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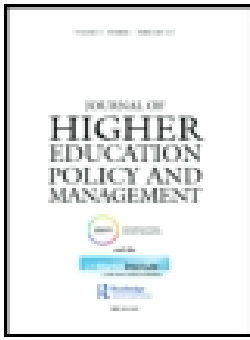
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Evaluating the non-academic impact of academic research: design considerations

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ABSTRACT

Evaluation of academic research plays a significant role in government efforts to steer public universities. The scope of such evaluation is now being extended to include the 'relevance' or 'impact' of academic research outside the academy. We address how evaluation of non-academic research impact can promote more such impact without undermining academic freedom and research excellence. Five questions on evaluation design are considered: (1) What should be the object of measurement? (2) What should be the timeframe? (3) How should non-academic users of research inform evaluation processes? (4) How should controversial impacts be managed? (5) When in funding cycles should impact evaluation occur? We conclude that non-academic impact should be selectively promoted and evaluated. This is how greater gains from research might be best captured without imposing misguided and onerous reporting requirements on individuals and institutions.

KEYWORDS

Academic research; evaluation methods; policy design; research assessment; research funding cycles; research impact; non-academic impact

Introduction

Recent trends in higher education policy suggest that academic research evaluation is at a critical juncture. This can be seen in the rising profile of the 'non-academic research impact' agenda. This refers to academic or university-based research having broad impact. The key question being asked is: How is this research relevant to the world outside the academy and does it deliver benefits beyond the research community? Such impact could be technological, environmental, economic or social. It could affect the policies, strategies, and actions of businesses, governments, non-profit organisations, and community groups. It differs from impact within the academic community, such as the influence of published articles and their citation counts.

Over recent decades, governments everywhere have increased their scrutiny of public spending. This scrutiny has affected public universities and the researchers working in them. Effects have included assessments of the quality of funded research (Orr, 2004). Academics have made many contributions to discussion of research quality assessments (Craig, Amernic, & Tourish, 2014; Reidpath & Allotey, 2010; Thomas, 2001). More recently, efforts have begun to assess research impact beyond the academy itself. Less scholarly attention has been paid to this non-academic impact agenda. When academics

have weighed in, their contributions have tended to critique the whole enterprise (e.g., Watermeyer, 2014). Our purpose is distinctly different.

Given the growing trend to assess value derived from public spending, we anticipate that governments will increasingly question the value of publicly funded research and seek to evaluate research impact. Such evaluation efforts could be benign. But they could also create unintended – and negative – consequences. Here, we review design considerations in the public evaluation of non-academic research impact. In doing so, we seek to inform discussions of research evaluation and reduce the likelihood that evaluation practices will have negative effects. We accept that impact evaluation efforts can be misguided. However, we do not accept that all such evaluation efforts are necessarily so. Indeed, appropriately designed impact evaluations could have salutary system effects. It is in the spirit of improving evaluation design that we here review design considerations. (Coates (2007), likewise, assessed use of evaluation for promoting learning and teaching excellence in Australian higher education.)

So far, different dimensions of the impact agenda have received initial analysis. For example, at the level of institutional management, Scoble, Dickson, Hanney and Rodgers (2010) identified the challenge ‘to devise strategies for actively supporting and facilitating the pathway from research to impact’ (p. 500). The authors noted how a greater understanding of the impact of academic research can provide insights into ‘how management strategies can be developed to integrate socio-economic impact into the institutional research capital’ (p. 500). On a related theme, Smith, Crookes and Crookes (2013) identified issues that arise when extending the criteria for academic promotion beyond published outputs to include the longer term impact of research. These authors also highlighted the methodological challenges associated with measuring such impact.

The focus on non-academic research impact is taking place at a time when, as Billot (2010) explained, ‘research activity and performance are coming under greater pressure and scrutiny. External policy and funding directives are resulting in revised institutional objectives, requiring variations to organisational structures and processes’ (p. 37). This is a context characterised by growing efforts to leverage university research to serve economic development (Warshaw & Hearn, 2014) and increased pressure for university researchers to secure ‘end-user’ support for their research projects (Pitman & Berman, 2009).

