



**Proceedings of the 3rd HEA Forward-Look Forum:
International Trends in Research: What Does Ireland Need to Succeed?**

15th April 2015

Gandon Suite North, Davenport Hotel, Merrion Street Lower, Dublin 2

Introduction

The HEA Forward-Look Forum, ‘International Trends in Research: What Does Ireland Need to Succeed?’, was convened at the Davenport Hotel on 15th April 2015 to explore the role of research in higher education. The Forum was the third event in a new series of fora which the Higher Education Authority (HEA) is hosting biannually to provide opportunities for forward-looking and disruptive thinking about the future of the sector amongst key stakeholders and thereby to enhance the policy-making capacity and capability of the higher education community. Cognisant of the global context within which Irish higher education operates, and of Ireland’s potential to emerge as a strong player within the ‘knowledge society’ of the twenty-first century, the fora aim to support the cultivation of fresh, long-term perspectives on topical, cross-cutting themes through inclusive, participatory, and action-oriented discussion and debate.

Building on the discussions that took place during previous fora in the series, the 3rd Forum focused on how the value of research in higher education can be optimised and its quality and impact be evaluated and demonstrated. Bringing together the leadership of Irish higher education, the public sector and enterprise to share knowledge and experience of fostering research excellence, the Forum provided an opportunity for free-ranging discussion about the strategic development of this central aspect of the mission of higher education. Keynote addresses were given by Professor Sir Peter Scott (University College London), Dr. Martin Curley (Maynooth University and Intel Labs Europe), Professor Arie Rip (University of Twente), David Sweeney (Higher Education Funding Council for England), and Dr. Jack B. Spaapen (Royal Netherlands Academy of Arts and Sciences).

The *National Strategy for Higher Education to 2030* (2011) identified research as one of ‘the three interconnected core roles of higher education’, and today this is a topical issue amongst policy-makers.¹ It is only over the past 2 decades that the Government of Ireland has invested in research in higher education, but during this time the research-capacity of the sector has significantly increased, as reflected in the rise of Irish universities in international rankings. The HEA has played an important role in supporting this capacity-building (through the Programme for Research in Third-Level Institutions (PRTL) and the Irish Research Council) and views research as vital to a high-performing higher education system. The Department of Jobs, Enterprise and Innovation (DJEI) is currently leading the development of a new *Strategy for*

¹ Department of Education and Skills, *National Strategy for Higher Education to 2030* (Dublin: DES, 2011), 63, <http://www.education.ie/en/Publications/Policy-Reports/National-Strategy-for-Higher-Education-2030.pdf>.



Science, Technology and Innovation for the period 2015–2020, which will be a comprehensive, whole-of-government strategy for Ireland’s research and innovation system, the consultation process for which has supported worthwhile discussion and debate. This strategy will support the next generation of investment in research, the last tranche of which was administered in 2004/05. At the same time, the Government of Ireland has established an Expert Group to examine future funding policy for higher education to which the role of research is also pertinent. At this pivotal time for the development of higher education policy, discussion about how the value of research can be optimised and demonstrated is therefore timely.

What is the role of research in higher education?

Professor Sir Peter Scott (Professor of Higher Education Studies, Institute of Education, University College London)

Within the context of policy-makers’ increasingly instrumentalist approach to higher education, it is instructive to recall the conception of the university formulated by John Henry Cardinal Newman in the mid-nineteenth century—and published as *The Idea of a University* in 1905.² Criticising those of his contemporaries who asked, ‘what there is to show for the expense of a University’, Newman conceived a ‘Liberal’ university education as ‘the process of training, by which the intellect [...] is disciplined for its own sake’, and which ‘aims at raising the intellectual tone of society, at cultivating the public mind, at purifying the national taste’.³ This view is contrasted by that of Clark Kerr who, in *The Uses of the University* (1963), situated the university within wider society, conceiving it as ‘a prime instrument of national purpose’ and ‘new knowledge’ as ‘the most important factor in economic and social growth’.⁴ The purpose of the university is still hotly disputed today, especially in humanities departments.

While up until the mid-nineteenth century, the pursuit of research was not central to the mission of universities, thereafter the academies in which research was undertaken were gradually assimilated into them. While universities have always had a professional orientation (providing, for example, teacher and medical training), their role in advancing science did not emerge until the Second World War. In the 1970s, ‘80s, and ‘90s, new patterns of knowledge-production emerged, including the concept of the ‘Triple Helix’ of the state, industry and the university, which is sometimes accompanied by a linear view of innovation; and of ‘Mode 2’ knowledge, as that which is generated collaboratively and which has a distributive impact across society, challenging the validity of models of research assessment focused on quantifying outputs. Today universities are at the heart of the creative environment within cities and are vital to regional development as well as to the global, high-technology economy.

In the twenty-first century, research is central to the mission of higher education, within which context it plays multiple roles. Research is concerned with critical enquiry, with advancing the

² See John Henry Newman, *The Idea of a University* (London, New York and Bombay: Longmans, Green and Co., 1905; repr. Forgotten Books, 2012).

³ *Ibid.*, 152–153, 177.

⁴ Clark Kerr, *The Uses of the University*, 5th edn (Harvard University Press, 2001), 66, xii.



sum of human knowledge and with thinking the unthinkable—with science, with scholarship and with the advancement of civilisation. The evolution of individual disciplines—and the renewal of the academic profession—is dependent upon research, and fostering a synergistic relationship between teaching and research (at undergraduate and postgraduate levels) is an important aim for university teachers. The application of research to the challenges we face is another key facet of the research mission of higher education institutions which, within the U.K., is now being captured through the case studies on research impact produced for the Research Excellence Framework (REF).⁵ There is, arguably, a risk that the new focus on evaluating the impact of research—in higher education in the U.K. and internationally—will discourage industry-sponsorship and other private funding of research activity in higher education. More broadly, university rankings have driven the selective funding of research in higher education, as governments seek to establish ‘world-class’ universities and to generate critical mass in priority areas. This has in turn affected the management of research at institutional level, strengthening the impetus for academics to secure external research-funding and to form academia–industry partnerships. Similarly, while the REF informs research-funding allocations in the U.K., its resource implications are minimal, the primary focus of the exercise being on institutions’ reputations.

