

Physics and: economic growth

An Institute of Physics briefing note



Policymakers and economists are generally in agreement that innovation is a major driver of growth. Much innovation comes from physics.

Physics-based businesses have long punched above their weight in the UK economy, accounting for as many jobs as the construction sector and as much gross value added as finance, banking and insurance.

But, particularly in tougher times, these businesses can't create the benefit all on their own. They will require continuing government support.

Measures such as support for specific R&D projects and for skills development – a particular concern of many businesses – will help to extract the maximum value from physics-based industries, to the benefit of the sector and the UK economy as a whole.

Norman Apsley, IOP Vice-President, Business and Innovation

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Supporting Physics in Business: An exploratory study of the innovation-related support needs of physics-based businesses in England

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Donal Denvir, Andor Technology

Physics can drive growth

That innovation can spur economic growth is uncontroversial.

Much innovation comes from the application of physics, as new technologies replace older ones or improvements are made to existing products, allowing them to do more with less.

Examples can be found in some of the things that are perhaps taken for granted, such as transport and computing.

The invention and continual improvement of planes and cars has not only brought an unprecedented level of mobility, and with it a raft of economic benefits, but has also spawned new industries of its own – billions of pounds each year are spent on motorsport, for instance.

Meanwhile, the ever-increasing number of transistors that it's possible to fit on a computer chip has led to smaller and faster devices being more widely available for cheaper prices – and sometimes with fewer natural resources – producing both the smartphone industry and web businesses such as Google or Facebook

with values estimated in the billions of dollars.

All of this technological development is fundamentally rooted in physics, and physics has proven its value to the economy. The Institute's report *Physics and the UK Economy*, published in 2007, showed that two years earlier, 32 000 physics-based businesses employed 5% of the entire UK workforce – a number equivalent to the construction sector. The economic activity, measured in gross value added, stood at £70 bn – 6.4% of the UK's total, the same as banking, finance and insurance.

“The government says it wants more manufacturing for export as this would decrease our dependence on other sectors; then you have to have products that other countries want to buy,” says Andor Technology's Donal Denvir, the 2008 winner of IOP's business and innovation medal. “Therefore you have to products that they cannot make, and you can only do that with investment in science and engineering, which includes physics.”

The innovation provided by physics delivers big gains. According to the latest Global Innovation Index, the UK ranks seventh in the world for innovation performance. This is good, but it could be even better – if the correct actions are taken in support of those businesses responsible for the greatest innovation. >>>

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Smartphones contain considerable computing power in a small size thanks to innovation

How to support physics-based business

To make the most of physics-based businesses and ensure they deliver the maximum possible benefit to the UK economy, they will need public support – and the right kind of support.

A study commissioned by the Institute and carried out by the Institute of Innovation Research at Manchester University's business school, found that support needs to be informed, targeted, and sector-specific.

The report, *Supporting Physics in Business – An exploratory study into the innovation-related business support needs of physics-based firms in England* – assesses the perceptions of past support received by physics-based businesses, and what they believe their likely needs will be in the future.

Based on a telephone survey of businesses covering a wide range of physics-based industries, their study found that these businesses felt that they need more focused and sector-specific support, and more scrutiny of the relevance of the knowledge and experience of those providing that support.

Physics graduates are valued by employers – but the UK needs to produce more of them.

SUPPORT ACTIONS

IOP recommends several measures to ensure that the UK extracts the maximum value for physics:

- An expanded R&D tax credit scheme to keep the UK ahead of European competitors;
- Enhanced support for collaboration and people-exchange between universities and industry;
- Roll-out of the Small Business Research Initiative across government to incentivise all departments to engage with small science-based businesses;
- Provision of long-term investment in start-ups through a large-scale, research-focused venture capital fund;
- Improvements in national infrastructure for transport and electronic communications (broadband etc.) to facilitate the development of knowledge networks;
- A more creative approach to public sector procurement, directing a fixed proportion of public expenditure to foster science-based businesses and support innovative solutions.

The report says: “Our respondents strongly stressed the need for informed, targeted and sector- or market-specific support. A number questioned the whole concept of generic business support, suggesting it has little or no value.”

Although most of the needs identified by physics-based companies apply as much to established, successful companies as they do to start-ups, small science-driven firms in particular require access to finance, assistance working with and exploiting the science base, and obtaining the required skills level.

