

Accessibility, sustainability, excellence: how to expand access to research publications

**Report of the Working Group on Expanding Access to Published
Research Findings**

Foreword

This report, *Accessibility, sustainability, excellence: how to expand access to research publications*, is the product of a year's work by a committed and knowledgeable group of individuals drawn from academia, research funders and publishing. The task which we were set was by no means straightforward. We were charged with recommending how to develop a model, which would be both effective and sustainable over time, for expanding access to the published findings of research.

There is no simple answer to the question set. Indeed had there been a simple answer there would have been no need to undertake this exercise. Members of the group represented different constituencies who have legitimately different interests and different priorities, in relation to the publication of research and its subsequent use. What united them however was a commitment to work towards an outcome which, although inevitably not perfect from any constituency's individual perspective, would signal an acceptable and sustainable future.

I believe that this report represents such an outcome, though inevitably there will continue to be debates about the best way of progressing these objectives. This could not have been achieved without the high level of commitment shown by group members, their willingness to cooperate in this enterprise and the sheer amount of work which was undertaken by many people – including members of three sub-groups - to get us to the final outcome. This was a working group in the fullest sense, and I am enormously grateful to all its members.

I would also like to single out Michael Jubb, and his colleagues at the Research Information Network, who provided the Secretariat, including drafting the final report and bringing unrivalled expertise to the group's deliberations.

It has been a great privilege for me to chair this exercise, and I look forward to seeing our recommendations taken forward.

Dame Janet Finch CBE

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Executive Summary

This report tackles the important question of how to achieve better, faster access to research publications for anyone who wants to read or use them. It has been produced by an independent working group made up of representatives of universities, research funders, learned societies, publishers, and libraries. The group's remit has been to examine how to expand access to the peer-reviewed publications that arise from research undertaken both in the UK and in the rest of the world; and to propose a programme of action to that end.

We have concentrated on journals which publish research results and findings. Virtually all are now published online, and they increasingly include sophisticated navigation, linking and interactive services. Making them freely accessible at the point of use, with minimal if any limitations on how they can be used, offers the potential to reap the full social, economic and cultural benefits that can come from research.

Our aim has been to identify key goals and guiding principles in a period of transition towards wider access. We have sought ways both to accelerate that transition and also to sustain what is valuable in a complex ecology with many different agents and stakeholders. The future development of an effective research communications system is too important to leave to chance. Shifts to enable more people to have ready access to more of the results of research will bring many benefits. But realising those benefits in a sustainable way will require co-ordinated action by funders, universities, researchers, libraries, publishers and others involved in the publication and dissemination of quality-assured research findings.

1. The issue

Communicating research findings through journals and other publications has for over 350 years been at the heart of the scientific and broader research enterprise. Such publications have been remarkably successful in enabling researchers to build on the work of others, to scrutinise and refine their results, to contribute additional ideas and observations, and to formulate new questions and theories. They play a key role in the complex ecology of research, both for researchers themselves and for all those in society at large who have a stake or an interest in the results of their work

The internet has brought profound change across all sectors of society and the economy, transforming interactions and relationships, reducing costs, sparking innovation, and overturning established modes of business. Researchers and journal publishers were quick to embrace the digital and online revolutions. But there is a widespread perception, in the UK and across the world, that the full benefits of advances in technologies and services in the online environment have yet to be realised.

Most researchers in the higher education (HE) and related sectors and in large research-intensive companies have access to a larger number of journals than ever before, at any time of day, and wherever they can connect to the internet. But in the rapidly-developing online environment they want more: online access free at the point of use to all the nearly two million articles that are produced each year, as well as the publications produced in the past; and the ability to use the latest tools and services to analyse, organise and manipulate the content they find, so that they can work more effectively in their search for new knowledge. Better, faster communication can bring better research.

Most people outside the HE sector and large research-intensive companies - in public services, in the voluntary sector, in business and the professions, and members of the public at large - have yet to see the benefits that the online environment could bring in providing

access to research and its results. For many of them, the only way in which they can gain access to quality-assured research publications is to pay up to £20 or more as a ‘pay-per-view’ (PPV) fee in order to read a single journal article.

The issue we are addressing, therefore, is how to expand and improve access to research publications for the benefit of all who have a stake or an interest in research and its results. Barriers to access – particularly when the research is publicly-funded – are increasingly unacceptable in an online world: for such barriers restrict the innovation, growth and other benefits which can flow from research.

The principle that the results of research that has been publicly funded should be freely accessible in the public domain is a compelling one, and fundamentally unanswerable. Effective publication and dissemination is essential to realising that principle, especially for communicating to non-specialists. Improving the flows of the information and knowledge that researchers produce will promote

- ❑ enhanced transparency, openness and accountability, and public engagement with research;
- ❑ closer linkages between research and innovation, with benefits for public policy and services, and for economic growth;
- ❑ improved efficiency in the research process itself, through increases in the amount of information that is readily accessible, reductions in the time spent in finding it, and greater use of the latest tools and services to organise, manipulate and analyse it; and
- ❑ increased returns on the investments made in research, especially the investments from public funds.

These are the motivations behind the growth of the world-wide open access movement. For it is clear that many benefits could result if we were to move world-wide to an open access regime, complete with peer review and with effective search, navigation and other value-added services currently provided by publishers, libraries and others. Moves towards open access have achieved a momentum that we believe will continue. The key policy questions are how to promote and manage the shift in an ordered way which delivers the benefits but minimises the risks. These are particularly important issues for the UK, whose researchers are world-leading in the quality as well as the quantity of the research they produce.

2. The current environment.

Research publishing already shows the influence of open access. There are now three principal interlocking channels for publishing, disseminating and gaining access to research findings.

- ❑ *Subscription-based journals* predominate, published by a wide range of commercial and not-for-profit publishers, including many learned societies. These include the most prestigious and highly-ranked journals, others that play a major role within the disciplines they cover, and yet others that have a more niche market. Many publishers provide ‘big deals’ under which institutions can subscribe to most if not all of their publications on discounted terms. But no single organisation can afford licences for all the 25,000 peer-reviewed journals currently being published; and people who do

not belong to an organisation that can afford large packages of licences have at best very limited access through this channel.

- *Open access journals* turn the subscription-based model on its head: instead of relying on subscription revenues provided by or on behalf of readers, most of them charge a fee to authors, generally known as an article processing or publishing charge (APC)¹, before an article is published. Access for readers is then free of charge, immediately on publication, and with very few restrictions on use and re-use. The number of journals operating in this way has grown fast in recent years, albeit from a low base.
- *Repositories* do not act as publishers themselves. Rather, they provide access to some version of papers *either* before they are submitted for publication in a journal *or* at some point after they have been published, usually subject to an embargo period. Most universities in the UK, and in many other countries, have established repositories, but the rates at which published papers have been deposited in them so far has been disappointing. In a few areas such as physics, however, subject-based repositories have become an important element in the daily workflow for researchers.

The variations within and the relationships between these three channels are complex. Some subscription-based journals, for instance, operate a hybrid model under which they also offer an open access option for individual articles; and subscription-based journals have developed relationships with some repositories. But the pace of the transition to open access has not been as rapid as many had hoped, for a number of reasons.

First, there are tensions between the interests of key stakeholders in the research communications system. Publishers, whether commercial or not-for-profit, wish to sustain high-quality services, and the revenues that enable them to do so. Funders wish to secure maximum impact for the research they fund, plus value for money. Universities wish to maximise their research income and performance, while bearing down on costs. Researchers themselves wish to see speedy and effective publication and dissemination of research results, but also to secure high impact and credit for the work they have done.

Second, there are potential risks to each of the key groups of players in the transition to open access: rising costs or shrinking revenues, and inability to sustain high-quality services to authors and readers. Most important, there are risks to the intricate ecology of research and communication, and the support that is provided to researchers, enabling them to perform to best standards, under established publishing regimes. Concern about these risks may restrain the development of wider access if it is not managed in a measured way.

Third, research and its communication is a global endeavour. Measures to promote open access need to be similarly international in scope if they are to deliver their full potential. The UK has played a leading role in promoting open access, but there are limits to what the UK can achieve alone. Although researchers in the UK are among the best and most productive in the world, they produce only 6% of the research papers published in journals each year.

Fourth, is the question of cost. Current funding regimes focus on providing access to research literature through libraries, via payments for subscription-based journals. Arrangements to meet the costs of APCs for open access publishing tend to be ad hoc and unsystematic. In the period of transition there are bound to be additional costs as both systems exist side by side.

¹ Other terms are used, including article publication charge and publication fee. We use the abbreviation APC throughout this report.

All four groups of issues need to be tackled if the transition to open access is to be accelerated in an ordered way.

3. Our recommendations

Our view is that the UK should embrace the transition to open access, and accelerate the process in a measured way which promotes innovation but also what is most valuable in the research communications ecosystem. The process itself will be complex, since as the transition develops over the next few years, no single channel can on its own maximise access to research publications for the greatest number of people.

We therefore recommend that:

- i. a clear policy direction should be set towards support for publication in open access or hybrid journals, funded by APCs, as the main vehicle for the publication of research, especially when it is publicly funded;
- ii. the Research Councils and other public sector bodies funding research in the UK should – following the Wellcome Trust’s initiative in this area but recognizing the specific natures of different funding streams - establish more effective and flexible arrangements to meet the costs of publishing in open access and hybrid journals;
- iii. support for open access publication should be accompanied by policies to minimise restrictions on the rights of use and re-use, especially for non-commercial purposes, and on the ability to use the latest tools and services to organise and manipulate text and other content;
- iv. during the period of transition to open access publishing worldwide, in order to maximise access in the HE and health sectors to journals and articles produced by authors in the UK and from across the world that are not accessible on open access terms, funds should be found to extend and rationalise current licences to cover all the institutions in those sectors;
- v. the current discussions on how to implement the proposal for walk-in access to the majority of journals to be provided in public libraries across the UK should be pursued with vigour, along with an effective publicity and marketing campaign;
- vi. representative bodies for key sectors including central and local Government, voluntary organisations, and businesses, should work together with publishers, learned societies, libraries and others with relevant expertise to consider the terms and costs of licences to provide access to a broad range of relevant content for the benefit of consortia of organisations within their sectors; and how such licences might be funded;
- vii. future discussions and negotiations between universities and publishers (including learned societies) on the pricing of big deals and other subscriptions should take into account the financial implications of the shift to publication in open access and hybrid journals, of extensions to licensing, and the resultant changes in revenues provided to publishers;

- viii. universities, funders, publishers, and learned societies should continue to work together to promote further experimentation in open access publishing for scholarly monographs;
- ix. the infrastructure of subject and institutional repositories should be developed so that they play a valuable role complementary to formal publishing, particularly in providing access to research data and to grey literature, and in digital preservation;
- x. funders' limitations on the length of embargo periods, and on any other restrictions on access to content not published on open access terms, should be considered carefully, to avoid undue risk to valuable journals that are not funded in the main by APCs. Rules should be kept under review in the light of the available evidence as to their likely impact on such journals.

4. What needs to be done

Implementing our recommendations will require changes in policy and practice by all stakeholders. More broadly, what we propose implies cultural change: a fundamental shift in how research is published and disseminated. A new shared understanding needs to develop of the interlocking roles of the various parties: researchers, policy-makers, funders, university managers, librarians, publishers and other intermediaries.

Our recommendations are presented as a balanced package, so it is critical that they are implemented in a balanced and sustainable way, with continuing close contact and dialogue between representatives of each of the key groups, and regular assessment of key indicators of progress. In the list of key actions below, we indicate where we believe primary responsibility lies.