The assessment of higher education institutions’ performance in research, which has been resisted in Ireland to date, enhances their accountability for funding received as well as supporting targeted funding of the strongest researchers. In the U.K., the Research Assessment Exercise (RAE) was instituted in 1992 as a mechanism for ascertaining which academic departments were research-active, as the foundation for prioritising the funding of the highest performing and thereby supporting the mission-differentiation of institutions. A range of strategies have been adopted for the funding of research, ranging from the ‘heavy-touch’ REF to lighter-touch strategies focusing on developing centres of excellence, on linking research, development and innovation at national level, and on the developing institutional strategies. (The German Government’s ‘Excellence Initiative’ provides an example of a lighter-touch approach to building research-capacity and enhancing research-quality in higher education.⁶) Within this broader policy context, there has been a trend towards the pursuit of teaching and research as discrete roles within institutions, raising questions about how best to support the career-development of young researchers and creating the risk of a decline in teaching quality and of the impoverishment of the university as an institution.

It is important for universities to acknowledge that, in the twenty-first century, they number among several players in the creation of knowledge. While universities lead the production of knowledge in some disciplines, it is difficult to argue that they do so in many areas of the economy (such as the financial services). Nevertheless they have a role to play in integrated innovation systems. The question arises as to whether research in higher education can best be supported by the adoption of a ‘top down’ national strategy or by organic ‘bottom up’ initiatives. In seeking to develop coordinated research and development (R&D) strategies,

⁵ On the Research Excellence Framework (REF) see <http://www.ref.ac.uk/>.

⁶ See http://www.dfg.de/en/research_funding/programmes/excellence_initiative/index.html.



governments face the dilemma of deciding whether to seek to establish as many ‘world-class’ universities as possible or whether to build a coherent network of regional institutions.

Dr. Martin Curley (Co-Director, Innovation Value Institute, Maynooth University and Director, Intel Labs Europe)

‘Open Innovation 2.0’ is an exciting new paradigm, based on the concept of the ‘Quadruple Helix’, through which government, industry, academia and civil society work together in the co-creation of knowledge.⁷ The emergence of this paradigm, which was introduced at the ‘Open Innovation 2.0’ conference during the 2013 Irish Presidency of the Council of the European Union,⁸ has informed the European Commission’s development of their funding model for research, with the inclusion of innovation in Horizon 2020 reflecting a significant departure from the Seventh Framework Programme (FP7). Under the chairmanship of Dr. Curley, the European Commission’s Open Innovation Strategy and Policy Group (OISPG) has, for the past 5 years, promoted open innovation as a user-driven model for fostering entrepreneurship and supporting sustainable economic growth, exploring the key patterns by which it is distinguished.⁹

That, since the Second World War, technological innovation has accounted for 75% of GDP in the U.S. has raised awareness of the importance of innovation, which was emphasised by President Barack Obama in his 2014 State of the Union Address.¹⁰ It was also highlighted during the Swedish Presidency of the Council of the European Union at a conference on higher education, research and innovation, held at Gothenburg University in 2009.¹¹ The processes of innovation are rapidly evolving. Today, the flow of knowledge within the ‘knowledge triangle’ is vital to innovation: as the former European Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn, remarked, ‘knowledge is the crude oil of the twenty-first century’. The provision of research-based higher education is the foundation for social and economic development, supporting knowledge-production and the provision of human capital. Nevertheless, with the emergence of open innovation, higher education institutions are situated within a broader innovation ecosystem in which externally focused, collaborative innovation is replacing closed, inward-looking research.

Intel Labs Europe have built up an extensive European R&D network which is dynamic in its formation, with laboratories continually opening and closing. Over the past four and a half years, this network has expanded from 800 to 4,500 professionals whose work is aligned with a shared vision.¹² Through this network, Intel has collaborated with European higher education

⁷ See European Commission, ‘Open Innovation 2.0’, <https://ec.europa.eu/digital-agenda/en/growth-jobs/open-innovation>.

⁸ See <http://eu2013.ie/events/event-items/associated-20130520openinnovation20/>.

⁹ See <https://sites.google.com/site/openinnovationplatform/>.

¹⁰ See <https://www.whitehouse.gov/the-press-office/2014/01/28/president-barack-obamas-state-union-address>.

¹¹ See http://www.gu.se/english/about_the_university/news-calendar/News_detail//eu-conference-on-higher-education--research-and-innovation.cid890558.

¹² See <http://www.intel.eu/content/www/eu/en/research/intel-labs-europe.html>.



institutions on over 70 FP7-funded projects, developing a common vision in partnership with other stakeholders in digital innovation and advancing the European Commission's 'Digital Agenda for Europe'.¹³

In 2012 Intel Labs Europe, Dublin City Council and Trinity College Dublin announced the launch of the 'Sustainable Connected Cities Dublin' project through which innovative new digital technologies have been developed and piloted to provide smart IT services and solutions for the citizens of Dublin. The wide support for the initiative was in evidence at the 2013 'Open Innovation 2.0' conference, during which over 90% of delegates affirmed that they would be willing to participate in the Dublin-based testing of new technologies. Intel is running a similar project in London, in partnership with Imperial College, which is supporting the use of sensors to monitor air and water quality in real time, along with the use of sound sensors to analyse bird-song. Through Intel's 'Walk the Talk' project, an online game and mobile activity-tracker are employed to encourage Brixton school children and their parents to walk to school with the aim of enhancing their health and well-being and lessening pollution in the environment. These projects exemplify the concept of 'living labs', which support user-driven open research and innovation *in situ*.

A key issue which is central to the debate about how best to support innovation is the half-life of knowledge, defined by the economist, Fritz Machlup, as the amount of time that has to elapse before half of the knowledge in a particular area is superseded or shown to be untrue.¹⁴ While in psychology this 'half-life' is estimated to be approximately 5 years, it is being transformed across all disciplines by technology.

Through collaboration with over 100 companies and organisations, Maynooth University's Innovation Value Institute (IVI) 'researches, develops, and disseminates empirically proven and industry validated IT best practice' in order to 'optimise business value'.¹⁵ Supporting Mode 2 research which is co-created, interdisciplinary, problem-focused, and context-sensitive, the IVI's work exemplifies open innovation in action within a dynamic eco-system, transforming the way in which public and private-sector organisations manage IT systems.

While, to date, the evolution of higher education has focused on knowledge-creation and on the supply of human capital, in the future there will be a stronger imperative to foster knowledge-driven entrepreneurship that supports wealth-creation as well as well-being and welfare. Universities of the future will be distinguished by the eco-system of which they are a part, and in Ireland there is great potential to advance a shared vision through the alignment of higher education institutions with private enterprise.

¹³ See <http://ec.europa.eu/digital-agenda/>.

