Delivering Impact in an Expertise Economy

Authors: Professor Paul Nightingale and Dr Rebecca Vine

Key points:

- As we have moved from manufacturing to services and now an information economy, the role of research - and how impact from research can be delivered - has changed.
- The experiences of a small group of industrial sectors, at a particular point in time, generated a way of thinking about the economic value of research that sees it as a linear process where research generates discoveries that, in turn, can be applied by research users to generate impact. The growing complexity of modern innovation and government services mean that this linear model is increasingly misleading.
- In a modern information economy, innovation in the underlying processes that enable the provision of services is growing in importance. This innovation is research intensive but is too complex to be based on the transfer of discoveries. Instead, impact is more likely to come from the transfer of talented people and collaborative engagement that builds shared stocks of expertise. These deeper stocks of expertise help individuals and organisations make better decisions in a complex and uncertain world.
- These two blogs explain why this kind of collaboration is important and how it can enhance collective expertise and generate impact.

What drives impact in a modern economy?

Recent increases in funding for research come with a growing expectation that researchers will do more to improve social welfare and economic prosperity (see for example). In these two blogs we explore how researchers can help deliver this economic and social impact and highlight how the activities that generate impact have changed over time as we have moved from a manufacturing-based, to service-, and now information-based economy. A second blog illustrates the argument, drawing on the experiences of an ESRC funded research collaboration delivered in partnership with the Infrastructure and Projects Authority in the UK.

Many of the frameworks we use to think about how research can deliver social and economic impact emerged in 1950s America, at a time when new scientific discoveries, such as plastics and antibiotics, were launched onto the market. Science policy at the time emphasised how the benefits from university research depended on downstream investments in R&D by industry, as a lot of work was needed to turn discoveries into commercially viable products. However, they identified low levels of public spending on research as the main bottleneck constraining growth, and successfully lobbied Congress to increase funding. The expansion of research funding that followed, coincided with a long period of economic growth. The way research delivered growth via new manufactured products has framed the debate around the value of research ever since.

Today it is widely accepted that innovation is a key driver of long-term economic growth and that public support for research complements private investment and helps to grow the economy. What is much more contested today is how research delivers impact and whether it comes from a process of knowledge transfer, of the kind sought after in REF impact case studies. Research generates a number of valuable outputs – discoveries are clearly important, but so are expertise, networks, instrumentation, methods and trained students. These are all valuable in different settings and their relative importance changes over time.

Importantly, they rarely operate in isolation. A narrow emphasis on the "findings from basic research" misses this interaction and reflects the atypical economic conditions of the immediate post-war period. At this time new products could enter global markets with only limited competition. Competition increased as war damaged economies recovered, so that by the early 1970s models of innovation emphasised the complementary importance of marketing, ensuring products addressed customers' needs, and the effective management of internal processes and external relationships. Firms needed a diverse portfolio of different kinds of knowledge to achieve commercial success, that would draw on research in varied ways.

The lack of attention to this broader stock of knowledge is partly caused by Europeans only considering federal funding when looking to the USA. This overlooks the diversity of non-federal funders. For example, the Ford Foundation's spending on behavioural sciences between 1951 and 1957 was more than the National Science Foundation (NSF) spend on *all the sciences put together*.[1] Between 1963 and 1966 the Foundation spent $35m on transforming management research – which adjusted for inflation would be about $310 million today! Only looking at the NSF distorts our understanding of what was happening in the US economy and misses how different kinds of STEM based and social science knowledge complement and enhance each other, to generate growth.

The 'transfer from science' model still works in some settings, but these are diminishing over time. Analysis of citations in patents suggests it is mainly high-tech manufacturing sectors, such as chemicals, pharmaceutical and electronics, that draw directly on university research. The economic size (but not necessarily importance) of high-tech manufacturing has declined over time and is now only 3% of the UK economy.

By contrast, services have rapidly expanded in economic importance and innovate in very different ways. Because services are consumed as they are produced, new service "products" depend on underlying process and infrastructure innovations for their delivery. The ability to pay bills on a mobile phone app depends on a large, data-intensive network connecting banks, mobile phone networks, customers, and their accounts. Just because innovation in the service sector doesn't normally draw directly from R&D and research discoveries, doesn't mean research isn't important. On the contrary, the growing importance of research to these sectors is possibly the most important issue in current science policy.

From discoveries to expertise

If research isn't valuable for generating transferable discoveries, why is it so valuable in an information intensive, predominantly service-based economy?

As the economy has changed, other kinds of research outputs have grown in importance. In particular, research helps to develop expertise, and expertise helps organisations find better

[1] Hunter Heyck (2021) "The Age of Systems", Johns Hopkins University Press. Page 57.

solutions to complex problems faster and at a lower cost. As we noted in a Treasury report over 20 years ago, the most valuable output of research is often 'talent, not technology'[2].

The growing value of expertise can be seen in the growing 'post-graduate premium[3]' in the UK labour market, where Masters level qualifications, particularly in the LEM subjects of Law, Economics and Management, command a significant salary uplift. Moreover, post-graduate salaries increase substantially in the years after appointment as employees build complementary job-specific expertise.

