangibles. Barnet’s analysis suggests that larger firms (those with turnover above £60 million) invest more than 75 times as much as smaller firms on “process changes”. This was by far the largest category of expenditure on intangibles by larger firms, suggesting that larger firms may face much larger coordination costs than smaller firms.

Organisational agility – are smaller firms better able to adapt to manu-service markets?

Smaller firms may also be more agile than larger firms, able to adapt their structures and business models more easily and quickly. This organisational agility may be particularly relevant in manu-services, because many firms move away from pure manufacturing towards manu-services, adopting new structures and business models in the process.

Barres et al. (2006)\(^{76}\) suggested that smaller firms tend to find their competitive advantage in their ability to adapt their organisational structure, rather than in technological or product innovations. If smaller firms do tend to be more organisationally agile, this would give them two significant advantages within manu-services:

- **Overcoming transitional problems** – smaller firms may be able to overcome the transitional challenges of servitization (as detailed in section 4) more easily; and
- **Responding to new market opportunities** – smaller firms may also be able to develop new product-service packages more easily in response to new market opportunities.

This analysis does not prove beyond doubt that smaller firms are better suited to manu-services. There may be a number of other explanations for the apparent advantages enjoyed by smaller firms: for example, it may be that only the most efficient smaller firms can achieve the move towards manu-services, or that struggling larger firms turn to manu-services in a bid to turn their performance around. More evidence on the links between firm size and performance in manu-service markets would be valuable to policy makers in this area.

Whatever the significance of the result, it raises questions about whether policy makers should focus on encouraging smaller firms to move into manu-services. Based on his analysis, Neely takes the opposite position; he argues that policy makers should focus on helping larger firms to overcome the problems they face in moving towards manu-services.

\(^{75}\) Barnett: *Intangible Investment Evidence from the Innovation Index Survey* (2009). This result should be treated with some caution, however, as Barnet used the data this is based on for different purposes, and the study was not specific to the manufacturing sector.

However, given the complexity of the challenges involved in servitization and the low rates of servitization among smaller firms, we believe that policy must focus on helping smaller firms overcome barriers to entry into manu-services.

**Barriers to entry into manu-services for smaller firms**

While it seems likely that smaller firms have some advantages over the largest manu-service firms, smaller firms may be prevented from entering manu-service markets by a series of significant barriers to entry. These barriers to entry may include:

- **Investment in technology platforms** – many manu-service activities are based on technology platforms which require significant initial investments from firms. Smaller firms may be less able to finance and sustain these investments compared to larger firms, because their lower output will raise average costs;

- **Access to finance** – as with all manufacturing firms, smaller manu-service firms may be less able to access finance from banks and other sources;

- **Ability to bear risk** – smaller firms may find it harder to manage the unusually high levels of risk associated with manu-service activities. Larger firms are better able to offset the risks involved in manu-services, as they will tend to have larger revenues and a greater range of products and services across which to diversify the risk. The smaller a firm, and the fewer different products it has, the less able to bear risk it is likely to be;

- **Access to markets** – larger firms typically have connections to a wider range of markets (both domestically and overseas), whereas smaller firms often find it harder to up-sell and cross-sell their services. In manu-services, this is most likely to apply to relationships with large clients, as many contracts depend on long-term relationships;

- **Control of market standards** – many manu-service markets are dominated by standards – key products, brands or systems that all other products and services must be compatible with. These standards tend to be controlled by larger companies (such as Apple or IBM), who can use them to exact market power and limit the scope for smaller firms to innovate effectively; and

- **Brand and reputation** – manu-service providers rely heavily on their brand and reputation to market themselves; this is part of the relationship-based marketing that predominates within manu-services. In general, larger firms are more able to invest in their brand, and build strong and wide-reaching reputations.
Summary – a dilemma for smaller manu-service firms

The role of smaller firms within manu-services presents a dilemma for policy makers: it appears that smaller manu-service firms are more efficient and more profitable, but they are much less likely to move into manu-services in the first place (due to barriers to entry).

