MAXIMIZING THE IMPACTS OF YOUR RESEARCH:

A HANDBOOK FOR SOCIAL SCIENTISTS

LSE Public Policy Group

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About this Handbook

There are few academics who are interested in doing research that simply has no influence on anyone else in academia or outside. Some perhaps will be content to produce 'shelf-bending' work that goes into a library (included in a published journal or book), and then over the next decades ever-so-slightly bends the shelf it sits on. But we believe that they are in a small minority**.** The whole point of social science research is to achieve academic impact by advancing your discipline, and (where possible) by having some positive influence also on external audiences - in business, government, the media, civil society or public debate.

For the past year a team of academics based at the London School of Economics, the University of Leeds and Imperial College London have been working on the Impact of Social Sciences project aimed at developing precise methods for measuring and evaluating the impact of research in the public sphere. We believe our data will be of interest to all UK universities to better capture and track the impacts of their social science research and applications work.

Part of our task is to develop guidance for colleagues interested in this field. In the past, there has been no one source of systematic advice on how to maximize the academic impacts of your research in terms of citations and other measures of influence. And almost no sources at all have helped researchers to achieve greater visibility and impacts with audiences outside the university. Instead researchers have had to rely on informal knowledge and picking up random hints and tips here and there from colleagues, and from their own personal experience.

This Handbook remedies this key gap and, we hope, will help researchers achieving a more professional and focused approach to their research from the outset. It provides a large menu of sound and evidence-based advice and guidance on how to ensure that your work achieves its maximum visibility and influence with both academic and external audiences. As with any menu, readers need to pick and choose the elements that are relevant for them. We provide detailed information on what constitutes good practice in expanding the impact of social science research. We also survey a wide range of new developments, new tools and new techniques that can help make sense of a rapidly changing field.

This Handbook will be of immediate practical value for academics, lead researchers, research staff, academic mentors, research lab leaders, chairs and research directors of academic departments, and administrative staff assisting researchers or faculty team leaders in their work.

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Defining research impacts

1. A *research impact* is a recorded or otherwise auditable occasion of influence from academic research on another actor or organization.

 a. *Academic impacts* from research are influences upon actors in academia or universities, e.g. as measured by citations in other academic authors' work.

 b. *External impacts* are influences on actors *outside* higher education, that is, in business, government or civil society, e.g. as measured by references in the trade press or in government documents, or by coverage in mass media.

2. A research impact is an occasion of influence and hence it is *not* the same thing as a change in *outputs or activities* as a result of that influence, still less a change in social *outcomes*. Changes in organizational outputs and social outcomes are always attributable to multiple forces and influences. Consequently, verified causal links from one author or piece of work to output changes or to social outcomes cannot realistically be made or measured in the current state of knowledge.

3. A research impact is also emphatically *not* a claim for a clear-cut social welfare gain (i.e. it is not causally linked to a social outcome that has been positively evaluated or validated as beneficial to society in some way).

4. However, secondary impacts from research can sometimes be traced at a much more aggregate level, and some macro-evaluations of the economic net benefits of university research are feasible. Improving our knowledge of primary impacts as occasions of influence is the best route to expanding what can be achieved here.

What shapes the citing of academic publications?

5. Citation rates are used as a basis for tracking academic impacts. The shape of citation rates vary widely across academic disciplines.

6. There are substantial differences in the general rate of citing across disciplines with more cites (including self-cites) being found in the sciences than the social sciences.

7. The type of output chosen affects citation rates e.g. on average a book will take longer to be referred to but will be cited for longer.

8. How academics balance their time across the six areas of responsibility will be another important factor in citation rates.

Knowing your strengths

9. In the past academics have had few available tools to track their citation rates. We suggest using a combination of the three best tools which are Harzing's Publish or Perish, Google Scholar and Book Search, and the ISI Web of Knowledge.

10. Having a distinctive author name is essential for academics' work to be easily found amongst a global deluge of information.

11. Conventional citation-tracking systems like ISI WOK and Scopus have limited coverage in the social sciences and humanities, and an American-based geographical bias, as well as capturing relatively few citations in languages other than English.

12. Internet-based systems like Harzing's Publish or Perish, Google and Scirus cover a wider range of academic outputs and now provide more reliable analysis of how research is being cited – much more reliable in the social sciences and humanities.

Key measures of academic influence

13. Simple indicators for judging citation rates - such as total number of publications, total number of citations, and an age-weighted citation rate do not accurately capture an academics' citation success.

14. Calculating an academic's h-score and g-score provides a more robust picture of how much an academic's work is valued by her peers.

15. Across all disciplines in the social sciences journal articles account for the majority of citations, reflecting the large numbers of published articles. Books account for 8 to 30 per cent of citations across different disciplines. Books may figure disproportionately amongst those well-cited entries that build h scores and the g index. Book chapters, however, are often hard to find and are poorly referenced.

16. Network analysis can help shed light on the difference in citation rates between 'hub' and 'authority' academics at different stages in their careers, which compares the number of inward and outward citations.

Getting better cited

17. Academics who wish to improve the citation rate of their journal articles should ensure that title names are informative and memorable, and that their abstracts contain key 'bottom line' or 'take-away points'.

18. Book authors should ensure that their titles and sub-titles are distinctive yet appear in general 'Google Book' searches around the given theme.

19. There are a number of schools of thoughts regarding self-citations. In general academics should aim to ensure their own self-citation rate is in line with academics in the same discipline.

20. Co-authored outputs tend to generate more citations due to networking effects between authors in a given research team or lab, especially if the co-authors come from different universities or countries.

Patterns of external research impacts

21. Generating impact within single academic disciplines is a complex process encompassing not only 'discovery' but also integration, application, and professional renewal; each of which impart significant demands on an academic's time.

22. Academic work is highly siloed into disciplines while societal problems are multi-dimensional. Bridging scholarship across disciplines, promoting integration at the university level, and engaging in academic and professional service are some ways in which academics' work can better reach and influence wider society.

23. The 'impacts interface' describes how in advanced societies intermediaries such as consultancies, think tanks, the media, and other organisational bodies aggregate, distil and re-package trends in academic research for clients and other actors in the private sector, government, and civil society.

24. Academics giving informal advice to businesses, along with lectures, networking, contract work, student placements, joint publications and consultancy are the most widely undertaken activities likely to generate external impacts.

Is there an impacts gap?

25. Government officials and businesses often complain of an 'impact gap' where academic research fails to fulfil its potential to influence wider societal development. (The wider issue of 'outcome gaps' is too difficult to track or discuss due to the multi-causal nature of social life and the weak existing evidence base about such issues).

26. If there is an impacts gap it could be attributed to:

- demand and supply mismatches;
- insufficient incentives problems;
- poor mutual understanding and communication;
- cultural mismatch problems; or
- weak social networks and social capital.

27. Solutions to effectively combat an impacts gap cannot be homogenous across all academic disciplines and sectors, but rather should be innovative and tailored to the demonstrated problem.

How researchers achieve external impacts

28. While different authors and schools of thoughts within disciplines will take a different view of what make a difference to an academic achieving external impacts, we hypothesize that the following eight factors are most relevant:

- His or her academic credibility;
- dispositional and sub-field constraints networking skills;
- personal communication capacity;
- external reputation;
- experience;
- and track record of successful work.

29. Analysis of our pilot sample of 120 academics shows that academics who are cited more in the academic literature in social sciences are cited more in non-academic Google references from external actors.

30. Researchers tend to claim impact in a haphazard way; it is possible to see a more robust correlation between outputs produced for a particular project and moderated impact assessments.

How organizations achieve external impact

31. While academic departments, labs, and research groups produce a great deal of explicit knowledge, it is their collective 'tacit knowledge,' which is the most difficult to communicate to external audiences, that tends to have the most impact.

32. The changing nature of commissioned academic work means that the time lag in achieving external impacts can be radically reduced, yet any external impact of non-commissioned work is likely to lag far beyond its academic impact.

33. It is important for both individual departments/ research labs, schools or faculties, and the University as a whole to systematically collect, access and arrange auditable data on external impacts; keeping in mind that some 'naïve customers' like funders, regulators, and other parts of their universities may insist on proof of 'extended' impacts

34. Making meaningful comparisons between universities' and individual departments' external impact requires contextual understanding of how departments and universities generally perform in a given country and institutional environment.

35. Seeking to improve external impact should not mean sacrificing academic independence and integrity; compiling a risk assessment for working with external actors or funders is one way to mitigate the politicization of one's research.

Expanding external research impacts

36. Academics should move beyond simply maintaining a CV and publications list and develop and keep updated an 'impacts file' which allows them to list occasions of influence in a recordable and auditable way.

37. Universities' events programmes should be re-oriented toward promoting their own research strengths as well as external speakers. Events should be integrated multi-media and multi-stage from the outset and universities should seek to develop 'zero touch' technologies to track and better target audience members.

38. Universities should learn from corporate customer relationship management (CRM) systems to better collect, collate, and analyse information gathered from discrete parts of the university and encourage academics to record their impact-related work with external actors.

39. 'Information wants to be free.' Publishing some form of an academics research on the open web or storing it in a university's online depository is essential to ensure that readers beyond academia can gain easy access to research.

40. Improving professional communication, such as through starting multi-author blogs, will help academics 'cut out the middleman' and disseminate their research more broadly.

41. Academics must realise key interface bodies like think tanks are not going to go away, Being smart about working with intermediaries and networks can broaden access to the potential beneficiaries of research.

Introduction

What are research impacts?

In any sphere of social life it is not easy to assess how much influence particular people, ideas, products or organizations have on others in the same occupation or industry, or on other spheres of social life. We are forced to look for indicators or ways of measuring influence ('metrics'), each of which (taken on its own) is likely to have limited usefulness and to be liable to various problems. In business fields the development of metrics is often most advanced, because there is a clear monetary value to many actors in knowing which advertising medium reaches most consumers, or which form of marketing elicits the greatest volume of eventual sales. Yet even the most well-developed metrics of influence only go so far – they tell us how many people read print newspapers, but not how many read each article. Online, we can say more – for instance, we know precisely how many people clicked on an article and how long they spent on each item. But we cannot know how many readers agreed with what they read, or disagreed, or immediately forgot about the argument. In short, metrics or indicators can tell us about many aspects of potential *occasions of influence*, but not what the *outcome* of this influence was.

Within academia, there has long been a studied disparagement of these 'bean counting' exercises in trying to chase down or fix the influence of our work. The conventional wisdom has been that we do not know (and inherently we cannot ever know) much about the mechanisms or byways by which academic research influences other scholars or reaches external audiences. On principle, the argument goes, we should not want to know, lest we are lead astray from the 'pure' and disinterested pursuit of academic knowledge for its own sake, and veer off instead into the perils of adjusting what we research, find or say so as to deliver more of what university colleagues or external audiences want to hear. Our job is just to put ideas and findings out there (via publications, conferences, lectures etc.), and then to sit passively by while they are, or are not, taken up by others.

We do not believe that this traditional approach is useful or valid in the modern, digital era. The responsibility of researchers and academics is to think their research through carefully from the outset, paying at least some attention to what 'works' in terms of reaching and influencing other researchers or external audiences. Researchers need to construct and maintain a portfolio of projects that help them make a difference to their discipline. They also need to try to ensure that the social sciences make some form of contribution to the wider social world and context in which the researcher is embedded. Whatever an academic or a researcher eventually decides to include in or leave out of their portfolio of projects, the only rational or responsible decisions to be made are those based on having good quality information about how their existing works have fared in terms of achieving academic impacts or external impacts.

We define a ***research impact*** *as a recorded or otherwise auditable occasion of influence from academic research on another actor or organization.* Impact is usually demonstrated by pointing to a record of the active consultation, consideration, citation, discussion, referencing or use of a piece of research. In the modern period this is most easily or widely captured as some form of 'digital footprint' (e.g. by looking at how often other people cite different pieces of research in their own work). But in principle there could be many different ways of demonstrating impact, including collecting the subjective views of a relevant audience or observing the objective behaviour of members of that audience.

Research has an ***academic impact*** *when the influence is upon another researcher, academic author or university organization.* Academic impacts are usually and most objectively demonstrated by citation indicators, the focus of the next four chapters. This is a 'revealed preference' approach to understanding academic influence, and an increasingly sophisticated one that now allows us to very promptly trace out flows of ideas and expertise in great detail, down to the level of an individual researcher or her portfolio of works (Harzing, 2010, p.2).

Sadly for the field, however, a range of crude and now-outdated methods are still deployed by academic departments, universities and governments when trying to assess the quality of academic work. A key example is using 'journal impact factors' (JIFs) which count how many academics cite a journal's output of papers on average, or (even worse) subjective lists of 'good' and 'bad' journals (or 'good' and 'bad' book publishers) to evaluate the contribution made by researchers. As Harzing (2010, p. 3) points out, using JIFs or such lists is actually applying a 'proxy indicator' of quality, by assuming that an academic's work is as good as the average article in the journal they publish it in, or that an academic's book is as good as the average of all those put out by that publisher in that discipline. Yet in fact, all journals and publishers publish rather varied work, some that proves influential and much that does not. This is especially the case in the social sciences (and humanities) where even the highest quality journals rarely achieve JIF scores above 2.0 – that is, an average of two other articles citing each paper within the first two years after its publication.

In addition, academic influence may also be gauged in a 'stated preference' way by developing recordable subjective judgements or qualitative assessments, which are systematically conducted and use a non-biasing methodology. Useful approaches include surveys of professional groups, academics voting online for their influences in a controlled market, and newer forms of open-access online peer group evaluations. Perhaps we might also include here government-designed or officially-mandated peer group review processes that seek to be comprehensive, such as the judgements of academic panels relied on in the UK's Research Assessment Exercise (the 'RAE' which ran from 2000 to 2008, covering all academic disciplines) and the new Research Excellence Framework (REF, which seems broadly similar). These essentially use a committee and some set of rules to try and do the JIF/lists proxy categorization of publications and other academic outputs a bit more systematically. However, the jury is still out on whether such externally guided and bureaucratically driven exercises do anything more than crystallize certain priorities of officialdom, let alone representing academically valid or worthwhile exercises in assessing the impacts of research within higher education itself.

Research has an ***external impact*** *when an auditable or recorded influence is achieved upon a non-academic organization or actor in a sector outside the university sector itself* – for instance, by being used by a business corporation, a government agency, a civil society organization or a media or specialist/professional media organization. As is the case with academic impacts, external impacts need to be demonstrated rather than assumed. Evidence of external impacts can take the form of references to, citations of or discussion of a person or work or meme (idea, concept or finding):

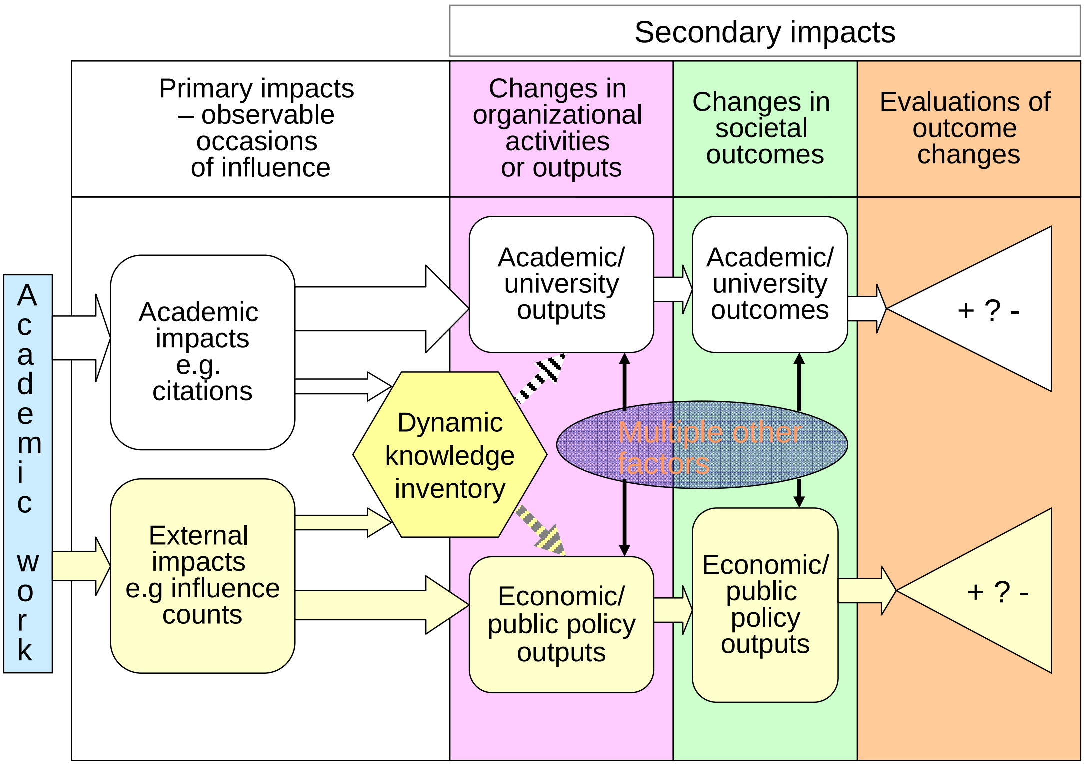
- in a practitioner or commercial document;
- in media or specialist media outlets;
- in the records of meetings, conferences, seminars, working groups and other interchanges;
- in the speeches or statements of authoritative actors; or
- via inclusions or referencing or web links to research documents in an external organization's websites or intranets;
- in the funding, commissioning or contracting of research or research-based consultancy from university teams or academics; and
- in the direct involvement of academics in decision-making in government agencies, government or professional advisory committees, business corporations or interest groups, and trade unions, charities or other civil society organizations.

Just as with academic citations, we could mainly follow a 'revealed preference' approach to finding external impacts, looking for a residue or 'footprint' and assigning to each reported influence as much credibility as the available evidence allows. Thus, extensive citation or use of distinctive research findings, concepts or memes would justify assigning more influence than scattered or isolated references. Similarly the commitment of more funding to commissioned research or showing that university academics were closely involved in external organizations' decisions could all provide indications of a greater degree of achieved impact. Note that in our approach an external research impact, just like an academic citation, is an occasion of apparent influence only.

In addition, however, a 'stated preference' approach can be very useful, by asking external users of academic research how much contact they had with and how they rated the contribution of individuals, research teams, universities and bodies of literature. Of course, such judgements and assessments are subjective, and prone to potential distortions familiar with all reactive measures (such as potential 'elicitation biases' involved in how the questions are asked of respondents). Yet especially if the sample of external people surveyed are expert in the utilization and contribution of university research, and the questionnaires used or interview methods are rigorously designed, this approach can powerfully counteract some of the many problems that can occur in trying to trace academic contributions to economic, business or public policy change in terms of electronic or other footprints.

In our terms claiming an external impact from research does not say anything further about what follows from this influence. As Figure I.1 shows, we can draw out further possible changes that may or may not follow from an initial occasion of influence, the primary impacts on which we focus here. Academic work that influences other academics or external organizations forms part of a societal-wide 'dynamic knowledge inventory', a constantly developing stock of knowledge and expertise of which universities are important but by no means sole guardians, nor even necessarily the most important custodians. The role of 'caring for and attending to the whole intellectual capital which composes a civilization' is one that the philosopher Michael Oakeshott (1962, p. 194) once assigned exclusively to universities. Yet now that role is in fact widely shared, and the dynamic knowledge inventory is constantly looked after, activated and recombined by many different institutions – for instance, think Google or Wikipedia as much as (often perhaps far more than) individual universities.

Figure I.1: The primary and secondary impacts of academic research



For many conventional people in the business world, the concept of any kind of inventory, construed as 'unsold goods' or things unused, gathering dust on warehouse shelves, comes across exclusively as a bad thing. Contemporary businesses

have invested a lot of time, money and energy in minimizing their inventories, paring down stocks to maximize efficiency, and bringing in 'just in time' delivery to transfer storage and inventory costs to other firms further up the supply chain. So in this view a dynamic knowledge inventory may sound no different in kind, an 'odds and sods' store of bric a brac knowledge without conceivable applications, expensively produced initially (often at taxpayers' expense) and now kept in ways that must equally be costing someone to store, curate and maintain.

Yet there are fundamental differences between the static inventories of physical goods that are fixed-in-form (once created) and the dynamic knowledge inventory. There are multiple forces at work that strongly *reduce* over time the costs of storing knowledge ready to use. Knowledge that is employed or applied is always routinized and simplified in use and over time. Partly this is because 'practice makes perfect' at an individual level, and experience counts even for the most esoteric or unformalized forms of tacit knowledge and skill, such as craftsmanship (Sennet, 2008). In intellectual life also, devoting a critical mass of time (perhaps 10,000 hours) to perfecting capabilities is often associated with exceptional individuals achieving radical innovations or breakthroughs in perception of how to tackle problems (Gladwell, 2009).

But the same processes of re-simplifying the initially complex, or routinizing the initially *sui generis*, of converting the initially unique solution into a more generic one, is also implemented far more powerfully at the collective level, across groups, occupations, professions and communities of interest. We discuss below (in Chapter 5) the importance of 'integration' scholarship within the development of academic disciplines. The initial work here involves isolated and hard-to-fathom discoveries being recognized as related, re-conceptualized and then synergized into more complete explanations. At a more macro-level, many initially distinct-looking phenomena may be recombined and re-understood through new 'paradigms' that unify understanding of them in intellectually coherent ways. Later on, much of the detail of initial research advances becomes less relevant and is screened out by improved understandings. The final stage of integration scholarship is that new ideas or discoveries are filtered through many layers of the research literature and into authoritative core textbooks and the professional practices and teaching of academic disciplines. Through all these stages, and in all these ways, knowledge often becomes 'easier' to understand over time, *less* costly to curate, store and maintain, as the fragmentary or disorganized discovery knowledge moves further and further behind the research frontier and is re-processed and re-understood.

We also embody knowledge in multiple cultural artefacts that function to make far easier the next round of knowledge acquisition and re-use. At root we embody knowledge in new languages and concepts, new intellectual equipment that makes the redeployment of old knowledge or the development of many new knowledge products (such as dictionaries, encyclopaedias, textbooks, review articles and journals) that make information accessing more comprehensive, quicker and better-validated. Equally knowledge is embodied in physical tools and equipment, from laboratory equipment, through machine tools and process manufacture capabilities, through to first analogue and now digitized information storage and retrieval machines.

The modern period is of critical significance in this respect because of the divergence between what (Anderson, 2009) terms:

- the 'world of atoms', where storage and retrieval are still expensive, inventories must be limited or minimized, and because everything costs, so everything has a price; and
- the 'world of bits', where storage and retrieval are effectively free, information and inventories can expand (almost) without limit, and new marginal users of existing knowledge or information goods costs nothing. Hence companies like Google can build a business on 'a radical price', offering many services for free.

Digitalization has already transformed private sector commerce and business, and has made feasible the 'long tail' in retailing, perhaps most notably for books (Anderson, 2006, or 2004). The digitalization of the dynamic knowledge inventory is the most important post-war step in human culture and development. And despite multiple premature sceptical voices, its implications have only just begun to track through academia, university research processes and the ways that they influence civil society.

Beyond the cumulating and sifting roles played by the knowledge inventory, it is possible that we can also disentangle and identify these secondary impacts of research in changing the *activities or outputs* or policies of firms, businesses, government agencies, policy-makers or civil society organizations. In at least some cases, we might be able to take this further, and to trace through *the social outcomes* that follow from such an influence. But we live in a complex social world where many different social forces contribute to the production of business or governmental activities, and to the evolution of social outcomes – as the blue oval box in Figure I.1 indicates. Any research impacts on outputs or outcomes in advanced industrial societies occur in an inherently multi-causal setting. Many influences are aggregated and cumulated by multiple institutions, so that dozens, hundreds or thousands of influences have some impacts, either simultaneously or in a lagged and cumulated way over time. In these conditions, it is not realistically possible to track in detail the outcomes of particular external impacts from individual pieces of academic work. Even if we were to look at the top set of influences, within academia or the university domain itself, environmental influences are so strong that tracing influences just on *university* outcomes from academic research is a tricky endeavour.

The final part of Figure I.1 concerns the evaluation of those social outcomes that are influenced by academic research - as positive, negative or indeterminate or contested for society. Even if we could track through the influence of any given piece of research amidst this welter of other influences, we cannot assume a priori that societal outcomes influenced by academic research are beneficial. Primary impacts are 'brute facts'. There is no inherent evaluative colouring built into the concept of a research impact as 'an auditable occasion of influence'. But once we consider secondary impacts mediated through changes of outputs and outcomes, this is rarely going to be a sustainable position. A scientific advance may help produce a cure for an illness, for example, or it may allow the construction of some new weapon or the manufacture of a severely addictive leisure drug. A social science paper may improve the efficiency of a business or governmental process, but it may also help to sway businesses or governments to make ill-advised choices that reduce the social welfare. The moral colour of the outcomes from any research impact is normally determined in subsequent use by others, and it cannot usually be controlled or even shaped by the original researcher.

However, not being able to track individual research work's secondary impacts on outputs and outcomes, and not being able to impart normative evaluations of individual influence flows, does not mean that the accumulation of impacts across a whole academic field has no effect or cannot be assessed. 'Bottom-up' processes of assessment are infeasible at this stage, but 'top down' and aggregate approaches are not. Indeed, at the level of primary impacts we can say a lot more in modern times by looking across researchers, research teams, institutions and indeed disciplines and countries. We can quantify and compare primary impacts (as occasions of influence), charting the extent to which different academics have influence with their peers in their discipline. And equally researchers themselves can make meaningful (if as yet only qualitative) analyses of how influential their different (large) strands of work have been, as we show below. Enhancing this capacity to understand academic influence can help all of us in the social sciences to become more effective as researchers. And for external actors, a better understanding of academic research can help organizations and governments to use it more intelligently and constructively to address contemporary social problems.

These warning words are likely to prove palatable to government officials and politicians, however. Governments worldwide demand that universities justify public funding of science and research efforts, effectively asking for an enumeration of outputs and outcomes linked to research, and for a systematic evaluation of these effects. In short they demand an itemization not just of primary impacts, which is do-able, but also of extended secondary impacts, which is not (in the current state of knowledge and technology). Yet scientists and universities in turn are tempted not to rebut such 'naïve customer' demands but instead to play up to them by producing inflated or mainly un-evidenced claims of their extended effects on outcomes and outcomes. These claims are then backed up using 'case studies' of research dividends, anecdotes and fairy tales of influence, and the organized lobbying of politicians and public opinion. The net effect is often to produce an unreal public discourse in which political and bureaucratic demands for unrealistic evidence co-exist with university claims to meet the actually unattainable criteria being set. The forthcoming Research Excellence Framework in England looks like becoming a classic example of this pattern, like its RAE (Research Assessment Exercise) predecessors.

This is not to say that no economic evaluation of the costs, benefits and values served by academic research is feasible - but only that what is currently achievable is likely to operate at a very aggregate level. We can look across countries, and perhaps within countries across disciplines, at how far investing in different kinds of university research is correlated with other social, economic or public policy changes that we value as positive. Standard cross-national regression analyses already provide some basic pointers to guide policy-makers here. Useful analytic techniques have been developed in environmental economics for imputing values to things not paid for, or assigning values to the continued existence of things even when they are not currently being directly used. They could potentially be extended to other areas, such as valuing cultural institutions (O'Brien, 2010), or valuing university education and research efforts, or unravelling the latent value of the dynamic knowledge inventory as a key factor separating advanced industrial states from those that are still developing and industrializing.

As we develop much better knowledge of the primary impacts of research (both on academia itself and externally), so we can expect the scope and detail of linkages between academic influences and output and outcome changes to increase. Generating better data on primary research impacts is also likely to greatly expand what it is feasible to accomplish in evaluating the mediated influence of academic work on social outcomes. But even with our current rapid advances in information technology and the pooling of information over the internet, these shifts are most likely to occur over a period of years, and certainly are not immediately possible. In this book we primarily seek to give a boost to the analysis of primary research impacts, from which we are confident that further major improvements in assessing secondary impacts should flow.

Summary

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2. A research impact is an occasion of influence and hence it is *not* the same thing as a change in *outputs or activities* as a result of that influence, still less a change in social *outcomes*. Changes in organizational outputs and social outcomes are always attributable to multiple forces and influences. Consequently, verified causal links from one author or piece of work to output changes or to social outcomes cannot realistically be made or measured in the current state of knowledge.

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4. However, secondary impacts from research can sometimes be traced at a much more aggregate level, and some macro-evaluations of the economic net benefits of university research are feasible. Improving our knowledge of primary impacts as occasions of influence is the best route to expanding what can be achieved here.

PART A

MAXIMIZING THE ACADEMIC IMPACTS OF RESEARCH

Chapter 1

What shapes the citing of academic publications?

Understanding why citations patterns are the way they are for any individual academic or researcher, and how they might be improved upon, is not a simple thing to do. Thinking about these issues demands a good deal of appropriate context. Some academics may avoid dipping their toes into the water at all out of fear that their work is not being cited as much as they would like, whereas others are keener to better understand their citation record. In this chapter we aim to give readers an appropriate context, within which it will be easier to make sensible judgements about citations. How many cites anyone can expect to get depends on several key factors – especially the distinctive features of their discipline and sub-discipline; the specialized academic role that their career fits into; which country they work in; which language they publish in; how old they are (or rather how far out they are from their PhD); and other factors (such as, gender or career interruptions).

Another concern with citations is that academics may get cited as easily for making a famous mistake as for getting something right. In principle this is possible – but in practice we know that academics do not usually cite mistakes, or work that they believe is plain wrong. Our Impact of Social Sciences project looked at 10,400 citations in social science papers and found that explicitly negative commentaries accompanying a citation occurred in only 10 out of these cases. If a paper is wrong (or thought to be wrong), it is simply not cited. Note that we would argue that citing research from an author's own work with which you disagree, perhaps literature that takes a different view from the author's own position, is just as much a case of achieving an impact on disciplinary debates as is being cited because the author fully agrees with you.

It is tricky for an individual academic to make sense of their citation record, but it can be equally difficult for a whole department or research lab to understand how they are collectively performing, or to make sensible judgements about what more they could or should do to create greater impact. So academics who are asked to sit in judgement on colleagues – whether because of interviewing applicants for new staff roles, appraisal or promotion systems, mentoring, or departmental administration tasks - should take special care to appreciate the complexities described in this chapter. There is no realistic single archetype of how an academic career should develop, but instead a number of different trajectories. This diversity both reflects the variety talents and capacities of academics and researchers themselves, and it responds to the complex, interlocking needs of disciplines, departments and research labs for many different types of contributions.

We begin by considering the different rates at which publications are cited across disciplines. Within these gross differences in citation rates, we turn secondly to look at the overall influence of age and experience in shaping the cumulation of citations. Third, many different factors at work across an academics' lifetime - such as their choices of what to do, their experience or their success in getting to a research intensive university – can be summarized by considering a number of somewhat stylized *career trajectories*. In the third section of the chapter we consider how these narratively organized influences shape characteristic publications profiles and citation rates.

1.1 Variations in citations rates across disciplines

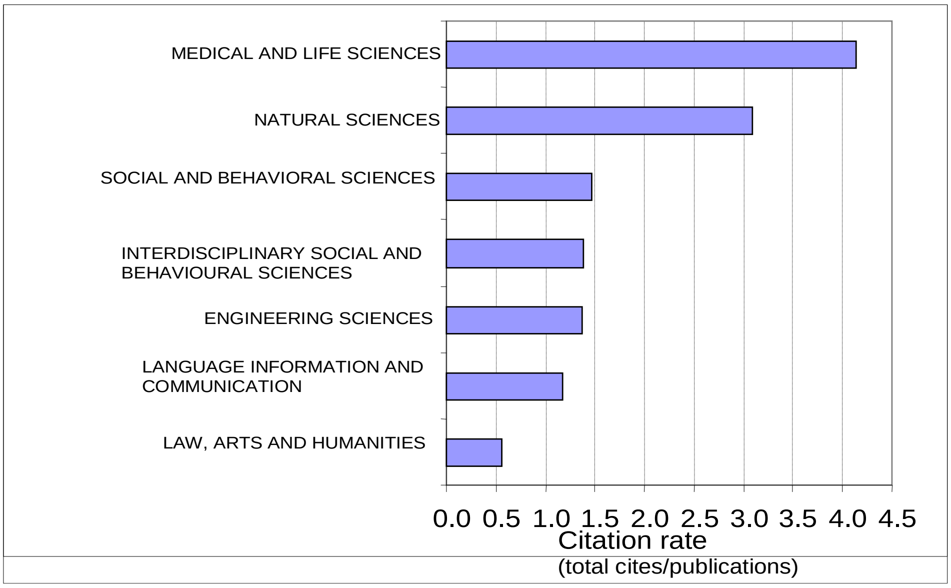
> The average article in the social sciences and humanities is cited less than once a year.
> *Anne-Wil Harzing* (2010: 6)

For many years (from 2004 to 2009) the leading UK specialist journal/magazine for the university sector, the *Times Higher Education* or *THE*, published league tables of world universities that purported to show their academic quality derived from their gross citation counts. In fact, the *THE* rankings principally showed how large their medical faculties and physical science faculties were relative to other parts of the universities. Universities with big medical schools and lots of staff in the physical sciences did very well. And universities without them did relatively worse. Yet the power of focusing on what is easily or immediately quantifiable was such that it took many years for *THE* to admit that their approach was deficient, fire their citations metrics analysts and recruit a new team.

Figure 1.1 shows the roots of this problem by looking at the total number of citations to journal articles in a given year divided by the number of journal articles produced in the same year, as recorded in the ISI WOK citations database. The cite rate in medicine is greater than the cite rate in the social sciences by a factor of 8 to 3, and greater than that in law and the humanities by a factor of 8 to 1. Physical sciences papers in the ISI WOK are also cited twice as often as those from the social sciences, and four times as often as those in law and the humanities.

There are many possible reasons for this patterning. In medicine all published papers are written to a word limit of 3,000 words, whereas the norm in the social sciences is for main papers to be around 6,000 to 9,000 words long. Medical sciences have also developed a strong and rigorous culture of 'systematic review' which requires that all relevant studies be cited initially, but that only those that pass certain criteria for methods and merit need be analysed closely. This very structured and well-defined approach to reviewing literature is mirrored (perhaps in a less rigorous way) in the physical sciences. But a culture of systematic review or comprehensive referencing is far from being established in most social science disciplines – for instance, in theoretical economics and public choice only methodologically similar work is cited, and authors often make a cult of minimal referencing. Systematic review, or a stress on comprehensive referencing, is entirely absent in the humanities.

Figure 1.1: Differences in the average aggregate citation rates between major groups of disciplines, (that is, total citations divided by number of publications)



Source: Centre for Science and Technology Studies (2007).

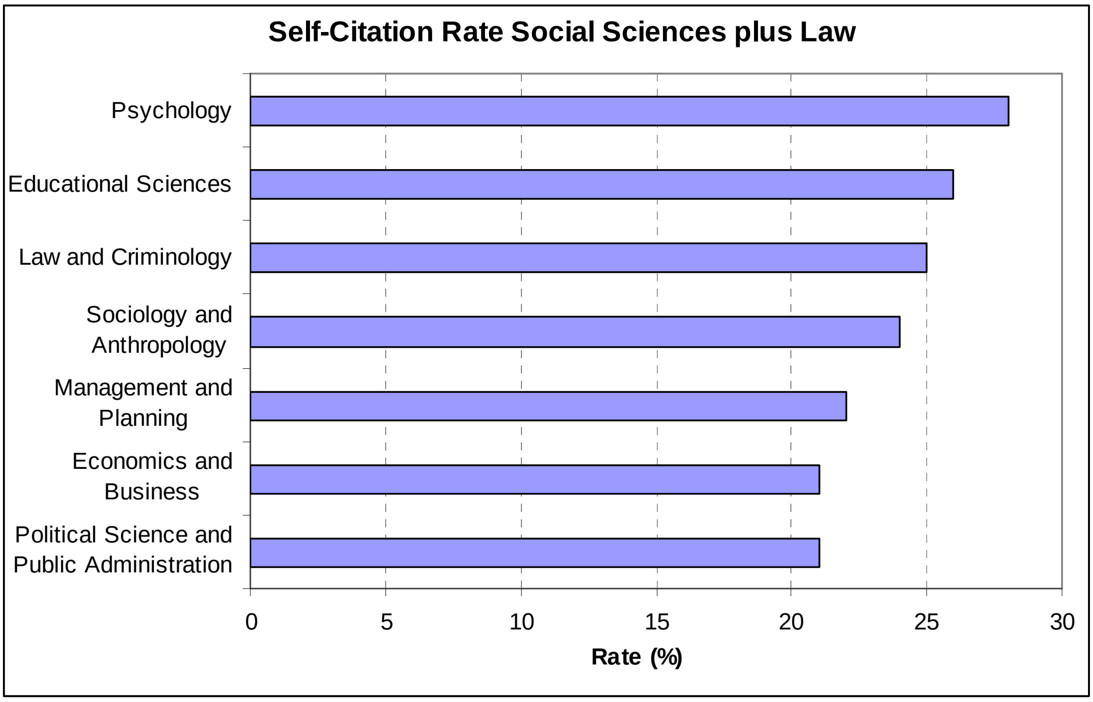
The differences in citation patterns between the medical/physical sciences and the social sciences and humanities can also be explained by the development of a 'normal science' culture in the former – whereas in the social sciences there are still fundamentally opposed theoretical streams across most of the component disciplines. In the social sciences citations can become a way of taking sides on what constitutes a valid argument. All of these features are even more strongly marked in the humanities, where referencing is often a matter of personal choice.

While discussing citation patterns it is worth briefly mentioning several technical facts about ISI WOK coverage that will be discussed in more detail in Chapter 2. First, its roster of journal articles is much more comprehensive for the medical and physical sciences, the areas where the database first developed. Second, the ISI WOK does not include books (which are an important element of professional communication in the social sciences and the humanities), but does include book reviews (very much more important in the social sciences and humanities, but of course almost never cited by anyone else and hence tend to depress the average citation scores of these disciplines). Third, we know that the self-citation rates (where academics cite their own work) vary dramatically across disciplines – for instance, being twice as high in engineering as they are in political science (see Chapter 4 for a detailed discussion). There are some good grounds for arguing though that citation rates should be assessed leaving out self-citations – although as Chapter 4 shows there are also strong arguments the other way as well. Cumulatively these effects are more than enough for us to emphasize that no worthwhile comparisons of citation rates or scores achieved by different academics can be made across the major discipline groups recorded in Figure 1.1. The nature of an academic subject, the ways in which it is set up to generate different kinds of publications, and how practices relating to citation and literature reviews have developed over time, are all far too distinctive across major subject groups to make inter-group comparisons legitimate or useful.

Looking in more detail at the detailed variations across individual social science disciplines in citation rates, Figure 1.2 shows that they vary from just under a third in psychology (which we count as being half included in the science, technology, engineering and maths or STEM disciplines), down to just over a fifth in economics and political science. In terms of not blowing your own trumpet, this low level makes these disciplines amongst the most austere of any discipline outside the humanities. Alternatively, these appear to be disciplines where cumulative work by a single team or research laboratory on developing ideas, methods and approaches distinctive to their lab or university plays least role in developing knowledge. Whichever interpretation makes sense, in all the fields where self-citation is below a quarter in Figure 1.2, there would seem to be scope for academics and researchers to be somewhat more generous with self-citations. There is also some preliminary research work suggesting that perhaps authors who self-cite, also get cited more by other people than those who are too puritanical in approach.

Lastly by way of introduction, it is important to notice that key bibliometrics and citation tools initially developed in America and some of the, notably the ISI WOK, continue to have a strong built-in orientation (or bias, depending on your viewpoint), towards English language publications. All the citations tracking systems have begun to diversify in the last decade, but progress has been fairly slow, especially in ISI WOK. Authors who publish exclusively in English will have the most comprehensive citations information. Citations for authors who publish both in English and in other languages are likely to be seriously under-counted on the non-English side. And authors publishing exclusively in a non-English language will be the most under-represented of all.

Figure 1.2: Differences in the average aggregate citation rates between major groups of disciplines, (that is, total citations divided by number of publications



Source: Centre for Science and Technology Studies (2007).

1.2 Academic careers and the accumulation of citations

Citation patterns are strongly linked to academic career development, a process which takes a long time to get started and to develop. Citations counts for academics are therefore highly attuned to age, gender, size of country, and other demographic variables. Citations chiefly depend on where authors are placed in their career trajectories, that is, how far along they are, and which route they are following.

Modern researchers and academics often feel under impossible pressures to perform brilliantly in many different spheres of activity, such as forefront 'discovery' research, academic integration of knowledge, teaching, academic citizenship and management roles, and achieving external impacts (see Chapter 5). In fact, however, these combined expectations cannot all be met by one person in a single time or even a single whole career – and yet they are often melded into a single composite image of what the 'ideal type' academic should be able to do. This image is unrealistic and disabling, because it takes insufficient account of the contemporary specialization of different, equally valid and important academic career trajectories. Modern academia is decreasingly a lone-scholar occupation and increasingly one where research and academic teams are important, further enhancing the need for role-specialization. Finally, different disciplines vary a great deal across the social sciences in how academic roles are configured and in the mix of roles needed.

Getting a doctorate initially and beginning to generate reputable publications both entail overcoming high peer review barriers. Not everyone with a PhD can get to stay on in academia if they want to, so only some researchers are able to transition to a first post-doctoral appointment, either in a research role or as temporary lecturer. Later on, transitioning from a researcher funded on 'short' project budgets, or from teaching fellowships or temporary/junior appointments, to being a tenured member of an academic department is again not easy. Being able to generate publications despite the many other demands in this period is often crucial to an individual making a successful transition to a long-run academic career. When academic researchers are in their late 20s and early 30s, and still building up their research skills and competencies, it often takes time for them to produce their first publications.

Once the turmoil of getting onto a tenure track is passed, many researchers are then at their most innovative and productive stage of new research work in their 30s and 40s, especially in technical or mathematically-based subjects. In this period publications become more frequent, because researchers are more experienced and formulate better 'standard operating procedures' for completing research and publishing outputs. Authors also become better known and so their citations cumulate, and their annual rate of citation normally tends to increase. These citations may either tend to reach a 'steady state' or plateau, or they may continue to grow rapidly or incrementally, often responding to how far the research community sees their work as successful, reputable and innovative.

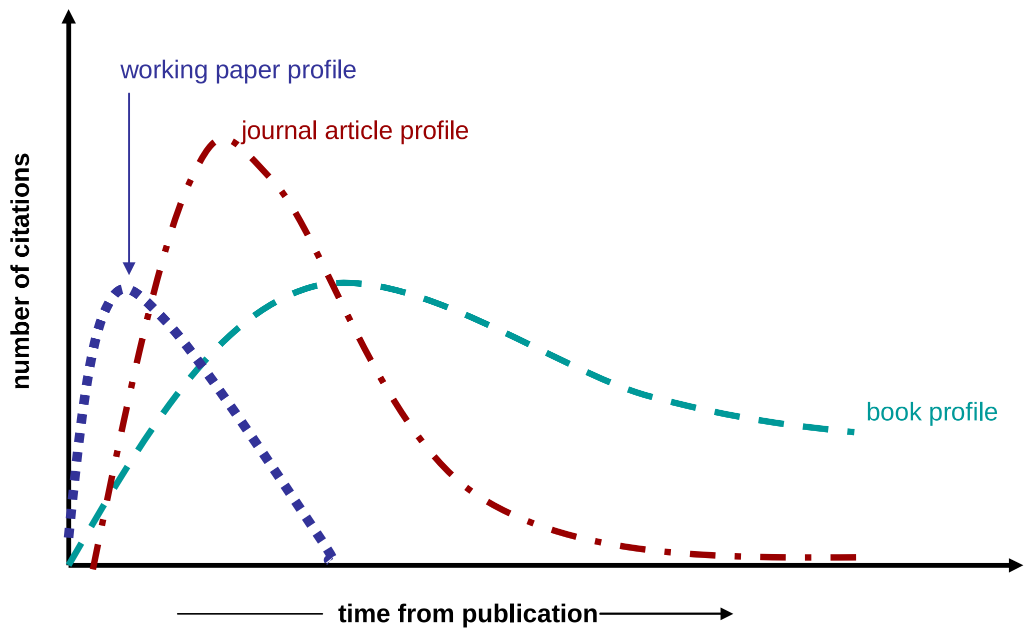
As in many other walks of life, in their late 40s, 50s and early 60s many academics move into more integrative or managerial roles. The most administratively competent or interested senior staff may end up running laboratories, departments or serving in university roles. The more academically orientated senior staff in many disciplines also tend to succeed better in securing funding, perhaps becoming a 'grants entrepreneur' and running large-scale research projects. Authors less involved in research teams also often edit journals and co-ordinate academic networks. Lastly, senior staff tend to undertake more applied work and they generally have greater recognition and hence more impacts outside academia itself. The cumulative effect of these changing roles is that senior academics' research-frontier journal outputs may decrease. At the same time in most social science disciplines they tend to write more books or book chapters, and in many disciplines they continue to play more of a research-leader role in joint articles. Senior academics are also generally better networked, they can draw on even more experience to formulate problems, and so their outputs may also get more attention in academic disciplines. They have established channels of influence. Hence their annual rates of citations tend to stay high or keep growing. Beyond retirement annual citation counts tend to reduce, as academics are not as active in professional networks as before.

For a minority of academic 'stars', however, citations per year may still increase rapidly in late career for several reasons. Their mature works may achieve wide recognition, often because they have strong integrative effects within a discipline; or their earlier work may acquire 'timeless' or 'standard reference' status and thus continue to be cited despite being long-published, also guaranteeing close attention to their later work; or they may undertake applied work that acquires wider influence beyond the academy.

These key demographic factors interact with the characteristic pattern of 'normal' citations, shown in Figure 1.3. Usually there is an initial lag in the recognition or take-up of published articles, of around a year or so, and longer for a book. This is followed by a higher-intensity citing period, generally from one to four years after publication in the physical and social science disciplines, perhaps longer in the humanities. This occurs when the work is first widely communicated to a research community and in some way shapes the research forefront – the optimal conditions for being cited. Being cited in one place will also create a smaller 'multiplier' effect for other current authors to cite the piece. After this peak period passes, however, journal articles will generally drop out of regular sight fairly completely. Hence, they will subsequently be found only by authors conducting literature reviews and searching with appropriate keywords. Similarly, new books will feature prominently in publishers' catalogues in their first year, less prominently for between one to three years after that (with research monographs getting least coverage in later years), and then cease to be mentioned. After initial world-wide sales to main university libraries have been exhausted, monographs may only be findable by people searching library catalogues, Google Books, Amazon or the internet. But books that achieve sales to students and professional audiences may be publicized for somewhat longer.

For all publications, we get a three-part pattern of influence, shown in Figure 1.3 – with an initial lag period for recognition, a core 'pulse' of citations in the optimal years (usually 2 to 5), and then a 'tail' of citations. For regular journal articles this will tend to decline very steeply. The tail may be rather longer for books, especially in the 'soft' social sciences, for example, communication and media studies.

Figure 1.3: Hypothetical citations profiles over time for three main types of publication



Different social science disciplines now vary a good deal in citation patterns across working papers and published journal articles. In political science, for instance, working papers have little currency and journal publication is the key stimulus. Most researchers here also seem to still use ISI WOK and older databases for searches. However, in economics working papers are more important, partly because it may take 3 to 3.5 years to get papers published in key journals. Hence there is a 'two pulse' model as in Figure 1.2 with working papers achieving impacts quickly, but subsequently ceasing to be cited as soon as a fully revised journal article is published after two or three years. Some prestigious working papers series (such as those of the National Bureau for Economic Research in the US) achieve wide currency as soon as they are issued, along with papers from some major economics profession conferences. Researchers will normally cite the paper in one but not both of the two core versions.

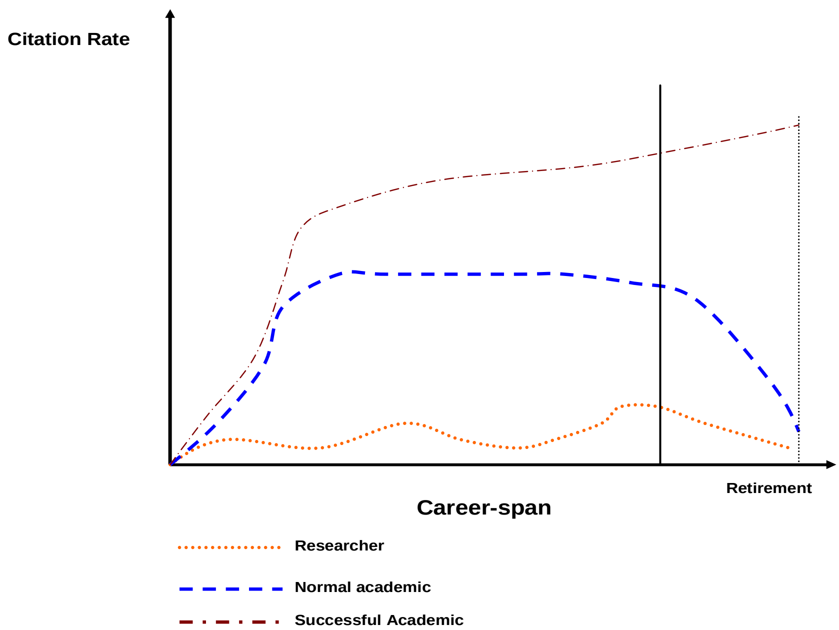
A few of an author's publications may break out of the 'normal' peak and decline pattern for journal articles and research monographs, and instead will achieve relatively higher levels of continuing references. Useful distinctions here are:

- An 'enduring' piece of research still has a falling citations profile over time, but one falling more gently and stretching beyond 5 years.
- A 'standard reference' in a discipline or sub-discipline will be distinguished by having a stable tail of continuing citations below its initial peak, but which does not thereafter decline for an extended period, perhaps for as long as 10 to 12 years. Standard references may reflect the prominence gained by a 'first-in-field' piece; or they may have strong multiplier effects; or they may just be located in slower-moving or less popular parts of a discipline. Finally,
- 'Classic' pieces of research can be distinguished because their over-time annual citations volume tends to expand for the same extended period, say 10 to 12 years, perhaps even beyond that in some cases.

How do these citation patterns affect the over-time profile of individual researchers and academics? Figure 1.4 shows three fairly widespread patterns.

Researchers whose outputs achieve medium levels of resonance only and tend to be episodic and separated by longer periods of time may have an over-time profile of small numbers of citations pulsed around the episodes of their work coming out. Academics who become better established, and can crank up a reasonable rate of publications and maintain that regularly, will benefit far more from the cumulation of citations for different pieces of work. Their annual citation rate will hence grow steadily in their early career years, reach a 'plateau' level fairly soon (perhaps most usually in their mid to late 30s) and broadly maintain that level (perhaps with a few ups and downs) until retirement. Finally, the most successful academics will not only benefit from the short-term blips of citations for their regular work, but will add layers of continuing citations from items that become enduring, standard references or classic references (as defined above), perhaps especially from books in the 'softer' social sciences. Researchers whose output includes some pieces of work that achieve these longer tails, especially those with a more intense pace of research outputs in mid-career years, become the most successful academics – those whose annual citation rates grow over long time periods, along with their seniority. Here an individual's retirement may not have immediate effects on reducing their cumulative citations count.

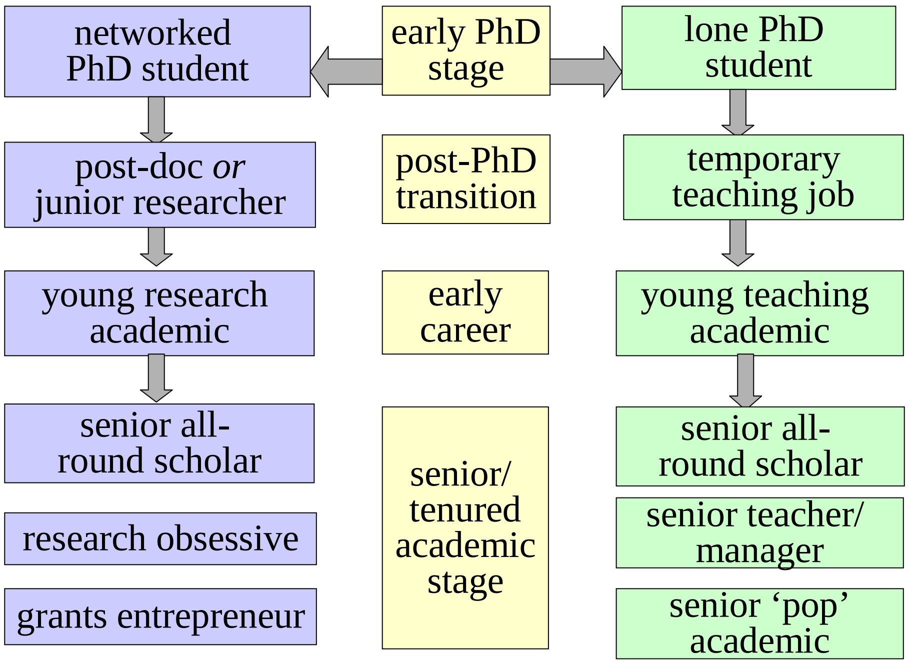
Figure 1.4: Normal and extended citations profiles for individual piece of research



1.3 Career trajectories and the development of capabilities and publications

There are many different routes for academic career trajectories, which could be characterized in a large variety of ways. For our purposes here, Figure 1.5 shows that a key branching point occurs between two paths, one that is research-predominant (conceivably research-only in some subjects), and the other which is a teaching plus research track. This divergence tends to occur early on during someone's doctoral work. The factors that incline people one way or the other at this and later stages are always complex, and so to summarize may always be to over-simplify. But an early factor that often seems to set people onto one or the other of these tracks concerns the extent to which their doctorate is undertaken as part of a large research team and in a university context that plugs them into strong networks in other universities, perhaps internationally. PhD students who are well plugged-in seem to be also more likely to adopt topics and approaches that lead more to research-track progression. They may also commit more strongly to attending professional conferences and do more 'fashionable' or forefront work.

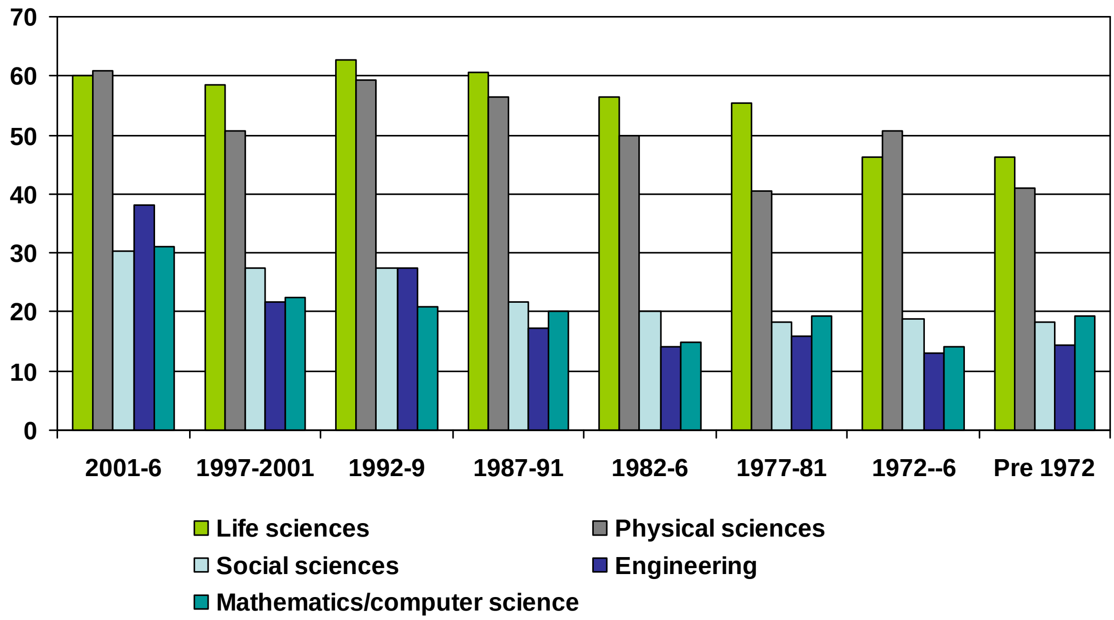
Figure 1.5: The research-intensive and teaching-based pathways in academia



By contrast, students who work on their doctorate in smaller departments or more on their own, with relatively lesser supervisory or peer-group support, tend to focus more on topics that may not lead easily to winning posts in research-intensive institutions at a later state. They often also invest more in developing their teaching capacities early on, and locating their futures within more teaching-orientated universities.

Research-dominated and research-only careers are far more feasible in the physical science subjects (including medicine), engineering, technology and mathematics (hereafter termed the STEM subjects) than in social science. One key factor behind is the transition from working on a PhD to getting a post-doc position. The latter are usually concentrated in research-intensive universities by patterns of government funding for the STEM subjects, and hence the availability of such posts varies sharply across disciplines. Figure 1.6 shows that in US universities three in every five PhD holders in the life sciences have held a post-doc position. By contrast, in the social sciences the proportion is half this level, at three in every ten. However, in the social sciences this proportion has grown slowly over three decades, from less than two in ten in the 1970s - more or less keeping pace with other disciplines where post-docs have been increasingly common, especially engineering and computer science and mathematics. In the physical sciences the proportion of social science PhDs with post-doc experience has oscillated quite sharply with changes in the economy or the availability of funding. By contrast, at least the experience of post-docs in the social sciences has been very steady over time.

Figure 1.6: The growth in the number of US PhD holders who have ever held post-doc positions, by discipline groups from 1972 to 2006



At the next stage in the STEM subjects also there is additionally a regular supply of contract research positions that can be alternatives to post-docs, and involve working in a junior role on larger scientific projects, funded from 'short money' budgets in university departments. There are also research positions in business labs and technical institutes, from which it is still feasible to return to an academic pathway. Not all academics do a lot of teaching. As a result many researchers are able to develop viable, research-only career routes, where their teaching outputs are minimal or zero. In the UK Figure 1.7 shows that more than a third of UK university academics hold research-only posts in the STEM disciplines – reflecting the concentration of five sixths of dedicated government research funding on STEM subjects, plus the additional commitment of corporate research and development monies. By contrast, only one in ten professional social scientists in higher education has a research-only job. The vast bulk of social science academics undertake both research and teaching throughout their careers.

Figure 1.7: Numbers of UK academic teaching and research staff, and sources of funding, by discipline group in 2005-06

	All disciplines	Social sciences and humanities	Science, technology, engineering and maths	Creative, arts and design
All academic teaching and research staff	160,000	59,800	88,000	12,400
Staff who only do research	36,800	5,500	30,800	600
Percentage of all staff who only do research	23	9	35	5

Source: HESA statistics 2005-06; LSE Public Policy Group (2008, Figure 1.2).

Alternatively in Figure 1.5 young academics may get appointed to a time-limited teaching contract, as a junior teaching fellow or on a short-term appointment as a lecturer or assistant professor, often in universities most orientated to undergraduate teaching. The scale of temporary appointments involved here has mushroomed in recent decades, as universities have run down the proportion of their staff who are full-time and tenured faculty and increased their use of part-time and non-tenured teachers. These developments match similar changes in a wide range of business and government organizations towards more 'flexibilization' of staff by organizations, with individuals more commonly having a 'portfolio' career path with multiple components, rather than lifetime careers with a single employer.

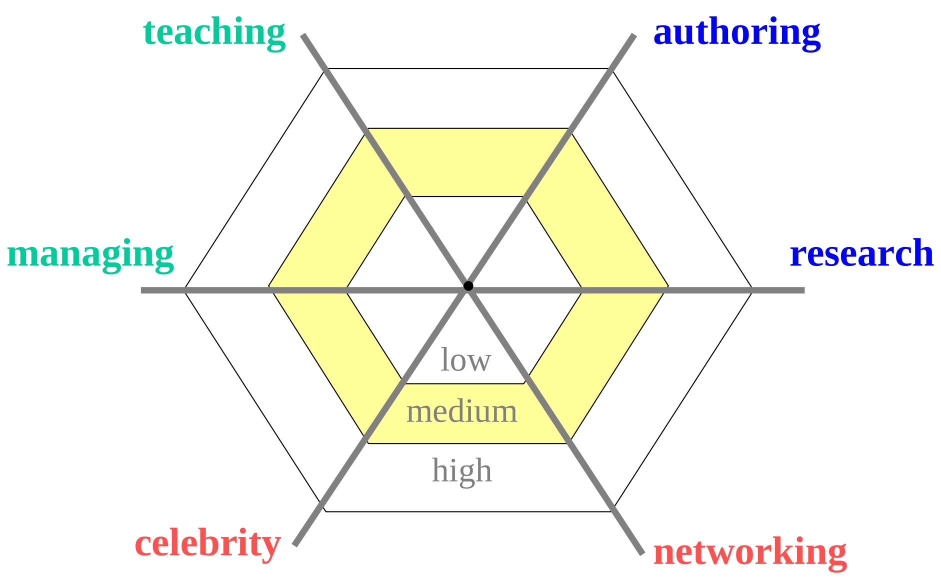
On an individual level, getting into one track or another often makes a large difference to the probabilities of subsequently publishing, but of course it is never decisive or fully determinant. At later stages people can shift between tracks, with initially teaching-track academics who undertake excellent research tending to move into more research-intensive universities over time. The bifurcation between 'research-intensive' universities, laboratories and departments and those in predominantly teaching-orientated departments is important, but it is also not complete. Even in the most research-intensive institutions some members of departments will be more 'research active' than others, and some will be more teaching-orientated, especially taken across long careers. And even in mainly teaching-based departments, a lot of good research gets undertaken – as the 2008 research assessment exercise in the UK demonstrated. Even a bureaucratic exercise weighted to legitimizing existing funding distributions none the less showed multiple 'islands of excellence' in smaller universities and departments. In some university systems, however, the separation of research-led and teaching-orientated universities has stronger consequences. In the US some evidence suggests that staff from the many non-PhD departments in the social sciences generate only around a sixth of journal articles in their discipline (Fowler et al, 2007). The situation is less stark in the UK and Europe, where almost all universities will claim to run PhD programmes in most subjects, but there is still a gap.