But why is this academic and job-based expertise so valuable? Experts don't just know more than novices, they understand things differently, drawing on more abstract, 'deeper' representations. Research on chess-grandmasters, for example, shows that they understand configurations of chess pieces by seeing deeper patterns. They will see a Sicilian defence, while novices may see a selection of chess pieces. This expertise enables them to configure positions in a chess game far more effectively than novices. It also makes experts better at solving complex problems. Experts draw different conclusions than novices, typically starting closer to more robust solutions, finding solutions faster, and exploring fewer dead-ends.

The complexity of the problems being addressed in a modern information economy means that it is extremely unlikely that there is a pre-existing 'answer' waiting to be found in the academic literature. Instead, formal and informal research and experimentation is needed to find answers. This problem solving mainly draws on in-house expertise, but organisations increasingly bring in academic experts. Sometimes this is just for guidance or academic consultancy, but increasingly we see demand for collaboration and co-produced research. Here researchers with field expertise can successfully work alongside in-house experts in a way that deepens their understanding of seemingly intractable problems. Rather than a science-push model of knowledge transfer, this model creates impact through the process of collective learning. This can generate ongoing benefits as individuals and organisations improve their own stocks of expertise, allowing them to solve problems more effectively and/or more ambitiously.

This kind of contribution is very different from the impact-model sought after in REF impact case studies. It doesn't come from research findings published in academic papers being transferred to users. Its contribution is often indirect but hugely valuable and generative because it adds to the distributed stock of expertise, with academic papers typically coming after the impact has been generated, not before.

Conclusion

The argument of this blog is fairly simple: economies have changed and the problem-solving tasks that generate social and economic impact are more complex. In the 1950s, in a relatively small number of sectors, under atypical conditions, research could be readily applied. This has structured how we think about the value of research ever since. For most of the economy, outside high-tech manufacturing, those conditions have passed.

The complexity of modern innovation is beyond anything that can be simply solved with off-the-shelf research discoveries. This doesn't mean research is less useful. In fact, research is more economically and socially important across a much wider range of industries. As high-tech manufacturing has

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[2] Salter, A., D'Este, P., Martin, B., Geuna, A., Scott, A., Pavitt, K., Patel, P. and Nightingale, P., 2000. *Talent, not technology: publicly funded research and innovation in the UK*. London: CVCP.

[3] Joanne Lindley, Stephen Machin (2016) The Rising Postgraduate Wage Premium, *Economica*, 83, 330 ,281-306 https://doi.org/10.1111/ecca.12184

shrunk to a small fraction of the economy, and the service sectors have grown, demand for research has skyrocketed. The graduate salary premium in the UK has become a post-graduate salary premium, as more and more firms seek the skills needed to undertake formal and informal research.

Given the complexity of innovation in a modern information-intensive service economy, solving problems requires more diverse kinds of knowledge and deeper expertise. Academic researchers with field expertise can play an important role in the co-production of research working with non-academic partners to find more ambitious solutions faster, and at lower cost. Academics are specialist researchers with distinct skills, frameworks, methods, and ways of thinking about problems. This can complement and engage with the problem-solving methods and subject-specific knowledge found outside academia. By working together to undertake fundamental research on key problems, both sides benefit and build new expertise. This differs from traditional knowledge transfer through academic consultancy practice because it integrates practitioner and academic expertise whilst collectively working on difficult problems, to deepen understanding on both sides. Academics use this expertise to write papers, and the non-academics use it to improve their problem solving.

This shift from creating impact through the application of research "discoveries", to generating impact through the co-production of organisational expertise, has yet to be picked up in the policy literature on the economic impact of research. But thinking in terms of expertise and its role in a modern information-based economy, helps us appreciate the growing importance of research and the very diverse ways it enhances economic and social outcomes. In the next blog we describe one way in which this new generative and distributed impact model was built during a research collaboration between the ESRC and the Infrastructure and Projects Authority.

Authors

Both authors were investigators on **Project X**, an ESRC funded programme of research undertaken with the UK Government to generate unique insights into the performance of major projects and inspire improvements in their performance.

Paul Nightingale is a professor of strategy at the University of Sussex Business School based in the Science Policy Research Unit (SPRU). He is also the Associate Dean for Engagement at the Business School and one of the UK editors of *Research Policy*, the leading international innovation studies journal. Originally trained as a chemist, he worked in industry before undertaking a PhD in Science Policy at SPRU. His main areas of research are science policy and the strategic management of technology. His research focuses on innovation, its management and financing. For 10 years he worked with the Complex Product Systems Innovation Centre at Sussex, funded by the ESRC. More recently he was the Director of Special Projects at the ESRC.

Rebecca Vine is an assistant professor in accounting at the University of Sussex Business School. Her research explores performance management, accountability and the governance of risk within large-scale infrastructure projects. It examines (1) the role of adaptive architectures of reports, forums and metrics in brokering consensus and project-based learning; (2) the orchestration and integration of accountability frameworks and interactive risk management practice; and (3) the transformation of control capabilities to enable sustainable futures. Before her academic career she was a senior management consultant and chartered accountant.

For more information about Project X visit the website https://www.bettergovprojects.com/