At this stage, more evidence is needed to prove that smaller firms are indeed more effective at providing manu-services. However, regardless of whether this is true, policy makers should focus on removing barriers to entry into manu-services for all firms, and particularly smaller firms.
This paper demonstrates that manu-services represent a major opportunity for the UK economy, but that they also pose significant challenges for manufacturing firms. British manufacturers are likely to continue moving towards manu-services, with varying levels of success.

Manu-services present an opportunity for the government to support the revival of the UK manufacturing industry. The ability to combine goods and services effectively is an important source of competitive advantage for UK manufacturing, and should become increasingly important in the future. With the right policies to support the growth of manu-services, the UK could become a world leader in this area by 2020.

It is clear from our analysis that manu-services have distinct policy needs from the rest of the manufacturing sector. First, manu-services depend on a different, non-technological type of innovation. Current policy on manufacturing tends to focus disproportionately on technology and intellectual property, while overlooking the importance of this softer innovation in services and business models. Second, manu-service firms face a unique set of challenges and barriers to growth, many of which are not reflected in current government policy.

If the UK is to have a world-leading manufacturing sector by 2020, it must take advantage of the opportunities afforded by manu-services. Our manufacturers can no longer compete on skills and technology alone; we must also develop advanced business models and service capabilities to support our manufacturing base. To support this, manu-services must be hard-wired in to the policy agenda. This section sets out an overview of what a manu-services policy agenda would look like within the context of a strong UK manufacturing policy.

Box 10 – Current UK manufacturing policy

The government’s Growth Review Framework for Advanced Manufacturing, published in November 2010, set out some of the barriers to growth facing advanced manufacturing. These included innovation and knowledge transfer, access to finance, skills and barriers to exports. The Growth Review Framework touched briefly on the role of services within manufacturing, but it did not emphasise the integral role that service-based business models can play in supporting the growth of UK manufacturing.

The government has also announced a number of specific policies designed to support the manufacturing sector:

- Retaining the Manufacturing Advisory Service (MAS) with an annual budget of £50 million. The MAS was previously run by Regional Development Agencies, but with their abolition the government plans to make it a “nationally run but locally delivered” service.

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77 From a speech by Vincent Cable MP, the Secretary of State for Business, Innovation and Skills, on 25th January 2011. See http://www.bis.gov.uk/news/speeches/vince-cable-perceptions-must-change-manufacturing
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- Investing £200 million in a network of Technology and Innovation Centres. These centres are designed to act as intermediaries between businesses and research centres, and to stimulate investment in technological innovation.\(^{78}\);

- Extending the Enterprise Finance Guarantee (EFG) to 2015, with funding of £700 million in the year to March 2011, and a further £500 million per year thereafter. The EFG provides a government guarantee on loans to small businesses, designed to promote access to finance among SMEs.\(^{79}\);

- Investing £300 million over 4 years in the Enterprise Capital Funds, a venture capital fund designed to allow small businesses to grow rapidly; and

- Spending £1.4 billion on creating apprenticeships, many of which are likely to be in the manufacturing sector.\(^{81}\).

The government has also sought to exert influence over the major banks, in an attempt to increase the amount they lend to businesses. Project Merlin, the latest agreement between the government and the four largest UK banks, set out a number of provisions, including:

- Committing to lend £190 billion to businesses, of which £76 billion is available to SMEs; and

- Providing a total of £2.5 billion to equity capital funds, which should target investment at the weakest areas of the UK.

What would a manu-services policy agenda look like?

A manu-services policy agenda should be built on a strong and coherent strategy for the manufacturing sector as a whole. The UK must focus relentlessly on increasing exports, driving innovation, boosting productivity and providing the skills that manufacturers need. The government’s three core priorities for the manufacturing sector as a whole are the right ones:

- To dismantle barriers to growth for manufacturers;

- To become Europe’s leading exporter of high-tech goods and services; and

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\(^{78}\) This policy was first announced in the Spending Review on 20th October 2010. See [http://www.hm-treasury.gov.uk/spend_index.htm](http://www.hm-treasury.gov.uk/spend_index.htm)


\(^{82}\) These priorities were outlined in a speech by Mark Prisk MP, the Minister responsible for Manufacturing, on 18th January 2011. See [http://www.bis.gov.uk/news/speeches/mark-prisk-cbi-manufacturing-festival](http://www.bis.gov.uk/news/speeches/mark-prisk-cbi-manufacturing-festival)
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• To improve manufacturing’s image, to allow it to attract talented workers.