¹⁴ See Fritz Machlup, *The Production and Distribution of Knowledge in the United States* (Princeton, New Jersey: Princeton University Press, 1962).

¹⁵ See <https://ivi.nuim.ie/about-us>.



Discussants

Professor Mark Ferguson, CBE (Director General, Science Foundation Ireland)

As Matt Ridley argues in *The Rational Optimist: How Prosperity Evolves* (2010), the exchange of ideas is central to both research and commerce, and, in the internet age, the speed of this exchange is accelerating.¹⁶ The phrases ‘basic research’ and ‘applied research’ are viewed as pejorative by different audiences: ‘basic’ evoking a stereotyped view of academics as left-wing, passive and lazy, and ‘applied’ evoking a stereotype of short-term, uninteresting, and second-rate. Both of these terms are untrue and unhelpful because they suggest that the research-process is linear rather than dynamic and cyclical. They also obscure the fact that the generation of knowledge has been democratised, with the exchange of ideas by professors and citizens alike being of equal value.

While, in supporting knowledge-generation, both small and large countries share common challenges, the prioritisation of research assumes greater importance within the former. In a small country such as Ireland, funding research solely on the basis of excellence may not support national strategic development. Groups of excellent researchers have a tendency to expand, as leaders in an area tend to congregate, attract and grow talent and wish to work together. However it is also necessary to ensure that the skills-base being developed can support the national interests. For example, we currently have a situation in which the scarcity of experts in manufacturing in the Irish higher education sector is unsupportive of the economic development of a country whose GDP is heavily reliant on manufacturing. This highlights the need for the development of a national research strategy.

Within small countries, excellence is distributed and so is not captured in global university rankings which showcase comprehensive research-intensive universities. There are no Irish universities in the top 20 of such rankings, but Ireland nevertheless hosts leading research centres which have been reviewed by researchers in the top 10 universities globally and deemed to be comparable to research centres in those institutions. There is therefore a need to develop mechanisms to showcase centres of excellence.

Evaluating the impact of research is very important. While many academics wish to be funded on trust, it is necessary politically to demonstrate the impact of the research undertaken in higher education within what is a highly complex knowledge-ecosystem with many actors. As Science Foundation Ireland (SFI) has documented, the impact of research is not just economic, but rather can be measured across any of the following 6 pillars:

- Economic and commercial impacts;
- Societal impacts;
- Impacts on public policy and services;
- Health impacts;

¹⁶ See Matt Ridley, *The Rational Optimist: How Prosperity Evolves* (New York: HarperCollins, 2010).



- Environmental impacts;
- Impacts on professional services.¹⁷

A recent report, ‘Broadening the Scope of Impact’ summaries the key measures of impact in six small advanced economies—Denmark, Finland, Singapore, Israel, New Zealand, and Ireland.^{17a}

In order to maximise the strategic value of research, it is important to have the flexibility to change priorities over time, and this requires the maintenance of reservoirs of resilience within the research ecosystem. For SFI, as the national foundation for investment in scientific and engineering research, measuring research-impact is essential in order to stimulate engaged scholarship and in order to maximise the value of public investment for human capital development and economic growth.

While it is often stated that public investment in research displaces (or ‘crowds out’) private investment by industry, a study undertaken for the U.K.’s Department for Business, Innovation and Skills and HM Revenue and Customs has demonstrated that it actually helps leverage private investment (i.e. ‘crowds in’ private investment).^{18, 18a} Many academics are concerned that engaging with industry results in sub-standard research, yet the most highly cited academic papers are those that have been co-authored with researchers from industry. 30% of academic papers produced in Ireland across disciplines are not cited by anyone which, in commercial terms, means a 30% loss. These insights highlight the value of data-analytics for the development of research policy.

Professor Orla Feely (Vice-President for Research, Innovation and Impact, University College Dublin)

People are the most important output of research for a ‘knowledge economy’ and an informed society, and it is vital that the pipeline of talent through higher education institutions, from undergraduate to postdoctoral level, is strengthened. This involves the research-informed education of undergraduates as well as the development of research-trained postgraduates

¹⁷ See SFI, ‘Types of Impact’, <http://www.sfi.ie/funding/sfi-research-impact/impacts-and-outputs/types-of-impact.html>.

^{17a} See ‘Broadening the Scope of Impact, defining, assessing and measuring impact of major public research programmes, with lessons from six small advanced economies’, January 2015 http://www.smalladvancedeconomies.org/wp-content/uploads/SAEI_Impact-Framework_Feb_2015_Issue2.pdf.

¹⁸ See Charles Michaelis, Karl King, and Alison Radevsky, *Qualitative Research into Businesses’ Research and Development (R&D) Decision-Making Processes*, HM Revenue and Customs Research Report 101 (2010), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32557/report101.pdf.

^{18a} See Frontier Economics, *Rates of Return to Investment in Science and Innovation: A Report Prepared for the Department of Business, Innovation and Skills (BIS)* (London: Frontier Economics, June 2014), <http://www.frontier-economics.com/documents/2014/07/rates-of-return-to-investment-in-science-and-innovation.pdf>.



and postdoctoral researchers, all including strong emphasis on innovation. The onus is on higher education institutions to ensure that there is a symbiotic relationship between teaching and research.

Higher education institutions are unique in their capacity to support interdisciplinary research across a wide range of disciplines, and are dynamic environments in which a relatively small number of leading researchers are complemented by a throughput of creative postgraduates and postdoctoral researchers. The reputation of universities, as mediated through, but not limited to, global rankings, is now heavily reliant on research-performance.

In respect of the need to support a broad range of basic research, the question is not whether we invest heavily in large-scale activities in any one specialist area but whether we are open to maintaining some capacity where excellence is demonstrated. With the loss of an excellent and inspirational research leader in any such area, we lose also their ability to attract and inspire young scientists, educate across disciplines, enhance our scientific standing, and feed cross-disciplinary research and serendipitous opportunities. While in a small country, the prioritisation of research is necessary, this must not be to the detriment of the maintenance of a solid research base. It will be imperative for the new *Strategy for Science, Technology and Innovation 2015–2020* to recognise and support this.

Open discussion

It was observed that, within Ireland there is an opportunity to enhance the connectivity between the physical and virtual worlds in which we live in order to create a seamless community of researchers which extends beyond the confines of the campus. One panellist noted that the boundaries between the campus and the wider community are already extremely porous, with companies and research-incubation centres situated on university campuses, the creation of professorial chairs which are co-funded with industry, and the provision of research fellowships that include an industry-placement. However others felt that there is much more to be done to foster academia–industry interaction, and that, with 56% of multinational companies not engaging with the research-base in Ireland, there is a strong imperative to address the difficulty of securing state co-funding for industry-led research. It was reported that SFI is currently holding discussions with Enterprise Ireland and IDA Ireland about coordinating funding streams.

