

Bringing Manufacturing Back

Is the tide of offshoring beginning to turn towards reshoring?

Marcus Gibson

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Executive Summary

- As of August 2014, reshoring has been undertaken only by a very small number of UK SMEs – 64 in total – according to our nationwide search. We utilised the database resource of UK SMEs, Gibson Index, in order to trace all known examples of reshoring that had occurred. The index contains profiles of the 49,000 most important SMEs in the UK. To this sub-total were added certain companies identified by UKTI-Manufacturing Advisory Service staff together with further SMEs emerging from Google Alert-type searches in the past six months, beginning March 2014.
- The UK has limited spare manufacturing capacity and a critical shortage of skilled manufacturing workers. This may cripple future efforts to reshore production
- Key UK manufacturing sectors that offshored production in the past – printing, consumer electronics, building products and textiles – remain relatively weak in the face of continuing competition from China/Asia and emerging manufacturing nations such as Indonesia, Vietnam, Turkey, and increasingly from countries in eastern Europe such as Poland and the Czech Republic.
- Only a proportion of the reshoring of production from China/Asia by UK companies is coming back to the UK. Some is likely to move to eastern Europe
- A stream of new offshoring is being undertaken by British companies which are moving production from the UK to China/Asia. However, this is being offset by a growing number of SMEs that chose to keep manufacturing of new products in the UK.
- The extent of reshoring in the UK may be five or more years behind that of the US, where the sentiment against offshoring is now strongly critical, and even aggressive. America's sharply decreasing energy costs in recent years should also be considered a factor in their accelerated reshoring.
- The revival of manufacturing in the UK is likely to depend more on factors such as the availability of highly skilled engineering staff, an increase in production capability, the emergence of new markets at home, the level of wage costs

and, finally, the refocusing of investment into UK manufacturing rather than UK property markets.

- Efforts to revive manufacturing in the UK may impact on the imports bill since most of the new manufacturing/machine tool equipment required for the revival is itself manufactured overseas.
- The proportion of UK manufacturers now owned by foreign firms is much higher than in the rest of Europe. Much of that supply chain has now left the UK. Re-creating a UK-based component supply will be difficult.
- Recent UK government policies have, so far, had little impact in terms of encouraging SMEs to reshore production to the UK, although it is early days for several new initiatives.
- Overall efforts to 'rebalance' the economy by the Conservative/Lib Dem coalition since the end of Labour administration may need a generation to take effect. Recovery and restoration of the UK's manufacturing capacity and workforce to the scale and numbers of the mid-1990s now seems unlikely.
- While heavy manufacturing/engineering sectors such as steel, coal mining, mining engineering products and rail engineering components all suffered near-elimination under the Conservative government of Margaret Thatcher, it was the many thousands of companies involved in light engineering that fell foul of policies of the Blair/Brown administrations.

Introduction

From the 1990s onwards, a substantial proportion of the UK's manufacturing production and its finance services were outsourced to China and the countries of South Asia, especially India and Bangladesh. In 2000, multinationals were able to lower their labour costs by 77 per cent using factories in China instead of the UK.

The main factor in this unprecedented loss of manufacturing at home was the availability of massive, low-cost production lines in China. A second factor was the UK government's policy over the housing and commercial property market, where prices rose rapidly during an extended period of very low interest rates and cheap loans. This housing bubble forced – or enabled – tens of thousands of owners of manufacturing firms to abandon operations and sell factory premises for housing, or to the growing number of import firms.

Early retirement and mass emigration of UK-born manufacturing workers to Australia, the US, Dubai, Canada, Spain and Europe were behind the outflow of three to five million skilled workers from the UK from the mid-1990s onwards.

Today, there is virtually no wholesaler, retailer or original equipment manufacturer (OEM) in the industrialised world that is not sourcing some, if not all, of its products from China. A large number of supply chains start, lead through or finish in China. The advantages of low-cost production for export and a competitive and deliberate clustering of second- and third-tier suppliers, combined with a large and rising internal market, created huge new industries in China.

From 'Made in Hong Kong' in the 1970s to 'Made in Taiwan' or 'Made in Singapore' in the 1980s to 'Made in China', the trend of outsourcing manufacturing from the West has been relentless.

Uniquely in Europe, Labour government ministers and even senior civil servants at the Department of Trade & Industry did not believe that UK industry should be 'protected' from low-cost imports from China. An obsession with 'services' ruled their thinking. As a result, no protection from imports to the UK was introduced, in contrast to the policies of other major European countries where supply chains, most notably in France and Italy, are strenuously guarded.

Research by Gibson Index suggests that around 95 per cent of the companies involved in British light manufacturing disappeared during the years of the Blair/Brown era. The industries worst hit include textiles, toys, building products, electrical components, consumer electronics, metal parts, auto and marine parts, and household goods, all of which were major employers up to the mid-1990s.

Manufacturing itself became a dirty word among certain local councils. A single complaint of noise or smell was all that was needed for a council to enforce the closure of a long-standing manufacturing company, regardless of the effect on the workforce.

- In 2013 Goss Springs moved from its factory in Walthamstow, where it had operated since 1968. The old factory had operated alongside residential housing for decades. However, Waltham Forest Council served a noise abatement notice on the factory as a result of a single complaint. As a result, a manufacturing operation that had hitherto secured local employment – some 450 at its height – and a steady stream of income to the local authority via business rates, was lost to the district when the company moved to new premises in Epping, some 11 miles from the old site.
- In March 2013 Walter Purkis and Sons, a historic smoked fish shop in north London, fought to stay open. The Purkis family, owners of the Walter Purkis and Sons kipper factory, were ordered to shut down their facility by Haringey council, after a complaint from a neighbour. They were told that their smokehouse now violated both the 1993 Clean Air Act and the 1990 Environmental Protection Act, and would have to close. Following an intervention by a member of the Prince of Wales's staff, the closure order was rescinded by the council. The shop had been allowed to stay open, but would have to restrict their hours of operation, and they remained concerned they would be driven out of business.

Part of the Labour government's antipathy towards manufacturing was political: many skilled workers had consistently voted for Mrs Thatcher and had been a key element in her electoral success. Meanwhile, the Chinese government, a close-knit cabal of Chinese Army officers and Communist Party officials and oligarchs, poured vast state funding into giant manufacturing complexes.¹

None of the Chinese companies paid the myriad costs borne by 'free market' UK firms: taxes, business rates, duties, employee benefits, health & safety or environmental regulations and levies. The result was a massacre among British manufacturers with tens of thousands of profitable, internationally competitive British firms going to the wall.

Interestingly, few British business academics – of whom around 3,000 are currently employed at universities in the UK – have researched or reported on the scale of the disaster, especially the collapse in light manufacturing after 1997. The plight of SMEs was not widely covered by the national press during the period – the BBC has, for example, never employed a specialist 'SME correspondent' – and the majority of business and digital media coverage on the BBC is devoted to large, mostly US-owned firms, or Silicon Valley start-ups.

Before the disaster occurred, nearly all of the companies located on the UK's trading estates and business parks were manufacturers; today only a handful survive. The great majority of firms are distributors, importers, logistics/storage firms and, at best, finishers, processors or assemblers of imported components.

In a telling article in *The Guardian* in November 2011, reporter Aditya Chakraborty made a rare exposé of Labour's industrial policy. He wrote: 'When Thatcher came to power, manufacturing accounted for almost 30% of Britain's national income and employed 6.8 million people. By the time Brown left Downing Street last May, it was down to just over 11% of the economy, with a workforce of 2.5 million.'²

The episode may be judged as the greatest economic disaster in peacetime for any European country. All of Europe found its manufacturing diminished, but no other country suffered such a slaughter of its manufacturing capacity, or corporate strength, or skilled workforce.³ Labour ministers often commented on the inexorable tide of 'globalisation', of which offshoring was a major part, but they failed to anticipate, recognise, identify or even halt the huge, destructive impact on UK manufacturing and engineering sectors.

Now, some two decades later, a variety of factors has reduced the early advantages of offshore production. A modest number of UK companies have decided to bring manufacturing of their goods back to the UK, or to eastern Europe. This is known as 'reshoring'.

UK Government Policy

The trend towards reshoring first gained momentum in the US approximately five years ago, and in 2014 the UK Coalition government declared its support for the phenomenon in the UK. The Engineering Employers Federation claimed that, in 2009, 15 per cent of companies who outsourced had returned some or all of this work to the UK.⁴ More recently, in 2012, a further survey by EEF indicated that ‘up to 40 per cent’ of those who had taken work overseas were bringing some or all of it back.⁵ However, this survey had only 271 respondents, according to EEF official Mark Swift.

In January 2014, UK Trade & Investment joined forces with the Manufacturing Advisory Service (MAS) to launch Reshore UK, a one-stop-shop service to help companies bring production back to the UK.

In July 2014, in a presentation to the North East Reshoring Conference, the Department for Business Innovation & Skills (BIS) said Reshore UK would be taking a broad approach to maximising the ‘opportunities for rebuilding industrial capabilities, strengthening supply chains and winning back jobs more widely’ provided by the emerging trend of reshoring. Location decisions are becoming more complex and finely balanced, said a spokesman.

BIS believes wages in China rose by an average of 15 per cent between 2005 and 2011 and are predicted to rise fourfold by 2030. As well as helping firms to bring back offshored production to the UK, Reshore UK is also helping UK firms to win contracts back from overseas suppliers. This includes working with overseas investors to anchor and expand local supply chains through Reshore UK’s ‘location and matching’ services and providing support for capital investment through the Advanced Manufacturing Supply Chain Initiative (AMSCI). BIS said Reshore UK was ‘already working with a total of around 100 companies’.⁶

In October 2013, the Manufacturing Advisory Services’ Barometer survey suggested that one in nine SMEs had ‘reshored work in the past year’.⁷ The survey by MAS said companies had cited costs, quality and reducing lead times as the top three reasons for moving production back to the UK. UKTI will use its global networks to attract foreign companies to invest.