But the mechanisms for achieving these priorities differ for manu-services. Manu-services are based on innovation in processes and business models, not products and technology. Exporting services is quite different to exporting goods. And the skills required for manu-services are more diverse than for pure manufacturing.

These different needs of manu-services are not well reflected in government policy. The government has highlighted two particularly significant barriers to the growth of manufacturing83:

• Access to finance, especially among small firms; and

• Failure to invest in technological innovation.

Access to finance is an issue that affects all manufacturing firms, whether they offer manu-services or not. But by choosing to focus on technological innovation, the government is explicitly overlooking the non-technological innovation involved in manu-services. If the government is to support the growth of manu-services, it must place as strong an emphasis on non-technological innovation. Manu-services must be embedded within the government’s policy agenda, with government actions reflecting the unique needs of the sector.

There are two distinct parts of a manu-services policy agenda that must be ingrained into UK manufacturing policy:

1. Creating effective manu-service networks – manu-service firms don’t just rely heavily on each other; they depend on a range of other institutions to support their growth and drive non-technological innovation. These institutions include universities, intermediary institutions, banks and venture capital funds. If the UK can develop networks that support innovation and growth in manu-services, the UK is likely to be able to secure a significant competitive advantage in this area; and

2. Removing unique barriers to growth – manu-service firms – especially smaller firms – face a series of unique barriers to growth. These range from their ability to bear risk and access finance, to accessing markets at home and overseas. The government must look at how it can address these barriers, to ensure that manu-service firms of all sizes can grow to their full potential. Efforts to tackle these barriers must be based on an understanding of the special needs of manu-service firms.

This policy agenda does not have to involve direct government intervention or “picking winners”. The government plays a significant role in the manu-service eco-system, through its role as a regulator, funder of universities and research institutions, provider of advice and support to businesses, and infrastructure provider. By ensuring that all of these areas

83 These barriers were highlighted in a speech by Vincent Cable MP, the Secretary of State for Business, Innovation and Skills, on 25th January 2011. See http://www.bis.gov.uk/news/speeches/vince-cable-perceptions-must-change-manufacturing
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are configured in a way that supports manu-services, the government can significantly improve the prospects for manu-services in the UK.

But before manu-services can be embedded into the policy agenda, there is an urgent need to develop a more complete evidence base on how manu-services work in practice. At present, there is a growing body of evidence on the scale of manu-service activity in the UK\(^4\), but much less is known about the opportunities and challenges involved in manu-services. This makes it much harder to develop informed policies to promote the growth of manu-services in the UK. Research into manu-services should focus on how the UK can promote the non-technological innovations associated with manu-services, and how businesses and government can overcome barriers associated with manu-services.

Creating world-class manu-service networks

Modern manufacturers – whether involved in manu-services or not – are closely integrated into complex eco-systems and supply chains. No manufacturing firm can operate in isolation: firms depend on suppliers to deliver on time, on universities and research hubs to support innovation, on banks for financial support, and on the UK’s infrastructure network. The effectiveness of these networks is one of the reasons that the UK is a world leader in some types of advanced manufacturing. If the UK is to be a world leader in manu-services, it needs to develop networks that support manu-services.