Key actions: overall policy and funding arrangements

- i. Make a clear commitment to support the costs of an innovative and sustainable research communications system, with a clear preference for publication in open access or hybrid journals. (*Government, Research Councils, Funding Councils, universities*)
- ii. Consider how best to fund increases in access during a transition period through all three channels – open access publications, subscriptions, and repositories – and the balance of funding to be provided through additional money from the public purse, by diversion of funds from support of other features of the research process, and by seeking efficiency savings and other reductions in costs from publishers and other intermediaries. (*Government, Research Councils, Funding Councils, universities*)
- iii. Put in place arrangements to gather and analyse reliable, high-quality and agreed indicators of key features of the changing research communications landscape, and to review those indicators and the lessons to be drawn from them. (*Government, Research Councils, Funding Councils, universities, publishers*)
- iv. Keep under review the position of learned societies that rely on publishing revenues to fund their core activities, the speed with which they can change their publishing business models, and the impact on the services they provide to the UK research community. (*Government, Funding Councils, Research Councils, learned societies, publishers*)

- v. Renew efforts to sustain and enhance the UK's role in international discussions on measures to accelerate moves towards open access. (*Government, Research Councils, Funding Councils, universities, publishers*)

Key actions: publication in open access and hybrid journals

- vi. Establish effective and flexible mechanisms to enable universities and other research institutions to meet the costs of APCs (*Government, funders*); and efficient arrangements for payment, minimising transaction costs while providing proper accountability (*universities, publishers*).
- vii. Discuss with other funders in the commercial and charitable sectors how best to fund and promote publication in open access and hybrid journals. (*Government*)
- viii. Establish publication funds within individual universities to meet the costs of APCs, making use of dedicated moneys provided by funders for that purpose, as well as other available resources. (*universities*)
- ix. Develop in consultation with academic staff policies and procedures relating to open access publishing and how it is funded. (*universities*) The issues to be considered should include
 - a. whether to promote open access publishing as the principal channel for all research publications
 - b. how much funding should be provided to support the payment of APCs each year, the sources of that funding, and how the funds are to be administered
 - c. how to work together with researchers, and in line with the principles of academic freedom, in making judgements about the potential for publication in journals with different levels not only of status, but of APCs
 - d. how support for publication should be integrated with other aspects of research management, for example the development of research capacity, and support for early-career researchers
 - e. policies relating to payment of APCs when articles are published in collaboration with researchers from other institutions.
- x. Extend the range of open access and hybrid journals, with minimal if any restrictions on rights of use and re-use for non-commercial purposes; and ensure that the metadata relating makes clear articles are accessible on open access terms. (*publishers, learned societies*)
- xi. Provide clear information about the balance between the revenues provided in APCs and in subscriptions. (*publishers, learned societies*)

Key actions: licensing

- xii. Rationalise and extend current licence arrangements for the HE and health sectors, so that as many journals as possible are accessible to everyone working or studying in those sectors. (*Government, Funding Councils, universities, publishers, learned societies*)
- xiii. Work together to find ways to reduce the VAT burden on e-journals. (*Government, universities*)

- xiv. Discuss with representative bodies in the public, business and voluntary sectors the feasibility of developing licence agreements that provide access to relevant journals and other content across key parts of those sectors; and possible ways of funding such agreements. (*Government, publishers*).
- xv. Examine the feasibility of providing licensed access to journals for small research-intensive enterprises with which universities have close relationships. (*universities, publishers, JISC Collections*)
- xvi. Continue to work with representatives of public libraries to implement the proposal to provide walk-in access to the majority of journals in public libraries across the UK, and to ensure that the initiative has the maximum impact. (*publishers, British Library*)

Key actions: repositories

- xvii. Continue to develop the infrastructure of repositories and enhance their interoperability so that they provide effective routes to access for research publications including reports, working papers and other grey literature, as well as theses and dissertations; a mechanism for enhancing the links between publications and associated research data; and an effective preservation service. (*funders, universities, JISC, publishers*)
- xviii. Consider carefully the balance between the aims of, on the one hand, increasing access, and on the other of avoiding undue risks to the sustainability of subscription-based journals during what is likely to be a lengthy transition to open access. Particular care should be taken about rules relating to embargo periods. Where an appropriate level of dedicated funding is not provided to meet the costs of open access publishing, we believe that it would be unreasonable to require embargo periods of less than twelve months. (*Government, funders, universities*).

5. Costs

There will be additional costs during a period of transition which may last for several years; but we cannot be certain about the total costs of all the measures we recommend, particularly with regard to open access publishing. Our estimates are best available evidence at present, including average levels of APCs currently being paid by the Wellcome Trust. But any calculations as to costs for the future depend on a series of assumptions as to

- ❑ the pace of change towards open access publishing, and in particular the extent to which the UK is on average ahead of the rest of the world
- ❑ the average level of APCs as more journals adopt the open access model
- ❑ the number and proportion of articles with overseas as well as UK authors for which UK funders and institutions would be required to pay a full APC
- ❑ the extent to which during the transition universities and other organisations are able to reduce their expenditure on subscriptions even as their expenditure on APCs rises.

We recognise that there is considerable room for debate about assumptions on all these issues; and that variations in them could bring significant changes in our estimates, both upwards and downwards.

Much depends on how quickly the rest of the world moves towards open access. There are good reasons to believe that there is international momentum in this direction, but it is

difficult to predict how fast or comprehensive it will be. It is clearly in the interests of the UK to enhance its role in international discussions on these issues.

Much also depends on levels of APCs and also of the amounts that continue to be paid to publishers in subscriptions, and it is important that in the context of the mixed model we recommend for the medium term, both should be looked at together. Hence the importance of publishers' providing clear information about the balance between the revenues provided in APCs and in subscriptions. But one of the advantages of open access publishing is that it brings greater transparency about the costs, and the price, of publication and dissemination. The measures we recommend will bring greater competition on price as well as the status of the journals in which researchers wish to publish. We therefore expect market competition to intensify, and that universities and funders should be able to use their power as purchasers to bear down on the costs to them both of APCs and of subscriptions.

Taking all these factors into account, our best estimate is that achieving a significant and sustainable increase in access, making best use of all three mechanisms, would require an additional £50-60m a year in expenditure from the HE sector: £38m on publishing in open access journals, £10m on extensions to licences for the HE and health sectors and £3-5m on repositories, plus one-off transition costs of £5m.

The uncertainties we have outlined clearly mean that there is a risk that the costs could be higher than we estimate. But that risk can be managed by slowing the pace of transition. Moreover, the costs are modest in relation to total public expenditure on research (£5.5bn from the Research Councils and Funding Councils alone). Indeed, we believe meeting the costs of transition is essential in order to manage in an ordered way the move from a research communications system which is becoming increasingly unsustainable as a result of the economic, technological and social changes we have highlighted. While any estimates of the benefits that will accrue to the UK economy and society are similarly subject to much uncertainty, it is clear that the benefits will be real and substantial. In short, we believe that the investments necessary to improve the current research communications system will yield significant returns in improving the efficiency of research, and in enhancing its impact for the benefit of everyone in the UK.

6. What will change

The measures we recommend should begin to make a difference quickly but the whole transition process will come to fruition over a number of years.

Open access publication

Our recommendations and the establishment of systematic and flexible arrangements for the payment of APCs will stimulate publishers to provide an open access option in more journals. Most universities will establish funds for the payment of APCs, along with policies and procedures which will in some cases move towards open access as the default mode of publication. That will give universities a greater role in helping researchers to make judgements, in line with academic freedom, about how they publish their work. Different universities may develop different ways of handling this in consultation with their staff. The result will be that a much higher proportion of the publications produced by researchers in the UK will be freely accessible to everyone in the world, with minimal restrictions on their use and re-use.

Subscriptions and licences

Subscription-based journals will remain a key channel for the publication of research results from across the world for some years to come. Implementation of our recommendations will

mean that staff and students in universities and in the health sector will enjoy a much more integrated information environment.

Access to the great majority of journals and articles for walk-in users of public libraries across the UK will make a real and substantial difference to many people and organisations, especially if it is accompanied by effective marketing, training for librarians, and guidance for users. It will also bring a significant enhancement of the role of public libraries in their local communities.

For people and organisations in the public, business and voluntary sectors, exploration of the scope for extensions to licensing for online access will be a step towards wider availability, providing evidence of its value. We hope that some testbeds will be established by consortia of organisations in specific sectors.

Repositories

The further development of repositories will make them better integrated and interoperable, and higher standards of accessibility will bring greater use by both authors and readers. Institutional repositories will develop the roles they perform for their universities, both in providing a showcase for their research and in supporting research information management systems. In the wider scholarly communications sphere, repositories will develop their roles in preserving and providing access to research data, to theses, and to grey literature.

Subject-based repositories will continue to develop refine their roles alongside publishers and their platforms, especially in those areas where such repositories operate effectively already, and have an established position in researchers' regular workflows.

Overall

Implementation of the balanced programme we recommend will mean that more people and organisations in the UK have access to more of the published findings of research than ever before. More research will be accessible immediately upon publication, and free at the point of use. Our recommended programme will accelerate the progress towards a fully open access environment in the UK, and we hope that it will contribute to similar acceleration in the rest of the world. We believe that such movement will bring substantial benefits in transparency and accountability, engagement with research and its findings, closer linkages between research and innovation, and improved efficiency in the research process itself. Our work has shown how representatives of the different stakeholder groups can work together to find ways to achieve those ends.

Introduction

This report has been produced by a working group made up of representatives of the higher education sector, research funders, the research community, learned societies, publishers, and libraries. The group's work was funded by the Department of Business, Innovation and Skills, the Higher Education Funding Council for England, Research Councils UK, and the Publishers Association. But its terms of reference required it to operate independently of all four sponsors, and with its own secretariat. The group's remit has been to examine how to expand access to the peer-reviewed publications that arise from research undertaken both in the UK and the rest of the world, with a particular focus on articles published in scholarly journals (henceforth in this report we shall use the term 'journal' to cover any serial publication that publishes peer-reviewed articles reporting on research and its results in any discipline); and to propose a programme of action to that end.

The group has adopted an evidence-based approach to its work in appraising the current research communications landscape in general, and issues of access in particular. Our aim has been to identify key goals and guiding principles in a period of transition towards wider access, and then to find ways both to speed that transition and to sustain during the process what is valuable in a complex ecology with many different agents and stakeholders. The future development of an effective research communications system is too important to leave to chance. Shifts to enable more people have ready access to more of the results of research will bring many benefits. But realising those benefits in a sustainable way will require co-ordinated action by funders, universities, researchers, libraries, publishers and other intermediaries in the information landscape.

1. Research and Communication

- 1.1. Researchers are driven by a desire to enhance knowledge and understanding of the world we inhabit, and to communicate their findings to others so that they may learn about them and benefit from them. Governments, businesses, charities and others invest large sums of money in research in order to achieve those benefits: to increase knowledge and understanding, but also to make tangible contributions to social welfare and to economic growth. For research and its products are not just economic assets: they contribute immeasurably to the intellectual and cultural life of the nation. Governments across the world therefore see the vitality of the research base as fundamental to the health of a modern society and economy. Generating social and economic benefits through investments in research are thus key considerations in the development of public policy.
- 1.2. The development of effective channels of communication between researchers across the globe has been a critical factor underpinning the growth in our understanding of the world over the past 350 years. Since the establishment of the first scientific journals in 1665, the communication of theoretical and empirical findings through such journals and other publications has been at the heart of the scientific and broader research enterprise. The core functions of these journals were identified by Henry Oldenburg, the first Secretary of the Royal Society and the creator of its *Philosophical Transactions*:
 - ❑ registering research findings, their timing, and the person(s) responsible
 - ❑ reviewing and certifying the findings before they are published
 - ❑ disseminating the new knowledge
 - ❑ preserving a record of the findings for the long term.
- 1.3. Communicating research results through journals has proved remarkably effective in enabling researchers to build on the work of others, to scrutinise and refine the results, to contribute additional ideas and observations, and to formulate new questions and theories. As the Royal Society notes in its report on *Science as an Open Enterprise*², ‘openness is intrinsic to the progress of science’. Journals play a vital role in facilitating that progress, as key channels of communication which also help to build up the ‘invisible colleges’ of researchers working in fields of common interest.
- 1.4. The ways in which journals fulfil their core functions have been transformed over the past twenty years, as a result of changing technologies, but also the combined efforts of publishers, editors, and researchers themselves. So have the behaviours

² Royal Society, *Science as an Open Enterprise*, 2012, available at : <http://royalsociety.org/policy/projects/science-public-enterprise/>

and attitudes of researchers both as producers and consumers of the information that journals contain. The UK has been in the lead in both developments. It is a global centre for the publishing of research; publishers based in the UK are responsible for over five thousand journal titles, and a fifth of the articles published globally each year. The UK's prominent position derives in part from its long tradition of publishing by learned societies, and more recently the development of close relationships between them and other publishers. UK publishers in both the commercial and the not-for-profit sectors were among the first to make full-text articles available online in the 1990s; and they have remained at the forefront of innovation. They make a significant contribution to the British economy, to export earnings, and (not least through the surpluses used by learned societies to fund their scholarly activities) to the performance and standing of the UK research community.