So although we acknowledge that the pathways in Figure 1.5 are approximations only, it is still useful exercise to use them as a framework to discuss how individuals characteristically develop some of the main dimensions of their academic activity.

To think about these dimensions we use a fairly simple conceptual schema known as a 'balanced score card'. This is an approach that developed in business and government as a way of coping with the complexity of assessing an organization's overall performance. Our schema, shown in Figure 1.8, charts an academic's profile as low, medium or high when moving out from the centre along each of the six dimensions shown. We begin by exploring the earliest-developed capabilities, coloured blue in the Figure, then move to those shown in green and finally cover the red dimensions.

Research skills and competence are in many ways the first developed aspect of any academic's profile, since everyone entering the profession now must complete a doctorate. In the physical and social sciences this means that they master a range of methods and skills in an increasingly systematized and professionalized way. In the humanities research capabilities are more varied, typically involving more stress on theoretical and thematic ideas development, and on archival or literary-based methods for analysing texts. Research competences also typically continue to grow strongly in post-doctoral and early teaching posts. But in principle this is an area where researchers can keep pushing their competences outwards throughout their careers, especially at points where they change topics, or sub-fields, or the direction of their work.

Figure 1.8: A 'balanced scorecard' for assessing academic achievement



Authoring capabilities are normally the second dimension that academics develop early on, usually somewhat lagging behind research skills. In the physical sciences especially, the tradition has been to undertake series of experiments first (for say two or three years) and then to 'write up' extensively only at the end of the doctoral period. In many (but not all) STEM subjects, composing this final text for submission is also often still done in a restrictive technical structure and format. In the social sciences and especially in the humanities, however, it is more normal for people to treat writing as 'constitutive' of their thinking, and hence to write chapters as they go along (Dunleavy, 2003, 2009). In 'soft' subjects students write a 'big book' thesis where how a researcher's authoring skills shape up early on often determines to a large extent (say 30 to 50 per cent) how successful their PhD is and whether they are able to generate early journal articles (Dunleavy, 2003). In other more technical social sciences (like economics) most students now complete a different 'papers model' PhD, which is a shorter text, but where the authoring and presentation standards are higher and where the three or four component chapters must attain a 'publishable' quality (Dunleavy, 2011). Whatever pattern is followed, during the later years of their doctoral work anyone entering modern academia must begin to strongly develop the (admittedly often strange or off-putting) forms of professional writing used in each discipline. In all subjects following the 'big book' model, a PhD thesis can often be (one of) the longest piece of sustained writing that a researcher completes across their academic career.

Teaching capabilities are the third dimension that would-be academics start developing in the middle to later years of their doctorate, when they begin teaching classes and seminars, and perhaps giving a few lectures. In some subjects PhD students often take on course administration tasks, and even examining responsibilities, especially in the US and Europe. Nowadays most PhD students in the UK complete a more structured programme for developing their teaching capacities and skills, with certification linked to the Higher Education Academy, a body that *inter alia* provides assurance to future university employers of their basic competence.

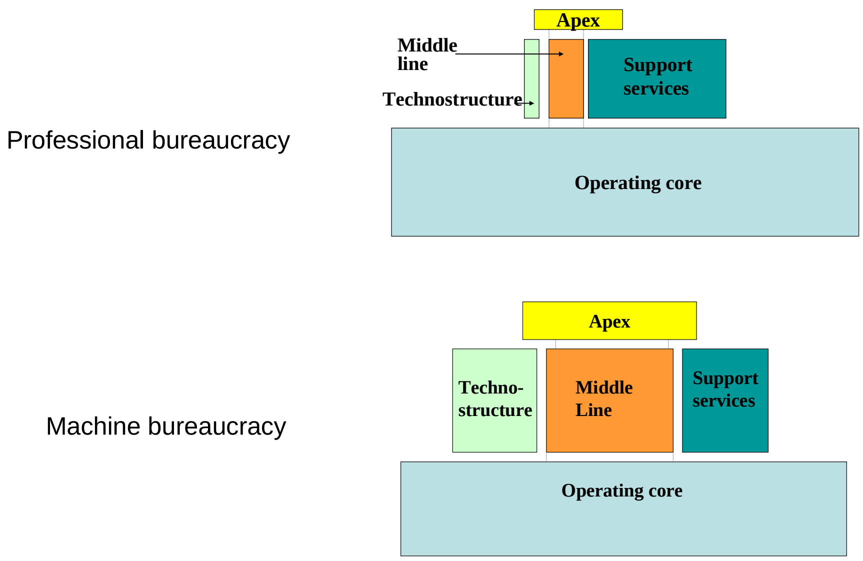
However, the most critical stage in the expansion of teaching skills occurs when new lecturers or assistant professors start work full time and begin to cope with a full teaching load, often initially in temporary or time-limited posts. Their employing university will normally provide formal induction processes designed to enhance their capabilities, and their department may require completion of a formal certification as a competent teacher (especially for tenure track posts). Beyond this beginning stage, teaching capabilities generally take many years to develop as academics' experience of different types of courses and student groups grows, from undergraduates through masters courses and extends to PhD teaching and supervision. So far, academics have generally been exempt from the requirements to periodically re-certify their professional competence that are common in other professions, such as medicine and law. However, in modern universities student feedback scores provide a ceaseless commentary on teachers' success and some spur to continuing improvement.

Management capabilities for academics and researchers generally are acquired informally as their career develops and they assume senior positions. Academic management roles relate chiefly either to running combined teaching and research departments or in the STEM subjects to full-time posts organizing research units and labs. The implication of Figure 1.7 is that in the social sciences perhaps 90 per cent of management tasks relate to conventional academic departments, while running research units and labs is either much less common or more of a part-time commitment. Indeed, in many universities and in 'softer' social sciences with less team-effort in the research process, academic management is almost synonymous with departmental staffing and administration issues.

As in most other serious professions, management capabilities tend to be developed as people become older and more experienced, normally in their late 30s through to their 50s (for someone entering academia in their late 20s or early 30s). Universities have some rudimentary training for heads of departments, but these capabilities are primarily inculcated across the sector in a rather amateurish way – by 'socializing' academics into administration issues piecemeal. The core process here involves the parcelling out of numerous administrative chores, along with broader 'departmental citizenship' tasks and the job of representing the department on numerous faculty or university committees. Younger academics get to do the more boring or tedious chores here, and with age and experience gravitate to more consequential or outwards-looking roles. The process may seem rather random and disorganized, and academics often spent inordinate amounts of time bewailing having to handle a quota of administrative and bureaucratic tasks. However, universities are very unlike what Henry Mintzberg calls 'machine bureaucracies', by which he means the classic forms of administration of firms and government bureaucracies analysed by Max Weber. Instead universities are classic 'professional bureaucracies' with a quite different internal structure as described below in Figure 1.9.

The rationale for universities' apparently unusual approach to organizational management has always been to maintain a close control of all university politics, decision-making and management by their academic departments – what Mintzberg calls their 'operating core', the part of any organization at the heart of its mission. Like other professional bureaucracies, universities are politically dominated by their 'operating core' – so that their professional academic staffs collegially decide their policies. Compared to machine bureaucracies, universities have minimal 'middle management' and a curiously undeveloped 'strategic apex', because the academics insist on retaining so much control. They also have big support services (covering functions such as libraries, IT services, collecting student fees and research grants, and running catering facilities and halls of residence). But however large-scale they become, these operations are kept in a very subordinate role to the dominant professional group, namely the academics.

Figure 1.9: The key differences between universities as 'professional bureaucracies' and Weberian or 'machine bureaucracies' (such as government agencies or some large private corporations)



Notes: Each form of bureaucracy includes five elements, but their relative sizes, roles and powers vary a good deal across the two types. The 'strategic apex' covers the controlling decision-makers and their immediate support staffs. The 'middle line' covers the routing of resources to production and the supervision of what gets done. The 'operating core' is the part of the organization that implements production or carries out the core 'mission' of the organization. 'Support services' are things that support the organization's main mission but are not part of it directly (and so could be outsourced in the modern era). The 'technostructure' is the part of the organization that innovates, designs new products and pushes forward organizational efficiency.

Professional bureaucracies also have very slender innovation, improvement or product-development specialist units (called the 'technostructure' in Mintzberg's terms). The vast bulk of this work is instead done by the academic departments themselves. In research-intensive areas, the effective organizational management of labs and specialist units requires very high (post-PhD) levels of context-specific information, expertise and understanding, as well as more generic leadership and management skills and capabilities. Thus universities depart in many key respects from modern machine bureaucracy paradigms in business and the private sector (Roberts, 2004) or in the government and public sectors. The apparently haphazard socialization of academics into management roles plays a key part in maintaining all these features. But, just as in other large organizations, managerial capacities still form a key part of the burdens of seniority.

Networking is an academic skill that develops over time and is clearly linked to research in several dimensions. At its most basic, the ability to work in teams of two, three or more co-researchers and co-authors is an important influence on the quality and type of research that any academic can undertake. Modern social science is more specialized than in the past, yet co-author teams have remained much smaller here than in the STEM disciplines. Networking and the ability to build teams is also important for winning research grants, itself a key influence upon research productivity - given that most social scientists have continuing teaching obligations, from which grants allow them to be bought out. Academic networking within disciplines but across universities and countries is a key element in broadening academics horizons, keeping researchers in touch with the constantly-moving research frontier, and up-to-date with recent substantive and methodological developments.

Networking within universities *across* disciplines is often a key influence on inter-disciplinary research, as is academics' ability to engage in 'bridging scholarship' that works across fields and helps develop meta-theories and intellectual waves – both of which influence external impacts (see Chapter 5). Finally, networking with external actors is a key element in fund-raising for research from non-foundation and non-government sources, and in academics achieving external impacts at later stages of their careers.

Celebrity is the final dimension in Figure 1.8, and at first sight this label may seem an odd one to choose. Do not academic capabilities and professional virtues stand in acute contrast to the ungrounded, 'famous for being famous' quality of celebrity in contemporary media or popular culture? Of course, as a result of peer review academic reputations are normally grounded in more solid and well-attested achievements. But it is also clear that the distribution of fame and knowledge of their work and arguments across academics is highly uneven. Some excellent academics are little known, and some of those who become well-known are not necessarily strong figures in intellectual terms.

What shapes academic celebrity? In a famous analysis of 'public intellectuals', Regis Debray (1981) argued that there have been three phases of development in their characteristic origins and roles since the last quarter of the nineteenth century. The first was the age of universities' pre-eminence, from the 1860s to the early twentieth century. The second was an era dominated by writers and literary figures, from the 1900s to the 1950s. The third is the age of public intellectuals as media-savvy celebrities, whose reputation depends far most closely on their ability to project and convince via the mass media. This still-current period dates more or less from the advent of pervasive television coverage in the mid 1960s onwards. Arguably Debray's analysis is overly orientated to a restrictive French concept of public intellectuals, and it neglects the enduring role of science-based intellectuals, who remain resolutely university-grounded. Yet the growth of popular science books and media productions, and of science/technology-watching magazines and newspaper columns, has also contributed to the emergence of 'celebrity scientists'.

The apparatus of achieving academic 'celebrity' has also drastically simplified and been democratized in the digital era, so that internet mechanisms are now reasonably decisive in conditioning someone's renown. Counting an individual academic's cites in Google Scholar or Google Books, is a once-specialist activity that can now be easily (almost instantly) undertaken by anyone. Their prominence in ISI ratings or Scopus is a bit more tricky because of the access costs involved, but even these older, paid-for databases should be equally instantly available to staff and students across the university network.

So what was once vague or requiring expert judgement has now become simpler. We can index and measure someone's prominence on the 'celebrity' dimension perhaps more easily than almost any other. In an increasingly globalized academic community, the importance of academics' and researchers' wider reputation in attracting attention to their work has never been greater. Celebrity has hugely increased in importance relative to networking interactions. Whereas once academics relied on people knowing them and their work personally in order to gain citations from other academics, now what matters is how easy it is to find someone's work - and how many versions of it there are out there in different channels to be picked up and noticed by other academics and researchers.

Similarly, contra Debray, academics' dependence upon mass media intermediaries to reach any audience beyond their immediate discipline has arguably reduced in an era where full academic works can be accessed through the internet at the click of a button. A whole series of developments have recently coalesced to begin far-reaching changes in the inter-relationship of academic work and wider societal development in advanced industrial societies including:

- Google's push to 'organize the world's information', especially via its Scholar and Books operations;
- the growth of free research depositories for academic materials, making them much more accessible to non-professionals;
- improvements in the standards of professional communication with the public in the physical sciences and (after a long lag) the social sciences; and
- the emergence of many think tanks, a burgeoning industrial and professional consultancy sector, and numerous NGOs and specialist media interested in debating and processing much more specialist themes (see Chapters 5 and 6 below).

These changes have occurred rapidly in the last two decades, but in many ways they have only just begun and they have a long way further to run.

Celebrity has also begun to change the ways in which government, business and to a lesser degree actors in civil society gain access to academic expertise. As late as the 1980s officials in government departments especially could afford to maintain costly, long-run personal networks of contacts that formed their gateways into seeking external expertise when needed. Since the age of 'new public management' and the subsequent austerity period following the 2008-10 financial crash in many advanced industrial societies, government's apparatus has been pared back. Now when they need academic expertise, UK civil servants told us for this research that they go on Google and search digitally like anyone else, as their American counterparts have been doing for a decade or more. In many STEM disciplines large business corporations close to particular academic discipline areas still operate networks based heavily around personal contacts, as do business schools in most countries and some increasingly specialist public policy schools in the US, Europe and elsewhere. But increasingly academic celebrity rather than personal contacts has become the currency by which the media initially and other sections of society form a view of the debates and knowledge-terrain inside disciplines.

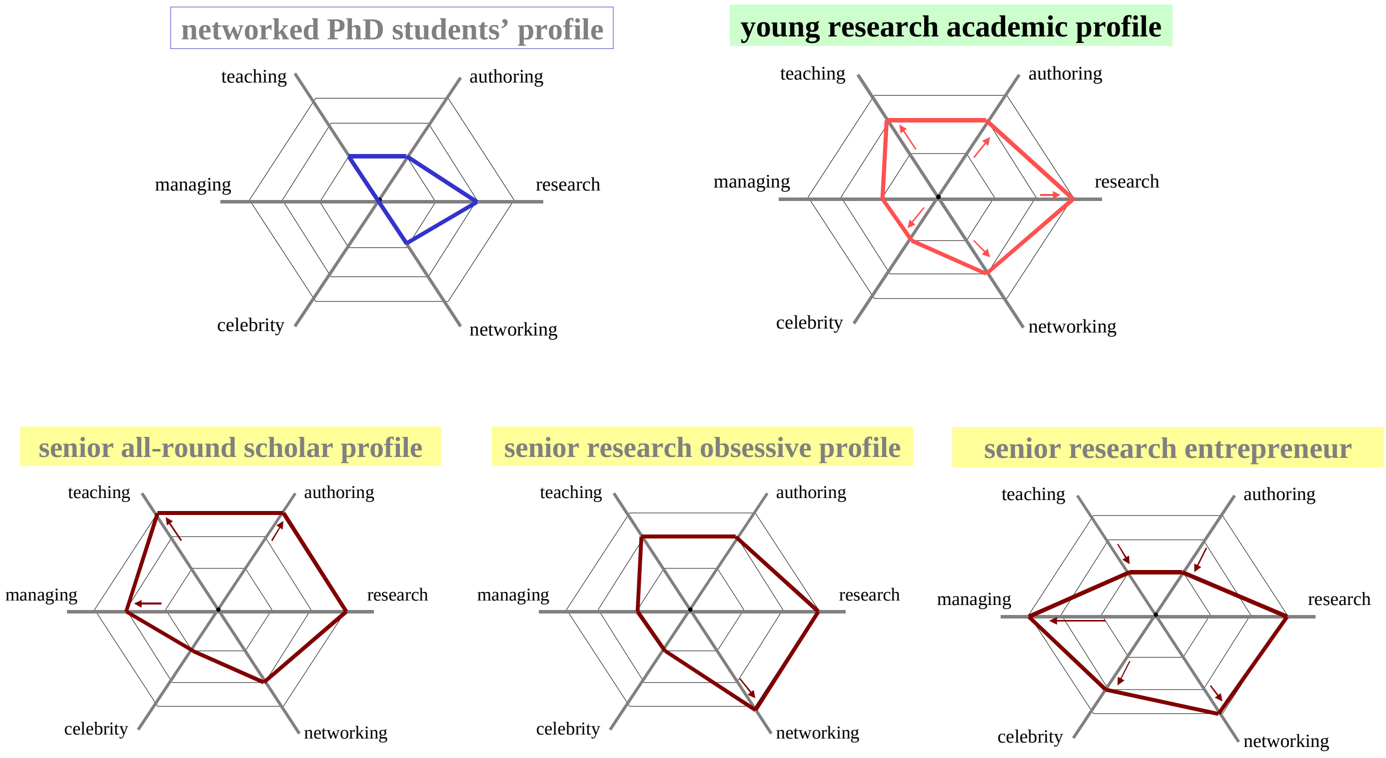
How should we weight or compare individuals' achievements on the six dimensions in Figure 1.8? The whole rationale of such scorecards is that organizations (and here individuals) need to do many different things at once, all of which need to be kept in view for an accurate assessment of their progress. Thus, a firm that makes short-run profits by taking big risks or neglecting to invest in its talent-development or business infrastructures is not a good investment. And nor is a government bureaucracy doing well if it saves money by worsening the standards of services it delivers to citizens or cuts corners on consultations or rule of law principles. The rationale for using a balanced scorecard approach to assess academics is very similar. In the same way, the six dimensions in Figure 1.8 are all important in some combination for all kinds of university professionals.

But this is not to say that any given person can or should be expected to perform excellently on all these dimensions. A disabling paradigm of the 'ideal academic', who is good at all these things simultaneously – a great researcher, author, teacher, manager, networker and celebrated disseminator of knowledge -

often lurks pervasively in the culture of higher education and academic disciplines. It shows up strongly in appointment, promotion and appraisal discussions and it is pervasive in the pages of most universities' HR manuals. This mythical image of an omni-competent academic is also powerfully codified by government bodies conducting research audits (like the UK's Research Excellence Framework) and by government or foundation grant-giving bodies demanding 'impact' and 'dissemination' from those to whom they dispense funding. Yet our argument here is that no one can be simultaneously good at or focused on all six of the dimensions we have reviewed. Instead most academic career tracks involve people in specializing to a considerable degree, and thus ending up with a configuration of capabilities that will differ significantly from those of other academic professionals who choose alternative career routes.

To explore what this means in practice, we follow through in more detail how people's capabilities develop at the key stages in the two trajectories shown in Figure 1.5, beginning with the research track sequence of roles. Here Figure 1.10 suggests that *PhD students* are likely to have their best-developed capabilities on the research dimension, where they should score medium, because they are still learning the craft of research at this stage. At the same time they will have to achieve at least a basic competency in authoring (to communicate their findings), in teaching (which even research-track people must usually do at this stage for pecuniary and career-development reasons), and in networking (essential if they are to have a decent sense of where the research frontier is and of the requirements for career progression). Most PhD students will not have developed even low managerial capacities, nor will they normally rate any level of celebrity.

Figure 1.10: Development paths for research-track academics



Moving on to being a *young academic in the research-track* is a time when people's capacities improve in many dimensions at once, with changes shown by the arrows. Thus the second chart in Figure 1.10 shows individuals growing their research capabilities from medium to high; improving their teaching, authoring and networking capabilities from low to medium; and establishing low capabilities in managing and in terms of celebrity and citation scores. Achieving such a multi-dimensional improvement is an extraordinarily demanding thing to do, and younger staff can expect to work many hours a week to get it done, perhaps in a way that is not sustainable over the long term.

At a senior academic stage in the research track, Figure 1.10 suggests three possible patterns of development, each much more sustainable over the long term once the first burst of career-establishing effort has occurred:

1) The *senior all-round scholar* profile involves maintaining a high level of research capabilities, while expanding teaching and authoring performance to a high level, and growing managerial capacities to a medium level. The costs of

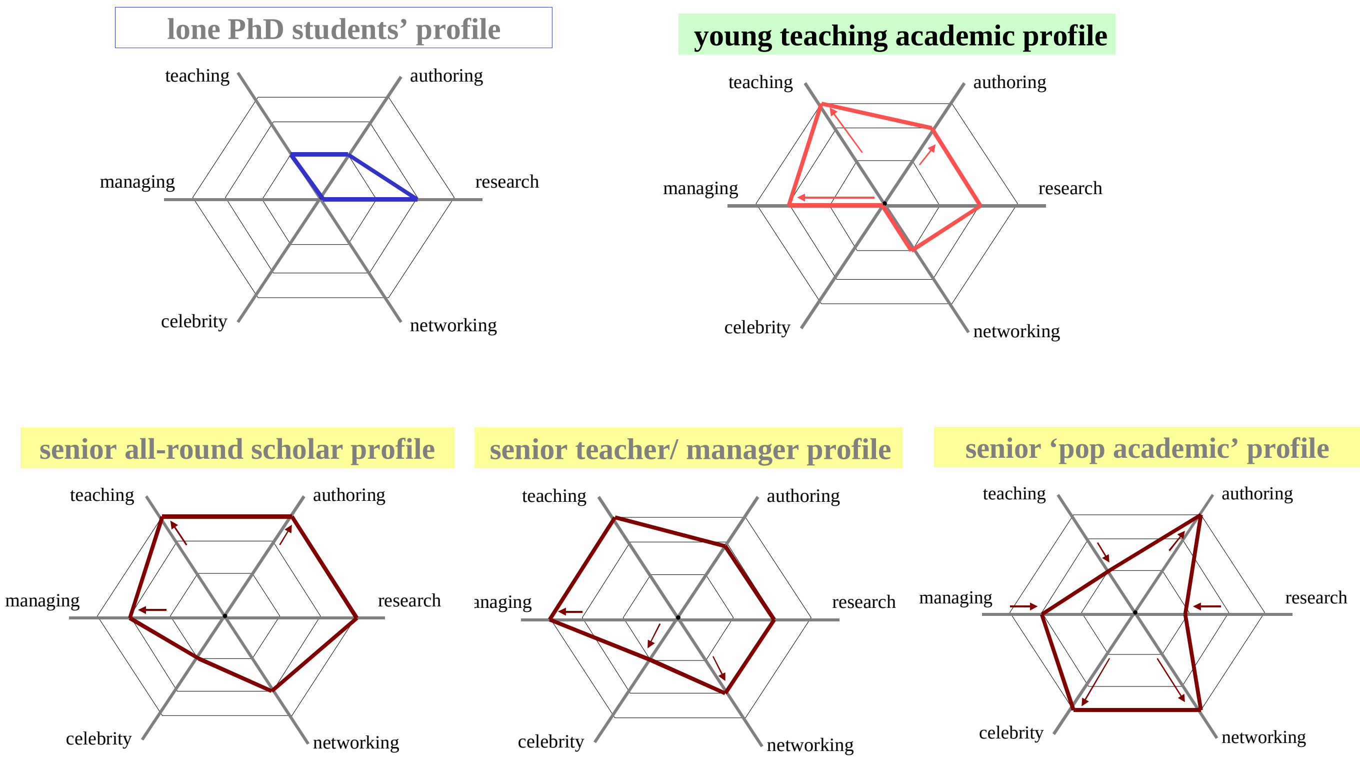
achieving this transition is often that the researcher in question does not become any better connected in professional networks and that their ‘celebrity’ level remains low, with publications staying resolutely academic and discipline-bound.

2) The *research obsessive profile* here captures senior academics whose central focus demonstrates a continuing commitment to research allied with passion for their discipline or sub-discipline. Scholars here become more specialist and focused in their interests and so invest heavily in expanding their networks, especially internationally as their seniority rises. This emphasis fits well with the ‘lone scholar’ mode of research in the social sciences and humanities, and is perhaps less common in the physical sciences where teamwork is fundamental and the financial and time costs of research are high. Research obsessives may achieve a continuing research profile only at the expense of not much expanding their management capabilities (they shun all administration) and remaining little known outside their sub-field (so their celebrity score remains low). They are also not known for being outstanding teachers.

3) By contrast the *research grants entrepreneur* denotes a crucial role in areas of research like the STEM disciplines where assembling and funding teams of researchers is vital for achieving advances. Here academics tend to withdraw from teaching to focus on leading a research unit, and they may also do markedly less authoring due to lack of time and because of the specialization of roles within the research team. Instead grants-entrepreneurs maintain their research capacities at high, but also expand their management and networking capacities to high. To help win grants and to tap wider resources beyond grant-funding foundations or government bodies, they must also become at least moderately well-known, expanding their celebrity capacity to medium. Grants entrepreneurs, of course, rely on junior researchers to undertake virtually all time-consuming primary research, and often to write up the first drafts of papers, with their contribution being in intellectual leadership, managing team members, providing a fount of accumulated experiences for the team to draw on, and securing a continuing funding stream.

Turning to teaching track academics, Figure 1.11 shows that the only salient difference at PhD level is that the student here is not networked. Indeed the context of many students' doctoral work remains very closely bound by what is going on in their home university department, and perhaps a little beyond. PhD students here have a medium research capacity (because they are still learning), and a low capacity in authoring and in teaching, where the roles for PhD students are inherently rather limiting.

Figure 1.11: Development paths for more teaching career track academics



Once people on more of a teaching-track make the transition to being full-time young academics with tenure, Figure 1.11 suggests that they invest heavily in boosting their teaching capabilities from low to high, in expanding their management and administrative capabilities from zero to medium, and in improving their authoring to a medium rating. Not surprisingly, achieving this degree of change leaves little time for expanding research capabilities and methodological skills, which may stay at medium as a result. In terms of celebrity younger teaching track academics may remain very low profile, since their publications are new. However, most people at this stage will expand their networking capabilities to at least a low level.

For senior people in this track there are three possibilities for further development:

1) The *senior all-round academic* profile here is exactly the same as that already discussed in Figure 1.10. What is different in Figure 1.11, however, are the arrows showing the degree of change from the young teaching track profile. Teaching capabilities stays at high and management at medium, but as they become more experienced with successive projects and writing articles and books senior teaching-track academics invest heavily in expanding both their research and authoring capabilities to high. The accumulation of publications also expands their celebrity from zero to low, and their networking capabilities from low to medium.

2) Some senior teaching-track staff specialize instead in *academic management roles*, running departments, and often moving on to undertake university roles as well. While keeping their teaching capabilities at high, and their research and authoring at medium, they invest in moving their management capacities from medium to high, which absorbs a lot of time. Broadening their management roles also tend to expand their networking capacity, while their accumulation of publications and citations expands their celebrity from zero to low.

3) Finally some senior academics in fields where lone scholar research prevails (as in many humanities and 'soft' social sciences) may transition to a *pop academic* profile, as may some individual expositors in areas more dominated by research-team work (such as 'popular science' expositors). Here the academic tends to withdraw from teaching and strongly avoids all administration (so that their capacities on both dimensions may decrease). Their research capacity stays stable (at medium) but they specialize strongly in achieving excellent authoring skills, which move to high. Other expository skills, such as lecturing, designing media programmes and expounding in person on TV also move to high. Well-known academics will invest time and effort in becoming strongly networked

(where their score improves from low to high) and household names in the media and externally (where their score improves from zero to high). Authors here may achieve high level of citations for books that expand public understanding of their discipline, but many also undertake important scholarship in a more 'integrative' vein focusing less on discovery research and more on thematic or theoretical understandings. And academics in this stream may often have high overall external impacts also, parlaying their celebrity into influence also with businesses or governments. But in other respects this still remains a somewhat risky choice of career-turn, as James Boyle noted:

> 'For those in my profession, being readable is a dangerous goal. You have never heard true condescension until you have heard academics pronounce the word "popularizer" '.[1]

Trying to categorize diverse academic career pathways into just a few types (as we have here), risks over-simplifying a complex picture. Yet we believe that it is worthwhile to do so in order to stress that people at different stages on different career paths are likely to have quite distinct profiles of citations within academia, and quite different impacts outside the higher education system itself. Research track academics, as we have described them here, are likely to fare well in the most conventional, journal-orientated bibliometric systems, such as the ISI Web of Knowledge discussed in the next chapter, whereas teaching track staff are likely to fare better in broader bibliometric systems, such as Google Scholar and Google Books. Younger staff are likely to have slender citations profiles, and senior staff will generally fare better in cumulative citations terms, although their annual rates of citation may not be so different.

Summary

1. Citation rates are used as a basis for tracking academic impacts. The shape of citation rates vary widely across academic disciplines.

2. There are substantial differences in the general rate of citing across disciplines with more cites (including self-cites) being found in the sciences than the social sciences.

3. The type of output chosen affects citation rates e.g. on average a book will take longer to be referred to but will be cited for longer.

4. How academics balance their time across the six areas of responsibility will be another important factor in citation rates.

Chapter 2

Knowing your strengths: using citation tracking systems

In the past academics and researchers have had relatively few tools at hand for finding out which bits of their work are appreciated and used by other academics. There are well-known, first generation, proprietary citations tracking systems (like ISI Web of Knowledge and Scopus) that cover only or chiefly well-established journals with long time-lags. In the digital-era there are also newer internet-based systems drawing extensively on Google that now offer a much broader and more responsive picture of who is citing or using whom in academia. Both types of systems have limitations and we describe their different pros and cons in detail below, as well as giving step-by-step guidance on how academics can use the systems to look at their own work.

Our best advice to researchers wanting to find out how their work is being used by other academics is to use a combination of the three best tools, which are:

- *Harzing's Publish or Perish (HPoP) software*, which is a tweaked version of Google Scholar that delivers rapid feedback and covers far more sources (and somewhat more diverse sources) than anything else;
- *ISI Web of Knowledge or Scopus,* which are most useful for senior academics with a slate of published work already in high impact journals, and for academics in the physical sciences; and
- *Google Book Search and Google Scholar* for people working in disciplines where books and other non-journal academic outputs are important.

In the main body of this chapter we review these three systems and quite a few alternatives in depth, and explain how they work, what each of them is good for, their limitations, and how to get the best possible results from each of them. Armed with our advice notes below, we suggest that readers try out these systems and see which ones seem to work best for their discipline and for tracking their particular type of research.

We begin with a small but key digression on how to maximise finding an academic's name in a search engine so that her citations can be more easily tracked. Next we consider the older citation tracking systems that focus only on (some) journal articles. In section three we look at the new Internet-based systems.

2.1 How distinctive is your author name?

If an academic has a distinctive author name (with an uncommon surname and plenty of initials to identify her uniquely) then it will easier to find out how many other authors are citing her research. However, if an author has an indistinctive name (like Smith, Jones, Brown, Li, Dupont, etc. and only one initial), it will take longer to obtain the same accurate information. It may not be possible to efficiently use some of the best citation systems at all (such as HPoP), and an academic may have to piece together citations for each of their publications using the titles to exclude references to many namesakes. A key implication arises here for new researchers just starting out on academic career (or a mentor advising a new researcher). She must choose her author name with great care, using the full first name and adding her second name or initial if applicable. Academics should keep in mind that from now on (for the rest of their career) people will be looking for their work in a global-sized haystack of competing information.

In Britain and Europe generally there is a huge extra problem to citation tracking arising from the restrictive and old-fashioned practices of journal style sheets. Coming from mostly small countries it is still common to find that most European social science journals include only the first initials of authors in footnotes or reference lists, so that they do not give authors' first names in full, nor include their second or subsequent initials. Since academic knowledge is now organized on a global scale this is very bad practice. In the US, where there are over 300 million people, the demands of finding people in a larger society have generally meant that much better author details are included. This is a pattern that European academics and journal editors should urgently start to copy.

2.2 Orthodox citation-tracking systems

> ISI completely ignores a vast majority of publications in the social sciences and humanities.
> *Anne-Will Harzing* (2010: 109)

There are some well-established and proprietary systems for tracking citations, also known as bibliometric systems. Compiled by hand and run on mainframe computers, they started as far back as the 1970s, and the best-known now is the ISI Web of Knowledge (ISI WOK)(which has a Social Science Citation Index). Its main rival is the Scopus. Since these mainframe systems went online they have become a lot more accessible and somewhat easier to use. Most academics, post-docs and PhD students should now be able to access one of them from their offices or home computers via their university library. (Few libraries will pay for both of them, because their subscriptions are expensive.)

The companies that produce these systems (Thompson for ISI WOK and Elsevier for Scopus) rightly stress that they are well-established and well-founded on decades of experience. The systems give accurate citation counts (without duplications or phantom citations) because they are human-edited systems - one reason why they are also expensive to produce and hence are charged for. Above all they emphasize that the carefully guarded portals of the ISI WOK and Scopus include only academically verified journals and exclude irrelevant or non-standard sources. However, there are conflicts of interest in Scopus being run by a company that is itself a major global journal publisher. Both databases also have a strong vested interest in running their operations in a restrictive way, to protect their costly proprietary model.

University hierarchs and government research boards love the solid, IBM-era technology of these systems, and view their costliness as a sign of quality. In addition, there is a whole sub-community of scholars and consultants who have grown up to analyse scientific referencing, especially in the physical sciences. Practitioners in this sub-field of library science have invested a lot of intellectual capital in learning how to use these large systems. Because it requires some time to extract meaningful data from ISI WOK and Scopus, most bibliometrics experts favour a strategy that presents their data as comprehensive of the best journals. This has hindered the development and recognition of newer internet-based systems and approaches.

Conventional citation systems like ISI WOK and Scopus have some severe limitations that need to be kept in mind - especially by social scientists and academics in the humanities - because these systems cover only a limited number of journals, and no or few books. In addition, the indexing criteria for journals are lengthy and heavily weighted towards journals that have already accumulated a critical mass of citations from journals that are already in the index.

The two conventional systems have a heavy bias in coverage towards English-language and towards older established journals. ISI WOK especially is heavily US-dominated. Because the US is a large and rich society, with many more academics in most social science fields than in Europe or any other region of the world, the conventional systems automatically tend to deliver rankings and statistics that are weighted heavily towards success in the US 'market', compared with the rest of the world. The ISI WOK system does not cover references in books, (although it does cover some book reviews in journals). The Scopus system covers book series. Excluding books is a fairly small problem in the physical sciences, which explains why the ISI WOK systems are set up in this way. But it is an insurmountably serious limitation across the humanities where books are the main mode of scholarly communication and a key vehicle of disciplinary development. The lack of book coverage poses is a serious difficulties for accurately measuring citations within 'softer' social science fields where books remain very important.

The older systems completely exclude references in working papers or conference papers, and hence have very long time lags. Publishing in a journal across the social sciences generally takes a minimum of two years from submission to publication, and often up to 3.5 years in the most competitive and technical fields like economics. In the interim, conference papers and working papers often provide many indications of how much work is being cited. But neither type of outputs is included in the ISI WOK, nor in the Scopus index. Rather than reflecting the latest advances in academic research, these systems tend to reflect the output component of the discipline three or four years in the past.

As a result of all these factors, ISI WOK and Scopus only cover a low fraction of academic journal papers in social science published worldwide, and far less than the coverage in the physical sciences, which can be regarded as near complete

Figure 2.1 assesses the effects of ISI WOK's limited coverage of social science research. It captures the *internal coverage* of the ISI WOK databases in 2006 by showing the percentage of references made in ISI WOK articles that were made to journal articles already included in the database. If ISI WOK is capturing as it claims the most important

Figure 2.1: How far the ISI Citation Indexes for 2006 include the references cited by articles contained in the database across groups of related disciplines

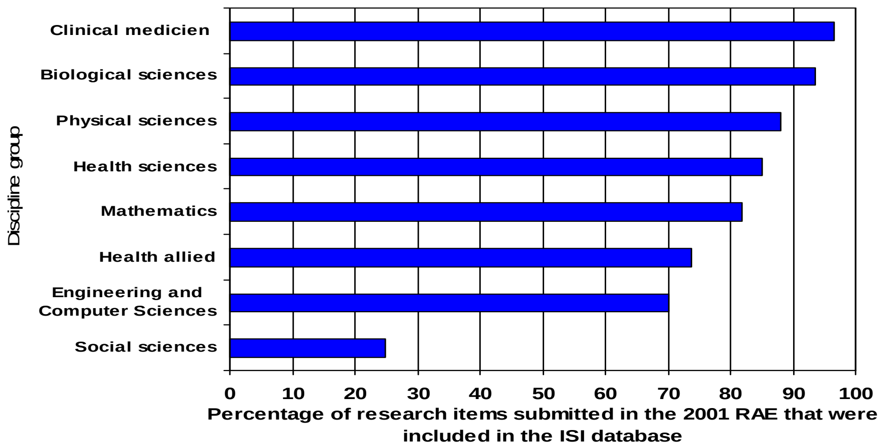
Percentage of references cited in the ISI databases that are to other items included in the databases			
High (80-100%)	**Medium (60-80%)**	**Low (40-60%)**	**Very low (less than 40%)**
Molecular biology and biochemistry (90%)	Applied physics and chemistry	Mathematics (64%)	Languages and communication (32 to 40%)
Biological Sciences – humans (82 to 99%)	Biological sciences – animals and plants (c.75%)	Engineering (45 to 69%)	All other social sciences (24 to 36%)
Chemistry (88%)	Psychology and psychiatry (c.72%)	Computer sciences (43%)	Humanities and arts (11 to 27%)
Clinical medicine (85%)	Geosciences (62 to 74%)	Economics (43%)	
Physics and astronomy (84 to 86%)	Social sciences in medicine (62%)		

Source: Centre for Science and Technology Studies, 2007, Tables 3.1 and 3.3.

work in a field, then most of these references should be to articles elsewhere in the ISI WOK database. Figure 2.1 shows that ISI WOK's internal coverage was indeed high in the medical and physical sciences, for instance over 90 per cent in physics. Across other STEM disciplines from four fifths to nearly all of the references are included. In more applied physical science fields this proportion falls to two thirds or three fifths, and in maths and engineering to between two and three fifths, a level that is relatively lower. Social sciences, however, are strongly affected by ISI WOK's coverage bias. With the exception of social sciences related to medicine, coverage for the rest of social sciences falls below 50 per cent; for example, 43 per cent for economics and between 24-36 per cent for all other social sciences. The humanities are the most affected with only 11-27 per cent of internal coverage. Most bibliometric experts acknowledge that the usefulness of these systems declines sharply if they include fewer than three quarters to two thirds of all journal articles world-wide.

In addition, how far does ISI WOK's strong orientation towards US journals affect coverage when we come to look at research undertaken in other countries, like the UK? A detailed analysis was undertaken of the research submitted to the UK's Research Assessment Exercise for 2001 (covering publications in 1996-2000), providing a useful external measure of coverage. It found that the ISI WOK database included five out of every six RAE items submitted in the physical sciences (the STEM disciplines) , but only one in four items for the social sciences, as Figure 2.2 demonstrates below. These numbers are very similar to the ISI WOK internal coverage numbers above, even though they relate to different dates. So the internal coverage estimates for the database as a whole and the UK-specific external estimates of coverage offer a similar picture.

Figure 2.2: The inclusiveness of the ISI databases for items submitted to the UK's Research Assessment Exercise of 2001



Source: Centre for Science and Technology Studies, 2007.

A final dimension to consider for the social sciences concerns the trends over time – has the ISI WOK got better at including social science materials? Do its continuing problems perhaps reflect chiefly its origins in the physical sciences and initially rather restrictive approach to including journals? As the database has expanded along with the growth of social sciences journals and publishing, has it become any more inclusive? Figure 2.3 shows how the detailed ISI WOK internal coverage of the social science disciplines changed over a decade and a half. There has indeed been a general substantial improvement in coverage of these disciplines, but one starting from a pretty low base. By contrast, in humanities subjects the ISI WOK's inclusiveness has generally either declined or increased only slightly. Subjects bridging from the social sciences into STEM disciplines also show increases in internal coverage, but with smaller percentage changes because they start from a higher initial base.

Figure 2.3: How far the ISI Citation Indexes have improved over time in their including the references cited by articles contained in the database across social science and neighbouring disciplines, from 1991 to 2006

	ISI's internal coverage (%) in		Percentage change 1991 to 2006
	2006	1991	
For comparison: Life sciences	93	87	7
Psychology	72	59	22
Health sciences	62	50	24
Computer sciences	43	38	13
Economics	43	35	23
Inter-disciplinary social sciences	40	33	21
Languages and linguistics	40	26	54
Educational sciences	36	27	33
Management, Planning	36	23	57
Law, Criminology	31	27	15
Sociology, Anthropology	34	22	55
Information science, Communication science	32	32	0
History, Philosophy, Religion	27	24	13
Political science, Public administration	24	17	41
Creative arts, Culture, Music	14	17	-18
Literature	11	14	-21

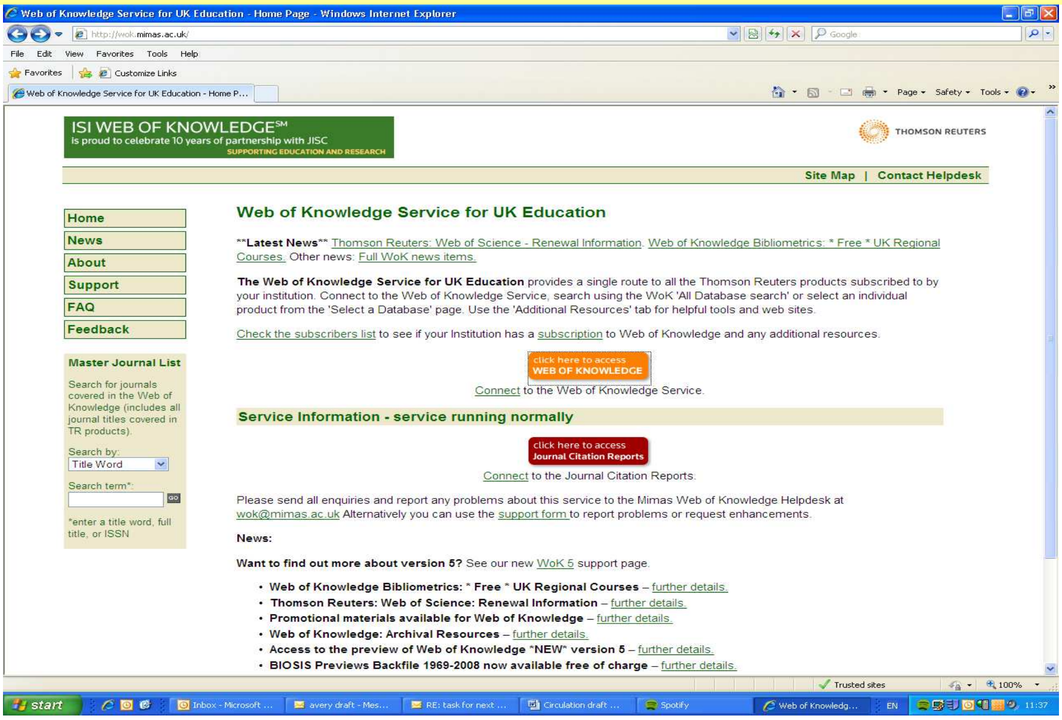
Source: Centre for Science and Technology Studies, 2007, Table 3.3.
Notes: 'Internal coverage' means the percentage of references cited in articles in the ISI databases that are to other items included in the databases.
The yellow-shaded rows here are those for social sciences, green for humanities, and blue for subjects that are primarily physical sciences or STEM subjects.

For many years the known deficiencies of the ISI databases in the social sciences were routinely acknowledged, but none the less were put somewhat on one side because the data represented one of the only sources of insight. However, in the modern era where there are viable alternatives (indeed superior options for most social scientists, as we show below) this stance is no longer appropriate. Bibliometricians commissioned by the UK's Higher Education Funding Council to help them consider the use of citations data recommended that it was not appropriate to rely on conventional citations systems like ISI WOK unless the internal coverage of items approached four fifths (the 'high' level in Figure 3.1) (Centre for Science and Technology, 2007: 54-6). The lower that coverage gets in a field, the less useful ISI WOK ratings could be for assessing scholarly performance. They recommended that in disciplines where less than 50 per cent of references are being included in ISI WOK, citations analysis could not contribute reliable information to a research assessment process.

Bearing in mind ISI WOK's limited coverage and geographical bias, academics should interpret ISI WOK citation data with some degree of caution. In the social sciences ISI WOK does not in any sense provide a more accurate insight into the overall and global impacts of academic work than newer internet-based systems. It can offer, however, a somewhat better picture of academic impact for those disciplines which tend to focus on high-prestige American-based journal articles. As the US is still normally rated as the first or second most influential country in the world across all social science disciplines, this is an important consideration.

Box 2a explains how to access ISI WOK and the somewhat complicated processes that are normally necessary to extract a record from it of how your work has been cited:

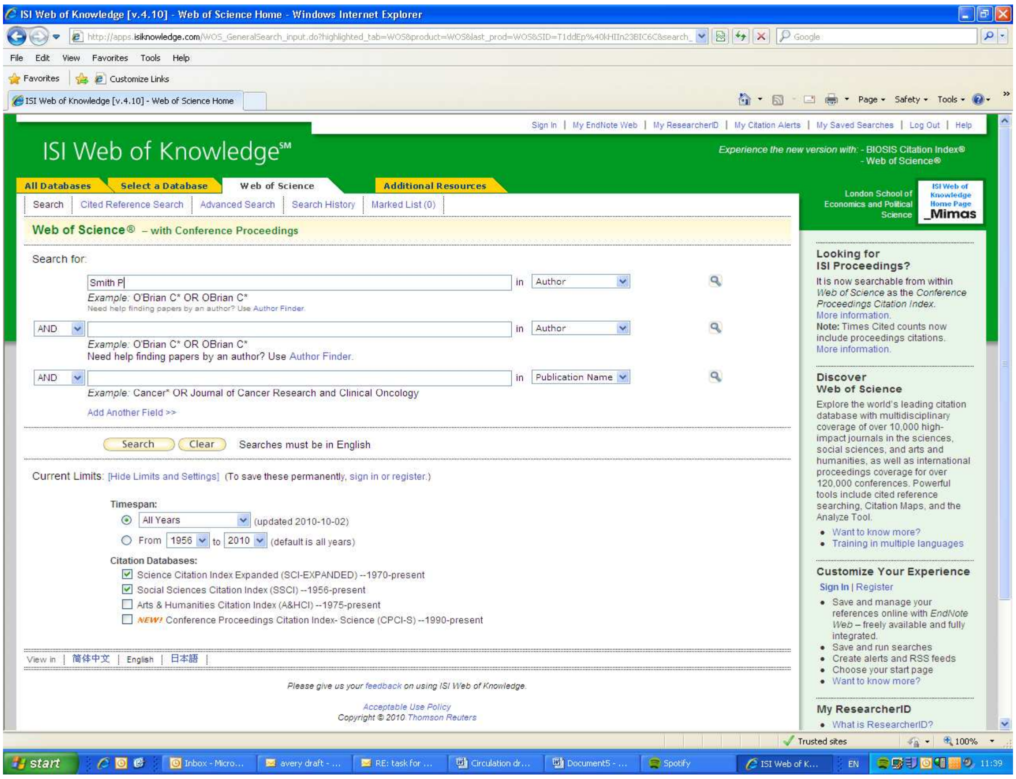
Box 2a: How to use the ISI Web of Knowledge



Gaining access will usually require going to your library's website and following a link to the online version of ISI that you can operate from your desktop in your office or home office. Once you are logged on:

Step 1: Click the button to access the Web of Knowledge. First use the "Select A Database" tab on the top right of the screen and click on Web of Science. One of the most confusing aspects of the ISI website is its proliferation of differently named databases (all sitting on different mainframes). These names obviously mean a lot to ISI and bibliometrics experts but they are just confusing 'chaff' for normal users. You can choose to look across four citation indexes or only choose the ones you want.

Step 2: Input the author name you are searching for, your own or someone else's. It is important to do it in the restrictive (old-fashioned) format suggested by the software. For example, if your name is 'Peter Smith', you will have to enter '*Smith P*'.



Step 3: The outputs from the software will include each article name, journal title, volume, issue, pages, publishing year and times cited. The most important parameter to understand the academic impact of a researcher is the times each piece of work is cited.

To read, store and analyse the data in a more convenient program like Excel, and to 'clean' it of misleading materials and statistics, do the following:

Step 4: Scroll to the bottom of the page and under Step 1 of "Output Records" select "All records on page".

Step 5: Under Step 2 of "Output Records" deselect "plus Abstract".

Step 6: Under Step 3 of "Output Records" in "Save to other reference software" pick "save to Tab delimited (win)" (or Mac if you have a Mac).

Step 7: A Notepad file will be created that you can either open immediately or save onto your desktop. With two or more screens of data you need to past each screen into Notepad in sequence and then save it.

Step 8: If you now open the Notepad file and highlight and copy its full contents you can then just paste them directly into Excel – the data and text will come into Excel fully formatted.

Step 9: Alternatively you can import your saved Notepad file into Excel. You will be prompted to complete three steps to import the data

(a) Select "delimited"
(b) Select "Tab"
(c) Just click on FINISH

Step 10: You could archive the whole resulting file and then copy the records to a new worksheet where you can construct a summary tile. Delete any columns that are of no interest to you. Normally it will be enough to retain the publication name, authors, publication year, and times cited.

Step 11: If you have written a lot of book reviews in journals they will be included as items in the ISI lists. But such single reviews are almost never cited by anyone. Hence they will always act to depress your 'times cited' average. To get rid of them, and get a better picture, sort the ISI WOK entries in Excel in descending order of times cited, so as to group all the zero cited items together at the end of the list. Copy the sorted full data to a new worksheet in the same file, and then delete the book reviews from the end to give a new listing of just genuine journal articles.

ISI WOK can be a helpful system for expanding normal literature review searches. However, it doesn't provide the 'snippet-view' materials that Google Scholar does, which can be very helpful in ascertaining what a paper is about if it has an obscure title, and which are more helpful for checking through the backlist works of particular authors. But ISI WOK does provide a relatively useful means of checking for key terms in article titles. It has a good date record and hence is an effective way of surfacing some of the main journal articles with keywords in their titles in say the last 5 or 10 years, often the most relevant search periods.

2.3 Internet-based citation-tracking systems

Google has been the prime force in the development of article-finding, book-finding and citations-tracking systems free over the internet, having ambitiously declared its mission to 'to organize the world's information.' Less than a decade after its founding, the company's twin academic research engines *Google Scholar* (for journal articles and other academic papers) and *Google Books* now dominate the university sector.

There are other similar internet-based systems. The nearest counterpart to Google Scholar is the little-known *Scirus* system from Elsevier, a free-to-use counterpart to their Scopus system, and one that draws more widely on current working papers and conference papers. It operates similarly to Scholar and is worth checking as an additional source. In the US there are some other Scholar competitor sites, but they all rely on academics registering and voluntarily uploading materials. As many academics are unlikely to do this, the coverage of these sites (like CiteSeerX and getCITED) is now far too restricted and non-comprehensive to be very useful.

The current dominance of automatic search systems like Google Scholar (also an approach used by Scirus) derives from the fact that they voraciously and automatically record *all* citations. In particular they include:

- all ‘black’ literature in journal articles or books, that is, material that has been definitively and formally published, and is normally well-edited and certified through some form of peer review; plus
- less conventional ‘grey’ literature, such as working papers, conference papers, seminar discussions or teaching materials that has been issued in a less formal or definitive form. Often, of course, these research items are versions of material that is later formally published, but at this stage they have not been formally peer-reviewed. Some items included in Scholar are also academic but more teaching related.

This inclusiveness makes Google Scholar far more up-to-date in its picture of academic debates and controversies in each discipline, especially so in fields like computer science and IT studies where the pace of change in technologies and social uses of IT is very rapid. Scholar also gives users much more immediate information about the work being found, and it often gives full-text access to it if the material is not in a published book or placed behind a journal pay wall.

The dominance of automatic systems has been strengthened (and the obsolescing of American voluntary article-aggregator sites has been speeded up) by the growth of online research depositories in most serious universities in the advanced industrial countries. These university archives now host copies of their professors’ and lecturers’ works that previously were accessible only with great difficulty (by going to each individual author’s personal website) or behind journal pay walls. University online depositories also often contain conference and working papers that have not yet been formally published in journals, which Scholar and Scirus can both access and provide immediate full text access to.

Another useful development for Scholar and Scirus has been the development of some important multi-institutional sources hosting key research in pre-journal forms for free download. In the physical sciences newsletters and research feeds now often sustain a vigorous window into professional culture and current developments. In the social sciences these networks are somewhat less developed, but research paper depositories are big news. Two of the most important are the multi-field Social Science Research Network (SSRN) and in

American economics the National Bureau for Economic Research (NBER). But there are many others.

For assessing citations in journal articles, papers and related materials, at first sight it seems clear that Scholar and Scirus should be the most useful search tools. However, there are also four significant problems.

1) Both the Scholar and Scirus systems clearly access a range of mainly academic sources, but unlike ISI WOK and Scopus neither company provides any full specification of exactly which sources they use. Scholar clearly searches many conventional academic index systems, as well as journals' and publishers' websites, conference proceedings, university sites and depositories, and other web-accessible materials in academic contexts. But Google provides almost no information on exactly how this is done. This non-disclosure creates a big problem for government or professional bodies, and for university hierarchs. For all three groups it often feeds their resolution not to take what Google says on trust.

2) For commercial reasons Google and Scirus are both equally secretive about the algorithms that they use to sort and search, in particular to discount duplicate entries for the same material, and how they count the remaining citations (after duplicates are removed). This is a highly sensitive subject and adds another barrier. However, the companies also argue that only by keeping their algorithms secret can they effectively counter spam, which is a growing and huge problem. Clearly if the ranking of sites could be distorted by spammers, the usefulness of Scholar or alternatives could become completely devalued.

3) Critics argue that because Scholar and Scirus are automated systems they sweep up together lots of different academic sources, some major journal articles, books, key professional conferences or major university e-depositories - but others quite likely to be of questionable academic status and provenance. So citations become blurred and over-inclusive, with far more marked variations in the 'academic value' or 'research' status of different citations than occur within the walled gardens of the ISI WOK database.

4) Another problem with these systems is that they cannot recognise duplicated outputs, for example, a paper that is available both on a standard journal website and on the author's personal website. This has implications for accurately counting the number of outputs and citations.

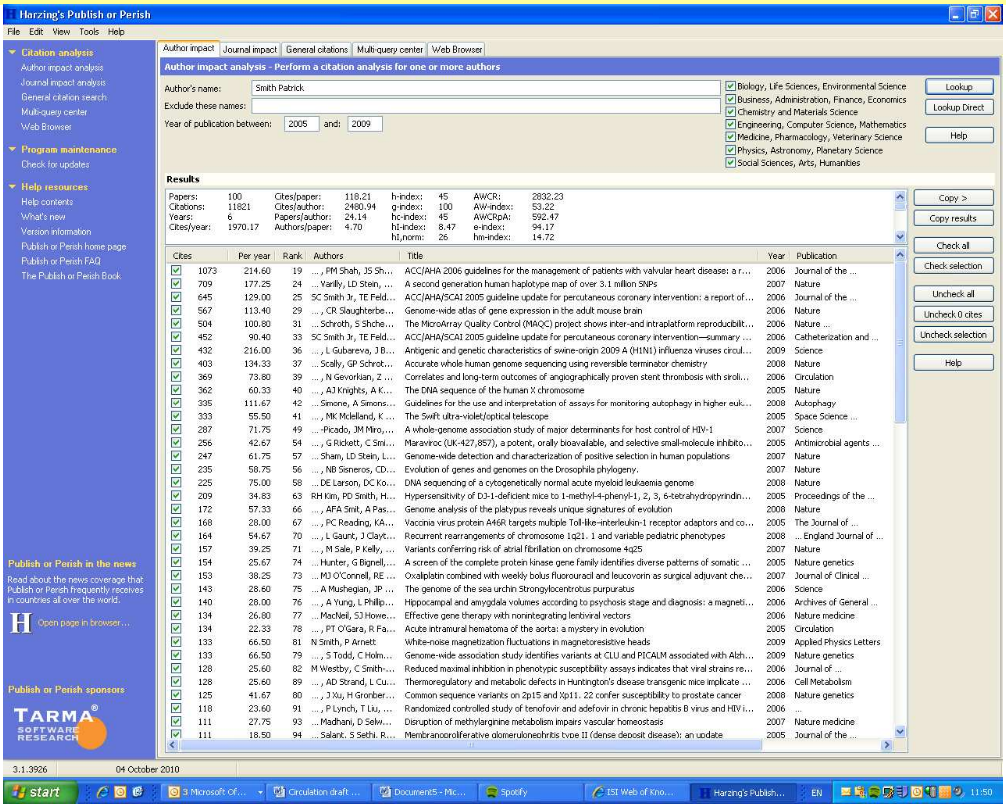
These are indeed potentially serious problems if the purpose of accessing Google Scholar (or Scirus) were to rank scholars' standing or citations to their research comparatively in fine detail; perhaps especially if these rankings were then also being used to allocate rewards like research support funding between departments or universities. However, we have chosen to focus on two distinct features of these systems:

- allowing individual academics and researchers, or teams and departments to track their own citations; and
- expanding literature searches of other authors' or researchers' main works.

For both purposes, the four key problems above are still worth bearing in mind, but they are only limitations that emphasize the need for individual judgement by the person consulting them. Authors and research teams know their own work better than anyone else, and are therefore better able to analyse the comprehensive listings data available.

In addition, there are now simplified and tweaked forms of accessing Google Scholar, of which the most important is the 'Public or Perish' software designed by Professor Anne-Wil Harzing of the University of Melbourne, and available for free download from www.harzing.com/pop.htm. This is a most valuable programme that combats many of the problems of interpreting Google Scholar outputs. It allows academics to easily check their own or others' performance - without having to become bibliometrics specialists in the process. The software presents academic outputs quickly and computes excellent citation statistics about each author's work, including an overall 'times cited' score and times cited per year since publication. We will continue the discussion of the more complex versions of HPoP's citation statistics in Chapter 3 below. Box 2b explains how to download the HPoP programme and then how to use it.

Box 2b: How to use Harzing's Publish or Perish software



Step 1: Download the software for free from www.harzing.com.

Step 2: Launch the application from your desktop.

Step 3: Choose 'Author Impact Analysis'.

Step 4: Enter the name you want as *surname, firstname*. (Capitalization is not necessary.)

Step 5: The statistical indicators for that author will be displayed in the upper portion of the screen, and a detailed list of works in the bottom panel, initially arranged in descending order of total citations for works. You can rearrange the order of the list of works by clicking any of the column headings here.

Step 6: Check the detailed list for any irrelevant entries for other authors – exclude them from the statistics by de-clicking the tick box in the leftmost column.

Step7: If other authors have cited your work in different ways (e.g. some include sub-titles and others don't, or get the title or name spelling wrong) there will be *duplicate entries*. To eliminate (most of) these, click the 'Title' heading to temporarily re-arrange items in alphabetical order of titles. Then work through and when you find duplications, right click the duplicate item to highlight it, and then move it to place it above the main reference for that work: HPoP will now show these as one item. With several duplicates, be careful to choose the most accurate one as the main reference.

Step 8: The list of works can be saved in Excel format (comma delimited) or copied and pasted into Word. The Word lists initially look a bit jumbled. They can be quickly clarified by going to the very end of each entry (giving the URL for that work) and clicking on one space to show the URL in clickable format. Then click *return* to start the next entry on a new line.

Step 9: Save the HPoP statistics displayed in the upper portion of the screen by copying and pasting them in Word format.

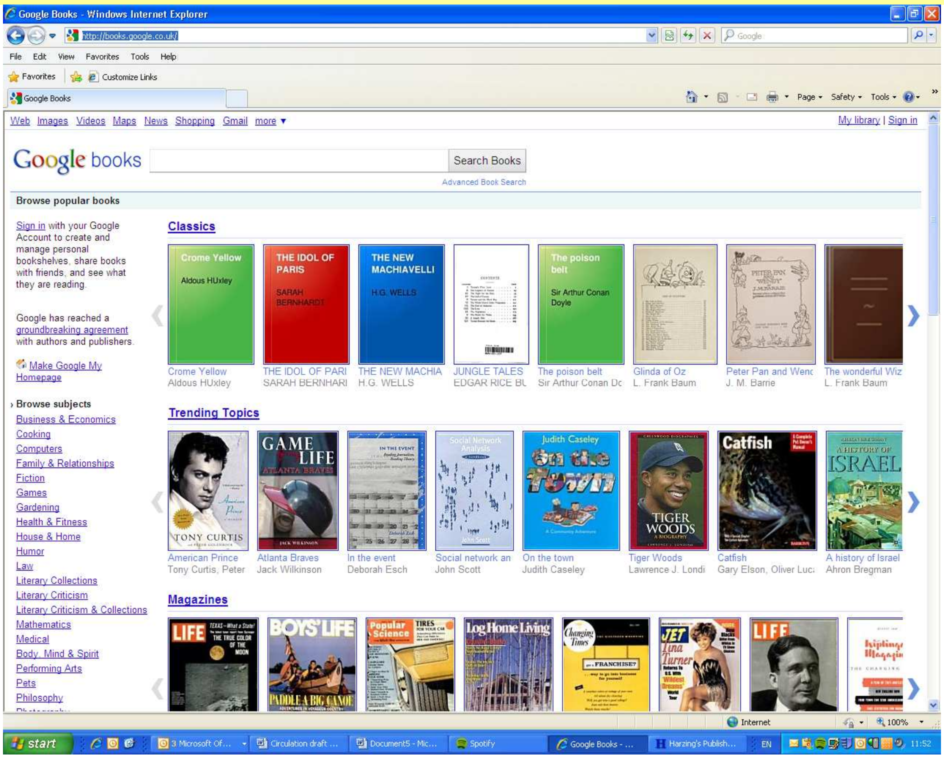
Google Books is a system that is primarily designed to make available a range of different online views of a book's contents to potential readers. Essentially Google has now run around 10 million books through optical character readers so as to create online images of each page. For books that are out of copyright, Google makes available the full text for reading online, but the material cannot be downloaded in the free use version of the programme. The text of most out of copyright books is also fully searchable, so you can easily find specific sentences, quotations, or words of interest anywhere in the book. This software is so powerful and so good that many scholars now use Google Books as an online index to find material within books that they already have on their shelves, but which have either no index or the normally very inadequate academic book index system. There are also links through from Google Books to the publisher's website, to booksellers offering the book, or to libraries nearby to the searchers' location that stock it.