This new terrain in higher education has created new challenges for both policy-makers and researchers. At the policy level, there is a challenge to develop effective research evaluation systems to measure and encourage the broader societal impact of publicly funded research. For higher education institutions, new imperatives are emerging that need to be understood and incorporated into research management. This has consequences for academic researchers in terms of both their academic practice and future rewards and recognition. We seek to move this discussion forward by identifying critical variables in evaluating non-academic research impact. The main part of this essay introduces five policy design considerations, framed as questions: (1) What should be the object of measurement? (2) What should be the timeframe? (3) How should non-academic users of research inform evaluation processes? (4) How should controversial impacts be managed? (5) When in funding cycles should impact evaluation occur? We discuss these questions with the purpose of improving understanding of how non-academic research impact can be most effectively assessed.

Research evaluations systems

Efforts to measure the quality and quantity of publicly funded research can be seen as part of the New Public Management trend where audit and evaluation have been introduced in the name of accountability (Kells, 1999, p. 209). For example, in the United Kingdom (UK) the Research Assessment Exercise (RAE) was introduced in the 1980s. Henkel (1999) explains this as a period where professionalism was under challenge and ‘science policies in the UK were increasingly centred on the need to focus and prioritise the public funding of research’ (Henkel, 1999, p. 107). The RAE became an accepted and integral component of UK Higher Education and it had widespread effects on academic behaviour and institutional planning (Reidpath & Allotey, 2010). Heightening competition for research funding in this fashion was anticipated to improve overall research quality, and it appeared to do so. Consequently, significant policy transfer occurred across the globe (Jongbloed & Vossensteyn, 2001). Hicks (2009) documented the worldwide evolution in multi-university research evaluations and identified how they have become increasingly elaborate, even unwieldy.

Whereas the policy challenge of the previous 30 years was to find a way to measure academic research performance to inform funding decisions, the current challenge for policymakers is how to steer academic research to certain ends. There is a desire to ensure that research delivers beneficial societal outcomes rather than merely assume that such outcomes occur. The gains from the application of knowledge to innovation are now judged sufficiently high that things should not be left to chance.

The focus on research impact represents an extension of the research evaluation exercises now in place in many countries. However, the theoretical work and empirical methods required to effectively measure non-academic research impacts are in their infancy (research impact; academic research; Husbands Fealing et al., 2011; Upton, Vallance, & Goddard, 2014). To date, evaluation efforts have borrowed the methods of social and environmental impact studies with the goal of carefully tracing the processes by which research findings have been translated into substantive and measurable social outcomes (Spaapen, Dijkstra, & Wamelink, 2007).

Academic research evaluation at a critical juncture

We are in a new phase of academic research evaluation where the non-academic impact agenda creates a new set of policy considerations. This new terrain is creating new challenges for both policymakers and those who are the objects of this policy intervention – university administrators and academics.

A shift is taking place from academic research being predominately evaluated and funded on the basis of academic excellence to a combination of excellence and relevance. This trend in academic research evaluation and funding can be seen in the following policy examples:

- Between 2003 and 2007, the Australian Government developed the Research Quality Framework (RQF) proposal. This included non-academic impact as part of a cyclical research evaluation process that would inform research funding allocations to universities (Department of Education, Science and Training,

- 2005). The RQF was not implemented owing to a change of the party in government; however, the impact agenda continues through the work of the Australian Research Council which awards grants to researchers (ARC, 2015).
- In 2008, the Netherlands revised the Standard Evaluation Protocol (SEP), the process used to inform Dutch research funding allocations, to improve the relevance of research. In 2014, the impact component was given greater importance within the 2015–2021 cycle of the SEP (VSNU, KNAW, and NWO, 2014).
 - In 2010, the UK confirmed that the RAE would be replaced with the Research Excellence Framework (REF). The REF is similar to the RAE, the main difference being 20% of the REF grade is determined solely by non-academic impact (HEFCE, 2011). This followed an earlier move in the UK to insist applicants of Research Council (RCUK) grants include in their proposals evidence they had considered any ‘Pathways to Impact’. Here, the onus rests with research applicants, not the potential research users, to consider and demonstrate how they would achieve excellence with impact. This enables the bodies of RCUK to assess the potential societal impact of the proposal where appropriate (RCUK, 2015).
 - In 2011, the European Research Council (ERC) launched Proof of Concept grants. This dedicated stream offers follow-on funding for existing ERC grantees to contribute to stimulating economic and societal impact flowing from the work undertaken during their ERC research grant (ERC, 2011).