- 1.5. UK researchers have also been among the leaders in taking advantage of the enhanced provision of e-journals: it is estimated that the number of downloads by readers in UK universities has been growing at over 20% a year³, and the UK research community has led key initiatives in developing new ways to exploit the benefits of new technologies. But while welcoming the increases in access to a larger number of journals and articles than ever before – at any time of day, anywhere where they have access to the internet – researchers want more. They want to be able to use the latest tools and services to enable them to analyse, organise and manipulate the content they find, in order to help them work more effectively in their quest for new knowledge; and the broader benefits that wider, faster access would bring.
- 1.6. Moreover, while researchers working in universities or large research institutes have enjoyed significant increases in access, others – including researchers working for organisations that cannot afford to purchase licences for large packages of journals but also the growing range of non-specialists who are interested in the results of research – have not seen the same fruits of increases in access. Indeed, they can find it difficult to secure access to research literature without paying up to £20 or more for 'pay-per view'(PPV) access to a single article.
- 1.7. The principle that results of research that has been publicly funded should be freely accessible in the public domain is a compelling one, and fundamentally unanswerable. Effective publication and dissemination is essential to realising that principle, especially for communicating to non-specialists. How to achieve that in a sustainable way in an internet world is the key challenge that this report seeks to address. This report therefore considers how the research communications system might evolve so that access to research publications might be increased, with the aim of maximising the benefits arising from the investments in research and from the work of researchers.

³ *E-journals: their use, value and impact: final report*, Research Information Network, 2011.

- 1.8. The current Government's position on access to research literature and the findings of research is set within the context of its broad objective of increased transparency⁴. There is some tension, however, between greater transparency and access on the one hand, and the objective of generating financial returns from the intellectual property created by researchers on the other; and a recognition that some of the results of research have to be protected from disclosure for commercial or other reasons. The Government also recognises the need to sustain the high standing and performance of the UK research base, and the high standards of peer review with which its success is closely associated. Finally, it recognises that there are limits to what can be achieved in the UK alone: action to promote access to research publications requires collaboration with international partners.
- 1.9. A key feature of the international environment over the past decade has been the growth of the open access movement. That movement has many different strands, and definitions and distinctions have become increasingly important as it has grown: between access without payment to a version of a publication through a repository (often called *green* open access) on the one hand, or to the version of record via the journal's own platform (often termed *gold* open access) on the other; and between the removal of the payment barrier giving a right to read the article (sometimes termed *gratis* open access), and the removal in addition of most of the restrictions on use and re-use of the article (sometimes referred to as *libre* open access). The key points here are that there are different routes to open access, and that it is not just a matter of removing payment barriers, but of rights of use and re-use. Progress has not been as rapid as many had hoped, but it is clear that we are already moving towards a regime in which more content is made accessible free at the point of use to more people, in the UK and across the world.
- 1.10. It was in this context that David Willetts, the Minister of State for Universities and Science, held a round table in March 2011 at which representatives of the research, library and publishing communities from both the UK and the US considered measures that might be taken to improve access to research publications. Following that meeting, it was decided that a working group should be established to examine the current position with regard to access to research findings; to identify the mechanisms and key principles that would support the objective of improving access; to establish a shared vision; and to agree on a programme of action. It was also agreed that the working group would have to take account of the views and interests of the full range of stakeholders, and that it should therefore seek to proceed on a collaborative basis. After initial discussions in the summer of 2011, the Working Group was formally established in October 2011, sponsored by the Department for Business Innovation and Skills, the Higher Education Funding Council for England, Research Councils UK, and the Publishers Association. The

⁴ Department of Business, *Innovation and Skills, Innovation and Research Strategy for Growth*, 2011, p.76; David Willetts, *Public Access to Publicly-Funded Research*, Speech to the Publishers Association, , 2 May 2012.

Chair was Dame Janet Finch; our terms of reference and a full list of members are at **Annex A**.

- 1.11. The digital revolution continues to bring profound change in the social and political, as well as the information environments. Our report comes at a time when there is increasing interest in issues of openness, transparency and trust across a wide range of sectors. We believe that it is essential that the research community as a whole, but also all those in society at large who have an interest in research and its findings, should benefit from the technological and other changes that enable easier and wider access to information than ever before. That is the way to maximise the efficiency and effectiveness of research itself, but also its social and economic value and impact.
- 1.12. In seeking to fulfil the remit passed to us, we have focused on measures to speed process of transition to wider access, and on how to achieve that in a sustainable way. For we are clear that, however it is done, communicating research costs money, and that judgements about the most appropriate channels and mechanisms for increasing access are in part judgements about costs and benefits; and about who meets the costs and how. We have therefore been guided by four principles.
- i. **Access:** our aim is to increase access to the published findings of research produced in the UK and the rest of the world for the benefit not only of researchers but also for the many people and organisations – in the public, commercial and voluntary sectors, as well as in society at large – who have an interest in those findings.
 - ii. **Usability:** there are now nearly two million peer-reviewed articles published in journals each year, along with huge volumes of monographs, reports working papers and other relevant information. In order to be able to use them effectively, researchers and others need help to navigate their way around and to interpret the inexorably-increasing volumes of research literature; and to be able to the full range of the latest tools to enable them to organise, analyse and manipulate the content relevant to their work.
 - iii. **Quality:** UK researchers are world-leading in the quality as well as the quantity of the work they produce. Their standing is underpinned by systems to ensure that they have effective and high-quality channels through which they can publish and disseminate their findings, and that they perform to the best standards by subjecting their published findings to rigorous peer review. Neither the quality and standing of the UK research community nor the underpinning of high-quality publishing channels must be put at risk.
 - iv. **Costs and sustainability:** the costs of research communications constitute a relatively small but nevertheless significant component in the overall costs of research. Those costs must be kept in check; but at the same time it is important that in seeking change, we do not put at risk the fundamental

functions and purposes of a research communications and publishing system that operates in the interests of researchers.

- 1.12. We have also been conscious throughout our work that the UK and its research community are but a part of a wider ecology. UK researchers produce just over 6% of the peer-reviewed papers published each year; and nearly half of them are produced in collaboration with colleagues from overseas. Research and its communication are activities which transcend geographical boundaries; in an internet world more so than ever. Our concern, therefore, is not just to ensure that the UK's research is accessible across the world, but much more broadly that the world's research is accessible across the UK. This important factor has significantly influenced our recommendations.
- 1.13. Individuals and organisations in the UK have played prominent roles in global moves to increase access over the past two decades. It is vital that in seeking to sustain its leading edge as a research nation, the UK should continue to fulfil that prominent role, for the benefit of researchers and all who have an interest in their work, across the world.

2. Scope of our Work

- 2.1. Our terms of reference specified that we should focus our attention on the published findings of research, in the form of journal articles, conference proceedings and monographs. They also made clear that in considering questions of access we should not restrict ourselves to publications produced in the UK, but extend our view to those produced in the rest of the world.
- 2.2. Much of our attention focused on journal articles, since they constitute in volume and importance the major published outputs for researchers in the great majority of disciplines⁵. There are some exceptions to this, for example in some fields of engineering, where conference proceedings enjoy high value. To the extent that we consider conference proceedings, we focus on those that are formally published after peer review; and in that case there is little difference between them and other kinds of journal articles⁶.
- 2.3. Monographs and edited collections of essays are of course particularly important in the humanities and some areas of the social sciences; but they feature hardly at all as key outputs of research in the life sciences and physical sciences. Moves towards digital and open access publishing have been much slower here than with journal articles, and experimentation is at a much earlier stage. We consider briefly some of the issues relating to access to monographs in the following section.
- 2.4. We also note that researchers in the UK and across the world are increasingly engaged in the production of reports, papers, technical notes or other documents commissioned and published by governmental agencies and other bodies but not distributed or indexed by recognised publishers. Publication may take the form of a link on an institutional website, or the distribution of hard copies to interested parties. Such reports and papers are often referred to as grey literature, since they lack strict bibliographic control, and basic information such as author, publication date or publishing body may therefore not be easy to discern. Similarly, non-professional layouts and formats, and low print runs, mean that the organized collection of such publications by libraries can be challenging as compared to more established media such as journals and books. It is therefore difficult to assess the volume and scope of the research that is now reported in grey literature, since by its nature it is often difficult to identify and to trace. Such literature may also be highly variable in quality: while some is subject to peer review, much is not, and the status of many documents is unclear. Moreover, reports and papers of this kind can be difficult to trace, particularly if active steps are not taken to preserve them and make them readily-findable for the long term in digital format.

⁵ Research Information Network, *Communicating Knowledge: how and why UK researchers publish and disseminate their findings*, RIN, 2009.

⁶ We do not consider in this report conference presentations and posters which are published only in the sense that they are made available at the conference in question and after that on a conference website.

- 2.5. We recognise the increasing importance of grey literature, however, both as a source for researchers themselves, and also as a channel for reporting the results of research to wider audiences. We suggest, therefore, that repositories can play an important role in providing access to the various kinds of grey literature produced by researchers, as well as in organising and preserving it; but we do not give extended consideration to grey literature in the rest of this report⁷, principally because our terms of reference focused our attention on access to peer-reviewed literature.
- 2.6. We note finally the growing volumes and importance of research data and other kinds of information produced during the course of research; the increasing interest in ensuring that such data are properly managed and, where appropriate, made available to others to scrutinise and re-use; and thus the increasingly close relationship between data and formal publications of research findings. Questions relating to access to research data itself, however, are being considered in the separate study being conducted by the Royal Society⁸, and we examine them only insofar as they impinge on issues relating to access and the use of formally-published findings.

⁷ Definitions of grey literature are sometimes extended to cover working papers which are circulated to selected colleagues, or on occasion and in some subject areas – such as economics - distributed more widely. Since there is no formal publication process involved, we do not consider issues relating to them in this report.

⁸ Royal Society, *Science as an Open Enterprise*, 2012

3. The Research Communications Revolution

- 3.1. The ways in which the published findings of research are produced, disseminated, managed, consumed and preserved have changed fundamentally over the past twenty years. The activities, roles and responsibilities of the various players in the research communications system – researchers, universities and other research institutions, research funders, publishers, learned societies, libraries, aggregators and secondary publishers, as well as readers – have been transformed. For all the organisations that act as intermediaries between authors and readers, the last two decades have brought unprecedented changes in the nature and scope of their activities, and continuing uncertainties as to the boundaries between their specific roles.
- 3.2. These changes are but part of a wider context of developments in the digital world: jockeying for position on a global scale between content providers, device companies, packagers, aggregators, delivery platforms, bandwidth suppliers and so on, all seeking a competitive edge. And change continues apace. Mobile access anywhere and at any time to content of all kinds, tagged with metadata, fully searchable, and interwoven with a rich array of other multimedia, is becoming a general expectation; and interactivity and interrelationships with social media are developing fast. All these developments bring the need to reconceptualise working patterns and practices. But few individuals or organisations have a clearly-defined vision as to what the research communications landscape will look like in ten or twenty years' time.
- 3.3. In this context, it is important to understand where we have come from; what has changed, why and how; and the key factors that are likely to drive change into the future. We consider in this section the nature of and the drivers for change under three main heads: economic, technological, and social.