Views were sought on the scientists' letter to *The Irish Times* of 18th March 2015 on the Government of Ireland's strategy for investment in research, the importance of supporting basic research, and the need to support the continuum between education and research.¹⁹ It was observed that the key point made in the letter was that the funding of prioritised research areas needs to be balanced with funding for exploratory basic research, and the case for a portfolio of investments, which supports early-career as well as leading researchers, basic and applied research, and which supports the creation of synergies between industry-led research

¹⁹ See 'Funding Basic Research in Science', *The Irish Times*, 18th March 2015, <http://www.irishtimes.com/opinion/letters/funding-basic-research-in-science-1.2142827>.



and the implementation of national policy was made. (It was noted that, while previously SFI only funded basic research, the Industrial Development (Science Foundation Ireland) (Amendment) Bill 2012 extended the organisation's remit to encompass the funding of applied research. This has led to a reduction in the level of SFI funding available to support basic research, but has nonetheless created a more balanced portfolio of investment by the agency.) There was a call for an increase in the public funding available for research, for greater international collaboration, and for the development of a sophisticated national research strategy.

It was suggested that the thematic approach to research prioritisation adopted in Ireland to date could usefully be replaced by one that is based entirely on addressing a set of national challenges; and that there is now a need to create a vision for the research landscape in Ireland. Accepting that, as a small country, Ireland cannot support research excellence in all areas, the conundrum of how to maintain 'reservoirs of resilience' in the research eco-system was posed. The imperative for the *Strategy for Science, Technology and Innovation* to include a commitment to the provision of small-scale grants (of ~€150,000) to researchers across disciplines was identified as an important means of addressing this need. However it was also acknowledged that few countries (with the exception of the U.S.) host self-contained research ecosystems, and that the 'reservoirs of resilience' reach across national borders, particularly within the European context.

It was noted that the number of applications from Irish researchers to the SFI–Health Research Board–Wellcome Trust Biomedical Research Partnership funding scheme has been low, and that the success-rate of applications received from Irish universities to the scheme is below that of mid-ranking U.K. universities.²⁰ Likewise the success-rate of Irish applications to the U.K.'s Royal Society is, at 50% of that of U.K. applications, comparatively low. The weak capacity of Irish researchers to successfully bid for such funding was lamented, particularly given the desirability of leveraging funding from other sources and of working in partnership with researchers in the Britain, Northern Ireland, the U.S., and Europe to build resilience through international networking. However the point was made that these low success-rates are more likely to be due to gaps in support for, and unfamiliarity with, new schemes than to lack of quality. The positive impact of the introduction of such support is seen in the improvement in the success-rate of Irish applicants to the highly prestigious European Research Council schemes. Further to national supports being put in place for these schemes, Irish applicants achieved a very high success-rate in 2014 by contrast with their much lower rates of success in earlier years. It was also noted that the citation-rate of Irish research is well above the international average, and that in certain fields Ireland has a high percentage of the top-cited papers (top 50%, 10%, 5% and 1%).

With the acknowledgement that entrepreneurship is often associated with rapacious capitalism, it was noted that, within higher education, the rewards on offer for high-performance in research are far greater than those on offer for high-quality teaching, and that

²⁰ On the SFI–HRB–Wellcome Trust Biomedical Research Partnership see <http://www.wellcome.ac.uk/Funding/Biomedical-science/Application-information/wtx062869.htm>.



this is an imbalance that needs to be addressed, particularly in respect of the career-development prospects of academics. However, conversely, it was suggested that, in the resource-constrained environment of Irish higher education, heavier teaching loads are eroding the time available for research, as reflected in the decline in the number of Ph.D. enrolments and of publications produced within the system. With the acknowledgement that terms such as ‘entrepreneurialism’ and ‘impact’ can become ideologically loaded, it was argued that entrepreneurship is not solely about wealth-creation, but about shifting resources from lower value to high-value activities, and that there is a need to facilitate this transition within higher education.

A question was raised about how Ireland can influence the international policy-discourse on higher education to enhance the focus on centres of research excellence. In this regard, it was acknowledged that international students pay heed to global university rankings when selecting their programme of study, and it was observed that a policy that focused exclusively on the reputation of research centres could therefore militate against the achievement of the Government’s objectives in respect of the internationalisation of Irish higher education. It was suggested that it is imperative for every higher education institution which hosts a centre of excellence to take the credit for this, following the example of the University of Manchester, whose success in the recruitment of international students is attributable to a marketing strategy branding the institution as employers’ university of choice. The importance of ensuring that a consistent, whole-of-government approach to higher education policy-making is adopted was further illustrated with reference to what has been described as the ‘tension between the [U.K.] government’s immigration policy of significant reduction and its belief that significantly increasing numbers of international students is an “achievable” goal’.²¹ There was a call for constructive suggestions about how closer inter-departmental working can be fostered within Ireland.

Re-defining research relevance: for whom and for what?

Professor Arie Rip (Professor of Philosophy of Science and Technology, University of Twente)

The relevance of research, which depends upon the interaction of a range of actors, is an elusive quality which cannot be codified but which, in conjunction with research excellence, is of vital importance. Nevertheless academics are under pressure to ensure the relevance of their research within the broader context of the emergence of new modes of knowledge-production. Since the 1980s, the new category of strategic research has emerged to describe basic research undertaken with the expectation that it will produce a broad base of knowledge from which the solutions to practical problems will be extracted. This is research undertaken within a long-term horizon, which is supported within institutions with the expectation of the eventual uptake of the results attained. With the outcome of the research moving beyond the control of the original researchers into what Michael Gibbons has described as ‘knowledge

²¹ Universities UK, *International Students and the UK Immigration Debate* (London: British Future and Universities UK, 2014), 10, <http://www.britishfuture.org/wp-content/uploads/2014/08/BRFJ2238-International-Students.WEB-FINAL.Embargo-25.8.14.pdf>.



pools', it is essentially unpredictable and unmanageable. Nevertheless, the 'research compass card' developed by Philippe Laredo provides a framework for monitoring the progress of an institution's research mission across the following 5 dimensions, the balancing of which entails strategic choice:

- Manpower embodied knowledge;
- Innovations (competitive advantages);
- Public understanding of science expertise;
- Collective goods (power (nuclear weapons), prestige (space), and welfare (health, environment));
- Certified knowledge instruments.²²