Evaluation design considerations

To inform good impact evaluation methods, we need to look beyond the production of academic knowledge within the academic community and consider its adoption, application and absorption in society. The different funding schemes outlined above identify how research impact can be incentivised in different ways. This suggests that several approaches are possible for assessing non-academic impact. To improve understanding of the evaluation process and its potential complexities, we here address five policy design questions.

What should be the object of measurement?

The impact agenda assumes a connection between academic work and the world beyond the academy that results in impact. However, these linkages are context-dependent and not unidirectional. Kenney and Mowery (2014) identify the complex interactions between university, industry and government that underlie the growth of some sectors of California. The authors point out ‘we still know surprisingly little about the dynamics of these relationships’ (p. 3). For example, in Silicon Valley, a two-way flow of people and knowledge exists where university researchers absorb knowledge from industry through many of the same mechanisms that transfer knowledge from the university to industry. Kenney and Mowery also highlighted how academic research can be applied commercially both with, and without, intellectual property protection such as patents. This illustrates how academic knowledge that cannot be captured in a patent can also have impact outside the academy. The complexity of these relations means that

they are most effectively analysed through detailed case studies, rather than quantitative indicators of innovation like patents granted, or the number of spin-off companies generated.

Case studies help capture the context-dependent nature of impact. But the attributes of those cases matter greatly. The most fundamental component of an impact case study involves clarifying what counts as ‘impact’. We need to ask, first, what evidence is required to substantiate non-academic impact? Second, what academic outputs are eligible, by the criteria of evaluation, to be recognised as sources of that impact? Accurately tracing the line of influence from one specific research project to a well-defined non-academic impact is, of necessity, challenging work. Such a tight definition may also exclude many impacts that cannot be attributed to particular academic outputs but flow from academic work more generally. However, impacts not flowing from a specific output are more difficult to directly attribute to academic research, therefore creating further methodological challenges. To ensure methodological reliability, assessments of research impact need to be valid and findings should be replicable. Careful effort should be made to ensure comparability across disciplinary areas in terms of measured impacts and their economic or social value. These significant requirements of sound impact evaluation lead us to conclude that evaluations should be confined to a well-chosen subset of cases, perhaps those where the non-academic impacts of research are deemed of highest social value.

What should be the timeframe?

The time lapse between an academic output and any impacts should also be taken into account. Mansfield (1991) famously estimated the social returns of academic research to be 28%, with a typical time lapse between academic research and commercialisation of 7 years (Nowotny & Felt, 2002, p. 168). The studies in Kenney and Mowery (2014) confirm the difficulty of estimating the time lapse to absorption. Many other studies within the science and technology policy literature further note the difficulties and limitations in calculating ambitious empirical estimates such as these. Some research impacts might come fast – especially when technologies with well-known properties can be matched to well-specified problems. Other research impacts, particularly those from basic research, could take years. The birth of molecular biology in the 1940s, leading to the development of fundamental work in human genomics, demonstrated how the impact of such basic scientific research can run over generations. Only in hindsight can the impact of such work be assessed. This suggests the importance of informing research impact assessment exercises with some historical perspective. It again supports the view that evaluating the non-academic impacts of research should be performed selectively, so as to ensure it is done thoroughly and generates accurate insights into the pathways from the production of research findings to unambiguous creation of valued societal impacts.

How should non-academic users of research inform evaluation processes?

An important part of research evaluation design concerns who is involved in the assessment process. Academic excellence can be decided by a panel of peers looking at citations and influence on academic disciplines. Academic impact can be decided by

academics themselves. A key question is whether including non-academic criteria in the evaluation process requires, in consequence, opening up this assessment process to non-academics. Having academics alone assessing and rating non-academic impact may lead to a lack of confidence in the evaluation process. This is because academics, using the values from within the academic community, may privilege impacts perceived and valued by academics as of importance. There is therefore a case for bringing research users into the evaluation process. Yet the total population of research users is as diverse as civil society. Only a sample of 'non-academic voices' could ever inform evaluations of research impact.