Economic factors

- 3.4. *Research and its outputs.* There are some six million researchers in the world, and their number has been growing fast. That growth has reflected significant increases in expenditure on research and development (R&D), particularly by Governments. Across the 34 members of the OECD, for example, gross expenditure on R&D increased by over 60% in real terms in the ten years to 2008, and in major research countries it has tended to exceed the rate of growth in GDP. Up to 2008, therefore, across OECD countries as a group, R&D grew as a proportion of the economy as a whole: from 1.9% in 1981 to 2.3% in 2008⁹.
- 3.5. Of course, much of the expenditure on R&D is devoted to the development of products, processes or services, relatively little of which results in the kinds of research findings and outputs that are reported in books and journals. Governments

⁹ See OECD Science, Technology and R&D Statistics, available at <http://dx.doi.org/10.1787/strd-data-en>.

tend to be the major funders of the basic and applied research that results in such findings; and they have increased – or at least sought to protect – their budgets for investment in research because they see such investment as an essential underpinning for a successful modern economy and society. In the US, for example, the Federal budget for basic research increased by 28% in real terms between 2000 and 2009, including the stimulus provided by the American Recovery and Reinvestment Act¹⁰.

- 3.6. The result has been a sustained increase in the amount of research being undertaken, and in the outputs of that research. The number of articles published in journals has been growing in recent years at nearly 4% a year, so that in 2010 over 1.9 million articles were published, alongside an unknown number of research reports, conference presentations, working papers and so on.¹¹ Although expenditure on research has been constrained in some countries since the financial crisis of 2008, there is no sign that the rates of increase in global research publications will fall in the foreseeable future.
- 3.7. *Globalisation.* Within the context of these increases in research activity and outputs, there have been dramatic shifts in the global research landscape in recent years. Strong economic growth in countries such as Brazil, China and India has driven large increases in investment in R&D, which have in turn brought huge rises in the volume of research outputs. Between 2006 and 2010, the annual growth rate in articles with authors from Brazil was 9.8%, from China 12.3%, and from India 13.7%. Chinese authors accounted for 17.1% of the global total of articles published in 2010, and they are now second only to researchers in the USA in the number of articles published. Some countries starting from a lower base have seen even higher rates of growth: for Iran it was 25.2% between 2006 and 2010, for Malaysia 35.4%¹².
- 3.8. This global shift in the production of research outputs has been accompanied by a rise in international collaboration among researchers. Research is increasingly being undertaken in a distributed way that blurs the distinctions between countries, making it more and more difficult to attribute research inputs and outputs unequivocally to specific countries. But collaborations are increasingly focused in a core of countries (including the UK) which collaborate with each other as well as with others in the periphery: collaborations in the periphery itself are relatively rare¹³.

¹⁰ National Science Board. 2012. *Science and Engineering Indicators 2012*. Arlington VA: National Science Foundation (NSB 12-01), Chapter 4.

¹¹ *International Comparative Performance of the UK Research Base 2011*, a report prepared by Elsevier for the Department of Business, Innovation and Skills, 2011. The figures are based on analysis of the SCOPUS database.

¹² Ibid.

¹³ Boshoff, N. (2009) "South–South research collaboration of countries in the Southern Development Community (SADC)" *Scientometrics* 84(2) pp. 481–503

- 3.9. In this context of globalisation and collaboration, the UK itself sustains, as we shall see in Section 4, a world-leading position in both the productivity and the quality of its research base.
- 3.10. *Prices and Costs.* The steady growth in the volumes of research publications presents a series of challenges. Between 2006 and 2010, the global total of journal articles alone increased by a fifth, alongside much larger increases in other forms of output, especially research data. Responsibilities for disseminating, preserving and providing access to research publications – in the interests of both authors and readers – are shared between publishers, aggregators, libraries and other intermediaries; and in fulfilling those responsibilities they incur significant costs. Publishers – both commercial and not-for-profit – must seek to recoup those costs, and generate surpluses for investment, for distribution to shareholders, or for transfer to support other activities. Subscription-based journals do so in the main through their charges for licences, the largest proportion of which are met by academic and other libraries. Open access journals secure most of their revenues through article processing or publishing charges (APCs), paid by authors once an article has been accepted for publication. Some journals operate as hybrids, generating their revenues partly from subscriptions and partly from APCs for open access articles. For all categories of journal, costs and prices vary, depending critically on the number of manuscripts submitted to them, and the numbers they publish¹⁴: the more articles submitted, the more must be rejected and this increases the cost per article published.
- 3.11. Academic libraries have faced financial pressures arising from the expansion both in the numbers of staff and students they are required to serve, but also in the volumes of books and journals they are expected to provide. A seemingly-inexorable rise in expenditure on journals has put pressure on all other elements in their budgets. Most libraries have achieved significant savings by streamlining their operations, driven in part by budgetary pressures. Thus the expansion of the HE sector and of research has not been accompanied by commensurate increases in library budgets, at least in Europe and North America. In the US, for example, gross expenditure on basic research rose by over 54% in real terms between 1999 and 2009¹⁵, but the budgets for members of the Association of Research Libraries (representing universities where the majority of US basic and applied research is carried out) fell from over 3.5% of university expenditure in the 1980s to under 2.0% in 2009¹⁶. The UK experience has been similar: while library expenditure in UK universities rose in real terms between 1999 and 2009, as a proportion of total expenditure in universities, it fell from 3.3% to 2.7%.¹⁷

¹⁴ For a discussion of the literature on the drivers of journal costs and prices, see *Activities, costs and funding flows in the scholarlycommunications system in the UK*, RIN 2008

¹⁵ National Science Board (2012), *Science and Engineering Indicators 2012*. National Science Foundation, Appendix Table 4-4

¹⁶ <http://www.arlstatistics.org/about/series/eg>

¹⁷ RIN, *Trends in the finances of UK higher education libraries, 1999-2009*, 2010

Technological issues

- 3.12. *The digital revolution in publishing.* We have now reached a position where the current contents – and in most cases the back-runs – of nearly all journal titles are available online. This has brought a key shift in the relationship between libraries and publishers. Where libraries formerly purchased physical copies of journals, they now purchase licences under the terms of which publishers provide access to content that is held on their platforms¹⁸.
- 3.13. This shift has been accompanied by a huge increase in the number of journal titles made available through university libraries. That has been the result of so-called big deals under which publishers sell licensed access to a broad range (sometimes all) of their journal titles for a fixed period of three years or more. The pricing of such deals is complex: for while the price of individual titles is discounted deeply, publishers are in effect expanding their market by shifting libraries from highly-selective to larger all-encompassing collections. Taken together, the internet and the rise of big deals have brought a fundamental shift in research communications, particularly in relation to journals¹⁹.
- 3.14. The changes have been welcomed by researchers across all disciplines. For in their capacities both as producers and as consumers of research outputs, researchers see articles in journals as the dominant channel for communicating the results of research; and that dominance has been enhanced in the last decade²⁰. Numerous surveys have shown how researchers have welcomed and embraced easy 24/7 access to unprecedented amounts of content²¹. Tenopir and King's studies of researchers in the US²² indicate that the number of articles read each month by university faculty has increased by over 80 per cent since the late 1970s.
- 3.15. The form in which articles are read has not changed as much as some would wish. Most papers are downloaded in the PDF format that mimics the form of the printed page; and a high proportion are printed for reading offline. Nearly all content is produced and also made available, however, in XML and HTML format; and there are increasing moves towards the use of more sophisticated semantic mark-up with more extensive linking and interactive features that cannot be accommodated in PDFs. Publishers are also addressing the demands for making their content

¹⁸ It is important to note, however, that for a range of reasons, many libraries purchase both physical copies and online access, even though this adds to both libraries' and publishers' costs, not least in relation to VAT. See *Only Scholarly Journals: overcoming the barriers*, RIN, Publishing Research Consortium, JISC and Research Libraries UK, 2010.

¹⁹ As we shall see below, the shift to online access for monographs, however, has been much slower to take off.

²⁰ *Communicating Knowledge: how and why UK researchers publish and disseminate their findings*, RIN, 2009.

²¹ *E-journals: their use, value and impact: final report*, RIN 2011.

²² Tenopir, C., D.W. King, Sheri Edwards, and Lei Wu. "Electronic Journals and Changes in Scholarly Article Seeking and Reading Patterns." *Aslib Proceedings: New Information Perspectives*, vol. 61 (2009): 5. A recent parallel study of researchers in the UK indicates that they read on average 267 articles a year (298 if humanities researchers are excluded from the calculation). See Carol Tenopir and Rachel Volentine, *UK Scholarly Reading and the Value of Library Resources*, JISC Collections, 2012

available on mobile devices including smartphones, tablets and e-book readers, where PDF formats are not appropriate. In this way they are responding to the growing demand for the content they publish to be delivered through a range of devices, at any time or place.

- 3.16. Publishers, libraries, aggregators and others, including the general search engines such as Google, have also invested heavily to ensure that researchers and others can easily discover and navigate their way around the huge volumes of research content that are now available online. Readers can thus discover and gain access to content through a wide range of ‘gateway’ services, as well as through publisher platforms; and services such as citation linking and chaining are underpinned by the allocation of persistent identifiers (in the form of digital object identifiers (DOIs)) managed by the CrossRef organisation.²³
- 3.17. These developments have been accompanied by huge investment in systems to manage the flows of information along the various supply chains in the research communications system: between authors, publishers, aggregators, subscription agents, libraries, end-users and so on. Developing systems and standards to facilitate effective and more open flows of metadata continue to be the focus of much effort, along with systems to generate consistent and more sophisticated information about users and usage. Access under licence has also required considerable investment in systems to manage such access; libraries and publishers have joined in establishing systems to authenticate and authorise users so that they can gain access to the published content they are entitled to read; and to ensure that they are not denied access free at the point of use when that is indeed what they are entitled to. Libraries have also invested considerable sums in systems to identify and track the digital resources for which they have purchased licences. And both libraries and publishers are investing considerable sums in systems to track levels and patterns of usage. All the infrastructural costs associated with licensing regimes are reflected in the prices charged by publishers, and also in the costs borne by libraries not only in subscriptions but in operating expenses.
- 3.18. Recently there have also been moves by some publishers – along with much experimentation from members of the research community - towards using Web and Semantic Web technologies to enhance journal articles in ways which some have termed ‘semantic publishing’. This has included enriching the text by providing interactive figures and ‘semantic lenses’ which turn a table into a graph, or animate a diagram; providing links to definitions of terms or concepts, or to additional information about such terms, or about relevant people or organisations; direct links to all cited references; access to the data within the article in actionable form, and links to the full datasets that underlie the article; and machine-readable metadata. The aim of enriching articles in such ways is to render the information and knowledge contained in and relating to the article easier to discover, analyse, extract, combine and re-use.

²³ <http://www.crossref.org/> .