Thus, with the rise of 'strategic science', the old division between basic and applied research is no longer maintained within higher education institutions, blurring the distinction between the university and public and private research organisations. Science has become 'de-professionalised' as a range of actors have emerged in the research arena, diversifying the research landscape. In response to this development, universities have become more entrepreneurial, with widespread adoption of the principles of the 'new public management'. As Marginson and Considine argue, the key challenge facing the institutional managers is how to harness the creative energies of researchers in order to optimise the position of their university within a competitive higher education system that places a premium on research as a source of prestige and value.²³ They observe that, while any explicit attempt at the 'top-down' management of researchers would be construed as an attack on the traditions of collegiality and the integrity of academic disciplines, nevertheless research-management is becoming increasingly comprehensive and indicator-driven, with traditional research practices being viewed as an impediment to high-performance. The evolution of the role of research in higher education has created the need for new organisational modes of decision-making to ensure institutions' responsiveness to the external imperatives of industry and the government.

The key challenge which universities now face is to diversify and reconfigure, both cognitively and institutionally, into a postmodern university complex, in which synergies between centres of excellence and other organisations, as well as between research and teaching activities, are fostered, and ambidexterity becomes an attribute of academics and institutions. With the emergence of a range of other providers, as well as of online higher education, universities are losing their monopoly on research training, and they are becoming symbolic sponsors of research within an ecosystem that includes a range of actors, including private foundations. We need to foster a continuum within the research ecosystem—a theme which has been

²² See Michel Callon, Philippe Larédo, Philippe Mustar, *The Strategic Management of Research and Technology: Evaluation of Programmes* (Economica, 1998).

²³ See Simon Marginson and Mark Considine, *The Enterprise University: Power, Governance and Reinvention in Australia* (Cambridge: Cambridge University Press, 2000), 133 ff.



explored by the European Science Foundation in their recent report, *Science in Society: Caring for our Futures in Turbulent Times*.²⁴

A fashionable discourse about universities' role in addressing grand challenges has emerged along with the new category of 'challenge-oriented' research, which necessitates changes in institutional structures and processes as well as the development of critical mass. The concept of 'responsible research and innovation' has also gained currency, defined by the European Commission as a process through which 'societal actors (researchers, citizens, policy makers, business, third sector organisations, etc.) work together [...] in order to better align both the process and its outcomes with the values, needs and expectations of society'.²⁵ The emergence of these new paradigms requires a re-examination of system-level dynamics and policies in higher education.

Subsequent to an intensive phase of research capacity-building and research-prioritisation, Ireland is now engaged in this process of re-examination with a view to enhancing the strategic development of the research landscape to increase responsiveness to social and economic needs. With a strong focus within the policy-discourse on the economic impact of research, and on inputs and outputs within a linear process, there is a risk that the complexity of higher education will be under-estimated and diminished. As reflected in the *Report of the Research Prioritisation Steering Group*, it should be acknowledged that national research and innovation systems are patchworks rather than machines, and that they evolve in response to tensions and challenges.²⁶

With the rise of strategic research, and the focus on supply and demand, a quasi-market for research has been created within which the concepts relevance and excellence are operationalised as indicators of success.

Discussants

Dr. Graham Love (Chief Executive, Health Research Board)

While across the developed world, there is a trend towards developing critical mass in centres of research excellence, there is a risk that this trend will erode the resilience of our research ecosystems. A recent Canadian study showed that impact (in terms of the number of academic papers produced and the number of citations of those papers) does not increase linearly with grant size. Accordingly the provision of a limited bedrock of smaller grants focused on diversity should be considered in parallel with the drive towards fewer, larger grants, as a means to ensuring resilience in the system.

²⁴ See European Science Foundation, *Science in Society: Caring for our Futures in Turbulent Times* (June 2013), http://www.esf.org/fileadmin/Public_documents/Publications/spb50_ScienceInSociety.pdf.

²⁵ See <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation>.

²⁶ See Forfás and Department of Jobs, Enterprise and Innovation, *Report of the Research Prioritisation Steering Group* (2012), http://www.djei.ie/publications/science/2012/research_prioritisation.pdf.



Professor Vinny Cahill (Dean of Research, Trinity College Dublin)

While we have a tendency to treat research as separate from wider society, it is for people and it is the foundation for the 'knowledge society' as well as for higher education. We depend upon the generation and communication of knowledge and so it is important that we create the right kind of opportunities—for individuals and for institutions—in order to optimise research-impact. The research role of higher education institutions is vital to creating graduates who, as entrepreneurs, innovators and leaders, will contribute to society. Creating a broad base of research expertise is fundamental to the successful pursuit of strategic research. The limited set of quantitative metrics used to evaluate research fails to capture its breadth and to reflect the benefits of research-led education for wider society.

Dr. Alison Campbell, OBE (Director, Knowledge Transfer Ireland)

Companies engage with the research-base in order to gain access to talent. We need an innovation system that supports a blended, rather than linear, approach to research in order to maintain a balanced portfolio of research activity. We need to undertake the complex task of examining the components that comprise an effective research system in order to develop a strategic vision for Ireland, where we have a pitiful record of securing industry-funding for research and of generating revenue from licensing. Knowledge Transfer Ireland will shortly publish a survey of the interaction between higher education and industry in Ireland, which will include case-studies showcasing successful initiatives.

Mark Redmond (Chief Executive, American Chamber of Commerce Ireland)

The availability of talent is crucial to attracting foreign direct investment (FDI). Approximately 700 U.S. companies operate in Ireland creating 130,000 jobs (directly) and 100,000 jobs (indirectly) as well as generating approximately 26% of GDP. The American Chamber of Commerce Ireland has just completed a consultation across all sectors of the economy about how Ireland can succeed in innovation with a view to creating a shared vision for the future. While Ireland has been very successful in attracting FDI, the country is no longer differentiated within the changing geopolitical landscape. Strengthening R&D will be crucial to enhancing Ireland's international reputation and to securing the next wave of investment, and we have a strong base on which to build. Success in this endeavour will necessitate investment of 3% of GDP in R&D by 2025, as well as the development of a shared vision for the research ecosystem. We need to ensure that Ireland is viewed as an attractive location in which to work, study and live in order to respond to the enthusiasm within the FDI community to establish research-bases here. Research capacity-building is now an international, rather than merely a national, imperative.