Aside from manufacturing companies themselves, the key institutions that form these networks include:

- **Universities and other research institutions** – universities play a key role in developing cutting edge ideas and technologies for the manufacturing industry. Manufacturers rely on universities to support their research and innovation, and to provide the expertise and skills they require. Funding university research is one of the main ways that government supports the manufacturing sector; if government is to improve this support, it must ensure that all research money is spent effectively;

- **Banks and financial service providers** – manufacturers rely on financial services firms to finance investment and support their operations;

- **Venture capital** – venture capital funds play a key role in enabling both start-ups and medium-sized manufacturers to grow. By providing finance in return for an equity stake, venture capital can provide both the funds and the initiative for firms to grow rapidly; and

- **Intermediary institutions** – there are a range of intermediary institutions that help to transfer knowledge and capital between institutions and manufacturers. These include national bodies, such as NESTA and the Technology Strategy Board, and

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\(^4\) See BIS (2011) *Manufacturing in the UK: An Economic Analysis of the Sector*
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centres such as university Technology Transfer Centres and the newly created Technology and Innovation Centres.

At present, the institutions within these networks tend to focus disproportionately on technology and intellectual property. If networks that support manu-services are to be developed, these institutions must also focus on softer aspects of innovation, such as the business models and processes associated with manu-services.

To begin building these manu-service networks, the government should take immediate action in the three following areas:

**Recommendation 1 - Technology and Innovation Centres for manu-services**

The new Technology and Innovation Centres (TIC) must not focus on technological innovation alone. Each TIC should have a remit that includes investment in non-technological innovation, to allow businesses to fully exploit the value of products and technologies developed. In this role, TICs should draw on expertise and research from management schools and academics working on service innovation. Alternatively, it may be appropriate to have a TIC dedicated to advanced research into innovation in services and business models.

**Recommendation 2 - Embedding manu-services within manufacturing institutions**

The government’s manufacturing strategy can no longer focus on technology alone, but must also reflect the central role that services can play within manufacturing. There are a wide range of institutions that play a role within the manufacturing industry, and these must begin to reflect the importance of manu-services within their work. Such institutions include:

- Universities and other research institutions – universities with strong links to the manufacturing industry must extend their research to cover the links between manufacturing and services, and seek to drive non-technological innovations;

- Local Enterprise Partnerships (LEPs) – the Regional Development Agencies (RDAs) supported a number of cluster institutions (such as the North West Aerospace Alliance) that supported manu-services by enabling networks to work more efficiently. As the successor to RDAs, LEPs should consider how they can support manu-service clusters, and whether they can support any former RDA activities on manu-services that were effective; and

- UK Trade and Investment (UKTI) – UKTI must develop a manu-service capability, to enable it to promote UK exports of manu-services.

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85 The North West Aerospace Alliance (NWAA) is one of a number of clusters, backed by RDAs, that facilitate effective collaboration and joint innovation between different businesses within an industry. See [www.aerospace.uk](http://www.aerospace.uk) for more details on NWAA.
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Recommendation 3 - Developing an evidence base for manu-services

The government should commit resources to research on the opportunities and challenges involved with manu-services. This funding could be directed through a number of funding bodies, but should be focused on developing evidence that can inform policy and be useful to businesses. Institutions carrying out such research should be able work closely with businesses to disseminate knowledge about manu-services. These research institutions should also form a key part of manu-service networks, acting as sources of innovation in services and business models.

In addition, the Office for National Statistics (ONS) should develop statistics specifically aimed at manu-services. As well as better reflecting the blurring between services and manufacturing in the Standard Industrial Classification (SIC), the ONS should provide evidence and statistics on the value and performance of manu-services within the UK.

Removing unique barriers to the growth of manu-services

Businesses in all industries face barriers to growth, but there are a number of unique obstacles that can prevent manu-service firms from growing. These include:

- Ability to bear risk;
- Access to finance for investment in technology platforms; and
- Overcoming transitional problems.

Helping manu-service firms manage risk

The risk involved in providing manu-services represents a significant barrier to entry for smaller firms. Every business faces risks, but risks involved in manu-services appear to be especially high and difficult to quantify.

Normally, businesses would seek to mitigate risks as far as possible, and to purchase insurance against risks wherever appropriate. It is difficult for smaller manu-services firms to effectively mitigate the risks of product failure and associated reputational damage, especially where they rely on a small number of products. Equally, insurance firms may be reluctant to provide insurance against large and uncertain risks. This makes it difficult for manu-service firms to manage risk effectively, which represents a significant barrier to the growth of manu-services.