Skills development was a particular concern of most of the companies surveyed, due to a mix of the technical knowledge and problem-solving skills required by physics-based businesses. Physics graduates, and the skills that they possess, are valued by employers – but the UK needs to produce more of them.

The businesses surveyed acknowledged that, for example, the needs in the north of England are different to those in London and the south east – they must therefore be met in a different way.

Although the respondents were relaxed about the reversion of policymaking to the national level with the scrapping of the Regional Development Agencies, they said that delivery of support should not only take local factors into account, but also be designed with them in mind.

The Institute believes that innovation strategy

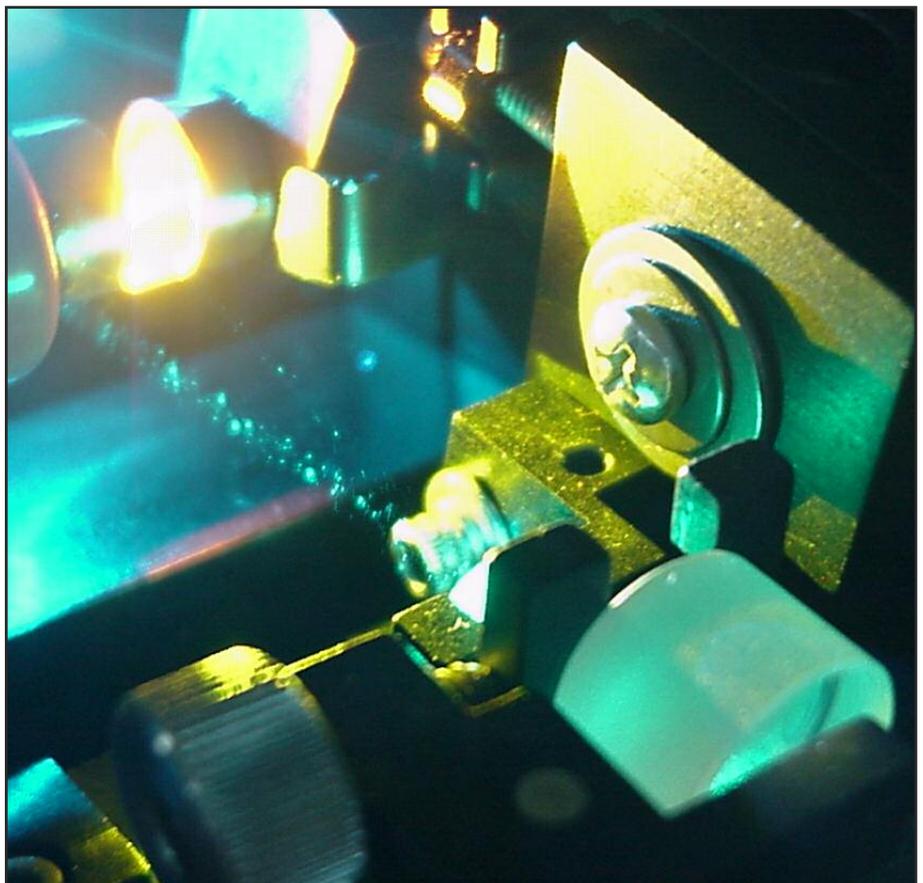
should be set at a national level, taking into account regional strengths, but delivered locally. IOP supports the planned Technology Innovation Centres, but to have a greater chance of succeeding they need to have a strong business lead, a long-term commitment, and not to have their budgets spread too thinly.

According to the Manchester study, the past support received by physics-based businesses that was most frequently mentioned was that for networking and collaboration, followed by support in acquiring external knowledge, for testing or proof-of-concept, and financial support for specific research and development projects. To address this, the Institute believes that there should be consideration given to easing the regulatory burden on venture capitalists and angel investors.

In addition, the surveyed businesses said that in the future they'd like to receive assistance with identifying market opportunities and needs, and support for internal skills development.

The businesses acknowledged that innovation-related support has been important in the past, and that carefully focused support will be vital in the future – if done in the right way.

Supporting physics-based industries in the right way will enable them to achieve the maximum possible success, continuing to innovate and helping to drive the growth of the UK's economy.



Dye lasers such as this Argon-ion device have a range of industrial applications