In announcing the initiative, the Business Secretary Vince Cable said: 'British industry is coming home. Over the last few months I have welcomed many companies who have taken manufacturing, textiles, call-centre work or software abroad, bringing jobs back to the UK. This is a sign that diverse, high-quality British manufacturing is on the rise once again.' Mr Cable said the UK Government would offer '£100 million worth of support to help UK manufacturers reshoring work to the UK'. He added: 'A strong manufacturing sector is vital to a balanced economic recovery, and I want to ensure that Britain's supply chains are up to the task of supporting the sector in the long term... Our industrial strategy, which has given business the confidence to invest, is paying dividends in the reshoring we have seen so far. We will continue to support businesses to secure more highly skilled jobs and a stronger economy.'⁸

The £245m manufacturing supply chain initiative

In addition to the Reshore UK unit, the Government has attempted to strengthen the UK supply chain – and stimulate home production capacity – by announcing a Manufacturing Supply Chain initiative worth £245m.

One example of the scheme in action involved the Nottingham-based JCB supplier AH Garner. In June 2014, supply chain funding enabled it to extend its capacity by investing in a new large CNC lathe. AH Garner is a leading manufacturer of hydraulic cylinders and also offers a subcontract manufacturing service.

The Manufacturing Supply Chain initiative is designed as an incentive to assist organisations in increasing the global competitiveness of UK manufacturing supply chains. The scheme also covers support for research and development, skills training and capital investments. It aims to encourage sustainable collaborative partnerships between supply chains, and entice major new suppliers to locate themselves within the UK and integrate with its economy. In turn, this will create new job opportunities and strengthen the UK's contribution to innovation throughout the manufacturing sector. However, one problem with this sort of scheme is that it often benefits importers of manufacturing equipment, which is now largely made abroad. AH Garner used its grant funding to purchase a new, Korean-made Hwacheon CNC lathe, not a British one.

The UK government also highlighted Somerset-based Numatic Ltd, maker of the ubiquitous Henry vacuum cleaner, which has brought production back to Britain from China. Other companies include Santander bank, which has recently brought back its call centre to the UK, and the makers of the Raspberry Pi computer, who have relocated production from China to Pencoed in Wales. Sony UK announced that it had built a million Raspberry Pi computers in South Wales for element14.⁹ Next, Aston Martin, moved production of its Rapide S model from China to the Midlands. Food firm Symington's has brought back the production of its pot noodles from China to Leeds.

Early examples of reshoring to the UK included Laxtons Ltd, the spinning company which has returned production to Yorkshire, cutting lead times and increasing control over quality and raw materials. Marks & Spencer's unveiled its 'Best of British' men's wear and women's wear collections in October 2013. The range, it said, was part of a three-year deal with the British Fashion Council (BFC) to support domestic designers and craftspeople, as well as increasing the company's sourcing from the UK.¹⁰ Sir Philip Green announced that he planned to get more British-made garments into his Topshop empire, but no figures were forthcoming. In June 2013, Harvey Ellis, head of manufacturing at furniture retailer DFS, said the firm was switching production to the UK. An *Observer* article stated: 'In three years DFS has toned down its Chinese activities to join the march of the makers, increasing UK production by a quarter.'¹¹

Large firms have also announced reshoring schemes. Pharmaceutical firm GlaxoSmithKline brought back the manufacture of a steroid called betamethasone, used to treat eczema, to its Montrose, Scotland, facility. By the end of 2014, the company said it would choose one of four UK sites for its new biopharma facility, GSK's first new UK factory for 30 years, and in October the town of Ulverston in Cumbria was selected as the new site. Earlier, in 2012, Sir Andrew Witty, chief executive of the pharmaceuticals giant, declared that the government's new tax treatments of patents, as well as the decrease in corporation tax, 'have swung the balance towards the UK'.¹²

In July 2013, high street giant John Lewis announced a major push to repatriate its manufacturing to British shores. It planned to increase sales of British-made goods 'by at least 15 per cent by 2015 to £550m – more than 12 pc of annual revenues'. The drive is one of the biggest yet to bring back manufacturing to the UK and

would see more textile production withdrawn from current suppliers in Turkey and Portugal.¹³ At present only 10,500 out of the 350,000 John Lewis products on sale are British-made, although the number of UK suppliers has swelled in the last year. Almost 210 UK firms now supply the retail chain, up from 132. 'We think our customers want to buy British if they can,' said John Lewis's MD Andy Street. 'A big area for us is home-based: our fitted kitchens are made in Birmingham, we have beds made in Leeds. We want to help British manufacturers to grow their share as much as we can.'¹⁴

In 2014 Vince Cable said that a survey of SMEs by the Manufacturing Advice Service, commissioned by his department, found that '11 per cent of those questioned had reshored production back to the UK in the past 12 months. This compared with five per cent who sent production overseas.' He commented:

One of the most striking features of the reshaping of the British economy which took place since the 1970s was the loss of much of our manufacturing industry. Some four million jobs were lost in the last 30 years. Cheaper labour and lower operating costs overseas, combined with a serious loss of domestic productivity, rendered it impossible for Britain to compete across a range of industries. Textiles and clothing, toys, shipyards and other industries migrated overseas. But in the last few years we have started to see a reversal of this trend. A combination of global trends and a more favourable domestic environment, helped by a stable investment climate and a competitive exchange rate, have led to early signs of jobs and supply chains returning to the UK from overseas. Britain's manufacturing is becoming great again.¹⁵

Ahead of the World Economic Forum in Davos, Switzerland, in January 2014, Prime Minister David Cameron visited Vent-Axia, a manufacturer of ventilation products, which had moved some of its production capability from China to Crawley, Sussex. In a speech at the conference, the Prime Minister said Britain needed to seize the opportunity to persuade companies to relocate manufacturing and production jobs to the UK:

To win these jobs we need to understand what is driving these changes. Part of the story is about rising costs in the emerging markets, a natural consequence of these economies developing and their people becoming

wealthier. At the same time, there are a number of factors pulling companies back home. Some companies are choosing to locate production nearer to their consumer markets in the West. By shortening their supply chains, they can develop new products and react more quickly to changing consumer demand. More customisation. More personalisation. Better customer service. I want Britain to seize these opportunities. I think there is a chance for Britain to become the Re-Shore Nation.¹⁶

The US Experience

The father of the American reshoring movement is Harry Moser, founder and president of the US-based Reshoring Initiative, a non-profit organisation. According to a report published by the Reshoring Initiative in July 2013, higher wages have been the main reason for most of the reshoring activities by US companies. High-profile companies such as Caterpillar Inc, Google Inc and Ford Motor Co have followed the reshoring trend, but finance professors and business consultancies in Shanghai warn against overplaying the situation.

In August 2014 the Reshoring Initiative claimed that 'for the first time in decades, new reshoring is at least balancing new offshoring: the US is now reshoring about 50,000 mfg. jobs/year'. The trend, which is rapidly gaining currency in the US, was kickstarted by a large-scale plan from retailer Walmart to relocate large amounts of manufacturing back to the US.¹⁷

Other reasons stated by US companies for leaving Asia were the unfavourable exchange rate, quality issues, freight costs, delivery problems and deadlines not being met. Reshoring Initiative has so far logged more than 2,500 media and corporate stories about US firms that have either reshored, or are considering it. Examples covered in the media include Sleek Audio LLC, which took manufacturing jobs back to Florida after losing hundreds of thousands of dollars in scrap – and more in lost sales – because of poor quality control in China. Scovill Fasteners Inc said its repatriation to Georgia was due to rising salaries in China and the fact that a quarter of its Chinese staff had failed to return from their annual holidays.¹⁸

The US Economic Development Administration's Make it in America Challenge is a \$40 million initiative providing grants to support reshoring projects. Other drivers compelling companies to jump ship include high oil prices, which make international shipping more costly, and friendlier investment climates in the US.¹⁹

Mr Moser has said: 'Current research shows many (US) companies can reshore about 25 percent of what they have offshored and improve their profitability.' He provided statistics showing that the number of manufacturing jobs offshored from the US grew by 100,000 to 150,000 annually from 2000 to 2008, compared with about 2,000 a year that reshored. That equation, he claimed, has since changed

dramatically to between 30,000 and 50,000 jobs a year being offshored versus 30,000 a year that are reshoring. If true, this illustrates how the mass exodus out of the West five years ago has been replaced by a growing sense of equilibrium. 'New offshoring is down 70 per cent to 80 per cent, and new reshoring is up about 1,500 per cent,' he said.²⁰

In recent years Washington has not been afraid to voice fierce objections to offshoring by American firms. Companies have been heavily and vocally discouraged from 'exporting jobs' and offshoring by the proposed Call Center Worker and Consumer Protection Act. If passed, the Act will make companies who offshore call-centres ineligible for any indirect federal loans or loan guarantees for five years. The legislation also would require overseas call-centre employees to reveal their location to US consumers and give them the right to be transferred to a call-centre in the US.²¹ There are more restrictive measures in place already at a state level. For example, in Arizona any transaction via a call-centre where the operator does not disclose their location can be voided. The Florida senate passed a similar bill requiring disclosure of location in the first 30 seconds and before any personal information is disclosed by the customer.

President Barack Obama said in January 2014: 'Ask yourselves what you can do to bring jobs back to your country, and your country will do everything we can to help you succeed. I will stop giving tax breaks to companies that ship jobs overseas, and I will start giving them to companies that create good jobs right here in America.'²²

There are several statutes already in force in the US, and many more pending, such as the Health Insurance Portability and Accountability Act (HIPAA), in the case of electronically stored or transmitted health related information, and the Gramm-Leach-Bliley Act (GLBA) which restrict the movement of data or at least mandate clear accountability and responsibility for companies operating in offshore locations.²³

Offshoring to China

Rising costs in China

In the past few years a series of economic circumstances has undermined the competitiveness of China's huge manufacturing sector. First, labour costs have risen by between 15 and 22 per cent a year, eroding its overall cost advantage. China has recently introduced a minimum wage, for example, and nearby countries such as India, Thailand and Vietnam are planning to follow suit. Secondly, a rise in automation and the advent of 3D printing techniques in the West has helped to narrow the difference in manufacturing costs between China and the rival continents of North America and Europe.²⁴

However, there are dissenters from this view. Tim Leunig, economic historian at the London School of Economics, told *The Financial Times*: 'Reshoring will not happen - in China 34 million urban factory workers are paid an average of \$2 an hour. A further 65 million in town and village enterprises average 64 cents. They would be delighted to work for \$2. Chinese wages will rise but the potential supply of low-cost Chinese labour remains elastic.'²⁵

China is a rapidly emerging major market for US-branded goods. The Chinese middle class alone comprises 350 million people and is growing rapidly. Other Asian nations are also developing rapidly, making Asia the largest growth market by far of any region in the world. Gathering and analysing market data and determining key trends is critical to manufacturing location and localisation decisions, particularly for consumer products. For example, you may be manufacturing and selling mint-flavoured toothpaste in the US, and tea-flavoured toothpaste in Asia.