Professor Mary E. Daly (President, Royal Irish Academy)

As key stakeholders in research, we share a common belief that research matters—that it is fundamental to the society in which we live. We have a responsibility to educate the wider



public (including citizens, policy-makers and politicians) about the importance of research if it is to be valued. While most people are not full-time researchers, we are all consumers of research, and we need to ensure that the public are informed consumers who have an understanding of the research process. Communicating to politicians the value of research is particularly important as they determine funding allocations.

Open discussion

Arguably research is not the crude-oil of the twenty-first century because it is increasingly widely available rather than privately owned. Accepting that research is for all of society, and that its impact is neither predictable nor manageable, questions were raised as to how we can best support enhanced engagement between researchers, higher education institutions and citizens in order to showcase its value and relevance.

The strong track-record of engagement between medical researchers and patients in the U.K. over the past 10 years, through which patients have become active participants in the selection of research topics, the development of proposals and the evaluation of outcomes, was cited as an illustration of good practice. This has been supported by INVOLVE—a national advisory group, established in 1996 and funded by the National Institute for Health Research, which supports public engagement with researchers throughout the research process.²⁷ This patient-engagement helps to ensure public accountability for the expenditure of tax-payers' money.

Attention was also drawn to the initiative, funded by the Royal Irish Academy as part of the Politics Plus exchange programme, which brought together 8 elected representatives from the Northern Ireland Assembly and geoscientists from Northern Ireland and the Republic of Ireland to enable the politicians to establish links with active scientists and the scientists to understand the political process.²⁸ Organised in partnership with the Geological Survey of Northern Ireland (GSNI), Queen's University Belfast, and the Northern Ireland Assembly Legislative Strengthening Trust (NIALST), the Politics Plus initiative has established a unique channel of communication between leading scientists and elected representatives.²⁹

It was noted that a great deal of public opinion is formed in a reaction to ill-informed media coverage, and there is therefore a pressing need for individuals and agencies to develop diverse and targeted solutions to providing accurate information about research. It was observed that there is a strong appetite in Ireland for literature about science but that too few Irish scientists engage with the public. The importance of engaging citizens in research-prioritisation was noted, and it was reported that the Ministry for Business, Innovation and Employment in New Zealand has engaged the public in the identification of its 'National Science Challenges'.³⁰

²⁷ See <http://www.invo.org.uk/>.

²⁸ See <https://www.ria.ie/News/Politics-Plus-MLA-Scientist-pairing-initiative-lau>.

²⁹ See <http://politicsplus.com/>.

³⁰ See <http://www.msi.govt.nz/update-me/major-projects/national-science-challenges/>.



Cognisant of the ‘ivory tower’ traditions which still prevail in some disciplines, there is a need for a plural conception of the relevance of research. However the notion that universities are unreceptive to collaboration in research was rebuffed on the ground that research is a global, collaborative endeavour and that most academics are engaged in external collaboration nationally and internationally. It was emphasised that the range of actors in the research ecosystem have different roles to play, and that it is incumbent on academics to deliver excellent research which informs their teaching. Given that multi-national companies invest in the countries which have the strongest human-capital base, higher education institutions are critically important because they produce and maintain the pipeline of talent. Within this context, the importance of recruiting and retaining top-class researchers was also highlighted along with the need to education multi-national companies about the benefits of operating in Ireland. It was noted that Ireland’s superb manufacturing base in the pharmaceutical industry bears testimony to the country’s success in supporting the R&D needs of industry.

It was observed that some academics experience a critical backlash when they engage in industry-funded research because of the perception that this compromises academic integrity. However it was noted that there is a *National Policy Statement on Ensuring Research Integrity in Ireland*, developed by a consortium of agencies and launched in 2014, which provides the framework to enable academics to address such concerns.³¹ It was suggested that the calibre and productivity of many centres of research excellence declines over time, and that it is important that funders of such centres have the ability to close them down as deemed appropriate. Science is continually evolving and this needs to be reflected in the dynamism of the research ecosystem.

How can higher education best demonstrate impact and value?

David Sweeney (Director, Research, Education and Knowledge Exchange, Higher Education Funding Council for England)

In the higher education sector in the U.K., knowledge-transfer, industry–academia partnerships, and community engagement are well-established and are rewarded through the allocation of the block grant to institutions. The Higher Education Funding Council for England (HEFCE) collects voluminous data on the activities of higher education institutions in these areas, and all research-funded is allocated on the basis of performance. The HEFCE introduced the assessment of research-impact through the REF in order to strengthen the case for research-investment. While the REF imposes a heavy bureaucratic burden on higher education institutions, it is fundamentally owned by the academic community, with 1,200 academics participating on the assessment panels.

The U.K.’s Royal Society has averred that, in the twenty-first century, ‘advances in science and technology will continue to transform the way we live, create new industries and jobs, and

³¹ See <http://www.iua.ie/wp-content/uploads/2014/06/National-Policy-Statement-on-Ensuring-Research-Integrity-in-Ireland-2014.pdf>.



enable us to tackle seemingly intractable social and environmental problems'.³² Meanwhile the British Academy has observed that, in addition to their intrinsic value, the humanities and social sciences 'guide—and promote—reasoned political and public discourse, by bringing fresh knowledge and ideas to the fore'.³³ Recognising that 'the U.K. has one of the most successful higher education systems in the world', the British Government acknowledges the centrality of higher education to its *Plan for Growth*, which aims to make the U.K. the best place in Europe to start and grow a business; to encourage investment and exports as a route to a more balanced economy; and to create a more educated and flexible workforce.³⁴

The U.K. research-base punches above its weight, performing better than the world average in all subject fields based on field-weighted citation impacts. The national objectives for the research-base are to provide intellectual leadership in the development of new knowledge; to optimise the contribution to society from that new knowledge through university–community and university–industry engagement; and to develop highly skilled individuals who will take forward the challenge of developing and applying new knowledge. Higher education is also central to the implementation of the national industrial strategy, which identifies international education as a strategic priority amongst a number of broad areas, including aerospace, the information economy, nuclear, oil and gas, off-shore wind, and automotive, without constraining the research activity of higher education institutions, whose funding is administered by the HEFCE as a block-grant.³⁵

It is recognition of the need to ensure that research undertaken in higher education contributes to addressing societal challenges that, through the REF, the HEFCE evaluates research-impact—necessarily on a retrospective basis because impact cannot be predicted. The REF takes place on a 6-yearly cycle, and provides a mechanism for assessing the quality of research in all U.K. universities across all disciplines. The assessment is carried out by 36 expert panels, which are grouped into 4 main panels in the areas of medical and life sciences; physical sciences and engineering; social sciences; and arts and humanities. The results of the first REF were published in 2014, further to the publication of guidelines and the criteria for assessment in 2011–2012, and the receipt of submissions in 2012–2013. The evaluation of research-quality through the REF is focused primarily on outputs, the assessment of which accounts for 65% of the marks awarded, with research-impact accounting for 20% and evaluation of the research environment for 15%. There were 1,911 submissions to the 2014 REF, 191,150 research

³² The Royal Society, *The Scientific Century: Securing Our Future Prosperity* (London: The Royal Society, 2010), 4, https://royalsociety.org/~media/Royal_Society_Content/policy/publications/2010/4294970126.pdf.