For books in copyright how much information is viewable on Google Books depends on what agreement the book's publisher has reached with them. The most restrictive 'no preview' entry just replicates the publishers' blurb and perhaps gives the contents pages. The next most restrictive approach is a 'snippet view' that offers only a few short glimpses of the book's content, but still allows readers to search the full text and to find relevant material. If you want to find out if a book covers the kind of topic you are interested in, even in snippet view you can very quickly check far more material in a fraction of the time that would be needed for previous literature searches. The most expansive Google Books preview allows you to read many full pages of the text, but normally will leave out some key chapters or sections. However, you can usually search across the omitted sections as well as the full text pages (helpful for knowing how much coverage a book gives to your topic of interest). But again you cannot download a copy of the book in the free version.

Eventually, Google Books will be available worldwide in a commercial version that will make all copyrighted books in its database available for download, of course in return for a fee that will be agreed between Google, the publishers and universities. Google will potentially have an enormous monopoly position here, in a market that is bound to grow very strongly in size and value over the next decade, as e-books take off. How governments in the US, Europe and other regions of the world decide to regulate Google's operations of this key intermediary role will have very substantial consequences for how academic research develops, especially in the most book-based disciplines, such as the humanities and 'softer' social sciences.

Leaving these meta-issues on one side, however, what concerns us here is the citations-counting capacity of Google Books, and Box 2c explains how to use it.

Box 2c: How to use Google Books for citations tracking



Step 1: Go to http://books.google.co.uk. Alternatively go to the main Google site and pull down the menu tab labelled 'more' on the left of the Google menu bar and go to Books directly in the options menu.

Step 2: Enter the author name in double quotes, as "Firstname Lastname" and search. You can also try it as "Initial Lastname". Search using the 'Listwise' (default) option that shows a snippet about each item found.

Step 3: When the Books search results come back make a note of how many items are returned in the initial count given at the top of the search list. It is generally better to go with the version of the author name that yields most results.

Step 4: Check that the search process is producing a close fit to the author you want and is not cluttered up with works from many other authors. This is easy if the author name is distinctive. If the author name is a commonplace one use 'Advanced Search' to exclude 'confuser' author names and perhaps to require a field-specific word to be present – e.g. entering 'politic' for a political scientist, should capture almost all their work but exclude non-political items.

Step 5: When you have a basically OK listing, print the citations pages off and go through manually excluding any remaining 'confuser' entries. Unless you have a very common author name or a great deal of citations, this takes hardly any time to do. (You may also wish to separate out and count those references that are to the author as a book editor rather than to the author's own writings).

Step 6: Always click through to the final Google Books page, and you will get a completely different citations count, one that is a fraction of the initial count. This appears to be the count of citations excluding multiple cites. You will need to deduct from it a number for the entries you have hand deleted.

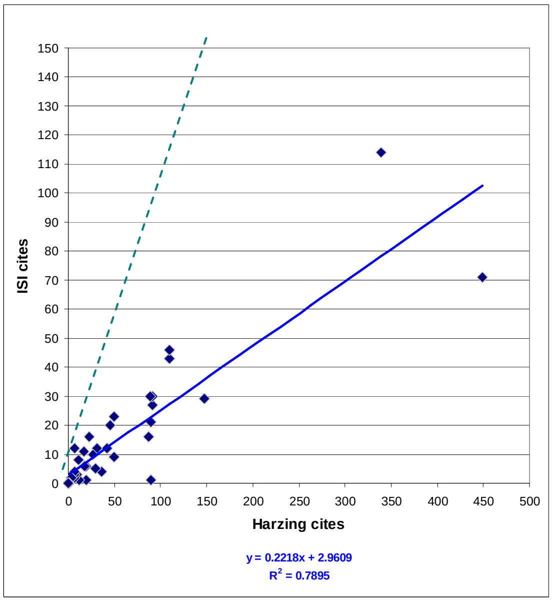
Step7: If the author name is impossible to untangle from a multitude of similar names, even in the same field, you can try repeating the search above using their main book or journal titles as the search items.

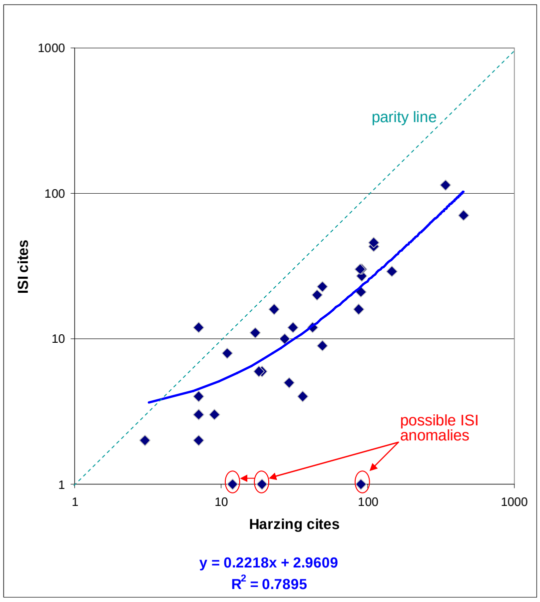
2.4 Comparing conventional and internet citations tracking systems

It is worth comparing how the two broad categories of citations systems discussed above perform against each other. In general the HPoP/Google Scholar database is much more inclusive than the ISI WOK one, especially in disciplines where books and book chapters are an important means of professional communication. Figure 2.4 shows how the ISI WOK and HPoP/Scholar indices compare. The top two parts show only the items included in the ISI WOK, first on a linear scale (which shows a strong bunching of low-scoring items) and secondly on a logarithmic scale (which helps to spread out the lower scores and shows the patterns of data better). In every case the ISI WOK cites score for a publication is less than the HPoP/Google Scholar score (the point where they would be equal being shown by the parity line).

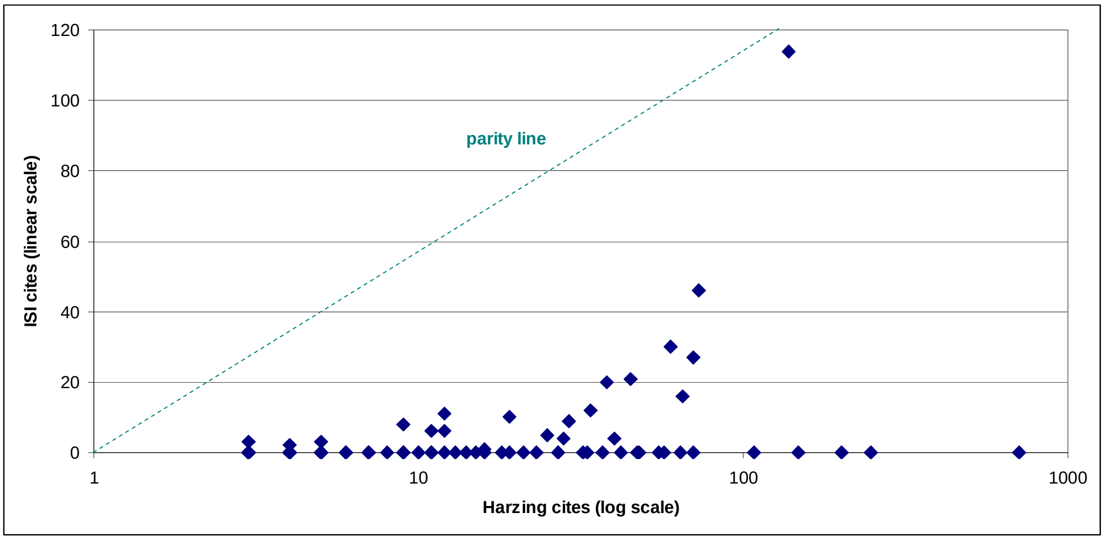
Figure 2.4: The inter-relationship between ISI WOK and HPoP scores for one example academic, a senior professor in political science
Each diamond represents one item's citation scores.

(a) Linear scales (coverage: ISI items only) (b) Log scales (coverage: ISI items only)





(c) ISI WOK and HPoP scores for all items included in this author's HPoP listings



Notes: Figures 2.4a and b include only items in the ISI WOK database for this academic; Figure 2.4c includes all items in the person's HPoP listing with at least three cites. The HPoP scores have been manually cleaned to eliminate duplicate Google Scholar entries.

Figure 2.4c shows the scores for all the person's HPoP scores. The items scoring high on HPoP but zero on the ISI WOK are in all cases comprised of books, book chapters and journal articles in journals that are not indexed by ISI

WOK. Five of this author's top 6 cited items fall into this category, and 12 of the person's top 20 cited pieces.

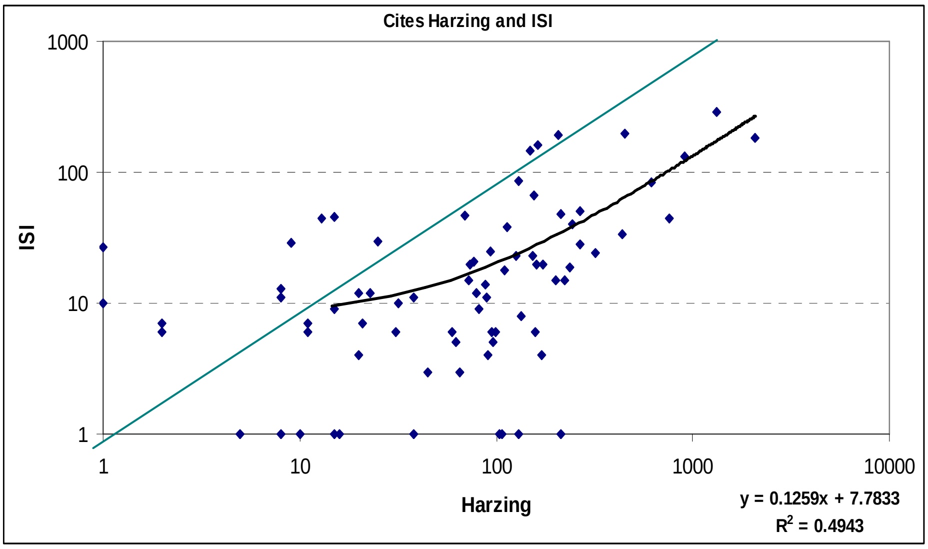
Of course, a single example of this kind is only indicative, and so to get a broader picture we turn next to data collected as part of the Impact of Social Sciences project. This dataset collated by the LSE Public Policy Group is described in Annex 1. Essentially we collated ISI WOK and HPoP scores for all the traceable publications of a sample of 120 academics spread across five social science disciplines. We also carefully checked by hand all the publications listed in HPoP/Scholar and looked at all the sources citing them. We removed all duplicate entries, unacknowledged citations, publishers' publicity materials etc. to produce a completely 'cleaned' PPG score, one that also incorporated citations in books. We aggregated the ISI WOK, HPoP and PPG scores for each academic concerned, and compared them.

Figure 2.5 below shows a strong continuity with the picture drawn above. Most ISI WOK cites scores for authors are much lower than their HPoP scores, although it is noticeable that one in 10 of the sample showed ISI WOK scores that are higher than their HPoP score. One in twelve of the sample were rated by ISI WOK as having a minimal score of 1, whereas their HPoP scores ranged from 0 to 2089 cites. (On a per author basis there are obviously fewer instances of ISI WOK registering zero cites than was the case for the per item basis in Figures 2.4a, or (b) or (c).)

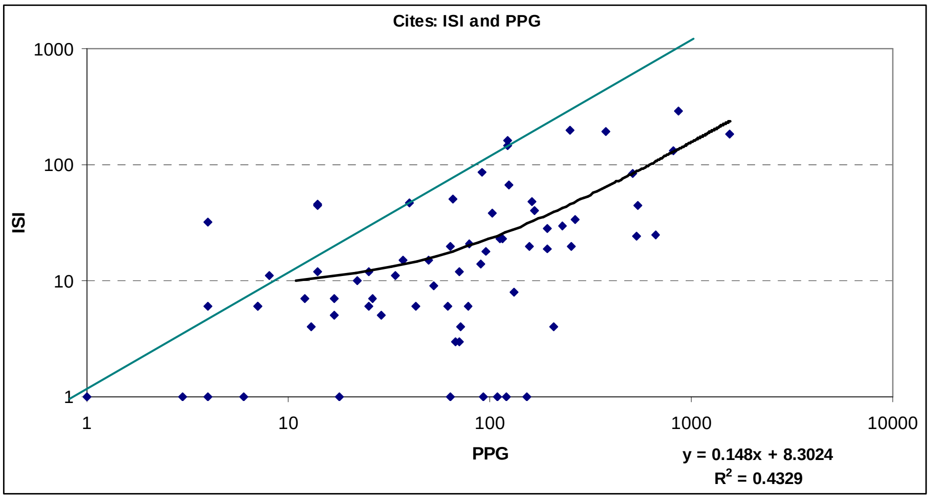
Figure 2.5b shows that this picture is also strongly born out at the author level in the manually checked PPG scores. The key reason for this is shown in Figure 2.5c, where the HPoP/Scholar and PPG scores are shown to correlate almost perfectly (and of course significantly). By contrast, the ISI WOK scores correlated weakly with the HPoP/Scholar scores for our sample, and even less well with the carefully checked PPG scores.

Figure 2.5: The inter-relationship between ISI WOK and HPoP scores, and between ISI WOK and PPG scores, for 100 academics in the PPG dataset
Each diamond represents one author's aggregate citation scores. Graphs are log scaled.

(a)



(b)



(c) Correlation coefficients between the aggregate scores for authors

	ISI scores	HPoP scores
HPoP scores	0.22 (0.24)	
PPG scores	0.14 (0.46)	0.95** (0.0)

Notes: Correlation coefficient (significance test, two-tailed).

So far though these are rather aggregated analyses, at the level of an author's whole profile of work. By pooling data across multiple authors, and looking instead at the level of individual items we can examine how the relationships between the ISI WOK, HPoP and PPG scores operate at the level of individual publications. Figure 2.6 shows the results for all the publications of a small sub-sample of 15 academics taken from 120 in PPG dataset. We essentially repeat here the analysis above, but at the level of individual publications.

Figure 2.6: The inter-relationship between ISI WOK and HPoP scores, and between ISI WOK and PPG scores, for all the publications of a subset of 15 academics drawn from the PPG dataset

Each diamond represents the citation scores for a single publication. Graphs are log scaled.

(a)

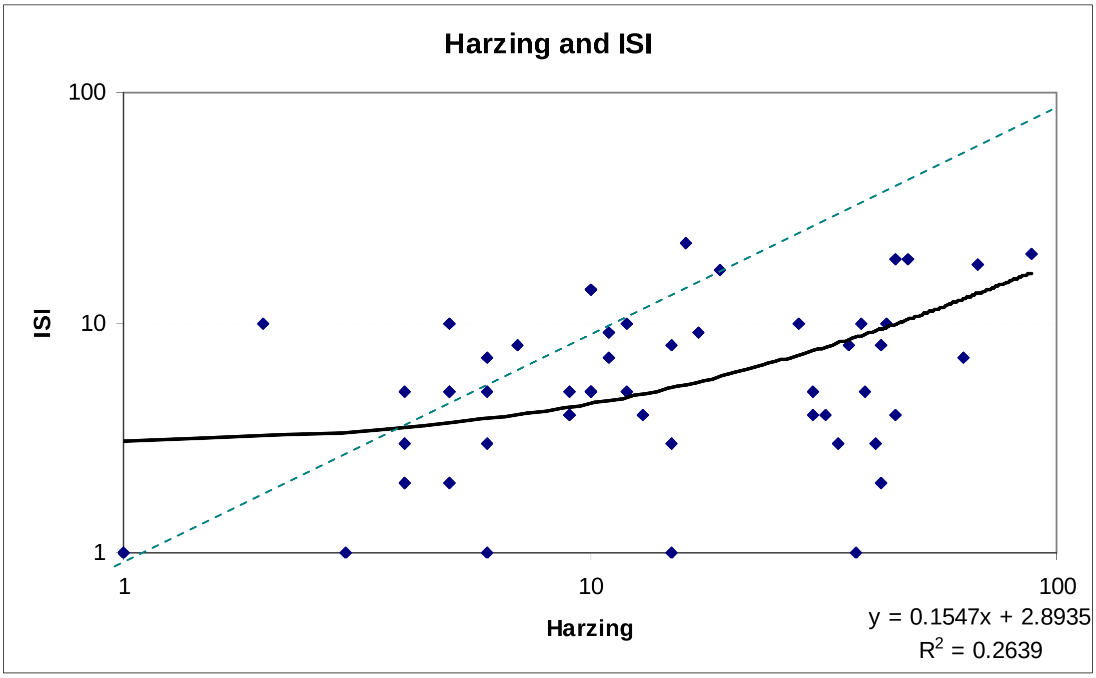
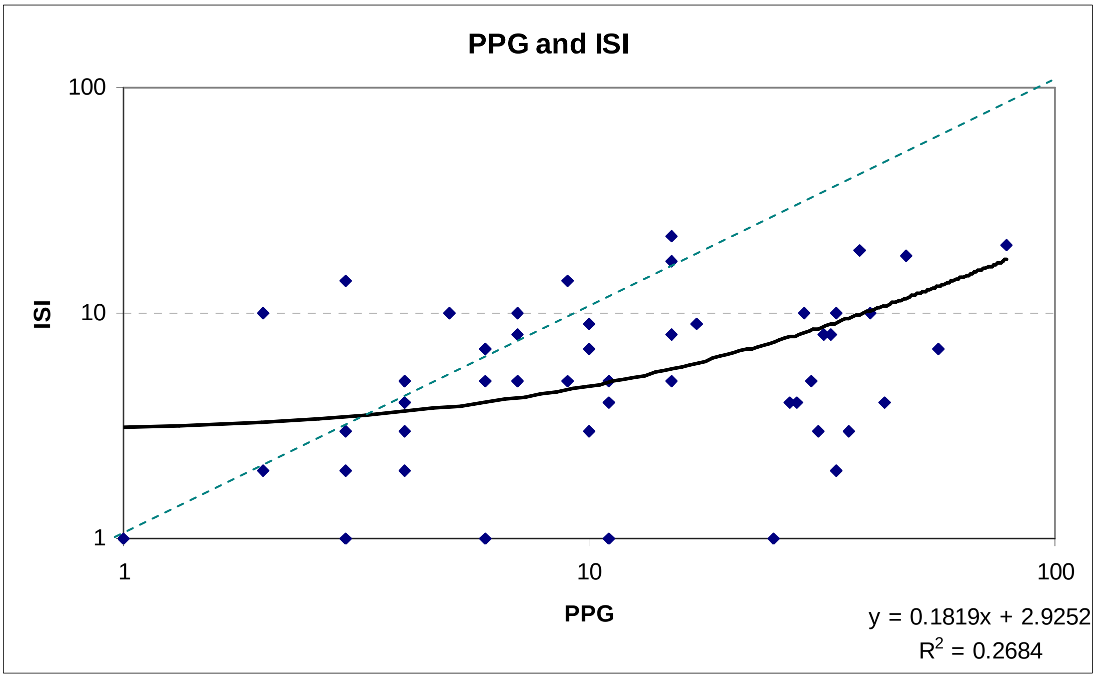
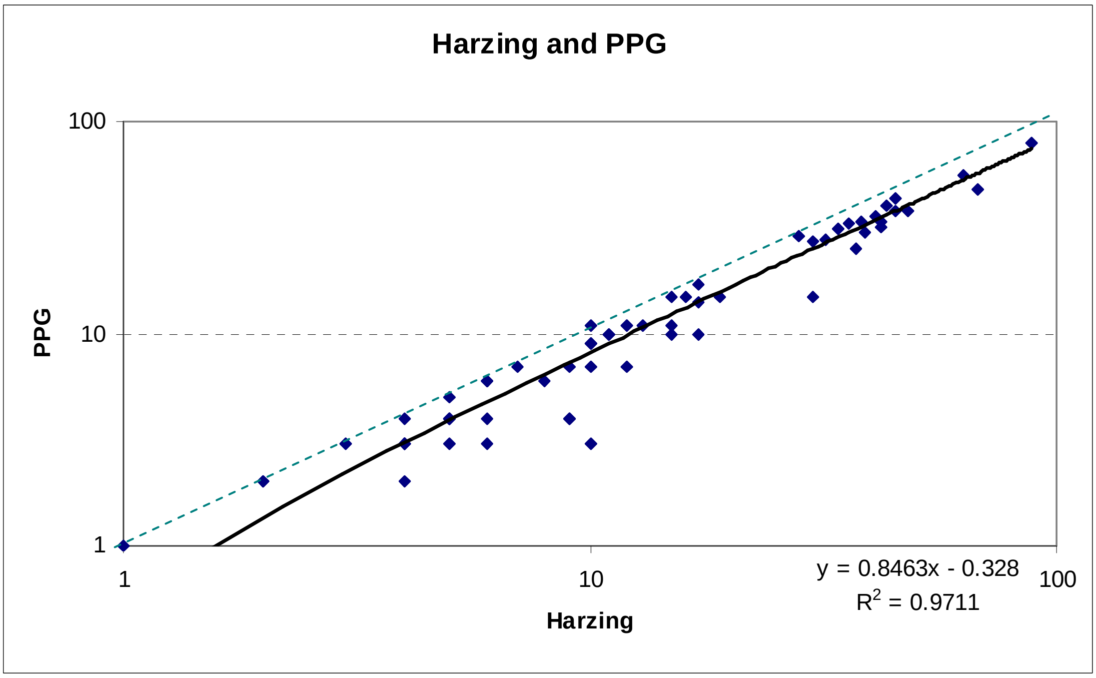


Figure 3.6 continued
(b)



(c)



The previous patterns found are strengthened. Figures 2.6a and 2.6b show that only around a quarter of the score that individual social science publications get in the ISI WOK database can be explained in terms of HPoP/Google scholar citations, or in terms of the manually cleaned and checked PPG scores (also including manually checked Google Books scores). By contrast,

Figure 2.6c shows that the HPoP/Google Scholar scores for all publications included in the analysis are very similar indeed to the checked PPG scores. Indeed the R squared proportion of variance explained is 97 per cent, meaning that the two indicators are clearly tapping the same phenomena. Interestingly, although our analysis eliminated a good deal of double counting in the HPoP/Google Scholar listings, none the less the checked PPG scores are somewhat *above* the parity line here – reflecting the role of Google Books in boosting item scores. The two indicators move closely in step, but are not exactly the same. By contrast, the ISI WOK citations count for most social science publications is far less than the HPoP/Google Scholar or PPG counts.

The implications of this analysis are clear-cut for academics. The quickest, most reliable and most comprehensive way of understanding how their research is being cited is to run a HPoP/Scholar analysis of their outputs and to manually clean the results so as to correct for problems, as discussed above. The ISI WOK cites scores perhaps add insight into which journal *articles* are being cited in other US-orientated research articles. But in most social science fields, and especially more book-orientated disciplines, the ISI WOK simply does not include enough materials to be a useful or reliable guide to what is being found useful and cited by other members of the profession.

Summary

1. In the past academics have had few available tools to track their citation rates. We suggest using a combination of the three best tools which are Harzing's Publish or Perish, Google Scholar and Book Search, and the ISI Web of Knowledge.

2. Having a distinctive author name is essential for academics' work to be easily found amongst a global deluge of information.

3. Conventional citation-tracking systems like ISI WOK and Scopus have limited coverage in the social sciences and humanities, and an American-based geographical bias, as well as capturing relatively few citations in languages other than English.

4. Internet-based systems like HPoP, Google and Scirus cover a wider range of academic outputs and now provide more reliable analysis of how research is being cited – much more reliable in the social sciences and humanities.

Chapter 3

Key measures of academic influence

So far we have focused chiefly on finding out which parts of an academic's outputs are being cited and achieving influence. Once this information is collated, it is then possible to look at a range of different indicators or measures of success.

Some of the concepts discussed in this section (like the h-index versus the g-index) may sound overly technical or complex. In fact, all of the indicators we discuss here are relatively straightforward and each is useful in capturing one facet of the complex picture of academic impact. Any single indicator will have some things it does well, along with some limitations that need to be borne in mind. The most useful approach is to take a small set of indicators and create a well-balanced view of an individual's citations profile.

We first consider the indicators that are useful in assessing an academic's citations records. We next consider how indicators of a journal's success can be useful in deciding where to try and place future articles, and how to assess the comparative dividends from publishing journal articles and from books. Finally we consider who cites a little and a lot in academic disciplines, often discussed under the 'hub' and 'authority' patterns.

3.1 Assessing how well an author is cited

Straightforward totals are the simplest type of indicators for judging how widely a researcher or academic is being cited:

1) An author's total number of publications is obviously fewer for new researchers, and tends to grow over time. Comparisons are easier if you know *total publications per year measures*, starting with someone's PhD award date. This is easy to do for academics analysing their own records but PhD dates are difficult to calculate for other academics. Total publications per year measures are therefore not readily available on a comparative basis. Clearly there is also a great difference between a short note or report, a full journal article, or an academic book, so any publications head-count that treats each output the same can only be of limited value. In HPoP/Google publications count details can be distorted by other authors mis-spelling the original author's names or mis-referencing the title, each of which will register as a separate publication. But the HPoP software hugely improves on Scholar by including a handy facility to merge together records. Simply click on the titles tab to view titles in alphabetical author, and then pile duplicate entries for an item into the correctly cited entry for that item.

2) The total number of citations for an author solves this problem somewhat (we'd expect a book to be more cited than a short report). However, citations totals are equally shaped by longevity, and hence normally flatter senior academics relative to new entrants. To meet this problem, HPoP calculates a useful *average citations per year* index that controls well for senior versus junior staff differences.

3) HPoP also provides an *age-weighted citation rate* (AWCR) that measures the average number of citations to an entire body of work, adjusted for the number of years since the academic's first paper was published. The AWCR is very useful, but it only works if publishers enter the dates of their online materials correctly.

Some other apparently straightforward-looking indices raise quite interesting issues about whether they are of any use, because they are not easy to interpret. The key instance is the *average citations per item*. This may seem a useful statistic for estimating how influential an author's work is on average, and it does have a certain rudimentary value. However, any mean score like this makes most sense when data are normally distributed, which is rarely true for academic citations data. Most authors will tend to have a few strongly cited pieces that 'break through' into being extensively referenced by others, a larger number of medium-cited pieces, and a 'long tail' of rarely and barely cited pieces, including some or many that are uncited by anyone. (The more book reviews the author writes in ISI WOK journals, the longer this tail will be.)

There is extensive evidence for academic disciplines as a whole that patterns of citations of journal articles display a 'power law' configuration, such as that shown in Figure 3.1 for physics papers analysed by Sidney Redner. On the left are the small numbers of highly influential papers, and as one moves to the right so the number of papers with a given but lower and lower number of cites increases. The vertical axis uses a logarithmic scale here so that if the distribution approximates to a straight line sloping down to the right, then this is a sure sign of a power law effect in action.

Figure 3.1: The 'power law' effect in the citation of physics journal articles

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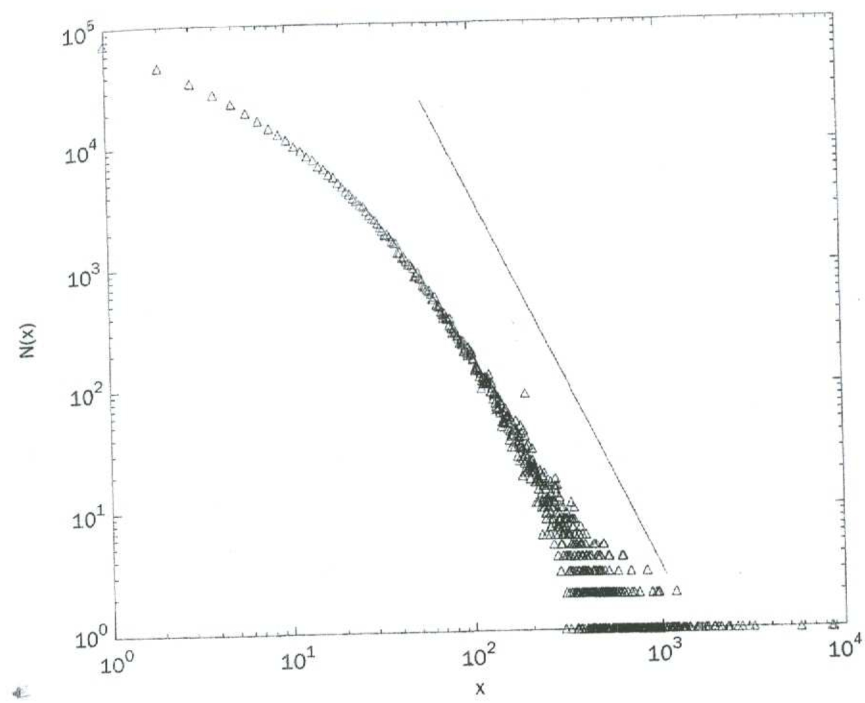
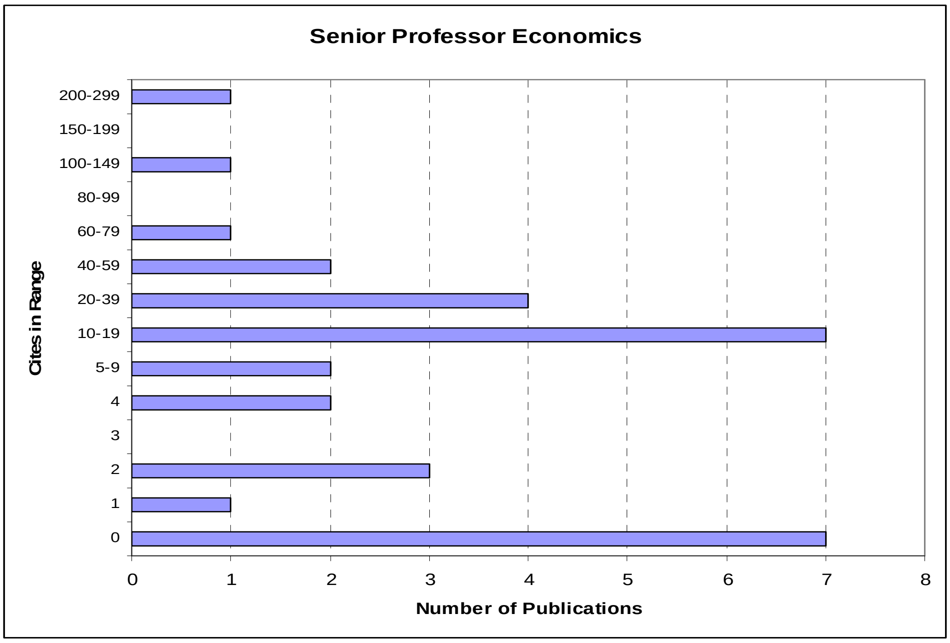
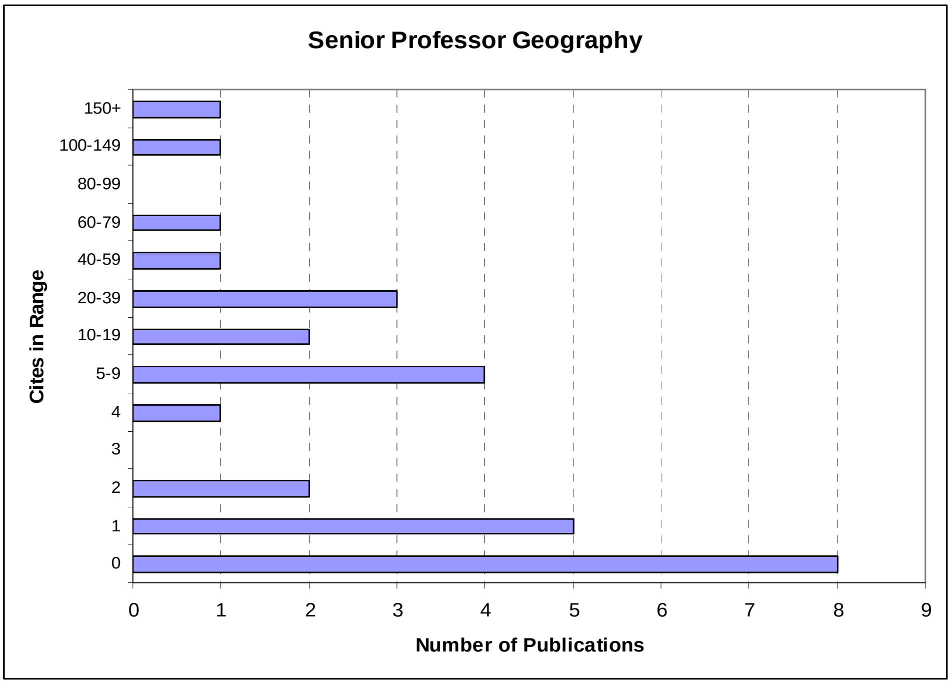


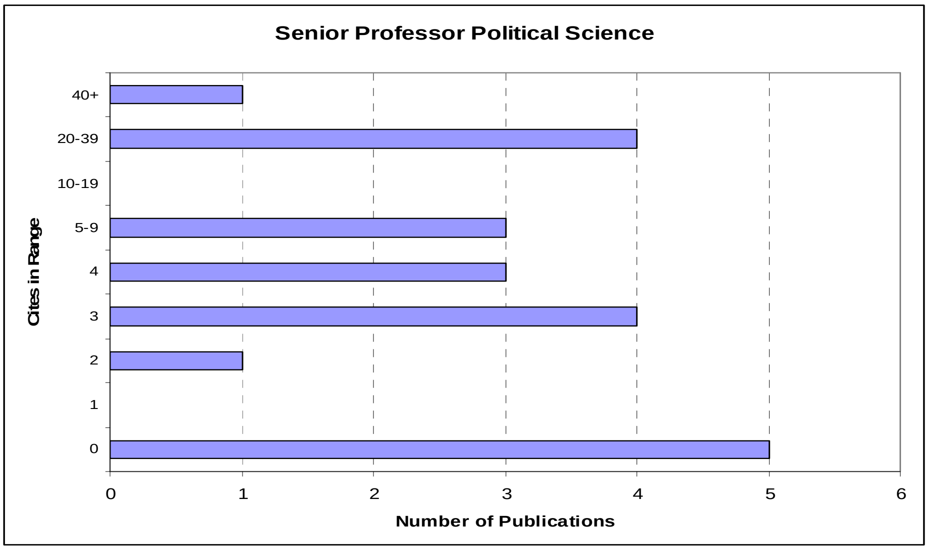
Figure 22 Distribution of research papers according to the number of citations they receive. (Adapted from Sidney Redner, *Eur. Phys. J. B.*, 1998; 4: 131–4, reprinted by permission.)

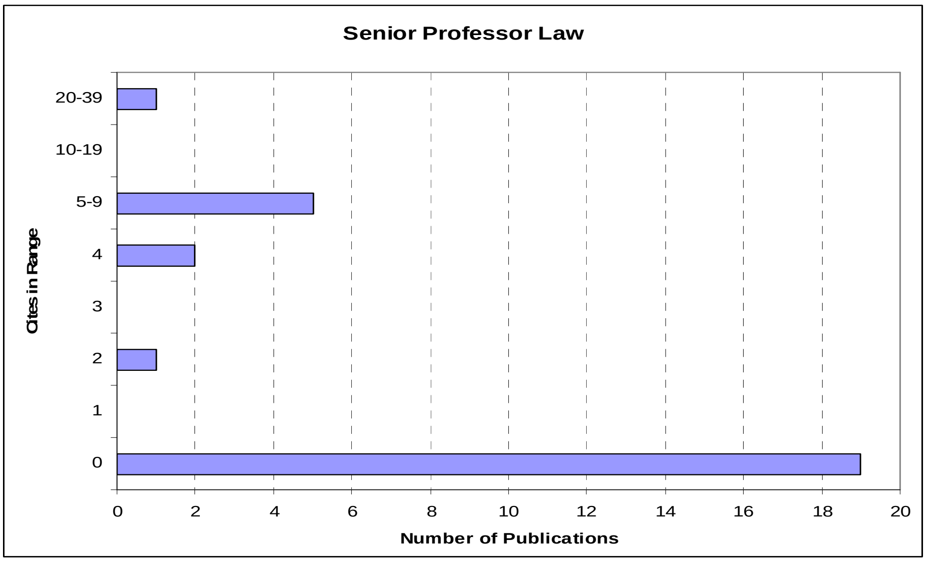
Compare this distribution with that for the same five senior social science professors whose distributions of publications across rates of citation are shown in Figure 3.2.

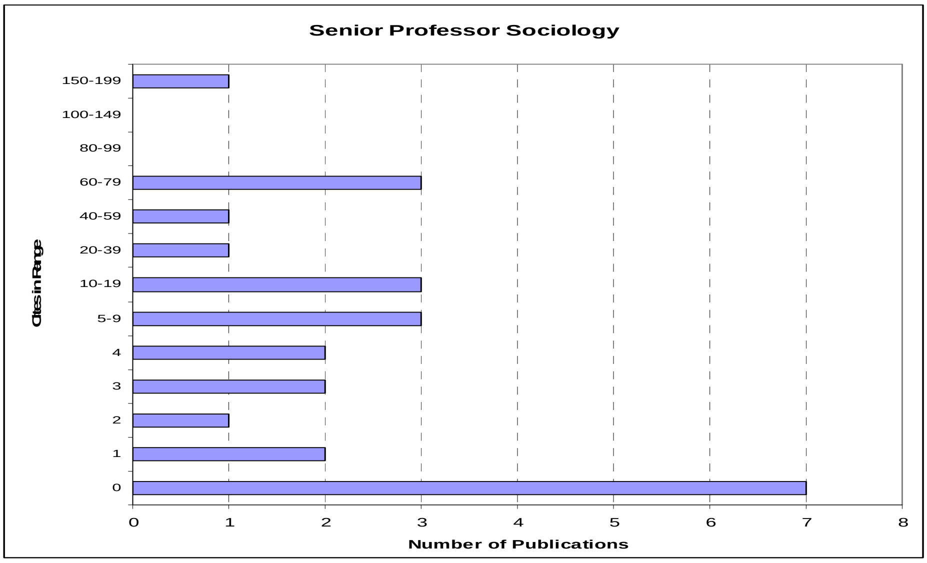
Figure 3.2: Publication profiles for five senior social science academics






Senior Professor Political Science
Cites in Range
40+
20-39
10-19
5-9
4
3
2
1
0
0
1
2
3
4
5
6
Number of Publications


Senior Professor Law
Cites in Range
20-39
10-19
5-9
4
3
2
1
0
0
2
4
6
8
10
12
14
16
18
20
Number of Publications


Senior Professor Sociology
Cites in Range
150-199
100-149
80-99
60-79
40-59
20-39
10-19
5-9
4
3
2
1
0
0
1
2
3
4
5
6
7
8
Number of Publications

For this illustration we chose one senior academic from each discipline included in the PPG dataset because their longer career time, plus their greater prominence in their academic disciplines, helps to bring out patterns more clearly. (By contrast, the scantier publication profiles of younger staff are often susceptible to different interpretations.) Among our chosen professors the top-cited publications have from 40 to 250 references each, but in most cases there are only one or a few such papers or books. The number of publications generally increases as we move into lower citation ranges, with the peak being in items with single or zero citations. There are good grounds for expecting that this kind of broad pattern will be reasonably common across most academics.

To just take a mean average per item score across distributions such as these is clearly not a very useful thing to do, because the preponderance of single cited or zero cited items will produce very low numbers, which capture very little of the real variations in success in being cited across different academics. We need to use instead some slightly more complex indicators that compute a number by looking across the whole of an author's outputs:

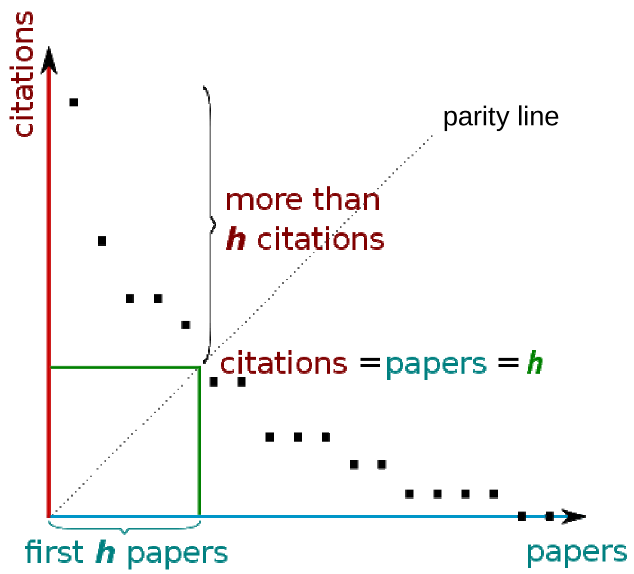
The h index has become the most widely used of these indicators. It was suggested by Jorge S. Hirsch and defined by him as follows: 'A scientist has index h if h of [his/her] N_p papers have at least h citations each, and the other $(N_p - h)$ papers have at most h citations each'. In case this leaves you none the wiser, an h score of 5 means that the person involved has at least five papers which have attracted at least five citations each; and an h score of 10 means they have 10 papers with at least 10 citations each.

Figure 3.3 shows how this approach works. We graph the number of papers an academic has on the horizontal axis, against the level of cites achieved on the vertical axis and then find the point where the resulting curve cuts the 'parity line', where the number of cites equals the number of papers at that level of cites. As a physical scientist, Hirsch envisioned that this computation would be done in ISI WOK, which is easy to do. As we have seen, this is a reasonable approach in physics, where the internal coverage of the ISI WOK database is high. However, for the social sciences we suggest that it should instead be much better carried out in HPoP/Google, which also has the great advantage of computing an h score index automatically for all authors. (In the humanities only HPoP should be used at all.) This number is accurately calculated provided that two things are done:

i) Check that no extraneous (similarly named) authors are included in the top publications in the HPoP listing, those close to or above the h-score level. (For authors with very numerous publications, it is not strictly necessary to check the whole listing to ensure an accurate h-score, only down to just below the h-score level.)

ii) Check through the full HPoP list to ensure that any duplicate entries for one of the top listed publications have been added to the appropriate entries. If duplicate entries appear lower down the list, this may somewhat depress the h-score level below what it should be.

Figure 3.3: How the h-index works



The huge advantage of the h-index is that it is very robust – it will not be much affected by mis-citations of most pieces and it usually will not move very radically even when corrections are made to clean data as recommended above. In particular, the index is highly resistant to being influenced by the numbers of low cited or uncited items (where most errors live). Hirsch also claimed that the index summed up in one useful number a measure of how much an academic's work is valued by her peers, how diverse that individual's contribution has been, and how sustained it is over time.

Perhaps Hirsch was so keen on this index because it gave him a personal h-score of 110, a very high level even for extensively citing disciplines like physics or medicine (see section 1.2). The strong variations in publishing and citing behaviours across disciplines also mean that 110 is probably more than twice the score that is ever likely to be attained by any social scientist – and it would be still less using the ISI WOK with its strong physical science roots. So what would a good h-score index level be in the social sciences? Probably we can set the maximum feasible level at around 45 to 50 for the greatest international stars across these disciplines, and this would be using the HPoP index h-scores and not just looking at the ISI WOK databases.

The PPG dataset also suggests that in the social sciences the range of h-scores that are attained by staff at different levels of age and seniority are markedly different as Figure 3.4 shows for five main disciplines. Taken as a whole our 20 geographers have the best h scores, closely followed by economists, while law academics have noticeably lower citation scores. These h score variations clearly reflect differences in citations behaviours across disciplines, with more article-based disciplines having higher scores. (On our definitions, geography is also of course regarded as being 50 per cent a physical sciences discipline.) H scores are also almost certainly affected by the sheer sizes of disciplines, and perhaps by other confuser factors. (For instance, because economics lecturers in the UK are generally paid around one third higher academic salaries than others of the same age in other disciplines, they may also be somewhat older on appointment to full-time positions than elsewhere.) Overall, economics and geography professors clearly top the average h score rankings here; and lecturers in these two disciplines have h scores more or less equivalent to those of professors elsewhere in our sample.

The h-score has some limitations. A rather key one is that your h-score is constrained not just by how many cites you get, but by the simple fact of the number of papers you have had time to produce. The index tends to favour senior people who have had the chance to publish a lot, as well as having had more time for their items to accumulate citations. So it is not surprising that Figure 3.4b shows that h scores vary a lot by rank, with professors generally having more than twice the h-scores of senior lecturers and lecturers. (To counteract the age-bias of the h-score in the social sciences you can just use age-weighted benchmarks. The HPoP software calculates an age-weighted version of the h-score that helps compare across different staff of different ranks or ages.) Putting together discipline and rank influences in Figure 3.6c shows a more complicated picture from the mixing of the two factors. Some lecturers (in economics and geography) have h scores above law professors and comparable to those political science and sociology professors. The senior economics lecturers in the PPG dataset also have rather low h scores on average.

Figure 3.4: Average h-scores for 120 social science academics in PPG dataset

Average h-scores by Discipline

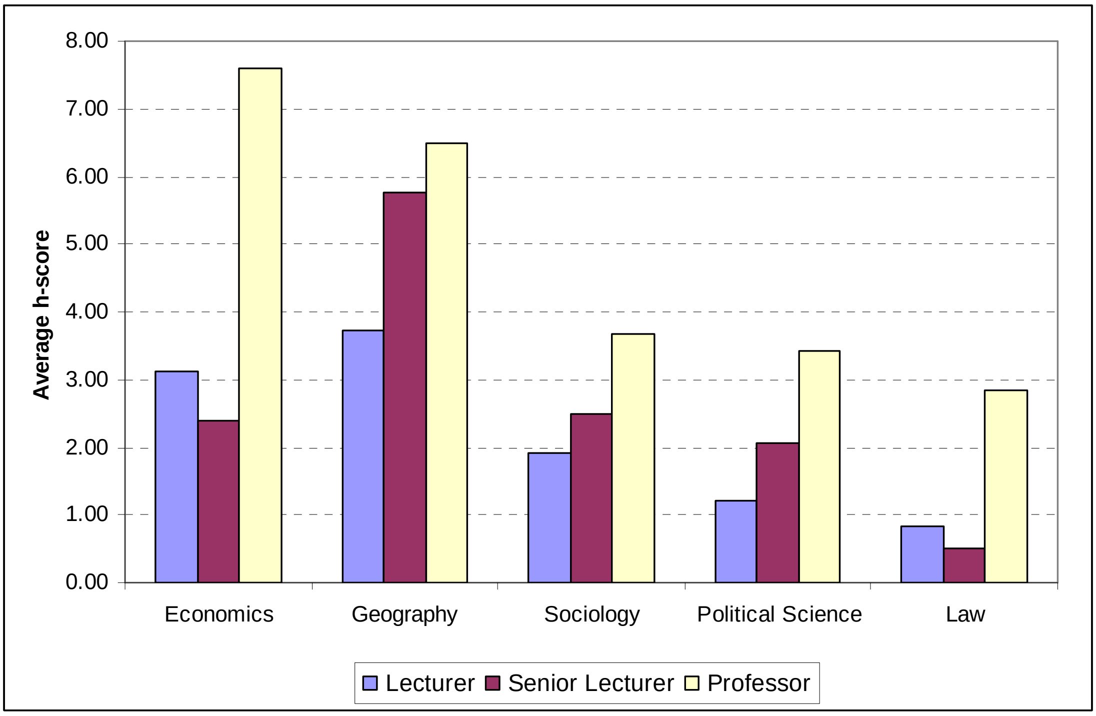
DISCIPLINE	AVERAGE h-SCORE
Geography	5.04
Economics	4.83
Political Science	2.46
Sociology	2.38
Law	1.25

Average h-scores by Position

POSITION	AVERAGE h-SCORE
Professor	4.97
Senior Lecturer	2.29
Lecturer	2.21

Average h-scores by Discipline and Position

SUBJECT	Lecturer	Senior Lecturer	Professor
Economics	3.11	2.40	7.60
Geography	3.73	5.75	6.50
Sociology	1.91	2.50	3.67
Political Science	1.20	2.07	3.43
Law	0.83	0.50	2.83



A more fundamental critique of the h-score is that it assumes that all academics in a field have the same pattern, such as the cites curve shown in Figure 3.1 and the profiles considered in Figure 3.2. But what if they don't? Should we not more highly value an academic whose top publications are very highly cited, compared with another academic whose top items are not much more cited than those on the h-score boundary? To address this issue another score - the ***g index*** - has been developed. It is a key variant of the h-score, and it was suggested by Leo Egghe to incorporate the effect of very highly cited top publications. It is also automatically calculated by the HPoP software.

To understand how the g score is calculated, we first need to draw the same graph as for the h-index in Figure 3.3 above. According to Egghe we then pick 'the (unique) largest number such that the top g articles received on average at least g citations'. (Note that here what Egghe means by 'the average' is the mean.) In practice, we add up total number of cites for items above the h score limit, and find the mean of this sub-set of well cited publications. If an author has some very highly cited pieces in her top listed h pieces, then their extra impetus operates to raise that person's g score well above their h score. For instance, for one senior researcher we looked at the h score in HPoP was 28, but the g-score was 53, almost twice as great. This is because the top cited piece here had over 700 cites, and several more have 100 to 250 cites, thereby strongly raising the mean level of cites across the whole top-cited group. By contrast, if an academic does not have this marked inequality in cites across their different publications then their h-scores and g-score will tend to be much closer together, although the g-score will almost always still be higher. HPoP (2010, p. 13) judges that the g index 'is a very useful complement to the h index', and we concur that using the h and g indices in tandem is clearly very helpful.

3.2 Assessing how far journals and books are cited

In the STEM disciplines, and in the social sciences in subjects such as economics and geography, there are strong and straightforward incentives for academics to concentrate on producing peer-reviewed journal articles, as far and away the premier form of output. Journals are also arranged in a clear and well-known hierarchy in terms of their journal impact factors, a rather inadequate proxy indication of outputs quality there, but still the main determinant of journals' relative prestige. Books (and even more book chapters) constitute only a small proportion of research outputs, although a few classic or standard reference high-end textbooks may also be influential and well cited in the research literature.

By contrast, in some humanities subjects the hierarchy of journals is often rather weakly defined, with multiple specialist outlets. Here books can often appear to be more well cited, a pattern that might apply in some of the social sciences as well, such as in sociology and law. Here too external assessors (such as the REF panels in the UK) may assign as much or more weight to books. And promotion committees may expect young academics to make a distinct ('own voice') contribution to the discipline by publishing at least one book before being promoted to more senior or tenure track positions. Hence it is important for academics in these disciplines to assess carefully the likely gains to their citation scores from concentrating solely on journal articles, or from widening their outputs to include books.

On the other hand it seems clear that book chapters are generally second-order publications, unless the edited collection involved is an especially prestigious or influential one (such as a widely used *Handbook* for a sub-field). Regular series of edited books in some disciplines may also be well referenced. But normally book chapters will be harder for other authors to find and reference, unless they actually own the book in question, than are whole books or journal articles. Because more senior authors in 'soft' subjects tend to gravitate towards writing book chapters in later life, and may not sustain journal publications, book chapters may still seem to be well-cited – but we would need to be able to discount here for seniority and cumulative reputational effects to be sure of this.

To shed some more light on these issues, we look next at some preliminary data on citation patterns for 120 academics across five social science disciplines included in the PPG dataset. Figure 3.5a shows that looking across all areas journal articles account for more than three fifths of the more than 1,100 citations included. Books and book chapters are the next most important category, accounting for one in six citations, followed by research and working papers accounting for a tenth of citations.

Perhaps surprisingly, Figure 3.5b shows that journal articles were more important as a source of citations in geography and political science than in economics. However, in economics discussion papers and working papers also accounted for a further fifth of citations, reflecting the longer lags to publication here, Books and book chapters accounted for less than one in twelve citations in economics, around one in six citations in geography and political science, over a quarter of references in sociology and law. In these last two areas journal articles only accounted for just over half of citations.

Figure 3.5: The importance of different types of outputs in academic citations

(a) Total outputs by type

Output Type	**Total**	**Percentage**
Academic articles	743	63
All book outputs	199	17
Discussion and Working papers	126	11
Conference Papers	54	5
Research Reports	30	3
Other	18	2
Not available	7	1
Total	**1,177**	**100**

(b) Variations in the citing of type of outputs across discipline (percentages of all cites per discipline)

	Geography	**Political Science**	**Economics**	**Law**	**Sociology**	**Total No**	**Total %**
Academic articles	69.6	64.5	63.7	56.1	53.0	743	63.1
All book outputs	17.5	15.8	7.4	25.7	29.9	199	16.9
Discussion and Working papers	4.6	7.9	21.2	6.1	7.3	126	10.7
Conference Paper	5.7	5.3	3.8	2.0	5.5	54	4.6
Research reports	2.0	3.3	2.7	3.4	1.8	30	2.5
Other	0.6	2.6	1.1	4.1	1.2	18	1.5
Not available	0.0	0.7	0.0	2.7	1.2	7	0.6
Total	**100**	**100**	**100**	**100**	**100**	**1,177**	**100**

We also looked at the patterns of citing for outputs across academics of different ranks in the university hierarchy, and Figure 3.6 shows the results. Lecturers were cited four fifths of the time for journal articles, but the same was also true of professors, with both groups also showing small cites for working papers. By contrast, senior lecturers were cited more than twice as often for books and book chapters than other academics, although even for this group articles were the main outputs that were extensively cited. This pattern may reflect a concentration of senior lecturers in more teaching track forms of academic work.

Figure 3.6: The origins of citations to academic social scientists in five disciplines, by university rank and the type of outputs

Type of Output	Lecturer	Senior Lecturer	Professor
Academic Article	80	66	80
All book outputs	13	29	12
Discussion & Working papers	6	3	6
Conference Paper	0.7	0.6	0.8
Research Report	0.3	0.7	0.8
Other	0.1	1.5	0.0
Not available	0.2	0.0	0.1
Total	100	100	100
Percentage of all citations	**18.2**	**14.1**	**67.7**

Source: LSE PPG dataset.

In numerical terms, the predominance of journal articles in terms of citations is unsurprising, because a large majority of academic outputs are in this form, and books (even book chapters) are published less frequently. A key question to consider is how publishing books or articles compare in terms of achieving high h score items, those which fall above the parity line in Figure 3.3 above. Here the picture is more mixed, because books tend to have a longer shelf life in referencing terms than most articles and so may accumulate citations for longer.

In many academic fields where (senior) authors write books (such as political science), it is common to draw attention to a book being forthcoming by condensing its key content into one or two rather 'hard-boiled' journal article that show key parts of the argument in a professionally impressive if rather hard-to-understand way. The book itself is not so condensed and is written in a somewhat more accessible style, designed more to maximize its audience. The book may also give more details of methods etc. than is feasible in the brief compass of a journal article. Little wonder then that the book will tend to be more referenced, and in a wider range of academic media, than its article precursors.

For all these reasons, we hypothesize that in social science disciplines where books remain a regular and important type of output:

- an individual author's books tend to figure disproportionately in the h-score entries above the parity line, compared with their journal articles;
- an individual's books also figure disproportionately in the 'above the line' h score entries with higher than average citations, and hence they tend to build that person's g index number;
- an individual's books rarely accumulate no or only a few (under 5 say) citations, whereas some or many journal articles will tend to do so;
- however, chapters in books will also tend to figure disproportionately below the h score parity line, and they may also disproportionately accumulate no or very few (0, 1 or 2) citations.

Currently the PPG dataset offers some supportive indicative evidence for each of these propositions, but their fuller exploration must rest on creating a wider database by adding additional academics from a more varied range of subject disciplines.

3.3 Who cites a little or a lot: Hub and authority patterns

Network analysis provides some interesting insights into how academics tend to cite and be cited. Research on network analysis originated in the work of Kleinberg (1998) on computer sciences, exploring which websites link to each other. The approach has greatly expanded in recent years in the social sciences, where researchers try to show how many different kinds of things are inter-connected. For instance, researchers have examined which US Supreme Court decisions cite other decisions as precedents (Fowler, 2008; Fowler et al., 2007) and how major US universities academic departments secure the placement and hiring of their PhDs (see Fowler et al., 2007; Fowler and Aksnes, 2007). However, network analyses of academic citing behaviours are far better developed.

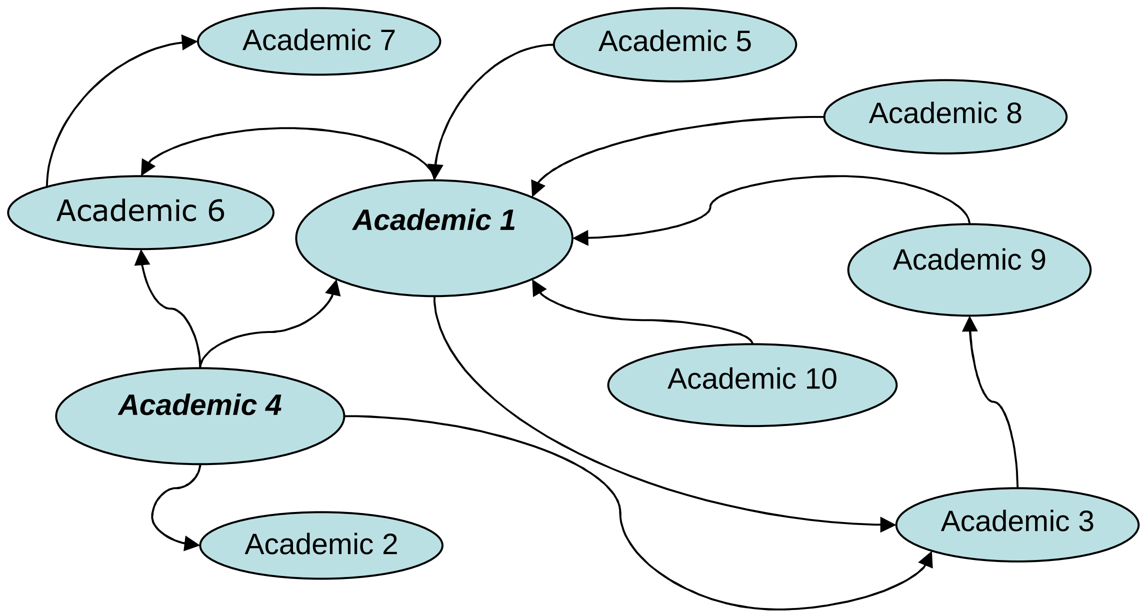
The basic concept of network analysis is to consider the different units (articles or books, individual researchers or whole academic departments) as *nodes* that are connected among each other by *inward* or *outward* citations.

Taking the example of individual researchers, an *inward citation* is a citation to that person, while an *outward citation* is that academic citing someone else. The number of inward and outward citations flowing into and out of a node may be considered as a degree of centrality.

In network analysis nodes with a high number of inward citations are regarded as an *authority*, because they are identified by units within the network being analysed as worthwhile tokens or links to make. An academic who receives a high number of *inward citations* is clearly considered an authority by her peers. Typically, an authority will have published key works in the disciplines, works that are frequently cited by other academics in order to ground new research – such as classic treatments or standard references. Given that it often takes time for their key articles or books to be widely recognized in the discipline, we might expect that authority scholars will be generally older and well established researchers, usually in high prestige universities. A scholar who achieves wide peer-recognition initially at a less prestigious university is generally able to move into an Ivy League or other high-prestige university. And indeed, Figure 3.6 above shows that in the PPG dataset covering 120 UK social scientists the professors accounted for two thirds of all inwards citations, compared with less than a fifth of citations for the numerically most numerous group, the lecturers.

Network theorists also argue that the number of outward citations can be used to indicate whether the work of a given academic is well grounded in the body of academic research. An academic with a high number of outward citations can be considered as a *hub* because she cites and aggregates a set of relevant works in her discipline. Figure 3.7 below shows a hypothetical network of academics with inwards and outwards citations. In this Figure 'Academic 1' is clearly an 'authority' because she receives a total of 5 inwards citations (represented by the inward looking arrows). By contrast, 'Academic 4' is a hub because he has 4 outwards citations (represented by the outward-pointing arrows).

Figure 3.7: Network of academic citations



Young academics will probably have a higher number of outward citations relative to their inward citations, because they are in the early stages of their careers and hence receive fewer citations than well-established academics. Younger staff may also tend to cite more works than established academics, because they are keener to demonstrate diligent scholarship and may feel more pressure to establish that their work is grounded in a comprehensive knowledge of relevant works in their discipline. Senior academics may be more experienced in defining topics narrowly, using a customary range of sources. And they may feel less need to prove knowledge of the literature through comprehensive references.

Summary

1. Simple indicators for judging citation rates- such as total number of publications, total number of citations, and an age-weighted citation rate do not accurately capture an academics' citation success.