But, as most manufacturers will attest, salaries are only a small factor in the overall cost of production. The increasing cost of raw materials, transportation and the complexity of supply chains are also major considerations. It has taken harsh lessons in reality to educate companies that, when considering offshoring, the fully loaded cost, not just the unit cost, has to be identified. Aside from the increasing costs already mentioned, there have always been 'hidden' costs associated with offshoring that, when considered, paint a slightly different picture.

Fears about China's stability have also given some firms, especially those in the US, second thoughts about maintaining production there. The Chinese government reports tens of thousands of protests around the country every year, many violent and involving masses of people. Such protests seem surprising in an authoritarian state with a growing middle class and manifest materialism.²⁶ There are daily battles over the seizure of land from farmers for speculation and development; all conditions that Chinese authorities fear could ignite something beyond control. Secondly, China is on a precipice of a demographic challenge, with a rapidly ageing population. The one-child policy formalised in 1980 still applies. In a state that provides almost no social welfare net – no pensions, no health care – the growing prosperity that is producing an ageing population will evaporate for the elderly, who will depend on a diminishing number of working-age people to care for and support them.²⁷

Managers in the West have begun to analyse the 'total cost' of offshoring to China and discovered that the savings on home production are much smaller than they had expected. Unforeseen costs in set-up and on-going management can affect costs. The bargain-basement labour rates that tempt firms to move operations to India or China tell only a fraction of the story about cost savings related to offshoring. In reality there are a lot more hidden costs involved in this process. It can take years of effort and large up-front investment to reach that optimum cost-saving phase.

The London-based outsourcing experts Elix-IRR Partners said that while 'offshoring has been an excellent and proven management tool for improving cost, productivity and quality – a consideration of near-shore delivery should be part of any location and/or sourcing decisions and increasingly, we believe, companies must diversify their portfolio of near-shore and offshore operations in order to minimise economic, operational, geopolitical and cultural risk, while optimising competencies and costs'.²⁸

Lastly, the growing number of territorial disputes between China and neighbouring countries such as Vietnam and Japan over maritime issues such as deep-sea oil drilling, fishing rights and ownership of remote groups of islands has led one UK finance house to issue a warning to British companies that manufacture solely in China. Its director, who asked to remain anonymous, said: 'In future we will mark

as “higher risk” any British firm that has put 100 per cent of its manufacturing in China, and which has no immediate access to production alternatives.’

Back in 2011 Business Secretary Vince Cable commented: ‘Recent economic and natural shocks such as the ash clouds, tsunami and Japanese earthquake have shown the fragility of long distance and single-source supply chains. I want to seize on the increased preference that big global companies are showing for co-locating key elements of their supply chains with their UK manufacturing operations.’²⁹

The risks of doing business in China

While many Chinese manufacturers have undertaken the task of making European goods in huge quantities with exceptional skill and speed of delivery, a significant number of British SMEs have encountered numerous problems in the process.

Nick Jones, sales director at electronic components firm Wilson Process Systems, based in Hastings, summarised his experiences:

Payment terms can be unfavourable; cash up front, before shipment, is normal. Hence the quantity of goods in transit at any one time can place a strain on finance. Customs tariffs are charged at the time of importation, adding an extra challenge to cashflow management. Returning any manufacturing rejects for repair is known to be difficult and in some cases is prohibitively expensive. Some OEMs [original equipment manufacturers] say they expect to scrap anything up to around 30 per cent of each shipment if repairs are not possible locally. As the cost per unit continues to rise, this level of waste can become unsustainable. This is an aspect of managing the supply chain that is often overlooked; the cost is difficult to calculate until it is incurred.

UK firms have encountered an array of operational problems when outsourcing to Chinese manufacturers. The most common include poor quality production, the length of the supply chain, time delays, rampant counterfeiting and even theft of UK-designed products.

Maintaining quality

The quality of the initial batch of products made in China is usually high quality and meets the specification. Subsequent production runs often see a falling-off in quality. Frequently, the UK firm thinks the products are being manufactured by the contracted supplier but they have in fact been sub-contracted to a third party in China. The UK firm has already sacked its local workforce and cannot bring production home. To stem the flow of poor quality products, the UK firm establishes an expensive control operation to try to weed out the worst offenders.

Optoelectronics expert Dr Martin Lawrence, a former board member of the National Physical Laboratory, said: 'Firms that took manufacturing to China have nearly all met this drop-off in quality and reliability.'

Example 1: Commuter Technologies: Shirt Shuttle

In 2012 entrepreneur Andrew Brundan turned his innovative Shirt Shuttle – a case that keeps shirts crease-free when travelling – into a successful business. In 2014 the business is on target to turn over £1.2m. However, Brundan admits that he has faced a host of challenges since he launched the first Shirt Shuttle in 2011:

It sold incredibly well but after six months it was clear that we needed more products to follow. As a start-up, it was a very tricky position to be in. Last year, we launched the Shirt Shuttle MK2 – an improved version of the first design – and the Tablet Shuttle, which is a hard case for tablets and iPads. But the Tablet was nearly the company's downfall. It's a clever piece of design but it's extremely difficult to make. At the time our manufacturing was being done in China and despite sending specific instructions about how to make the product, these were ignored. We received the shipment four months late, the quality wasn't up to scratch and although we replaced faulty parts we had to withdraw the Tablet from the market.

As a result, Brundan is moving most of Patrona's manufacturing back to the UK.

All our new products will be built in British factories. We've got one factory in the New Forest, one in Cambridge and another in Manchester. It's a great deal easier to get in the car and drive to three different factories in one day. When you compare that to a 10-hour flight to Hong Kong, jet-lag and

communication issues – it makes so much more sense. More businesses should consider bringing their manufacturing back to the UK. If companies make their products here then the money is kept in Britain.

Encouragingly, there's plenty in the pipeline for Patrona at the time of writing. Brundan is in talks with retailers, including Halfords and Harrods, and will be launching a variety of products in the next few months, including a luggage range and the 'etched wallet' – a cardholder that attaches to the back of an iPhone. In the next five years, he would like to develop his range of products and be represented by major retailers internationally. 'We're going to talk to two US department stores, which is very exciting.'

Example 2: Ecoegg

Although the award-winning Ecoegg laundry egg was conceived and designed in the UK, China was initially selected as the source for production and the manufacture of the suite of plastic injection moulding tools required. According to Ecoegg MD Dawn White:

Our tools were designed in the UK but manufactured in China, which is the biggest mistake I have ever made. The supplier cut every corner with the tools during the manufacturing process, and when it came to the production run changes were made to the material specification. The initial samples were fine but the 40,000 production run was carried out using a much cheaper, locally sourced material, which caused a number of problems.

The Engineering Companies Trade Association (GTMA) was approached to find a solution. With the help of the GTMA, Dawn White brought the tooling and production back to the UK. After looking through its extensive membership for the best company to tackle the project on a truncated time scale, GTMA recommended BEC Group, based in New Milton, Hampshire.

The length of the supply chain

Example 3: DiskLabs

In July 2014 Tamworth-based manufacturer DiskLabs started making a speciality bag which prevents mobile phones, tablets and laptops from being wiped or accessed. It has built up turnover to the £2 million mark and now employs 11 staff following the launch of the 'Faraday Bag'. The technology works by using electromagnetic shields to block external static electrical fields, such as mobile phones, tablets or similar devices. Director Matt Jones said:

There is a much greater need these days for businesses to protect their data and we are finding a lot of interest in the corporate sector. We have been selling a lot to mining companies that operate in places such as Africa and China. Their representatives need to protect their devices from being hacked via Bluetooth, so what we have been finding is that a lot of them will place their devices into a Faraday Bag before they enter a meeting to ensure data is protected.

Disklabs now only uses manufacturing companies in the UK, whereas previously it was outsourcing to China, and is aiming to produce between 7,000 and 8,000 bags during 2014. Maxine Chapman, adviser at the Manufacturing Advisory Service, the state-funded organisation that helps SMEs to improve their production performance, said:

DiskLabs recognised the need to reconfigure and re-manufacture some of the key products in order to meet client needs so we helped it to achieve this. We shortened the supply chain by introducing the business to not just UK-based manufacturers but ones within the West Midlands, thereby drastically cutting its production costs in the process.

Time delays

Example 4: Elite Electronic Systems

Based in Enniskillen, Northern Ireland, Elite Electronic Systems is a provider of contract electronics manufacturing services to customers all over the world. In

2005, Elite made the decision to source cables from China, which previously were manufactured in Enniskillen, with the expectation of large cost savings. After a lengthy process to select a Chinese partner, which included several trips to China and selecting, auditing and validating potential suppliers, a partner was chosen.

Initially things were good and the process ran smoothly, although even at an early stage lead times were an issue and, in order to shorten times, Elite shipped components to China. However, various issues started to emerge in the course of time: product quality decreased, costs started to increase, lead times increased, shipping times and costs increased, and communication difficulties were also increasing. Elite also found that an elongated supply chain made coordination with customers difficult, and prototyping and product development was also proving challenging. The project was making small savings, but at what cost? Concerns were further magnified during the global downturn, when a culmination of issues meant that the firm went from carrying two months' worth of stock to twenty months' worth. This resulted in cash-flow issues, component and product obsolescence and warehousing costs.