In the UK REF, an example can be found of individuals from outside the academic community being involved in the assessment of impact. In this framework 'research users' were identified as people outside of academia in the private, public or charitable sectors. These are individuals who make use of university research in their organisation or professional activity and those who commission or collaborate with academic researchers. Research users were involved in the REF in two ways. First, this occurred by providing universities with evidence to corroborate the impact of the academic research being submitted. Second, over 250 research users were appointed to all the assessment panels and were fully involved throughout the criteria-setting and assessment phases of the impact component of the REF. These research users sat alongside academic panel members and their involvement was intended to ensure they would make a strong input into the impact evaluation of every panel. These panel members grade the impact component by its *Reach* which refers to 'the spread or breadth of influence or effect on the relevant constituencies' and its *Significance* – 'the intensity of the influence or effect'. An overall judgement about the reach and significance of impacts is made by the assessing panel, where each criterion is not graded separately (HEFCE, 2011).

One of the consequences of involving non-academics in the evaluation process is how this can potentially break the 'closed shop' of academic interests. Henkel (1999) identified how introduction of the UK RAE represented a successful attempt to sustain academic values and academic control in a context where the state was making new demands on research (Henkel, 1999, p. 105). Authors such as Martin and Whitley (2010) explain how this represents a form of 'regulatory capture' – that is, the producers of the services manipulated the regulation of those services to support their own interests. The addition of impact criteria and the inclusion of non-academic assessors within this new generation of research evaluations could potentially challenge this perceived regulatory capture and diminish academic control. This raises the issue of 'balance' in the evaluation of academic work. Too much control by outside entities could undermine long-held values of academic freedom and research excellence. Carefully selecting the areas in which non-academic impact is evaluated would not remove this tension. However, it would reduce the risk of such efforts having unintended harmful effects on the broader academic culture.

How should controversial impacts be managed?

Making value judgments on impacts also requires consideration. Economic impact can be measured in dollar terms or in improved efficiency or productivity. Societal impact can be more complicated to measure as efforts to define what is good for 'society' rarely

avoid controversy. Impact may also be associated with activities that are politically divisive such as Mining with Hydraulic Fracturing or Genetically Modified Crops. The impacts – and anticipated impacts – of Human Embryonic Stem Cell Research have likewise caused controversy. On these issues, it is difficult to establish a consensus on how scientific progress impacts ‘the public good’.

Providing a rounded judgment on the societal impact of emerging scientific and technological developments such as nanotechnology in food, synthetic biology, biofuels and cloud computing can be particularly challenging. Impacts from emerging technologies can also result in societal tensions. This can be partly explained by the differing perception of their impacts through different formal or informal assessments, such as Technology and Risk Assessments, Ethical Reviews or media analysis of public perceptions. Judging such societal impacts is rendered more complex by the integration of non-economic aspects that have often been ignored in the past. These include environmental damage, public health, natural and cultural resources, and quality of life.

The significance of this issue can be seen in how it was included as a theme in the European Union’s 7th Research and Innovation Framework *Science in Society* work programme. This argued that earlier impact assessment frameworks – conducive to an assessment of specific advances in knowledge – are no longer sufficient for debating and shaping the next waves of innovations, and that research in this area is urgently needed. This is because integrated approaches to impact evaluation, which include the non-economic considerations of the impact of new knowledge, are necessary to more accurately reflect the development of the knowledge society (Göksu, 2010, p. 55). This highlights both the complexity and infancy of the work being undertaken to develop measures. Evaluating the non-academic impact of academic research should not create controversy. Controversy could be avoided by narrowing the scope of research that is evaluated for its non-academic impacts, rather than introducing impact evaluation across the whole spectrum of publicly funded research. While controversy is always possible as a consequence of evaluating impact, focusing the evaluations on a carefully chosen set of research activities could yield important insights about research utilisation. Doing so would avoid stirring up unnecessary and distracting arguments over the impacts of research on topics such as religious studies or critical social theory.

When in funding cycles should impact evaluation occur?

Policy interventions can be made at various points in the research process. There are also different means through which those interventions can promote academic impact. Distinctly different incentives can be established for researcher depending on where impact evaluations occur in research funding cycles – before (*ex ante*) or after (*ex poste*). We consider five possibilities.

- *Ex-ante direction where a funder issues a request for proposals to investigate a specified topic.* An example of this is the European Union Research and Innovation Horizon 2020 work programme. In some elements of the programme, the desired impact is described in the request for proposals as well as the problem statement.
- *Ex-ante direction where grants are available for research topics that come from researchers themselves.* An example of this is the research funding available from

the various UK Research Councils. Although the research questions come from researchers, the funder requests applicants to display evidence they have considered potential research-users and built impact into their application for a grant.