³³ British Academy, *Prospering Wisely: How the Humanities and Social Sciences Enrich Our Lives* (London: British Academy, 2014), 3, <http://www.britac.ac.uk/prosperingwisely/pub/pdf/prospering-wisely.pdf>.

³⁴ HM Treasury and Department for Business, Innovation and Skills, *The Plan for Growth* (London: HM Treasury, March 2011), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/221514/2011budget_growth.pdf.

³⁵ See <https://www.gov.uk/government/collections/industrial-strategy-government-and-industry-in-partnership>.



outputs by 52,061 staff were reviewed, along with 6,975 impact case-studies.³⁶ Overall, the research of 154 U.K. universities was assessed, 30% of which was judged to be ‘world-leading’ (4*), 46% ‘internationally excellent’ (3*), 20% ‘recognised internationally’ (2*), and 3% ‘recognised nationally’ (1*).

Cognisant of the need for a broader definition of excellence, the HEFCE assigned 20% of the marking under the REF to the assessment of impact in order to identify and reward the contribution that high-quality research has made to the economy and society. This enables the HEFCE to demonstrate the value of research to the Government and wider society; to create a level playing field for applied and theoretical research, recognising only the impact of excellent research; and to encourage institutions to maximise the contribution of their researchers to society in the future. While excluding the impact on research or the advancement of knowledge within an institution, and on teaching and other activities of the institution, the definition of ‘impact’ upon which the assessment is based is very broad. Defined as ‘an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia’, the assessment of impact includes an effect, change or benefit to the activity, attitude, awareness, behaviour, capacity, opportunity, performance, policy, practice, process, or understanding or an audience, beneficiary, community, constituency, organisation or individuals in any geographic location whether locally, regionally, nationally or internationally. All case studies produced are 4-pages in length, and they document both economic and non-economic impact. While it was permissible for submissions to document the impact of research undertaken up to 20 years ago, most of the research reported on was more recent.

The assessment of research-impact presents a number of challenges. Since impact cannot be measured against metrics, its evaluation depends upon qualitative assessment by expert panels, with indicators used as supporting evidence. Impact across disciplines (e.g. drama and physics) is not comparable, and so impact is only benchmarked across universities in any one discipline. Assessing the impact of research (including multi-disciplinary and collaborative research) in terms of its ‘reach’ and ‘significance’, the expert panels include user-representation, with users focusing on impact rather than on outputs.

The 2014 REF case-studies demonstrated a range of impacts across all disciplines, referencing over 200 countries. Many of the case-studies are stunning, strongly supporting HEFCE’s advocacy role on behalf of the sector by showcasing the impact of universities’ research to the Government. Documenting impact of approximately £7 billion *per annum*, they are also a source of pride for institutions, many of whom (along with the U.K.’s research councils) are re-publishing the case studies. In addition they have transformed attitudes in universities and have enhanced the evidence-base for institutional strategic management and development. While the REF provides a small financial reward to high-performers, and applies a small financial penalty to institutions which perform less well, it does not erode the stability of core funding for institutions through the block-grant.

³⁶ The impact case-studies are available on the HEFCE’s website at <http://impact.ref.ac.uk/CaseStudies/search1.aspx>.



The 2014 REF cost £55 million over a 6-year period and there is a question mark over whether its impact on research performance in the longer term will be deleterious. However, with 4 times as many experts volunteering to serve on panels than were required and almost 7,000 case-studies produced, the strong engagement of the U.K. higher education with the sector is clearly in evidence.

Professor Jack Spaapen (Senior Policy Officer, Royal Netherlands Academy of Arts and Sciences)

The Netherlands is positioned, along with Ireland, as an ‘innovation follower’ on the European Innovation Scoreboard, which provides a comparative assessment of the research and innovation performance of the European Member States and of the relative strengths and weaknesses of their research and innovation systems.³⁷ However in the World Economic Forum’s ‘Global Competitiveness Index 2014–2015’, the Netherlands is ranked 7th and Ireland 25th, although Ireland’s ranking is improving while that of the Netherlands is declining.³⁸

With the European Commission’s research policy focused broadly on addressing ‘grand societal challenges’, questions about the kind of universities we want, the kind of research and innovation we need, and the kind of education we want remain to be answered. The Netherlands has 13 universities ranked in the top 150, and 6 ranked in the top 100, of the *Times Higher Education World University Rankings 2014–2015*, but the debate about whether the country could succeed in positioning 1 or 2 universities in the top 50 continues.³⁹ With an operating budget of \$2.82 billion, Yale’s income is greater than that of the entire higher education sector in the Netherlands, and raising questions about the desirability of these aspirations. A key strength of the Dutch higher education system is that there are few bureaucratic barriers to inter-institutional collaboration.

The Rathenau Instituut developed 4 scenarios for the future of universities focusing on national solidarity, regional power, European variation, and international selection, with consideration given to 2 cross-cutting ‘critical uncertainties’—pertaining to the dominant ‘value network’ within which the university operates, and to the degree of competition and to the scale on which this competition takes place.⁴⁰ In the first of the 4 scenarios, society emphasises the public value of education and research within a stable environment with little competition; the second depicts a stable environment with little competition, in which knowledge is seen as a private commodity; in the third, knowledge is seen as a private commodity in a hyper-competitive global environment in which competitive advantages are highly volatile; and the fourth depicts a hyper-competitive, global environment in which competitive advantages are volatile and in which society recognises the value of education and research. Emphasising the important differences between universities and private businesses, the Dutch ‘Science in

³⁷ See http://ec.europa.eu/enterprise/policies/innovation/policy/innovation-scoreboard/index_en.htm.

³⁸ See <http://www.weforum.org/reports/global-competitiveness-report-2014-2015>.

³⁹ See <http://www.timeshighereducation.co.uk/world-university-rankings/2014-15/world-ranking>.