Meanwhile, back in Northern Ireland, Elite had invested in new, more efficient equipment and, through lean manufacturing, had developed more-efficient processes. It was clear they could now manufacture at home and still be competitive without compromising other vital criteria like quality, time to market and customer service. The company could also maintain process and supply chain control, have better visibility and minimise risks.³⁰

Example 5: Alucast

In March 2014, a trend for business being brought back to the West Midlands from abroad continued after a foundry reshored £2.5 million worth of business. Wednesbury-based Alucast, which specialises in sand, gravity and pressure casting, has won back business from India and Brazil, continuing a reshoring theme that has created 1,500 manufacturing jobs since 2011. According to MD Tony Sartorius:

Customers want greater flexibility and control over logistics. Even being able to just jump in the car and be at a supplier within two hours is a major bonus. We must also not underestimate our technical innovation and ability to get involved in adding value through design. These are major selling points.³¹

Counterfeiting, IP theft and product duplication

Stories abound of Chinese factories having two production lines – one for export and one for illicit production – with a thin curtain in between when Western executives visit. Protecting products from being copied is almost impossible and global markets are often flooded with fakes. For example, there are many fake golf clubs, a multi-million pound industry in itself, in circulation after many US club manufacturers switched their production to places like China. Some of the copies, having been made to the same specification, are of comparable quality and go unnoticed by the end-user, whilst others are of poor quality, damaging the company image and potentially losing future customers. Either way western companies haemorrhage millions of pounds as a consequence. British companies that have been hit by intellectual property (IP) theft or taken legal action against Chinese manufacturers include Aston Martin Lagonda and Omega Plastics.

In January 2013, the Canadian Broadcasting Corporation (CBC) reported that some of Canada's C-130J transport aircraft had counterfeit Chinese microchips in their cockpit displays. After initial denials, CBC reported that the Canadian defence department confirmed that 'suspect counterfeit parts' had been found by the C-130J aircraft manufacturer Lockheed Martin. An earlier study by the US Senate armed services committee concluded in 2012 that the parts were more likely to fail and cause such results as blank instrument screens during flight.³²

Example 6: Aston Martin Lagonda

Luxury sports car manufacturer Aston Martin had to recall more than 5,000 cars after discovering that its throttle pedal arms were made with counterfeit materials from China. This was later expanded to include more than 17,000 cars. The cars' throttle pedals were assembled in Swindon, Wiltshire, by Precision Varionic International. The latter in turn gets its parts from Fast Forward Tooling in Hong Kong. In this case, Fast Forward Tooling subcontracted the moulding of pedal arms to Chinese firm Shenzhen Kexiang Mould Tool Co, which then bought its allegedly counterfeit material from Synthetic Plastic Raw Material Co. in the Chinese factory town of Dongguan. Aston Martin's engineering specification requires pedal arms to be made from a specific plastic supplied by DuPont (DD). Some cunning folks at Synthetic Plastic Raw Material had in fact been allegedly shipping out materials in bags labelled as DuPont PA6, but those bags actually contained an inferior imitation plastic.

Although no accidents have been ascribed to the glitches in the accelerator pedals, Aston Martin issued the recall out of safety concerns. The plastic used in the manufacturing of the pedal was not of industrial quality and as such could break under force.³³

Example 7: Omega Plastics

In 2006 Omega Plastics was bought out of administration by MD Dave Crone and chairman Chris Thompson. In January 2011 this plastics company quadrupled staff numbers and in May 2012 it opened a new factory in Hartlepool.³⁴

The firm, whose clients include Reckitt Benckiser, Unilever and luxury car manufacturer Aston Martin, now expects to grow its sales by between five per cent and ten per cent by the end of March 2014, after picking up a number of new orders, including an order for 10,000 Lifesaver bottles – which are able to filter contaminated water into water of drinkable quality – to the Ministry of Defence in Afghanistan. According to Crone:

Our business has continued to grow because although you can get things cheaper in China, customers fear for the safety of their intellectual property in China and that's a big concern in the product development cycle. Our moulding services are often used to prove a concept and make up the final stage in the design process before mass production, so it's vital that the IP is safeguarded.

Example 8: Hype Luggage

In 2012 a costly experience with a Chinese factory prompted CEO Paul Holmes to manufacture his Hype Luggage range in the UK. He explained:

A few years ago, we were 'ripped off' by a Chinese factory. We had dealt with them for 6 to 7 years, and I got complacent, paid a huge deposit and after numerous delays and excuses, no product materialised. The end result was that we were almost broke. We pursued the case through the Hong Kong Police, they arrested the factory owner entering Hong Kong from China, I did the ID parade with the double sided glass and the numbers on the floor in front of the suspects (just like in the movies), we identified him but all to no avail. The saga is still continuing with the Police Complaints Commission in Hong Kong, but we will never see any of the money again.

Now, I'm not relaying this story because I want everyone to think that the Chinese are evil and every single one of them is going to rip you off. In fact, over the years I have worked with some amazing people in China. However, I think that the moral of the story here is that if you are using a manufacturer who is a long distance away, and who you cannot pop in and discuss issues with fluently face-to-face, then eventually there will be problems.

Each piece of luggage from Hype is made with great attention to detail, manufactured from high-quality leathers, and with much of the work carried out by hand. So sure are Paul and his team of the quality of their products that each bag is guaranteed against material and workmanship defects for the life of the registered user, and should an unfortunate accident happen to your luggage then you can also return it to them for repair. As Holmes explained: 'You wouldn't be able to do that with a bag made in China.'

Unsophisticated production in China

Example 9: Bicycle Manufacturing

Experienced cycle-maker Cy Turner launched Bicycle Manufacturing, based in Penistone, Yorkshire. They aim to produce bicycle frames and parts in a range of materials, including carbon fibre, and have spent the past two years working on this. The new company will initially manufacture the Cotic Rocket, a steel-framed full suspension mountain bike, which they intend to sell for the same price as the Taiwanese built frame. They reckon they can be competitive on price with the Far East for producing high-end products. Instead of buying the necessary machinery and tooling off the shelf, they've actually produced their own equipment. They've built their own frame jigs because they reckon the ones available on the market weren't suitable in terms of production capacity, speed and accuracy. They've developed their own automated cutting system for tubes, they've even made their own bespoke heat sinks and argon purge. That's a lot of investment in the equipment.

One of the trump cards in the company's favour is being able to reduce development time. They can turn prototypes and samples around much quicker

than the long lead times of Cotic's current Taiwanese suppliers. And it's not just steel they'll be working with; they say they are able to work with all materials, including aluminium and titanium.

Example 10: Elektron Technology

Cambridge firm Elektron pioneered Checkit sensors that provide wireless monitoring for cold storage, food and hygiene checks, winning orders from Mayfair hotel Claridges and a large US hotel chain. Elektron CEO John Wilson recently disposed of its manufacturing assets in China. He explained:

Our manufacturing footprint in Shenzhen was for commodity product manufacture. With labour costs increasing 20 per cent year-on-year and declining flexibility, it has always been my medium term strategy to exit China manufacturing. The lion's share of our China manufacturing was transferred to our Tunisia plant at the end of last year – where labour costs are almost half of China costs.

Smaller quantity orders

Example 11: OceanLED

Father and son team Nigel and Lee Savage develop an LED lamp for underwater applications. The company broke new ground with its 2005 introduction of the OceanLED Thru-Hull lighting systems – the first to require only a one-inch hole.

In January 2010, OceanLED needed a fast and flexible way to produce low cost, high quality components for state-of-the-art LED boat lights. It turned to UK design firm Proto Labs and its rapid injection moulding service. OceanLED's design engineer Richard Sant said:

Like most people venturing into plastic mass production, we started by using a company in China but became increasingly unhappy with the quality and costs. So we looked for someone who could do a better, faster job. That's when we found Protomold. At the moment, we only order 500 each time. If we were using traditional steel moulds in China we would have to run off thousands just to make the tooling economical.

Example 12: P&B Metal Components

P&B Metal Components has grown from a one-person business in 1961 to a multinational supplier employing over 220 people who work on contract manufacturing and tool making. The company has just turned 50 years old, but perhaps the greater achievement is that more than 40 per cent of its contract assemblies are exported to Asia. Engineering director Phil Penny explained:

This is a fast-paced company, very responsive and progressive. We are all about manufacturing and the philosophy is about how the rest of the business supports that manufacturing.

How can P&B Metals compete against China? The answer: high automation, meaning 30:1 person ratio between Chinese competitors and P&B, as well as its consistent quality. Mr Penny added: 'It's common for us to work into the night and work weekend shifts, to put orders on a plane. That differentiates us in this market. Clearly we can't compete on labour with China, but we far exceed their productivity rates and I believe we get better quality as well.'

Example 13: Surgical Innovations

AIM-listed Surgical Innovations experienced a sharp increase in quality when it brought back its high-tech manufacturing to the UK. Doug Liversidge, chairman of the fast-growing keyhole surgery technology company, believes that the time is right for other manufacturers to do their sums again:

Bringing manufacturing back from China has paid off for us. We have since trebled our workforce here in Leeds and our quality has significantly improved.

Lower production costs in the UK

Example 14: Meridian Audio

Meridian Audio was founded in 1977 by engineer Bob Stuart and industrial designer Allen Boothroyd, and it pioneered digital technology at a time when the rest of the industry was analogue. Thanks to advances in home cinema, multi-room

music streaming and the omnipresence of Apple's iPod and iTunes, home entertainment has never been more digital.

The firm has kept manufacturing in-house and in the UK, when most businesses have outsourced. Stuart is proud to have stuck it out. He said:

I believe passionately that exporting your manufacturing base is not good in the long term. We have skills and people who can make the product better. A company loses flexibility when it gives away manufacturing. We struggled with this, because it was 30 per cent cheaper to produce in the East. Almost all our competitors exported their manufacturing base.

The good news is that making things in the UK is getting cheaper.

