



Just what the Dr ordered

How PhD graduates can contribute to the competitiveness and productivity of your organisation.

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New, ground-breaking research from Research Councils UK and the Higher Education Funding Councils for England and Wales shows the ways in which doctoral graduates contribute to the competitiveness and innovation of businesses, and helps to dispel some of the myths about those with PhDs.

For those businesses that employ staff with PhDs, such is the value placed on their specialist knowledge, research skills and problem-solving abilities, that three quarters of employers taking part in the research said their loss would have either a business critical or significant impact on operations. More than one in five employers of doctoral graduates who took part in this recently published study said they were business critical and the loss of them would be catastrophic. Examples were provided of the various ways those with PhDs use their skills to innovate, boosting the profitability and competitiveness of companies, as well as enhancing their employers' profile and credibility.

Innovation: from pet food to antibodies

We know that doctoral study develops high level research skills and specialist knowledge. This new report highlights other skills and qualities that the PhD provides, but also, perhaps more importantly, the ways in which these are used by PhD graduates working outside of academia and the benefits for their employers. Not every business will want, or need, to employ people with doctorates. But for those employers in the knowledge economy, employees with doctoral level

skills and knowledge can really add value. While many of the employers involved in the research who had benefited most from PhD graduates were in research and development or science and technology based roles, there is evidence of doctoral graduates having an impact across a broad range of businesses. The study captured the views of nearly 100 employers of doctoral graduates, from small engineering firms to national museums, from government bodies to investment banks and from social research companies to a major retailer (and no, the doctoral graduate wasn't stacking shelves but had been recruited specifically for their ability to work with data and to bring a new perspective).

The employers of doctoral graduates that took part in this research particularly valued their excellent research skills, ability to manage large amount of information and rigorous approach. Problem-solving and critical thinking skills were also said to be key attributes of doctoral graduates; and it is these skills that enable PhDs to contribute to innovation.

The report finds that doctoral graduates working outside of higher education are often involved in innovation. Doctoral graduates have been involved in developing a diverse and fascinating range of products and services including: sensors for use in cars, an ante-natal programme, alcoholic drink formulations, heating systems, websites and apps, teaching aids, anti-bodies, musical compositions, pet food, cancer treatments, visitor attractions and sports analysis. These new and improved products in some cases resulted in increased sales or enhanced competitiveness through better quality or more differentiated products.

Doctoral graduates' ability to 'think outside the box' means they spot opportunities and develop solutions to problems, contributing to new or improved systems or ways of working.

And this in turn can generate enhanced efficiency, productivity gains or reduced overheads.

The two case study examples at the end of this briefing illustrate well the benefits of doctoral graduate innovation to employers.

Connecting ideas and industry

Recent government analysis of the UK innovation sets out the importance of what is called absorptive capacity. This is a firm's ability to identify, adapt and integrate new technologies and ideas. A key method of enhancing a company's absorptive capacity is through collaboration and engagement with universities. With the experience of the world of academia doctoral graduates have the contacts and credibility to forge effective links. 75 per cent of doctoral graduates responding to our survey stated that they had been engaged in collaborative projects between universities and industry. Employers explained how doctoral graduates bring with them the cutting edge knowledge and ideas which can then be applied for commercial benefit.

“People come out from universities with the latest ideas and thinking and feed that in and that's quite beneficial.”

Medium size employer, research and development.

Raising the game of those they work alongside

And the benefits of the doctoral study don't just stop at the individual concerned. The research also demonstrates the different ways in which the skills and attitudes of doctoral graduates can 'spillover' to others. The vast majority of graduates responding to research said they had been involved in improving the problem solving skills of others,

and helping them to think more creatively. This was corroborated by their employers, who described how doctoral graduates encourage, support and inspire those they work alongside to achieve more and better. They ask questions, bring new ideas and knowledge to a company and offer fresh perspectives on old problems.

“I think they bring competition and in doing so people are always keen to compete. For me, it is fresh skills, knowledge and ideas which keeps people on their toes.”

Medium size employer, finance, business, IT and legal sector.

A badge of quality

The other key way in which employers said doctoral graduates contributed was through enhancing the organisation's profile or credibility. A doctoral qualification was often seen as a badge of quality and rigour. Firms with products developed by PhDs can 'talk with swagger' about this fact. When it is important for outputs to be innovative, rigorous or evidence based, having a PhD on board, can help to provide this reassurance. Employers taking part in the research talked about winning new clients due to the expertise of doctoral graduates or gaining recognition through awards or high profile projects where doctoral graduates played a role.

“One of our doctoral graduates was key, through their knowledge of the subject matter, to us winning new business.”

It was a major win, it was an in-road for a new client as well, which was even better because it opened the door [...] and clearly when other projects followed, they were keen to have this individual work on their projects.”

Small employer, research and development.

Challenging stereotypes

For some, the stereotypical view of the PhD graduate is a ‘lone-genius’, with a narrow interest in an arcane topic, who would really rather be working as an academic. Certainly doctoral graduates have excellent specialist subject knowledge, and this is particularly valued by employers where there is a close match between the knowledge they require and a PhD graduate’s specialism. But while a few employers of doctoral graduates commented that they felt that inter-personal and team working skills might be improved amongst some of their PhDs, the stereotyped picture is not one widely shared by employers of doctoral graduates. And many of the doctoral graduates we spoke to made positive and active choices to build careers outside academia. A doctoral graduate in physical science and engineering explains the response of some to the PhD:

“There is a polarised reaction; some people look at you as if you’re some kind of genius and some people look at you as some kind of freak. I don’t think that’s fair because what is required to do a PhD is determination and bloody-mindedness.”