⁴⁰ See http://www.rathenau.nl/uploads/tx_tferathenau/Future_knowledge_-_4_scenarios_for_the_future_of_Dutch_universities_01.pdf.



Transition’ initiative has kindled a debate among researchers and policy-makers in the Netherlands about the future of the research ecosystem.⁴¹ There have also been student-protests within universities about their increasing business-orientation, which is now being broadened to encompass responsiveness to societal challenges.

With growing pressure on higher education institutions to be responsive to the needs of wider society, there is increasing focus on how the societal impact of research can be evaluated. As the sum of the many contributions by different stakeholders to a research network, impact may refer to changes in human behaviour, to organisational change, to conceptual innovation or to societal innovation. It is therefore an elusive concept which is challenging to measure. Expectations in respect of the impact of research vary across fields, with some researchers viewing the need to demonstrate impact as a burden and a distraction from their research.

The evaluation of research-impact therefore represents a challenge, particularly given the varied missions of higher education institutions, and given that the types of impact produced depend upon how the research is funded, with increasing demands on institutions to fund research from private sources. In the Netherlands, a new Standard Evaluation Protocol (SEP) for research assessment during the period 2015–2021 has been produced, the aim of which is ‘to reveal and confirm the quality and the relevance of the research to society and to improve these where necessary’.⁴² Conducted on a rolling, sexennial basis across all universities and institutes, the SEP assesses the outputs of research, the use to which these are put, and their recognition (e.g. in terms of citations, reviews, and funding obtained), giving equal weight to scientific quality and societal impact. Recognising the complexity of research and innovation processes, which entail complex interactions between fundamental researchers and end-users, the SEP assessment outcomes are shared with a range of stakeholders, facilitating extended peer-review and raising awareness of the value of research.

Discussants

John Dooley (Head of Research and Innovation Policy Advisory Unit, Strategic Policy Division, Department of Jobs, Enterprise and Innovation)

The issues with which the Royal Netherlands Academy of Arts and Sciences is grappling in respect of the development of Dutch higher education and the assessment of research have strong resonance in the Irish context, within which the Government is seeking to optimise the performance of a diverse higher education system. The strong positioning of Ireland on the European Innovation Scoreboard as an ‘innovation follower’ as well as the country’s improving ranking within the ‘Global Competitiveness Index’, bear testimony to the impact of the investment in research in Irish higher education since the start of the century.

⁴¹ See <http://www.scienceintransition.nl/english>.

⁴² See the Royal Netherlands Academy of Arts and Sciences (KNAW), the Netherlands Organisation for Scientific Research (NWO), and the Association of Universities in the Netherlands (VSNU), *Standard Evaluation Protocol 2015–2021: Protocol for Research Assessments in the Netherlands* (2014), 5, <https://www.knaw.nl/nl/actueel/publicaties/standard-evaluation-protocol-2015-2021>.



Professor Willie Donnelly (Vice-President of Research and Innovation, Waterford Institute of Technology)

Like Dublin Bus, education is a government-funded industry with a social remit. While Intel does not hesitate to close down inactive labs, the evaluation of higher education institutions is a sensitive issue. This reflects the reluctance of the higher education community to face up to this reality and to embrace the role of higher education within wider society. A more mature discussion of research impact is needed which acknowledges the differences between industry-funded and academic research, and the unique scope of higher education research (addressing economic and social aspects). There is a need for acceptance that higher education is an industry, as reflected in the international-student market, otherwise the sector will be eliminated by competition from private enterprise. Within Ireland there is a need to understand the role of research within society and to develop metrics which reflect this and capture the value of higher education.

Open discussion

Welcoming the evaluation of culture and creativity within the REF, questions were raised about how the impact of research on teaching is assessed in the U.K.. In response it was noted that, while teaching is fully funded in universities in the U.K. through the £9,000 tuition-fees paid by students, assessing teaching-quality remains a challenge which a 'Teaching Excellence Framework' would address. It was also argued that, the importance of pedagogy notwithstanding, research needs to have an impact beyond the classroom. There was a call for an examination of how research informs postgraduate teaching and research in order to assess the impact of research on teaching, and for a 10-year plan to develop this.

The risk to the diversity of the higher education landscape posed by the allocation of funding on the basis of research-assessment is mitigated by HEFCE by periodically changing the criteria for assessment and the membership of assessment panels. The same strategy is adopted in the Netherlands, where students have been protesting about the negative impact on teaching of the 'publish or perish' mentality that pervades academia.

It was noted that the HEFCE acknowledges that there is a possibility that the REF may have a deleterious effect upon science in the longer term, and a question was therefore raised about when this may be known, along with a question about the extent to which researchers are accepting of the REF. In response it was clarified that it is very difficult to know if, in the longer term, the effect of the REF will be deleterious but that it is hoped that the HEFCE aims to support a wide range of research within a complex system. It was acknowledged that some academics are very uncomfortable with the REF, but that only time will tell whether or not it has become embedded in the culture of higher education. It was reported that researchers in the Netherlands have become accustomed to the SEP, within which the average score attained has risen from 3.5 to 4.5.



Questions were also raised about the appropriate time-scale for measuring the impact of research, and about the proportion of research which should have impact in order to merit funding, in response to which it was reported that, typically, an academic department of 25 staff submit 2 or 3 case-studies. Further questions were raised about whether the HEFCE's request for 4 outputs from researchers during the sexennial cycle of the REF undermines the ambition of the research undertaken, and about the impact of national research assessment systems on the research allocation models developed by individual higher education institutions. In response, it was argued that the expectation of 4 outputs over a 6-year period should not be unduly onerous, and it was clarified that books can be double-weighted to account for 2 outputs. It was also noted that funding research at scale creates the capacity for some researchers to undertake research which will not have a high impact, but that this creates challenges in respect of ensuring accountability for the funding provided. It was observed that the REF serves as a mechanism for the analysis of the U.K. higher education system, and that therefore credit accrues to all members of the higher education community from the case-studies published.

It was observed that the failure of academia to predict the rise of the Islamic State of Iraq and Syria (ISIS) can be attributed to the fact that the research system is dysfunctional, and a question was raised about how we can foster a functioning research ecosystem. Connectivity and productive interactions were identified as key to addressing this challenge because, without the interaction of a range of actors (including industry and the government), knowledge cannot be fully utilised. It was reported that, over the next 2 months in the Netherlands, the public will have an opportunity to pose questions to be addressed by researchers, connecting the research community to the public to develop the Dutch science system.