- 3.19. Related to such moves has been a growth of interest in exploiting the potential of text-mining tools to analyse and process the information contained in collections or corpora of journal articles and other documents in order to extract relevant information, to manipulate it, and to generate new information. The use of such techniques is not yet widespread, not least because arrangements for making publications available for text mining can be complex, and because the entry costs are high for those who lack the necessary technical skills. But text mining offers considerable potential to increase the efficiency, effectiveness and quality of research, to unlock hidden information, and to develop new knowledge²⁴. The Government recently consulted upon the proposal in the Hargreaves Review of Intellectual Property to remove one of the barriers to wider adoption of text mining by introducing a new exception to copyright. This would allow whole copyright works to be copied for the purposes of text-mining and data-mining for non-commercial research²⁵. We note that publishers of open access and hybrid journals can generally take a more relaxed view about the rights of users to analyse and manipulate the contents of their journals; but we have not repeated in our own work any investigation of the issues covered by the Hargreaves Report.
- 3.20. *The data deluge*. Computational and remote sensing technologies have in recent years created new ways of doing science. They have led to what some have referred to as a data deluge, and a new era of data-driven research. The business of both the public and commercial sectors is increasingly driven by the gathering and progressively more sophisticated analysis of data from a range of sources. It has been estimated that by 2020 35 zetabytes (10²¹ bytes) of digital data will be created each year. Linked data and semantic web technologies promise the creation of new information by deep integration of an increasing number of datasets of growing complexity, and finding new ways of re-using them. It is not our purpose to examine all the consequences of the huge growth in the volume and scope of the data that researchers gather, create and use. Many of the implications are considered in the Royal Society's report on *Science as an Open Enterprise* referred to earlier²⁶. We note, however, that data is increasingly important in its own right as an output of research; and that there is increasing interest in how to support researchers in managing their data more effectively, and in making it available for others to use in their own research and for other purposes²⁷. For the infrastructure and services through which data are made available and readily-usable are now seen as an essential underpinning for successful research.

²⁴ McDonald, D et al, *The Value and Benefits of Text Mining*, JISC, 2012.

²⁵ I Hargreaves, *Digital Opportunity: A Review of Intellectual Property and Growth*, Intellectual Property Office, 2011; *Consultation on Copyright*, Intellectual Property Office 2012,

²⁶ Royal Society, *Science as an Open Enterprise*, forthcoming 2012

²⁷ See, for example, the OECD's *Principles and Guidelines for Access to Research Data from Public Funding*. OECD Publications. Paris. 2007; and the guidance produced in the UK by JISC, the Digital Curation Centre, the Research Councils and others. For an example of Research Council guidance, see the Biotechnology and Biological Sciences Research Council, *BBSRC Data Sharing Policy*, June 2010.

- 3.21. The key challenge for publishers as well as for others concerned in the effective communication of research is how to handle the increasingly complex relationships between the books, articles and other publications on the one hand, and the data that underlies the findings that those publications present on the other; and how to ensure that they are presented and made accessible in an integrated way.
- 3.22. Most scholarly publishers accept that data and publications belong together. The relationship between them is sometimes presented as a pyramid with a broad base of raw data and data sets, on the basis of which researchers construct a smaller set of structured data collections and databases, then processed data and data representations, and topped off with the relatively small amount of data (typically in the form of small tables and charts) that is contained within the publication itself²⁸. Journal publishers increasingly link from articles to relevant data stored elsewhere, and some enable readers to interact with and edit data presented in the article itself. Journals have also seen a dramatic increase in the past five years in the amount of supplementary material presented to them along with articles in the traditional format. For some this has become a growing problem, with the supplementary material exceeding in volume the articles themselves, and presenting problems in peer review and quality assurance²⁹.
- 3.23. Publishers have an important role to play in making more of the data that researchers produce more readily available for others to peruse and re-use. Some are already introducing stricter policies requiring authors to make underlying data available, along with advice on reliable and trustworthy data archives. Some are also enhancing articles to provide better integration with underlying data; ensuring that data have persistent identifiers to underpin effective two-way links between data and publications; and helping to promote guidelines for the proper citation of data. There is also scope for much more effective co-operation between publishers and data centres to facilitate integration between data and publications, including support for full interactivity when readers wish to re-use data; and for the publication of data journals that describe data sets and data methods. In an ideal world, there would be closer integration between the text and the data presented in journal articles, with seamless links to interactive datasets; a consequent fall in the amount of supplementary material; and two-way links, with interactive viewers, between publications and relevant data held in data archives. The availability of, and access to, publications and associated data would then become fully integrated and seamless, with both feeding off each other.

²⁸ See, for example, Susan Reilly et al *Report On Integration of Data and Publications*, 2011, available at http://www.stm-assoc.org/2011_12_5_ODE_Report_On_Integration_of_Data_and_Publications.pdf

²⁹ Such difficulties led the *Journal of Neuroscience* to decide in 2010 that it would no longer accept any supplementary material along with the articles submitted to it.

Social, political and behavioural issues

- 3.24. *Openness and transparency.* The technological developments outlined above have enabled the creation of a wide range of new services. Together they have brought a new age of abundance in the provision and availability of information resources. As information of all kinds has become more readily available, members of the research and academic community have become increasingly used to operating in a complex information environment of data, information and ideas; and they have changed their workflows accordingly. They have also come increasingly to expect that information and the services surrounding it are, and should be, available free at the point of use, at any time and wherever they are. Such notions are underpinned by the widespread availability of research content provided via academic libraries: researchers are often unaware of the routes through which content is provided to them, and the extent to which they rely on licences paid for by the library.
- 3.25. Some researchers, as well as librarians and others, have also become active in movements to promote access to data, information and other forms of content that people are free to use, re-use and redistribute without any legal, technological or other restriction. In this context, any restrictions on access are seen as barriers against realising the full potential of information – whether formally published or not – as an essential component of social and economic welfare, and as the raw materials for the development of innovative tools and services.
- 3.26. Similar motivations underlie the Government’s commitment to openness and transparency in enhancing access to data generated by public bodies. It intends through its open data initiative to facilitate accountability; improve outcomes and productivity in key services through informed comparison; enhance social relationships; and drive dynamic economic growth by making data available for use in the market. Again, there are legal and ethical constraints, but such objectives are readily transferable to the research domain. As we noted earlier, Governments across the world are concerned to maximise the social and economic benefits that they gain through the investments they make in research; and it is therefore not surprising that they are increasingly interested in how to ensure that publicly-funded research findings are readily available not only across the research community itself, but more widely.
- 3.27. *Disintermediation and the disruption of established roles.* Over the past two decades, all intermediaries - publishers, aggregators, abstract and indexing services, libraries and so on - have had continually to re-assess and redefine their roles, in a world where authors can in principle communicate direct with their readers: for they can readily broadcast information direct via a blog or a website. Readers no longer have to visit a library to find material relevant to their work; for they can discover and gain access to relevant material whenever and wherever they have access to the internet. The central position that libraries once played in the research environment has now shifted to other sources.

- 3.28. Reducing the role of intermediaries in such ways is sometimes referred to as ‘disintermediation’. But these changes have not eliminated the need for intermediaries, for a variety of reasons including the continuing need for quality assurance of content, and for effective search and navigation systems to guide readers to the content they want. Intermediaries develop and invest in such services, and they need to operate under business models that provide the revenues that enable them to do so. But all are operating in an environment where they face repeated questioning of the value of the services they provide. They also face insistent demands for greater customer focus, even as many of the services they provide are increasingly less-visible to authors and readers. The digital revolution has also brought the need for new services in areas such as digital preservation: the role of research libraries in ensuring the long-term preservation of print does not readily transfer to digital content, and while services such as Portico and the e-depot at the Koninklijke Bibliotheek in the Netherlands have made considerable progress, we are still some way from a position where there are robust arrangements in place for the long term preservation of digital copies of all issues of all journal titles so that they remain accessible for future generations³⁰. Further investment is likely to be needed in this area.
- 3.29. *Behaviours and expectations.* We have already noted that researchers now read many more articles than they did twenty years ago. They also make extensive use of journals and other material to which they did not have access the print era. But how they read and navigate has changed too. They read on screen as well as in print, bouncing from one site to another, ‘power-browsing’ through content and spending less time reading individual items. But researchers are now more likely to navigate to the content they want through use of a gateway service or search engine rather than by browsing through the tables of contents of individual journals.³¹ And they expect that when they discover material that looks relevant to their work, they will be able to access the full text immediately without charge: one of the key frustrations they express is when that expectation is thwarted. A growing minority, as we have seen, also want to use a variety of tools to organise and manipulate the content they find.
- 3.30. On the whole, however, researchers operate in an environment where information is abundant, and face challenges in dealing with that abundance. In the research communications landscape, as elsewhere, there is thus growing interest in ideas

³⁰ For Portico see <http://www.portico.org/digital-preservation/>; for the e-depot at the Koninklijke Bibliotheek in the Netherlands see <http://www.kb.nl/hrd/dd/index-en.html>. Other services include, LOCKSS (Lots of Copied Keeps Stuff Safe) (<http://www.lockss.org/>) and CLOCKSS (Controlled LOCKSS) (<http://www.clockss.org/clockss/Home.>).

³¹ Nicholas, D. (2009). The information-seeking behaviour of the virtual scholar: from use to users. *Serials* 21(2), 89-92; Carol Tenopir and Rachel Volentine, *UK Scholarly Reading and the Value of Library Resources*, JISC Collections, 2012

surrounding what has been termed the economy of attention³². This is based on the insight that the consumption of information requires investments of time and attention. Since those are limited resources, however, as more information is produced, each item must compete for the limited attention of readers. Such competition underlines the need for all those concerned in the research communications landscape to pay close heed to issues such as ease of search and navigation, branding, and to systems that provide effective signals of trust and authority.

- 3.31. *Social Media*. Over recent years, researchers have made increasing use of social media – blogs, wikis, podcasts, online videos, Twitter feeds, RSS feeds, comments on online articles and so on. Recent studies indicate that around a half of the members of academic staff in the UK make use of some form of social media at least occasionally in the course of their work. They do so, however, for the most part on an irregular basis, and much more as readers than as creators: only a minority are frequent users and creators of social media content. Thus while researchers are generally supportive in their attitudes towards social media as a means of sharing ideas and collaborating with other members of the research community, they are wary of the lack of quality assurance, and see them as a supplement to - not a replacement for – traditional publications: they ‘cannot at any point replace high-quality peer-reviewed journal articles’³³ Nor do they as yet form a key part of researchers’ general workflows. In terms of our remit, they are not peer-reviewed publications.
- 3.32. Some services with social media aspects do, however, show signs that they might become more generally embedded in research workflows. Mendeley, for example, provides a web-based service which allows researchers to manage and annotate their bibliographies, but also to connect with colleagues and share papers and annotations with them³⁴. It also provides a means to discover papers as well as other researchers and research groups working in specific fields. It now has nearly two million registered users worldwide.

Open Access

- 3.33. The development of the open access movement can be traced back to the 1990s, when the earliest e-print repositories³⁵ (initially called archives) and open access journals (that is, journals that make their contents available free of charge upon publication) began to appear. These initiatives were stimulated by the rapid

³² See, for example, Fang Wu and Bernardo A. Huberman, ‘Novelty and Collective Attention’, Proceedings of the National Academy of Sciences. 105, 17599, 2007; and Gonçalves, B., et al’ Modeling users' activity on twitter networks: validation of Dunbar's number’, PLoSOne, vol 6 (8), 2011.

³³ *If You Build it, Will They Come? How Researchers Perceive and Use Web 2.0*, RIN 2010; Carol Tenopir and Rachel Volentine, *UK Scholarly Reading and the Value of Library Resources*, JISC Collections, 2012.

³⁴ <http://www.mendeley.com/>

³⁵ The ArXiv repository for e-prints in physics was founded by Paul Ginsparg in 1991, and was followed by by the Social Science Research Network (SSRN) in 1994 and Research Papers in Economics (RePEc) in 1997.

development of the internet, by concerns about the increasing cost of subscriptions to journals, and also the growth of the view that the results of publicly-funded research should be in the public domain. In that context, the Scholarly Publishing and Academic Resources Coalition (SPARC)³⁶ was launched in 1998 by the Association of Research Libraries (ARL) in North America in 1998, with a mission to correct what it saw as imbalances in the research communications system that had driven up the cost of journals and thereby inhibited access to information and thus the advancement of scholarship.