There are two aspects to solving this risk problem:

- Helping manu-service firms to better understand and account for the risks they face, through business support; and
- Providing help for firms that cannot insure themselves against risks associated with manu-services.
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Access to finance for smaller firms

All manufacturing firms depend on banks and other financial institutions to access finance. Manu-services firms – especially smaller firms – are likely to be particularly in need of finance, because of the large investments in technology platforms that are often required. Access to finance is one of the key barriers to growth that we have identified for smaller firms within manu-services.

The government has a significant amount of influence over the major banks, as demonstrated by the recent Project Merlin agreement. Government has also implemented policies, such as the Enterprise Finance Guarantee, to promote lending to smaller businesses. The government must continue to work with the banks to ensure that manu-service companies do benefit from the lending agreed with the banks, and that manu-service firms are able to access government-backed finance easily.

Overcoming problems with the transition to manu-services

As section 4 suggests, firms may face problems in making the transition to manu-services. If manu-services firms are to be successful, they need to understand the complex business models and processes involved in integrating goods and services. Most manufacturing firms do not specialise in business models, and have limited capacity to conduct strategic changes. This applies especially to smaller firms, who may lack the resources to procure specialist advice in this area. These challenges may hold back firms from making successful transitions into manu-services, and exploiting their full competitive potential.

At present, it is difficult for policy makers to help manufacturing firms to overcome these problems, because they are not well understood. The government should actively fund and promote research to develop an understanding of the challenges firms face in moving into manu-services. This understanding should then be embedded within the Manufacturing Advisory Service, and other bodies within manu-service networks that are in a position to provide advice and support to businesses.

Providing support within the context of manu-service networks

A small or medium-sized manu-service firm with the potential to grow quickly will typically need support in overcoming all three of these barriers. Therefore, government support should combine support in accessing finance, bearing risk and designing business models within a single package of measures. However, each manu-service firm is likely to have different needs, while these services will be provided by different institutions.

Therefore, these support functions must be integrated into manu-service networks, with firms able to access a wide range of advice and support through a single point of contact. To facilitate such networks, the Manufacturing Advisory Service could act as a local point of contact for manu-service firms, able to provide advice and highlight other available support. Where manu-service firms require specialised support, or need assistance in
accessing finance or managing risk, MAS would be able to connect firms with appropriate organisations at a regional or national level.

To begin dismantling the barriers to growth facing manu-service firms, the government should take immediate action in the three following areas:

**Policy recommendations for manu-services**

This section sets out a number of steps the government can take to promote the growth of manu-services in the UK, beyond the general policies that are needed to support the manufacturing sector as a whole. Each of these policies builds on the manu-services policy agenda developed here.

**Recommendation 4 - The Manufacturing Advisory Service**

The Manufacturing Advisory Service (MAS) should be given a more explicit role in advising firms on manu-services. This advice should focus on helping businesses overcome the transition to manu-services, and adapting their business models to succeed within manu-service markets. The MAS may also have a role in advising manu-service firms on how to manage risk.

Besides this role, the MAS could also act as a local point of contact for small and medium-sized businesses within manu-service networks. The MAS should look to link businesses with research institutions, banks or insurers that can provide specialist advice or support where needed.

To fulfil these roles, the government should look at increasing the resources available to MAS.

**Recommendation 5 - Providing integrated support to tackle the barriers facing manu-service firms**

The government should look at how it can develop a support function for manu-service firms that can tackle the three key barriers they face: risk; access to finance; and overcoming transitional problems. This support may be provided by a combination of different bodies, including banks and the Manufacturing Advisory Service, but they must be closely linked so that all manu-service firms are able to overcome each of these barriers.

As part of this, the government should explore options for setting up a publicly-backed insurance fund for smaller manu-service firms. Such a fund would enable manu-service firms to overcome the risks associated with manu-services, enabling them to grow with more confidence.
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Recommendation 6 - Skills for manu-services

The government should work with manufacturers and universities to understand the mix of skills that are required by manu-service companies. Where these skills differ from existing course offerings (for instance, more joint degrees combining STEM with non-STEM subjects are required), the government should encourage universities to adopt more courses of this type.