2. Calculating an academic's h-score and g-score provides a more robust picture of how much an academic's work is valued by her peers.

3. Across all disciplines in the social sciences journal articles account for the majority of citations, reflecting the large numbers of published articles. Books account for 8 to 30 per cent of citations across different disciplines. Books may figure disproportionately amongst those well-cited entries that build h scores and the g index. Book chapters, however, are often hard to find and are poorly referenced.

4. Network analysis can help shed light on the difference in citation rates between 'hub' and 'authority' academics at different stages in their careers, which compares the number of inward and outward citations.

Chapter 4
Getting better cited

A key reason why academic work is poorly cited is that the authors make virtually no effort to encourage citation. In pursuit of an obscure ideal of making their work appear 'academic' researchers seem go to enormous lengths to make their work impossibly hard to find and understand. So a reader who is undertaking a literature review will have difficulty finding a piece, especially from knowing the title or reading the abstract for a journal article or the blurb description for a book. The first part of this chapter explores some straightforward solutions to these problems, focusing on using titles and abstracts for journal articles that will better inform readers, and writing book descriptions in a similarly more informative way.

Academic work by any one researcher or team often hangs together in a web of connections, for which the 'natural' solution is for the author or team to cite their previous work, so as to build up a cumulative picture economically without repetitions. Yet the whole issue of self-citations is also fraught with conflicting norms suggesting that they are boastful, illegitimate or count less than normal citations. In section 4.2 we explore some of the issues here.

Citations are in part the product of networks of intellectual contacts, and on the whole academics who write with others in research teams might be expected to have greater access to more networks as a result. The social sciences have conspicuously lagged behind the development of co-authorship in fields that are better cited, like medicine and the physical sciences. Our third section accordingly looks at whether working with co-authors offers a route that will tend to produce better cited work.

4.1 Writing informative titles, abstracts and book blurbs

Academics may remember and pass on recommendations about works to others in conversation (a form of 'viral marketing'), but often only if the title has memorable or distinctive words. And when researchers search for articles on Google, ISI WOK or other sources they will generally do so in formats that only show the most abbreviated details of a source, especially its author and title/sub-title, plus maybe a few lines of the abstract or book blurb. These 'snippet' entries are quickly scanned for useful gold-dust in building the searcher's intended argument. Student searchers will normally scan only the top two screenfuls of information before giving up, and they will rarely alternate search words. Academics, research assistants and PhD students are usually more persistent and professional. They will quickly appraise (say) the top 50 (or perhaps 100) Google or ISI WOK entries that they have in front of them, but then also try alternate search words. Only the most conscientious researchers will scan say the top 200 to 300 possibly relevant items from searches.

One of the key tasks for an article author who wants to be cited is to quickly persuade people to click on the title of their piece and learn more from the abstract or book outline. From there, the next task is to persuade searchers to download the whole article or to look for a copy of the book in a library or order it from a bookshop. At each stage there will be an 'attrition' loss of people through:

- not finding the title of the piece in their searches at all;
- not recognizing the title of a piece as relevant for their needs;
- not clicking through from the title to learn more from the abstract or book outline;
- not recognizing from the abstract or book outline that the piece is relevant for their needs;
- not being motivated enough to pursue the full text, always a considerable hassle for a book, but in principle for an article easily accessible to a university searcher.

Even when a piece is found and downloaded or read in full, the next stage involves the reading academic deciding to cite the piece or not. Often this decision may be a completely separate one, made perhaps weeks or months (or even years) after the person involved first read the piece. So here the key determinants of whether an article or book is now cited are usually:

- whether the potential citer remembers the existence of the piece or not;
- how much the person remembers of the key 'take-away' points that they found valuable in the piece when they first read it, which may often be its 'bottom-line' conclusions, or alternatively only one or two noteworthy points or pieces of data within the text;
- whether they can find the piece again easily on their often voluminous PDF library on their PC or on their crowded book shelves, so as to confirm its details;
- whether they can quickly re-access the argument or details of the piece so as to accurately cite it and characterize it when citing.

Many academics do things that effectively ensure that the title of their work makes it hard to find initially in literature reviews and very hard to cite later on:

- Choosing an obscure, formal or completely vague title for an article or book, one that essentially gives readers no useful clue as to what the publication covers. Academic titles commonly convey not the slightest idea of what the author's substantive findings, 'bottom line' conclusions or line of argument may be.
- Choosing a title that is positively misleading, digressive or at a tangent from what the publication actually covers. Often in the humanities and 'soft' social sciences authors choose a 'clever' or 'learned'-looking main title, whose meaning is non-obvious or positively diversionary at first sight, but which they then explain in the main text. The trouble is that this form of words is not one that anyone else doing an online search will put into a search engine, or indeed associate in any way with the actual content. For example, in 2004 a committee from the British Academy produced a report on the role of the humanities and social sciences in the UK economy and society. They chose as a title a quotation from the eighteenth century philosopher David Hume, *That Full Complement of*

Riches, which does not provide any clues to the report's content. This might explain why the report has not received the number of citations it deserved in this important field.

- Choosing the same title words as thousands of other works, so that your own title has no memorable or distinctive words that might stick in the searcher's brains and cause them to easily find (or re-find) your piece. For instance, titling an article 'Mill on liberty' would make it completely indistinguishable from literally thousands of others.

` It is useful to consider here some specific examples of social science article titles and what can go wrong with them, shown in Box 4a below.

Box 4a: Good and bad practice for choosing article titles

Is your title:	**Example** *(and comment)*
• A full 'narrative title' that clearly summarizes the substance of what the article argues or what has been found out? (Very good)	'New public management is dead – Long live digital era governance' - *the whole argument of the paper in 10 words*
• An ambiguous title but with at least some narrative or substantive hints about your line of argument or findings? (OK)	'Modernist art – the gay dimension' - *probably highlights themes about homosexuality, but might deny them instead*
• A title that perhaps contains some cues as to the author's argument, but where you'd need to read the piece first to understand these hints? (Poor)	'One for All – the logic of group conflict' - *actually this is a book title about solidarity pressures in ethnic groups, (and not Alexander Dumas's 'The Three Musketeers' which it apparently references)*
• An overly general title that could lead to multiple conclusions or lines of argument? (Poor)	'The Economic Institutions of Capitalism' - *probably related to organizational /institutional aspects of economics*
• An interrogative title, albeit with some cues? (Poor – because there are many interesting questions, but far fewer useful or interesting answers.)	'Is economic growth in Argentina endogenous?' - *why not actually tell us the answer? Is it 'Yes' or 'No', or 'A bit'?*
• An unspecific and hackneyed title that has been used many times already (Very poor).	'Mill on liberty' - *could make searchers think, ' Not another one'*
• A title so unspecific that it could cover work in several different topic areas or	'Measuring power' - *this article could be in sociology/*

even disciplines? (Very poor – should be rewritten to avoid possible 'confuser' meanings.)	*political science, or it could be in electronics/engineering*.
• A title that is almost completely formal or vacuous? (Very poor – should be redone.)	'Beyond Economics' *- actually this is all about economics, while apparently claiming to not be.* 'Interpreting Social Behaviour' *- all social life is here*

When it comes to writing article abstracts, most academics then compound the problem by being as uninformative as possible in the 150 to 300 words that they are typically allowed. Most abstracts say very little about what authors have found out or what their key findings are, what they are arguing as a 'bottom line', or what key 'take-away points' they want readers to remember. A conventional journal abstract will be structured as follows:

- the opening sentence argues that the topic of the paper is an important one;
- however, the next two or three sentences argue that the previous literature
  has neglected an aspect of the topic or has used approaches with some limitations that need to be improved on;
- the abstract may now define what the author's particular focus is, without saying what is being argued substantively;
- for empirical articles, the abstract will almost always expound at length on what methods have been used, or what data coverage has been achieved;
- the abstract ends by stating that following this approach the author has indeed reached certain (unspecified) conclusions. Perhaps the author even lets it be known via hints that their conclusions are different in some way from the previous literature. But the abstract still ends without giving the slightest real glimpse of what the substantive findings are, nor does it indicate what argument the author herself makes at the end.
- There is also no clue as to what the 'value-added' of the article is in theoretical or empirical terms.

Often these problems reflect the fact that abstracts are rather casually written, perhaps at the beginning of writing when authors don't yet really know what they want to say, or perhaps as a rushed afterthought just before submission to a journal or a conference. Once an abstract exists, authors are also often reluctant to reappraise them, or to ask critically whether they give the best obtainable picture of the work done and the findings achieved. To counteract these problems the checklist in Box 4b offers a structured set of suggestions for what an abstract should include, and what should be kept to a small presence.

Box 4b: Good practice guidelines for writing informative abstracts

1. How long is the abstract? [Generally it should be 150 words minimum, usually 300 maximum.] Does it have paragraphs? [No more than 2.]

How much information does the abstract give about:	***None***	***A bit***	***A lot***	***Suggested number of words (for a 300 word abstract; reduce pro rata for smaller word limits)***
2. Other people's work and the focus of previous research literature?				No more than 50 words
3. What is distinctive to your own theory position or intellectual approach?				At least 50 words
4. Your methods or data sources/datasets?				From 50 words minimum to c. 100 maximum
5. Your bottom-line findings – i.e. what 'new facts' have you found? Or what key conclusions do you draw?				As many words as possible within your limit
6. The value-added or originality of your work within this field?				At least 30 to 50 words

7. Does the abstract systematically follow the sequence of elements in 2 to 6 above? [good] Or does it have some other sequence? [bad] Is the progression of ideas clear and connected?

8. How many theme/theory words from the article title recur in the abstract? Does the abstract introduce any new theme/theory words, which are not present in the article title?
Do the two sets of words fit closely together? [good] or suggest different emphases? [bad]

9. *Style points*: How many words are wasted on 'This article sets out to prove..' or

'Section 2 shows that…'
Is the description of your own research in the present tense? [good] or the future tense?[bad]

10. Look carefully at the 'ordinary language' words in the title. Are they 'filler' words only? In which case, are they needed? If not, do they have a clear and precise meaning or implication that you want your title to express? (Most ordinary language words with substantive content will have multiple meanings.)

11. Suppose that you have read on the web (in a long list of other articles and items) the article title and the first three lines of the abstract. Do they make you want to download the full article? What kind of academics elsewhere will be able to reference this article usefully in their own work, using just the information given in the title and abstract alone?

12. Type the whole title (in double quotes " ") into Google Scholar and check against the table below. Then type the three or four most distinctive or memorable title words separately into the search engine, and check again.

	Full title in quotes	**Three or four most distinctive title words**
How many items show up?	- None (good) - Many (poor)	- None (bad) - Very few (bad) - Modest number (good) - Lots and lots (bad) – it's an inverted U curve here.
How do most of the other references or items that show up relate to your topic and subject matter?	-Very close (good) - Close (OK) - Remote (bad) - Completely different topic (very bad)	
Does the search show that you are using terms, phrases or acronyms that	- Have the same meaning as you are using (good) - Or have a number of different meanings from your sense (bad)	

In choosing article titles it is worth remembering that articles have compound identities, because the journal title itself often gives many clues to what the work is about. Academics and researchers in the field will know well what a top journal covers, and what type of work it generally publishes. Hence article titles do not necessarily need to be as distinctive as books (see below). It is fine for your title to have *some* of the key words used by other authors, but preferably in some distinctive combination with other words. Your title must include some key words likely to be typed into search engines by potential readers.

Beyond the title and abstract, the introduction to a paper also has an important role to play, not so much in being a condensed record of the whole paper's argument (since the title and abstract should already fulfil this role), but rather as a piece of text that motivates readers to read the whole paper (or at least to read further into it). A useful suggested mnemonic for the opening paragraphs suggests that they cover the four M's of:

- *motivation*, why the article is important and worth readers spending time on;
- *methods*, what analytic approach is employed;
- *measurement*, what data or sources of evidence are used; and
- *message*, what implications the article has for the key issues or controversies considered.

To engage readers' attention, and to persuade them to read the whole paper, it can also be useful to begin with a 'high impact start', one that expresses issues or key findings in an especially engaging or interesting fashion. Ending the introduction or lead-in passage with a clear set of signposts to the structure of the remaining sections of the article can also help readers to gauge in advance what is being argued. Lastly, most professional academics will also turn immediately to the paper conclusions to assess whether it is worth their while investing the time needed to work through the whole paper in detail, or to cite its key results and argument. Hence a succinct but clearly expressed conclusion is very useful. It should always give the most salient details of the findings or argument in an accessible way, but more precisely and substantively expressed than in the abstract, and accompanied by a clear author evaluation of their own work.

Turning to ***research books***, one might expect that their titles and back-jacket blurbs and outlines on publishers' sites or Google Books would be much better written than article abstracts, since publishers as well as authors are involved in what gets chosen here. After all, while most articles will be available online with a few clicks to researchers or students via their university library, gaining access to a book will often entail higher transaction costs. Potential readers need to be persuaded to check through more of a book on Google Books, to look for the book in the library or to order the book from a retailer like Amazon – each fairly time-consuming operations. Yet despite this, much the same obscure academic approach is often adopted to choosing book titles and giving a summary of their contents as with articles. Completely formal or vacuous book titles are prevalent in STEM disciplines and in the 'hard' social sciences. And in the 'soft' social sciences and humanities, deliberately obscure, idiosyncratic or even actively mis-directing titles are often used to try and create a particular intellectual impression. However, the costs of this gambit is again that internet searchers probably never find the book.

As for book blurbs, authors and publishers often do little more than write out in joined-up text form the sequence of titles for the chapters, which are also generally quite formal or obscure. At best this lets readers know what topics are being covered, but usually without any 'narrative cues', without in any way hinting at what the authors' conclusions or distinctive contributions are. Book blurbs and outlines may also indicate a readership group, and publishers often insert vague promises about how valuable or accessible the analysis is, often without saying anything substantive.

Choosing a book title intelligently can radically increase the ability of other academics and researchers to first find out about the piece of work, then to remember it when needed, and hence to retrieve its details and cite it, perhaps months or years later. Box 4c provides a checklist that may be helpful to work through here. In the current digital era all authors should also run their potential titles through main search engines, as suggested in point 7. A book title has got to be good for the book's lifetime, so spending some time in getting it right is always worthwhile.

Box 4c: Good practice ideas for choosing a book title

1. How many words are there in the title? How many of these are theory or theme words?

2. Is there a main title and sub-title separated by a colon or other device? [usually a good idea] Or is it integrated in one piece? [less good]

3. Is the book meant to be of interest
    a. primarily for theory reasons? Is it solely theoretical?
    b. primarily for empirical reasons? Does it have any theory interest?

Conventionally in academic books this distinction is signalled as follows:

	Before the colon	*After the colon*
Primarily theoretical book	Theory or thematic words	Empirical field stuff
Primarily empirical book	Empirical field stuff	Theory or thematic words

Be honest with yourself here – if your work is primarily empirical, don't choose an over-theory-claiming main title to try and look more impressive.

In choosing wordings, you should also bear in mind that the sub-title may often be left off by other authors citing your work. It also may not show up in many abbreviated internet listings.

4. Does the title accurately characterize the book as a type of academic work, making clear its discipline and approach?

5. Are the thematic or theory words included in the title fashionable or recent? In which case, will they endure? Or are they familiar or long accepted? In which case, are they already over-used? Who will like these words and who will dislike them?

6. Look carefully at the 'ordinary language' words in the title. Are they 'filler' words only? In which case, are they needed? If not, do they have a clear and precise meaning or implication that you want your title to express? (Most ordinary language words with substantive content will have multiple meanings.)

7. Type the whole title (in double quotes " ") into Google Books and check against the table below. Then type the three or four most distinctive or memorable words separately into the search engine, and check again.

	Full title in quotes	**Three or four most distinctive title words**
How many items show up?	- None (good) - Many (poor)	- None (bad) - Very few (bad) - Modest number (good) - Lots and lots (bad) it's an inverted U curve here.
How do most of the other references or items that show up relate to your topic and subject matter?	- Very close (good) - Close (OK) - Remote (bad) - Completely different topic (very bad)	
Does the search show that you are using terms, phrases or acronyms that	- Have the same meaning as you are using (good) - Or have a number of different meanings from your sense (bad)	

It is a very good idea that wherever possible your book should not have *exactly* the same title as any other volumes. However, your title (and to a lesser degree sub-title) should include some words used by other authors, preferably in some distinctive (or even unique) combination with other words. Your title and sub-title must include if possible those key words that are most likely to be typed into search engines by the book's potential readers.

Since books are much longer and less accessible than articles, the summary provided by a book 'blurb' (its back-cover description, also included in the publisher's catalogue) is ultra-condensed. Hence it is correspondingly easier in writing a blurb to mask what the book's contribution or value-added is supposed to be. If the book is extensively viewable on Google Books (in preview mode) then potentially readers may look more widely to try and find out what it covers: here a poor title and an obscure outline may not matter so much. Even if the book can only be viewed in 'snippet' mode, the most persistent would-be readers can often find out a little more about its style, approach and contents using the excellent search facility in Google Books to look for how often keywords occur. (How successful this strategy is depends on how much of the text the publisher has required to be blanked out.) But otherwise, the book titles and descriptions on the publishers' site or Google may be all that readers have to go on in deciding whether to go through the considerable sweat of trying to get to read a copy.

As with articles, one of the most important reasons why people choose poor titles for books, and write such poor summary descriptions of them, is a drive towards academic respectability, often construed as being small 'c' conservative in academic terms. Younger researchers who still have to win tenure-track jobs, or who may want to move to a different university in future, often believe that the key thing for them is not to look in any way 'flashy', or 'popularizing' in their approach. Hence they choose article titles exactly like their thesis chapters, and use only slightly shorter versions of their PhD title for their books, accompanying them with abstracts or blurbs of oracular obscurity. This imperative towards poor professional communication is not usually well thought through. Younger researchers perhaps may not yet have come to terms with the remorseless battle to secure any recognition and make an impact on the discipline and to secure citations that tends to be more important to older academics. And people who have so far been preoccupied with research may also underestimate the importance of being able to communicate in teaching and to achieve external impacts to departments.

To help put such attitudes in a better perspective, it can be useful to imagine that you are a member of a university department's appointment committee and you are reviewing a large pile of applications for a junior academic post, with a view to identifying a shortlist of people to interview. You see this book or article title on an applicants' CV or resumé.

- Does the title motivate you to look further so as to find the book outline or article abstract, ideally included somewhere along with the CV or alternatively online? Or does it leave you none the wiser, or make you want to move onto the next candidate in the pile?

- How would a young researcher who has investigated this topic fit into your department's teaching portfolio? Would they be able to teach a wide range of courses, or only a few? Would their courses be of wide interest for your students, or restricted to covering only a specialist subject?
- In research terms, what kind of project would you expect the person who completed this article or book to do next?

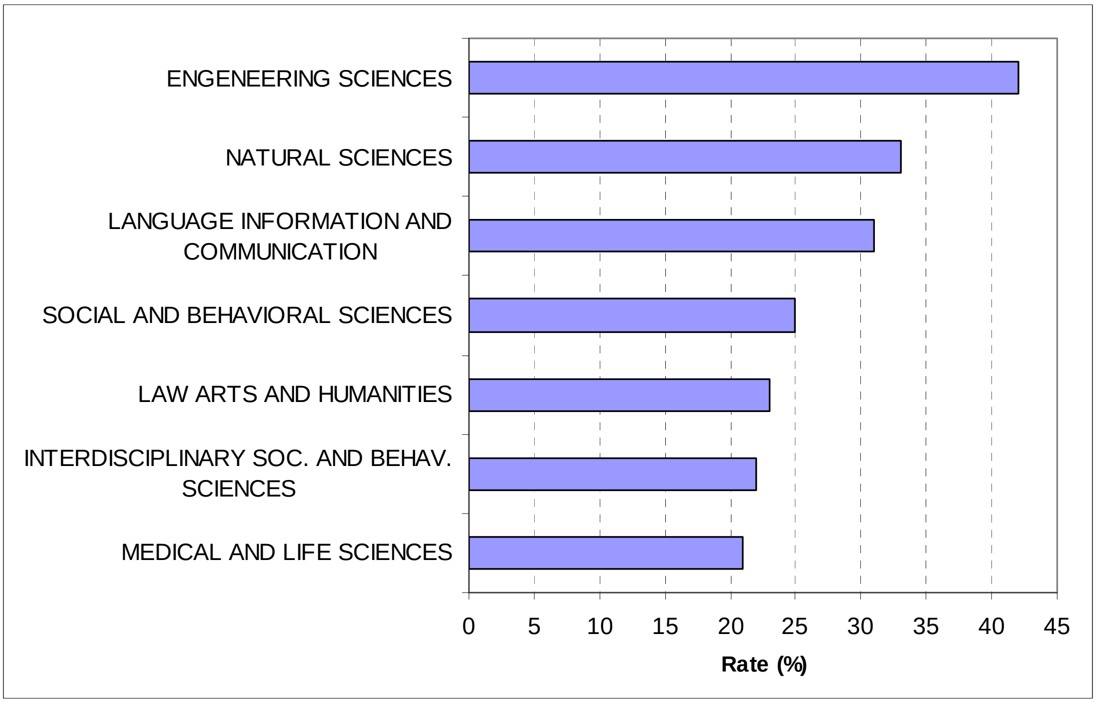
4.2 The issues around self-citation

> The distrust of self-citations is completely misplaced
> *Anne-Will Harzing* (2010: 4).

In the social sciences self-citation is often considered problematic – some scholars see it as a case of 'blowing your own trumpet', while others may argue 'If I don't cite my work, no one else will'. For similar reasons, official bodies often ask for citations data to be adjusted so as to exclude self-citations, as if these were somehow illegitimate when measuring academic performance. Some bibliometric scholars also concur that self-citation should be excluded from citation counts, at least in undertaking comparative analyses of the research performance of individuals, research groups, departments and universities. In this view self-citations are not as important as citations from other academics when determining how much of an authority an academic is within a field (Fowler and Aksnes, 2007: 428). To meet this demand to filter out self-cites some producers of bibliometric indicators have begun to identify and publish the proportion of self-citations in order to compare them with the number of citations to other authors.

However, there are also good grounds for objecting to this approach and for recognizing self-citations by individuals and research teams as a perfectly legitimate and relevant aspect of disciplinary practices in different parts of academia. Figure 4.1 shows that there are very large and systematic differences between discipline groups in the proportion of all citations that are self-citation, ranging from a high of 42 per cent for engineering sciences, down to a low of 21 per cent for medical and life sciences.

Figure 4.1: Self-citation rates across groups of disciplines



Source: Centre for Science and Technology Studies, 2007.

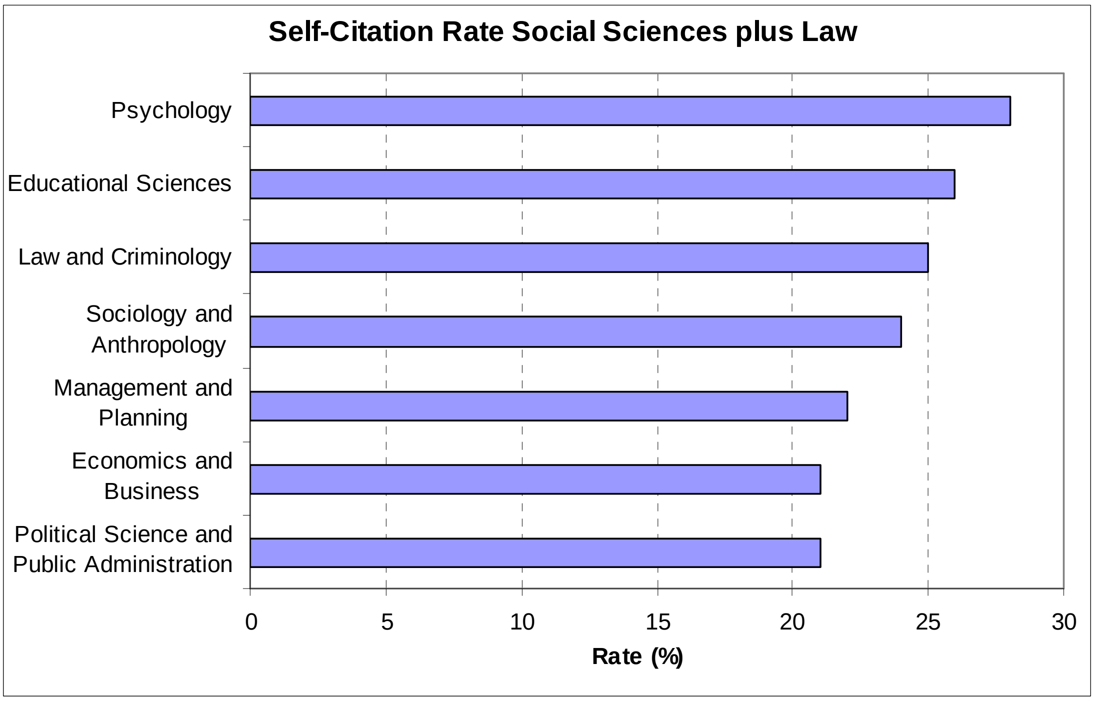
The social sciences and the humanities generally have low rates with a fifth to a quarter of citations being self-cites, whereas in the scientific STEM disciplines the rate is around a third. It seems deeply unlikely that this pattern reflects solely different disciplinary propensities to blow your own trumpet. Rather the extent of the variation is likely to be determined most by the proportion of applied work undertaken in the discipline, and the serial development nature of this work. Many engineering departments specialize in particular sub-fields and develop the knowledge frontier in their chosen areas very intensively, perhaps with relatively few rivals or competitors internationally. Consequently if they are to reference their research appropriately, so that others can check methodologies and follow up effects in replicable ways, engineering authors must include more self-cites, indeed up to twice as many self-cites as in some other disciplines. Similarly quite a lot of scientific work depends on progress made in the same lab or undertaken by the same author. In these areas normatively excluding self-cites would be severely counter-productive for academic development. And doing so in bibliometrics work is liable to give a misleading impression.

In this view the lower levels of self-cites in the humanities and social sciences may simply reflect a low propensity to publish applied work in scholarly journals, or to undertake serial applied work in the first place. The low proportion of self-cites in medicine (arguably a mostly applied field) needs a different explanation, however. It may reflect the importance of medical findings being validated across research teams and across countries (key for drug approvals, for instance). It may also be an effect of the extensive accumulation of results produced by very short medical articles (all limited to 3,000 words) and the profession's insistence on very full referencing of literatures, producing more citations per (short) article than any other discipline.

The 'serial development of applied knowledge' perspective on self-citation gains some additional evidence from the tendency of self-cites to grow with authors' ages. Older researchers do more self-citing, not because they are vainer but simply because in a perfectly legitimately they draw more on their own previous work than do young researchers who are new in a sub-field. Older academics also do a great deal more applied work in the social sciences than younger staff, and as a consequence we show in Part B they also have far larger external impacts. So they may have to cite their own corpus of work more for reasons similar to those dictating higher self-cite rates in engineering – namely that their work draws a lot on reports, working papers for external clients, or detailed case studies that may not have great journal publication possibilities.

So are self-citations a good or bad idea for academics? Our advice here is that all researchers should prudentially ensure that their own self-citation rate is not above the average for their particular discipline. Figure 4.2 shows that there is some detailed variation within the social sciences, with political science and economics at a low 21 per cent, but with psychology and education higher in their rates of self-cites at 28 and 26 per cent, respectively.

Figure 4.2 Self-citation rates for social sciences and law



But it is equally not a good idea to 'unnaturally' suppress referencing of your own previous work. Some research has tested whether citing one's own work tends to encourage other people to cite it as well. After controlling for different factors, Fowler and Aksnes (2007) found that each additional self-citation increases the number of citations from others by about one citation after one year, and by about three after five years. Other scholars have also found that self-citations can be a useful promotion mechanism to increase citations from others. These empirical studies reveal that self-citations can increase the ***visibility*** of someone's work. One possible logic behind this is that 'Conscientious Scholar A' doing a literature review may see 'Author B' in one of her best-known works including a citation to some of B's lesser known pieces of research. Hence A becomes more likely to look at and cite B's less well-known work – whereas if they were directed also to B's better known works A's citations would perhaps have more impact in growing B's h score and g index.

We therefore recommend that academics do not actively avoid or minimize self-citations, as long as their level of use is in line with their discipline's average rate. Self-citations may be useful to promote relevant original work that may otherwise pass unnoticed by others. For senior academics, citing their own applied research outputs (such as research reports, client reports, news articles, blog posts etc.) makes sense because such outputs are often missed in standard academic sources. For young researchers and academics, who are lesser-known in their field and have a smaller corpus of work to draw on, self-citations need to be handled carefully. They can be legitimately used to get visibility for key or supportive works that may not yet be published (such as working papers, research reports, or developed papers under review etc). However, self-cites must only ever be used where they are genuinely needed and relevant for the articles in which they are included.

4.3 Working with co-authors and research teams

Modern research is becoming an ever-more complex and specialized business in many disciplines. In the STEM disciplines, and some of the 'hard' social sciences, it is increasingly difficult to carry out purely individual scholarly work. Most research is carried out in teams here, because forefront research demands expertise in methodologies, analysis capabilities, increasingly advanced IT expertise, and often specialist statistics and mathematics, as well as substantive knowledge of a topic or field. It is increasingly hard for any one person to master all these specialized aspects alone, hence the shift to team production.

Figure 4.3 shows that the number of co-authors per journal article across all science fields in the US grew by half in the last decade, from just over three in 1998 to somewhat under five in 2008. Co-authors are especially numerous in astronomy, medicine, physics and biological sources, all of which have more than five co-authors on average per article. Again the growing size of research teams in these disciplines partly reflects the need for increased numbers of researchers, each handling different technical aspects. It also responds to the increasingly inter-institutional and often international character of modern research. For instance, research on a new drug or treatment may often need to take place across many countries simultaneously if the drug once assessed is to secure regulatory clearances.

By contrast, in the US social sciences the number of co-authors for journal articles still did not reach two per article by 2008. It started the decade at just under half the sciences average, and ended it at two fifths of the new higher STEM disciplines average. In other words, the social sciences moved backwards in co-authoring terms relative to the physical sciences. Co-author numbers grew by a third in the social sciences, the second lowest growth of any science field, closely matching mathematics.

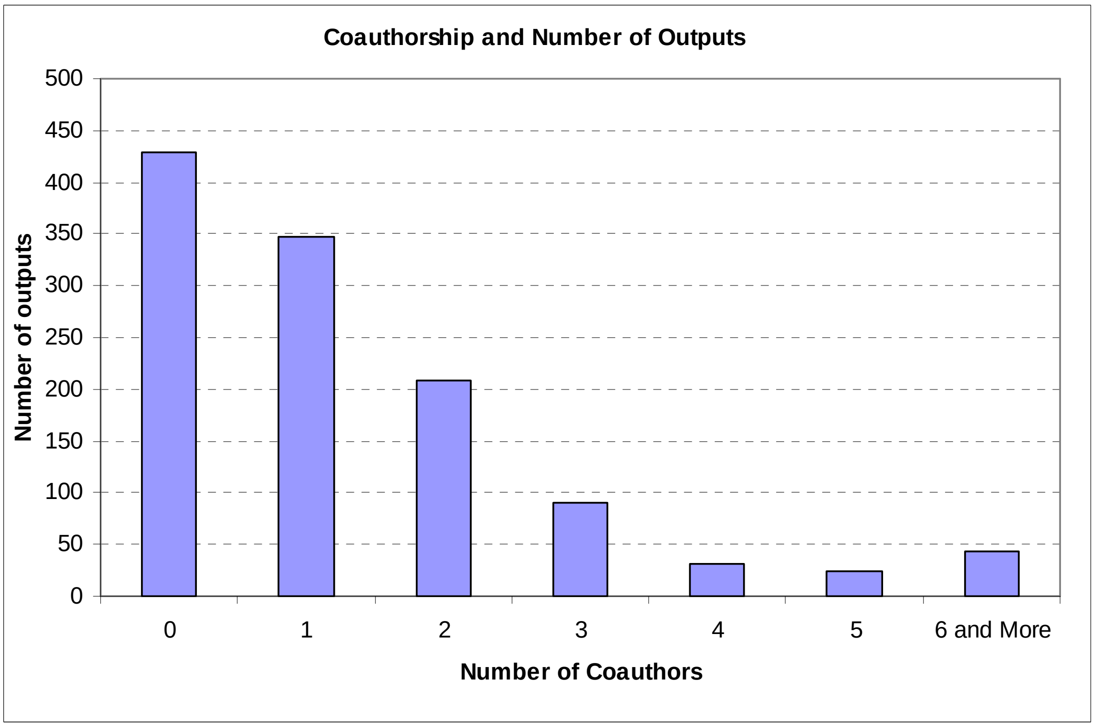
Figure 4.3: The growth in the number of authors per journal article in the United States, across selected science fields from 1988 to 2008

Science field	Average number of authors per journal article in					Percentage change 1988 to 2008
	1988	1993	1998	2003	2008	
Astronomy	2.5	3.2	3.6	4.5	5.9	136
Medical sciences	3.6	4.1	4.5	5.0	5.6	56
Biological sciences	3.3	3.7	4.2	4.6	5.3	61
Physics	3.3	3.8	4.2	4.7	5.3	61
Average for all 'science' fields	3.1	3.4	3.8	4.2	4.7	52
Chemistry	3.1	3.3	3.6	3.9	4.3	39
Agricultural sciences	2.7	2.9	3.3	3.8	4.3	59
Geosciences	2.4	2.7	3.2	3.5	4.0	67
Engineering	2.5	2.8	3.1	3.4	3.8	52
Other life sciences	2.0	2.1	2.4	2.9	3.2	60
Psychology	2.0	2.2	2.5	2.8	3.2	60
Computer sciences	1.9	2.0	2.3	2.6	3.0	58
Mathematics	1.5	1.6	1.8	1.9	2.0	33
Social sciences	1.4	1.5	1.6	1.8	1.9	36

Note: Articles classified by year they entered database rather than year of publication.
Source: US's Science and Engineering Indicators 2010, derived from Thomson Reuters, Science Citation Index and Social Sciences Citation Index, http://thomsonreuters.com/products_services/science/; The Patent BoardTM; and National Science Foundation, Division of Science Resources Statistics, special tabulations.

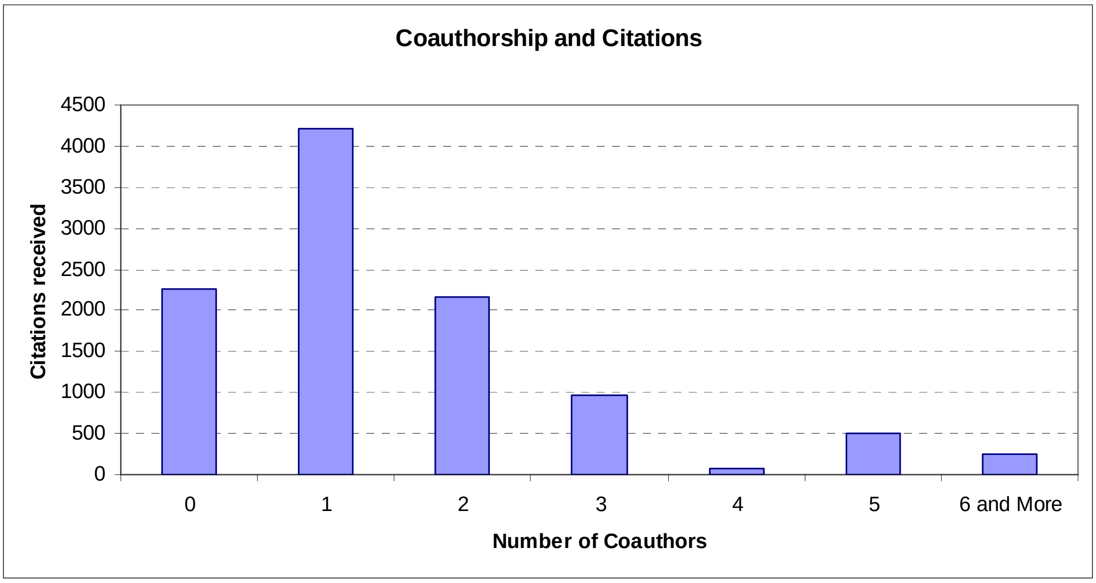
Turning to the UK social scientists covered in the PPG dataset, Figure 4.4 shows that the somewhat less than half of the 10,432 outputs we recorded were single-author works. The bulk of the remainder had only two or three authors. Outputs produced by larger teams account for only less than a tenth of all outputs. Clearly outputs become less common the greater the number of co-authors involved. Some commentators have suggested to us that this reflects the difficulties of team authoring unless a hierarchical 'research laboratory' structure is in place, which as we have already noted is rare in the social sciences. A frequent comment made in our interviews has been that teams of two are the optimal size.

Figure 4.4: Co-authorship and the number of outputs in the PPG dataset across five social science disciplines



However, Figure 4.5 also shows that analysing the number of citations received by the number of co-authors shows that outputs with one co-author actually receive the highest number of citations, around 40 per cent of the citations in the PPG dataset. This suggests that co-authorship may actually pay-off, since two-author or three-author pieces are cited at more than twice the rate of those that are single-authored. Four-author pieces are strongly cited but there are fewer such outputs. The relationship between numbers of co-authors and being better cited does not persist in the tiny fraction of outputs with five or more co-authors.

Figure 4.5: How outputs with different numbers of co-authors are cited in the PPG dataset across five social science disciplines



Why should co-authored pieces generate more citations than those that are single-authored? There are a range of possible explanations, some technical and others of potentially substantive significance. A technical issue is that book reviews and shorter pieces (including ephemeral or non-lasting articles, such as those in the press and magazines) are mostly single-authored, and such brief pieces normally are never referenced by others. By contrast, co-authored works tend to always be longer and more substantive research outputs, which generate many more references.

More substantively, we have seen that citations tend to reflect networking effects. Each author in a team will have their own contacts in a discipline. If the team is a hierarchy of a professor plus contract researchers, who are located in a single university or laboratory, then the addition of extra team members does not much expand the network of author contacts beyond those that the research leader would have on her own. However, if the co-authors are co-principals on a piece, they are more likely to come from different universities or different countries, or from different areas of the discipline, bringing with them their own distinctive networks of contacts. All these factors will mean that the authors' contacts and networks will only partially overlap, which clearly expands the chances of other researchers learning of the article or book, since each author has their own unique links to other people and other debates that are not shared.

Looking a bit more closely at the social science disciplines covered in the PPG dataset so far, Figure 4.6 shows that co-authoring is most common in geography and economics and least common in law, with sociology and political science in the middle. These discipline differences clearly hold across different academic ranks and seniority.

Figure 4.6: Average number of co-authors by discipline across five social science disciplines in the PPG dataset

Subject	**Lecturer**	**Senior Lecturer**	**Professor**
Geography	1.9	1.5	2.4
Economics	1.3	1.6	1.6
Sociology	0.8	1.1	1.6
Political Science	0.5	1.0	0.9
Law	0.3	0.6	0.6
Overall Average	*1.0*	*1.2*	*1.4*

Source: LSE PPG dataset.

Figure 4.6 also shows that professors (and in a less clear-cut way, also senior lecturers) generally co-author more than lecturers. Various factors may be involved in this seniority effect. Professors may co-author because they work in teams more with research officers and assistants who do detailed implementation, data collection and analysis. Here professors' roles may be more orientated towards major ideas, themes and opportunities, or towards project direction, management issues and fund-raising. Senior academics may also tend to have developed better inter-university linkages and international links over time, even if their style of research does not strictly require team efforts. They may also co-author more because they can more easily keep these links alive – e.g. by getting travel funding to make overseas research visits. Senior academics are also more desirable partners for other academics to want to co-author with.

Managing complex arrangements amongst co-authors for crediting academic work is another area where difficulties sometimes arise. In the STEM subjects because author numbers have increased sharply, well-recognized conventions have emerged to signal the role of different authors in the production of an article, albeit there are disciplinary variations also. Common elements include:

- *First name*: the person who actually undertook the key research and who is often the main author of the final text.
- *Second name*: the second most important contributor, either in research or writing terms.
- *Third etc names*: people who made particular inputs on empirical work, data preparation or assisting with the analysis.
- *Last name*: the team leader or head of the lab or research unit, who may or may not have been closely involved in this particular piece of research.

In the social sciences and humanities there are no equivalent well-recognized name order conventions. Instead only two basic configurations operate:

- *Alphabetical name ordering* denotes that all the authors made an equal input to the work. Where two or perhaps three authors collaborate on a series or sequence of connected papers, then the order of names can be rotated to ensure that one author does not benefit overly from having an early alphabet surname, without moving out of this convention.
- *Variable name ordering* indicates the ranking of authors' contributions, with the most important contributor first, the next most important second, and so on. Sometimes there is a tension between distinguishing within a long list of contributors those who actually wrote the paper or designed and conducted substantive research (say authors A, B and C) and acknowledging others who made more specialist or routine inputs (say researchers D and E). A two-part name list may be used here to indicate this distinction - as 'A, B and C *with* D and E'.

Both the STEM conventions and the social science/humanities conventions are open to potentially serious abuse, usually caused by a senior author (who has control of the final submission of an article to journals) rearranging the name order so as to give themselves more credit or prominence than is merited. Sometimes senior authors do this because they genuinely and innocently over-value their own contribution, or have lost sight of how crucial was work actually done by other team members. Reputationally this is a poor course of action to embark on, however, and one that will reduce the efficacy of team-building in future.

There are other sources of strain in the author-crediting system, however, that are worth briefly enumerating, since they may cumulate in further changes in the near future in how conventions apply:

- The ability of some citations and indexing systems to find and attribute items to author names that are not first or second on the author lists is quite problematic. ISI WOK, for instance, only works excellently for first authors, OK for second authors, and poorly for third and subsequent contributing authors. (If you are an author low-down in the sequence, you may need to search additionally by title for papers where you have contributed). HPoP/Google Scholar is generally better at finding lower-placed authors, but is not perfect, especially on books.
- The increasing numbers of authors has caused science journals especially to be less willing to include long author lists in citations. Many will now only list the first x number (usually 5 to 10) names for multi-authored works in reference lists, where previously they would name them in full. For heads of labs in STEM disciplines, traditionally listed last, this new restrictiveness threatens to severely reduce their citations, which may lead to the emergence of a new convention, listing them second or third.
- In medicine and life sciences journals external regulatory pressures have lead to increasing requirements that any senior investigator listed as an author has played a distinct role in drafting initially and in revising the paper, and is not there for window-dressing – especially important for drugs trials papers funded by 'big pharma' companies.
- At the same time in medical areas the increasing requirements for multi-country drugs trials has tended to increase author numbers, and lead to a convention in some areas of only listing the most senior investigator per country, and not their research staffs as well.

- Virtually all journals will abbreviate in-text references to the first author (sometimes first two or thee authors) plus *et al*.

In short, author naming conventions remain in flux in parts of the physical sciences, and even with fewer authors in the social sciences there are sources of strains. For instance, for publicity and contract simplification reasons, book publishers often only want to list one or two senior authors on a volume, and not whole teams as co-authors. So this is an area where researchers need to tread carefully. It is best to think ahead to how research will be billed at the time when team research efforts are first set up.

Summary

1. Academics who wish to improve the citation rate of their journal articles should ensure that title names are informative and memorable, and that their abstracts contain key 'bottom line' or 'take-away points'.

2. Book authors should ensure that their titles and sub-titles are distinctive yet appear in general 'Google Book' searches around the given theme.

3. There are a number of schools of thoughts regarding self-citations. In general academics should aim to ensure their own self-citation rate is in line with academics in the same discipline.

4. Co-authored outputs tend to generate more citations due to networking effects between authors in a given research team or lab, especially if the co-authors come from different universities or countries.

PART B

MAXIMIZING RESEARCH IMPACTS BEYOND THE ACADEMY

Chapter 5

The origins and patterning of external research impacts

An external research impact is a recorded or otherwise auditable occasion of influence from academic research on an actor, organization or social process taking place outside the university sector itself - whether in business, government, civil society or elsewhere (see Introduction). Again it is worth emphasizing that societal changes are always due to myriad causal influences and university developments. To suppose that academics have some kind of special impact on such multi-valent processes is to envisage a kind of Platonic republic where philosopher kings impose an allegedly well-informed way of doing things on all their fellow citizens. And again we must mention that external research impacts do not necessarily imply positive social welfare gain; all societal changes create winners and losers and have unintended consequences, so that evaluating their net effects is always a non-trivial task.

Governments and research funders, however, often seem to hold to a dangerous illusion, supposing that the causal outcomes of academic work can and should be intensively mapped so as to isolate the specific influence of university research on (positive) external changes. Partly this is because in advanced industrial societies both the academy and wider elites still seem preoccupied with the 'discovery myth', in which a lone researcher looking down the barrel of a microscope makes a brilliant discovery that results in an immediate social benefit. This illusion pushes universities to create implausible and over-claiming 'case studies' of alleged research impacts, which are now seen in almost all universities' public relations materials. This approach has also been extensively adopted by UK academic lobby groups, both in the humanities and social sciences (for instance, British Academy, 2010, 2008; Academy of Social Sciences, 2010) and for the sciences (Royal Society, 2009) and elite universities generally (Russell Group, 2010). This 'fairy tales of influence' approach cannot help advance our understanding of the critical and systemic roles that higher education now plays in modern social and economic development. By perpetuating myths of determinant individual impacts from academic work all that universities, foundations and research sponsors achieve is to help sustain a naïve and simplistic discourse about how impacts happen and how they contribute to modern social development. Even more extended and properly executed case studies of impacts may not be very persuasive beyond the 'apt anecdote' level, because they inherently focus on 'best practice' cases, and not the wider research picture (Kitson et al, 2009).

In this chapter we examine and try to understand the pathways by which research and scholarship actually achieves external impacts. We begin by examining the different currents of work inside a single discipline and the varying ways in which these currents help shape social processes outside the university sector. Although in the past most attention has focused on 'research as discovery', we argue here that three other elements of disciplinary activity - theoretical integration at the discipline level, applied work and teaching - can have equivalent or even greater effects than discovery.

The influence of any single discipline on society is inherently limited because most problems in business, government and society are 'joined-up'. These multi-layered problems defy the heavily siloed grid of academic disciplines and knowledge development. However, there are 'bridging' processes within or close to the academic sphere where universities and researchers can do much to enhance the rates at which knowledge, ideas, applications and technologies percolate through the impacts interface.

Nonetheless, the fundamental consequence of single-discipline processes and relatively weak bridging mechanisms has been that much of the 'aggregating' of ideas and solutions takes place *outside* universities, at what we term the 'impacts interface'. In advanced industrial societies, this border zone includes a wide range of large and powerful institutions that process Research and Development of many kinds into more integrated, useable and immediately applicable 'packages' of ideas, creating 'value-added' in the process. Academics and universities have to be realistic about this interface process. In the last section of the chapter we examine the evidence on how extensively academics and university researchers engage in knowledge transfer and impacts-generating activities.

5.1 Types of scholarship within disciplines and external impacts

One of the first stumbling blocks to understanding impact is that many commentators presuppose a direct link between what academics do inside single disciplines and wider society. Yet academics' roles are too often rather broadly categorized, in ways that make little distinction between *activities* and *purposes* or broader roles. In terms of activities, or the main demands on academics and university researchers' time, four categories are conventionally distinguished - research, teaching, administration and 'academic citizenship'. Of these only research and perhaps academic citizenship are widely seen as having any visible effects outside the university sector itself.

In addition to these traditional roles we can now add a fifth demand on academics' time, namely engaging in activities to disseminate ideas and explicitly seeking to achieve external impacts. In the UK this aspect of academic activities is now stressed both by research councils funding specific projects, and by the quasi-government agency distributing state financial support across universities and departments. A recent consultation document proposed that a quarter of all state funding for academic research in England should be allocated in the 2014 'Research Excellence Framework' on the basis of how much external 'impacts' (construed as quasi-outcomes) have been achieved by universities and departments. In the US, the remit of the National Science Foundation was altered in 1992 to broaden the criteria for research support away from its previous single-minded pursuit of the best intellectual value-added to also include the 'broad interest' of research for the wider society and economy. However, even this five-fold description of academics' roles still offers only a very limited view of what it is that academic staff and researchers do, and of how disciplines achieve advances.

Turning to the deeper-lying purposes, rationales or ends of academic work, an influential approach suggested by Boyer (1977) stresses that ‘scholarship’ is not a simple matter of making new discoveries - important though these may be. Rather, intellectual advances in disciplines are inherently bound up with other key functions – including a scholarship of integrating knowledge across disciplines, a scholarship of applying knowledge in academic service, and a scholarship of what he again termed ‘teaching’. However, Boyer’s categories are too limited for our purposes. For instance, he defined scholarly integration as pooling knowledge across disciplines, while we find that scholarly integration oftentimes occurs at the stage of pulling together ideas and concepts into a coherent ‘world view’ *inside* single disciplines. Similarly, knowledge development forms a very large part of any discipline’s activities, going far beyond academic service (which we instead separately treat in section 5.2 as a form of ‘bridging’ activity). This is especially the case in disciplines focusing on ‘human-dominated systems’, a broad category that includes engineering, design, IT and computer sciences, and medical sciences along with the social sciences and aspects of the humanities. Finally, the primary intellectual function served by teaching is the ‘renewal of the profession’, a key aspect by which new ideas and innovations are stimulated being bound up with the sifting out and incorporating of cohorts of new talent into the discipline – a set of activities that includes but also extends far beyond teaching.

In our view the fourfold discovery/integration/application/renewal categories capture essential differences between various type of academic focus and purposes. But since these distinctions are novel in the field (in their extensively revised form here), it is not easy to point to empirical evidence that is organized on exactly the same lines. However, there is a widely used three-categories distinction between ‘basic’ research and ‘applied’ research, plus the intermediate category of ‘user-inspired basic research’.

Combining this radically revised version of Boyer’s categories with the four conventional academic roles yields the overview table shown in Figure 5.1. The cell entries here show only one or a few of a larger number of activities. We say a little more about the four row variables below.

Figure 5.1: An overview of how four types of scholarship mesh with the five main demands on academics' time

Cell entries show only the top one or few of several or many components

	Five main demands on academics' time				
Four types of scholarship	**Research**	**Academic citizenship**	**Academic management**	**Teaching**	**Dissemination and impacts work**
Discovery	Primary research	Journals editing and professional service to the discipline	Research leadership	Supervising doctorates; training new researchers	Disseminating research
Integration	Theory definition; pooling of ideas; field-defining textbooks	Review articles, reviews; conferences; sustaining the 'oral wisdom' of the discipline	Fostering a 'research culture' in departments or labs	Developing less important textbooks and resources	Enhancing public understanding of the discipline; writing 'cross-over' books
Application	Innovations for use, tool-making, solutions-testing	Academic service in government, business or charity/NGO bodies	Liaison with external clients, partners and contacts	Executive education and training	Direct research for clients
Professional renewal	Supervising doctorates	External examining and shared curriculum development	Course management; examining	'Core' teaching	Liaison with employers and workplaces

Discovery

> There is nothing so easy as what was discovered yesterday, nor so difficult as what will be discovered tomorrow.
> *Jean Baptiste Biot*

> Nothing was ever yet done that someone was not the first to do. All good things which exist are the fruits of originality.
> *John Stuart Mill*

The forms of scholarship that produce specific 'new facts' or original insights, those we associate most closely with innovation, originality and the uncovering of new findings or relationships, are by far the most mythologized, not just in outside views, but within academic professions themselves. The key forms of discovery scholarship include:

- *experimental science* and the uncovering or untangling of new relationships and effects under tightly controlled experimental conditions in laboratories. This approach lends itself to a reductionist approach common in the 'classical' physical sciences, where the focus is on understanding components at the smallest feasible scale, and where the aggregation of components is well understood or follows relatively simple laws.
- *randomized control trials*, which seek to apply an experimental approach to natural, computer, internet, human or societal environments where lab conditions cannot usefully be replicated because multiple causal relationships are in play simultaneously. This approach is associated with the analysis of holistic (often chaotic) phenomena, which cannot be understood as simple or predictable aggregation of component influences.
- *field trips*, where the researcher's efforts uncover 'new facts', such as expeditions to map new species, archaeological 'digs' in new terrain, archival research in historical work or literary and cultural studies, and many other related forms of investigative effort.
- *database analysis*, where already collected or available information is aggregated, cleaned and analysed in new ways, using new mathematical tools or algorithms, and often drawing on new theories or hypotheses. The scale of databases in the social sciences has mushroomed in the digital era with the growth of new administrative and transactional data heaps, accumulated by governments and corporations (Dunleavy, 2010).
- *new theory development*, ranging from the focused cogitation leading to new maths formulae and theories, through progressively 'softer' but yet forms of definite theoretical innovation.

Undeniably some combination of these activities lies at the heart of most academics' concept of research. An extensive specialist literature also tries to understand the conditions of creativity and 'break-through' forms of research, especially in the physical sciences and technology. Indeed in many ways this aspect of academic activity is often considered the 'be all and end all' of academia. In the inter-generational division of labour that is often observed in academia, new discovery is often the domain of younger researchers, while older academics tend to focus more on creating the multiple conditions for discovery to happen and on holistic or more systematizing contributions, that we consider next.

Core research obviously demands a significant portion of top academics' time, but it is by no means the only activity they undertake in achieving advances. But in order to do effective discovery research or even just secure a few hours of 'core' research time, academics need to create and run well-organised labs and departments, acquire and set-up equipment or access to data, perfect methods (often through trial and error), establish research protocols and ethical permissions, obtain access to relevant survey respondents, organize field trips, establish research traditions and detail institutional expertise and memory, immerse themselves in other people's forefront research, transfer knowledge, work on publications, organise and attend conferences, develop research grants, and supervise doctorates. These activities are in no way *separate* from discovery. Rather they form integral parts of the process of uncovering new knowledge.

In her book, *How Institutions Think*, the anthropologist Mary Douglas (1986) stresses that it is the professions, research laboratories and academic departments, journals, conferences, funding bodies and other related organizations that govern the recognition of ideas in any discipline as novel and worthwhile. Other organizations (many involved in the impacts interface we discuss below) control the rate at which innovations and 'worthwhile' discoveries are picked up. In the digital era the scale of such organizational filtering (what Douglas determinedly calls organizational 'thinking') is often international, and sometimes global.

It is also worth noting that in the past discovery processes in the physical sciences were far more closely linked to application imperatives than they are today. In the era of the most rapid scientific advances from the 1600s onwards, there have been close and integral linkages between pure and applied science, with the technological spur from practitioner fields influencing new scientific advances. In many contemporary 'big science' fields covering natural systems, such as particle physics or astrophysics, this linkage has been decisively severed, and the only conceivable 'paying customer' for forefront research has become national governments. Yet in human-dominated systems, a far closer binding of discovery to application persists. The 'big pharma' nexus of giant multi-national drug companies with medical academics and university hospitals across many countries is perhaps the best example of an essentially complete inter-penetration of industry and academia in the production of new knowledge. But there are also important, very similar clusters in knowledge sectors close to defence industries (such as aerospace and materials science), nuclear energy, bio-sciences, agribusiness and high-end forms of information technology.

Integration

> Thinking is a struggle for order and at the same time for comprehensiveness.
>
> *C. Wright Mills*

> Each scientific research paper is a package of ideas which, when it nestles down in the pre-existing network of ideas, triggers some large or small rearrangements.
>
> *Mark Buchanan*

The processes by which academics absorb, digest, synthesise, and connect knowledge garnered via the discovery process into coherent theoretical and interpretive knowledge frameworks is critical for many reasons. Discovery alone is not easy to make sense of or act on. The modern philosophy of science stemming from Thomas Kuhn stresses that at many levels (and not just the conventionally understood macro level), all the sciences and social sciences are shaped by 'paradigms', integrating conceptions that help to explain the body of scientific knowledge in the relevant area as a whole. Scientists and academics in any discipline will often tolerate an extensive accumulation of ‘puzzles’ or discoveries inconsistent with the prevailing paradigm, so long as there is not a competing alternative paradigm. An inability to integrate new findings into the existing body of knowledge most commonly creates a sort of side-lining of the ill-fitting results. In ‘hard’ sciences only the production of an alternate synthesis, a new paradigm that can better account for both ‘mainstream’ observations and known but unintegrated puzzles, can shift established ways of thinking within a discipline and beyond to a wider set of specialist users and the public at large.

In many disciplines a general pattern of intellectual controversy prevails, with a currently hegemonic paradigm, that functions as a form of professional ‘conventional wisdom’ or mainstream view, and is critiqued by a ‘legacy’ view that was previously hegemonic, and by one or more new and ‘insurgent’ intellectual approaches. Shifting from STEM disciplines with a ‘normal science’ structure to ‘softer’ sciences with more inter-theoretical debates brings this pattern out more, creating pervasive ‘schools of thought’ controversies. In pure humanities disciplines inter-theoretical struggles define the commanding heights of the discipline, and Collins (1998) suggests that an ‘intellectual law of small numbers’ applies, limiting top-level positions to between two and seven points of view.

The stress we lay here on integration forms of scholarship within each discipline is also a recognition that most advances come out of supportive academic environments in which a particular mix of activities, people, skills and favourable organizational structures encourages radical innovations in knowledge structures and ideas and connections. Perhaps the most productive integrator in modern science history was the Nobel-prize winning physicist, Lord Rutherford, whose skilful direction of laboratories at Manchester and Cambridge helped eleven of his close colleagues to earn the same prize across two ‘miracle’ decades for the expansion of physics as a discipline, from 1898 to 1920.

Application

> Knowing is not enough; we must apply.
> Willing is not enough: we must do.
> *Johannes Goethe*

Applied forms of scholarship in the modern world cover a wide range of activities where basic theory and knowledge already established is applied to unique physical or social situations in a differentiated way that takes full account of the uniqueness of a specific environment, system interconnections or multiple constraints. Hence the scholarship of application is fundamentally about the differentiation of basic knowledge and research so that it can be meaningfully used in highly complex, 'real-world' situations where there are dozens, hundreds or thousands of factors that need to be considered and evaluated as a whole so as to reach an acceptable solution.

In concrete terms the scholarship of application extends across both a substantial share of university sector work in every discipline, and across applied university research on externally-defined problems, consultancy in government and corporations, design work and prototyping. The complex development of modern civilizations entails that an ever-increasing proportion of academic work is now concerned with 'human-dominated systems', such as the medical sciences, engineering and computer sciences, design disciplines and the social sciences. In such fields the vast bulk of work may fall in or close to the application category, since the development of new knowledge may not change the 'first principles' science base much. Instead it primarily extends the remit of basic knowledge to constantly developing forms of human-generated artefacts and social situations.

The scholarship of application is particularly important in today's world when businesses need *new* things to create competitive advantages; when medicines 'wear out' as the organisms targeted develop resistance; and when public policies must constantly develop in an 'agile' fashion to counteract the capacity of civil society to find countervailing ways to respond to government interventions. One of the marks of an advanced industrial society is the existence of a huge knowledge inventory that contains multiple possible solutions for myriads of actual or possible civilizational problems. Only a small proportion of this knowledge is normally drawn down and used at any given time, but advanced industrial societies have a capacity to rapidly access (or develop) many appropriate solutions even for radically new or highly intermittent problems.

Renewal

> He [or she] who receives an idea from me, receives instruction himself without lessening mine; as he [or she] who lights his taper at mine, receives light without darkening me.
> *Thomas Jefferson*

Finding new talent to develop and replace senior scholars is a constant task in each academic discipline and professional groups linked to them. The scholarship of renewal inevitably absorbs a large part of academics' time, and connects in integral ways to the vitality of discovery, integration and application. Key tasks include developing research-led teaching and helping to supervise and socialise PhD students. Bringing on young researchers in the field is closely bound with the management of research laboratories and academic departments, together with the creation of inter-university institutions and linkages that can sustain a decentralized process of talent management. The close involvement of senior academics is essential to how all these processes work out.

The varying success of different universities and different countries across disciplines closely reflects their levels of investment in renewal processes and ability to master the sophisticated knowledge transfer and knowledge management approaches needed for disciplines to grow and flourish. The scholarship of renewal also has a strong and slow-to-change influence on overall academic 'culture'. In many science disciplines it also has close links with the culture of government and corporate research labs, through them exerting a key influence on overall national R & D achievements.

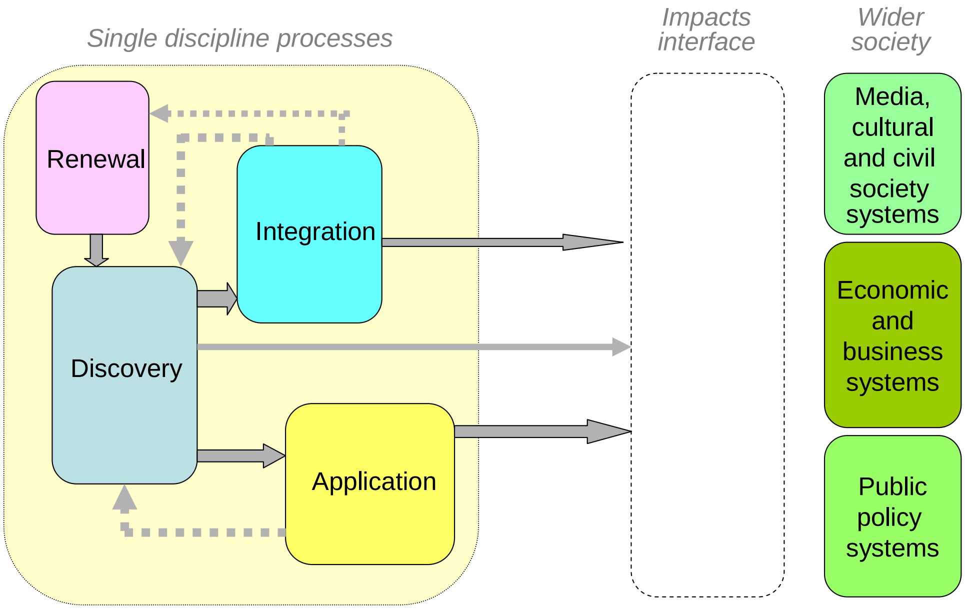
More broadly though, renewal activities are constantly shaped by the demands of the wider economy and society, since in every discipline academic departments necessarily provide education for undergraduate and even Masters students who do not necessarily go into universities or even other research occupations. Especially for disciplines dealing with 'human dominated systems', that are in practice almost wholly 'applied' in orientation, there is no hard and fast line between what is needed for outside employment or vocation and what is needed for academic study. Currently in the US more than half of undergraduates complete vocationally orientated degrees, rather than traditional, academically-defined qualifications. The necessary interaction of academic departments with employers in such subjects entails an extended liaison between academics or researchers and businesses or government.

