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# The future of manufacturing in Australia is smart, agile and green

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Technologies like 3d printing and robotics will be crucial aspects of Australia's manufacturing future. Oak Ridge National Laboratory, CC BY-NC-ND

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*This article is part of our series on the [Science and Research Priorities](#) recently announced by the Federal Government. You can read the introduction to the series by Australia's Chief Scientist, Ian Chubb, [here](#).*

## Alan Finkel

*Chancellor of Monash University, and Fellow and President of the Australian Academy of Technological Science and Engineering (ATSE)*

In a rapidly changing world, attempts to preserve the past will doom the future. The [research priorities](#) seek to avoid that trap by identifying the need for our industries to be agile and transformative, to provide high value-add and to recognise their place in a complex global supply chain.

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## Disclosure statement

The research priorities also note the importance of seeking to dominate in selected niche product categories where we already have some wins, such as high-performance materials, composites, alloys and polymers.

Not explicitly stated in the priorities, though, is the reality that the efficiency of tomorrow's industries will be driven by automation and artificial intelligence. More will be achieved with fewer workers.

We must accept that revenue growth in manufacturing will not routinely be accompanied by jobs growth in the manufacturing industry itself. That is not necessarily a bad thing, because as new wealth is created it will be invested in services, health and other industries, with net creation of jobs.

If we are smart about aligning our research to our priorities, there will be ample opportunity for us to develop advanced manufacturing techniques to create, or in some cases, bring back added-value manufacturing in food and resources, and expand our achievements in medical devices.

We will be able to improve quality and productivity, improve scheduling and logistics, and in many cases produce products in Australia more cheaply than we could import products of equivalent quality.

But measuring our success in manufacturing will be confounded by its changing nature. For example, printing and distributing text books is clearly a manufacturing industry. In the future, when textbooks fully transition to online delivery, will that mean that the manufacturing jobs in that sector have been wiped out?

Or should we think of the engineers who develop and maintain the cloud-based delivery systems as the manufacturing workers of the future? We must learn to value our successes in the context of a changing definition of what we are measuring.

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### **Cathy Foley**

*Deputy Director and Science Director of the Manufacturing Flagship at CSIRO and former President of Science and Technology Australia*

The fourth industrial revolution has started! Known as [Industry 4.0](#), in 15 years time [40% of the jobs we know today will not exist](#), and the way we manufacture products and get them to the consumer will be radically different.

Just-in-time, personalised, agile and adaptive “creator robots and machines” will build a world that is a little like the Jetsons cartoon from my childhood. But this means that, as a country, we have to change our approach to manufacturing too.

Having standalone industrial companies and innovation organisations doing their own thing, competing against one another, simply will not work.

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Veena Sahajwalla has collaborated with OneSteel through the ARC Linkage grants scheme. The PIT technology – “Green Steel” – has been licensed to OneSteel for commercialisation. Current grants and previously received grants are ARC grant schemes (ARC Linkage, Discovery, ARC Industrial Transformation Research Hub), Australian Laureate Fellowship, Australia India Strategy Research Funding, CRC Low Carbon Living, and industries including: Arrium Mining and Materials, Hyundai Steel, Brickworks Building Products, Jaylon Industries, Tersum Energy, TES-AMM Australia and LKAB. She is a member of a range of professional associations: EA, AIST, ACS, ASM International, AusIMM, ATSE, Climate Council and NSW Australia Day Council Board member.

Alan Finkel and Cathy Foley do not work for, consult, own shares in or receive funding from any company or organization that would benefit from this article, and has disclosed no relevant affiliations beyond the academic appointment above.

### **Partners**



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We need to reset our thinking to compete globally and collaborate locally. Australia's success in Industry 4.0 will pivot on our willingness to shift our currently poor ability to collaborate across sectors – such as from research to industry – and within sectors – industry to industry, and research organisation to research organisation – so that we can move rapidly up the ranks and be a world leader in collaboration.

We currently rank [81 out of the 143 OECD economies](#) for innovation efficiency. We have all the components we need to do this: top-class research; great design; well-educated citizens; a strong small-to-medium enterprise community; and a terrific services industry.

We are poised to make that transition. But our focus can't remain on competing among ourselves, whether it is between academic institutions, states or within local industry sectors.

Can we be a “big” enough country to rise above the local and think global? I think we can.

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### **Veena Sahajwalla**

*Scientia Professor, and Laureate Fellow and Director, SMaRT Centre, UNSW Australia*

Last year, I wrote about the ability of [engineers to build Australia into the future](#) by fostering invention and innovation. I still believe it will be engineers who can deliver previously unimaginable solutions, like green manufacturing, which is an area that will transform the manufacturing industry.

Australian industries need the flexibility, insight and foresight that comes from thinking creatively, asking critical questions, forming and testing hypotheses and reasoning quantitatively. They also need access to the research and technologies that will add value to manufactured products.

At the Sustainable Materials Research and Technology Centre ([SMaRT](#)) at UNSW, we are working on green manufacturing in collaboration with industry, using waste and end of life products as raw materials.

We are rethinking the way we have traditionally done manufacturing and looking at creating new resources from waste. But it is fundamental and applied research that have created the foundations of where we are today.

The ability to produce ferrous alloys from auto waste and copper-based alloys from e-waste is also forcing us to rethink mining, which has traditionally been about extracting raw materials and sending them long distances, with one large processing plant transforming them into usable material.

Not only are natural resources being depleted at an unsustainable rate, industries are



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beginning to recognise the cost-effectiveness of reusing materials, and the importance of high value-add, small, agile and localised processing facilities.

Silicon from silica in glass, or copper from e-waste, are extremely valuable, so we need to look past the fact that initially they present as waste. This is where science and innovation come in. It's looking for the beauty within. The future manufacturing scientists and engineers will be creating high-value materials by discovering novel green manufacturing solutions.

I see a huge opportunity for green manufacturing in micro-factories across regional Australia, and new jobs for regional communities that offer economic opportunities in tomorrow's industries. We believe these new industries can happen on a small scale quite effectively based on new scientific discoveries.

In Australia, where our population is small and the tyranny of distance presents its own challenges, doing it cleaner and smarter, and developing innovations that are good for the environment and sustainable on every level, offers huge economic benefits and a brand new manufacturing sector built around transforming waste into resources.

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