Just recently we found we can buy a speaker cabinet cheaper in Yorkshire than in China. That was a moment of victory for UK plc. With the exchange rate, well educated staff and a great skill base you can get products made at competitive prices again.

British Manufacturing: Two Sectors in Detail

Textiles

The death knell of what was left of the British textile industry seemed to occur when Courtaulds' factory in Worksop, which employed more than 1,000 people in its heyday, closed in 2000, and Burberry's Rhondda Valley plant shut its doors in 2007. Ironically, the UK's biggest garment export became the export to China of the machines that did the dyeing, spinning and knitting. By 2007 the Chinese town of Dalang, known as the 'Knitting Sweater Town', collected an enormous number of knitting machines with the ability to produce 1.2 billion pieces of knitwear per year.³⁵ Leicestershire's textile sector was decimated during the 1990s as major retailers, such as Marks & Spencer, moved production to India, North Africa, China and other Far Eastern countries to cut costs and compete with international rivals in 'fast fashion', the term given to cheap clothing aimed mostly at teenagers in western countries. So-called value-players, including Primark owner Associated British Foods and Next, source most products abroad.

Some 90 per cent of the clothes worn in the UK come from abroad, with a net import value of £12.5bn. Britain is still in the fashion game, with a steady stream of world-class designers, quirky supermodels and fast-fashion retail barons, but the actual business of making clothes in the UK seemed dead.³⁶

In November 2012 a conference, 'Rebuilding UK Textile Manufacturing', was held at Clothworkers' Hall in London, attended by 260 industry representatives. Surprisingly, there have been encouraging signs that clothing manufacturing is making a comeback – albeit still on a minor scale.

Britain's fashion trade is a £26bn model of success and supports 4.5 per cent of all jobs. At the premium end of the market, Burberry and Mulberry have been able to carry on producing a higher proportion of their items at home, thanks to the huge profit margins they can command and their ability to cash in on their 'Made in Britain' heritage with overseas buyers. Burberry's cashmere throw was made by Johnston's of Elgin, a leading Scottish knitwear company, while half of Mulberry's leather goods are made in Somerset. Mulberry recently opened a second factory in the West Country, but it says its biggest challenge is that all the skilled workers disappeared when the bulk of clothing production moved abroad 30 years ago. Finance director Roger Mather said:

The key challenge is finding the high level craftsmanship needed. We have had to train workers from scratch and the government has contributed £2.5m under the regional growth fund. When you are buying into Mulberry, you are buying a bit of England – Made in England is a very powerful selling point.³⁷

Remarkably, there has even been a revival in Leicestershire's textile sector. The city's Farago Fabrics is a textile-producing unit and dyehouse run by brothers Harvi and Suki Johal. It is one of 20 companies in the UK producing – actually physically producing – Marks & Spencer's Best of British range, which launched its third collection at London Fashion Week in May 2014.

Last year, HJ Hall – which began manufacturing socks in 1882 – switched a large chunk of production from Turkey to its factory in Hinckley. It means about half of the firm's socks are now made in Leicestershire, compared with 40 per cent previously.

In 2013 the former fashion buyer Kate Hills set up makeitbritish.co.uk, a website dedicated to bringing production back to the UK. In June 2013 she organised the first trade show for buyers, brands, factories and makers, bringing them all together at the Old Truman Brewery in East London. Ms Hills has a database of around 1,000 factories and units, but 'nobody knows for sure what's left of the industry'.³⁸

Bill Macbeth, MD of the Textile Centre of Excellence in Huddersfield, said the recruitment and training of the next generation of textile workers was vital. The workforce in UK textiles is ageing – 54 per cent are over 45 versus 40 per cent overall in the UK. Over 60 per cent of employees have more than five years' experience in the job, which is a strength for now but a major problem in the future when they retire.

There are some encouraging signs. Richard Craig, MD of Margaret Howell, said the brand 'is based on authenticity', and that some '56 per cent of their product is made in the UK, with their 30 suppliers tending to be small specialist mills and manufacturers'.

The benefits of using UK suppliers include the authenticity and tradition of well-made products; the creation of interesting designs; the convenience of location and ease of working; and the commitment of the staff. However, there are also

weaknesses: an ageing workforce; undercapitalised firms; and relatively small sales in home markets.³⁹

Brooks Brothers' network of stores creates a global window for UK products. The company uses a number of British suppliers, including Hawick and Barrie (knitwear), Abraham Moon and Johnstons (fabric).

Camira Fabrics has a dominant market share in the office contract market and, more recently, mass transportation fabrics. The company encountered issues with poor quality off-shade yarns, and decided to create a joint venture with its major supplier, Holmfirth Dyers, to establish the first dye house built in the UK for over 25 years. Park Valley Dyers has state of the art machinery, is environmentally benign and quality has improved significantly.

In February 2014 a new clothing business, the AMA Group, opened in County Durham, bringing with it over 100 jobs. The founders are hoping to re-start the North-East rag trade, which largely disappeared in the 1990s.⁴⁰

In 1999, 4,000 jobs in the textile industry in the region were lost, with companies such as Berghaus in Washington, North Tyneside's Textillion, JPS in Washington, Bairdwear in County Durham and Claremont Garments on Tyneside and in Durham all shedding jobs or closing operations.

Textile machinery manufacturing, once a substantial sector in the UK, is now a shadow of its former self. But a determined hard core of firms have survived, said Alan Little, director of the British Textile Machinery Association. According to Mr Little:

Virtually all of today's textile manufacturing processes – from the carding, spinning, weaving, knitting, tufting and nonwoven bonding of fibres through to advanced colouration, finishing and printing techniques – can be traced back to British patents and research and development somewhere along the line.

Electronics

Back in the mid-1990s, the UK had around 200 electronics components manufacturers; today there are only a few dozen stalwarts left. Specialist, high quality electronics manufacturing in the UK continues, but the manufacturing model

of endless rows of standard products on a line has long been abandoned. Low volume production is common, mostly focused on the defence, security and aerospace or healthcare and life sciences sectors. The products require highly complex manufacturing processes with strict regulatory compliance standards.

Using a UK-based prototyping facility will give a company direct access to engineers, operators and technicians that they may not have in-house. This close proximity to the design team is critical in reducing the overall design cycle time. Proximity to a home market is also key, according to Barclay McKenna, European marketing manager at Omron Electronic Components Europe. Companies are increasingly locating manufacturing close to demand, often in more than one location: 'Europe currently uses more consumer electronics than it manufactures, so could end up being a net beneficiary of this trend.'

John Bowman, marketing director for semiconductor products at Anglia Circuits, pointed out that small size was not a disadvantage in electronics production: 'Small/medium volume manufacturers have recognised for some time the value of a short supply chain, and it seems that this thinking is creeping up the supply chain. Asian labour costs are rising, leading to increased use of automation, and obviously it costs little more to operate a machine in the UK than it does in the Far East.'

Chris Shipway, country director at Avnet Memec, said: 'I'm not seeing any great trend for large scale manufacturing projects being brought back on-shore. We are seeing some evidence that small to medium scale manufacturing is on the increase, however.'

Adam Fletcher, chairman of the sector support group Electronic Component Supply Network, said: 'Whilst there is some evidence of reshoring taking place between China and Eastern Europe and returning to Mexico from China, this is having little impact on the UK market. What we are seeing is greater thought about the impact on total acquisition cost of offshoring. This is resulting in some projects remaining in the UK / Europe, which is sensible and likely to continue.'⁴¹

Much to the amazement of many observers, PC manufacturing has not only survived but also thrived in recent years due to a small elite of British manufacturers. Rafi Razzak, owner of UK IT giant Centerprise International, said

his industry was 'back with a vengeance' and more than capable of competing with China's production lines:

By the year 2000, some of the bigger boys wanted to grow their market share. But in the last three or four years we've seen the revival of the desktop in the UK, not only in the gaming arena but in business. The bigger boys are aiming at market sectors, but when it comes to custom configuration, being able to react and smaller volume, their model doesn't work very well. If I'm going to make 100,000 computers all the same, I'll go to China. But that's not the market. Not in gaming. People want choice. And that's why the desktop is alive again today – because no large manufacturer could meet the needs for 100 to 1,000 custom computers.⁴²

Other firms manufacturing PCs on home soil include YoYoTech (which Centerprise acquired in 2013), Overclockers and Scan Ltd. Overclockers UK executive director Steve Ling said:

If you look back to a few years ago, you had a lot of big companies doing big volumes, but the market wasn't focused so much on the high-end PCs at the time.

Scan builds around 1,000 high-end systems every month. James Gorbald from Scan's technical marketing department said: 'Our customers demand individually tailored systems, so we manufacture in the UK – other lead times to market would be too long.'

The Future

Training programmes

In recent years the UK government has recognised the scale of the loss of the manufacturing base, with the destruction of hundreds of thousands of jobs, and has taken steps to 'rebalance' the economy. However, without a pool of skilled labour, some politicians and civil servants have realised that a revival in manufacturing will not take place. This means that skills training is critical if manufacturing is to be re-established on any scale in the UK. Despite relatively high unemployment in Britain, especially among young people, there is a marked shortage of skilled manufacturing workers.

For the past two years, Josh Younger, 19, has been learning how to fuse heavy steel pipes used in nuclear power plants at the Alstom plant in Stafford. The job, called high-integrity welding, is essential to Britain's heavy engineering sector.⁴³

A third of employers across Europe have said that the lack of skills is causing major business problems in terms of higher costs, insufficient quality and lost time, according to a recent survey by the consulting firm McKinsey. At least 27 percent of the 2,600 companies surveyed said they had left an entry-level vacancy unfilled over the past year because there were no eligible applicants.⁴⁴

But manufacturers also complain that the commercial skills, motivation and self-discipline of young people are not sufficient to enable them to complete an apprenticeship. One executive at a manufacturing company told of a young woman who asked to start the workday at 10 a.m. because she was not an early riser and to finish before 4 p.m. so that she could get home for her favourite TV show.