The scholarship of renewal also carries with it a stream of impacts that are not easily recordable or traceable in the electronic footprints of the digital era, but are none the less real – namely the carrying over of education and socialization from university courses to other sectors, by students moving out of universities and into different occupations. These effects and consequences do not feature further in this analysis, but they are none the less large-scale and important ones, and they operate over considerable periods of time.

We close this section by putting together an interim picture of how academic work achieves impacts, as shown in Figure 5.2. Essentially, in each discipline the four forms of scholarship interact with each other, originating influence flows (shown as the left-to-right arrows in the Figure) towards the impacts interface, which for the moment we leave as a blank box. Behind the interface on the right we assume that modern society can be thought of as a set of relatively autonomous systems. For our purposes the three most important are business and economic systems, government agencies and public policy systems, and media, cultural and civil society systems. These are the ultimate targets for academic work to achieve external impacts.

We hypothesize that academic and research work in any single discipline characteristically originates three main impact-producing flows of influence.

Figure 5.2: How key forms of scholarship within each academic discipline begin to achieve external impacts



First, we expect that applied work in the discipline will normally have the largest direct external impacts, shown as the thickest arrow from the Application box to the impacts interface. The volume of connection here reflects both the substantial importance of application scholarship relative to other elements in every discipline, and the greater closeness of the connections here that link universities to external economy, government and civil society.

The second aspect of scholarship in generating external impacts is likely to be integration, the synthesizing of new discoveries into existing knowledge and the paradigm changes and smaller transformations that occur in how the discipline thinks. Again a large part of any discipline's academic activity is integration. And changes here have a wider general resonance in shaping the knowledge base and the organizational culture of the discipline and professional, business or government sectors to which it is closely linked, than any other aspects of scholarship.

Third, as a result we should generally expect that discovery will be a much more slender and perhaps intermittent set of influences outside the university sector itself. Many academic discoveries are inwards-facing to a discipline, concerning the 'swarms' of methods, techniques, equipments, routines, and standard operating procedures of academia itself. Hence, in any discipline, relatively few 'discoveries' can be successfully explained or 'sold' to an elite outside audience. Even fewer can reach general media or achieve any widespread dissemination (such as the results of new medical or drugs trials).

Conflicting results and scientific controversies often take the edge off initially promising new findings, almost invariably in the direction of problems and possible solutions being more complex than they may appear at first sight. Discovery-learning by societies and social groups (for example, in the spread of new social practices, new internet tools or new environmental threats) often outpaces academic knowledge, meaning that researchers are often scrabbling to understand the surprising and unforeseen changes in social practices and even natural environments, often with no special claim to expertise.

Across most of the social sciences (and some parts of all human-dominated systems) the possibility or wide relevance of the 'discovery' form of scholarship (especially the concept of 'breakthrough' research) can also be questioned. Development following social 'laws' authoritatively validated by 'professional social enquiry' is rarely (if ever) an appropriate model for the social sciences (Lindblom and Cohen, 1979). Instead professional investigation tends to form at best scattered pinpricks of high quality knowledge that must be joined-up by what Lindblom and Cohen term 'ordinary knowledge': this often includes, but also often contradicts 'common-sense', and always extends far beyond it into many areas of specialized (even esoteric) knowledge that are not themselves scientifically validated.

The internal arrows inside the discipline box in Figure 5.2 also suggest that there will typically be three strong internal feedback loops. The closest and largest volume feedback is likely to be from discovery scholarship to integration, as new results and relationships expand and morph accepted understanding in the discipline. In turn, integration activities mostly select (or discard) avenues in discovery, while new theories, ideas, memes and juxtapositions of knowledge suggest a flow of new experiments, field investigations or data analyses that can be attempted. Similarly, we expect to see a constant and relatively direct feedback loop operating between discovery and application activities. In many STEM disciplines there are possibilities for patenting processes and applications, extending also to spin-out companies from universities, and increasingly facilitated by expert sections of university administrations or specialist consultancies. Since strong incentives may attach to converting discoveries into applications here, the push is especially strong. In turn, new developments often suggest and spur new patterns of investigation of previously accepted knowledge. The third feedback loop operates from discovery to integration and then via professional renewal back to discovery, with the training of new students (and especially PhDs) for positions in and outside universities functioning as a key stage at which new potentials for discovery are originated. Essentially new cohorts of students bring in (and student-based external linkages with industry and society, and with other countries, sustain) new directions in discovery scholarship. Plato famously commented that younger people 'are closer to ideas' than the old, and younger people have lesser stakes in established ways of doing things and are more willing to innovate than their elders who may be set in their ways. So it is no accident that in many disciplines student-linked and teaching-linked innovations are important stimuli for discovery scholarship – especially in some human-dominated systems where the scope for setting in train 'social learning' is strong, such as information technologies.

Finally, the vertical positioning of the three arrows in Figure 5.2 is perfectly deliberate, clustering opposite the economic systems box. We expect discovery scholarship to have most impact on business alone, partly because there are more immediate or potentially 'cashable' gains feasible here. As a result corporations expend significant resources in monitoring disciplines where the predominant patterns of knowledge advance mean that such discoveries most often occur, especially in STEM disciplines. Governments generally follow suit less intensively and then mostly in defence or medical areas. We expect applications scholarship to have broader influences on both business and public policy. And we expect integration forms of scholarship to have most influence on cultural systems, media, civil society and business.

5.2 The role of joined-up scholarship

> Thus have I made, as it were, a small globe of the intellectual world, as truly and faithfully as I could discover.
> *Francis Bacon*

Academic work is highly siloed into narrowly specialized disciplines and sub-disciplines. For instance, for this study we counted 44 significant and organized fields and sub-fields in the UK social sciences alone. Looking across all academic disciplines, the number of subject areas is set at just over 170 across 19 subject groupings by the Higher Education Statistics Agency in the UK. This highly differentiated grid of knowledge specialisms fits very poorly with the general need of business or government decision-makers to integrate and aggregate knowledge at much higher levels of generality, and to consider all aspects of an issue in making a multi-criteria choice of strategy or response. Almost all acute business, government and civil society concerns involve 'joined-up' and inherently multi-dimensional problems. The result is that academics are often happy to advise governments or corporations on a particular problem within the 'comfort zone' of their specific discipline area. But characteristically they are relatively inexperienced in working across discipline boundaries, and are often reluctant to bring their expertise to bear on or comment about closely related issues and areas outside their particular academic purview.

For example, consider how western governments might solicit advice from universities on an over-arching problem like the growth of obesity in modern societies. In the UK ministers commissioned a specially formed team of civil servants (under the label of the Foresight programme) to bring together a range of physical scientists expert in nutrition and food components, medical and physiological researchers with expertise in eating behaviours and exercise, to work with psychologists, sociologists, behavioural researchers and social and public policy experts to try to identify a strategy for improving government's response. In interviews with participants we found that this joint working was almost uniformly novel for the academics involved (and for other researchers in different parts of the central government and health service), and was predominantly welcomed. The same was true of eight other major Foresight projects we examined. In other countries national academies of science tend to organize the nearest equivalent of Foresight studies, and hence they are often more academic-dominated. So while they respond to the same need for joining-up knowledge, they perhaps less often bridge across major discipline groupings.

There are three main ways in which academics and researchers currently combat the siloing of academic disciplines so as to produce more joined-up scholarship:

- bridging scholarship is cross-disciplinary or multi-disciplinary work that explicitly seeks to improve inter-professional communication within groups of academic fields;
- integration that focuses mainly on the role of individual universities in creating particular syntheses of academic contributions, sustaining distinctive combinations of academic cultures at each main university site; and
- academic service, by which we mean the pro-bono or paid-for direct inputs made by academics and university researchers to the operations of the government and business sectors or civil society bodies.

Figure 5.3 shows how these forms of scholarship mesh with the five activity streams that absorb most of academics' time. We discuss these different forms of joining-up in turn.

Bridging scholarship

This form of academic work operates across academic disciplines in ways that increase inter-professional communication, define meta-theories and help to shape wider academic meta-cultures (such as the meaning of 'science' in western countries). (This is often what Boyer seems to have had in mind when he spoke about 'integration'.) At the meta-level bridging entails experienced academics thinking across disciplines and engaging in activities that lead to broad shifts of academic fashions over time. Key aspects of this form of scholarship are the 'waves' of ideas affecting multiple disciplines either simultaneously or sequentially, such as chaos theory (which led to a change of focus that spanned across many STEM subjects), post-structuralism and post-modernism (which washed through many literary, cultural and 'soft' social science disciplines), or rational choice approaches (which spread from mainstream economics to colonize many social sciences and parts of the humanities). Developing the pedagogy appropriate for such waves to reach new disciplines is often a controversial point, where bridging scholarship can play an influential role in opening doors to curriculum changes.

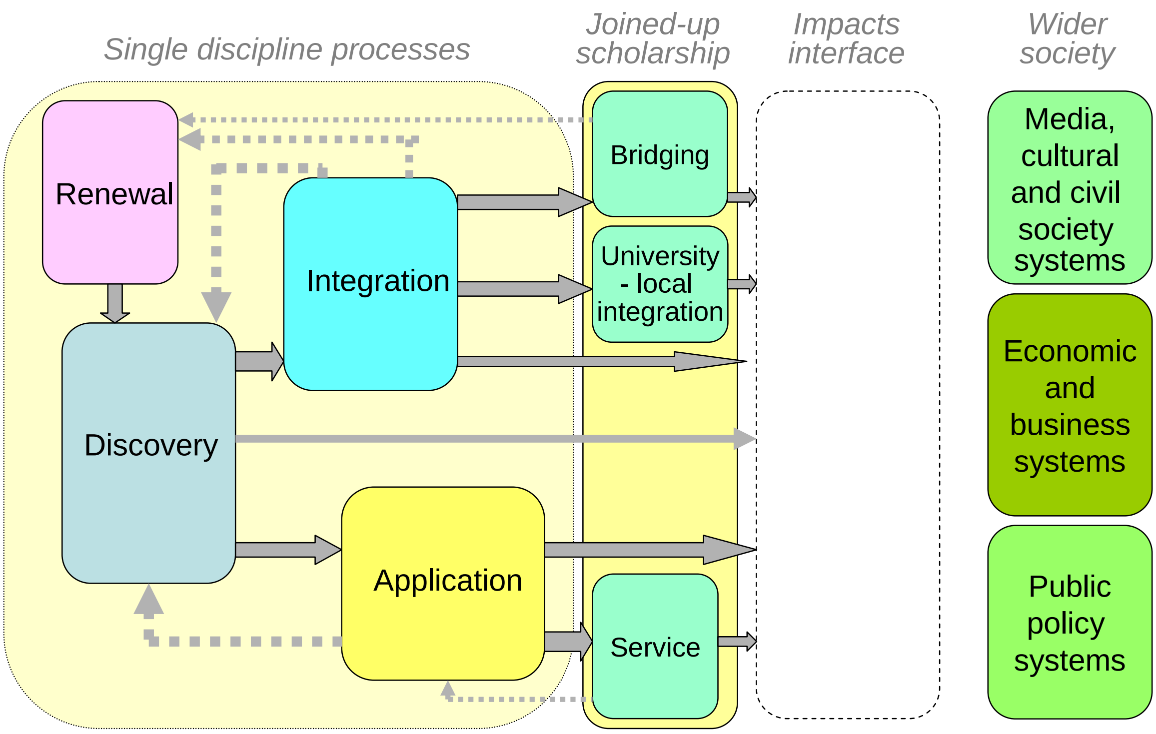
Figure 5.3: An overview of how three types of joined-up scholarship mesh with the five main demands on academics' time

Cell entries show only the top one or few of several or many components

	Five main demands on academics' time				
Three types of joined-up scholarship	**Research**	**Academic citizenship**	**Academic management**	**Teaching**	**Dissemination and impacts work**
Bridging	Meta-theories; cross-disciplinary knowledge integration	Cross-disciplinary communication	Channelling broader intellectual changes to research labs and departments	Pedagogic aspects of cross-disciplinary 'waves'	Expanding the 'public understanding of science' or social science
University-level integration	Personal interactions at local level creating bridging across academic disciplines	Knowledge exchanges operating through university governance and priority-setting		Cross-disciplinary and inter-disciplinary teaching	Community, alumni and donor linkages facilitating knowledge and resource exchanges
Academic service	Membership of innovating state investigatory bodies; cross-disciplinary applied research for government or corporate clients	Membership of more routine state advisory, funding or investigatory bodies; professional service	Research liaison with clients handling 'joined-up' problems	Cross-disciplinary training or development, especially for government or corporations	Using research to 'nudge' behaviour changes with government; developing cultural events

Bridging scholarship certainly stems closely from our much deeper but single-discipline use of 'integration' in the previous section, as Figure 5.4 shows. Those academics and researchers who move most deeply into cross-disciplinary areas and make most impact there are almost uniformly people with a long track-record of theoretical and integration contributions in their own discipline. This group extends from science- or university-based "public intellectuals" at one end of the spectrum (such as Richard Dawkins or Stephen Hawking in recent years), through to well-known scientific discoverers or academic innovators with a penchant for thinking more widely and an enhanced openness to other discipline's contributions at the other (such as Einstein in the early twentieth century, or Richard Feynmann and Stephen J. Gould in its later decades).

Figure 5.4: How joined-up scholarship adds on to single-discipline effects in generating impacts from academic research



There are strong age-related influences on who gets to do bridging scholarship. Younger staff tend to do more detailed research, and are often more technically competent at the expense of having a more narrow vision. Academics in their mid-30s to mid-50s, who often have more managerial roles, tend to focus on broader themes and ideas. Their experience and reputations can be better assessed externally, but they may also fall behind the technical curve of the newest developments in their area. So bridging scholarship tends to be undertaken chiefly by a smallish group of relatively senior and more research-orientated staff, who can combine mastery of the research frontier in their disciplines with the necessary experience of their own and other disciplines to enlarge their intellectual horizons. They have the strongest incentives to engage with broader theories, ideas and issues - usually stemming from integration scholarship within their own discipline. Because joined-up scholarship and cross-disciplinary work tends to be undertaken by well-known authors and researchers it may have disproportionately large effects in achieving influence, even though it remains fairly small in overall volume.

Local integration by universities

A large part of the unique value-added created by universities combining many disciplines together stems from the many effects of the knowledge exchanges, personal interactions and intellectual networks that are thus created. As Figure 5.3 shows a key foundation of this phenomenon in different research fields stems from academics in different academic fields getting to meet each other beyond their own departmental or research lab boundaries. Such activities unleash synergistic and often serendipitous effects that include spreading awareness of new theories, ideas, methods and empirical results beyond normal pathways.

How much of such interchange do universities actually sustain, given their characteristic patterns of organization? Sceptics might argue at this point that most universities remain heavily siloed on disciplinary lines. Relatively few have the strong cross-disciplinary linkages such as those produced by the collegiate systems at Oxford and Cambridge universities – where groups of academics drawn from all the different academic disciplines organize most teaching at the college scale and dine frequently with each other. Most universities instead have an apparatus of faculties and sometimes 'schools' overlaying strongly independent and single-discipline based departments, perhaps supplemented by more cross-disciplinary patterns of organization in 'professional' schools for medicine, business, public policy or environmental studies. Seminars, conferences and personal collaborations on research projects and grant bids may often help to produce knowledge exchanges and create the beachheads for wider bridging scholarship influences to affect new areas, but mostly within faculties or connected fields rather than between distant disciplines.

However, university-level linkages are potent precisely because they are often multi-dimensional and most academic staff will have local knowledge of what colleagues in other departments and faculties do that has been gathered over years of experience. The involvement of staff in university governance and committees tends to produce a lot of knowledge exchange, since this is how the university gets to set priorities, judge promotions, develop academic strategies and refine and improve its research performance and ability to project achievements to external audiences. Senior staff who are most active in academic citizenship and in university management are often the most informed about and alert to intellectual changes in disciplines neighbouring their own faculty.

Teaching interactions on genuinely joint degrees (those which are cross-disciplinary or multi-disciplinary) certainly may generate very sustained contacts across the departments involved, which are boosted by regular student interactions with the groups of teachers involved. (By contrast, teaching on the common modular degrees have much smaller effects, since the burdens of integrating knowledge are born almost entirely by students, while the academic departments involved continue to teach in a single-discipline way.)

How much interchange of ideas and joined-up development of knowledge can be sustained by such research, governance, academic citizenship and teaching linkages? It is certainly a minority activity in what universities do compared with the bulk of single-discipline, single-department processes. Yet, there are good theory and empirical reasons to believe that the value-added of this extra edge is important. In social network theory, there are 'small worlds' models in which a close-knit web of very restricted and local linkages is supplemented by some additional longer links that are scattered randomly across the network or occur only episodically in time. The presence of very few of such long linkages between dissimilar parts of the network can dramatically expand the speed and extent of communication that occurs, especially cutting down the time needed for messages in one part of the network to reach all parts of it (Watts, 2003).

And in empirical terms, inter-disciplinary linkages and university-wide organizational cultures seems to play an important part in defining what makes one university different from another. Although there are very important resources differences that separate, say, Ivy League institutions from less well-known American universities, there are also many other intellectual influences and characteristics of their academic cultures, that are not resource-linked and that impart to each university its own specific character or academic personality, its own style of doing common academic activities and its own traditions, institutional memories and capabilities. Similarly in the UK and Europe, different types of universities have different qualities, often located in their varying mix of 'strong' disciplines, which characteristically tend to dominate university governance and academic cultures.

These differences are especially important in the final area of the university-led integration row in Figure 5.3, namely how universities create local interchanges of ideas and external linkages to their alumni, donors, funders, external partners and external communities. For most universities in most countries these groups tend to strongly overlap each other, with all them being geographically proximate – in the same city and region as the university is located. In some federal countries there are close university linkages to state governments, as in Germany, China and American public universities. Here the ties of funding and regional elite linkages are especially strong, and universities often put in extra effort to strengthen local or regional partnership with business and fitting their curriculum to regional needs. The growing importance of regional-level knowledge transfers in the modern network economy has strengthened university incentives here (Christopherson et al., 2008).

At the other end of the spectrum are major universities whose alumni and donors may spread very widely nationally or internationally, sometimes complemented by a strong regional/city base. However, these institutions may be geographically *in* a particular locality but not really forming part *of* it in intellectual terms. Many of the top 'world' universities have particularly strongly separated catchments for alumni/donors and community groups, and their corporate relations and external fund-raising efforts are highly non-local and very developed functions. The effort to communicate what the university is doing in coherent terms often contributes strongly to the development of joined-up knowledge within the university itself.

Academic and professional service

Many mid-career academics take on part in public life by applying their professional judgement and knowledge in a wider context beyond the borders of their academic discipline or university. Most of these activities are *pro bono*, either undertaken for no pay at all or in return for expenses or for modest fees that only partly compensate those involved for the time absorbed. These important activities include: serving on the professional body in the discipline or in 'practitioner' occupational or industry groups; becoming a member of cross-disciplinary professional bodies (such as academies of sciences, social sciences and arts in many countries; becoming a member of government commissions, boards and official advisory committees; and holding seats on charitable boards and foundations. On some occasions, government departments will turn to reputable academics as a sort of filter for who they will engage with to solve a particular policy challenge.

Some sociologists of professionalism argue that there has been a socially significant decline of 'private practice' professionalism across many key fields of social life under twin pressures:

- the growth of 'big science' which makes partnership forms of private practice less feasible, since only large corporations and national governments can now afford the equipment costs of building even a core capacity in the field, producing a decline of independent professionalism in favour instead of 'state patronage' or 'corporate patronage' (Johnson, 1977); and
- the conversion of many large 'partnership' structures in the private sector into large (often multi-national) corporations, as a result of globalization and scale-inclusion factors, a change that has been especially marked in many knowledge-intensive fields such as

accountancy, legal services, architecture, design and management consultancy.

In this analysis, university researchers and academics (along with other quasi-government professional staffs, like government scientists and laboratories, government economists, lawyers, doctors and social researchers) are increasingly salient for governments and civil society in replacing the vanishing private practice professionals as key societal sources of relatively autonomous knowledge development and independent (less potentially self-interested) advice (Dunleavy, 1982). In this view university academics bring to public service key and trustworthy expertise in dispassionately monitoring trends, disinterestedly refereeing controversies and 'speaking truth to power' (Wildavsky, 1987).

A recent study of 'the UK public elite' (covering 187 different central government 'quangos') found that one in fourteen elite members (7 per cent) were academics (Griffiths, 2010). Figure 5.5 shows that this influential group showed a strong bias towards senior academics (this is highly expected, given evidence on academic reputations analysed in Chapter 3). Over two fifths of the academics involved came from research intensive universities, a tenth from most teaching-based and recently formed universities, and just over a quarter from institutions in between these two poles. Almost half the academics were involved in governance of the public bodies funding and regulating universities, a quarter in cultural bodies, one in six in public scientific bodies, and the smallest group (under a tenth) in regional or local bodies (reflecting the strong centralization of the UK state) (Griffith, 2010: 745-6).

Figure 5.5: The seniority of academics involved in UK central government quasi-government agencies

	University funding bodies	Wider government bodies	All bodies
Top academics (managing universities)	28	21	24
Heads of department	15	12	13
Professors	58	57	57
Lecturers	0	11	7
Total	101%	100%	100%
Number of academics	*80*	*131*	*232*

Source: Computed from Griffith, 2010, p.740, Table 1.
Notes: The category 'top academics managing universities' includes vice-chancellors and pro vice-chancellors (i.e. the number one or two officials in British university hierarchies) and the deans of faculties.

Different ways of assessing the influence of academics suggest alternative estimates of the importance of academic service, however. For instance, in the UK the government (acting in the Queen's name) awards New Years honours to people who have made noteworthy contributions to national life. This captures a much broader concept of academic service, one that is less central political and top-organizational and pays a lot more attention to work at a number of levels in national level, including regional and local service, and work in charitable, philanthropic and community dimensions, as well as unusual economic or policy advice contributions.

Academics also often fill a wide range of roles in the economic life of advanced industrial nations, for example serving as non-executive directors on company boards, especially in relation to

(a) spin-out and 'starburst' companies linked to universities and their science parks, mostly in STEM discipline areas, often with multiple current or former university scientists or engineers serving as directors;

(b) non-university-linked companies where senior academics as board members assist with technical assurance and scrutiny;

(c) boards with business school academics, or academic economists, lawyers or social researchers as members, providing market-orientated or organization-orientated expertise.

We consider some evidence from the UK in section 5.4 below that bears on the scale and importance of these activities.

Other forms of academic service include briefing media and extended dissemination work, serving on the boards of charities, foundations and not-for-profit bodies, and working with cultural organizations. A recent study for the British Academy reviewed many different activities here, and noted that humanities scholars especially often play an important role in working with major museums, art galleries, theatres and other cultural organizations in preparing major cultural events - such as those marking cultural anniversaries, providing broadcast media programmes and in co-operation with other institutions sustaining major lines of cultural development that involve mass audiences (LSE Public Policy Group, 2008: 51; and 2008a: 39-40, 65-6).

Looking overall in Figure 5.4, adding in the three joined-up scholarship influences serves to double the number of ways in which academic work reaches the impacts interface. We suggest that the new linkages are at least as significant in scale as the direct impact of discovery research from single disciplines, but are somewhat less extensive than influence flows from integration scholarship, and hence also much less extensive than those arising from applied scholarship.

Bridging scholarship and academic service both tend to operate at more central or national levels in the public policy realm, the economy and civil society. Top-level academics and researchers often have a strong push towards international-level developments. However, in large federal countries with state/provincial/regional governments, and more widely in countries with well-developed regional elite networks (as in France, Italy and Germany) there are often strong counterpart sub-national systems of academic service and sometimes also bridging scholarship networks. In the UK these elements are best developed in Scotland and Northern Ireland, with less strong counterparts in Wales, and in London metropolitan/regional government. However, the regional or local integration of scholarship provided by universities is a pervasive feature across all OECD countries, and is clearly accentuated wherever coherent regional or local elites and distinctive languages or cultures add multiplier effects – for instance, in the Basque country in Spain. More generally, small countries operating in world markets tend to make better use of their slender academic and researcher resources because they face a 'group jeopardy' problem that induces the wider community to pull together to stabilize and fosters national economic progress (Katzenstein, 1985).

By contrast, larger, dominant or formerly dominant countries (such as the US, Britain or France) seem to experience intra-academia competition (often highly adversarial) for influence over policy-makers and social elites. Especially in the social sciences, governments in these countries often behave as if they can afford to strongly filter academic advice on partisan lines by alternating (left/right or liberal/conservative) political elites. Hence, at any given time dominant countries seem to be more likely to have a large 'insider' group of academics and researchers favoured by the government, and another sizable 'outsider' group of excluded academics and researchers, whom the government politicians mostly ignore or discount as being oppositional, 'unconstructive' or ideologically suspect. In the US this effect is mostly marked in the executive branch, and the structures of Congress that tend to require that new US policy has 'supermajority' support to blur legislative politics' barriers (Saeki, 2010). Meanwhile, at the state level, political control is more mixed and the logics of academic service tends to resemble more that of a 'small country.'

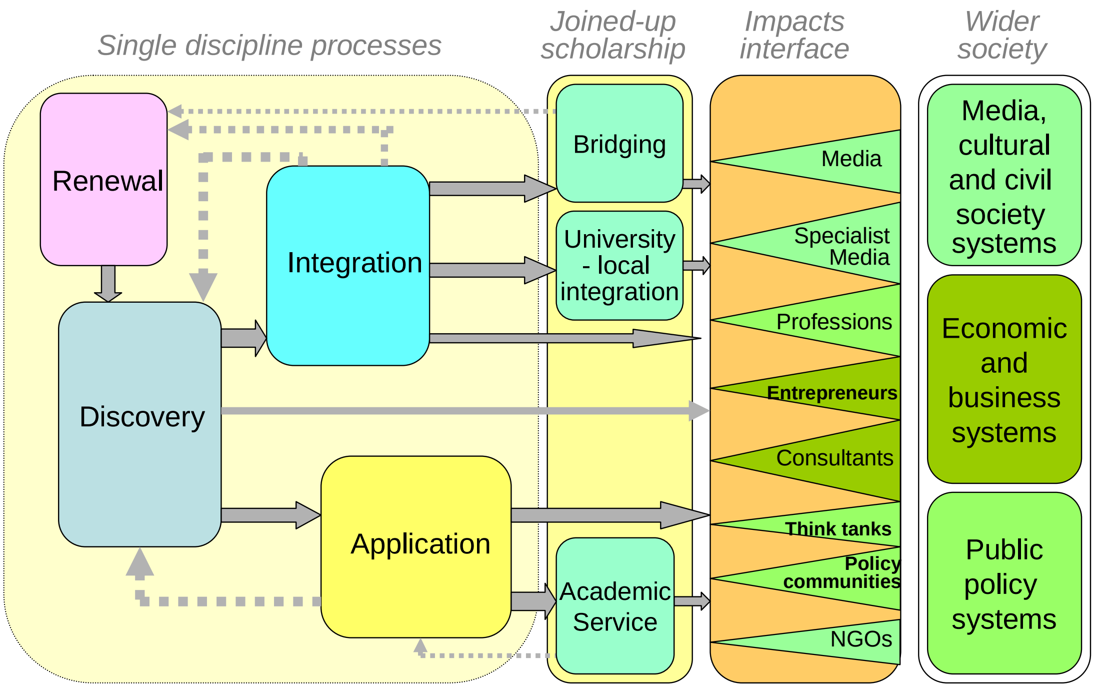
5.3 Understanding the impacts interface

> 'Many of the nation's most influential reports are little more than junk science'.
> *National Education Policy Centre (US)* (2011)

Ideas hardly ever travel on a linear path from A to B, and knowledge is rarely transferred directly from original innovator (or inventor) to ultimate end-user. Instead advanced societies have developed intermediaries such as think-tanks and consultancy firms whose role is to absorb the reams of information coming out of academic disciplines and other sources and present cogent analyses for interested parties. They simplify, re-process, rearrange, aggregate and re-package ideas and information so as to more effectively or persuasively communicate information, ideas or technical expertise to target groups. In the process these intermediary organizations and actors almost universally seek both to add their own 'value-added' and to receive a return for their costs, time and investments. However, some intermediaries may also strip ideas and evidence from their essential context; over-simplify or aggregate ideas and evidence in careless ways; and introduce the kind of distortions that can occur at any communications interface.

Universities, departments and academic researchers often dislike having to rely on mediated communication of their ideas in this way for two reasons. First, they see themselves as the original inventors of or investors in particular experiments, techniques, ideas or innovations, who risk being 'ripped off' or exploited by late-in-the-game but better-connected middlemen. Why should our work, universities often lament, be so extensively a means for generating returns to intermediaries who have not paid for it? How can we get rid of or displace intermediaries, and communicate more directly with end-users ourselves? To add insult to injury, while academics see themselves as scrupulous in acknowledging sources and influences in their citations, many of the intermediaries who pick up and deploy university knowledge are cavalier in their treatment of sources. They are seen as credit-claiming sharks or pirates, who are adept at re-labelling other people's knowledge as if it were their own.

Figure 5.6: Looking inside the impacts interface



Secondly, universities and academics dislike the extra elements that intermediaries add in achieving communication, viewing them often as ordinary-language simplifications of complex materials that verge into mis-representation. Similarly academics and universities often see the 'value-added' elements that many intermediaries seek to add as illegitimate, mixing up scientifically-proved results or academically-validated knowledge with proprietary, partisan or otherwise tendentious 'ordinary knowledge' ideas and information. This linking of value-added elements with academic-established information with extras also provides much of the basis of the branding, privatization or 'proprietarization' of knowledge that often sees intermediaries claiming credit for innovations or suppressing or side-lining the academic role in knowledge-creation. Two particular kinds of intermediary figure largely in these worries and complaints, namely consultancy firms in business, technology and public management, who barter proprietized knowledge directly into corporate income and profits; and think tanks across the public and social policy spheres who aggregate ideas into implausible 'best practice' recipes that can convert publicity into corporate funding support.

Yet this impacts interface is too developed and important in its own right for such hostile characterizations to be accepted at face value. In advanced industrial societies the diversity and extent of the institutions and organizations that transmit academic ideas to the rest of society is too great to be some kind of accident or a dispensable set of processes. In Figure 5.6's two dimensional representation we cannot effectively capture the multi-varied ways in which knowledge transfer connections are established – for instance, with consultancies often influencing public policy and media coverage as well as linking to businesses. Nonetheless placing elements in the impact interface in Figure 5.6 does shows their primary role and the organizing frame is useful for exploring each of them in some more depth.

In the central economic zone the key interface components are:

- *Consultancies*, which may range from highly specialized scientific or technical firms with wholly legitimate value-added expertise, through a wide variety to the very large, global firms in accounting and management consultancy, and legal services. They value academic knowledge quite highly where it can create a competitive edge, a knowledge advantage or a knowledge-application insight that can help persuade large industrial or service companies, or governments, to keep outsourcing operations to the consultancy. In the STEM disciplines there can be a strong inter-penetration of particular industries, end users and consultancies with relevant university departments, especially those close to the cutting edge of technology and other scientific fields for industry. Across the social sciences, major consultancies in accountancy, economics, marketing and business or government organization maintain a broad sweep surveillance of new developments and academic 'memes' that might acquire future business or sales value in competitive markets.
- *Major corporations* with strong stakes in particular STEM disciplines have the resources to license technologies and techniques developed in university labs, and often maintain regular funding and personnel

exchange links with close academic partners. Where iterative contacts occur then formal profit-sharing and licensing agreements can create stable relations.

- *Entrepreneurs*, especially those with a university background and the increasing numbers of leading figures who started their business careers at university, do not have the search capacity of large corporations, but do have personal contacts in key niches they specialize in, and the capacity to act fast with much lower influence and decision costs than in larger companies. Hence entrepreneurs (and private venture capitalists) often invest most speedily in new techniques and pick up innovative ideas.
- *Professions* across a wide range of subjects have close relations with university academics and researchers, especially in occupational fields where corporate dominance is less prevalent, such as medicine, law, architecture and design.
- *Specialist close-to-business media*, such as the trade press, media directed at executives and professionals and business TV play a role in picking up and mediating key academic developments, both in STEM areas and in business schools, marketing, economics and organizational management areas.

In the public policy zone at the bottom of Figure 5.6, key actors include:

- *Policy communities*, linking politicians, professions and government bureaucracies in closely-bound networks, perhaps divided on opposing ‘advocacy coalition’ lines, but regularly interacting to set detailed debates and lines of development. Policy communities are key channels by which civil servants and public sector officials update their ideas and monitor new developments in academic knowledge.
- *Government Professions* (such as government scientists, lawyers, economists and social researchers) are key providers of information for evidence-based policy-making, and essential conduits between academia and executive decision-makers, supplemented by the networks of government advisory bodies and committees discussed above, where academics and officials meet extensively in person.

- *Think tanks* are increasingly influential ideas aggregators, drawing mostly on academic research in different forms but marrying this search and represent mission with light touch 'best practice' research and examples gathering, and a flexible, agile style of acting as a government interlocutor or broadening the information base of political debates. Think tanks are in many ways the opposite of academia, often appearing as rather generalist information-and evidence-scavengers, but with excellent communication, dissemination and public relations skills that academics rarely have time to develop. However, in social science fields they have internalized an important lesson, that any given 'solution' for policy problems is likely to have evanescent effectiveness and hence will need to be constantly renewed or reappraised.
- *NGOs, interest groups and pressure groups* tend to use university research in a more episodic way, selecting evidence to reinforce political campaigns but often relying on general news media or specialist policy media to alert them, rather than regularly scanning the academic research landscape.
- *Specialist 'close to policy' media* are very important in government sector management and decision-making, and have greatly expanded their coverage of university-based research and ideas, partly responding to universities' increased expertise in generating press releases and engaging in dissemination. Government officials and professionals are uniformly graduates, and increasingly have postgraduate degrees also – so that their appetite for and capacity to absorb applied academic themes and innovations is considerable.

Lastly, in Figure 5.8 the civil society zone includes:

- *General media*, which have expanded greatly with the development of internet communications and 24-hour news channels and has become less 'mass media' and more specialist or segmented in character as media channels have multiplied and the capacity to serve smaller audiences has increased.

- *Creative, arts and design*, and *cultural industries* (such as music, theatre, film and video, painting, sculpture, literature, and architecture) are much more closely linked to academia than in the past, partly because of the growth of applied academic work, and partly because they have become far more uniformly graduate areas than back in the 1960s, for example. Creative and cultural industries have also been extensively influenced by meta-theory forms of bridging scholarship, which artists, designers and innovators in many fields have found useful in sparking changes and carrying forward debates and artistic dialectics. And the shift of all creative and cultural activities online and into digital forms has had wide repercussions, advancing the capacity to record and study art and design more comprehensively and extensively.

- *The extensive specialist media close to these sectors* has an increasing appetite for university-generated content and ideas, for many of the same reasons that apply to the business/trade and to specialist close-to-policy media.
- *Social policy NGOs, charities, foundations etc.* operating in less partisan and more consensual ways attract a lot of participation by academics, both on their controlling committees and at regional and local levels. They tend to make rather specific use of academic research, especially across the social sciences and law, mainly as a key (free) evidence base to sustain their campaigning at low cost. Philanthropic foundations' giving support for NGOs and pressure groups, especially the countervailing funders and backers enhancing the representation of the poorer and least advantaged social groups, and backing medical research, like investing in university research, and form long-term links in a few STEM and medicine areas. But most NGOs, charities and self-help groups lack the resources to sustain regular surveillance of relevant academic work. They often extensively rely on individual researchers and academics in their membership to keep the organization posted as part of their *pro bono* activities, although their

press offices can pick up and promote research they see as especially helpful to them.

It may be helpful to take an extreme example of how the impacts interface can operate in a highly industrialized and inter-penetrated form, where economic, regulatory and academic interests and specialist intermediaries are closely meshed together. The development of new drugs is dominated by 'big pharma' companies that invest extensively in laboratory research in universities and in academic hospitals mounting drug trials. Academics winning funding for drugs trials play a key role in designing studies, securing ethical clearances, securing patient involvement and implementing protocols. Nowadays this usually requires multi-country implementations by large teams of medical academics, so as to facilitate later global regulatory approvals. Increasingly it is open to questions how many of the articles on drug and related treatment regimes appearing in medical journals have actually been written at all by the university hospital doctors named as authors. Big pharma companies increasingly employ specialist firms (medical communication agencies), staffed with ranks of PhD-qualified writers and editors. The writers receive the raw data from drugs trials and fashion them into the required 3,000 words format for medical journals, and highly skilled specialist editors then ensure publication in the most prestigious journals feasible - including getting material translated into different languages and tailoring it to fit different journal styles and requirements across countries. Writers and editors also prepare the academics' high-powered presentations for conferences and accompanying dissemination materials. And corporate staff plus agency writers will accompany the medics involved to conferences to garner reactions and counter any criticisms. A typical big pharma multi-national will have its medical communication agency maintain a vast database of tens or hundreds of different articles and review articles and notes that are ongoing at any one time. Yet the papers in questions will appear under the names of a wide variety of medical academics, who will often do little more than read, sign off and possibly amend the work at the final writing and submission stages.

This extreme example of academic research being absorbed into and transformed by economic and governmental pressures is, of course, highly unusual. But it serves to highlight the strength, depth and apparently ineluctable nature of the many forces that have increased the complexity of the impacts interface in the last two decades. However lamentable or even repugnant some of these developments may be, academics and universities must recognise that these social processes are not going to become less complex over time. We review in below whether there are things that universities can themselves do to foster 'disintermediation' processes ('cutting out the middle man') analogous to the digital disintermediation processes in private sector commerce. But here we close by stressing the strong casual reasons that lie behind a more complex and articulated impacts interface, and the importance of universities and academics working with a differentiated and realistic notion of what influence they can acquire by working in tandem with interface organizations above, and what they can hope to achieve directly or working alone.

5.4 How far do academics and researchers undertake activities likely to generate external impacts?

Recent investigations of how far university researchers engage in impacts-related work and interventions has often been conducted under the rather tendentious label of 'knowledge transfer' activities (often shortened to KT, or KTE for KT exchange). The problem here is that there is a presumption that 'knowledge' sits in the university sector or is generated solely or pre-eminently in higher education institutions before being shipped across to external sectors of society. Yet our discussion above stresses instead that the impacts interface involves interactions and two-way flows of communication. For instance, when a business poses a specific problem that generates successful applied scholarship or academic research, there is no sense in which 'knowledge transfer' is one-way. Instead, across the impacts interface knowledge of different kinds flows both ways.

With this caveat in mind, it is none the less very useful to survey the existing evidence, which mainly derives from asking academics in surveys to itemise their recent activities that bear most closely on achieving external impacts or 'knowledge transfer'. Figure 5.7 shows data drawn from two surveys undertaken by researchers in Cambridge, with different samples of UK academics, spread across all disciplines, but with a larger sample size in 2009 than in 2008. The earlier survey also covered a set of disciplines that was more science and technology orientated, whereas the later survey's sample was more carefully drawn so as to represent all disciplines. The information here is self-reported and is a fairly limited measure, since an activity is counted once for each respondent whether it occurs once in the relevant period ('the last three years') or many times. It is clear that the absolute values of self-reported activity vary considerably across the two surveys, being appreciably higher in most key respects in the 2008 survey. None the less, what seems reasonably consistent across the two surveys are the comparisons within each dataset of the relative frequency of reported impacts-generating activities.

Figure 5.7: Knowledge transfer activities reported by a sample of UK academics in 2008 and 2009 surveys

Knowledge transfer practice	% academics involved 2009	% academics involved 2008	type of academic activity
Attending conferences	87	56	general
Informal advice to business	57	35	application
External lectures	65	34	application
Networks	67	32	integration
Joint publication	46	26	application
Advisory boards	38	22	service
Student projects/placements	33	20	renewal
External visits		19	application
Formed/run consultancy	14	18	application
Contract research	37	18	application
Undertaken consultancy	43	17	application
Been involved in consortia	35	17	application
Joint research	49	17	application
Post-course placements	na	14	renewal
Prototyping and testing	10	na	application
Patenting	7	12	application
Licensed research	5	10	application
Standards forum	31	10	application
Spin out companies	4	7	discovery application
Enterprise education	6	4	renewal application /
External secondment	10	3	application

Sources: Abreu et al. (2009) for column 2. Ulrichson, 2009, for column 3, survey of academics stratified by university departments. N = 1,175
Key: business/economic sphere in yellow

The most widely undertaken activities likely to generate external impacts involve informal advice to businesses, along with lectures, networking, contract work, student placements, joint publications with external personnel and consultancy. These are all areas where the social sciences in Britain are represented quite comparably with science and technology disciplines. Engineering areas show the greatest involvement in the STEM disciplines and business schools and economics the highest levels of engagement in the social sciences. However, some other areas are much more confined to STEM disciplines, especially applying for patents (which occurs only rarely in the social sciences and not at all in the humanities), licensing technologies, forming spin-out companies and being involved in consortia.

In Figure 5.7 we have also sought to post-code each kind of external involvement in terms of the seven main kinds of academic activity discussed above (that is, discovery, integration, application and renewal at single-discipline level, and bridging scholarship, university integration and academic service at the cross-disciplinary level). The available information here is very limited, confined to the detailed wording of the prompt items used, plus the overall 'knowledge transfer' orientation of the survey design and general wording. Thus it is not surprising that the codings that can be confidently made post hoc focus on applied research. In addition, there are a few teaching-related elements falling within the 'renewal' stream, and some isolated items where 'discovery' and 'academic service' are clearly involved.

Focusing on the social sciences more specifically Figure 5.8 shows a different kind of information, provided by an e-survey that was completed by 370 social science and humanities academics in mid 2008. This was not based on a pre-set sample but on free responses to a questionnaire posted on the British Academy website and circulated to UK learned societies, with questions asking respondents to assess the actual and potential external impacts of their discipline across business and the economy, public policy, civil society and public debates and cultural areas, and impacts on science and technology. Respondents were also asked to code their responses on a seven point scale and to add additional qualitative comments explaining or amplifying their answers, which were frequently completed in some detail. The pattern of responses shows clearly that social scientists believed that their impact on public policy to be highest, followed by civil society and then contributing to public debates and culture. However, the more that academics classified their discipline area as overlapping the social sciences and humanities, or as only in the humanities, the less confident they were of impacts on public policy and the more they located their key influence in contributions to public debates and culture. None of the groupings were confident of their impacts on business and the economy (although social scientists were more so) and all of them rated their influence with scientists and technologists inside universities as lower than those with external sectors. These evaluations are interesting in showing how far academics themselves judge the intensity of their impacts and the extent of as yet unrealized but potential impacts. In general the British Academy responses suggest that only around one in six of academics responding across these disciplines took a 'purist' view opposed to their disciplines seeking to expand or maximize their impacts.

Figure 5.8: How UK social scientists perceived the actual and potential external impacts of their discipline on areas of society, in 2008

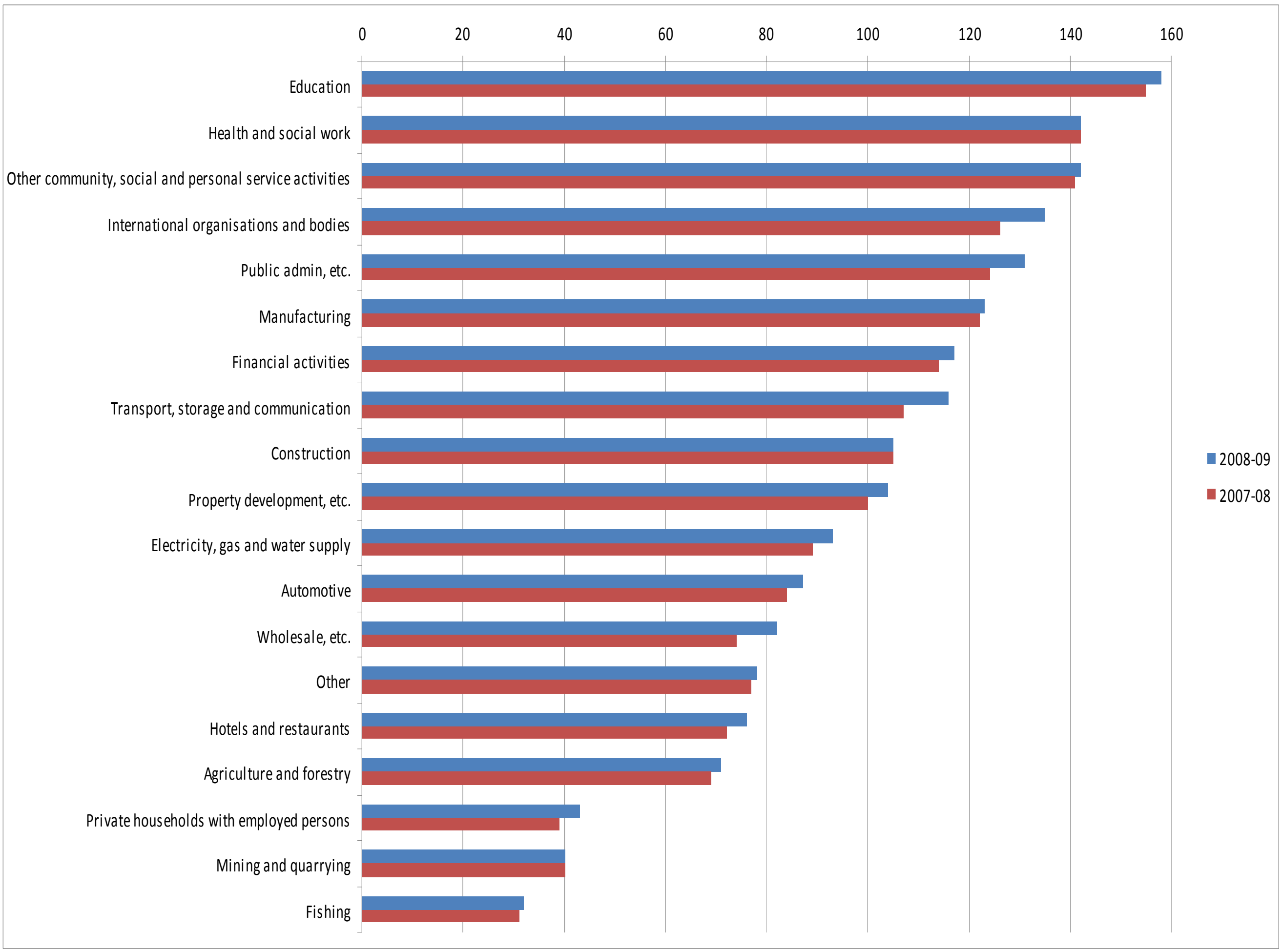
Area of external impacts	Level of impact	**Social scientists only**	**Academics spanning social sciences and humanities**	**All respondents (including academics across all social science and humanities)**
Public policy	Actual	4.6	3.6	3.4
	Potential	*6.0*	*5.5*	*5.1*
Civil society	Actual	4.5	4.1	4.1
	Potential	*5.6*	*5.3*	*5.1*
Public debates and culture	Actual	3.9	5.0	4.6
	Potential	*5.4*	*5.9*	*5.6*
Economy and business	Actual	3.6	3.1	3.0
	Potential	*4.7*	*4.0*	*3.8*
Science and technology	Actual	3.1	3.4	2.9
	Potential	*4.5*	*4.1*	*3.9*

Source: LSE Public Policy Group (2008, p. 67). Online survey of HSS academics on the British Academy website, conducted in 2008. Respondents were self-selected and recruited via the Academy website and via emails from humanities and social sciences learned societies. They were asked to give scores on a 7 point scale, where 7 = highest influence, and 1 = lowest influence.

Numbers of respondents: Humanities N = 150, Social Sciences N = 124, Mixed Disciplines N = 102.

A third useful data source is a survey of universities conducted by the funding council (HEFCE) which asked them to identify the economic sectors that they most commonly worked with. Figure 5.9 below shows that the highest number reported interacting with other educational institutions but that the next highest groupings all related to public policy in one form or another, covering interactions with the NHS, local social services, international organizations and public administration (mainly local government and central government). Each of these public policy interactions were more common than links to manufacturing, which were almost overtaken by links to financial services. However, it is clear that the large bulk of linkages in Figure 5.9 are to the different parts of the private sector. The three limitations on this data are also worth bearing in mind though – the survey was a corporate one sent to university administrations, the linkages are self-reported, and they are not quantified, so that comparisons of significance are tricky.

Figure 5.9: Number of UK universities reporting interactions with particular sectors



Source: HEFCE Higher Education Business Community Interaction survey 2009.

However, the same UK survey also gathered data on a range of specifically business-facing linkages formed by universities, shown in Figure 5.10.

Figure 5.10: Key forms of University and Business Interactions in the UK, 2007-9

	2007-08	2008-09	Change	% Change
Collaborative research (£000s)	697,030	731,734	34,704	5
Contract research				
Total number of contracts	27,051	28,111	1,060	4
Total value of contracts (£000s)	834,627	937,373	102,746	11
Consultancy				
Total number of contracts	64,292	64,025	-267	0
Total income (£000s)	334,768	331,541	-3,227	-1
of which, number with SMEs	22,802	20,596	-2,206	-11
number with large business	10,499	10,360	-139	-1
Patents				
Number of new patent applications	1,898	2,097	199	9
Number of patents granted in year	590	653	63	10
Intellectual property income				
Total revenues (£000s)	66,271	124,368	58,097	47
Total costs (£000s)	21,003	27,794	6,791	24
Spin-off companies				
Number created	2,223	2,289	66	3
Estimated external investment received (£000s)	89,497	154,451	64,954	42

Source: HEFCE Higher Education Business Community Interaction survey 2009.

The scale of the income and activity generated by academic-business interactions is clearly impressive, and although the statistics only cover three years some areas of interaction clearly increased considerably in this period. For instance, in areas dominated by the STEM disciplines, revenues bought in by intellectual property work grew by just under 50 per cent and income received for spin-out companies increased by just over 40 per cent in this period. By contrast, consultancy incomes (where social sciences play a larger role) were static.

Summary

1. Generating impact within single academic disciplines is a complex process encompassing not only 'discovery' but also integration, application, and professional renewal; each of which impart significant demands on an academic's time.

2. Academic work is highly siloed into disciplines while societal problems are multi-dimensional. Bridging scholarship across disciplines, promoting integration at the university level, and engaging in academic and professional service are some ways in which academics' work can better reach and influence wider society.

3. The 'impacts interface' describes how in advanced societies intermediaries such as consultancies, think tanks, the media, and other organisational bodies aggregate, distil and re-package trends in academic research for clients and other actors in the private sector, government, and civil society.

4. Academics giving informal advice to businesses, along with lectures, networking, contract work, student placements, joint publications and consultancy are the most widely undertaken activities likely to generate external impacts.

Chapter 6

Is there an impacts gap from academic work to external impacts? How might it have arisen? How might it be reduced?

When governments invest public money in higher education research, and even more so when businesses, foundations or charities directly fund academic outputs, academics often see the difficulties in recording or demonstrating positive social outcomes as an inhibitor of future funding. Academic outputs can generate specific numbers of citations and be evaluated for quality in other ways. But the looming 'So what?' and 'What next?' questions tend to go mostly unanswered. Researchers applying for new funding sometimes get driven by crude government or business demands into concocting dubiously plausible claims about the social, business or public policy outcomes that have followed from their work. This straining of credibility characteristically takes the form of researchers or universities 'credit-claiming' in multi-causal contexts where the research involved was perhaps only a tiny element of a complex pattern of far wider influences. This tends to devalue the reputation of research and to debase the coinage of 'impact' claims behind a mixture of university public-relations-speak, general hype and over-claiming, exacerbated by inadequately documented 'case studies' of influence.

These sorts of developments feed a general pattern of complaint from government and businesses that:

(a) there is a wide *impacts gap* between research being completed and published and its being recognized or achieving any external impacts beyond the university sector itself; and

(b) there is an even wider *outcomes (or wider consequences) gap* between research being registered or used in some way by non-university actors and its then having any visible effect on how these other actors behave or decide to act.

In this chapter we review and address some of the difficulties that people have in mind when they discuss an 'impacts gap', and how this gap might arise in terms of the supply of research by academics, and the demand for research from business, government or civil society. The 'impacts gap' label is often used also to cover what we have described as the 'outcomes gap' above, and so we say a little about this extra dimension of the problem. However, our focus here remains solidly on achieving external impacts (defined as occasions of influence) and not on trying to trace the social consequence or outcomes of such impacts.

If there is indeed an impacts problem in UK higher education research, and in the social sciences particularly, it is worth examining what could be the causes of the problem before looking at possible remedies. We have identified five potential kinds of impact gap resulting from: demand and supply mismatchs; insufficient incentives problems; poor mutual understanding and communication; cultural mismatch problems; and a problem of weak social networks and social capital.

6.1 Demand and supply mismatches

A quick way to get to grips with the possible supply and demand problem for research impact is to consider that 85 per cent of the UK economy is based around the service sector yet 84 per cent of research funding flows into the STEM disciplines, covering all the physical sciences. Some social scientists argue that politicians in the UK and US especially are overly pre-occupied with an outdated model of 'science' that focuses disproportionately on research areas most linked to manufacturing and technology industries. In the UK the charge is that political elites (in alliance with traditionally powerful sectors of manufacturing industry) are trying to use research funding to create an economy that we don't actually have, resulting in a surplus of science and technology expertise that can't be possibly be absorbed by the country's small manufacturing base (Howard Davies quoted in Clements, 2010). And in most OECD countries there is a similar potential problem in matching up how governments allocate research funding support and the economic importance of different sectors.

However, there are also clearly some important problems in looking for any one-to-one linkage between discipline groupings and particular parts of the economy. Some US research administrators argue that the apparently almost complete hegemony of the STEM disciplines in US government support for research is deceptive, because it fails to recognize that much of this funding total goes into what they term 'human-dominated systems'. This concept covers areas like medical sciences, information technology and engineering, where there are close connections between the applied physical sciences and the development of social processes, including many vital services sector processes. They also argue that in these areas physical science or technology innovations often lie at the root of new industrial developments and the success of new service products. For example, the rise of Google was founded on a mathematical algorithm for ranking web pages, and innovations in the web-based handling of networks and rich media lay behind the rise of Facebook (which now includes 500 million people worldwide).

It is not feasible to fully separate out the 'human-dominated systems' parts of economies or research funding in these numbers, but we have been able to distinguish the importance of the medical sector in GDP numbers (here including both medical manufacturing and pharmaceuticals and medical services delivery via hospitals and family doctors) and in government research funding. A lesser problem is that although economic data cover agriculture separately from other primary sector industries (such as mining or forestry), we can only pick out agricultural research funding, but not research focusing on the other parts of the primary sector. Within these limits, it seems clear that across OECD countries, government funding for the STEM disciplines is always more important than the share of manufacturing in their economies, as Figure 6.1 shows for six major countries.

Yet the Figure also shows that different countries have quite varying policies in how they support different discipline groups. The US has the strongest mismatch between the dominant importance of services in its economy and a research support policy that awards only one in every 16 dollars to the social sciences, and effectively none at all to the humanities. Sweden and Germany show a more 'moderate' pattern, with services accounting for around 70 per cent of their economies, and around a fifth of total research support flowing to the social sciences and humanities (SSH). Australia is quite similar, but ups the SSH share to a quarter. Finally, two countries, Japan and Spain, allocate appreciably more resources to research support for SSH disciplines, a third in Japan's case and nearly two fifths in Spain.

Figure 6.1: The match-up between the economic importance of sectors in the economy (share of GDP) and the share of government research funding across discipline groups in six major OECD countries

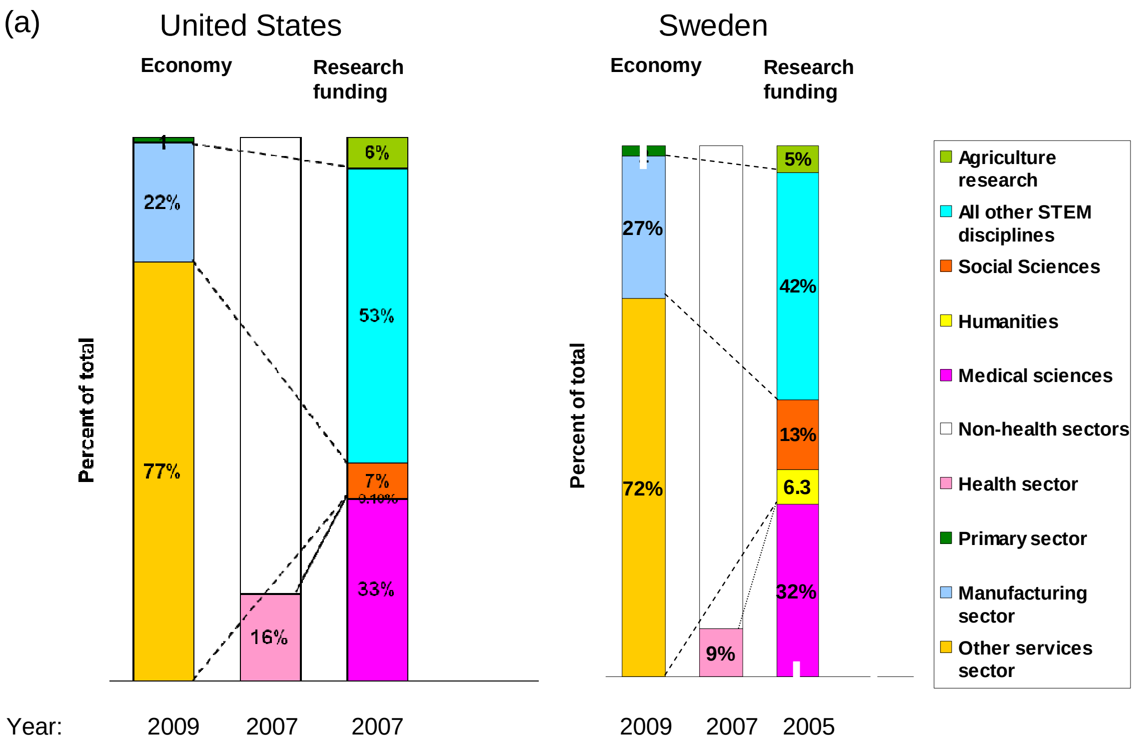
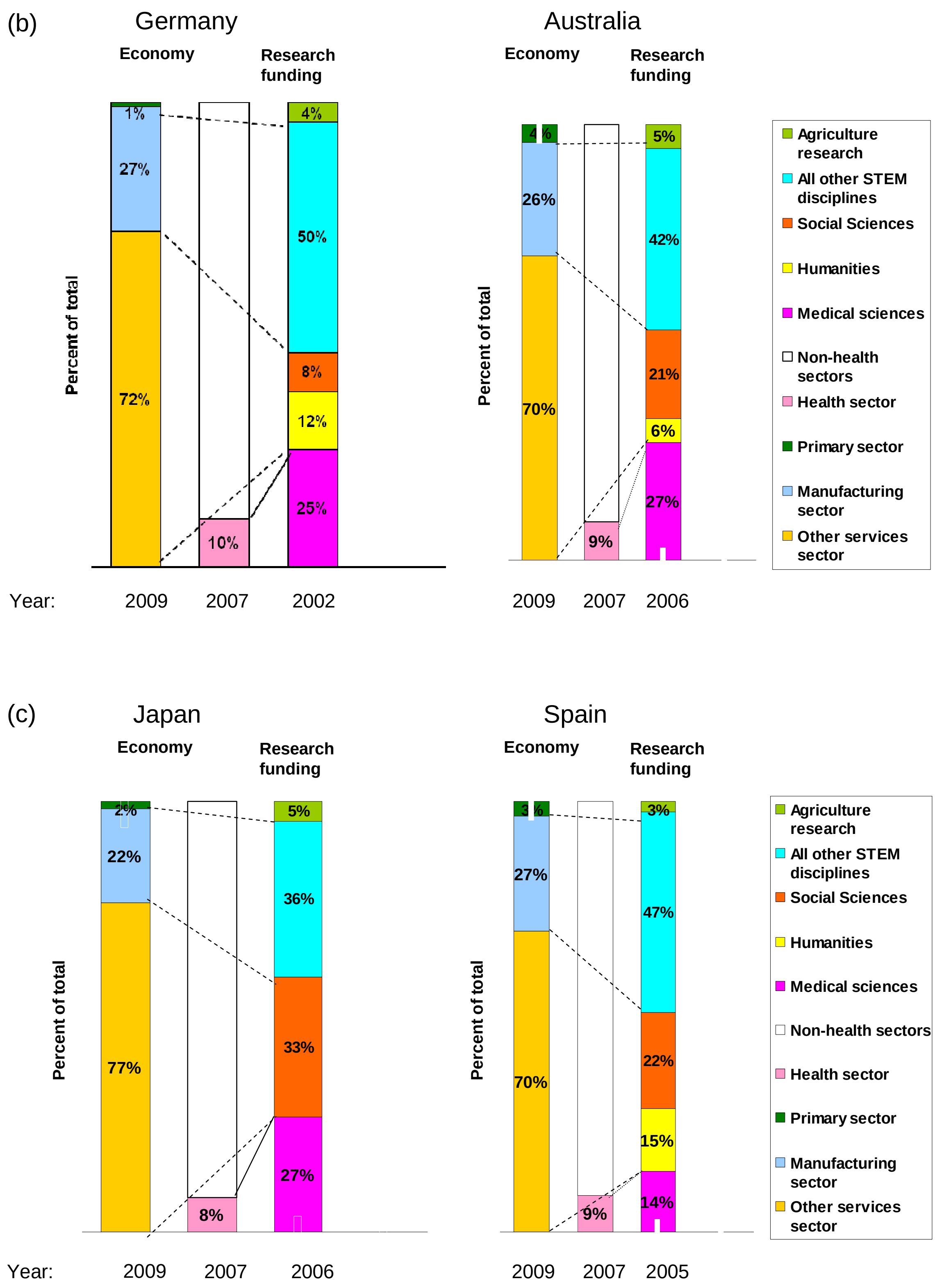


Figure 6.1 continued



Sources: GDP data taken from the CIA, *World Factbook*. Government research funding data are taken from National Science Foundation (2010), Table 4-16.