The government should also continue its efforts to promote careers in manufacturing among young people, to ensure effective matching between graduates and manufacturing jobs\(^6\).

\(^6\) For more detail, see The Work Foundation’s research on skills in the knowledge economy. Levy and Hopkins (2010) *Shaping Up For Innovation*
Table 5.1: Summary of policy recommendations

<table>
<thead>
<tr>
<th>Policy recommendation</th>
<th>How it contributes to the manu-services policy agenda</th>
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<tbody>
<tr>
<td>1. Ensure that <strong>Technology and Innovation Centres</strong> engage in non-technological innovation, specifically designed to promote manu-services</td>
<td>This will provide a focal point for innovation in services and business models, which can drive growth among manu-service firms. An explicit manu-services role for UKTI would boost export performance.</td>
</tr>
<tr>
<td>2. <strong>Embed manu-services</strong> within government policy and public institutions, including LEPs, universities and UKTI</td>
<td>This will ensure that key institutions play a role in supporting the growth of manu-services. An explicit manu-services role for UKTI would boost export performance.</td>
</tr>
<tr>
<td>3. Develop a <strong>comprehensive evidence base for manu-services</strong>, by investing in targeted research. The ONS should provide statistics that allow proper analysis of manu-services</td>
<td>This will fill the policy gap on manu-services, and improve business understanding of manu-services.</td>
</tr>
<tr>
<td>4. Expand the capability of the <strong>Manufacturing Advisory Service</strong>, to allow it to provide comprehensive support on manu-services</td>
<td>This action would assist firms with overcoming transitional problems in moving towards manu-services. It would also provide a link between smaller manu-service firms and key institutions.</td>
</tr>
<tr>
<td>5. Provide <strong>integrated support to manu-service firms</strong>, that can tackle the joint barriers of risk, access to finance and transitional problems</td>
<td>The government should ensure that all manu-service firms with the potential to grow are not held back by any of the key barriers to growth affecting the area. Exploring a publicly-backed manu-service insurance fund may allow government to play a role in removing barriers imposed by risk.</td>
</tr>
<tr>
<td>6. Universities should work with manufacturers to provide <strong>skills for manu-services</strong>, which may include joint STEM and non-STEM degrees</td>
<td>This would ensure that manu-service firms have access to the skills and specialists needed to effectively combine goods and services.</td>
</tr>
</tbody>
</table>
This paper has set out an outline of what a manu-services policy agenda should look like, together with some concrete steps that government can take to support manu-service firms. An effective policy agenda for manu-services must build on a strong manufacturing policy, which emphasises the importance of exports, innovation and productivity growth.

Aside from this, a manu-services policy agenda should have two key features. The first is the creation of manu-service networks, which develop and exploit innovations in non-technological areas such as marketing, business models and experiential services. These networks should be made up of both businesses and institutions, many of which are supported by the state. The government can support the development of these networks by ensuring that the principles of manu-services, and the need for non-technological innovation, are ingrained within every relevant organisation it supports.

The second key feature is helping manu-service firms – especially smaller firms with the potential to grow rapidly – to overcome a series of challenges and barriers that are unique to manu-services. These barriers, which include managing unusually high levels of risk and achieving transformational changes in business models, hold back the growth of manu-service businesses.

The specific policy recommendations we have set out in this report reflect the need to move towards a manu-services policy agenda. On the one hand, the government must seek to develop evidence on the opportunities and challenges posed by manu-services as a matter of priority, and seek to embed this knowledge within key institutions. At the same time, government must look at how key policy instruments, including Technology and Innovation Centres, the Manufacturing Advisory Service and universities can provide targeted support for manu-services.

If the government adopts this policy agenda, manu-services can play a key role within a balanced UK economy in 2020. Manu-services can be a key driver of exports, innovation and growth for the UK economy, but the UK can only fulfil its potential if it puts in place a coherent manu-services policy agenda as a matter of priority.
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