- 3.34. The open access movement began to take off in a significant way in the years immediately after 2000, with the launch of what are still the two biggest open access publishers, BioMedCentral³⁷ in the UK, and the Public Library of Science (PLOS) in the US³⁸. Three key statements on open access were launched in 2002 and 2003: the Budapest Open Access Initiative³⁹ at a meeting organised by the Open Society Institute in February 2002; the Bethesda Statement on Open Access Publishing⁴⁰, drafted at a meeting organised by the Howard Hughes Medical Institute in April 2003; and the Berlin Declaration⁴¹ at a meeting organised by the Max Planck Society in October 2003. All three stress that open access implies that authors should grant free access and rights to use published works, subject only to proper attribution of authorship. Each also acknowledges two complementary routes to open access – publishing in open access journals, and providing access by depositing material in open access repositories – and the need to develop appropriate financial as well as legal frameworks to support the moves to make the published findings of research more widely available via the internet.
- 3.35. The open access movement is clearly an international one, and UK representatives have played a significant role in it. The SHERPA⁴² project was established at the University of Nottingham in 2002, funded by JISC, to support the development of institutional repositories and to facilitate the rapid dissemination of research. It soon established the Romeo online database of publishers' policies relating to the deposit of published articles in repositories, followed by the Juliet database of funders' policies on open access, and the OpenDoar database of open access repositories. The latter complemented the Directory of Open Access Journals⁴³ established by the University of Lund in 2003.

³⁶ <http://www.arl.org/sparc/>

³⁷ <http://www.biomedcentral.com/>

³⁸ <http://www.plos.org/>

³⁹ <http://www.soros.org/openaccess/read>

⁴⁰ <http://www.earlham.edu/~peters/fos/bethesda.htm>

⁴¹ <http://oa.mpg.de/lang/en-uk/berlin-prozess/berliner-erklarung/>

⁴² <http://www.sherpa.ac.uk/>

⁴³ <http://www.doaj.org/>

Repositories

- 3.36. Repositories are now a familiar way to facilitate open access. There are now over two thousand repositories worldwide, the great majority of them based in universities and other research institutions. They vary hugely in size and scope. Some have fewer than a hundred items, while the CERN repository in Geneva has more than a million; and the kinds of records they contain include reports and working papers, conference papers and posters, dissertations and theses, designs, exhibition materials, performances and so on. They vary also in the amount of material that is available in full text, as distinct from simply metadata records. In many of the larger institutional repositories, the majority of items are recorded only as metadata.
- 3.37. Some of the largest repositories are not institutionally-based, but operate as a service to specific subject communities across the globe. Among the most notable of these are ArXiv⁴⁴, for e-prints mainly in physics, and PubMedCentral (PMC)⁴⁵, which is run by the U.S. National Institutes of Health's National Library of Medicine (NIH/NLM). The nature and scale of repositories such as these will be considered further in Section 7.

Open access journals

- 3.38. The number of open access journals has risen rapidly since they first began to emerge in the 1990s. There are currently over 7,600 open access journals listed in the Directory of Open Access Journals (DOAJ), published in 117 countries. The three countries with the most journals are the US (1360), Brazil (690) and the UK (533). There have been some criticisms of the DOAJ statistics, but it is clear that open access journals now represent a significant proportion of the journals published globally. They are highly heterogeneous nature and scope, and like all journals they vary considerably in editorial standards and in the quality of peer review⁴⁶. Most are relatively new journals which have been open access from the start, many of them founded by individual scholars on tailor-made platforms, often with a business model based on voluntary labour and the use of a university's web server free of charge; others are older-established journals that have converted to open access; while new open access publishers such as BioMedCentral and PLoS have established a large-scale presence in the market, with their operations funded by charging APCs to authors .
- 3.39. In addition to the fully open access journals, nearly all the large scholarly publishers now offer the hybrid option for at least some of their journals: that is, in return for the payment of an APC, they will make an article in an otherwise

⁴⁴ <http://arxiv.org/>

⁴⁵ <http://www.ncbi.nlm.nih.gov/pmc/>

⁴⁶ The qualification for entry in the Directory is that the journal has in place a 'quality control system to guarantee the content'. But as with subscription-based journals, standards vary.
<http://www.doaj.org/doaj?func=loadTempl&templ=about&uiLanguage=en>

subscription-based journal accessible immediately on publication, without any reader having to pay a subscription or PPV charge⁴⁷.

- 3.40. The proportion of the global total of articles published each year which are published in open access or hybrid journals is not easy to calculate. A recent study estimated that over 190,000 articles were published in open access journals in 2009, about 7.7% of all peer-reviewed journal articles published that year⁴⁸. The EU-funded Study of Open Access Publishing (SOAP) estimated a slightly higher 8-10% of all peer-reviewed articles were published open access⁴⁹. Such figures should be set in the context where the total number of articles in all kinds of peer-reviewed journals worldwide is rising at the rate of around 4% a year.
- 3.41. Most publishers providing fully open access journals operate on a small scale, with only one title, publishing fewer than one hundred articles a year. A recent study⁵⁰ suggests that two-thirds of open access articles are published by 10% of publishers, and that fourteen publishers are responsible for around 30% of open access articles. Science, technology and medicine account for two-thirds of journals and more than three-quarters of articles. Social science and humanities, on the other hand, account for a third of journals but only 16% of articles⁵¹.
- 3.42. Take-up of the open access option in hybrid journals is relatively low, at around 2% on average⁵². Some publishers have seen higher levels of take-up in certain disciplines: Oxford Journals have seen 10% of authors in the life sciences selecting the open access option across 16 participating journals, as against approximately 5% in medicine and public health and 3% in the humanities and social sciences. *Nature Communications* reports take-up of the open access option at over 40%.
- 3.43. Overall, recent studies suggest that the growth of open access articles has been much faster than for peer-reviewed articles as a whole. This has been the result both of the creation of new ‘born open access’ journals and the switch of established journals either to open access or to the hybrid model. The recent development of what have been termed ‘repository’ journals⁵³ such as PLoSOne - where the peer review process focuses solely on whether the findings and

⁴⁷ There are, however, some variations as to rights of use and re-use.

⁴⁸ The study also charted rapid growth from 19,500 in 2000 to 191,850 in 2009. Laakso et al, The development of OA journal publishing 1993-2009, *PLoS ONE* 6(6): <http://www.plosone.org/article/info:doi/10.1371/journal.pone.0020961#pone.0020961-Morris1>

⁴⁹ Suenje Dallmeier--Tiessen et al, *First results of the SOAP Project: Open Access Publishing in 2010*. <http://arxiv.org/ftp/arxiv/papers/1010/1010.0506.pdf>. Analysis of the SCOPUS database by Elsevier, however, suggests a lower figure of around 4-5%.

⁵⁰ Suenje Dallmeier--Tiessen et al, *op cit*

⁵¹ It is also notable that while APCs and membership subscriptions are the most important sources of income for STM publishers, sponsorship and print subscriptions are favoured in social sciences and humanities. Dependence on APCs is also characteristic of publishers with large numbers of journals, and less common among *small publishers*.

⁵² Suenje Dallmeier--Tiessen et al, *op cit*.

⁵³ House of Commons Science and Technology Committee *Peer review in scientific publications*, HC 856, 2011

conclusions are justified by the results and methodology presented, rather than on assessment of the relative importance of the research or perceived level of interest it will generate – has stimulated further growth. Established publishers such as American Institute of Physics, Nature Publishing Group, the BMJ (British Medical Journal) Group, and SAGE Publications in the social sciences, have all launched similar journals in the past couple of years. PLoSOne is now by some counts the largest journal in the world. Such journals play a role different from the highly-selective journals which seek to present only the best and most significant research in their fields.

Funders' policies

- 3.44. Major funders of research began from 2005 to introduce policies to promote open access to the published findings of the research they fund. The National Institutes of Health (NIH) in the US introduced a policy requiring that scientists should submit final peer-reviewed journal manuscripts arising from NIH funding to PubMed Central upon acceptance for publication; and that they should be accessible to the public no later than 12 months after publication⁵⁴. In the UK, the House of Commons Science and Technology Committee issued a report in 2004⁵⁵ recommending that research funders should require that published findings should be deposited in institutional repositories, and that there should be a further study of the funding of open access journals. In response to that report, Research Councils UK (RCUK) produced in 2005 and 2006 position statements⁵⁶ outlining a requirement that articles should be deposited in repositories, but recognising that access would depend on copyright and licensing arrangements relating, for example, to embargo periods. The Wellcome Trust introduced a policy requiring that published outputs of the research that it funds should be made available through PubMedCentral within six months of publication; and it complemented that policy with arrangements to meet the costs of the APCs charged by open access publishers⁵⁷.
- 3.45. Similar policies were introduced from 2006 onwards by a range of organisations including the Deutsche Forschungsgemeinschaft (DfG)⁵⁸ in Germany, the Centre National de la Recherche Scientifique (CNRS)⁵⁹ in France, and the Canadian Institutes of Health Research⁶⁰. The European Union's interest in open access was reinforced by its funding of initiatives to support the development of Europe-wide

⁵⁴ <http://publicaccess.nih.gov/policy.htm>

⁵⁵ <http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/399/39902.htm>

⁵⁶ <http://www.rcuk.ac.uk/documents/documents/2006statement.pdf>. The 2005 statement also made explicit reference to provision for the payment of APCs under the full economic costing regime then being introduced: <http://www.rcuk.ac.uk/documents/documents/2005statement.pdf>

⁵⁷ <http://www.wellcome.ac.uk/About-us/Policy/Policy-and-position-statements/WTD002766.htm>. The Medical Research Council also introduced a policy requiring deposit within six months, but did not follow the Wellcome Trust in its policies relating to the payment of APCs.

⁵⁸ http://www.dfg.de/en/research_funding/programmes/infrastructure/lis/digital_information/open_access/index.html

⁵⁹ http://www.ccsd.cnrs.fr/support/content/PDF/DGauxDU_060621.pdf

⁶⁰ <http://www.cihr-irsc.gc.ca/e/32005.html>

research infrastructures, and the introduction of open access policies for part of the Framework 7 programme and by the European Research Council⁶¹.

- 3.46. These policies and initiatives varied as between encouraging and requiring open access, in the extent to which any requirement for deposit and access via repositories was mitigated by embargo periods, and in whether or how they were backed up by the provision of funding to meet the costs of publishing in open access journals. They also vary in the extent to which they have been policed or enforced. Even the Wellcome Trust, which has been the most generous in its arrangements for funding for open access publishing, has seen compliance with its policies requiring deposit of articles in the UK PubMedCentral repository reach only around 55 per cent.

Institutional policies

- 3.47. Policies from individual universities and other research institutions to promote or require open access have been somewhat slower to emerge. In the US, Harvard University's Faculty of Arts and Sciences introduced in 2008 a policy under which its staff grant the university a nonexclusive, irrevocable right to distribute their articles for any non-commercial purpose, and articles are stored, preserved, and made freely accessible in digital form in Digital Access to Scholarship at Harvard (DASH), the University's open access repository⁶². Other US universities have followed with similar policies. In the UK, universities from across the sector – including University College London, and the Universities of Leicester, Salford and Abertay Dundee⁶³ – have introduced policies to require deposit of publications in their institutional repositories. But the policies are qualified by such terms as 'copyright permissions allowing' and 'where publisher agreements permit'. As with funders' policies, it is not clear how extensively the policies are policed, and rates of compliance are as yet not high. These issues are considered further in Section 4.

Publisher and learned society concerns

⁶¹ For the DRIVER programme to develop the infrastructure of repositories, see <http://www.driver-repository.eu/>; for the open access policy for Framework Programme 7, see <http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1300&lang=1>; and for the European Research Council policy, see http://erc.europa.eu/sites/default/files/press_release/files/erc_scc_statement_2006_open_access_0.pdf The ROARMAP service (www.roarmap.eprints.org) indicates that some fifty funders worldwide have instituted policies to promote open access.