Notes: On the X axis of this chart, outputs are shown as a percentage of GDP using the output (or % contribution) approach; by contrast, the 'health sector' number shows health expenditures as a percentage of GDP, so are not strictly comparable.
The breakdown of research funding shows the expenditures going to broad discipline groups as a percentage of all government science/research funding. It is important to note that the GDP sectoral percentages refer to billions of dollars, whereas the government research funding percentages refer to much smaller sums.

Part of the explanation for these variations rests on how far countries' research funding supports medical sciences in relation to their medical industries sector. Sweden gives the medical sciences a share of research funding that is almost four times the importance of the medical industries in their economy, while Japan and Australia give three times as much support. By contrast, Germany and the US only give twice as much funding support to medical sciences as the economic importance of medical industries. Lastly, Spain actually gives less support to medical sciences than the medical industries share of their economy.

A further source of variation in funding support allocations may reflect the fact that non-English speaking countries assign more resources to language-related support. In Spain the humanities get more than a seventh of research support, and in Germany an eighth. Although we cannot break the SSH share down in the same way for Japan, it seems clear that the humanities share there is also considerable. However, Sweden only gives one sixteenth of its research support to humanities disciplines.

Figure 6.2 shows some general outcomes of mismatches between the supply-side of research from higher education institutions (hereafter HEIs) and the demand-side from business, government, or civil society. The incentives for both sets of actors are influenced by the various costs and benefits involved, which can be either concentrated or dispersed. Ideally, of course, HEIs would undertake impactful research at no net cost to respond to highly concentrated demand, the situation shown in cell 5 of the table. Some engineering and IT departments, and perhaps as many business schools, have long-term relationships with major corporations that perhaps approximate this setting. More often than not, however, we see that the universities face high costs (in terms of times and resources) in producing externally-facing outputs without the certainty that external actors are genuinely interested in considering (or paying for) their labour (as in cell 2). Even when producing research impact is cost-free and benefits academics and HEIs, having dispersed benefits on the demand side results in a sub-optimal situation of academics chasing business people, government agencies, or other actors with potential solutions to real-life problems (as in cell 6).

Where producing research impact represents costs for academics on the supply side - which is more often the case - it is even more important that research funding responds to existing demand patterns as opposed to politically desired demand. Even where benefits to the demand side are concentrated, if there are dispersed costs (and benefits) on the supply side this will result in a strong demand but weak supply (as in cell 3). When benefits to the demand side and costs to the supply side are both concentrated HEIs face a risk management problem which universities and academic research teams will respond to in different ways (as in cell 1). Where the benefits to the demand side are more dispersed (as in cells 2 and 4) there is an opportunity for government research policy changes to create specific incentives to encourage the take-up of research (e.g. via tax concessions for companies giving universities research funding or making joint investments). But the most fundamental decision for governments to make will still focus on accurately understanding the potential of their economy to productively absorb different types of research, and maintaining a balance of research funding across discipline groups that responds to that.

Figure 6.2: The impact of demand and supply mismatches for research

		Benefits of research to demand side actors (in business, government or civil society) Concentrated	Dispersed
Costs and benefits to the academic supply side (that is researchers and universities) of doing research	Concentrated costs	1. Some strong demand but risky for universities to enter the area	2. Disciplines avoid applied research in the face of only weak, fragmented or episodic demand
	Dispersed costs (and benefits)	3. Strong demand but weak supply incentives	4. Weak or fragmented demand, and only patchy supply from universities with weak incentives
	No net costs, instead net benefits for universities	5. Optimal (e.g. enduring engineering, IT or business school links with major corporations)	6. Academic solutions chasing reluctant adopters (e.g. arguably 'oversized' STEM disciplines in UK, with few outlets in a slender manufacturing base)

6.2 Insufficient incentives problems

A closely related explanation for the existence of any possible impacts gaps is that there are too few or too weak incentives, either for universities to undertake applied or potentially applicable research, or for businesses or government users to provide active, consistent demand and associated support for universities' applied efforts. Academics and researchers often lament that there are weak incentives inside universities or research institutes to undertake applied research. For instance, the Research Assessment Exercise in the UK was widely cited as incentivizing only pure research by academics and senior scientific civil servants. But it is also possible that the incentives for business or government to take up applied research are also weak. For instance, UK universities' engineering departments complain that they are frequently called in by small and medium-sized firms to sort out acute analytic problems, who tend to rely on such support being continuously available – yet these firms do little to generate any continuous engagement or funding support for engineering departments.

There are three problematic conjunctions possible here, and one optimized situation, shown in Figure 6.3.

In cell 1 there are poor incentives to undertake applied work in the university sector, but equally only fragmented, incoherent or weak or passive demand from business or government potential users. In cell 2 the demand side users are involved and intelligent customers for research, and back up this stance by offering resources or involvement, but universities and researchers are diffident or reluctant to get involved with applied or applicable research.

In cell 3, by contrast, universities and research labs invest in external-facing research (perhaps because they are incentivized to do so by specialist government research funding bodies), but then find many difficulties in interesting their presumptive or potential clients in business or inside mainstream government departments and agencies to use or engage with the research. For instance, STEM labs may find that the firms who could benefit from their research are in fact too small, too conservative, too inexpert or too lacking in venture capital to do so. Equally, government research bodies may make 'political' decisions to fund university research in fashionable or 'manufacturing-fetishism' areas that actually have little commercial potential, while neglecting other 'hidden innovations' with much greater business potential (Nesta, 2007).

Finally, in cell 4 there are strong and appropriate incentives for universities and research labs to focus on applied research, and there is active support and a ready market for well-evidenced ideas and solutions from businesses or public sector officials. Here incentives are adequate on both sides, there is no conflict of interest and business or government engagement with researchers is close, continuous and constructive. Universities and their clients face only less serious coordination and information-sharing challenges in aligning their research priorities.

Figure 6.3: Insufficient incentives problems

		Incentives for business or government to take up applied research are:		*Symptoms – researchers say:*
		Weak	**Strong**	
Incentives in universities for academics to undertake applied research are:	**Weak**	1. Is this a problem? Slough of lethargy on both sides	2. Universities view applied research as inferior or unrewarding	*'Given academic values and my university's incentives, it is not worth my while getting involved in applied work'*
	Strong	3. Universities beaver away, but clients are too small, too conservative, or too 'political' to take up well-evidenced ideas	4. Few difficulties, or only co-ordination problems. No conflict of interests	*'Applied research and contacts with our end-users generate new ideas for basic research and help keep our teaching curriculum "state of the art"'.*
Symptoms – business or government senior personnel say:		*'We have a recurrent "Invented here, applied overseas" problem'*	*'Thanks to constant scanning, we knew in good time that X could be profitable/ important'*	

Historically government research funding bodies have been preoccupied with insufficient incentives problems, especially in the relationships between university STEM research and high tech manufacturing industries. By strengthening the incentives for business to invest in more blue skies research governments have repeatedly tried to 'pick winners' and to influence the specific sectoral shape and content of high tech industrial growth. At the same time funding bodies in recent decades have increased the pressure on academics seeking research grants to show that they will disseminate findings, commercialize research wherever feasible and work co-operatively with industry to realize economic and societal benefits. Financial incentives (tax concessions to businesses and grant 'conditionalities' for researchers) plus regulatory measures (such as requiring industrial engagement of researchers) can both have extensive influence in readjusting both demand-side and supply-side incentives. Within universities and research labs, changes in funding arrangements tend to be highly effective (critics say 'over-effective') in accomplishing a re-prioritisation of applied research and better communication of existing research outputs, which could stimulate demand. But other more enduring aspects of academic culture may still create difficulties.

6.3 Poor mutual understanding and communication

Even if there is a reasonable match between the university supply of and external demands for potentially applicable academic research, and even if incentive structures are appropriate for encouraging collaboration between academia and external actors, there may still be an *understanding* or *communication* gap between academics and potential clients. Potential clients often voice the view that researchers speak in academic jargon, think in silos, define problems in unnecessarily esoteric ways and cannot extend their specialized knowledge to effectively embrace joined-up problems. Pro-business commentators often add that insulted academics do not empathize with the difficulties and struggles of firms operating in relentlessly competitive environments.

Meanwhile academics tend to believe that business or government clients are content to remain stubbornly ignorant of relevant theoretical knowledge, which they under-value along with pure research, and do not understand which disciplines do what or the basics of the academic division of labour. Researchers in the social sciences and humanities told us in research for the British Academy that government officials are potentially better informed and educated, but they are often hamstrung by political interventions and a governmental short-termism that makes attention to academic work highly episodic, selective and hence partial. 'Evidence-based' policy-making in this perspective can too easily degenerate into a short-term search by officials for some expedient academic 'cover', boosting the legitimacy for what ministers or top policy-makers want to do anyway.

These critical perceptions might partly be explained in terms of each side's lack of information about the other actors. Potential clients in business or government actually face high information costs in understanding the specialized world of university research, in entering and acting as 'intelligent customers' in the often weakly defined 'markets' for applied research. Government officials have to stick to academics who are supportive of current government policy or come up with convenient-messages, rather than using the researchers with the most expertise. Business users may lack the expertise or intellectual firepower necessary to assess what universities have on offer, and hence can make poor choices of supplier – especially true for smaller firms or those operating in radically new markets. If external actors have gone directly to a particular academic in the past and found the research unhelpful or irrelevant, this could trigger a 'market for lemons' perception – the bad driving out the good - that is accentuated by the proliferation of consultancies, think tanks and other 'impacts interface' actors.

However, there are ground for optimism that problems of understanding or communication can be alleviated, if not immediately, at least in the reasonably short term. The physical sciences have greatly improved their standards of internal and external professional communication over the last twenty years and changed the public understanding of science, as witnessed by the growing demand for well-written and authoritative 'popular science' books. The social sciences could learn a great deal from the physical sciences, not least in how to better write, design and explain evidence in books, articles and more generalist publications. Other general remedies could be to improve professional communication in academia, especially in the social sciences, and to increase funding for dissemination and communication in research support. Universities and research labs could also sponsor more frequent interaction events that bring academics and external audiences into closer and more extended or continuous contact, a goal of the UK's Higher Education Innovation Fund (HEIF).

In the physical sciences there are often much stronger incentives underlying efforts at better communication. Venture capitalists are driven financially to maintain surveillance even of technically difficult areas if they may potentially produce large-benefit innovations or help create competitive advantage (as the 'Eureka' model of research as discovery suggests). Similarly it is a truism that university and industry synergies lie behind some of the most dynamic industrial zones located in the hinterland of major university cities and clusters, like the concentration of medical innovators around Boston, Silicon

Valley in California (close to Stanford), or the science parks around Cambridge. These strong synergies sustained by spinout companies have few parallels in the social sciences, but in capital cities (like Washington, Brussels (for EU institutions) and London) and other centres of government decision-making university social sciences often have greater chances of developing applied research for government, trade associations, unions, charities or lobbying clients that are in some ways parallel the STEM-discipline industrial zones concentration.

6.4 Cultural mismatch problems

> ‘Shortly before graduating [from Cambridge]with a first [in physics], John Browne relates [how]… : “I was made to understand vividly that business was not held in high regard." He was with friends, walking through Cambridge when they met one of his professors, the eminent physicist Brian Pippard. "He turned to his colleague and said, 'This is Browne. He is going to be a captain of industry. Isn't that amusing?'" ’ (Bennett, 2010)

A more pessimistic take on communication and understanding problems is offered by analyses that stress much wider, deeper-rooted and hard-to-change cultural differences between academics and universities on the one hand, and their potential clients or patrons in government or business. If we look at the preference structure of academics and the ‘prestige structure’ of universities most observers would agree that for a majority of academics non-applicable (i.e. academic-only) research is ranked as more valuable or preferable than pure applicable research and both of these are ranked above immediately applicable research in most academics’ value systems.

Group:	Preference ranking
Most academics	1. ‘Pure’ and non-applicable research > 2. ‘Pure’ but applicable research > 3. Immediately applicable research

Most business leaders, government officials and elected politicians	1. Immediately applicable research > 2. 'Pure' but applicable research > 3. Pure and non-applicable research

Meanwhile, potential clients in business and governments have their own preference structure when it comes to research, in which mediated and immediately applicable outputs (produced by think tanks or consultancies) tends to win out over applicable research from academics. Pure and non-applicable is clearly seen to be of little or no interest to business. And despite the repeated evidence that some critical scientific, mathematical or technological discoveries have long-lagged effects, there is a recurrent tendency for government funding bodies to see pure or 'theory-driven' research as of academic interest only. Such work is perhaps supported in the interests of maintaining disciplinary balance or coverage, or perhaps helping to attract a good mix of academic talent from overseas, but otherwise it is viewed as paying few dividends.

Working on different time scales can exaggerate this disconnect. While academics often work on long-term research projects, most UK and American businesses operate their investments on two to three-year timescales. (Some European major companies have longer-term investment planning.) Government is similarly short on time and in the UK policy-making often suffers from a rapid turnover of ministers. For instance, under a Labour government, the UK's central government ministry covering social security (the Department of Work and Pensions) had 10 different secretaries of state in the eight years from 2001 and 2010, each of whom had different detailed policies from his or her predecessors (Mottram, 2007).

Keeping the government and business informed on what relevant research is available requires that universities and researchers have quick turn-around times for queries, responding to research requests or bidding for business or government contracts. This time pressure is particularly acute when so many other 'ideas aggregators' (such as think tanks, management consultants and technology consultants) are keen to fill the gap. These partly 'parasitic' intermediaries may also wish to keep clients dumb once hooked, in order to boost their proprietary roles.

The results of long-standing cultural gaps are often that academics and clients meet but can talk past each other instead of collaborating meaningfully. Fostering long-run cultural convergence requires efforts to produce long-term, serial encounters between university researchers and their potential external customers and network partners in business or government. Initiatives here include the coalition government in the UK (in an otherwise austere public spending climate) establishing 'an elite network of Technology and Innovation Centres, based on international models such as the Fraunhofer Institutes in Germany' (BIS, 2010, p. 43). Aimed at high tech industries, government funding is used here to sustain the growth of long-run awareness and relationships between business and research labs at a regional scale. Programmes for academic exchanges with business or government agencies, and for professional staffs in these sectors to spend time in university settings, are strongly developed in the physical sciences in the UK, and are growing but still small-scale in the social sciences. Exchanges need to be two-way to maximise their potential benefits. Along with the continuous modification of business or civil service cultures produced by new intakes of graduates and professional staffs, and the impact of their feedback on universities themselves, it should be feasible to mitigate even long-standing cultural problems and related organizational difficulties in co-operating over a reasonable time period (say a decade) – as the growth of applied research in the UK in the 2000s strongly suggests.

6.5 Weak social networks and social capital

A final approach to understanding an impacts gap looks at the nature of the linkages between academia and impact targets. In the social sciences the interactions between universities and external 'customers' for their research are generally not the type of regular, durable, binding, reciprocal, transitive, developmental or cumulative relationships that foster cooperation and mutual benefit. Although we have reviewed evidence above of reasonably extensive contacts and linkages between researchers and business or government professional staffs, they none the less tend to be isolated, episodic, inconsistent, and unbalanced or non-reciprocal. The social sciences see more 'spot market' exchanges than 'relational contracting'.

For example, a company may solicit academic input for a short period (which requires investment from the academic or university) but then the company involved effectively 'drops' the supplier immediately afterwards – perhaps because of changes of personnel (which are often frequent at an executive level in major business corporations), or perhaps because the pressing exigencies of competition require a change of strategy or priorities. The same company may then come back to the same research team later, but unless future 'client' needs are reliably signalled in advanced it may be almost impossible for the university or research lab involved to guess what work may be needed in the future.

Things are somewhat more stable in government, but there again policy 'fashions' and political priorities often change in unpredictable ways. The alternation of political parties in power, allied with constraints on officials' ability to co-operate with politically 'unwelcome' research, may quite often create disruptive agenda changes that undermine effective research development. For instance, six weeks before the 1997 general election an LSE research team funded by the ESRC (a government funding body) sought co-operation from the Home Office (the relevant government department) on devising questions for an election survey researching voters' attitudes to alternative PR electoral systems, pledged in the manifestos of the Labour and Liberal Democrat parties. Officials responded that they could not provide any inputs at all, because it was not the then Conservative ministers' belief that any reform of the voting system was needed. Labour duly won a landslide at the 1997 election and embarked on four major voting system reforms, one of which the research team had not fully anticipated and so did not have specific questions included in the survey.

In the physical sciences and STEM disciplines, greater continuity in research relationships can be built up over time, where firms and research labs (and sometimes foundations or charities and labs) cement relationships that can last for long periods and encompass serial instances of co-operation. Sustaining the transactions involved is not cost-free, and uncertainties and risks produced by normal business cycles and competitive changes always require to be managed. It is only in cases where buoyantly funded government funding bodies invest long-term in creating major facilities or capabilities over long periods (say 10 to 15 years) that lower transaction costs, almost purely bureaucratic collaborations can be sustained.

In large or centralized countries (like the US and UK), strong competition between multiple universities for scarce patronage can produce a significant wastage of resources on seeking comparative advantages or negating other research centres progress. What economists term 'influence costs' (the costs of lobbying, campaigning, manoeuvring and seeking power) may rise and consume some of the national research budget. By contrast, small states in world markets (such as the Scandinavian countries) have 'group jeopardy' pressures that tend to foster greater pulling together in the national interest. Small countries with distinct languages characteristically confront shortages of talent and expertise in many niches and market segments where large country companies or governments enjoy the luxury of choosing between alternative university suppliers.

Adjusting the quality of relationships with external 'customers' is not easy to accomplish, either in the stronger networks from industry to the STEM disciplines or the more fragmentary and fluctuating networks in the social sciences. But it is possible to encourage the sort of virtuous cycles of academic/client relationships seen more often in Scandinavia and smaller countries and to pursue strategies that tend to foster an accumulation of 'social capital' and inter-sectoral trust relationships over the longer term. Pooling government or business funding of research around regionally-based development outcomes appears to have constructive results. Other possible remedies could include incentivising companies (and perhaps government agencies with consistent research needs) to donate more to universities and creating funding opportunities for joint university-client applications. De-siloing research funding pots and encouraging more joined-up scholarship could also help.

Government funders could also do more to get over their 'rule of law'/fair treatment hang-ups about picking 'winners' from the university sector. But they could also require institutions getting larger or more secure funding to much more clearly foster and lead inter-university cooperation at regional and local levels, rather than behaving in a purely self-interested and competitive-aggrandizing fashion. Assessing smaller countries' research progress and capabilities cross-nationally, even in a middle sized nation like the UK, tends to be helpful in forcing universities and research labs to take a more accurate view of their capabilities in a globalizing economy and polity.

If there is an impacts gap it has many different aspects and the character of any overall disjuncture in developing applicable research is likely to vary sharply across different disciplines, countries and time periods. Yet government funding bodies often seek to apply single-tool remedies rather homogeneously across all areas of the university sector, both in the name of fairness and of administrative simplification. The UK government's blanket proposal to shift research funding support to one where all disciplines receive 25 per cent of available funding on the basis of demonstrating their 'impacts' is a signal case in point. Premised (apparently) on the view that there is an acute incentives gap and under-supply of applied research by British universities, such blanket moves are highly unlikely to be effective. Such a gross re-targeting of funding will no doubt produce a substantial and visible diversion of efforts into finance-attracting research pathways. But if the UK's impacts gap in fact stems in part from demand and supply mismatches, poor communications, or cultural discontinuities, the additional applied research that is summoned into life may not be either effective or good quality, nor likely to generate favourable consequences for the economy or public polity. A more granular view of the problem, and more differentiated strategies addressing the different causal origins of impacts gaps, would clearly be more likely to help produce better tailored and more effective new research.

Summary

1. Government officials and businesses often complain of an 'impact gap' where academic research fails to fulfil its potential to influence wider societal development. (The wider issue of 'outcome gaps' is too difficult to track or discuss due to the multi-causal nature of social life and the weak existing evidence base about such issues).

2. If there is an impacts gap it could be attributed to:

   - demand and supply mismatches;
   - insufficient incentives problems;
   - poor mutual understanding and communication;
   - cultural mismatch problems; or
   - weak social networks and social capital.

3. Solutions to effectively combat an impacts gap cannot be homogenous across all academic disciplines and sectors, but rather should be innovative and tailored to the demonstrated problem.

Chapter 7

Understanding how researchers achieve external impacts

Most of the interesting and least studied topics in social science lie at the intersection between different disciplines (or different sub-fields), straddling the boundaries of academic silos often uncomfortably. And so it is with the study of academics and university researchers' impacts beyond the academy itself, which has been approached somewhat tangentially by sociologists, philosophers of science, education researchers, knowledge management and organizational learning experts, economists and technology-transfer researchers, network analysts, and political scientists and public management specialists. But it would not yet be true to say that any of these sub-fields have really *tackled* the topic of systematically studying how, why, and where the full range of academics and researchers in higher education have impacts on business and markets, public policy-makers and government, media and cultural organizations, and civil society and NGOs. The different approaches adopted have all tended to have other slants and preoccupations.

We seek to rectify the resulting gaps in our knowledge by collating evidence and arguments from these different sub-fields to address these twin questions. Theoretically, what factors might we expect to make a difference to academics achieving external impacts? And what evidence can be brought to bear upon these expectations, especially for the social sciences? We aim to build up a plausible picture of the bases of individual-level factors that tend to enhance the external influence of university researchers. In Chapter 8 we apply these individual-level insights to understanding how different levels of academic organizations acquire and develop their external impacts.

7.1 Theoretical discussion

A key starting point for considering how academics and researchers achieve external impacts has to start squarely with the problem that different authors and schools of thought within disciplines often take significantly different views of how to understand the physical and social worlds, and of what evidence is relevant and credible for societal actors seeking to determine their own strategies and developments, or to settle public policy decisions. In most fields of university research it is normal to find something approaching at least a three way split of viewpoints into:

- a dominant *conventional wisdom*, which tends to monopolize the 'commanding heights' in each academic profession. This 'mainstream' view always faces difficulties and puzzles in parts of its field where phenomena cannot be well explained. Accordingly it is constantly challenged by
- one or more new and *'insurgent' positions*, offering a different and novel approach that may over time be worn down or incorporated into the mainstream, or may alternatively succeed in defining an alternative paradigm. In addition,
- the mainstream view may also be critiqued by at least one past conventional wisdom or *'legacy' position*, whose exponents are still fighting rearguard or guerrilla actions on behalf of their now less fashionable approach.

Given this kind of contestation of what counts as 'knowledge', 'science' or 'evidence', it is commonly a fairly complex problem for governments, businesses, media organizations and civil society organizations to determine what counts as credible expertise.

In their influential book *Rethinking Expertise* (2007) Harry Collins and Robert Evans stress that even in the physical sciences knowledge relevant for societal decision-making is communicated rather slowly and incompletely. For instance, they formulate two key rules for the deploying of scientific expertise into public policy making:

The *fifty year rule*: Scientific disputes take a long time to reach consensus, and thus there is not much scientific consensus about.

The *velocity rule*: Because of the fifty year rule, the speed of political decision-making is usually faster than the development of scientific consensus (2007).

In a careful and nuanced discussion of how scientific and technical expertise can none the less be legitimately and constructively engaged with societal decision-making, Collins and Evans suggest that three bottom-line criteria are important – the *credentials* of a claimed expert, their *experience* in the applied field, and their *track record* of operating in this field or making relevant practical interventions already.

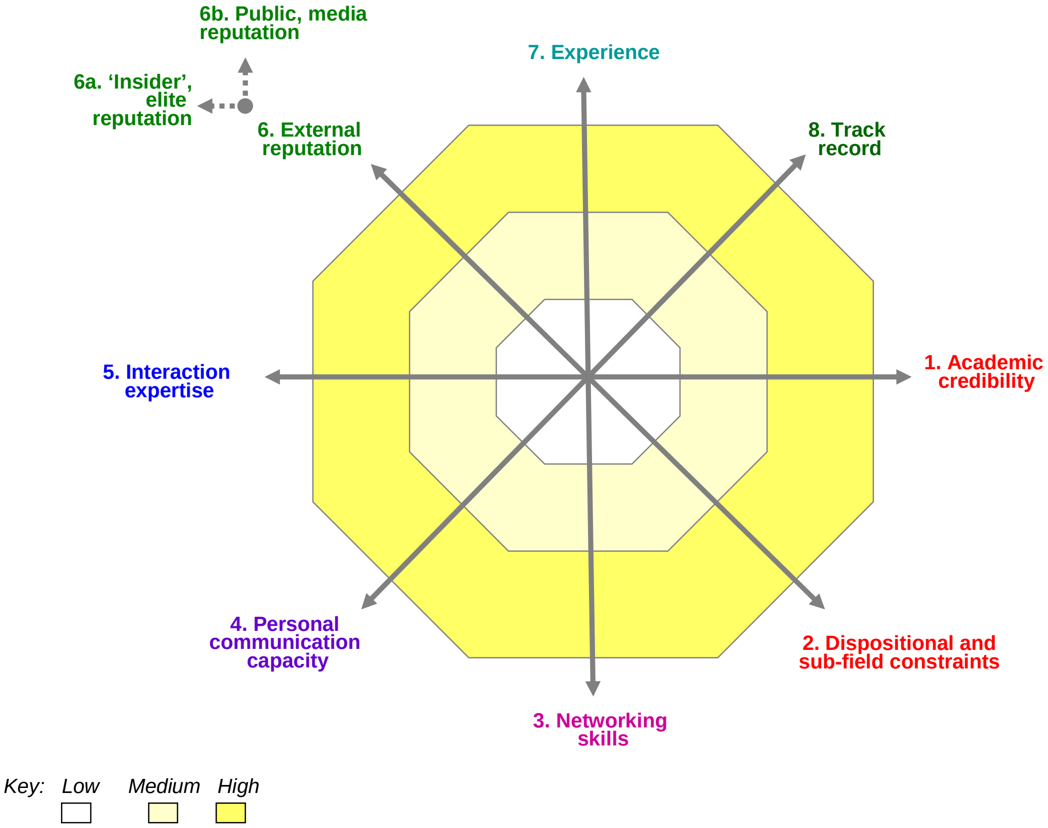
Other observers take a more sanguine view of consensus in the sciences. Another Collins, the sociologist of philosophy Randall Collins, famously argued that the STEM disciplines have far greater consensus-generating processes than the social sciences and consequently can sustain a more rapidly advancing knowledge frontier. 'High-Consensus, Rapid-Discovery Science' as found in the physical sciences began to develop around 1600 onwards and it subsequently grew at an accelerating pace over time. In Collins' view all the STEM disciplines were distinguished by 'high consensus on what counts as secure knowledge and rapid-discovery of a train of new results'. A 'law of small numbers' in intellectual disputes still operates in these disciplines (see Collins, 1998), limiting the number of top-rank theories or competing approaches to between two and seven positions. But in science disagreements occur *only* at the research frontier itself, not in the disciplinary foundations:

> It is the existence of the rapid discovery research front that makes consensus possible on old results. When scientists have confidence they have a reliable method of discovery, they are attracted by the greater payoff in moving to a new problem than in continuing to expound old positions. The research forefront upstages all older controversies in the struggle for attention. Because the field is moving rapidly, prestige goes to the group associated with a lineage of innovations, which carries the implicit promise of being able to produce still further discoveries in the future. Rapid discovery and consensus are part of the same complex; what makes something regarded as a discovery rather than as a phenomenon subject to multiple interpretations is that it soon passes into the realm of consensus, and that depends upon the social motivation to move onward to fresh phenomena (Collins, 1994: 160-1).

By contrast, in fields without assured rapid discovery methods, Randall Collins argues that not only is debate between alternative positions pervasive, but academic prestige can often best be built by debating or reinterpreting 'fundamentals', 'the cannon' or classic texts over (and over) again. In this light, the social sciences certainly have recurring-but-moving-on debates. For instance, modern theories of the state in political science, spreading into sociology, philosophy and political economy also, have remained recognizably connected across two decades of modern debates (compare Dryzek and Dunleavy, 2009 with Dunleavy and O'Leary, 1987).

Our approach to understanding the potential influences bearing upon academics or university researchers achieving external influence is summarized in Figure 7.1, another multi-dimensional or 'balanced scorecard' type of framework, this time involving eight main factors (one of which might in turn be further sub-divided). Starting at the centre right position we move in a clockwise direction through these eight dimensions, commenting on each in turn.

Figure 7.1: A typology of key factors shaping the external influence of academics and university researchers



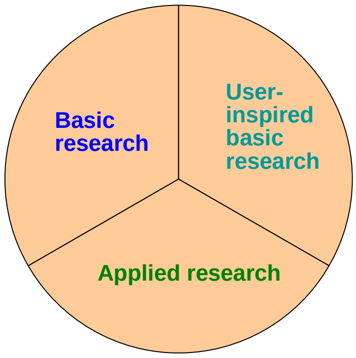
1. Academic credibility is always likely to be of key importance to university researchers achieving external impacts, without in any way being determinate. Academics with dodgy or slender academic credentials can sometime achieve influence with external interests. But for most university researchers who do so having a *bona fide* academic record of publications and advancement is an important necessary (but far from sufficient) condition. Other things being equal, academics from more prestigious research universities will tend to be accorded more attention, and have their opinions sought more frequently. And (again *ceteris paribus*) academics with many publications, strong citations and consequently large h-scores can be expected to have more credibility than those with slender portfolios of publications that have been accorded little notice. Of course these are very large *ceteris paribus* clauses, and among the things that are in practice highly unlikely to be equal are the seven other factors in Figure 1.

2. Dispositional and sub-field constraints govern whether academics or researchers are actively trying or wanting to achieve external impacts, and how likely it is that they can do so given the areas in which they work. In an open survey for the British Academy in 2008 (that is, not a sample survey) we found that only around one in six respondents across the social sciences and humanities expressed 'purist' opposition to their discipline seeking great public policy, business or civil society impacts. This slender piece of evidence meshes with the trend for applied work to grow in many STEM disciplines, and with the strong rate of applied work and engagement with outside interests reviewed in more recent times. It is possible therefore that the strong public expression of 'purist' opposition to greater emphasis upon impacts and applied academic work may be misleading, the product of entrenched 'traditions' in academic discourse that have in the past been a majority view, and continue to be differentially expressed for 'bandwagon' reasons – energizing people who are anti-impacts and creating a 'spiral of silence' for people favouring more applied work. On the other hand, there have been well-documented instances of more purist views of academe, as in the petition submitted to HEFCE by the University and College Union in early 2010, which attracted 13,000 signatures (*THE*, 3 December 2009).

A key influence upon how much academics are willing to engage with achieving external impacts concerns the type of field that they work in. A well-known three-fold distinction was coined by Donald Stokes and is shown in Figure 7.2. It is widely used to get academics and researchers to situate their own work in surveys, as primarily involving three categories:

- *Basic research* is driven by academic and theory-based concerns and has no direct application (or potential for direct application) – it is 'performed without thought of practical ends' (Geiger, 1993: 186, quoting Bush, 1945).

Figure 7.2: The three-way division of research



- *User-inspired basic research* is blue-skies, theory-driven, and concerns fundamentals, but none the less responds to the interests of (potential later) users. In Alan T. Waterman's (1965) terms, this is 'basic research which may be termed "mission-orientated" – that is, which is aimed at helping to solve some practical problem' (quoted Stokes, 1997: 62). And
- *Applied research* is directly driven by a concern to answer users' problems and to improve existing in-use technologies or social arrangements.

Clearly the more academics fall into the first category, the less likely they are to want to or in practice to have any chance of achieving external impacts. Academics doing applied research are likely on the other hand to have a much easier time achieving some external impacts, and stronger career incentives to do so. Academics in the middle category here may less regularly see opportunities for achieving external impacts. But on the other hand because they are doing basic research, the consequence of their achieving success in their work may be more far-reaching – for instance, in STEM disciplines they might achieve more basic patents.

3. Networking skills (or accomplishments) are the first of a series of personal qualities and characteristics that are likely to extensively condition which academics achieve external impacts and how much influence they come to exert. If business people, government officials, media journalists or NGO staff are to take advice from an academic expert, quote their arguments or employ them as consultants, they must first know that they exist. In commercial areas, work enquiries, RFPs (requests for proposals) or ITTs (invitations to tender) will characteristically be sent only to academic organizations that are on lists of potentially tenderers. Getting on such lists requires in itself considerable amounts of information and undertaking preparatory work.

The principal reasons why academics are not asked to advise external bodies when they have highly relevant and credible expertise is that the potential recipient of advice has no idea that they exist and would confront pretty high costs n becoming better informed (often as short notice). By contrast, well-networked academics or university research teams know early on about business contracts, government research and policy initiatives, charity or NGO campaigns, and media foci (like anniversaries). They are plugged in so that they can be easily asked or consulted, and they are well prepared to respond to typically very short deadlines for business or government contracts, and to complete the also typically onerous 'box-filling' elements of tendering for contracts, applying for grants or participating in extended public consultation processes.

The obvious difficulty here is that top academics are busy people, and (as Oscar Wilde remarked of socialism) networking seems to take too many evenings. Making and keeping contacts characteristically involves a lot of scarce time. In addition, the personal characteristics of successful academics and top researchers may not match well with the capabilities needed in successful networkers – such as personal confidence, extrovertness and an outgoing personality, and an ability to communicate complex ideas simply.

These considerations also arise in other contexts, however. For instance, the people who come up with radically new inventions or innovations in business are often presented as unconventional 'geeks' or 'mad inventor' types, whose approach makes business executives ('suits') doubt or reject their capabilities and ideas. Some business advice texts accordingly recommend two-person teams (dyads) of innovators allied with a more managerial and conventionally dressed/operating 'product champion', an executive whose task is to be the public face of the innovation, smoothing its path through approvals and finance-raising and providing assurance for investors that business plans will be adhered to. Pairings of academic experts with 'product champions' are not widely observed in the university sector, but within research teams the development of specialized managerial roles such as 'grants entrepreneur' may parallel those of product champions in business. More generally senior professors often provide 'ballast' for work that will actually be carried through by younger (often more 'geeky', aka technically capable) research staff.

4. The personal communication capacity of academics is an additional, if often closely related, personal quality. Research results and implications never speak for themselves, and they can only rarely be communicated to elite level personnel by producing a report and assuming that it will be read. Academics who are going to have external impacts must normally be good public speakers, adept at presenting a case for funding, responding to questions, expounding complex issues in a clear way, explaining scientific or technical concepts to a 'lay' audience, and through their personal appearance communicating informed conviction, confidence in their analysis and academic credibility. These 'political' qualities are not universally available in academia, although the requirements of teaching, professional communication at conferences etc and increasing elements of formal training during doctoral work or induction as a junior lecturer all tend to give many academics a considerable starting proficiency in this area.

5. Interaction expertise is a different personal quality stressed by Collins and Evans (2007). It denotes the ability to get on constructively with other people while worked in extended organizational teams. The importance of collective 'tacit knowledge' means that translating academic knowledge to apply to particular problems and organizational situations is a far from straightforward business. It is a common experience in science that a laboratory or research team may have considerable initial difficulties in appreciating what exactly the techniques being used in a different lab are, or how to replicate them in a different setting. This key barrier can very frequently only be overcome by visiting the other research lab in person, thereby absorbing a huge amount of contextual and 'organizational culture' information that remains latent in other forms of communication.

Similarly, it requires an empathetic competence on the part of scientists, academics or researchers to appreciate how their knowledge or expertise needs to be adapted in order to apply it in particular different organizational settings, such as those of businesses and government. In the social sciences there is always a huge 'culture shock' in considering how knowledge can be translated into a business, governmental or organization in civil society – which largely explains the increasing emphasis in professional educations upon internships, capstone projects and consultancies undertaken directly for external organizations. The same importance of tacit knowledge largely underpins the value of secondment schemes providing academics and researchers with opportunities to work directly in external organizations.

6. External reputation is the first of a complex but important set of conditions that may lie largely outside the control of academics or university researchers themselves. An external reputation operates essentially at two different levels, the first and most important being the insider, elite, or 'client' reputation (flow 6a in Figure 7.1). Closely related to networking, one group of people who can build a successful insider reputation are distinguished scientists or stellar academics with effective public personas and strong elite connections established through their university, or academic service on quasi-governmental agencies, consultative committees or professional bodies - and sometimes though party political linkages. At a top board level a few major corporations sometimes forge links with very senior outside business academics, economists or scientists, using them to internalize either a 'challenge' function to their strategic or technical thinking, or to enhance their long-term horizon-scanning capacity.

In addition, however, there is a much larger group of academics with lesser reputations but who have good contacts with business managers or government officials. They acquire insider reputations as 'sound' judges of technical issues, or 'a safe pair of hands' for handling more 'middle-levels of power' issues – usually because the researchers involved are assiduous networkers, convincing personal communicators, and in personality terms they are ready and able to work co-operatively and to deliver reliably on deadlines. At this level in government, *not* being linked to a political party, and *not* having expressed prior strong views on key issues in the media or in NGO campaigns, are often seen by officials as indicative of neutrality, trustworthiness on secrecy concerns and lower public or insider risk. Someone like this is the kind of dispassionate expert who will not 'bite back' or make a fuss if their views acquire a different political spin in practice, or if work they are commissioned to undertake is left of the shelf when things do not work out as initially planned. In business, less well-known university researchers who can work closely within a company 'line', or whose views mesh most closely with other aspects of company strategy or carry conviction with board members or top managers may be preferred as academic partners over more distinguished but less tractable academics. In short, ministers, government officials and business managers often pick researchers to link with because their views are congenial, rather than because they are impartially 'the best' experts for a job, especially where the commission involved is a low-profile one.

Once academics or researchers become involved with external organizations outside higher education there are clearly additional risks for them, which arise from the linkage not going well, from their advice being ignored, or from a 'guilt by association' effect linking them with controversial government or business policies. Universities and academic professions are critical environments and senior researchers are naturally sensitive to the implications of attracting criticism from colleagues or the student body, especially if developments occur that might seem to call into challenge the 'scientific' or impartial credentials of their work. Quite often senior academics will turn down possible commissions, contracts or associations with businesses or government departments because they foresee potential negative impacts upon their academic reputations, or believe that the linkage will not work and hence could risk damaging their existing, often carefully nurtured 'insider' reputation.

Equally government-academia relationships are sometimes marked by crises where a researcher's intellectual integrity clashes with a 'policy' line being maintained despite the current evidence-base by a minister or politician. For instance, in the autumn of 2009 the Home Secretary in the UK's Labour government (Alan Johnson) dismissed a medical professor (David Nutt) from the chairmanship of a misuse of drugs advisory body, saying that had 'lost confidence' in the quality of his advice. Nutt's offence was to publish a listing of the dangerousness of drugs that classified cannabis as not causing harm (and hence as legalizable), whereas the government's official classification placed it in the second most dangerous category (BBC News, 2009). Nutt accused the government of not heeding the medical evidence-base in its approach, and his dismissal caused further resignations by academics.

The other key dimension of external reputation is the public or media profile of a researcher (flow 6b in Figure 7.1). Businesses often wish to bring in external experts from universities partly for technical reasons (in which case their technical credentials need to be strong) and/or for quasi-marketing reasons – for instance, to produce a generally favourable 'thinkpiece' or a piece of research that can be useful in high-end marketing terms. Similarly government agencies sometimes commission research for purely technical assurance that their strategies or policies are appropriate or will work, but more often they also want a public report or document that strengthens the legitimacy of the policy choices made. This legitimacy-seeking by government occurs both in long-run, slow changing situations, and often in crises also. Most government advice documents in advanced industrial countries either have to be published directly, or may be force-released under freedom of information (FOI) legislation or other open-book government policies. 'Transparency' requirements are typically strong in technical policy areas. So in both business and government it is often of the first importance that the technical or professional credibility of academic experts is unchallenged, and that they do not have a prior public or media reputation that is any way adverse.

Entering the public policy arenas can often significantly increase the risks that researchers and their universities confront. During 2009, for example, a climate change research centre at the University of East Anglia closely linked with the science of global warming became the target for hostile criticism from warming-denier groups on the political right. By requesting copies of emails between researchers under FOI legislation, the global warming-deniers were able to assemble a dossier of emails in which scientists could be represented as selectively accentuating favourable evidence and seeking to suppress discordant evidence. The resulting storm of controversy significantly damaged public confidence in the science of global warming and required two different university and scientific reports to clear up.

On a much smaller scale, the political risks of public engagement for academics were illustrated by the case of a professor of health policy who gave evidence to a parliamentary Select Committee critical of the use of Private Finance Initiative (PFI) contracts in building new contracts. However, one of the MPs on the committee had been briefed by critics in the PFI industry about the professor's work, and used the oral evidence hearing to impugn its academic credibility – a public criticism to which of course the academic involved had no form of redress (since conventional libel laws etc do not apply in such top legislature settings).

Normally perhaps, with very packed political and media agendas it might seem highly unlikely that a particular academic's research can become the focus of any sustained attention. However, the expansion of the specialist media close to public policy, business or professional practice has considerably expanded the scope of what may now get attention. The development of 'attack blogs', whose authors quite often extend into criticism of university research being used or cited by opponents, has particularly enlarged the chances of academic work attracting sustained 'political' criticism that goes well beyond the scope of conventional academic criticism.

One of the further implications here is worth bringing out explicitly, namely that academics who frequently write directly for the media as columnists or regular commentators, along with major public intellectuals in the French mode, are typically debarred from many 'academic' roles with government or business. They may already have a fixed public reputation on one side of an argument or another that more or less debars them from being seen as technically or academically impartial. They may in addition be seen professionally in the US or UK as a 'pop academic', for it is certainly true that the time demands of regular media (or even specialist media) contributions are often very severe, leaving the person involved little time for longer-term academic work, let alone other forms of external impact. Of course there are prominent exceptions to this rule, such as the economist Paul Krugman, who has combined ceaseless commentary for the US media with winning the Nobel Prize in economics (for his earlier work), or the palaeontologist Stephen Jay Gould, whose *Scientific American* column was influential over many years, but who still found the time to compose his magnum opus, *The Structure of Evolutionary Theory* (2002) in the closing years of his life. But on the whole, for most academics, the demands of maintaining a constant media presence tends to be a barrier factor to other forms of external engagement.

7. Experience is the penultimate dimension in Figure 7.1 and in Collins and Evans' terms it denotes the accumulation of practical knowledge of the area of scientific endeavour and of its practical applications or extensions. Experience especially is a relevant criterion for governments seeking expert advice about the interpretation of risk factors and of what is known and unknown, especially of what the US Defense Secretary Donald Rumsfeld once famously characterized as 'known unknowns' and 'unknown unknowns'. Experience also covers the extent to which an academic or researcher has existing knowledge of what is required in working with a particular client or 'customer' – especially the organizational know-how to operate successfully outside their academic comfort zone, with its famously long and elastic deadlines, conditional judgements and regular conclusion asking for more evidence. Experience especially covers the ability of the expert to move (usually in interactions with others, for instance, in committee meetings) from technically known ground to broad judgements of possible risks and future developments.

Inherently the best way to acquire relevant experience is to have carried out an exactly similar role previously. The next most useful basis for judging an expert's experience is that they have previously carried out a parallel or analogous role, perhaps on a smaller scale, or perhaps in lower-level contexts that provide many clues and guide points for the current area. These considerations explain why governments especially tend to rely heavily on the same people to carry out successive expert roles. Indeed government agencies with extensive needs for academic advice (such as defence and scientific development funding bodies) regularly run a kind of *nomenclatura* system designed to 'bring on' a suitable range of researchers to fill these future slots when needed by giving them relevant experience. Academics who start down the route of extensive academic service may also tend to attract serial appointments from public bodies.

Business attitudes towards expert advice generally show a stronger focus on using young researchers and academics in the prime years of their creative flourishing. Venture capitalists especially may be interested in researchers with no experience at all, but with creative potential, innovative thinking and new ideas. They may also be interested in angles of analysis that can help firms achieve a (usually temporary) comparative edge over competitors, again usually associated with younger researchers most in tune with modern methods. Hence especially innovative firms run on more *ad hoc* organizational lines may place little value on past experience, which they associate with being sucked into established organizations' ways of thinking or already-familiar technologies and approaches to problems. Pairings of innovators with more senior 'product champions' (that is, business-experienced people, or those with strong 'insider' status already) are also more common in innovative business areas (whereas in the public sector, outside experts are often expected to stand alone).

However, in broader business contexts and in more hierarchically organized firms the risk-reduction that follows from using outside researchers with experience is still considerably valued. A well-established way of combining it with the characteristic focus on innovation and on new techniques of analysis that confer a (brief) competitive advantage is to ground contacts with academic teams or research labs where the internal division of labour between senior, experienced academics and younger (more technically hot shot) researchers provides a strong form of collective tacit knowledge. Hence large corporations often wish to maintain contacts with STEM labs over relatively long terms, and to commission applied research from teams whose capabilities they know well.

8. A track record of previous successful work in exactly the area, or in analogous areas, goes beyond simple experience to offer concrete evidence that an academic or a research team has achieved something similar to the current task – whether produced a report or undertaken an analysis, or invented a procedure or technique (or conceivably a product) that is similar to solving the current problem. In Alvin Gouldner's view (1973) a track record of past success in the same or similar endeavours (like the survival rate of a surgeon or the win rate of a lawyer) is a much better basis for a lay person to make judgements about whether to trust an expert or not than simply looking at their credentials or totting up their experience. A track record is also highly reassuring for risk-averse government or business leaders committing substantial resources or envisaging a later requirement to publish outcomes or justify the spending undertaken.

Looking across all the dimensions in Figure 7.1, we can also identify some important overarching factors that bring some of the dimensions together into different clusters of potentially linked elements. In the first place, there are some *strongly age-related influences*, especially building up academic credentials (dimension 1), developing networking skills (3), acquiring an established external reputation with insiders (6a), and being able to point to relevant experience (7) and a track record (8) of past work – all of which take time and hence can rarely be done by newly appointed academics. It may also be that researchers in at least their 30s or 40s also have more interaction expertise (dimension 5) through committee experience in their university or undertaking academic service roles. However, it is also worth noting that some dimensions in Figure 7.1 are not age-based. More senior academics may be dispositionally less inclined to invest the time required to achieve external impacts, for instance, in undertaking media work. Nor are personal communication skills likely to be affected by age, while younger academics may have less of a constraining public reputation, without being known for fixed views or linked to political or corporate rivals. And as we noted above young researchers may be more in touch with forefront research techniques and analysis approaches valued by innovative businesses, especially in mathematical or technical areas.

Secondly, some dimensions in Figure 7.1 are more related to *external legitimacy considerations*, in cases where the involvement of an academic or researcher is seen as useful for building public confidence, or for strengthening the business, marketing or public policy case for pursuing a given course of action. Government officials or business managers choosing which academic researcher to ask to be involved may worry less about getting absolutely the top expert or the very best obtainable research or evidence, in favour of choosing someone with the right profile to present a case authentically and plausibly to the public and the media. Especially important, here are the overall fitness (note, not necessarily optimality) of the expert's academic reputation and credibility (dimension 1 in the Figure); the personal communication capabilities of the researcher in making speeches, fielding media questions or explaining findings in print (5); and the person's public reputation (6a).

It should go almost without saying that it is unlikely that any university researcher is going to perform highly on all the criteria in Figure 7.1 at the same time. Instead there are likely to be many different combinations of qualities that can generate external impacts, just as we noted in Chapter 3 above that there are many different formulae for career trajectories in academia, as different from each other as those of grant entrepreneurs, hub authors, obsessive researchers, 'pop' academics and senior teaching-orientated academics. Within the current state of knowledge about external impacts, there is no body of literature or argument that suggests how these combinations work a priori or on theoretical grounds, except to highlight an expectation of diversity. We move on in the next section to consider the available empirical evidence.

7.2 Empirical evidence

The PPG dataset provides a rare source for looking at some of the individual-level influences that may affect how many external impacts academics or researchers accumulate. Our approach here focused on the main Google search engine, and accordingly relies a good deal on the main Google algorithms and systems for screening out duplicate entries. We asked our coders to enter the names of each academic in the PPG dataset and to work their way through the web pages linked to them in the sequence that Google suggested, but this time filtering out all results that related to their academic impacts within the university system. (We also eliminated all entries relating to academic publications, from book or journal publishers, and all sales entries, from bookshops or web-aggregators.) We then collated information for the first 100 instances of external impacts related to that person. This rather laborious approach none the less generates high quality data about the electronic footprints left as a residue from academics' or researchers' external impacts. The Google ranking algorithms also filtered what got included in this partial census of each academic's external impacts.

Figure 7.3: Summary of external impacts mentions gathered for academics in the PPG dataset

Discipline	Mentions	% of all mentions	Academic rank	Mentions	% of all mentions
Economics	1616	24.5	*Lecturer*	2207	33.5
Geography	1515	23.0	*Senior Lecturer*	1608	24.4
Law	1123	17.0	*Professor*	2782	42.2
Political Science	1249	18.9	***Total***	**6597**	**100**
Sociology	1094	16.6			
Total	**6597**	**100**			

Note: Our main Google search method was to look for and record the first 100 references to an academic's or researcher's work made by external sources outside the university sector. Hence it is important to note that there is a maximum ceiling of 100 external references here. We covered somewhat more than 20 academics per discipline.

Our data covered just over 120 personnel across five disciplines, shown in Figure 7.3, and generated nearly 6,600 mentions of academics or their research by outside organizations, split fairly evenly across the disciplines. Professors generated most external impacts references, but not by much because our methods limited us to collecting only 100 references per person, a limit that most professors easily attained. Lecturers taken as a whole generated somewhat more references than senior lecturers, whose roles may be more inwards-facing or teaching orientated. However, Figure 7.4 shows that the median number of references per senior lecturer was slightly greater than for lecturers. Professors as a group had many more external impacts references than their more junior ranked colleagues – indeed half of professors achieved the full 100 mentions that we collected, compared with only the top quarter of lecturers and senior lecturers.

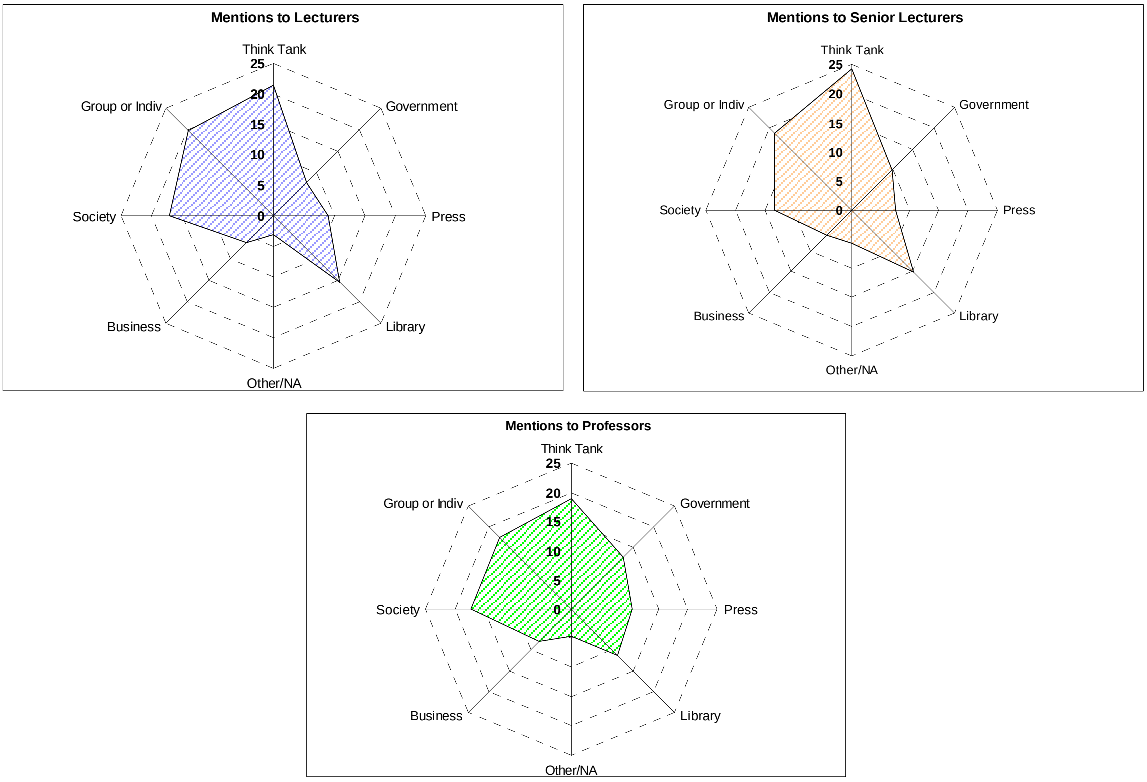
Figure 7.4: The number of citation by external sources for academics and researchers across academic ranks (for five social science disciplines in the PPG dataset)

	Maximum	Upper quartile	Median	Lower quartile	Minimum	Mean	Standard Deviation	*N*
Lecturers	100	100	28.5	5	0	43	41	*49*
Senior Lecturers	100	100	34	9	0	49	44	*35*
Professors	100	100	100		0	78	39	*36*

Notes: as for Figure 7.2.

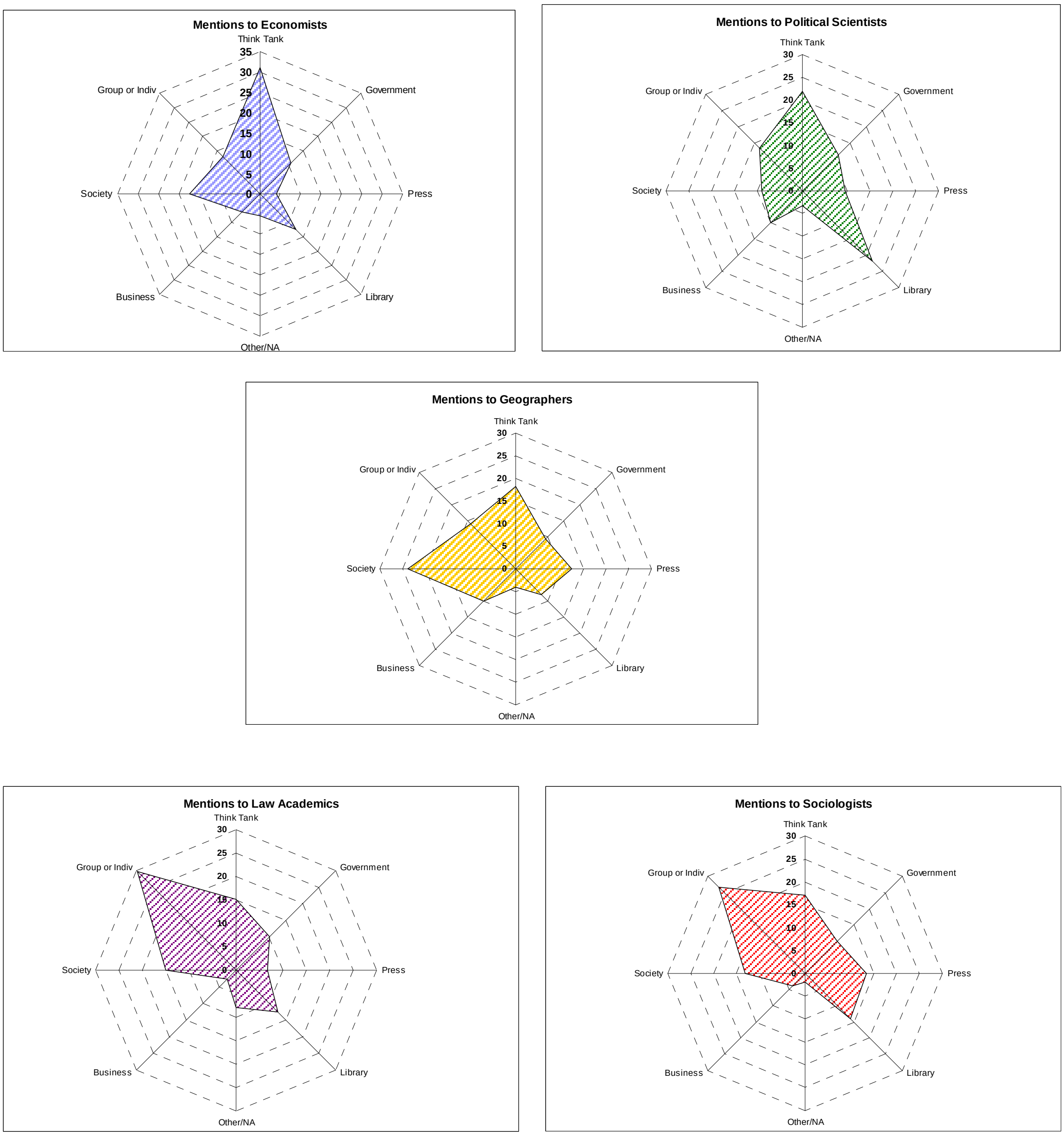
Turning to the nature of the external organizations referencing university researchers in the social sciences Figure 7.5 shows that for lecturers and senior lecturers the most common external source was think tanks, confirming the view of them in Chapter 6 as assiduous collators of university research and important ideas aggregators in the contemporary period. The second largest source of external impacts for these academics in these two ranks were interest groups, pressure groups, with other civil society organizations coming in at a closely similar level. Thus for lecturers and senior lecturers the main external impacts occur in sectors of society that are closest to their discipline and most interested in their line of research. Figure 7.5 shows that press and media interest was moderate but that impacts of government were slightly less, and impacts with business less again. Turning to professors, it is apparent that their pattern of external influences in Figure 7.5 is rather different. It appears more rounded because they attract somewhat higher proportions of their total references from government and from the press. Their references from business and diverse sources are also slightly raised compared to more junior staff.

Figure 7.5: Which kind of external sources referred to academics and researchers across academic ranks (for five social science disciplines in the PPG dataset)



Looking across the five disciplines included in the PPG dataset, Figure 7.6 shows that the largest source of external references to economists are think tanks, more so than for other disciplines, followed by civil society sources, interest groups and government. In fact, looking across all five social science disciplines in Figure 7.6, government regularly seems to account for slightly more than or closer to 10 per cent of external references (least for geographers). Perhaps somewhat unexpectedly, political scientists as a group attract most references from business, as well as interest groups, and less from civil society – but like economists they seem to influence think tanks most externally. Geographers have a completely different pattern, with much less influence upon think tanks and much greater direct civil society and the lowest rate of influence on interest groups of any of our disciplines. At the bottom of Figure 7.6 the patterns for both law academics and sociologists are surprisingly similar, with a strong dominance of civil society and interest group influences. Both have few business impacts, but law academics are mentioned somewhat more by government agencies and officials, while sociologists score somewhat higher press and media coverage.

Figure 7.6: Which kind of external sources referred to academics and researchers across five social science disciplines (in the PPG dataset)



A key question arsing from the first section of this chapter concerns how far the external impacts of social science academics can be shown to be correlated or not with their academic citations scores. Inherent in the previous analysis is the idea that academic credibility is only one of many different factors that shape external influence – hence we should expect to see a relatively low correlation between academic and external impacts. Across our complete set of 120 academics in the PPG dataset the correlation coefficient is in fact 0.42, significant at the 1 per cent level – so that academics who are cited more in the academic literatures in social sciences are also clearly cited more in Google references from non-academic actors. However, this correlation of course could run both ways – showing that university researchers with greater academic credibility also have more external influence; but also potentially suggesting that academics judged significant or influential external also attract extra academic citations.

Figure 7.7 shows that this linkage is weak for lecturers (whose academic publications are often restricted), strongest for senior lecturers and weak for professors – although this effect is almost certainly an artefact of our method here – since we impose a restrictive ceiling of 100 external references on all individuals in the dataset, a limit that half of the professors in our sample ran up against, creating a severely skewed and non-Gaussian distribution for this group. Turning to the linkages across disciplines shown in the second part of the Figure, the linkage between external influence and academic citations is strongest for academics in law and sociology, somewhat weaker for economists, and both much weaker and non-significant for the geographers and political scientists in our sample.

Figure 7.7: Correlation coefficients between cleaned academic citation scores and external actors citing influence, in PPG dataset

Seniority	Lecturer	Senior Lecturer	Professor
Correlation Coefficient	0.278	0.552	0.22
Significance level	>0.1	>0.01	Not significant
N	48	36	36

Discipline	Sociolog y	Law	Economics	Geography	Political Science
Correlation Coefficient	0.595	0.591	0.415	0.299	0.194
Significance level	> 0.01	> 0.05	> 0.05	Not significant	Not significant
N	24	24	24	24	24

Note: Our main Google search method was to look for and record the first 100 references to an academic's or researcher's work made by external sources outside the university sector. Hence it is important to note that there is a maximum ceiling of 100 external references here. We covered somewhat more than 20 academics per discipline.