The great majority of the students graduating from the new universities created or boosted under Labour after 1997 have no practical engineering or manufacturing skills. However, in 2014, the situation is starting to change for the better. The Coalition government authorised the setting up of more than 50 university technology colleges, or UTCs, in which 14-18 year olds will be taught skills in engineering, manufacturing and industrial design. Thirty UTCs are now up and running. Founded and vigorously supported by the Baker Dearing Educational Trust – which itself was founded by former Tory education secretary Lord [Kenneth] Baker and higher education grandee Lord Dearing – the UTCs have

been widely welcomed by SMEs, and by young people who want a practical, not a theoretical, education.

Open Days held by UTCs in Swindon, Greenwich, Sheffield and Norwich to select new students have been so popular that additional days had to be organised. The move has been greeted with delight by SMEs. The trust states that: 'by 2016 more than 30,000 students will be able to follow this new technical education pathway'.⁴⁵

Specialist courses have also been started in recent years. In 2014, a new Bradford College degree produced the first foundry graduates in the UK for 20 years. Carl Baker, quality assurance manager at Skipton's Brooksbank Valves, was among the first three students to graduate with the college's new foundation degree in casting technology, designed in partnership with the Institute of Cast Metal Engineers (ICME) to 'educate the future technical leaders the industry needs'. It is a start.

Example 15: Brompton Bicycle

All employees at Brompton Bicycle, which is based in Middlesex, near London, start out as apprentices on the factory floor. The system helps to ensure that the intellectual property and craftsmanship stays in Britain. The apprenticeship system it started more than 20 years ago has helped turn a small builder of handmade foldable bikes into a global leader in that category.

Liam Brooker, who started as an apprentice at age 19, is now, six years later, Brompton's star at brazing, a complex form of welding that is key to keeping the bikes' frames supple and light. 'Brompton has made the rule that "Made in England" involves highly skilled people,' Mr Brooker said. 'It makes me proud when I see a Brompton bike. It's a real craft.'

New technologies

'Connected production'

In 2013, 'Industry 4.0' was launched as a key new concept at a major trade fair in Hannover, Germany. The concept is a combination of so called 'cyber-physical' concepts and systems, such as the Internet of Things, M2M (Machine to Machine) and cloud computing to create a more intelligent factory – based anywhere in the world – and with a skeleton workforce.⁴⁶

Virtualised technology such as Cloud and IoT are a first step towards making 'geography irrelevant'. M2M is a similar step towards improving flexibility in international manufacturing. If you have facilities in Asia this could make it easier to track what is going on there, in the way you can manage and measure the facility 100 metres from the office.

Increasingly, Asia may be seen as the place the West should be focused on selling to, not just buying from. This means building factories there to produce product for the local market rather than simply using the region as a way to make products for Europe more cheaply.

3D printing: the saviour of British industry?

3D printing, the technique of creating near-perfect parts and products via additive printing with very little human involvement, has been hailed as a potential 'equaliser' in global manufacturing – the ability to manufacture products at the same or lower cost than companies in China 'on demand'.

In the Gibson Index there are 149 UK design and prototyping companies currently active in 3D printing. The monthly magazine *Design Products & Applications* is filled with case studies about the impact of 3D printing on production costs, efficiency and repeatability.

UK firms such as Fripp Design, 3T RPD, Hobs Reprographic and Croft Additive Manufacturing provide prototyping services to manufacturers, helping to telescope the time it takes to develop new products. Even Denby Pottery has invested in a 3D printer in the preparation of its casual tableware.

The leading company in the UK in 3D printing is Ion Core, based in South Molton, Devon, which launched its Zinter Pro printer at the vast CeBIT trade show in Hannover in early 2014, an event jointly opened by PM David Cameron and Chancellor Angela Merkel. Its home-version printer costs only £1,499, and the results are of equal quality to those created by American-made printers.

However, China is also very interested in 3D printing, perhaps more than many nations in the West. According to the Wohlers Report, an industry bible of additive manufacturing, the Chinese government is investing \$245m (£153m) in a seven-year project to create a 3D printing industry. Beijing wants to set up ten institutes for the industry. Japan and Singapore are also investing in creating a 3D

infrastructure. The report quoted an expert, who said: 'Every time we organise a 3D printing seminar, hundreds of people show up.' Hong Kong's plastics injection moulding industry, for example, is paying close attention, as it sees the low-cost advantages of its mainland Chinese factories disappearing rapidly.⁴⁷

For UK companies 3D printing is still in its infancy, with around two dozen companies involved in high-level manufacturing techniques.

Reshoring or near-shoring?

While reshoring involves the return of manufacturing to the UK, 'near-shoring' is defined as moving production to a lower-cost locations closer to home turf, such as eastern Europe, or to Mexico and Puerto Rico for US-headquartered companies. In the UK there is evidence that regional cities such as Manchester, Glasgow, Belfast and Newcastle may have gained popularity. Near-shoring is a real and growing alternative to reshoring for British firms.

Example 16: AWS Group

Electronics provider AWS has recently cut back its UK manufacturing sites and is moving some production to its facility in Slovakia, which offers low production costs, comparable with south-east Asia. The capabilities of two satellite sites, AWS Newbury and AWS Biggleswade, have been incorporated into the company's main 48,000 square feet plant at Newcastle-under-Lyme. The change comes due to increased business at its offshore plant in Slovakia as customers in the high-technology sector move work there in order to take advantage of the lower manufacturing costs in Eastern Europe. AWS Group CEO Paul Deehan explained:

We wanted to focus on our core competencies and concentrate our key capabilities within one dedicated UK site to provide the best possible product and service levels to customers while maintaining our highly competitive pricing structures. We have retained all the specialist skills in what is often legacy and experience-driven work and are now able to show customers our full end-to-end capabilities in one place. This change also enables senior management to focus solely on customers, rather than dissipating effort on the management of multiple and dispersed plants.⁴⁸

Continued offshoring by UK firms

It should not be forgotten that the tidal wave of offshoring may have slowed but it has certainly not ended, as companies seeking to survive take every opportunity to cut production costs.

In September 2013, Intersurgical, a Berkshire-based medical devices manufacturer, invested more than £8.7m in its first wholly-owned factory in China. The company will manufacture airway management, anesthesia, critical care and oxygen and aerosol therapy devices in the facility in Changzhou, Jiangsu province.⁴⁹

A second example is P2i, one of Gibson Index's 'Top 100 Companies of the Future' and a hi-tech supplier of liquid repellent nano-coating used to protect electronics circuits. The firm remains the most successful spinout from the UK's defence agency Dstl/DERA. It recently opened a technology centre in Shenzhen, China. The Abingdon-based company said it is seeing increased demand for its protective coatings on consumer electronics such as smartphones, tablets and wearable devices. Carl Francis, CEO of P2i, whose electronics coatings are used in 50 million devices from Motorola, Plantronics and GN ReSound, said: 'The new Shenzhen facility will allow us to hold strategic meetings with brands and OEMs close to their own manufacturing sites in China.' It is envisaged that the Shenzhen office will start with 17 staff in roles ranging from administration and finance to implementation technicians and process engineers. Peter Rankin, chief operations officer, said:

In January alone, P2i had over a million smartphones going through our nano-coating systems in China. Having local support services means we can respond to any production stresses in a timely manner, while remote monitoring allows us to spot potential issues before they arise.⁵⁰

A third firm is Norwich-based Syfer Technology Ltd, which has been producing hi-tech electronic components including multilayer ceramic capacitors and EMI suppression filters and exporting its products across the globe for more than 40 years. Its products are used in a wide range of industries, including telecommunications, aerospace, automotive and medical. When it was first formed,

Syfer made components for primarily UK consumption, but it has since branched out to supply product globally to Europe, North America, China and Asia. Now, 90 per cent of its customer base is non-UK. In a bid to be more aggressive in the global components market, the company is amalgamating with a sister company and moving its manufacturing operation to China. Syfer's MD Howard Ingleson stated:

This move to Asia is part of a much larger plan for us and it's a major investment. Our R&D will remain in Norfolk, where we will continue to develop innovative products that are at the cutting edge of component technology.⁵¹

Conclusions

Gaining insights into the current state of UK manufacturing and the reshoring phenomenon has not been easy. Overall, the UK government seems unusually ignorant of the structure, status and circumstances surrounding the SME sector of the economy, especially the micro-SME sector of 1-9 employees, where the majority of investment goes unlogged and recorded by any state institution. The quality of data produced by state-funded organisations such as Companies House, the Office for National Statistics and the new Enterprise Research Centre co-run by Aston/Birmingham Universities is, in our view, unacceptably poor.

The weakness of the National Audit Office is also marked. At an event organised by the Westminster Higher Education Forum at the Royal Society in London on 27 March 2014, Dr Sally Howes, Executive Leader, National Audit Office, stood up and unveiled its list of the top ten sectors in the UK by R&D expenditure. Food & drink, almost certainly No.1, or No.2 on the list, on a par with auto engineering expenditure, was omitted.

Today, the companies that have reshored, such as Start-rite Shoes or security equipment maker Pyronix, stand out as isolated examples in their sectors. A wider trend has been the decision by many more existing UK manufacturers to manufacture at home, occasionally via a Government supply chain grant.

Origin Global, a UK manufacturer of bi-folding doors, has opened a new production facility at its headquarters in High Wycombe, Buckinghamshire as part of the company's expansion plans. According to Neil Ginger, CEO at Origin:

UK manufacturing looks set to be on the rise, and we have found the demand for products carrying the 'Made in Britain' badge has never been stronger. The new factory has enabled us to expand and cope with the extra demand, while improving efficiency, through the new flow-line process, enhancing the overall quality. By investing in the new production facility, we hope to uphold our record for constantly delivering to customer lead times as part of our strategy for growth in the year ahead.⁵²

Certain sectors of the UK economy have flourished in recent years. For example, the remarkable revival of the UK auto sector has helped local firms to increase production. The recent success of Jaguar Land Rover has helped put new millions

into the back pockets of the surviving auto components companies. Jaguar Land Rover's drive to re-shore tooling and components created an immediate need for additional wire EDM capacity at Pontypridd Precision Engineering, based in Ferndale, South Wales. PPE was established in 1988 by MD Mal Price. The family-owned and run business, which also operates CNC machining and turning centres, employs 20 experienced staff.