⁶² For a full statement of the policy, and a list of the schools which have now adopted it, see <http://osc.hul.harvard.edu/policies>. It should be noted, however, that only a small proportion of the articles and other publications published by Harvard authors are as yet available in DASH. See also Amy Brand, 'Beyond Mandate and Repository, toward sustainable faculty self-archiving', *Learned Publishing*, 25(1), 2012.

⁶³ For UCL, see <http://www.ucl.ac.uk/library/publications-policy.shtml>; for Leicester, see <http://www2.le.ac.uk/offices/researchsupport/policyandstrategy/open-access/pubpolicy>; for Salford, see http://www.salford.ac.uk/_data/assets/pdf_file/0006/58722/USIRPolicy.pdf; and for Abertay Dundee see <https://portal.abertay.ac.uk/portal/page/portal/abertayknowledge/research/Self-Archiving-and-Research-Repository-PolicyV1-1.pdf>

- 3.48. When funders and institutions began to develop policies to promote open access, especially access via repositories, both commercial and learned society publishers that publish subscription-based journals tended to see them as a threat. Many such publishers saw the prospect of a requirement that articles should be made available through institutional and subject-based repositories, after what was seen as a relatively short embargo period, as a threat to their revenues and even to the survival of their journals, with the prospect of sales falling as swift, free access became accessible via repositories. Learned societies saw a threat to the publishing income that sustains many of their charitable scholarly and public engagement activities; and also to their income from members who are often attracted by society publications as a membership benefit. Some learned societies have also expressed concerns that allowing use and re-use of research results on open access terms might limit the UK's ability to exploit those results commercially.
- 3.49. The reaction of many publishers and learned societies to the policies introduced by funding agencies and others was therefore to put restrictions around what could be deposited in repositories, and the rights associated with it. Thus many publishers insisted that only the manuscript submitted to them by the author or, more commonly, the manuscript accepted for publication after peer review, could be made available, rather than the 'version of record' copy-edited and marked up by the publisher. And in addition to embargo periods, publishers sought to restrict the rights of readers to re-use material deposited in repositories. These issues are considered more fully in Sections 4 and 7.
- 3.50. Subscription-based publishers' reactions to the development of open access *journals* were more mixed. Many were initially hostile, suggesting that the new journals represented a lowering of standards, or that they were not sustainable without heavy subsidy. Others including Oxford University Press and the Institute of Physics responded by launching their own open access journals alongside their existing subscription-based ones, or by developing the hybrid model. Most of the larger scholarly publishers now provide a mix of options in this way.

4. The Current State of Access in the UK

The UK Research Base: Inputs and Outputs

- 4.1. UK research is distinctive in a number of ways. Gross expenditure on research and development (GERD) has grown only modestly as a share of GDP, and on that measure of research and development intensity the UK is significantly below most key comparator countries and international benchmarks⁶⁴. But research in the UK is heavily concentrated in the HE sector: 28% of R&D is conducted in that sector, considerably higher than the averages for the G8 and the EU, and higher than that for all comparator countries except Canada. Conversely, the proportion of R&D conducted in the business sector, at 60%, is lower than the G8 average, although in line with the EU average; and the proportion *funded* by the business sector, at 45%, is markedly lower than the G8 average of 65%. The UK is strongly dependent on Government, charitable and overseas sources of funding for its R&D.
- 4.2. The UK's longstanding focus on university-based research is reflected in the distribution of the 250k researchers in the UK, and in the kinds of outputs it produces. The UK is very successful in producing high-quality research publications, but relatively weak in producing other kinds of outputs such as patents⁶⁵. Research does not operate like a production line where resources are put in at one end, and results leading to innovative products and services come out at the other end. Rather, it functions as an eco-system with complex and intricate interdependencies. Nevertheless, it is entirely appropriate that there should be repeated efforts to improve the connectivity between the research base in universities on the one hand, and the innovation system on the other; and improving access to published research findings is one way of facilitating such efforts. This section outlines the routes through which access is currently provided, and examines the levels of access for different sectors in the UK.
- 4.3. UK researchers are highly efficient and productive: among the top five research countries (US, China, Japan and Germany alongside the UK), they generate more articles, more usage, and more citations per researcher and per unit of research spend than their competitors. The rise in the number of articles published by UK authors has not been as fast as in the very high-growth countries such as India and Brazil mentioned in the previous section; and since 2006 it has been lower, at 2.9% a year, than the world average. As a result, the UK's share of the global total of articles fell from 6.7% in 2006 to 6.4% in 2010. Nevertheless, UK researchers' rate

⁶⁴ In 2010, the UK's R&D intensity was 1.8%, compared with the G8 average of 2.4% and the OECD average of 2.7%. The UK ranked 16th among OECD countries. Figures in this paragraph are taken from *International Comparative Performance of the UK Research Base -2011: A report prepared for the Department of Business Innovation and Skills*, Elsevier 2011

⁶⁵ Ibid.

of productivity is more than 50% above the world average⁶⁶. Moreover, citations to UK articles increased between 2006 and 2010 by 7.2% a year, faster than the world average of 6.3%. Hence the UK share of global citations rose from 10.5% to 10.9%; and its share of the top 1% of most-highly-cited papers was second only to the US, at 13.8% in 2010⁶⁷.

- 4.4. It is notable also that the UK research base is highly mobile: there is considerable movement both to and from the UK, and part of the explanation for the UK's success is that it attracts internationally-mobile researchers. UK researchers are also more likely than those in almost any other major research nation to collaborate with colleagues overseas: almost half (46%) of the articles published by UK authors in 2010 included a non-UK author.

Communication and Access Routes

- 4.5. A report in 2011 estimated that universities in the UK spent £112m on subscriptions to journals, a further £52m on managing and providing access to them, and £11m on article processing charges for open access journals⁶⁸. For the UK as a whole, expenditure on subscriptions is estimated to be £150m. For individual universities and other institutions, the expenditure on such items represents a major element in their total expenditure on libraries. Indeed, other elements of library expenditure have been squeezed in order to sustain journal subscriptions, in a context where library budgets as a whole have been under pressure. The proportion of overall university expenditure devoted to libraries fell from 3.5% in the mid-1990s to 2.7% in 2009. Nevertheless, the figures represent a small fraction of the UK's total expenditure on research and development (£25.9bn in 2009-10) or of Government expenditure (£10.4bn) or even of the expenditure of the Research Councils and Higher Education Funding Councils (£5.5bn)⁶⁹.
- 4.6. In return for these expenditures, access to the research literature is provided via a number of routes. The great majority of journals are still published under the subscription model, and access requires the purchase of a licence. Licences are also required for access free at the point of use to e-books, while print books are of course purchased. Other routes include various PPV or transactional mechanisms; and material that is available in open access journals or via repositories.
- 4.7. The growth of provision to underpin open access – both through repositories and through open access journals – has been significant over the past decade; but it is

⁶⁶ It should be noted that it is sometimes argued that high rates of research productivity in the leading research countries are achieved in part by establishing dependency cultures in other countries.

⁶⁷ *ibid*

⁶⁸ *Heading for the Open Road: costs and benefits of transitions in scholarly communications*. RIN, PRC, Wellcome Trust, RLUK and JISC, 2011. See also Annex E to this report. In addition to these costs, the UK also incurs significant costs in peer review of published articles. An earlier report – *Activities, costs and funding flows in the scholarly communications system in the UK*, RIN 2008 - estimated that the time spent by UK peer reviewers in 2007 represented a cash cost of £165m.

⁶⁹ SET Statistics 2011, Department for Business Innovation and Skills.

by no means evenly spread. The UK is among the leaders in the provision of repositories: together with the US and Germany it accounts for well over a third of the global total. An analysis of leading open access journals suggests even higher levels of concentration, with over 60% of the articles published in PLoSOne and 46% of the articles in BioMed Central journals coming from those three countries.

- 4.8. In terms of disciplines, recent studies show marked differences in the take-up of open access publishing, and of making articles available in repositories. It has been estimated⁷⁰ that open access journals accounted in 2009 for around 14% of articles published worldwide in medicine and the bio sciences, as compared to 5% in engineering. On the other hand, the proportion of articles published that year available from repositories ranged from over 20% in physics and astronomy, and 26% in earth sciences, down to between 6% and 8% in medicine and the biosciences. These differences reflect a number of factors, including the uneven spread of open access journals in different disciplines, with a concentration in medicine and the life sciences; the availability of well-established subject-based repositories and the tradition of making pre-prints available in subjects including physics; and the uneven spread of funding for open access in different disciplines, with the Wellcome Trust and the NIH having a significant influence in medicine and the life sciences. In the humanities, where much research is undertaken without specific project funding, open access publishing has hardly taken off at all; and it is patchy in the social sciences, for similar reasons.
- 4.9. Hence it is important to review each of the different routes through which access is provided, in addition to the open access options.

Licensed access

- 4.10. As a result of the big deals negotiated between publishers and academic libraries, most researchers and others who are members of universities and other major research institutes (including those in the business sector) have online access to significant proportions of the licensed literature. It is important to note, however, that while access, printing and downloading is allowed for non-commercial research and private study, copyright restrictions mean that it is typically not possible to copy or reproduce licensed content for other purposes. This restricts the use tools and services that might enable researchers to manipulate, organise and share information from a wide range of sources.
- 4.11. For staff and students in the larger and well-endowed research-led institutions, access is provided to virtually all the major journals in their fields, and on average to over 70 per cent of all the relevant journals. For those in smaller and less research-intensive institutions, without the resources to purchase access to large bundles of titles through big deals, the proportions on average are much lower. Subscription to individual titles is more common in such circumstances; but for anyone who is not a member of an institution that has purchased at least some

⁷⁰ Bo-Christer Bjork et al, Open Access to the Scientific Journal Literature: Situation 2009, *PLoSOne*, 5(6), 2010

licences, access through this route is nil. Levels of access for different sectors, and restrictions on use and re-use, are examined further below.

Pay-per-view

- 4.12. When licensed access is not available, payment for access to individual items, or pay-per-view (PPV), is an option; but it has not proved especially attractive in the online environment. A decade ago, the British Library's provision through its document supply service constituted a major route for access to material not available in the library of your own university or other organisation. The service still operates; but the advent of online access and publishers' big deals for university libraries has led to a steep decline in the numbers of articles and other material delivered through it, for both UK and overseas customers. Publishers' own PPV services have not proved widely attractive; nor as yet have new services such as DeepDyve⁷¹, which provides access on a time-limited rental basis for web browser viewing, rather than for downloading, shown signs as yet of generating large volumes of business.
- 4.13. A key problem for PPV and similar services is the cost to the user. The cost of PPV for a single article from many journals typically ranges from £15 to £20. Users are often reluctant to pay such fees, especially when they may be uncertain from the information given in an abstract whether the article is indeed relevant to their needs. Moreover, the transaction costs of paying for access to relevant content from many different journals and publishers present a significant barrier to many individuals and organisations. Both transaction and cash costs may be lower for researchers in universities and other non-commercial organisations who can use the British Library's document supply service at 'library privilege' rates, but even then the cost of a single item where supply is guaranteed within 24 hours is £16. Rental via DeepDyve is much cheaper, at US\$1-5, but the inability to download may be too restrictive for many users.

Repositories

- 4.14. A third route to access is through repositories. There are over two hundred repositories active in the UK: over 150 institutional repositories and the rest classified as either disciplinary, Governmental, or 'aggregating'⁷².
- 4.15. The largest institutional repository in the UK, according to the number of records contained, is the University College London (UCL) Discovery repository, with over 225,000 items, followed by the Cambridge D-Space repository with over 190,000 items. Other institutions in the top ten include Southampton, where the E-prints repository has over 82,000 items; Glasgow, with 52,000; Aberdeen with

⁷¹ <http://www.deepdyve.com/>

⁷² Unless otherwise stated, the figures in this and the following three paragraphs are taken from the OpenDOAR Directory of Open Access Repositories, <http://www.opendoar.org/>

41,000 and the Science and Technology Facilities Council, with 30,000. The RepUK service⁷³ shows 1.8m records in UK institutional repositories.

