Industry 4.0 and Regional Transformations

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Previous industrial revolutions were intricately associated with new technologies.

Innovations related to steam power, cotton, steel, and railways helped to give us the first industrial revolution of mass production and mechanisation. The second was triggered by the introduction of electricity, heavy and mechanical engineering and synthetic chemistry, while the third came with innovations in electronics and computers, petrochemicals and aerospace.

Today a raft of new technologies including Artificial Intelligence (AI), automation, 3D printing, sensors and much more are seen as driving a wave of innovation that takes us into a fourth industrial revolution, or 'Industry 4.0'. This is likely to transform how industry – and the wider economy – works.

In turn, what is termed 'smart manufacturing' may enable the upgrading and anchoring of manufacturing activities even in advanced and high-cost economies such as the European Union.

How will this shape future smart manufacturing? We can identify some key characteristics.

Firstly, new technologies will stimulate new sectors and upgrade existing ones. Core to this is the symbiosis between traditional manufacturing and services, through processes of "servitisation".

Take Rolls-Royce, which of course produces engines, but also sells them within a "power-by-the-hour" maintenance package that restructures its

offering as a service that delivers the ability to fly planes rather than simply selling a one-off product.

Secondly, smart manufacturing will fill market niches for personalised and customised products. These will be produced in small batches or even as unique pieces which require customers to co-innovate or even co-produce with the manufacturer.

One example is Shapeways, spun out of the Dutch electronics firm Phillips back in 2007. Now based in New York it offers a 3D printing marketplace and service. Customers can design and upload 3D printable files, which are then made for them from materials including acrylics, stainless steel, food-safe ceramics, and silver. Alternatively consumers and designers can work together to co-create unique items which Shapeways then prints.

Products like this tend to have a high content of technology, innovation, customised design and servicing. Moreover, their consumers tend not to be as price sensitive, so technology, knowledge and innovation come to the fore in terms of what makes the firm compete in the market.

Thirdly, smart manufacturing will redesign product supply chains by integrating the local and the global more strategically. Some hands-on innovators in the so-called "makers movement" are making the most of a trend towards linking innovating and making. They choose suppliers nearer to home, but connect with demand both close and far from home.

This offers the prospect of a more efficient form of production, which we can also see in the increased use of more sustainable processes, where resources are re-manufactured and components re-used, and where bio, waste or natural products are used as feedstocks.

It is this kind of circular-economy style efficiency at the heart of smart manufacturing that presents a real opportunity for advanced economies to pursue more distributed and sustainable socio-economic growth.

Enabling manufacturers to access and utilise the new technologies in this way will be key, we argue, in our new RSA Regions and Cities book Industry 4.0 and Regional Transformations, which represents a 'call for

arms' in developing transformational new industrial policies for the 'Fourth Industrial Revolution', across a range of issues.

We stress, for example, the need for a range of policies to enable business to properly embrace Industry 4.0.

These include new skills to be developed for Industry 4.0 technologies and the need for constant re-skilling and upskilling as Industry 4.0 progresses – this will need a much greater commitment to life-long skilling and re-skilling as new technologies develop and automation eliminates many jobs while creating new ones. Some countries, like Singapore, have already gone a long way in this regard, through its SkillsFuture programme.

Another policy priority is to enable SMEs to have access to funding and finance to embrace digital technologies – as the UK government has started via its 'Made Smarter' programme.

Policy needs to help recognise and exploit possibilities for firms, industries and regions to reinvent and reposition themselves, as the 'value added' of manufacturing changes over time, including in offering a service alongside manufacturing.

Policy can also seize 're-shoring' opportunities as 'relocalisation' opportunities open up – involving policies to rebuild supply chains closer to home. Furthermore, significant infrastructure investment is needed to embrace new technologies (e.g. 5G).

A key point to note is that Industry 4.0 will play out differently across sectors and regions. Because of this, new policies will need to bring together sectors with the new emerging technologies so that what we see as 'traditional' industries can be transformed. A 'transformative' industrial policy is needed to much better 'join up' technologies, sectors and places.

What this suggests is that we need more of a regional scale to industrial policy. Governments don't always do this very well. The British government's industrial strategy, for example, was meant to join up sector policy and place but so far has largely failed to do so. That needs to go further.

The British government's 'Made Smarter' programme being piloted in the North West is an important first step in beginning to address some of the issues we flag up in the book but not all.

Indeed, a major concern is government commitment and the lack of scale. Beyond the pilot, there is £121 million for the UK as a whole for business to adopt new digital technologies. This isn't going to go very far, and doesn't compensate for the government's scrapping of the Manufacturing Advisory Service a few years ago, which was a major policy blunder.

Other countries like Germany and Sweden have gone much further in embracing Industry4.0 and supporting businesses in making the most of Industry4.0 opportunities. The UK needs to follow suit.

Notes:

The new open access RSA Regions and Cities book Industry 4.0 and Regional Transformations volume edited by Lisa De Propris and David Bailey brings together a group of expert contributors to explore the opportunities and the challenges that Industry 4.0 (or smart manufacturing) is likely to pose for regions, firms and jobs in Europe.

Drawing on theory and empirical cases, it considers emerging issues like servitization, new innovation models for local production systems and the increase in reshoring.

Industry 4.0 and Regional Transformations captures the complexity of this new manufacturing model in an accessible way and considers its implications for the future. It will be essential reading for advanced students and researchers and policy makers in regional studies, industrial policy, economic geography, innovation studies, operations management and engineering.