Most notably, the No.1 manufacturing sector in the UK – food & drink – has been largely immune to the temptations – or ravages – of offshoring. A recent massive rise in smaller, specialist food & drink manufacturers, located in almost every corner of the UK, has been matched by a renaissance in British cuisine. Employment across the sector of the skilled, semi-skilled and unskilled has grown rapidly, again across nearly all of the UK.⁵³

Oddly, the UK government has only recently been made aware of the strength of the food & drink sector – not least because its policies had virtually no impact or influence on its success.

If there were a truly strategic initiative to reshore production by UK companies, could the current workforce cope with this new demand? Today, a manufacturing worker is required to be a technical expert and to be able to operate some of the most sophisticated equipment in the world. They need to cut steel with lasers, water jets and plasma cutters and programme robots to paint, package and palletise products. Operation of automation equipment is highly skilled and errors are extremely costly. In many industries semi-skilled and nearly all unskilled jobs have been eliminated by the widespread adoption of robotics and automation.⁵⁴

A top-to-bottom re-training programme by West Midlands-based Alucast illustrates what UK manufacturers may need to do in order to win overseas orders. MD Tony Sartorius ordered the biggest training scheme in the firm's 47-year history, which saw everyone from directors down 'upskilling'. The firm put 73 of its workers through a comprehensive programme that has delivered diplomas in Business Improvement Techniques (BIT) and a host of adult apprenticeships.⁵⁵

The Office for National Statistics stated in October 2014 that UK unemployment totalled 1.97 million, a fall from 2.5m, or 8%, towards the end of 2009.⁵⁶ In spite of these figures, apprenticeship places remain unfilled and the level of skilled workers in many manufacturing facilities is still well below that required. Key factors such as

the ageing population will mean a shortage of skilled labour. Maintenance is an area of particular concern.

Manufacturing production capacity in the UK is relatively small, and little of that is spare. It is likely that much reshored manufacturing will move to low-cost economies in Eastern Europe such as Poland, Bulgaria and Czech Republic, or to Asian nations such as Indonesia and Vietnam. Whenever manufacturing is reshored to the UK, many of the new machine tools required to produce the goods will have to be imported. The UK's machine tool industry, represented by the Manufacturing Technologies Association, has shrunk to a fraction of its original size – employing just 9,500 nationwide.⁵⁷

A key factor in re-balancing the economy to favour engineering and manufacturing compared with service industries is the state of the UK property market. The sad truth is that UK industrial companies must work very hard to produce goods that are worth more than the four walls of the factory in which they are made. Soaring UK property and land prices since 1997, and rises under earlier Tory administrations, have long been recognised as a 'bubble'. Yet, even in 2014, the governor of the Bank of England, Mark Carney, who took up his position in July 2013, has shown no enthusiasm for raising interest rates and thereby stabilising or, at last, forcing down property costs. In 2014, prices of housing in Scotland, the East Midlands, the West Midlands and the South West joined those in London, the East and the South East in having price levels higher than before the global downturn struck in 2007/08, according to the Office for National Statistics. Property costs across Europe tend to be lower, often far lower, than those in the UK, with the possible exception of Italy. Alongside unlimited cheap imports from China, excessive and unrestrained rises in property prices – much encouraged by the Blair/Brown Labour government – have been the principal enemy of British manufacturers.⁵⁸

Why is this? Under John Major's government, investment in light manufacturing, entrepreneurial engineering companies and micro-manufacturing SMEs, spinouts and start-ups was significant. Much of the investment in SMEs under Labour has been in the IT/digital sectors – where little capital equipment is required and initial costs are negligible compared with manufacturing start-ups.

Investment in manufacturing micro SMEs – defined by the European Commission as companies with up to 10 employees – largely disappeared in the UK after 1997 when property prices were hugely overstimulated by exceptionally low interest rates. The most recent report by the Commission into the health of SMEs across Europe confirms slow growth continent-wide.⁵⁹

Today, it is arguable that, unless interest rates rise to at least seven per cent again, engineering and manufacturing can never truly compete for capital as an asset class against the many advantages of investing in property. If this situation were allowed to continue for much longer it would be a tragedy for UK plc, for UK manufacturing and for our future export/balance of payments performance.

Conditions in the UK sharply militate against the resumption of production in key sectors which largely disappeared in the UK from the mid-1990s onwards, such as textiles, toys, building products and consumer goods. The British SMEs that do bring production home are likely to be a small number of manufacturers, such as Mulberry, which make high quality, high margin items.

As a result of all the combination of all these factors, we must sadly conclude that only a tiny part of current production in China will be returned to the UK during the next five to ten years.

UK companies that have engaged in reshoring as of August 2014

Alucast Ltd	JJ Churchill Ltd
Amtek Plastics Ltd	Joules Ltd
Antico Ltd	Keebunga Ltd
Antler Ltd	Kiravans Ltd
Apex Fluid Engineering Ltd	Laxtons Ltd
Aston Martin Lagonda Ltd	M&S plc - Best of British collection
Barkley Plastics Ltd	Martin's Rubber Company Ltd
Bathrooms.com	Mulberry Ltd
Bee Health Ltd	N Brown Ltd
BT plc	New Call Telecom Ltd
Brinsea Products Ltd	Numatic International Ltd
Caldeira Cushions Ltd	OceanLED Ltd
Patrona Ltd - Shirt Shuttle	Oxford Diecast Ltd
Core Products Ltd	Paper Cup Company Ltd
DiskLabs Ltd	Patrona Ltd
DVR Ltd	Phineas Products Ltd
EcoEgg Ltd	Pollard Boxes Ltd
Element14 (Raspberry Pi)	President Engineering Group Ltd
Elite Electronic Systems Ltd	Pyronix Ltd
Exception Group Ltd	RDM Group Ltd
GlaxoSmithKline plc	Rapanui Ltd
GM Vauxhall Ltd	Rotigrill Ltd
Grace Cole Ltd	Rutland Plastics Ltd
GreenBottle Ltd	RSA Insurance Group plc
H Grossman Ltd	Santander Bank plc
Haycock and Hague Ltd	Start-rite Shoes Ltd
Hereford Furniture Ltd	Surgical Innovations plc
HJ Hall Ltd	Symington's Ltd (Golden Wonder Pot Noodles)
Hornby/Humbrol/Airfix	Trunki Ltd
Hype Luggage - Just Hype Ltd	Vent-Axia Ltd
Jaguar Land Rover Ltd (drive to re-shore tooling)	Vinola Knitwear Ltd
Jaeger Ltd	Wilson Process Systems Ltd

Notes

¹ 'China's murky ownership rules: Who owns what?', *The Economist*, 7 July 2011, available at: <http://www.economist.com/node/18928526>

For an example, see: Kan, S., 'China's Military-Owned Business', Congressional Research Service, available at:

<http://congressionalresearch.com/98-197/document.php?study=chinas+military-owned+businesses>

² Chakraborty, A., 'Why doesn't Britain make things any more?' *Guardian*, 16 November 2011, available at:

<http://www.theguardian.com/business/2011/nov/16/why-britain-doesnt-make-things-manufacturing>

The article draws on a speech made by Paul Kennedy, Dilworth Professor of History at Yale University, at Clare College, Cambridge, on 17 March 2010. The event, the first Lucy Houston Dinner, was organised by Dr Martin Lawrence of the Smart Club East of England. www.scee.org.uk

³ International Federation of Industrial Energy Consumers Europe, 'Four million manufacturing jobs across Europe lost since 2008', 27 February 2014, available at: http://www.ifeceurope.org/docs/20140227%20IE_Press%20Release_Manifesto.pdf

⁴ EEF, 'Jobs boost from reshoring?', 2 July 2013, available at:

<http://www.eef.org.uk/campaigning/news-blogs-and-publications/blogs/2013/jul/jobs-boost-from-reshoring>

⁵ EEF, 'Backing Britain ... the reshoring story continues', 3 March 2014, available at:

<http://www.eef.org.uk/campaigning/news-blogs-and-publications/blogs/2014/mar/backing-britain--the-reshoring-story-continues>

⁶ Innovate UK, 'Advanced Manufacturing Supply Chain Initiative (round 3)', available at:

<https://www.innovateuk.org/-/amsci-advanced-manufacturing-supply-chain-initiative-round-3>

⁷ Manufacturing Advisory Service, 'MAS National Manufacturing Barometer Survey', available at: <http://www.mymas.org/barometer>

⁸ Manufacturing Advisory Service, 'New Government support to encourage manufacturing production back to the UK', available at:

<http://www.mymas.org/news/new-government-support-to-encourage-manufacturing-production-back-to-the-uk>

⁹ Raspberry Pi Foundation, '1.75 million sold so far – and 1 million made in the UK', 8 October 2013, available at:

<http://www.raspberrypi.org/1-75-million-sold-and-1-million-made-in-the-uk/>

¹⁰ British Fashion Council, 'Facts & Figures of 14' February 2014, available at:

<http://www.britishfashioncouncil.co.uk/pressreleases/Facts--Figures-AW14>

¹¹ Neville, S., 'DFS supports British manufacturing resurgence', *The Observer*, 30 June 2013, available at: www.theguardian.com/business/2013/jun/30/dfs-leads-british-manufacturing-resurgence

¹² Glaxosmithkline, 'Full year results 2012 webcast', 6 February 2013, available at: <http://www.gsk.com/media/280553/q4-2012-analyst-presentation-transcript.pdf>

¹³ Hawkes, S., 'John Lewis to "repatriate" textile manufacturing in made in Britain push', *The Telegraph*, 21 Jul 2013, available at: <http://www.telegraph.co.uk/finance/good-news/10193886/John-Lewis-to-repatriate-textile-manufacturing-in-made-in-Britain-push.html>

¹⁴ Sobbohi, M., 'John Lewis brings textile manufacturing back to Britain', *The Manufacturer*, 22 July 2013, available at: <http://www.themanufacturer.com/articles/john-lewis-brings-textile-manufacturing-back-to-britain/>