- *Ex-ante impact assessment can be used in an ex post research evaluation.* This would involve allocating funding for impact activities after an evaluation of a research project. The funds would facilitate an existing research project to achieve impact. An example of this follow-on funding is the ERC Proof of Concept Grant scheme which provides extra funding for ERC projects with innovation potential.
- *Ex-post evaluation which allocates a stream of generic research funding as a recurrent allocation.* Retrospective evaluation is used within the methodology of the UK REF and the Dutch SEP. Within both of these evaluations, impact is one of the criteria. The Australian RQF would have been such a scheme if it had been implemented.
- *Ex-ante forward looking interventions can be used to incentivise future impact.* This may involve a small grants scheme to support academics to undertake projects that are intended to deliver impact. Another example is the REF Evaluation process where, although a very small part of the total exercise, submissions include a template that involves outlining future plans to promote non-academic impact.

The prospect of a future, retrospective evaluation and the presence of impact expectations in research funding schemes both raise the profile of non-academic impact within the academic community. Through funding mechanisms that create appropriate incentives, the logics of impact could prevail. However, care should be taken in devising and applying such mechanisms. Some areas of academic research are unlikely to ever produce significant non-academic impact. Prioritising areas to be given special attention with respect to impact makes most sense. Indeed, limiting the impact focus could create knock-on incentives. Those researchers who believe their discipline has important impacts that are not being recognised could make their case for impact evaluation of research in their discipline by relevant funding agencies.

Discussion

Through exploring these design considerations, we assert that blanket approaches to promoting and evaluating non-academic research impact may be problematic. The greatest promise for the impact agenda is likely to be realised from focusing attention and evaluating in a manner that will elucidate ‘what works’ while avoiding the introduction of onerous and possibly spurious reporting requirements on individuals and institutions.

Because university autonomy and academic freedom generate hard-to-measure but significant social outcomes, direct command and control where the state simply ‘orders’ impact is not really suitable nor would it be effective. There are two reasons. First, in many areas of research activity, non-academic impacts are, by their nature, difficult to predict. They cannot be foreseen by governments. Second, it is hard to justify allocating money to something that does not yet exist. The state therefore cannot plan or purchase specific non-academic impacts in advance.

While the development of non-academic impact evaluation represents necessary work, it should be carefully focused. Significant effort could be wasted on developing unhelpful impact evaluations. In contrast, focusing on areas where impact is most desired would lead to learning among evaluators and researchers alike. Establishing appropriate incentives in research funding is an essential starting point for promoting greater focus on impact. Well-designed and judiciously applied impact evaluations offer the potential for testing the effects of those incentives.

Promoting non-academic research impact could be reinforced by strategies that seek to ‘nudge’ researchers towards paying more attention to the societal impacts of their work. Nudge theory, based on the work of Thaler and Sustein (2009), utilises insights from behavioural economics. It argues that system design and positive reinforcement can achieve non-forced compliance. Behavioural insights have been selectively applied in policymaking in the United States, UK and Australia (Leggett, 2014; Selinger & Whyte, 2011). But they are yet to be applied to promote non-academic impact of research.

Looking to the future, funding agencies could deploy various methods to encourage researchers to pay greater attention to generating valued non-academic impact. This could involve placing triggers within the research environment to nudge targeted researchers to think about impact, even where there is little immediate financial reward. This is precisely where well-considered evaluation efforts could pay off. Through iterative practices, policymakers, universities and individual researchers could improve knowledge of where and when valued impacts are most likely to occur and organise elements of the research enterprise with the goal of promoting greater non-academic impact.

Conclusion

Including research impact within mainstream processes of academic research evaluation is in its infancy. Those seeking to promote and evaluate non-academic impact face significant methodological challenges. However, careful policy design has the potential to raise research performance in universities and raise the societal relevance of academic research. Such results could be attained without necessarily undermining basic research or researcher autonomy. Discussion and debate informed by the design considerations outlined here could promote appropriately focused evaluation and improve knowledge of where and when valued impacts are most likely to occur. That is an exciting prospect – not least because it prompts reflection on the vital, on-going role of universities in human progress.

Disclosure statement

No potential conflict of interest was reported by the authors.

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