7.3 Credit claiming for research

Using a screened version of main Google references seems to be an effective and increasingly relevant criterion for tracing external references, perhaps especially for the social sciences. It is interesting to briefly consider the behaviour of individual lead researchers in seeking to identify impacts. We draw on two analyses. The first covers an intensive analysis of 33 projects funded by the ESRC in political science where project lead researchers were asked to nominate five main stakeholders with an interest in the success of and outcomes from their project, and to indicate the degree of impact which they claimed at the end of the project (LSE Public Policy Group, 2007). Figure 7.8 shows the relationships between the outputs achieved by the project and the impacts claims made by researchers, and it is immediately apparent that there is no worthwhile or substantial pattern, with researchers in the top left hand quadrant seeming to over-claim in 'hype' mode, and those in the bottom right quadrant seeming to under-claim for impacts in a diffident or unperceptive mode.

Figure 7.8: Impacts claimed by project lead researchers for their projects, graphed against the number of references achieved

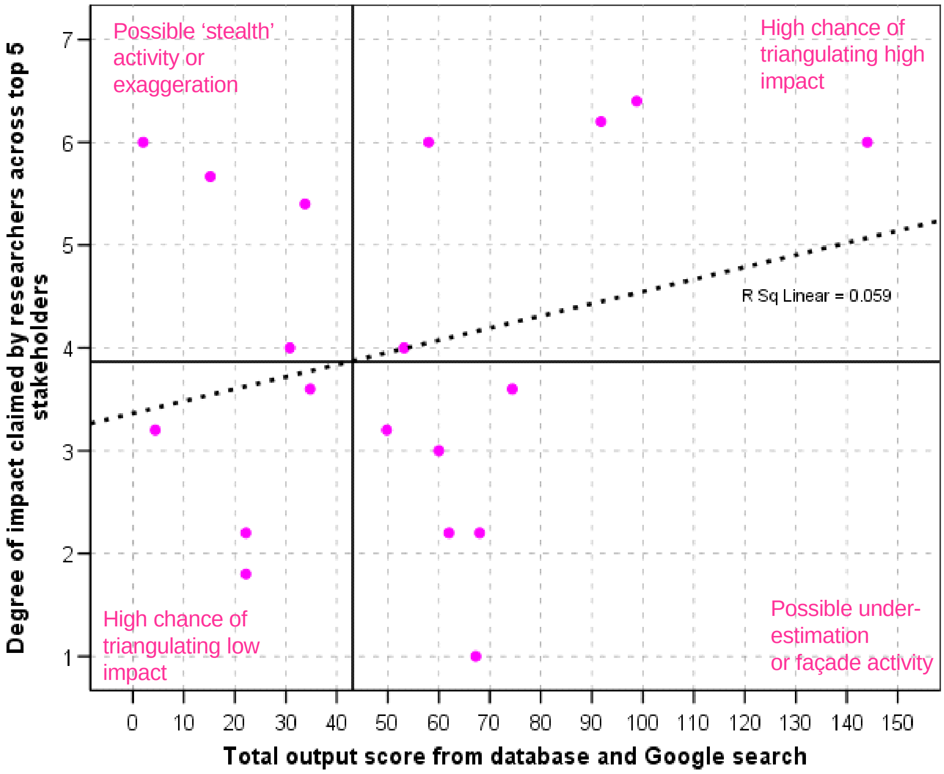
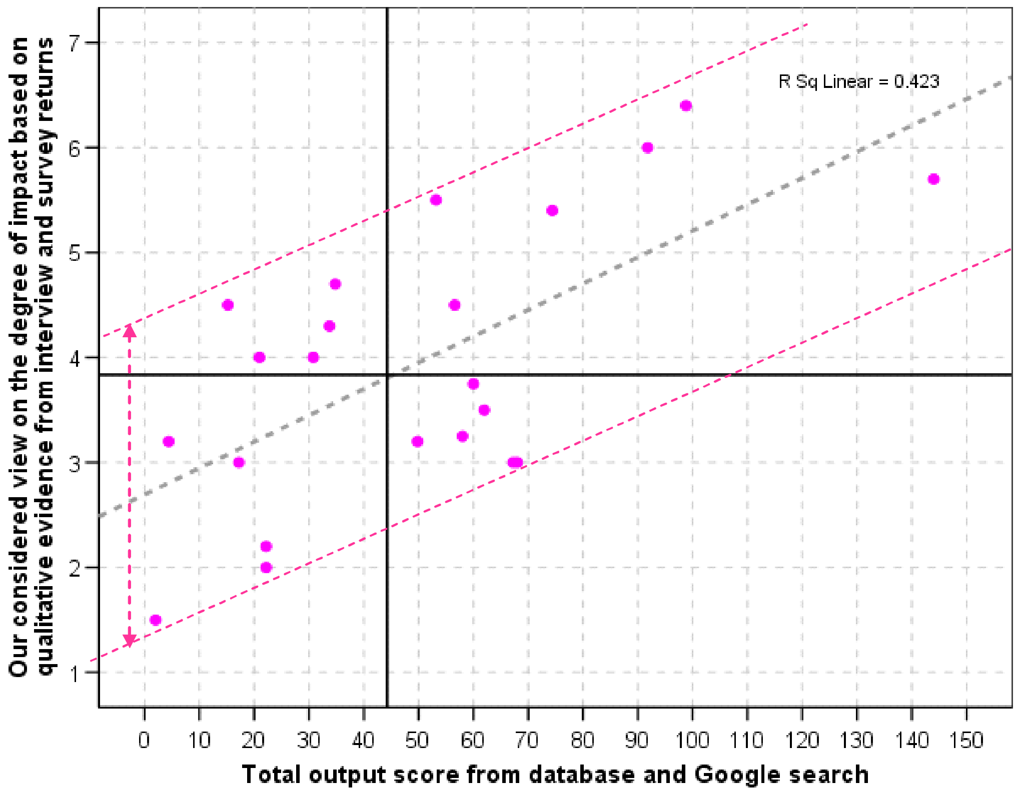


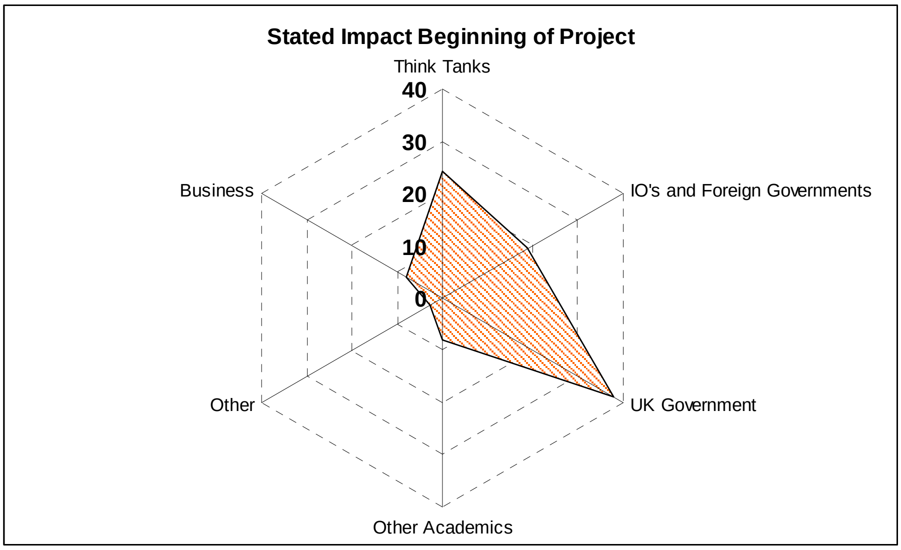
Figure 7.9: Revised degree of association between our overall moderated impact evaluation and our impact score from our unobtrusive web search

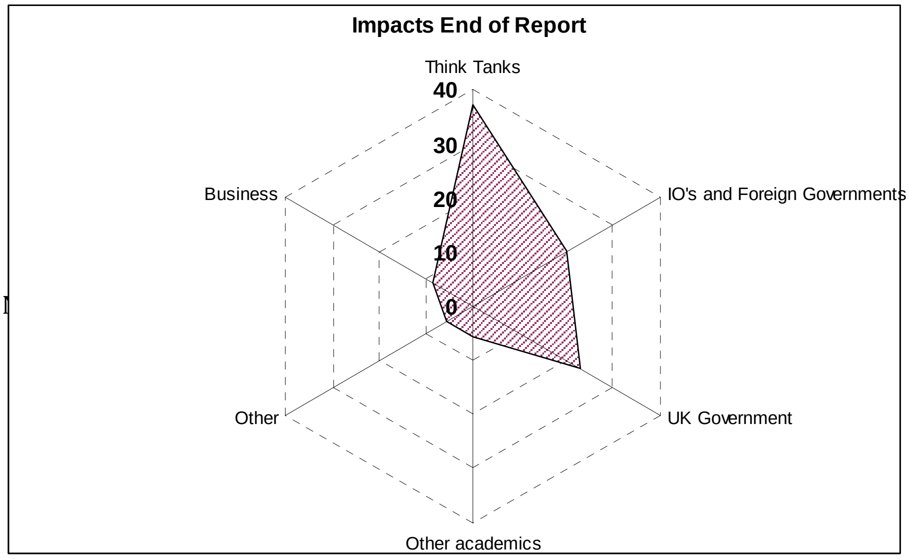


However, in Figure 7.9 we record the revised impacts claims that were arrived at PPG researchers who moderated the project documents in detail, and also re-assessed the impacts achieved using somewhat better developed methods than the overwhelmingly intuitive or ‘common sense’ accounts written up the lead researchers in their response documents. The key effect here is to create a reasonable if still weak correlation between the total output score for projects and the moderated impact assessments, with a lower standard deviation and a more recognizable (if still variable) patterning.

In a related analysis for the British Academy we also looked intensively at the promises on impacts made by 37 successful applicants from the humanities and social sciences seeking research grant support, and compared them in detail with the impacts claimed by the lead researchers at the end of the project. Figure 7.10 shows the results. There is a rather simple pattern of alteration. In applying for grants the researchers principally mentioned impacts relating to government agencies and bodies, with influence on think tanks as the second most common claims. In post-completion reports, the two switched positions, with most influence achieved claims relating to think tanks, and with claims for government impacts considerably reduced and lower. By contrast, claims for influence over foreign governments and international organizations were the third most common in both pre- and post-research reports. Claims of business impacts were slender at both stages.

Figure 7.10: Anticipated and achieved impacts claimed by research leads for British Academy funded projects





Summary

1. While different authors and schools of thoughts within disciplines will take a different view of what make a difference to an academic achieving external impacts, we hypothesize that the following eight factors are most relevant:

- His or her academic credibility;
- dispositional and sub-field constraints networking skills;
- personal communication capacity;
- external reputation;
- experience;
- and track record of successful work.

2. Analysis of our pilot sample of 120 academics shows that academics who are cited more in the academic literature in social sciences are cited more in non-academic Google references from external actors.

3. Researchers tend to claim impact in a haphazard way; it is possible to see a more robust correlation between outputs produced for a particular project and moderated impact assessments.

Chapter 8

Understanding, tracking and comparing external impacts for organizations

We live in a social world shaped primarily by organizations. Our links to organizations and professions confer or create personally important identities, often stimulating strongly rooted processes of identification with the places and teams where we work, and the projects we work on – especially in academia, where 'mission commitment' is an important incentive. In most cases organizational experiences and loyalties also trigger a substantial adaptation of our own goals and values to fit in with those of our surroundings (Galbraith, 1969). And organizations, professions and communities are the key determinants of what gets accepted as true or right or appropriate, of what knowledge once produced survives and of the criteria by which it is used, stored or lost. It is in this sense, that Mary Douglas stresses in *How Institutions Think* (1986) that although 'institutions cannot have minds of their own', none the less 'institutions confer identity', 'institutions remember and forget', 'institutions do the classifying', and they can also 'make life or death decisions'.

So it should not be surprising that departments, research laboratories, and research groups and units within universities (which themselves can be thought of as top-level organizations, or as congeries of smaller organizations, or as local network identities) are the primary vehicles for generating external impacts from research. Of course, each of these units is made up of individual academics and researchers. But the importance of academic teams, departmental traditions, research synergies and organizational cultures all mean that in the most successful research environments the whole is far more than the sum of the parts. From the outside world's point of view, for any reasonably specialist audience or professionally important issue, the primary unit of perception is the department, or the sub-units within departments, such as research groups and labs. In a more generalized way for specialist audiences, and for the general media and lay public at large, universities are important carriers of reputation and traditions.

We first examine how growing external impacts (construed as occasions of influence) is rooted in the importance of the collective 'tacit knowledge' in the development of organizations and networks of influence. Next we look at the time periods involved in achieving external impacts, which are generally much longer than those of academic impacts. The third section examines how to generate appropriate systematic information on external impacts. However, ascertaining any given level of influence in isolation is likely to be of only limited usefulness unless it can be set against a background of well-informed comparisons. In particular, research funders and government regulatory bodies, along with key external stakeholders themselves, may be 'naïve customers' with exaggerated expectations of what is possible or desirable in terms of external impacts. Hence in section 8.4 we look at comparing across organizations to ensure that a record of external impacts is assessed against meaningful benchmarks. Finally, we conclude the chapter by looking at some of the potential pitfalls and extra sensitivities that academic departments and universities need to take account of as the scope and scale of their external impacts expand.

8.1 External impacts are rooted in collective 'tacit knowledge'

Departments, laboratories, and research groups and units are the key or essential 'bearers' of external impacts for several reasons. They form the foci of 'team identity' for academics, the most important level at which work tasks are organized and specific duties and fields of activity are defined. And as we have charted above 'team' production of knowledge has been steadily increasing across all fields of academic endeavour over recent decades, although this trend is least strongly marked in the humanities, and has been more modest in the social sciences than in the STEM disciplines (see section 4.3). For external audiences these team production aspects are also likely to be of considerable importance. For instance, we noted previously that research for companies seeking comparative advantage often works best when the academic team includes senior academics with relevant experience and a track record in the sub-field, plus younger research staff in touch with the latest developments in analysis methods, IT or other research frontier 'technical' elements.

In departments, labs and research groups external impacts also become more visible and will seem more important (when viewed internally or externally). Influences on outside bodies can be put into a better perspective at an organizational level because:

- Contributions cumulate across individuals, with the experience of external work by one researcher for client A potentially feeding forward to later work by another researcher for client B, both in specific content terms and in terms of knowledge of how to interact and deal effective with external clients. This last aspect is particularly important in being able to handle the logistics of tendering, in response to requests for proposals (RFP) or invitations to tender (ITT), in the first place; and later on in terms of managing relations effectively with external clients during project completion and negotiations over licensing, patents, dissemination activities, what can be published in journals or reports, follow-on work, and 'intellectual property rights' (IPR) issues.
- Many applied problems that external clients bring up require joined-up solutions that do not fit any one researcher's competencies fully. Hence an approach from a business or from public policy-makers that is backed by funding, whether as a direct commission or inquiry, or in a tendering format, can stimulate the formation of new teams, networks and synergies inside academic departments and research laboratories or units. This 'focusing' effect is something that government and foundation research funding bodies also try to achieve in solely academic work by launching research 'programmes' with ear-marked funds for work fitting into themes that they specify. But whereas such initiatives are normally consulted on and signalled well in advance, new requests from business or government typically originate at short notice, requiring good 'horizon scanning' by departments or labs to find out about them and a capacity to respond

quickly and creatively, as well as to bear the often substantial tendering costs.

- A critically important means of external organizations and external professional practice meshing with academic departments and research laboratories is via the occupational mobility of students or young-alumni (such as post-docs) moving into jobs in business or government. Undergraduate and masters students and alums (and in the US doctoral students leaving at the ABD ('all but dissertation') stage) often bring to their new employers experience of the whole research environment of the department or lab. When academics and research leaders only put on specialized courses in their own areas, they often leave it to coursework students to integrate and make sense of very diverse intellectual offerings – and the best and brightest often succeed (against all the odds) and carry that value-added with them in moving on. PhD students and post-docs work in more specialized areas, and so they are less exposed to whole-department or whole-lab influences, although peer group networks in the 'group jeopardy' situation of doctoral work often compensate a little for this. When they move on, these alums also often go into specific, technical roles within business, profession and government, bringing with them key knowledge of the newest concepts, methods of analysis or experimentation.

Underlying these effects that tend to make the organization more than just the sum of its component parts are some key differences between explicit and tacit knowledge. Laboratories and departments of course cumulate a great deal of explicit knowledge, because they combine researchers and academics of different ages, orientations, skills sets and technical capacities within a single disciplinary focus. Including theorists and empirical studies fosters a useful dialectic of discovery and integration research, and the cumulative experience of departments or laboratories is valuable for businesses or government in giving them confidence that researchers have collectively tackled similar problems before and achieved success. In addition, a good deal of recent work on innovation and on scientific advances has stressed that scientists and academics invariably operate with many beliefs, practices and standard operating procedures that are only partially documented. Much knowledge that could in principle be made explicit is not in fact crystallized formally or written down, but instead is contained in traditions and working methods that are understood by the staff members.

An important strand of organization theory argues that the same is true of major corporations, government agencies and indeed all formal organizations (Nonaka, 1994; Nonaka and Takeuchi, 1995). Part of what makes different organizational cultures distinctive lies in what is not written down but contained only in the minds of current organization members. This can be summarized as 'tacit knowledge' and its importance is difficult to understate. It is especially hard for external clients and audiences to perceive or take account of 'tacit knowledge' unless the client maintains close and regular contact with the department or laboratory concerned, usually involving regular liaison, frequent visits or seconding staff to work inside the university. This is just as true of STEM disciplines, and indeed it is in exactly these disciplines that 'serial' linkages from business firms, government funders or major foundations with university units most commonly occur – precisely because recognizing and being able to evaluate tacit knowledge is likely to be of critical importance for future investment or funding decisions.

Recent work in the philosophy of science stresses, however, that the importance of tacit knowledge is more general and pervasive than the literature focusing only on innovations in high-tech industries suggests. Collins (2010) argues for the existence of three kinds of tacit knowledge:

- relational tacit knowledge, consisting of tacit knowledge that could be made explicit under more favourable conditions;
- 'somatic' tacit knowledge that relates to the limitations of human bodies and minds, covering forms of knowing (like how to ride a bike) that could not be conceivably written down for and implemented by a sophisticated robot; and
- collective tacit knowledge, held at the organizational level in the shared understandings of multiple personnel. In Collins' view this is

> the most irreducibly tacit form of knowledge, the most resistant to capture or rendering explicit.

The importance of tacit knowledge also underlies many of the difficulties of professional communication between scientists or academics and lay audiences. It explains why researchers are often made uncomfortable by how 'outsiders' to their discipline or research area (without access to its tacit knowledge) try to summarize their 'explicit knowledge' results or even their general orientation to research. Some authors have argued for a kind of 'periodic table' of different kinds of expertise, and stressed that the extent and character of tacit knowledge available to different kinds of actors underlies many of the key differences that we acknowledge as important for assessing the usefulness and authority of varying forms of expertise (Collins and Evans, 2007)

In an effort to control such effects, there has been something of a movement in universities away from the centralization of press and communications functions in a university-wide office that is necessarily generalist in its approach, and towards more 'embedding' of writers and communications or dissemination experts within laboratories, research centres of major academic departments. This trend often brings into universities former business or government personnel with a directly relevant scientific or academic background, but also with experience of publicizing and explaining exactly the same issues, problems and research potentials to lay audiences in key stakeholder organizations.

8.2 The time lags in achieving impacts

> In the 40s everyone was excited about supersonic flight and atomic power, and in today's history books we continue to think of that era being dominated by those technologies. It wasn't. One might more correctly think of the 40s as a time of tanks, aeroplanes, cars, coal and wheat and pig farming. We inhabit a world where what I call 'the futurism of the past' falsely conditions our conception of the past.
> *David Edgerton* (quoted in Sutherland, 2006)

The conventional wisdom is that achieving external impacts from academic work involves much longer time periods than those involved in academic impacts (discussed in section 1.2). Yet there are no reasons at all to believe a priori that this should this be so, so long as we are thinking of external impacts only as 'recordable occasions of influence' on society outside the university sector - rather than taking an all-inclusive view of 'impacts' as including causal contributions to external organizations' outputs or outcomes or positive changes in the social welfare. It is clearly true that the diffusion or wide implementation of new ideas and innovations does often (but not always) takes time – to which we return later in this section. But the initial influence from academia to the external organizations need not necessarily be long-winded.

Indeed some aspects of generating external impacts should show a radically speeded -up process of influence. Wherever university researchers are directly commissioned or contracted to undertake work for business (especially and always) or public policy-makers (often) the grounds for expecting rapid impacts (as influence) are manifold:

- The research processes involved in commercial or contracted research are typically much less leisurely and far more time-focused than conventional academic work, with much stronger time-disciplines, backed up by contractual or funding penalties for failing to hit agreed timelines and milestones. Where work is directly commissioned or contracted, there need be no information-access lags in its definition. Direct communication of research needs from the client to academics should in principle be much more focused, swifter and less ambiguous than a process of university researchers trying to anticipate 'client needs' in the abstract.
- The clearance, authorization or consultation times involved in academic research, especially in management or the social sciences can be radically reduced. For external academic researchers studying government services or the welfare state these barriers are very long, often so extended as to be almost insurmountable. The clearance, or authorization or consultation times involved in contracted research

for government agencies may still be substantial, especially where the research involves other government bodies than the one commissioning the work: but they are at least tractable. In businesses commissioned research often will work smoothly too, although in complex corporations with different sub-sections with different interests the problems of 'influence costs' are never completely eliminated for outside researchers (whether consultants or academics).

- Where researchers are working directly with the owners of proprietary or normally confidential data, the usual time lags involved in getting access to the relevant data are short-circuited. The company or government agency instead makes the requisite information available directly, albeit under appropriate NDA (non-disclosure agreement) safeguards. In STEM disciplines researchers may gain access to proprietary technologies or materials, or get to use improved or expensive equipment that would otherwise be unaffordable. In the social sciences researchers may gain access to huge transaction datasets about corporation customers or government services users that allow much better (often 'real time') social information to be collated (Savage and Burrows, 2007, 2009; Dunleavy, 2010). Or they may gain access to internal customer or staff surveys and the accumulated results of internal research (focus groups, usability studies, randomized control trials, etc.) that greatly reduces the time needed on data collection.
- Even if brand new research needs to be set up from scratch the normal extremely troublesome delays in gaining permissions, negotiating access for interviews or surveys, securing elite interviews and so on are all dramatically shorter for 'insider' research. The development of pilot studies can normally be dramatically speeded up when working directly with government or business clients. And strong external funding can allow main data-gathering periods to be reduced by upping the number of staff resources employed to do surveys, and

using more expensive or comprehensive techniques for recruiting respondents.

- Especially in STEM disciplines where academic researchers are working with manufacturing businesses, but also covering other areas (such as most work by researchers in business schools) the race to be first to acquire new knowledge or generate innovations or new techniques and business processes has strong commercial implications. There are much stronger incentives for researchers to make advances, especially where new technology is licensed to firms and the researchers and the universities involved stand to gain most from widespread adoption. A study of 86 US universities found that they give inventors 25 to 68 per cent of income generated, with the average being 41 per cent (Lach and Schankerman, 2007: 3). In addition, universities with bonus-pay arrangements generated 'on average, about 30-40 per cent more income per license, after controlling for other factors' (p.5). Four fifths of private sector universities had bonus pay incentives for staff, compared to only half for public sector universities, and private universities had more generous arrangements also.
- As soon as research is completed and written up it can be directly communicated back to the client. There are none of the lengthy publication timelines involved in conventional academic work, and nor are there any peer review demands creating uncertainty or potential distractor factors. Clients may want research work to be published for marketing or regulatory reasons – for instance, big pharmaceutical companies are legally required to publish the results of all drugs trials in some form, and often want favourable studies to be published in the most reputable medical journals achievable. But this is a secondary (marketing) add-on to their getting value-added from the research.
- There are no primary delays involved in research dissemination and client-recognition delays, such as most often occur with conventional research. This is not to say that the clients for university research

always respond positively to what they receive or act upon it, because we are concerned here only with the first-impact stage of a recordable influence - such as a business person or a government official reading a report of what research has discovered.

Of course, the later stages of corporations or public policy-makers deciding whether to do anything further in response to this primary influence, are perhaps just as likely to be protracted as would be the case if the firm or agency had just stumbled on the research in an academic journal. However, where businesses or government agencies have commissioned and paid for research work, rather than just getting it for free, we might hope that their incentives to follow-up on it are somewhat increased. A great deal here depends on the balance of the 'sunk costs' already expended on the research and the wider 'change costs' of doing anything to change production, services or business arrangements. In general this balance should be much more favourable for commissioned research (which in business or government will tend to be focused on incremental improvements) than for solely academic work.

However only some kinds of academic research is likely to be directly commissioned or contracted by businesses, government agencies or most foundations – namely applied research. Less often basic research work that also fits closely into the 'discovery' category (discussed in Chapter 5) may be funded by high-tech businesses, where it may potentially confer comparative advantage in very technical and fast-moving markets (such as IT and perhaps pharmaceuticals). Other kinds of research – basic research and basic research with user-interests – are less likely to be directly contracted or commissioned. (In terms of the categories used in Chapter 5 research that falls into the integration and bridging categories, along with blue-skies discovery research, are highly likely to be externally supported.)

For all such un-commissioned research, the possible contributory factors to an 'impacts gap' (discussed in Chapter 6) all tend to militate in favour of time lags for achieving external impacts that are longer than those involved in getting academic impacts. Governments and businesses doing general horizon scanning in their areas tend to rely on professional reputation and contacts for identifying reliable or important research. Hence the external impact gap factors largely come in addition to, on top of, the conventional time lags to publication or academic recognition. Thus demand and supply mismatches and weak incentives both imply possible recognition delays – academics responding weakly and late to new government, business or civil society needs; and external organizations missing entirely or picking up only very late on research relevant for their needs. Difficulties in communication, especially the esoteric quality of academic professional communication enhances these risks, as do the cultural differences between sectors. Hence Gillies' (2010) discussion of 'delayed recognition' problems for research (see section 1.2) all apply with particular force to mainstream academic research (when not commissioned). He points out that in the context of the papilloma virus causing cervical cancer, the time lags involved in securing academic acceptance of an idea inconsistent with the main paradigm delayed development of a vaccine for a dangerous and often fatal disease, with large-scale human costs and significant loss of revenue and profits for drugs companies also.

So over what period should academic departments and research laboratories seek to track and demonstrate external impacts? In preparing for its 2014 Research Excellence Framework (REF) exercise, the English state funding body (HEFCE) acknowledged that the period should be longer than the five years being used for citations-based and peer review research. It suggested that seven or eight year periods would be most relevant. Most UK universities responded to this suggestion by saying that even 8 years is too short to reach a meaningful estimation of impacts, where this is construed in a far broader sense going beyond occasions of influence to embrace also outputs, outcomes and implied social welfare journal

And indeed if for a moment we were to adopt such a maximally extended concept of 'impacts' as not just occasions of influence but also involving making a difference to the implementation of outputs, achievements of outcomes and to positively boosting social welfare – then here time lags can be much longer than is often supposed. The historian of technology changes David Edgerton called one of his key books *The Shock of the Old* (2006), in order to stress the very long time periods needed for most world-changing technologies to achieve widespread impacts or complete acceptance – for instance, the long period involved in the adoption of electricity, or the time lag involved in late nineteenth century internal combustion engine becoming the mainstay of the inter-country shipping trade (handling almost 95 per cent of goods moved between countries) more than eight decades later. In the digital era, the spread of innovations like mobile phones and internet systems have clearly speeded up. But equally as Edgerton points out many of the expected technologies of the early post war period (like rockets, atomic power and automation) have progressed just as slowly as most late nineteenth century changes.

A far more specific analysis focusing on the extended impacts of university research is that of James Adams (1990) who looked at the link between the growth of productivity in 20 US industries and publications in scientific journals directly related to them. He found that there were long lags between the publication of relevant research and improvements in industry productivity as a result, typically being 20 to 30 years. Even in areas like sciences, where time lags are lower and reducing faster, many years still have to elapse between the publication of research and improved economic growth.

8.3 Generating an evidence base about external impacts

Showing how university research feeds into wider economic, societal or public policy development entails three main information-collection steps:

- making an effort to track and record information that will otherwise be unknown or will be known only informally and thus left implicit;
- capturing in permanent form information that is explicitly known, but only in a temporary way, usually in ways that will otherwise be lost in the normal way of things;
- encouraging external audiences to express their appreciation of contacts with a department, research lab or university in a more direct and explicit form than they will normally do.

In addition, however, departments and universities need to be able to easily access and arrange information about external impacts in forms that will be plausible and convincing for external funders, government regulators, the media, or other sections of the university. Often funders or regulators will ask for information about external impacts in a particular prescribed form, and their formats will typically be different. They may also change over time, especially in the current period as interest in proven external impacts grows and universities get better at capturing relevant information. So it is a question of trying to anticipate what their format for reporting impacts will look like, and to collect information in forms that are sufficiently flexible that they can be adapted. Our general advice here is that nothing convinces external audiences so much as data and quantitative information. But in the current stage of development of impacts thinking it will also often be necessary to produce case studies of influence and qualitative accounts and assessments, a topic that we address in detail at the end of the section.

Also, most data collection recommended here fits closely within our main definition of an external impact as 'a recordable occasion of influence with a non-university organization or actor'. But it is important to recognize that many funders, regulators and other parts of universities will probably be 'naïve customers' who are still operating with an extended conception of impacts, encompassing not just occasions of influence, but also an expectation or demand for proven causal effects on outputs, outcomes or social welfare. Intellectually we have argued that such conceptions are indefensible and unimplementable – but this does not mean that external audiences (and even university hierarchs) will recognize this. Departments, research labs and universities are hence likely to be asked about extended 'impacts' over which they actually have no control, and they must be able to put up some form of intellectually coherent and well-evidenced account.

For departments or research laboratories, the first step in understanding external impacts as occasions of influence, and at least getting some handle on extended causal 'impacts', is to adopt a systematic approach to recording interactions with all forms of outside audiences for research. Our essential recommendation here is – try to track everything, including especially the following:

- *Electronic or other records of the department's or lab's work being discussed* in general media (newspapers, TV, radio and general-interest internet website and blog sources) and specialist media (such as the ‘trade press’, industry journals or magazines, close-to-public policy journals and magazines, and the journals, newsletters or other publications of professions, think tanks, consultancies, trade unions, charities and NGOs. The most general media information is often collected by the university media and communication office, and so is a free good for the department or lab, although you usually need to ask to be given tailored or more detailed reports. Other easily available data can be provided by the university’s web managers, and sometimes central units organizing major events, although again you usually need to ask to get specifically tailored information.

But it is important to recognize that usually far more information can be gleaned from specialist media that are much closer to the department’s or lab’s areas of interest, and that the knowledge needed to access this data will be largely confined to the department or lab itself. To tap into that will hence almost always require asking a researcher or post-grad to look specifically for especially electronic data in the most relevant sources that could show coverage of what the department has done. The first time such work is undertaken it may take quite some time to find out what information is available and to collate it back for as long a period as seems relevant. But so long as the initial investigation is well-documented to make clear what methods were used and what does and does not work for that department’s profile, subsequent annual top-up exercises can be quickly carried out.

It is worth bearing in mind here other public policy, professional or trade forums where the work done by the department’s staff may be discussed. Key sources in the social sciences might include:

- debates and proceedings in the legislature or Parliament and parliamentary committees;
- papers, publications and website coverage of research by the national government;
- sub-national legislatures, executives and bureaucracies; and

- regional and local councils or health authorities or regional development bodies etc.

- *Funded linkages*, such as research grants or support, consultancies or joint ventures, licensing income, payments made for training sessions or courses, conference or attendance fees for one-off events, and occasional donations or support for events. Much of the activity here will create an easily auditable financial trail in the university or department accounts. The great thing about financial data are that they give an excellent indication of the *scale* of outside interest in university research – the more money has flowed, the greater the interest and presumably the value to the external organizations or actors.
- *Time commitments* by external actors to come to department events or seminars, or to make visits, come and talk to researchers or consult them on issues. In business, government and civil society organizations, time is money. So the more that external actors give time to department or lab events, and the more senior these personnel are, the greater the imputed external value of what the department or lab is providing. It is worth bearing in mind the total time involved in getting to and from an event, including travelling time.

Having excellent data on events, including an extended, integrated conception of an 'event' discussed below in Chapter 9, is a key first step in being able to estimate time commitments. Getting department or lab members to log contacts with all external organizations in the most simple and time-economical ways is another key step, and should cover meetings, phone calls, emails, advice giving, inward or outward visits etc. - also discussed below in Chapter 9. If this cannot be done then the likelihood is that contacts will be hugely under-recorded. So at the year end, or even three or four years from now, the department will vaguely claim to funders or regulators that there have been 'many' contacts - without any recordable evidence to substantiate this. By contrast, simple logs of contacts, organizations involved, the people spoken to or attending meetings, and the time involved in the event or contact can create the basis for quantifying external time commitments precisely.

- *Appreciations of contacts or work done* are rarely explicit. People come to seminars, clap the speakers at the end, stay and chat over drinks, get ideas, make new contacts, and network with other attendees of interest to them. They think well of the department or lab because of all these things. But you cannot distil out this goodwill or favourable impression unless you ask the participants to record it in some way.

  Getting seminar or lecture participants to rate events in response forms is now quite common for paid-for courses (where it is often rather onerous and tick-boxish), but is otherwise rare. So it makes sense for departments or labs to make it easy and expected for contacts to give them some feedback on events, ideally in a form that is very easy to fill in and can let respondents log free-text comments. (For instance, pre-populate any response forms or emails with full details of the event or the contact already, and ideally also include the name, organization and position details of the person being asked to comment, so that respondents do not have to waste time filling in stuff that should already have been done). If staff members have given interviews or seminars or been consulted, it is a great idea to write individually to the organizer (or to senior people met there) and to ask them to very briefly record their appreciation in an email back, pointing out that this can be helpful for the department or lab in securing future funding support. (On both steps see Chapter 9.) Even automated requests for feedback that thank people for coming to events or contacting the department, but also solicit reactions or appreciations, may be useful with regular audiences.
- *Following up on causal influences to trace extended effects* is important in all those cases of funded linkages, salient time commitments (either in terms of extent or the quality and utility of time) where more significant results might be claimed. Staff members or department/lab leaders who believe that an important effect was achieved on outputs, outcomes or social welfare should make an effort to get that recorded

in some way by the external organization. Do not rest easy with 'rumours of influence' and a vague knowledge of what happened next. Instead, commit a little time or effort to making more concrete what you know about the extended 'impact' of an intervention or contact.

Asking close organizational or personal contacts of the department at the end of each year to evaluate what they got out of their relationship with the department can also capture causal follow-on effects more synoptically. It is important to also include here cases where a post-doc fellow or other skilled or well-trained student moves from the department or laboratory to a company or government agency and has an immediate effect in helping to sort out a problem or to bring a project to a successful conclusion. (You cannot plausibly claim later effects though.)

- *Growing departmental or research lab portfolios of external impacts activities* entails recognizing that at the collective, organizational level there are many opportunities for creating synergies and improving priorities and performance in contact-seeking. Individual staff members have so many demands on their time from academic work already, and may have such small or episodic external contacts, that it is not easy for them to manage their external contacts in different ways. And too often, this knowledge will be both tacit (unavailable to other staff members or the department/lab leaders) and evanescent, getting superseded by new concerns or forgotten before it can be of any wider help to the organization.

  Yet cumulated at the departmental level, broader patterns and synergies will become more visible, as will opportunities to do more and gaps in contact-seeking or contact-making. Creating basic data on what the department has achieved, and then getting discussions of this information at a senior staff committee meeting and more briefly at wider staff meetings, can all help turn an otherwise disorganized mass of contacts into a better understood portfolio of external activities, one that can be actively managed and where performance over time can be improved.

- *Developing metrics of performance*, that is, quantifiable measures that capture key aspects and stay the same over time so that comparisons can be made, is the final stage in departments or research labs increasing their self-awareness. Some of these metrics may be required anyway by government regulators or funding bodies, or by the university central administration. Often the indicators involved may not be all that valuable in capturing what really matters at the department or lab level. But they are valuable none the less, because they alone allow comparisons with other departments in the home university, or with similar departments or research labs elsewhere. Comparisons often trigger productive questions about what practices we are not as yet following but might usefully copy or import.

  However, metrics that are *sui generis* to the department may be more focused on what really matters to it, taking fuller account of factors that makes its situation different from others. Such internal metrics can also be kept consistent, even if external comparison metrics must be altered - in response to funders, government officials or university hierarchs changing their minds about what information is to be collected, as they will often do. But purely internal or *sui generis* measures are also harder to create initially, to maintain consistently over time, or to communicate externally.
- *Writing case studies and other short accounts* of external impacts is often a key activity in explaining what has been accomplished to funding bodies – whether foundations, government R&D agencies, or companies. The 2014 Research Excellence Framework (REF) used by the British government requires even the smallest academic departments to provide two case studies of external impacts, and limits the largest departments to providing no more than five or six such case studies. Typically case studies are short qualitative and narrative accounts, following the linkage from university research to influence over an external body, a stage that can be well documented and where sensible judgements and claims made.

However, funders and external scrutiny panels are rarely content to stop at this recognition and influence stage (the only sensible definition of impact in our view). Instead, like the UK's REF process, they typically want departments to go further and to trace out how achieving an external influence then translated into that organization's outputs, the outcomes it achieved or the effect on social welfare. This is more difficult for departments to cover. If it is to be an auditable account (and not one that is too vague, too general or often unsupported), it may well require departments going back to their external partners or to the bodies influenced and asking them to provide some such description or evaluation themselves.

Yet here politicians and public policy-makers are often reluctant to commit their debts or influences to paper, because they do want to be seen as 'pinching' ideas or as being dependent upon others for good ideas or information. Equally, public bodies may not wish to be seen issuing statements or responses that publicly favour one university or department over its competitors. Corporations especially may not want to formally credit university researchers with helping them to create value-added for their business, lest they potentially open their businesses to legal claims. So it may be best for departments to think of cumulating media or specialist media evidence of these extended impacts, marshalling what social scientists call 'unobtrusive measures' rather than relying on being able to 'cash in' claims of influence in explicit statements from the bodies or personnel influenced.

Lastly it is worth stressing that the writing of 'impact' case studies to meet external requirements, or just for media consumption or to explain the department's work for external audiences, is often a specialist, bureaucratic art form. For the British REF exercise, for instance, departments and research labs have incentives to try and define cases that span across the widest range of the department's staff – not an easy task when you have perhaps 50 to 80 researchers to cover and only five cases are allowed. Similarly, for external media departments will often want accounts of where and how they achieve impacts that are more simple than a complex underlying picture, and yet which are also defensible, supported by good evidence and do not open the department up to charges of over-claiming or misrepresentation.

For faculties (or Schools) that group together related disciplines, such as the physical sciences, technology disciplines, the social sciences or the humanities, the analysis of external impacts is also important. This may seem surprising, because for most academics and researchers, the department or research laboratory that they belong to is their primary organizational identity. Faculties come a long way down the pecking order of staff members' identities, usually third or fourth behind the macro-identity of the university and micro-identity of the departmental sub-group or specific research team or unit that they work in. Nor do most external organizations and actors think of their relationships with universities in terms of faculties. They overwhelmingly see themselves as having a relationship specific departments at the science-forefront, specific knowledge level, and with university-wide bureaucracy or component bodies, such as its sub-companies handling consultancy, contractual and research-licensing, or joint venture matters, or the university's corporate relations and media/communications units.

Yet faculties or schools are often important units within universities for the setting of priorities for spending increases or research expansion (or for cutbacks and research retrenchment) across individual departments. It is here that external contacts and impacts have to be integrated with the university's resource-allocation process, where promising areas need to be encouraged with seed-corn grants, where pilot linkages need to be nurtured and grown, and where staff and personnel recruitment need to be tweaked to give the right weight to the balance of discovery, integration and application work. Some key IT and web-based communication may also be managed at this level. So the deans and administrators of faculties and schools are hence often important decision-makers in any major relationships with companies or government departments and agencies, and are always key interlocutors with departments about what is working or not, what is growing and what is fading, and where the university's comparative advantage for the future (and hence its key mission) will lie. While large departments may have skilled research administrators, smaller ones will not. And so some or many of the key research administrators are usually located at the faculty or school level, where they can accumulate the necessary broader vision to cover several related disciplines and the information needed to collate knowledge of external contacts.

At faculty level it is important not just to aggregate up information as it stands from the departmental level, but also to try to create a value-added element that compensates for small departments' characteristically scantier information gathering. Faculty staff should aim to give particular help to give smaller departments an ability to contribute to a broad picture at faculty level that is complete and without gaps and lacunae. Achieving strong linkages across departments is also an important aspect of the 'local integration' of intellectual and research impulses identified earlier (in Chapter 5) as a key function of universities. The closest networks and links are naturally those within faculties, and the administrative importance of faculties or schools means that they are primary information circuits for whole-of-science or related-discipline knowledge transfers and translations.

Faculties and schools should also pay special attention to the synergies between different science departments and to the inter-disciplinary areas that lie uncomfortably across the remits of different departments and research labs. At any one time, some of the most dynamic and rapid-advance fields will lie at the inter-section of different disciplines. Politically these interstitial areas are often weak, tending to be marginalized within each of their component departments by the stronger and more numerous staff groups in 'core' established sub-fields, where in fact most work may be replication, confirmatory or only incrementally expanding on existing knowledge. It may frequently fall to faculty-level decision-makers to get the right balance of new developments funding for less tried and more inter-disciplinary areas with the most intellectual promise and the most applied potential.

For universities, the same key points and lessons apply, only at the whole-institution scale. Universities' central administrations are key centres for allocating resources at a top level between faculties and schools, and for conducting or monitoring some key aspects of external relations – especially via its press or media office, through the university's online research depository and library service, through centralized IT and web/internet services, via alumni and fund-raising arms, corporate relations units, and of course consultancy and R&D commercialization arms. University vice-chancellors and their deputies in the UK, or university presidents and provosts elsewhere, are not just important decision-makers but also key conduits for senior politicians, government departments and companies to form links with the university and its department. Hence their knowledge, dispositions and prejudices are often important drivers for certain kinds of advance that they know well or see as promising. Equally often, the personalities and prejudices of top university leaders can form key constraints on the progress of fields that they understand less well or have less sympathy for.

One of top leaders' key roles is to nurture and grow the diffuse and often elusive concept of the university's 'brand', capitalizing on long-established strengths but also seeking to constantly modernize and keep up to date the things that the university is well-known for, and to stop ancient strengths metamorphosing (as they so easily can do) into off-putting 'legacy images. University brands are long-lived, characteristically change rather slowly, and are often double-edged, attracting certain kinds of staff and expertise and repelling others. The same effects operate in the external relations realm also, in motivating possible partners or customers of the university's research to explore possible linkages, and in motivating alumni and other established contacts to make donations. The brand effects tend to operate powerfully at the level when potential collaborators or partners are *first* thinking of where to look for academic help or advice.

The local integration effect of the university in bridging across disciplines is often matched by their top leaders' central role as a conduit of external influence and information into all the faculties. University leaders move much more widely in elite business, government and professional circles than do even their most senior faculty. So maintaining good communication from departments and faculties to the vice-chancellor or president and their deputies, and good intelligence back from this leadership group to department and research leaders, is often critical for allowing the university to keep abreast of new opportunities. In small countries, and for lower-ranked universities in large countries, the university leadership team is often a key channel for ties to state/regional or local/city elites (covering businesses, public policy-makers, professions and other main civil society organizations). For universities in large countries this effect operates in a more fragmentary way, with their top leaders being key conduits of advance information about how to match other large universities in a much more competitive environment. Top university leaders often have more advance or 'over-the-horizon' information about changing government, business or professional priorities. Finally, top leaders play an equally important international intelligence role for large and research-intensive universities, who must increasingly live and thrive in a global university economy, struggling to acquire students, academic talent and direct investment in competition with other major universities across the world. Here top leaders often undertake more overseas trips, especially forging university partnerships with collaborating institutions. Where senior department and faculty staff also go along, there are strong possibilities for rapid intellectual and knowledge transfer advances here, characteristically allowing the information-seeking university to formulate a much more sophisticated and in-touch estimate of where its comparative strengths lie.

8.4 Comparing organizations' and disciplines' performance

Even if departments, faculties or universities have assembled good quality information on external impacts as occasions of influence, their decision-makers are often reluctant to do more than cherry-pick some tempting highlights that clearly put them in a good light. Often this stance of flashing only a few isolated titbits of information stems from a public relations fear that publishing more detailed accounts may open the academic unit in question up to criticism – especially the counter-claim that actually the department or university is not doing as well as it should be, given the funding it has received from the government. Academics and universities must often face 'naïve customers' in government or business, who often seem to 'expect the moon' from relatively small amounts of funding, to want the university contribution to external outcomes delivered in infeasible timescales, and to demand that such extended impacts are documented in unachievable detail. Hence departments or universities often react by hugging their cards close to their chest, and contenting themselves with rather vague 'fairytales of extended causal influence' that cannot be directly refuted.

However, if universities are to get better at legitimately claiming impacts (as influence), and at educating government and other funders about what kind of wider effects on outputs, outcomes or societal benefits can be reliably traced back to their research, it is important to break out of this cycle. The key step here is to find ways of comparing across departments and research labs and across disciplines. It is no good comparing evidence of the external impacts of a physics department and an English department unless we also know what how kinds of departments generally perform in a given country and institutional environment. Similarly the common university fear that somehow 'naïve' customers or readers will impugn perfectly creditable impacts scores can best be exorcised by setting performance within an appropriate framework, one that takes account of the difficulties of achieving different kinds of influence over external audiences.

In this respect we follow up the suggestions made in the previous section of data to collect by briefly reviewing some UK evidence. On funding and financing links from outside firms and government agencies to universities, Figure 8.1 shows that a website audit of the top ten UK universities in late 2007 (just before the onset of the financial crisis) found 74 different centres or institutes with formal external funding, nearly half being in STEM subjects (including medicine) but with the social sciences next in line, and with very few externally funded humanities centres of institutes. Unfortunately we do not have information on the scale of these funding or financial links, which are often not made very made explicit by universities or donors. Yet the Figure is already useful in providing useful context, especially in showing the social sciences not too far behind the physical sciences and medicine in terms of funded unit or centre numbers.

Figure 8.1: The number of research centres and institutes funded by or formally linked to different kinds of sponsor bodies, by discipline group (in our web census of top 10 UK universities, December 2007)

	Type of sponsoring organization				
	Government bodies	Third sector organisations	Private sector companies	Other academic institutions	**Total**
Social science	14	2	7	5	**28**
Medicine	6	10	2	3	**21**
Science and technology	8	1	2	2	**13**
Joint disciplines	7	0	1	1	**9**
Humanities	2	1	0	0	**3**
Total	**37**	**14**	**12**	**11**	**74**

Of course, the Figure also does not cover other important forms of economic and financial linkage from business, such as the formation of spin-out companies or joint business ventures, where it is clear that the STEM disciplines account for the vast bulk of activity in the UK. Similarly, it will be important to also look at other less formally institutionalized forms of linkage, especially the licensing of technologies from universities to businesses, and business support for individual research projects or the work of post-doc staff or PhD students. Different disciplines within the STEM group, and even different sub-fields within particular disciplines, will often attract sharply varying levels of linkage-attention from each other. The information on corporate patronage of PhDs in the US also suggests that these patterns can vary considerably over time across many STEM disciplines, with funding reducing sharply in recessions or hard times, but expanding in boom times and in close-to-business areas that are fashionable in these booms.

Turning to the issue of assessing external audiences for different subjects, Figure 8.2 shows the results of a census of UK central government websites. We recorded all references found in website documents to different forms of university research and some interesting results emerged, such as the extensive number of references to social policy, law, medicine, health policy and law and order research, and (for instance, the small volume of references to management, economics, technology and geography research here). Taking this analysis a little bit further, we also looked at which departments in the UK central government generated these website document references and Figure 8.3 below shows that the biggest group came from the ministries covering crime, law and order (the Home Office), social security and welfare state systems (the Department of Work and Pensions), overseas aid (the Department for International Development) and then health, environment (Defra), transport and education. By contrast, the departments handling local government, taxation and (ironically) innovations and universities, had the lowest rates of citing academic papers and university research findings in website documents.

Figure 8.2: The subject areas of academic research found on government department websites

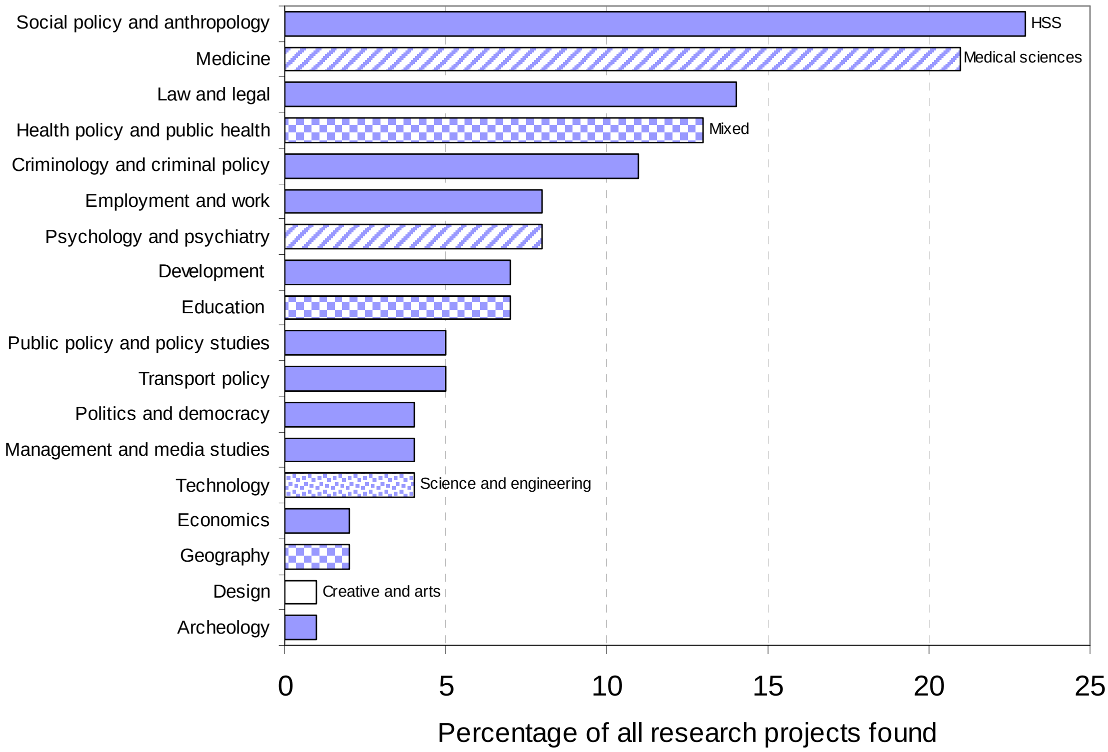
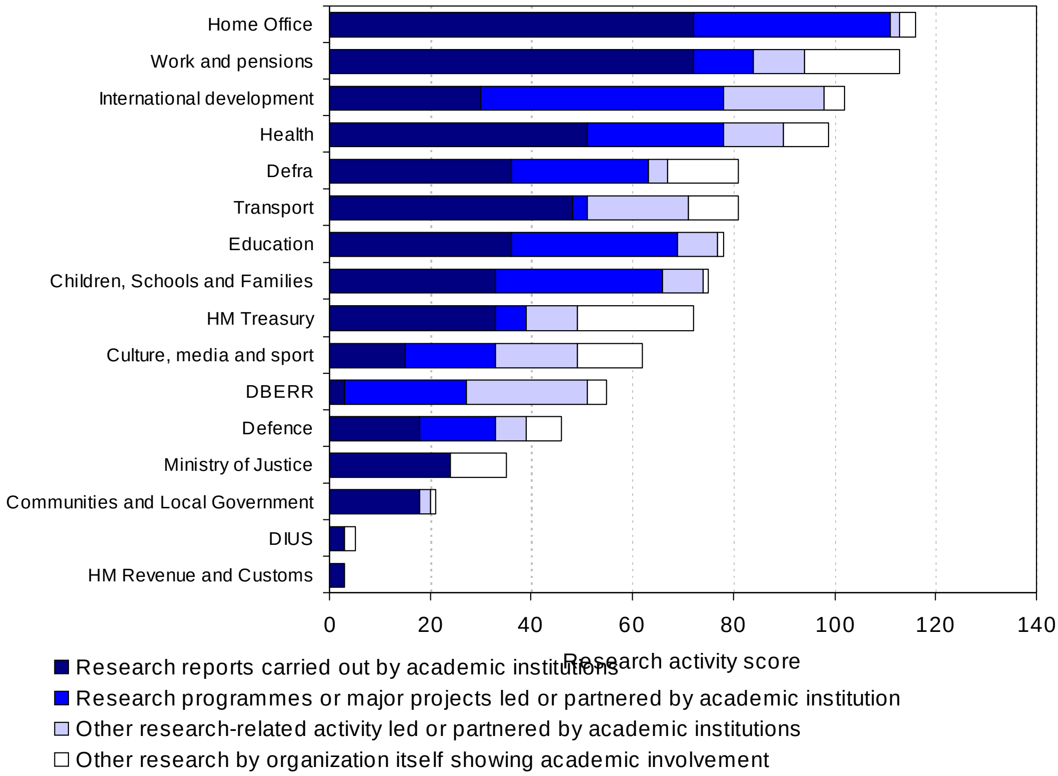


Figure 8.3: The visibility of academic research material on government department websites

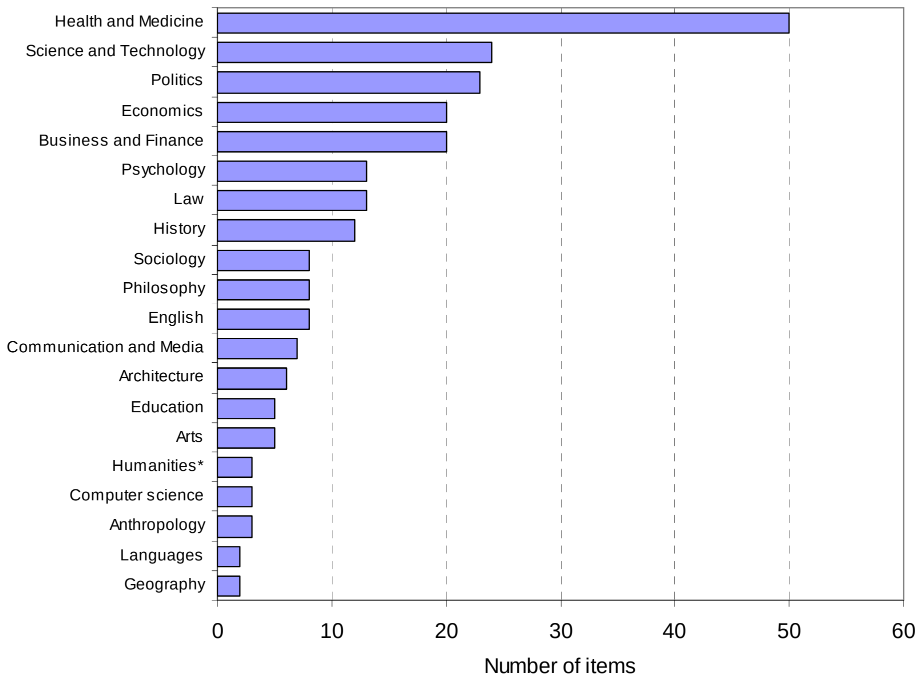


Yet we have good reasons for believing that these observed behaviours are quite specific to different spheres of influence, associated with different kinds of citation and acknowledgement of influences. For instance, the Treasury and the Bank of England are among government bodies that are relatively reluctant to cite outside research in documents on their websites. However, both these institutions have many specialist economists and financial experts on their staff, pay a great deal of attention to data trends and forecasts of economic variables, and on their internal websites or intranets they often review and cover a great many economics articles, forecasts and books from university economists and financial experts in the UK and overseas.

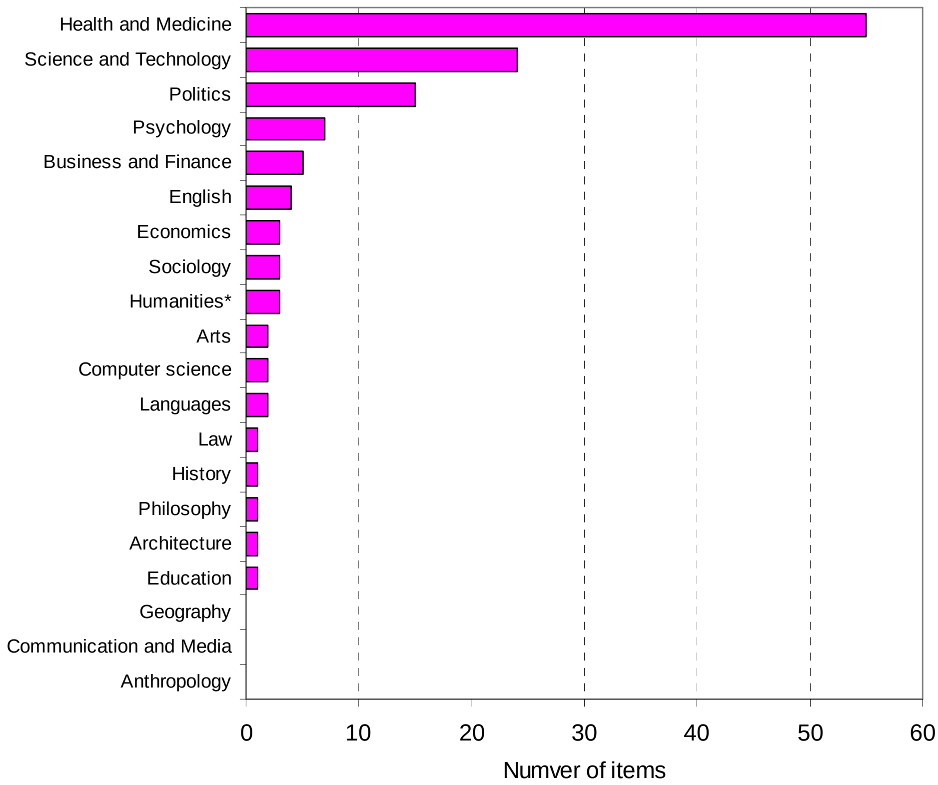
Moving from the public policy sphere to look at the general UK media also shows a different set of rankings of the external salience or visibility of different disciplines. Figure 8.4, for instance, shows that the choice of search words to indicate university research makes quite a difference to the rank order of disciplines that results. However, leaving aside these detailed differences, the two halves of Figure 8.4 agree that amongst university disciplines medicine, science and technology get the most media coverage. Political scientists and economics/business and finance academics also get a good deal of coverage, often commenting on developments in overseas countries or in economic or business data. They are followed at something of a distance by humanities disciplines like history, English and philosophy, and a range of social sciences, including law and sociology. At the bottom of the public visibility pile in both halves of the Figure are computer science (where there is a lot of IT coverage, but mostly company-focused), languages, anthropology and geography.

Figure 8.4: The disciplines of academic research covered in the UK press, May 2007

(a) Using search terms 'Professor' or 'academic research'



(b) Using search terms 'Dr' or 'new findings'



Method Note: 'Other humanities' here includes Classics, Theology and Religious Studies.

In comparing across universities, the normal approach to benchmarking is:

- To locate an individual university against its situation-neighbours. For instance, in the UK universities have organized themselves into different 'mission groups' with the Russell Group representing the oldest and most prestigious universities, and different groups for the older-established 'new' universities by the 1970s, and those converted from polytechnics in the later period. In the US the same kind of comparison groups span across from the Ivy League, leading and large state universities, other private universities and colleges, and other state universities. Alternatively universities offering PhD programmes can be contrasted with those offering four year degree programmes, and others offering only two year programmes.
- To locate a given department against the more general background of the university wherein it is located. The reasoning here in relation to

impacts is that even though a middling or low-ranked university may have stellar academics and research programmes in particular departments, it is very difficult for the academics and researchers there to break out of the 'mould' that the university's brand determines. Yet the 2008 Research Assessment Exercise in the UK showed that a good deal of works that was top-ranked by government-appointed review panels was still being carried out by 'pockets' of staff in less research-intensive universities (those with lower overall department rankings in the RAE exercise).

In terms of assessing external impacts, it seems especially important to emphasize that both government and business impacts are likely to be constrained in important ways by a university's general brand and reputation. An excellent department or research lab isolated in a middling or poor university will rarely be able to counteract the information problems thus created for external sources to recognize the strength of the work it does. However, in STEM areas it may be able to partly counteract this problem by building detailed links with specialist industries in niche markets. And at a local or regional level a strong department or lab may be able to make useful links with local or regional public policy-makers or businesses, especially in the US or Germany where university funding runs through state or regional governments and is partly conditional on making these sub-national linkages and promoting regional or local economic growth and development.

8.5 Managing impacts work – potential pitfalls

> Coming to power is a costly business… Power *makes stupid* … Politics devours all seriousness for really intellectual things.
> *Friedrich Nietzche* (cited by Flyberg,1998: 229)

> Power is more concerned with defining reality than with dealing with what reality "really" is.
> *Bent Flyberg* (1998: 66)

As an occupational group, university researchers and academics still operate within many of the older professional practice ideas associated with the 'private practice' concept that stresses a dispassionate commitment to advancing knowledge, closely associated with the profession having a socially neutral stance. Academia is supposed to not take sides in the social struggles between labour and capital, between rich and poor, between haves and have-nots. The development of science or culture or fine art or philosophical thinking should go where it will, pursuing an independent course that is not directly or centrally involved in a class struggle or in other forms of distributional and societal conflict. And in theory academics and universities are institutions without their own vested interests, or that should at least struggle to act as if they were, not taking sides beyond the side of promoting knowledge development and the advance of civilization.