¹⁵ Watt, N., 'UK manufacturing becoming great again, says Vince Cable', *Guardian*, 20 December 2013, available at: <http://www.theguardian.com/business/2013/dec/20/uk-manufacturing-great-again-vince-cable>

¹⁶ Gov.uk, 'World Economic Forum (Davos) 2014: speech by David Cameron', 24 January 2014, available at: <https://www.gov.uk/government/speeches/world-economic-forum-davos-2014-speech-by-david-cameron--2>

¹⁷ The Reshoring Initiative, 'August 2014 Reshoring News: Reshoring at IMTS', 13 August 2014, available at: http://reshorenow.blogspot.co.uk/2014/08/august-2014-reshoring-news-reshoring-at_20.html

¹⁸ English.Eastday.com, January 2013, available at: <http://english.eastday.com/e/131101/u1a7747988.html>

¹⁹ US Economic Development Administration, 'Make it in America Challenge', 2013, available at: www.eda.gov/challenges/MakItInAmerica

²⁰ Export Virginia, 'Firms heading home as benefits wane in China', November 2013: <http://exportvirginia.org/firms-heading-home-as-benefits-wane-in-china/>

²¹ US Congress 'United States Call Center Worker and Consumer Protection Act of 2013', available at: <https://www.congress.gov/bill/113th-congress/house-bill/2909>

²² The White House Press Office, 'Remarks by the President in State of the Union Address', 24 January 2012, available at: <http://www.whitehouse.gov/the-press-office/2012/01/24/remarks-president-state-union-address>

²³ Bureau of Consumer Protection, 'Gramm-Leach-Bliley Act', available at: <http://www.business.ftc.gov/privacy-and-security/gramm-leach-bliley-act>

²⁴ The Boston Consulting Group, 'Made in America, Again: Why manufacturing will return to the US', August 2011, available at: <http://www.bcg.com/documents/file84471.pdf>

²⁵ Leunig, T., "'Reshoring' jobs from China won't happen", *The Financial Times*, 30 October 2011, available at:

<http://www.ft.com/cms/s/0/bd30c094-0151-11e1-b177-00144feabdc0.html>

²⁶ Kim, P., 'Why There Won't be an Occupy Beijing', *The Diplomat*, 21 October 2014, available at: <http://thediplomat.com/2014/10/why-there-wont-be-an-occupy-beijing/>

²⁷ Population Reference Bureau, 'China's Rapidly Aging Population', Issue 20, July 2010, available at: <http://www.prb.org/pdf10/todaysresearchaging20.pdf>

²⁸ Elix-IRR Partners, 'Trends in Outsourcing and Offshoring in the Financial Services Industry 2008-2011', available at: <http://www.elix-irr.com/white-papers/trends-outsourcing-and-offshoring-financial-services-industry-2008-2011>

²⁹ BIS, 'New £125 million fund to boost UK advanced manufacturing supply chains', 6 December 2011, available at: <https://www.gov.uk/government/news/new-125-million-fund-to-boost-uk-advanced-manufacturing-supply-chains>

³⁰ EEF, 'Reshoring - the company story', 5 March 2014, available at: <http://www.eef.org.uk/campaigning/news-blogs-and-publications/blogs/2014/mar/reshoring--the-company-story>

³¹ 'New MD to oversee growth at Alucast', *Express & Star*, 12 August 2014, available at: <http://www.expressandstar.com/business/2014/08/12/new-md-to-oversee-growth-at-alucast/>

³² Weston, G., 'Fake parts in Hercules aircraft called a genuine risk', *CBC News*, 9 January 2013, available at: <http://www.cbc.ca/news/politics/fake-parts-in-hercules-aircraft-called-a-genuine-risk-1.1345862>

³³ Klayman, B., 'Aston Martin recalls 17,590 cars due to counterfeit material', *Reuters*, 5 February 2014, available at: <http://uk.reuters.com/article/2014/02/05/uk-autos-astonmartin-recall-idUKBREA141T420140205>

³⁴ 'Blyth plastics company moulds itself a bright future', *The Journal*, 6 January 2011, available at: <http://www.thejournal.co.uk/business/business-news/blyth-plastics-company-moulds-itself-4440628>

³⁵ See the 'Dongguan Today' tourist and information website section on industry, available at: <http://old.dongguantoday.com/Economic04.htm>

³⁶ Boggan, S., 'Is ANYTHING you're wearing made in Britain? Cheap imports have swamped the High Street', *Daily Mail*, 22 March 2012, available at: <http://www.dailymail.co.uk/femail/article-2118427/Is-ANYTHING-youre-wearing-Britain.html>

³⁷ Steiner, R., 'Can UK manufacturers cash in on Made in Britain trend? Fashion retailers lead way by 'selling a bit of England'', *This is Money*, 17 February 2014, available at: <http://www.thisismoney.co.uk/money/news/article-2561568/CITY-FOCUS-Will-Made-Britain-fashion-trend-really-off.html>

³⁸ Siegle, L., 'Britain's rag trade revival', *The Observer*, 15 February 2014, available at: <http://www.theguardian.com/fashion/2014/feb/15/britains-rag-trade-revival-marks-and-spencer>

³⁹ The Clothworkers' Company, 'A New Dawn: Rebuilding UK Textile Manufacturing - Notes from Conference at Clothworkers' Hall', 2 November 2012, available at:

<http://www.clothworkers.co.uk/getattachment/Textiles/Textiles-Conference/A-New-Dawn-Conference-Report-November-2012.pdf.aspx>

⁴⁰ Ford, C., 'Rag trade revival as clothing manufacturer The AMA Group is launched', *The Journal*, 27 February 2014, available at:

<http://www.thejournal.co.uk/business/business-news/rag-trade-revival-clothing-manufacturer-6751514>

⁴¹ Fletcher, A., 'Component market is improving, but weaknesses remain', *Electronics Weekly*, 1 July 2014, available at:

<http://www.electronicweekly.com/news/business/distribution/component-market-improving-weaknesses-remain-2014-07>

⁴² Sacco, D., 'British PC manufacturing 'back with a vengeance'', *PCR*, 6 January 2014, available at:<http://www.pcr-online.biz/news/read/british-pc-manufacturing-back-with-a-vengeance/032853>

⁴³ De Freytas-Tamura, K., 'Britain Scrambles to Fill Skills Gap', *The New York Times*, 17 January 2014, available at:

http://www.nytimes.com/2014/01/18/business/international/britain-scrambles-to-fill-skills-gap.html?_r=0

⁴⁴ McKinsey, 'Education to employment: Getting Europe's youth into work', January 2014, available at:

http://www.mckinsey.com/insights/social_sector/converting_education_to_employment_in_europe

⁴⁵ Baker Dearing Educational Trust website, available at:

www.utcolleges.org/about/overview

⁴⁶ Hanover Messe, 'Industry 4.0: Searching for a universal production language', available at: <http://www.hannovermesse.de/en/news-trends/integrated-industry-next-steps/articles/>

⁴⁷ Wohlers Associates, '3D Printed in China', 8 June 2013, available at:

<http://wohlersassociates.com/blog/2013/06/3d-printed-in-china/>

⁴⁸ AWS, 'AWS delivers end-to-end capabilities from fast-track NPI turnaround to through-life support from dedicated UK site', available at:

<http://www.awselectronicsgroup.com/content/aws-delivers-end-end-capabilities-fast-track-npi-turnaround-through-life-support-dedicated>

⁴⁹ Toloken, S., 'Intersurgical to open China medical disposables plant', *Plastics News*, 16 September 2013, available at:

<http://www.plasticsnews.com/article/20130916/NEWS/130919940/intersurgical-to-open-china-medical-disposables-plant>

⁵⁰ P2i Ltd company statement, 'Increased demand for water protection on consumer electronics leads P2i to open facility in China', 26 March 2014, available at:

http://www.p2i.com/news/articles/P2i_Technology_Shenzhen_China

⁵¹ Moore, T., '100 jobs go as Syfer Technology sends work to China', *The Manufacturer*, 13 November 2012, available at:

<http://www.themanufacturer.com/articles/100-jobs-go-as-syfer-technology-sends-work-to-china/>

⁵² Origin Global Ltd company statement, 'New Factory at Origin HQ', 3 February 2014, available at:

<http://origin-global.com/press/newfactory>

⁵³ BIS, 'Manufacturing in the UK: An economic analysis of the sector', December 2010, available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/31785/10-1333-manufacturing-in-the-UK-an-economic-analysis-of-the-sector.pdf

See also: Food and Drink Federation, 'Vision for innovation in food and drink manufacturing', available at: <http://www.fdf.org.uk/publicgeneral/Vision-for-food-innovation-2012.pdf>

⁵⁴ BIS & Government Office for Science, 'Future of manufacturing: a new era of opportunity and challenge for the UK - summary report', 30 October 2013, available at:

<https://www.gov.uk/government/publications/future-of-manufacturing/future-of-manufacturing-a-new-era-of-opportunity-and-challenge-for-the-uk-summary-report>

⁵⁵ 'New MD to oversee growth at Alucast', *Express & Star*, 12 August 2014, available at:

<http://www.expressandstar.com/business/2014/08/12/new-md-to-oversee-growth-at-alucast/>

⁵⁶ ONS, 'Labour market statistics', October 2014, available at:

<http://www.ons.gov.uk/ons/rel/lms/labour-market-statistics/october-2014/index.html>

⁵⁷ The Manufacturing Technologies Association, 'The UK manufacturing technology sector', available at: <http://www.mta.org.uk/industry-facts>

⁵⁸ Osborne, H., 'UK house price rises for 2014 almost twice as high as predicted', *The Guardian*, 26 August 2014, available at:

<http://www.theguardian.com/money/2014/aug/26/uk-house-prices-rises-twice-predicted>

⁵⁹ Ecroys, 'EU SMEs in 2012: at the crossroads. Annual report on small and medium-sized enterprises in the EU, 2011/12', September 2012, available at:

http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/supporting-documents/2012/annual-report_en.pdf