This highlights another key finding of the research; that the qualities required to complete such a long-term and tough challenge as a doctorate, are qualities that are in-demand and valued by employers – confidence, motivation, resilience and determination, the willingness to rise to a challenges and tackle problems in a systematic way. These transferable skills that doctoral experience develops have perhaps been overlooked in other research and potentially by employers who don’t have experience of working with doctoral graduates.

“Basically nothing worked in my whole PhD until right at the end. It’s just the most stressful time ever, but this is why I would totally go back and do it again. It teaches you that you can look at all the options and work out how to get around it, and if you can’t get around it, then you still get something out of it. So it’s more the mental status, overcoming obstacles, which I think is quite useful.”

Biomedical sciences graduate.

Is your business missing out?

Research and innovation are of increasing importance to maintaining the UK’s knowledge base and a strong supply of PhD graduates to industry is a fundamental part of maintaining the UK’s place in the global economy. This new research clearly illustrates the many benefits of employing doctoral graduates. Now more than ever it is important for businesses to innovate and harness the potential of research knowledge to remain competitive. However, a recent assessment of UK innovation from the Department for Business Innovation and Skills (BIS)¹ notes low levels of innovation amongst small and medium enterprises (SMEs) and suggests that this may be explained by average levels of collaboration between universities and SMEs. SMEs are highly important as ‘seedbeds’ of innovation and drivers of growth. It is therefore important that they can harness the value that doctoral graduates can offer.

¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/277090/bis-14-544-insights-from-international-benchmarking-of-the-UK-science-and-innovation-system-bis-analysis-paper-03.pdf

Case study 1:

A multi-million pound business built on doctoral innovation.

Moog Insensys designs, manufactures and supports blade sensing systems for the wind energy sector. Their office in the south east has 15 employees and turns over £2million of manufacturing technology derived from research undertaken by a doctoral graduate.

The technology uses innovative optical sensors rather than electrical sensors to measure the bending of materials. The key advantage of optical over electrical is that the sensors can be applied to a variety of materials rather than just metals. The business, which now primarily markets and sells this patented product, brought the technology into new markets across the globe, particularly the energy market.

“The technology has been developed into a component which is crucial to the control of large wind turbine generators and that component enables large wind turbine generators to survive in difficult wind conditions.”

The organisation employs a blend of both academics and engineers at their offices combining underpinning knowledge, theory and practical skills to achieve their business objectives of advancing the product through a rolling development and continuous improvement scheme. The doctoral graduate plays a pivotal role in supporting colleagues, and passing

on the knowledge and experience built up over a ten year period. They remain a crucial member of the organisation as his role evolves.

“Sometimes I will propose ideas or adapt those ideas that my team has come up with... often I am the person who proposes the ideas in the first place but I am also keen to encourage the engineering team that I manage to come up with the ideas as well.”

The contribution of the graduate’s research and innovations made subsequently has been at the heart of the business as stated by a senior representative of the business:

“We wouldn’t have a business without him and we would really struggle to maintain the business going forward if we didn’t have him or somebody who knows as much about the technology. In terms of innovation, and developing new products or new applications, then having doctorates around you is absolutely critical.”

The research undertaken by the doctorate was regarded as adding over £25 million to the UK economy and has contributed to businesses that have created around 50 jobs over eight years.

Case study 2: Environmental and economic benefits.

PassivSystems provides homeowners and businesses with the information and tools to control and optimise energy usage, delivering significant energy and cost savings. This SME has only a handful of doctoral graduates working in research and development and business development roles, yet they make an important contribution to the innovative outputs of the company.

For certain roles they look for staff with the academic rigour in research, where a PhD is a bonus, but also with commercial experience and ability in product development. They find doctoral graduates have more in-depth specialist knowledge and problem solving skills.

“They’re more disciplined in research and problem solving and often they bring with them a deeper domain knowledge of areas that they’ve worked on, than someone who’s just done a first degree or an MSc.”

Doctoral graduates excel in innovation and recent innovations in particular have been developed by doctoral graduates. PassivSystems develops advanced heating control systems and their latest product has almost exclusively, in terms of the control algorithms, been developed from research innovation prototyping done by a doctoral level employee. The employee interviewee takes up the story from here:

“Heat pumps are difficult to control and tend to be controlled in a crude way, but I came up with a very mathematical way of controlling them which should make them a lot more efficient.”

This innovation brings benefits for the company in terms of increased competitiveness, as the employer explained.

“I think we will have a very differentiated product. Secondly, it enables us to talk with some amount of confidence and swagger about the product, saying that it is innovative and has been designed on good quality evidence-based research.”

There are benefits for wider society and the environment too from these innovations. More efficient heating control systems can help the country decarbonise and contribute to the government’s vision for a cleaner society. Yet, what many people care about far more than carbon is money. This innovation could save 20 to 40 per cent off people’s bills. A lot of the heat pumps are used in social housing, saving money for councils and people in social housing, which is a big positive too.