Of course, expressed in this way it is apparent that these are ideals that any university and any discipline only partly lives up to, that there are biases in knowledge development in universities and academia that inevitably reflect the interests of academics and researchers themselves and their dependence on state and corporate patronage for research funding. Increasingly university education has also moved out of being overwhelmingly public funded into at least a 'mixed economy' where universities can seem like just another kind of corporation marketing services to 'customers'. Equally the contemporary importance of universities for the flourishing of local, regional and national economies means that the old private practice concept of a small and disinterested group no long stands up to critical attention.

None the less, universities and academics can and do actively seek to remain *relatively autonomous* from wider social and economic influences. They characteristically try to cultivate and protect a key area of independence, of openness and of responsibility to debate on the basis of evidence and well-tested scientific theory. And all university researchers in their hearts accept an obligation to constantly search for improvements in knowledge, and to recognize and adopt them, however uncomfortable they may be for established interests or commitments inside academia or amongst external actors and interests. This remains the heart of the concept of professional neutrality in academia.

Sustaining this conception becomes more important (and sometimes difficult) the more that a university's engagement with business or policy-makers increases. Paid for research or applied work can appear as ill-advised marketing or justification unless it is carried out to the highest scientific and professional standards. Critics of a scientific programme or a research conclusion are often mobilized politically and will look for means within their power to counter the effectiveness of contrary work from academics or university researchers. An influential perspective on public policy debates in liberal democratic countries portrays them as clashes between adversarial 'advocacy coalitions'. If academics come to form part of one advocacy coalition, as they often do, then the opposing coalition will look for their own academic advisors and proponents. The attacks in 2009 on scientists studying global warming at the University of East Anglia are a key example of this effect.

In politics it is also important to recognize that social science, medical and science/technology researchers often end up trying to 'speak truth to power' in conditions where the powerful are more interested in bending perceptions into more convenient moulds (as in the epigraph from Bent Flyvberg for this section). In 2007 academics at the London School of Economics published a long report critical of the Labour government's then flagship policy of introducing an identity card and compiling a huge IT-based register of all UK citizens, which they costed at around £10-18 billion, compared with a government estimate of the £5-6 billion. The minister in charge denounced the LSE study as 'mad' and the senior civil servant at his ministry rang the LSE Director to wonder aloud how unfortunate such inconvenient research could be for the university's future funding. In this case LSE stuck by its academics and strongly resisted government pressure (Whitley et al, 2010). (The ID card scheme itself was first drastically cut down in scale by Labour ministers, and opposed by all other parties and was then cancelled by the Conservative-Liberal Democrat government in mid 2010.)

However, not all outcomes end up with academia winning through. To give one example, again from the UK: in spring 2010 a senior professor chairing the UK government's drugs policy was forced by the home affairs minister to resign after publishing listings of the danger of drugs that clearly contradicted the official lists of the most dangerous drugs (for instance, rating alcohol as more dangerous than cocaine). In a second case a London university academic critical of government policies on using private finance to build hospitals in the National Health Service was giving evidence to a Parliamentary select committee, and found her research work attacked as shallow and biased by a loyal government MP – a charge that was almost impossible to refute in the time available. In all these cases the relative firepower of politicians or an organized lobbying group or advocacy coalition compared with unsuspecting or unprepared researchers is very unequal, and usually ends up creating casualties more easily on the university side.

These considerations suggest some key rules for departments and research laboratories that begin building new relationships with powerful external actors, or become associated in some way with an advocacy coalition that has already attracted counter-mobilization by an alternative coalition.

- Pick partners or funders for research work carefully and make sure that the terms of any funding and research linkage fits clearly within the university's rules for partnerships and research funding, in particular safeguarding academic freedom to report research freely in appropriate professional journals and reports, after the normal time periods. Going public with your research is the best guarantee of its overall quality, both for the university and the research clients. Of course, in many commercially sensitive areas there will need to be appropriate protections for the intellectual property of the company and the university, and so some research may not be fully disclosable. But publication so that results can be replicated should still be the normal goal, even if time delays or restrictions have to be imposed.
- Most universities will also have safeguards in place to try to ensure that their researchers do not sign up to carry out applied projects that they are not in fact appropriately qualified or experienced to undertake. It is reputationally important for departments and labs to stick to research that they are well qualified to do. This usually also means having some 'strength in depth' in the area, so that several researchers can operate in effective teams.

- It is important for researchers and departments to check that they have the backing of university leaders before entering into fields of work directly for business or governments that may become politically controversial in future. Compiling a 'risk analysis' can be useful here and provide assurance that the research will be of high quality and that risks can be mitigated.
- Once some controversy about external impacts work has arisen, it is also important that department and university leaders back up academic researchers who come under strong 'political' challenge, whether by an opposition advocacy coalition or by senior politicians or decision-makers.

Summary

1. While academic departments, labs, and research groups produce a great deal of explicit knowledge, it is their collective 'tacit knowledge,' which is the most difficult to communicate to external audiences, that tends to have the most impact.

2. The changing nature of commissioned academic work means that the time lag in achieving external impacts can be radically reduced, yet any external impact of non-commissioned work is likely to lag far beyond its academic impact.

3. It is important for both individual departments/ research labs, schools or faculties, and the University as a whole to systematically collect, access and arrange auditable data on external impacts; keeping in mind that some 'naïve customers' like funders, regulators, and other parts of their universities may insist on proof of 'extended' impacts

4. Making meaningful comparisons between universities' and individual departments' external impact requires contextual understanding of how departments and universities generally perform in a given country and institutional environment.

5. Seeking to improve external impact should not mean sacrificing academic independence and integrity; compiling a risk assessment for working with external actors or funders is one way to mitigate the politicization of one's research.

Chapter 9

Expanding external research impacts

It is no accident that most universities are currently collecting bits and pieces of knowledge about their external impacts, but then rapidly losing (or 'institutionally forgetting') it again. Alternatively they are lodging the scraps and indicators they have accumulated in different small silos, accessible only by those in the university who know it is there and walled off from view to all others. In terms of capturing external impacts as influence, and also extended 'impacts' (as extended consequences or social benefits) universities are where they are today for deep-rooted, structural reasons. Strong institutional and organizational culture influences explain the past neglect of this field.

So far different disciplines have mostly taken an equally siloed look at the problems. In terms of the academic sub-fields most closely involved, fragments of the knowledge needed are distributed across knowledge transfer studies, 'translation studies', educational research, organizational learning, innovation studies, sociology, economics, science studies, and applied philosophy. Even the terminology used to analyse impacts is not settled or agreed yet. However, Sebba (2011) suggests a useful three-way distinction between:

- 'Knowledge transfer' and 'dissemination', terms which signify only 'the movement of evidence from one place to another in order to increase access, without directly attempting to simplify, interpret or translate findings'.
- 'Knowledge translation', 'knowledge mobilisation', 'research brokerage' and 'research mediation', all of which may be taken to 'imply an intention to intervene in the process, for example, summarising, interpreting, etc., so as to increase use'. But Sebba stresses that such terms 'do not of themselves, provide evidence of use'. And

- 'Research use', 'research utilisation' and 'implementation', which all 'imply evidence of direct influence on policy or practice'. This usage might seem to 'depend on stakeholders' retrospective perceptions', but Sebba stresses that it is intended to go 'beyond rhetoric'.

Scientific and technological innovations have been the most studied aspects. But even here the available literature is still far from providing any effective synoptic picture of how the STEM disciplines achieve external impacts. In other areas, such as the social sciences and even more the humanities, the current coverage is very sparse indeed. If the state of knowledge about academic impacts is as poor as described in Part A above (despite its manifest importance for universities' central mission); and if the agreement on how to measure academic influence is so weak, partial and fragile - it is surely unsurprising that things are a lot worse in relation to external impacts.

So formulating recommendations that might help improve matters is quite difficult. On the one hand, most universities are still developing processes for getting a grip on external impacts, so that the scope for suggestions might seem large. However, the drivers for improving impacts recording and assessments are weak, mostly confined to outside pressures from funding donors and governments. And the constraints on improvement are considerable, ranging from the resistance of academic staff to further monitoring and yet more demands on their already overloaded schedules, through to deeply embedded organizational categories and architectures that are poorly orientated towards gripping external impacts, ranging from existing role definitions, through categories for recording activity through to strong 'legacy' IT systems that are rarely orientated to modern information needs. Any realistic set of recommendations must therefore show how to overcome these constraints. In particular, useful suggestions for improvements must have minimal impacts in increasing academic workloads and must work with the grain of wider changes already under way in universities.

We outline six key recommendations in turn, beginning with creating an impacts file for academics, a key building block of further progress. Next we consider a key part of all universities' external impacts effort, their events programme, and argue for a movement away from a 'ticket-less trains' conception and towards an integrated events concept that pays more attention to outward marketing of the university's own impactful work. Our third recommendation focuses on developing universities' organizational and IT systems for collecting, collating and analysing their performance in achieving external impacts. In the second half of the chapter, we shift to more outward-looking recommendations. Section 9.4 explores ways of ensuring that far more information about academics' work becomes accessible via the open web, rather than lurking behind journal pay walls, specifically with a push to create open web outputs for *all* research published. This links closely to a key way in which universities can improve professional communication in the social sciences, and also better communicate directly with target audiences, by starting multi-author blogs (MABs). Finally, we show how a better communicating university is in a much stronger (less dependent) position to operate in networks and 'information coalitions' with external clients and important organizations in the 'impacts interface', discussed in Chapter 5.

9.1 Developing an impacts file for individual academics

Even if they have stayed in the same university for a long time, virtually all academics and researchers maintain a CV (*curriculum vitae*) or resumé that lists their career positions in sequence, educational qualifications and professional honours, research projects conducted, grants awarded, teaching expertise, and university administrative roles undertaken. They will also have (as a component of their CV or as a separate file) a comprehensive list of all their publications, usually date-ordered in reverse sequence and/or segmented between different types of academic publications. Most universities require staff members to submit updated CVs and publication lists annually or at least every few years, and so it makes sense for academics to keep both documents updated as things happen.

But will generating external impacts show up in either of these documents, and so be regularly or reliably recorded by academics or researchers? In most cases the answer will be – probably not. Traditionally universities have tended to turn a blind eye to anything except academic impacts.

Private funding of a research project by a corporation might be visible in a list of grants or contracts won, or in publications sponsored by a company. And applied academics might also list on their CV the general details of consultancies or contracts undertaken, along with any spin out companies or external directorships. Other than that, however, academics and researchers will rarely tend to be asked about their external impacts by their university or department, and so they will have little incentive to record the details of occasions of influence in any systematic way.

Hence a foundational step for any department, faculty or university interested in learning more about its external impacts is to ask each academic staff member to develop and keep updated an 'impacts file'. The idea here is that the file will include enough details to enable that researcher to list in a recordable and auditable way the external organization and specific personnel there involved in all occasions of influence concerning them, along with the dates and times where the contact and influence occurred. Such a file would cover meetings, visits, interviews, phone calls and emails with outside organizations, and talks, seminars, lectures, training courses etc. along with details of the audience. Wherever possible evaluative statements that speak to the influence on the external organizations or personnel could be compiled in a number of ways, essentially by asking them to record their views.

For instance, if an academic gives a talk to an outside body, which is greeted enthusiastically, gets lots of questions and is warmly applauded at the end, how can this be recorded in some way? Well the academic involved might count how many people were in the room and record where they came from and their seniority or roles – simply putting in the file a copy of the participants' list (normally produced for external events) would cover this aspect. To capture the qualitative assessment of usefulness the academic should ask the organizer to include questions in their normal follow-up 'Thank you' letter or email. These letters are often very formal or vacuous, but priming the organizer about what would be useful, or asking them to be more explicit about 'impact' is often worthwhile in avoiding this problem.

How each academic compiles their impact file can vary a good deal. At one end, the bottom end in terms of how sophisticated the 'file' is, might be a box or a hanging file into which go all the paper records of that person's varied external contacts. This is essentially just a kind of document dump, such as many academics already keep in order to help fill in their annual income tax form. The great advantage of this approach is that it is easy to do and does not impose an extra workload on staff. However, the information recorded may vary a great deal from one person to another. There may well be many gaps or omissions, which would only be clear to the academic or their organization at the end of the year or of a multi-year reporting period - often making the occasion of influence too remote in time to be able to retro-fit the missing details.

In the middle of the spectrum might be an electronic form of the same thing, a data dump with emails, contact names and dates, and also residues of talks given or work undertaken, or at least links to them. If someone runs an electronic diary it might be convenient to store such details in attachments against diary entries, with clear labels that identify impacts occasions. However, many of the components, like chance meetings, conversations and phone calls may not be formally listed in calendar entries, so there is a risk of under-recording.

At the top (most sophisticated) end of the spectrum, a department, faculty or university might compile an 'impacts' database by asking academics to fill in a properly designed and online standard form for recording external impacts (as occasions as influence), covering the salient details of activities undertaken and immediate feedback received in a standard format for each year. Each unit's aggregate impacts file for a year would then be the sum total of their members of staff's impacts. The great advantages here are that:

(a) If the forms are well researched, it should be feasible to comprehensively cover a university's or department's impacts (as occasions of influence) and dissemination or applied activities
(b) Entries would be designed in a consistent way, so that they could form the basis for compiling statistics or undertaking quantitative analyses over time and measuring overall performance trends.
(c) For similar reasons, adding a research impacts picture to the department's or university's established data on research grants and publications, and on teaching and administration loads, can give a

much more complete picture of where resources are going (and where they are flowing back to the unit also).

(d) Academic staff and researchers who undertake a lot of applied work and impacts activities already are likely to be keen to fill in external impacts forms, because they have a story to tell here that no one has seemed to care about before. Often the most impactful researchers feel that much of what they are doing has to be done ‘on their own time’. They are given a strong institutional message that generating external impacts does not matter to their department or university, and instead counts only as some kind of avoidable distraction from what they ‘really’ should be doing. Stopping and reversing this message is going to be important for departments and universities if they are ever to develop greater external impacts.

(e) If the forms are well designed, it should be feasible to comprehensively cover a university’s or department’s impacts (as occasions of influence) and their current dissemination or applied activities. For instance, in the UK Research Excellence Framework the government body responsible (HEFCE) has told humanities departments that accumulating book sales can count as an external impact (because it creates jobs in the publishing industry, and because the sum of books sales shows how much other social actors have valued one the department’s outputs at. An impacts-reporting form could thus ask staff to give their book sales numbers in the previous year, and totals could be added up across all staff in a department or university (with suitable adjustments for co-authored books).

(f) Consistently implemented external impacts forms across departments could also allow universities or faculties to compare performance, and perhaps either to move resources to favour ‘impactful’ departments, or to learn lessons from them that could help others to copy their approach.

However, there are also several disadvantages, which may help explain why it is that few universities have so far adopted impacts-reporting:

(i) The greatest disadvantage is that academics famously hate filling in 'unnecessary and bureaucratic' forms, especially if they do not seem to bear directly on their research, teaching or other core activities. So more 'red tape' may well generate criticisms of diverting precious time to form-filling. A well designed and easy to complete external impacts form can reduce the wails of protest, but not remove them and the resistance that might be implied.

(ii) Tenured academics especially are strongly averse to any measures that may seem to them to build a 'surveillance state' in which their university or department knows ever more detail about how they allocate their time. Opponents of impacts reporting will be sure to raise an 'academic freedom' objection – even though there is nothing obviously different about asking people about their external occasions of influence from asking what work they have published in the last year.

(iii) This resistance will typically be greater the less external impacts a given academic or researcher can claim. Researchers working in 'pure' areas or those that rarely trigger outside interest may find it easy to fill in an impacts form, since they have less (or even nothing) to report. However, they are very likely to construe a request to report impacts as the first step in a disguised or insidious resource allocation process by the university or department that promises to be unfavourable for their type of work.

(iv) Annual reporting of current external or applied activities does not do much to address the characteristic demands of 'naïve' customers (such as governments or foundations) for evidence of impacts as extended consequences (in terms of outputs, outcomes or social benefits). Nor does it cope with the piling up of influence from successful impacts, as the observable economic or social consequences and benefits of research innovations grow slowly over the extended time periods discussed above (section 8.2). In its Research Excellence Framework for 2011-14 the British government regulator (HEFCE) allows university departments to claim 'impacts' (as extended consequences) from research conducted up to 15 years before the reporting year. (Indeed during the consultation period for this exercise physics departments in England argued that they needed to be able claim impacts in this sense going back 25 years.) Universities might therefore have to ask the heads of departments, laboratories and centres to report separately on multi-year consequences – perhaps inevitably in more qualitative and varied way.

9.2 Reappraising events programmes

Sometimes strange things happen in the public sector. For many years the UK government has financed additional spending designed to help its tourist industry to attract more overseas visitors to Britain, and to increase the amount of money that they spend when they come. Almost all visitors want to come to London, one of the most expensive parts of Britain. Yet Visit Britain has long been banned from spending money on promoting the London by political pressures to spread the benefits around more regions of the country. So the paradox is that a tourist promotion body actually spends next to nothing on its 'brand leader'.

For universities a rather equivalent kind of problem is that they often run costly events programmes that cover topical issues and are energetically promoted to outside audiences. But the speakers at these events are overwhelmingly academics from *other* universities, or non-academic people from different walks of life, such as leading politicians at home and abroad, the 'great and the good' in business or administration, or literary and artistic figures. In other words, most of the considerable costs and efforts involved go on promoting either competitor universities, or outsiders to the university sector altogether. Universities and departments are mostly publicizing everybody but themselves, and often especially in applied fields where they might have impact.

There are numerous reasons for this pattern, which has grown up historically and rarely been systematically evaluated, often for internal university reasons. It is useful for both staff and students to hear talks from outside academics, who may offer different perspectives and new ideas, not already familiar. Attracting prominent academics from elsewhere to speak also confers a kind of reflected glory on university A, or department X, showing that they are seen as an important academic hub or centre of research, and perhaps affording staff opportunities to interact with better known researchers. The movement of academic speakers around departments and universities also creates opportunities for researchers from university A or department X to give lectures or seminars elsewhere, by creating reciprocity linkages, and sustaining a speaking 'circuit' open to their staff also.

Similarly it is useful to universities or departments to demonstrate to their staff and students, and also to the local audience who receive their event invitations or publicity, that they are important places by attracting top politicians or business leaders. Again the university or department is building its reputation and standing in a very general and indirect manner, by providing a venue for an outside speaker and receiving some of the reflected glory. We have important people passing through, so we too must be important. We are a generally civilized place, so perhaps you would like to come to our events, like us and perhaps even donate. There is a good deal of merit behind these rationales. A good university or a good department should be a hub for academic exchanges and communication – tacit knowledge requires in person experiences. The traditional events-based model is also very familiar and has worked well as a mode of engaging external audiences, especially in fund-raising for elite universities and maintaining generalized reputations.

But as ever, where there are alternative strategies, there are also opportunity costs. More specific and targeted publicity may be generated by the university or department spending more of its events-budget (both its money budget and its budget of prominent time slots) on promoting and publicizing research work undertaken by its own researchers. Such events may help build the overall brand for the department or university in more of a direct demonstration way (contrasting with the self-aggrandising character of most university press releases, newsletters and other updates, which convey little substantive information about what research has been undertaken or what its key findings or methods were. And more resources flowing internally can help better develop the leading brand assets – i.e. the best known, or most read, or most externally influential academics. So it behoves universities to keep their allocation of events resources under review, and in most cases to enrich the mix of events with somewhat more internal academics explaining their work and approaches, rather than only outside academics and non-academics.

Whatever mix of speakers is adopted, the traditional university concept of an event as a talk given to a largely anonymous audience gathered together in one room, also needs to be modernized. This core activity remains a useful focal point, largely because of the importance of tacit knowledge and the difficulties of transmitting such knowledge remotely or via educational technologies. However, in addition to the core talk in front of the face-to-face audience, a more integrated concept of an event might include:

- a post on a university multi-author blog (see section 9.5 below) ahead of time which provides a substantive summary of what the speaker will be covering;
- or alternatively the blog might be a 'pre-put' (meaning a precursor or preparation output), which sets up the issues without disclosing the speaker's answer directly, or which provides key context or concepts to bring the audience up to speed (and hence can be usefully distributed also when the audience is arriving);
- an online webcast or podcast of the event, making it available simultaneously to an outside (even international) audience. More university seminar rooms and lecture theatres are set up to provide this functionality now. Alternatively, video cameras are now so small, excellent and cheap that versions of events of at least Youtube quality can be undertaken without special equipment or incurring extra costs, and uploaded to the internet after only a short lag;
- a blog post after the event that gives the speaker's core points and some substantive but accessible illustrations. From here it is very useful to have full links to the author's full materials on the open Web wherever feasible, since outside audiences may not have university library subscriptions to electronic journals or e-books.

It should be clear that an integrated events concept is multi-media and multi-stage from the outset, aiming to reach a far wider audience and to provide useful materials both for non-experts and those with considerable in-depth understanding of the topic already.

Universities also need to move away from the traditional concept of an event as like the railway trains of the 1970s or ’80s, where many ‘open’ tickets were sold for travel on a route, but railway operators had no idea *which* train people actually planned to travel on (or sometimes even which day they planned to travel). This made it very hard indeed to match train capacity with demand. The university version of this is that invitations are sent out from many different and uncollated mailing lists (often a general list for university functions, or a specially compiled list for many department events). Only a small proportion of events have an RSVP or require tickets – often universities or departments run ‘open house’ events for whoever shows up. An audience then materializes in the relevant room at the right time, but the university or department may not know who was in it. For the RSVP or ticketed events, someone may check who turns up on the day, but these details are commonly binned as soon as the event is past. They are almost never used in analyses designed to get better at attracting an audience, still less the ‘right’ audience for maximizing the external impacts of the university.

A fully professional approach to events would involve universities and departments moving to a different paradigm where:

- Most events are ticketed in a simple and ‘zero touch’ way. For instance, people attending any event log on to a central university website, give their email address and are sent a unique ticket with a barcode on it, which they are asked to print and bring with them. The ticket should have a map and full directions on it. It is very important that at this stage people are not asked to take a lot of time ‘registering’ for the site – if this extra stage is interposed then between a third and a half of them are likely to think better of proceeding and leave before getting their ticket. Tickets must be quickly there on demand. Remember that the university or department put people on a mailing list for a reason, and therefore already holds details about them. The dataset should be populated in this way and not by additionally burdening potentially attendees.

- When people come to the lecture, they simply swipe their ticket barcode past one of several portable barcode readers on the way in. (Lecture theatres heavily used for external events might have permanent readers.)
- Tickets should not be needed for internal attendees, students or staff – they should just swipe their university cards (which nowadays should all have a barcode). Alumni should similarly have a regular card that they can swipe.
- The same website used for ticketing should also direct people to downloading pre-puts or other advance publicity, to accessing the blog related to the event, and to accessing the webcast, or to downloading the full paper or other post-event materials, like podcasts. Again people should give an email address only to access these elements.
- People who come to lectures or events should then be matched with the original database used to mail out details, so that the university or department knows who was mailed, who asked for a ticket but then did not come, and who asked for a ticket and did come. In addition, it will be clear which pre-puts, blogs or downloads were accessed by all the guests who did come.
- The scale of use of other events elements, blogs and downloads of various formats, can also be measured, by looking at those who gave an email address to access them, and those who accessed them via the open web. Where there were a lot of remote users previously unknown to the university, it may be feasible to follow up with them to find out more about them, especially if small incentives are offered for giving more details.
- People who come to several or many events can be identified. And organizations or industries that originate several or many attendees or downloads can also be picked out. Targeted approaches can then be made to regularly attending or downloading individuals or

organizations to become 'friends' of the university and to try to get from them impacts evaluations.

- Where appropriate this work might also form a basis from which to follow up on potential donations or on achieving closer organizational relations with the university, department or research group.

A lot of readers at this stage (certainly in British universities) may be thinking this is unrealistic because the set up above is so far from being realizable within their current systems and processes. However, we would stress that all the different elements of this picture are already in place in universities in advanced industrial countries, although very rarely joined up in a systematic way. The ideal is to get to a 'zero touch technology' solution where as far as possible human intervention by university or departmental staff is not involved. So people invited to events or told about downloads are able to get tickets or access materials themselves, while giving just enough information to the university or department (their email address) to be able to track interactions with them.

9.3 Building improved management of 'customer relationships'

A much more general problem, already hinted at above, is that universities at present often have only a very partial, fragmented and episodic view of who they are achieving research impacts (as influence) with, or who their external 'customers' actually are. We noted in Chapter 7 that much of this information is held as tacit knowledge, in the heads of key staff who may easily move on elsewhere, or let their knowledge grow of out of date as their interests change.

In business firms there has been a strong fashion and heavy past investment in creating integrated systems for tracking contacts and clients, called customer relationship management (or CRM) systems. These are elaborate (and often expensive) pieces of software which are designed to ensure that information about a customer or potential customer (for instance, someone enquiring about buying a product or service) is always logged in a way that can be found and reached by other people in the organization. Knowing that someone is a customer who has already bought one product or service, for instance, or enquired about doing so, is very useful in trying to think of other things that a firm might sell them.

The more elaborate and high-end the product or service involved, the more worthwhile it may be for a firm to spend money on maintaining information about potential customers or sales targets, going beyond simple records of past business – the ideal being that a firm can not only track all its dealings with a firm or but also with influential individuals within it. So when a salesperson or any other staff members is contacted by someone or some firm, the staff member handling the interaction should be able to pull up a synoptic profile of the potential customer and key information about them, and with more time to uncover a full account of their possible needs or sales possibilities. For such a record to be up to date it is also vital that staff members who have contact with someone or some firm also log in details of the contact to the CRM, so as to expand the organization's information base.

There are many problems involved in getting CRM systems to work in business, because the effort to look across all the firm's IT systems, all its transactions and all its myriad of individuals and firms in contact with it is often very costly to do and may not work well. Some estimates suggest that seven out of 10 CRM implementations in the private sector do not work as intended. One key problem is that staff members may resist logging customer contacts for various reasons. Routine staff may not want to take time to complete contact details properly – especially perhaps where the contact did not go anywhere or may seem to have been a failure. And members of a company's sales force may not be keen to share information they have about potential customers, in case some other sales person uses it to tie up a deal for which the original informant then gets no credit.

Most universities do not have customer relationship management systems. Their chief 'customers' are students and potential students. Undergraduates in the UK (and perhaps to a lesser extent the US) have traditionally been viewed as 'applicants' for limited places at high prestige universities, rather than being seen as valued customers. At the graduate level, however, universities have often developed more of an active 'customer' orientation, and marketing efforts are more extensive and sophisticated at a first contact stage. Once students have arrived, the information systems for handling their records kick off from the original application. They add mountains of internal information over the lifetime of the students coursework, usually ending rather abruptly with 'first destination' information and sometimes an alumnus contact file being opened. US elite universities retain more contact with their graduates by maintaining a reference bank on them for the first period of years after they leave. But in Europe and less well-resourced universities there is no such system. Academics write references as individuals, or perhaps departments may have some capacity here. The details of graduates' later career paths are also rarely known at university level - except via special purpose alumni information systems. Much more tacit knowledge on this front rests with individual academics, some of which may be tapped from time to time by departments for bureaucratic or public relations reasons.

Typically all these information systems are set up in arcane ways and they are highly siloed from each other. Often they can only be consulted by people who are expert in the ways of the department involved. For instance, it would be quite normal for an academic writing a reference to have to ask an administrator in their department (who may in turn have to ask someone in the university records office) to undertake a database query to send across a transcript (or even a paper file) for the student involved. However, some universities have transitioned to much more high tech systems where the academic or other teacher can access the relevant records online on the university website directly and then proceed in a straightforward manner to get the information they need to write a reference. Equally, the siloed nature and records orientation of university databases means that although a great deal of information is accessible on an individual query basis, more analytic information about overall performance can often only be constructed at high cost, by running special data-collection exercises. Only material needed for established statistics requirements, or for reporting to government or other funding bodies, are usually easy to get.

When it comes to external research impacts as occasions of influence a good deal of potentially relevant information is typically available within universities, scattered around a large number of different units. Figure 9.1 provides an indicative list of some of the possible main 'stakeholders' here, including eight or nine different sections in the main university administration – the media/press office (often subsumed in broader communications or 'external relations' directorates), the research and projects division, the university consultancy arm, the executive education arm or company (if separate), the university main administration, the IT service, the events section, the legal officer. In addition equivalent faculty administrators are involved where they exist, and the department or research lab heads and their administrative staffs. Finally much of the information involved is held as tacit knowledge in the heads of either department staffs or individual academics or research teams involved in impacts-related research.

Just as existing organizational arrangements are likely to be diverse, so there is unlikely to be any one ideal structure for collecting, collating and analysing all this information, because universities differ a lot between 'Ivy League' or other top, internationally orientated institutions; larger public universities with a strong regional base, but also national or international ambitions; and universities primarily orientated to achieving research impacts in their own region or city. The information that is collected centrally or at the behest of the university administration (often for governments or other external research funders) will tend to be held as explicit knowledge. But the information that is held by individual academics, and much of the information held at department or research labs, will be held tacitly and hence is normally uncollated. It can be accessed if someone puts the right questions to the right person, but otherwise it will typically be held for a time (unacknowledged) and then lost.

Figure 9.1: How relevant information for assessing research impacts (as occasions of influence) is likely to be dispersed across different stakeholders inside universities

Type of information	Unit holding information	Example of applicability to evaluating research impacts
• Press and media releases issued	- University media/press office - Perhaps a media person at department, research lab or faculty level	
• National or local press coverage of university research	- University media office	
• Media enquiries about different pieces of university research	- University media office, - Department administrators, or - Individual academics	
• Broadcast media interviews or use in TV or radio broadcasts	- University media office - Individual academics Involved	
• Downloads information on items in the university online repository	- University library, or - other electronic repository operator	
• Outside (non-university) visitors to library and subscribers to the library services (.e.g. to journals)	- University library	- Especially useful for showing the use of university resources by local or regional business, NGOs or public agencies
• Numbers of emails from government email domain (.gov, or .gov.uk etc) • Numbers of emails from specific research user addresses, for instance a given company or agency	- Operator of university or faculty email systems, usually IT service	- Looking at email volumes to academic staff and department/lab administrators (excluding student correspondence) can document the strength of relationships. Certain 'confuser' factors need to be controlled for – e.g. relatives in external organizations, and non-research

		correspondence (e.g. student references)
• Visits to and downloads of pages from university or department websites	- University IT service, or Media/Press office - Department staffs using Google Analytics	
• Outside attendees for university or faculty Events programme and major conferences	- University or faculty administrators	
• Outside attendees for department or research lab conferences, lectures, seminars,	- Department/lab administrators - Individual academics	
• External funding of research projects by government, companies or foundations	- University research and development office - Departments/labs - Individual academics	
• External funding of equipment	- University research and development or consultancy offices - Departments/labs - Individual academics	
• External consultancy projects for companies and public agencies	- University consultancy or enterprise office - Departments/labs - Individual academics	
• Executive education for companies, NGOs and public agencies	- University executive education division or company - Departments/labs - Individual academics Involved	
• Other help for companies, NGOs and public agencies	- Departments/labs - Individual academics Involved	
• Projects or internships with firms, NGOs or public agencies undertaken by PhD students, or MBA/MPA capstone project groups etc	- Relevant programme administrators - Individual academics Involved	

• Spin-off companies • Joint ventures with external businesses	- University consultancy or enterprise office - Individual academics	
• Patents and trademarks submitted	- University consultancy or enterprise office	
• Perhaps also copyright protection cases	- University lawyers - Departments/labs - Individual academics	
• 'Hidden innovations' by companies, NGOs and public agencies with help or advice from researchers	- Departments/labs - Individual academics Involved	- Most service industry and public sector innovations are business process changes yielding no patentable products
• Alumni interactions and donations related to research	- University alumni relations office	- Donations linked to research units, labs or research projects
• Fundraising efforts related to research	- University Alumni Relations office; or - University Development office	- Donations to set up new research units, labs or research projects

A key aim of a customer relationship management system is to create opportunities and incentives for holders of this tacit information to record some of it, or much more of it, in an explicit format (ideally an electronic record of some kind) that can also be accessed by other people later on, and can also be cumulated and analysed with other peoples' information. Inherently this means that the recording system involved must be simple to operate by academics and department or laboratory administrators, without lots of extensive training or induction. It must be very speedily filled in and completed (so as to minimize staff resistance to extra 'bureaucratic' tasks). Some of the information in Figure 9.1 can be centrally collected – such as press/media activity and interest, web site and blog visits, e-publication download numbers, etc. – and this route should be used wherever possible because it is cost-effective and time saving.

Yet a great deal more information by volume will rest with the academics and department or research lab administrators and here the university or its component organizations must create an incentive for staff to log details or fill in report forms or contact forms. Firms have confronted many of these difficulties so that there are CRM type systems that are simple to fill in, such as systems that can log information in free-text formats but still produce useful materials for analysis. Yet the resistance of academic staff at least is often expected to be much stronger than that found in more hierarchical business firms.

However, there are some groups of academic staff who will have stronger incentives to log research impacts information more readily (perhaps even enthusiastically), especially those who undertake applied work or who have been conducting research impacts activities extensively already – while never being asked about them by their department or university. Most people in a workforce (and perhaps academics more than most) like recording successful things that they have done, whereas until now the impact-related work may generally have gone unacknowledged by traditional university categories and set-ups. Amongst the incentives that departments and universities can offer to academic staff for completing useful information and giving their compliance to a basic system for collecting information on impacts are:

- Incorporating impacts-related work in regular university monitoring of staff activities, so that it is officially assigned importance and recognition alongside pure research publications, teaching and administration.
- Consideration of impacts-related work (especially fund-raising and dissemination activities) in promotion rounds, and in merit or special effort cash or increment awards. For professors (whose income levels are often fixed individually by a review committee of university governors, advising the vice-chancellor or president) it will be important to know that achieving research impacts will matter to their next pay round.
- Explicitly incorporating impacts-related work into workload allocations at department or research lab level, which may well not happen at present.
- Better reporting on university and departmental websites of impacts-related work and stronger indications from senior university staff at all levels that these activities are positively valued and rewarded – for example, setting up a system of prizes or awards to recognize research impacts endeavours and achievements.

These steps can all play a key role in helping to create an organic structure for knowledge growth about research impacts and for flexible growing an information base that can guide future development. But none of them is easy to accomplish and all will require strong leadership from top university and department office-holders to get approved by university committees and to begin sustained implementation.

Given the current state of universities' information systems about metrics, and the poor development of relevant software adapted to the 'low intensity' context of research impacts, it seems unlikely that any full implementation of a CRM system is going to be practicable in most university contexts. However, a strategy of using incremental or piecemeal efforts to pull together and pool the information resources listed in Figure 9.1 can in itself be a very positive and successful step.

9. 4 Moving some version of all closed-web published research onto the open-web

> Twenty first century Free is different from twentieth century Free. Somewhere in the transition from atoms to bits, a phenomenon that we thought we understood was transformed. "Free" became Free.
> *Chris Anderson* (2009: 3-4)

The high pay walls that academic journals and academic book publishers place around their content have sparked a great deal of controversy in recent years. On the one hand, most academics are temperamentally orientated to distributing their materials as widely as possible and as cheaply as possible, subject to maintaining key safeguards against the theft or 'passing off' of copyright materials by businesses or by other academics or professionals. Academics more than most can chime with the internet folklore that says 'Information wants to be free' and appreciate the strong public interest case for knowledge being universally and freely available. Initially there were many more fears and misgivings amongst academics about safeguarding their intellectual property rights. However, there are now systems in place, especially the increasingly widely used 'Creative Commons' license, which provide most academics not operating in strongly commercialized contexts with all the protection that they need to ensure that their work is correctly acknowledged as theirs.

Increasing numbers of research funders (such as the Wellcome Foundation) are now demanding that research that they have financed should be published on the open web in one form or another. Key means here are free-to-view journals, which are growing in numbers and reputation in many fields. These journals make their money by charging the authors or research teams who submit materials to get their articles refereed and when accepted edited and produced. This fee is one that most scientists and research teams can cover in their initial grant-funding. None the less, in most academic fields (except IT and computer sciences), the most prestigious journals are still strictly pay-to-view publications, either published by commercial publishers or by professional associations. Associations have been a key roadblock to changes in the pay-to-view model, in fact, because they often rely on journals income for much of the funding needed to sustain their professional activities. For instance, one of the leading UK social science associations gets four fifths of its annual income from university subscriptions to its major and long-established journals.

The other main alternatives for open web publication of recent research are the online depositories now run by most major research universities. Universities can deposit here immediately any research papers that the funding body has required to be freely available. And they will negotiate with the publishers of pay-to-view journals and book publishers so as to be able to either deposit a typescript version of the paper or book manuscript on submission, or be able to publish a free-to-view version of the paper or book after a certain time period has elapsed (usually two to five years).

The momentum towards making the fruits of academic research freely available online is likely to get a strong extra twist from 2010 onwards because the governments in many OECD countries face a strong public spending squeeze following the 2008-9 global financial crisis and onset of economic recession.

Governments and taxpayers are increasingly querying a system for producing and certifying academic knowledge that requires them first to pay to produce the research, but then to pay again in high journal or book prices charged to universities (and everyone else), simply to access the results of research that taxpayers have already paid for.

From a research impacts perspective there are many strong arguments for extending the current very fragmentary and partial availability of research materials on the open web into a general and invariant policy that the university will make *some substantive version* of all its research outputs available online in a free-to-view form. We noted above the clear evidence that open access materials tend to be more cited than comparable material behind pay walls. Making an open access version of materials available can help companies, public agencies and NGOs find the right academic experts far more easily, because none of these groups typically have library access to learned journals – and so cannot access or assess materials behind a pay wall. In interviews with civil servants for this project and for an earlier study for the British Academy, officials repeatedly told us that when they need academic advice, especially in social science subject, they are often given little notice or warning by superiors or by politicians and ministers. A need for expert advice usually arises with a tight deadline and hence officials' *first* course of action is to use Google to search for the right materials or the right academic expert to approach to explain research issues to them.

A commitment to *always* making available a substantively useful open-web version of all new research materials can be upheld by a university, department or research laboratory in a wide range of ways, such as:

- publishing research articles where feasible in open-access journals;
- placing final versions of articles and books wherever possible in the university's online electronic research depository;
- in all other cases placing in the university online depository the last manuscript versions of articles and books;
- perhaps academics negotiating with book publishers to allow free distribution of a book after a period of years, using a 'Creative Commons' license;

- publishing shorter and accessible research digests of articles and perhaps books, that summarize their content in a useful, substantive and accessible manner. This might be in a university multi-author blog (see below) or in a freely distributed impacts-orientated short-article journal or briefing that is also available online.

The overall aim should be that wherever research is intended to be non-commercial and to be widely distributed the university strains every nerve to ensure that a range of readers beyond academia can gain easy access to the core materials. External readers tend to be interested in 'bottom line' findings and substantive business or policy implications, delivered in concise and precise fashion, and they tend to be less interested in methodological issues or purely academic controversies. So orientating so as to deliver substance on these priorities requires that academics change their approach to communication significantly. This effort can also have some strong academic and university synergies.

Communicating more accessibly will also make it easier to disseminate knowledge across discipline boundaries more easily, cutting the long lags that often attend the transfer of knowledge, techniques and ideas across different academic disciplines. This effect can help especially to maximize the local synergies between otherwise siloed academic disciplines that we identified in Chapter 5 as the special role and value-added of university-level processes in the development of academic knowledge. An excellent route to all these benefits, as well as increasing direct communication with external audiences, lies through a particular method of blogging, discussed next.

9.5 Improving professional communication: starting multi-author blogs

The most important contribution of the internet to the organization of social life is rather neatly captured in a single rather off-putting word, disintermediation. Simply put this means 'getting rid of the middleman'. In business disintermediation has meant that customers can now look for relevant information about products or services that was previously known only to service intermediary firms or professional – for instance, people can book their own air flights and holidays instead of using travel agents; they can order cars online from non-local dealers; and they can buy many products direct from manufacturers or from specialized, large-scale internet suppliers. Internet information sites allow far wider product searches and price comparisons than were previously possible. And for original manufacturers there has been a drastic reduction in the transactions costs of reaching customers directly, or through a much reduced intermediary chain.

For universities, disintermediation has been signalled by the importance of online communication with potential students (and staff), which has increasingly displaced older means (such as paper prospectuses). Some online teaching provision has begun, although there have been quality and product-character limits on take-up by students, despite the lower costs involved in online study. The internet has also cut communication costs for universities in reaching potential research users, via online depositories and other means of providing open-web access to research materials discussed in the previous section. It has to be said that most universities rarely devote generous resources to online tools, especially compared with the funding still expended on 'legacy' forms of marketing. Their level of investment in their web estate rarely matches well with the critical business importance of online course marketing, reputation-building and research dissemination. None the less there has been a substantial change, often driven by staff and student usage forcing new patterns of behaviour and interaction onto lagging university central administrations.

Yet in developing their impacts and public communication universities have been slow to adopt blogging and other closely related 'social web' techniques (such as using Twitter and Facebook to attract traffic). Although many individual academics and researchers run blogs, and the 'blogosphere' itself has become an increasingly important locale for social researchers, blogging by academics has overwhelmingly been seen as a single author, personal activity, and perhaps one that plays only a marginal role in serious modes of academic communication. Few if any university or national libraries are yet collecting or archiving blog contents, for instance, and blogging is seen as 'unofficial' and a 'pastime' activity by universities.

At one point great expectations were invested in single author blogs in academia as a means of broadening audiences. Many authors have argued that the web gives academics an unparalleled opportunity to distribute their work to audiences previously unavailable to them (Corbyn, 2008). This change was particularly lauded as an uncensored (disintermediated) form of academic communication, allowing experiments in instant and wholly personalized forms of academic communication. Some individual academic bloggers have also accumulated large web-based audiences, such as the US Nobel laureate in economics, Paul Krugman; or the British classicist, Mary Beard.

Yet the truth seems to be that after only a year or two of rapid growth, the single-author blog model has already gone out of fashion, and is in rapid decline. Recent estimates suggest that worldwide more than 75 per cent of blogs are either dead or dormant, with their authors never finding the time to update their 'vanity' publishing venture. In political areas too the early days of blogging were largely dominated by single author (and often single issue) blogs. This is still the case for a small number of the best-known political blogs in Britain (witness *Guido Fawkes*), but apparent American counterparts (such as Glenn Beck) are in reality corporate productions. In fact most single-author blogs on American or UK politics are now moribund, while themed multi-author blogs with professional columnists (such as the *Huffington Post* internet newspaper in the US) and integrated approaches (such as *The New Republic* in the US or *Left Foot Forward* in the UK) have roared away. For a blog is only as good as its readership – and without consistently strong posts, and an easy way of finding them, there will be no readership.

The chief barrier for academics and researchers in running their own single-author blogs has been finding the time to run them, all on their own, taking time away from their research and teaching schedules. Some may have that luxury, especially people already working in part as columnists or commentators for news media or professional blogsites, such as Paul Krugman. But most others will not. This is especially true in England and Wales in the social sciences, since the government announced in late 2010 that it is axing all public teaching funding for the social sciences, and perhaps will also squeeze social science research funding by a fifth over the next four years. So many university teachers and researchers are likely to find themselves stretched to the absolute limit by such austerity measures. Who then will have time and expertise to maintain their own individual blog?

An additional problem is that when it comes to blogs, universities and academic departments are often in the electronic equivalent of the Bronze Age in terms of thinking seriously about engagement and what users and readers are supposed to do. In the modern world of web 2.0, RSS feeds, Facebook and Twitter, it simply is not very useful to have a single author blog updated by an academic once a month with whatever thoughts come into their head. This will be about as relevant to the wider web as a very specialized journal article, and all the effort made in writing and posting will often be wasted.

A few universities have tried to create a combined blog portal for all the bloggers within their community. But with no quality controls at all, and a hugely complex index page often resulting, this approach is far from guaranteeing much success in communicating the knowledge hidden across academia. For instance, Warwick University runs a blog portal which lists over 7,000 different blogs run by staff or students - in combination these blogs include over 140,000 posts. But the Warwick portal gives readers no useful information about what the contents of the different blogs are. There are no indications of which are the popular or timely blogs, nor even a separation of staff and student work. Clearly nobody is going to know where to start in terms of finding out which blog is which, or in finding the ones that have some potential in better communicating the university's research to civil society. So as a way of getting knowledge hidden in the academy out into the wider world, lightly indexing all the random thoughts of a university's individual bloggers seems worse than useless.

This neglect is a pity, because organized in different ways, blogs can be an important addition to the tools available to universities for expanding their external impacts (as influence) and getting their research better known and used inside and outside academia itself. We set out the case for a different multi-author conception of top university blogs that are university-wide, or faculty-wide (but not at the level of individual departments, labs or centres for reasons we discuss below). Multi-author blogs (MABs) are themed and coherent blogs run by a proper editorial team and calling on the services of a large number of authors, who may each contribute only a few times a year. This approach means that the blog can always remains topical, with a good 'churn' of new posts every day, and can cumulate a great deal of content, without imposing a super-human effort on any one author. It can also span across a large enough topic area to attract a wide readership. We review how to set up a blog on these lines, and what their key rationales are.

Setting up a multi-author blog. When academics want to write a post, the blog processes need to be set up to help them get material out swiftly, with the blog team handling all the technical issues of posting up material for them, as well as ensuring that materials go up in a reasonably common blog format. For instance, a central blog team can often provide a much better heading and summary paragraph for a post, provide lots of electronic links to relevant material, and ensure that a blog post always ends with follow-on reading or places to go next for readers to learn more. The central blog team will need some detailed style guide that explains to academics how to enhance their readability and impact. It is important to ensure that every article has a narrative title, so that readers can quickly understand what the article is about and why they should read it. Narrative titles can also be easily re-tweeted on Twitter, a potent means of spreading knowledge of key messages. To help public understanding of science and the social sciences it is also very helpful if each post has at least one chart, diagram or photo illustration.

Once the blog article is written and approved by the academic, the actual posting is done by the blog team. Using a Creative Commons license helps to share the work across the wider web, while safeguarding key intellectual property rights for the author and the university. The blog team also ensure that regular readers are notified of all new posts via RSS feeds, Twitter, Facebook and other blog-aggregator sites and mechanisms of new and up-dated content (such as Feedburner). The team, working with the university press office and alumni office, should reach out in publicity to the widest possible range of readers, ensuring that the blog's contents are constantly added to university or faculty newsletters and mail-outs. Using the free Google Analytics programme, the blog team can also track in great detail who is reading different blogs, allowing universities or faculties to research what gets the most interest from which readers, where and when.

The internet is strongly influenced by a culture of reciprocity, and a key part of the blog team's role is thus to establish and maintain relationships with other groups in their blog's arena - asking them to cross link to the university's material, and linking out to other related blogs in return. Linking to other universities, faculties and laboratories is an important way of building a blog's profile and it may often be useful to ask both academics from other universities and external practitioners to provide articles. Because multi-author blogs are themed and focus on providing substantive information to readers (not just the kind of 'self-aggrandising' publicity included in most university press releases), it is usually feasible and often important not to be too precious in only drawing from the 'home' university or faculty in looking for content. Visiting speakers and researchers are often a useful first port of call here in broadening coverage, and in letting colleagues know of the blog's focus and usefulness.

In terms of securing content, the blog team can also act as both a way of regularly and speedily gathering outputs from academics, and then converting them into blog posts accessible to the public and practitioners alike. It is useful to have a 'clearing house' stage to ensure that all postings conform to the blog's style, 'look and feel', and the institution's rules (e.g. key ethics guidelines and avoiding publishing anything defamatory or phrased in ways that may cause offence). Maintaining the best attainable quality of blogs is key. A rather ropey-looking piece can often be improved by simply removing directly normative or prescriptive material, shortening the piece to focus on its key arguments, and linking it to other materials or debates already on the blog or the wider web. Hence the blog team need to be active editors who help upgrade materials, although academic authors normally need to approve all edits and changes.

The blog team can also monitor the many events and publications outputs that a university or a faculty produces, and contact academics and speakers, inviting them to contribute a blog article to be posted a week or so prior to the event. In some cases where seminars are for private audiences or public policy practitioners (often under 'Chatham House' rules prohibiting quoting people directly), academics can write materials post-event to summarise what was discussed.

It is often feasible to convert press releases into much more substantive and useful blogs, even though press releases are written in a different style to blog posts. The box below shows how to do this switch.

Box 9a: Converting press releases into substantive blogs

- Change the writing style from third person to first person so that the post is written *by* the academic and not *about* him or her.
- The meat of a press release is usually found in the middle and in the notes at the end. These bits convey what the research actually uncovered and why it is important. Try to lead with that.
- Either leave out any quotations from the author included in the press release, or if they contain good material or arguments, then rewrite as normal content. Press releases often include 'self-praising' material that is best omitted.
- You will probably have to read at least the executive summary, conclusions and recommendations (if any) of the original report to get a good understanding of the issue. Try also to find any synoptic chart or table that can sum up the author's finding well, possibly in a simplified form. Give a full link to the original research document in a bit labelled 'If you would like to know more…' bit (or some similar label), located at the end of the blog.
- Try not to clutter up the beginning of the blog with materials like the academic's professional title and research centre (hyperlinked). They can go in the Contributors details at the end of the blog or on a separate Contributors page, where the author's key publications can also be linked to.
- Omit from the body of the blog details of who the research was funded by or any other administrative details like which journal published the research. Links to the actual report or book can be placed at the end of the text. Journals can be hyper-linked to, but member readers without a journal subscription via a university library may not gain access.

The rationales for a multi-author blog. The justification for starting down the MAB route has four key components. First, the key advantage of such blogs is that readers can know to expect an interesting post on your blog tomorrow morning, or if not quite every morning with very regular and predictable updates every week. And so they will come back – especially where the blog development and dissemination is being professionally run as set out above.

Second, in any given year academics and researchers across departments and universities will produce a number of written outputs, journal articles, conference proceedings, books and chapters in edited books. They may also often speak at guest lectures, seminars, events or other public discussions, but these 'outputs' are often lost after the event, unless recorded by video, podcast, or even in the form of written-up notes or minutes. Equally academics and researchers may react and discuss a huge number of developments in the public realm – whether in their profession or occupational community, or in wider political, public policy, economic or media contexts. A tiny proportion of these expert and informed responses to current developments may find their way into formal media:

- via academics writing press articles in newspapers or the specialists press;
- via researchers giving TV and radio interviews;
- through the researcher being rung up by journalists to give a quote and to explain the significance of whatever a particular 'story' covered (but often academics consulted are not subsequently credited by the journalists involved);
- least often through university press releases or web posts on department pages, but here usually restricted to credit-claiming for any direct department involvement in some good new story; and
- through individual academics blogging on their individual blog sites.

But most of the expertise of the university in relation to current developments will remain stubbornly hidden from public view, never making it onto the open web, and known only to insiders.

Third, older modes of professional communication tend to be too long-winded, so that many opportunities for topical salience are passed up. When academics do (at last) publish in widely recognized forms, like books and papers, their research can appear often rather dated or backwards-looking. In the social sciences, new publications most often describe society or public policy as they used to be perhaps two or three years earlier, when the journal submission or book publishing processes first got started. Yet the self-same academics and researchers had great expertise to react to current developments in many different settings, but just somehow never got the opportunity – no one ever asked them to comment in a public form on contemporaneous developments.

By contrast, in the physical sciences the 'news cycle' for professional news seems to be quicker, and there are much more vigorous, commentaries on scientific, technological and medical developments in themed blogs and even in main scientific magazines. This partly reflects the much better 'public understanding of science' orientation in these disciplines and the large audience for understandable news of new findings in these fields. But more news of scientific controversies and occasional scandals probably leaks out into the general media because more of the initial debate gets recorded on the open web, plus there are many more science journalists than (say) social science journalists.

Fourth, a multi-author blog that is well-themed, easily findable on the open web, and well promoted and developed can be a great way to fulfil the key objective noted in section 9.4 above of providing an accessible open-web version of all the (relevant) outputs from the faculty or university involved. In relation to the university's events programme (discussed in section 9.1 above) it provides a way of ensuring that substantively valuable materials from the event are widely accessible on the internet for events that only a few people can otherwise attend.

We conclude that multi-author blogs are a very important development, and they can be an assured way for an academic institution to become more effective in the context of the web. We argued earlier in Chapter 5 that universities are important centres of 'local integration' across the otherwise highly siloed academic disciplines. Academic or university multi-author blogs (UMABs) should be thought of as a potent new means of achieving similar aims, but in a manner that is many times more visible to outsider stakeholders and organizations. The first mover universities in any field are likely to reap major gains from developing multi-author blogs. But even second-wave institutions should be able to replicate earlier successes. The internet is not a zero-sum game, and if many universities pitch in to better communicate academic knowledge to wider audiences the likely result will be beneficial for all.

This is especially true of the social sciences, where better professional communication across may help persuade governments from going further along its ill-thought through 'techno-nationalist' approach that only the STEM disciplines (physical sciences and technology) matter in terms of stimulating economic growth. We all need to show that the vast bulk of most OECD countries' economies is about services and that consequently the social sciences have a great deal to contribute to business, economic prosperity, and of course improving public policy and civil society.

We also believe also there is a huge untapped market for readers of well informed, continuously updated and varied academic blogging. Academics are already writing content and universities already function as huge dynamic knowledge inventories that insiders know about, but the wider public cannot access. So the hard part creative job is therefore already done. Multi-author blogs are a fantastic, easy, and moreover, cheap way for academics and universities to get their research out to what is essentially an unlimited audience. From this process, we can all benefit.

9.6 Working better in networks

Universities need to be able to work more effectively with the diverse impacts interface organizations discussed above in Chapter 5. The key interface bodies – especially consultancies, think tanks and professions – are not going to go away, although their importance may fluctuate a fair amount in different settings. These intermediaries' roles exist and have generally grown in prominence for very solid and material reasons. Yet many academics and even top university leaders still repeatedly express doubts about working with such intermediaries, feeling that they tend to take over academic materials giving little credit and exploiting university research in parasitic ways that give little or nothing back. Such suspicions can lead to universities behaving in 'blocking' or unco-operative ways that inhibit their own ability to develop research impacts or to realize more sustainable development patterns for academic research.

The key to being a better network partner, and to universities getting appropriate credit and reward for their research impacts, is for academics, departments and university officials to have much better information on where their strengths and weaknesses lie, and what the opportunities and threats they face in developing impacts are – the traditional SWOT analysis. Generating more information on impacts (for instance, by getting academics to keep an impacts file and regularly to report their external interactions), and then collating, analysing and updating this evidence will enable universities and departments to understand their strengths and to play to them more successfully. Where universities have tended to lose out in their interactions with intermediaries, this is chiefly because they lacked information and professionalism, failing to protect their strategic assets or to anticipate threats to their research advantage or reputation. Once you know what strategic needs and strengths you can better work in networks around the impacts interface. And universities can also work to by-pass always having to communicate with external audiences via impacts interface organizations, for instance by committing to publish all research in a substantive form on the open web and by developing multi-author blogs and other means of directly explaining research findings.

These steps will help universities, departments and individual academics and researchers to practice 'tough love' in their dealings with intermediaries, using them wherever fruitful for cultivating and broadening access to the potential beneficiaries from their research. But these steps will also increase the capacity of universities, departments and researchers to build direct relations with the final users of their knowledge in business, amongst public policy-makers and in civil society. Universities and departments can increase their partnering competency, the ease with which external organizations can work with them and understand what researchers are doing and saying. From such efforts may develop stronger 'relational contracting' competencies in which higher education enhances its ability to be paid for research and to deliver results of immediate application.

Summary

1. Academics should move beyond simply maintaining a CV and publications list and develop and keep updated an 'impacts file' which allows them to list occasions of influence in a recordable and auditable way.

2. Universities' events programmes should be re-oriented toward promoting their own research strengths as well as external speakers. Events should be integrated multi-media and multi-stage from the outset and universities should seek to develop 'zero touch' technologies to track and better target audience members.

3. Universities should learn from corporate customer relationship management (CRM) systems to better collect, collate, and analyse information gathered from discrete parts of the university and encourage academics to record their impact-related work with external actors.

4. 'Information wants to be free.' Publishing some form of an academics research on the open web or storing it in a university's online depository is essential to ensure that readers beyond academia can gain easy access to research.

5. Improving professional communication, such as through starting multi-author blogs, will help academics 'cut out the middleman' and disseminate their research more broadly.

6. Academics must realise key interface bodies like think tanks are not going to go away, Being smart about working with intermediaries and networks can broaden access to the potential beneficiaries of research.

Methodological Annex: the PPG dataset

The PPG dataset covers 120 UK academics. The dataset included academics from the following key social science disciplines: Economics, Geography, International Relations, Law, and Sociology.

Selection Process:

Five institutions per discipline were randomly selected out of a complete list of UK Higher Education Units. Then twenty academics per discipline were randomly selected. Finally, four academics from the LSE were randomly selected for each discipline.

The distribution was the following

- Economics: 24 academics
- Geography: 24 academics
- International Relations: 4 academics
- Political Science: 20 academics
- Law: 24 academics
- Sociology: 24 academics

The reason why international relations was separated from political science is that in some universities this is taken as a separate discipline and not as an orientation of political science (for example in the LSE). However, for the purposes of our analysis we consider both under the category of political science.

Distribution of academics by discipline and position:

The selection process led to the following distribution of academics across disciplines:

POSITION	Economics	Geography	Political Science	Law	Sociology	TOTAL
Researcher	0	2	0	0	0	2
Lecturer	9	9	6	9	11	44
Senior Lecturer	5	4	10	6	10	35
Professor	10	9	8	6	3	36
Not Specified	0	0	0	3	0	3
TOTAL	**24**	**24**	**24**	**24**	**24**	**120**

Dataset Lay-out

The dataset consisted of three main databases hosted in Microsoft Excel, which will then be possible to move to Microsoft Access. The three main databases have one common section with the ID, Name, Surname, Position and Affiliation of the academic. Then they have three specific sections:

1. **Google Scholar:** this database collects information from Google Scholar on the number of outputs and citations received by academics.

Google Scholar database description:

VARIABLE	DESCRIPTION	CATEGORIES
OUTPUT NAME	Describes the name of the academic output	Text
YEAR	Year of publication of the academic output	Number
NUMBER OF COAUTHORS	The number of co-authors (if any) of the academic output	Number
OUTPUT TYPE	The type of output produced by the academic	• Book (academic is author) • Book (academic is editor) • Book (academic is chapter author • Academic journal article • Research Report (for commissioning body) • Research Report (independent academic) • Discussion or commentary article • Working paper • Conference Presentation • "Citation" • Other • Not Available
SOURCE TYPE	Describes whether the characteristic of the site where the output is located	• Internal Website (belonging to the academic's institution) • Out World Facing
SOURCE NAME	Name of the source	Text
COMMISSIONING BODY	Type of commissioning body (only for research reports)	• UK Central Government • UK Local Government • Government International • Third Sector or Society • Think Tank • University UK • University International • International Organisation • Private Sector • Other • Not Available
NUMBER OF CITES	Number of citations received by the output	Number

2. **Google Scholar Inward**: this database collects information on the number of references made to an academic by other academics. The information

was collected through Google Scholar but introducing the name of the academic with a "-" sign in order to avoid self-reference to her/himself.

Google Scholar Inward database description:

VARIABLE	DESCRIPTION	CATEGORIES
YEAR OF OUTPUT	Year of publication of the output that cites the academic	Number
GEOGRAPHICAL AREA OF CITATION	Geographical area of the output that cites the academic	• UK • North America • Europe • Middle East • Asia • Latin America • Oceania • Other • Not Available
FORMAT OF HIT	The type of the output that cites the academic	• Book • Book Chapter Academic Journal Article • Research Report • Discussion article, comment or book review • Working Paper • Conference Paper or Presentation • "Citation" • Other • Not Available

3. **Full Google:** this database collects information about references to the academic from Google. The objective is to track what sectors and type of sources cite the academics themselves or their work

VARIABLE	DESCRIPTION	CATEGORIES
DOMAIN	Domain of the website where the academic is cited	Text
SUFFIX	Suffix of the website where the academic is cited	Text
SECTOR	Sector of the organization citing the academic	• Media and News • Public Sector • Publisher • UK Central Government • UK Local Government • Government International • Third Sector or Society • Think Tank International Organization • University UK University International

VARIABLE	DESCRIPTION	CATEGORIES
		• Library • Academic Resource Site • Individual website • Group website • Other
PAGE CONTENT	Type of output citing the academic	• Academic article • Research Report • Review or comment • News or press article • Bibliographic information listing academic work • Biographic information listing academic • Conference participation • Membership related information on posts held or membership of committees • Reading list or syllabus • Personal website • Blog • Other
BY/ABOUT	Is the output citing the academic written by the academic her/himself or about her/himself	Text
SINGLE / MULTIPLE AUTHORS	Is the citing piece a single or multiple authored one	Dummy
TYPE OF REFERENCE	Type of reference to the academic	• Personal Mention • General body of work • Specific Project/Team • Book (academic is author) • Book (academic is editor) • Book (academic is chapter author) • Academic article • Research report (commissioning body) • Research report (academic independent) • Discussion or commentary • Working paper • Conference paper or presentation • Other
CLICK FROM ARTICLE	Is it possible to access the academic's referred piece in two or one click?	Dummy: Yes / No
NEGATIVE REFERENCE	Is the citation negative or positive?	Dummy: Yes / No

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