- 4.16. Institutions have established repositories for many different reasons, including providing a showcase for their research on the one hand, and establishing a mechanism for creating a central record of their research outputs (with the forthcoming Research Evaluation Framework (REF) exercise very much in mind) on the other. Only a minority of repositories have clear policies on such matters as the content they will accept, the uses to which it may be put, and the role that they will play in preservation. Differences in the strategies and policies that are in place are reflected also in the nature and scope of the contents of the repositories. In practice patterns of deposit are patchy.
- 4.17. The UCL repository, for example, contains a wide array of reports, posters, working papers, theses, conference presentations, designs, exhibition materials, performances and so on, in addition to journal articles. And while journal articles constitute the larger part of the contents (162,000 items, more than 70% of the total), the great majority – 98% - of them consist of metadata records only: as of 6 March 2012, the UCL repository included 2,890 full text articles, 46 of them published in 2011. Similar patterns can be seen across next three largest institutional repositories: the Southampton repository, for example, has records for over 4,500 articles of various kinds published in 2010, but only just over 25% of those are currently available in full text, a figure that will rise to c35% when embargo periods lapse⁷⁴.
- 4.18. Moreover, it is important to note that, as with articles in subscription-based journals, copyright and other intellectual property rights subsist in the material deposited in repositories. Hence again, while access, printing and downloading are allowed for the purposes of non-commercial research and private study, users are generally not allowed to copy or reproduce, or to use many of the latest tools to manipulate and mine the contents of repositories.
- 4.19. It is difficult at present to get consolidated or detailed information on levels of usage of the material in institutional repositories⁷⁵. Of the larger repositories, there were 585,000 downloads from the Discovery repository at UCL in 2011, but usage of the smaller repositories is at much lower levels⁷⁶. At UCL, nine of the top 50

⁷³ <http://repuk.ukoln.ac.uk>

⁷⁴ A survey of 68 repositories by the Repository Support Project based at Nottingham University found that an average of 56% of records had full text associated with them in some way; but that figure includes reports, working papers, theses and so on as well as journal articles
<http://www.rsp.ac.uk/pmwiki/index.php?n=Institutions.Summary>

⁷⁵ The Publisher and institutional repository usage statistics project (PIRUS) is developing standardised COUNTER-compliant article-level usage statistics; but it is not yet operational. Until it is, we have to rely on applications such as Google Analytics. See <http://www.cranfieldlibrary.cranfield.ac.uk/pirus2/tiki-index.php>

⁷⁶ At Salford, downloads from the repository, which contains about 2,500 full-text items, are currently running at about 1500 a month.

items downloaded in 2011 were published journal articles, but it is notable that they tended to be relatively old: the top two articles were published in 2001 and 2002 respectively.

- 4.20. For researchers in a number of disciplines, however, subject or discipline-based repositories are a more important part of the landscape: a place where they go for information, to see what's new, to share early findings with their peers, and to look for collaborators, as well as to deposit their own articles. Provision is very patchy, and there are many gaps. But for researchers in a number of fields, subject-based repositories constitute an important element in their daily workflows.
- 4.21. Among the most notable of such services are ArXiv, predominantly but not solely for the physics community; CiteSeer^x for the computer and information science communities; RePec for the economics community; the SSRN for the social science community more generally; and PubMedCentral for the biomedical and life sciences communities.
- *ArXiv*⁷⁷ is a preprint repository, for papers before they are submitted to a journal for peer review and publication. It contains c735,000 full text articles, and is growing at about 75,000 articles a year. There is minimal filtering of incoming papers for quality control purposes. There are about a million downloads a week.
 - *CiteSeer*^{x 78} harvests documents and other material such as algorithms, data, metadata, services, techniques, and software; and it creates a citation index that can be used for literature search and evaluation. It has over 1.5 million documents with nearly 1.5 million unique authors and 30 million citations.
 - *Research Papers in Economics (RePEc)*⁷⁹ is a collaborative service at the heart of which is a database of working papers, journal articles and software. In addition to working papers (which are disseminated among economists much more commonly than in most other research communities) it provides information about 692,000 journal articles, 629,000 of which are downloadable. But it does not itself host or provide access to the articles; rather, it provides metadata and links to documents it harvests from archives across the world. It estimates about 700,000 downloads a month.
 - *The Social Science Research Network (SSRN)*⁸⁰ consists of a number of subject-based networks and encourages the early distribution of research results by soliciting and publishing submitted abstracts of research papers. It has agreements with a wide range of journals, publishers, and institutions. The SSRN eLibrary consists of an abstracts database of over 380,000 items and a collection of some 315,000 full text PDFs. It is widely used in the social science community, and has over 8m downloads a year.

⁷⁷ <http://arxiv.org/>

⁷⁸ <http://csxstatic.ist.psu.edu/about>

⁷⁹ <http://repec.org/>

⁸⁰ <http://www.ssrn.com/>

- *PubMedCentral (PMC)*⁸¹ is a repository for journal literature deposited by participating publishers, as well as for author manuscripts that have been submitted in compliance with the access policies of the NIH and other research funding agencies. Free access is a requirement, but publishers can delay the release of their material for twelve months after publication. There are currently 2.4m full-text articles, growing at about 10% a year. Most PMC articles have a corresponding entry in PubMed, the database of citations and abstracts which provides links to full-text articles at journal websites. UKPMC⁸² was established in partnership with PMC in 2007. In addition to access to most of the content in PMC itself, it provides a manuscript submission system which allows publishers and researchers to submit articles for inclusion in the UKPMC collection, along with information about researchers and research grants. Free access is a requirement, but publishers can delay release of their material for up to twelve months. Over 35,000 articles have been deposited in UKPMC since it was established, the great majority by publishers; and 200,000 visits (5,000 searches) are made each day.
- 4.22. A number of smaller-scale subject repositories have been established in the UK, including the PhilPapers⁸³ service which provides a directory of online academic philosophy, with metadata and links more than full-text. The OpenFields service⁸⁴ is an online library designed to meet practitioner and student demand for knowledge that supports and stimulates the development of land-based industries.
- 4.23. In sum, it is clear that a fairly comprehensive infrastructure of institutional repositories has been developed in the UK, and that they have the potential to fulfil a number of purposes in providing a shop window for the research activities and outputs of their host institutions, and links with research management systems, as well as an alternative route for access to published research findings. Despite the best efforts of repository managers and librarians, however, rates of deposit and usage of published materials remain fairly low; and a number of issues will need to be addressed if institutional repositories are to fulfil a bigger and more effective role in the research communications landscape. We consider those issues later in this report.
- 4.24. Some subject-based repositories, on the other hand, have developed a significant role for themselves in a number of subject areas, with high rates of deposit and use⁸⁵ enabling them to reach a scale which means that researchers find them difficult to ignore. Overall, however, the provision of subject-based repositories remains patchy, with many subject areas lacking them entirely, or with small-scale repositories which have not reached the critical mass to make them effective routes to access.

⁸¹ <http://www.ncbi.nlm.nih.gov/pmc/>

⁸² <http://ukpmc.ac.uk/>

⁸³ <http://philpapers.org/>

⁸⁴ <http://www.openfields.org.uk/>

⁸⁵ <http://www.rsp.ac.uk/documents/get-uploaded-file/?file=Swan%20-%20RSP%20June%202012%20web.pptx>

Open access journals

4.25. There is no published analysis of the numbers of open access articles published by authors from different countries; but analysis of the SCOPUS database suggests that authors with an affiliation to an institution in the UK were responsible for over 11% of the articles published in PLoS One in 2011. Similar figures apply to other major open access publishers such as BioMedCentral. Such figures are considerably higher than the 6% of the global total of all articles for which UK authors are listed; and the conclusion must be that authors from the UK are among the leaders – alongside colleagues in the US and Germany – in adopting open access publishing.

Monographs

4.26. In many areas of the humanities and social sciences, monographs and edited collections of essays (henceforth, monographs is the term used to cover both) are regarded as the most important channel for communicating the results of research, both to members of the research community and more widely. Monographs are also in many cases the standard against which the performance and standing of researchers is judged. But there has for many years been concern about the decline of the monograph, both in the UK and across the world. Hard evidence is difficult to come by, but it is clear that print runs have declined, that prices have risen, and that libraries have found it difficult to sustain the development of their collections of monographs. UK university libraries' expenditure on books has declined significantly since 2006 in real terms, while expenditure on serials has increased.⁸⁶

4.27. Digitisation has made a significant impact in improving access to books that are out of copyright. Alongside major international initiatives such as Google Books and Eighteenth Century Collections Online⁸⁷, individual libraries have made significant efforts to digitise material in special collections, and to expose metadata to the major search engines. Copyright restrictions constitute a major impediment, however, to digitisation and online access to more recent material, including publications ('orphan works') for which the rights-holder cannot be traced. The Hargreaves Review⁸⁸ last year made various recommendations to address some of the issues that libraries face in improving digital access to their collections, including orphan works; and the Government has responded positively to those recommendations⁸⁹. Much remains to be done, however, if we are to develop in the UK, and internationally, a more effective regime to address the issues highlighted by Hargreaves.

⁸⁶ *Trends in the finances of UK higher education libraries: 1999-2009*, RIN, 2010, http://www.rin.ac.uk/system/files/attachments/library_trends_report_screen.pdf

⁸⁷ <http://gale.cengage.co.uk/product-highlights/history/eighteenth-century-collections-online.aspx>

⁸⁸ <http://www.ipo.gov.uk/ipreview-finalreport.pdf>

⁸⁹ <http://www.ipo.gov.uk/ipresponse-full.pdf>

- 4.28. Despite the progress made in retrospective digitisation, the shift to digital formats and online access has been much slower with books than with journals. Relatively few research monographs are as yet available online, and there has been relatively little progress towards the publication of open access. For the health of research in the humanities and social sciences, the difficulties now faced by authors and publishers in developing a secure future for monographs is a matter of concern.
- 4.29. The EU-funded OAPEN (Open Access Publishing in European Networks) project⁹⁰ is a collaborative initiative to develop and implement a sustainable OA publication model for academic books in the humanities and social sciences. It is examining publishing and business models, as well as the publishing process itself in an OA context. In the UK, JISC Collections and the Arts and Humanities Research Council (AHRC) have recently established an OAPEN-UK project⁹¹ in partnership with publishers, research councils, authors, researchers and institutions. It is designed as a pilot to gather a range of qualitative and quantitative data which will be evaluated to help stakeholders better understand the challenges, and the developments necessary to support open access research monographs.
- 4.30. Publication fees as yet play relatively little part in the funding of open access monographs, not least because there are no arrangements in place from funders to meet them. Instead, much of the small amount of open access monograph publishing at present depends on subsidies from universities and other bodies that provide cash, facilities, equipment, personnel, or all four. A number of university presses in the US are now operating in collaboration with the university library, which provides the funding to support publishing. In some cases this funding derives from grants from bodies such as the Mellon Foundation. In Australia, the Australian National University Press has established an e-press initiative under which 350 titles have been published to date, along with a print-on-demand service; and other Australian universities have expressed interest in launching similar systems.
- 4.31. In many cases, free full-text open access editions are provided alongside print-on-demand (POD) editions for which payment is required; and in some cases services such as full browsing functions, full-text search, navigation tools, multimedia content etc. are charged for. The aim is then that such charges should defray, in whole or in part, the costs of publication. A more radical suggestion is that a system should be established under which a consortium of libraries would pool funds to pay for the fixed costs of monographs selected by the members of the consortium. Publishers would submit proposed titles to the consortium, which would disseminate this information to member libraries who would then decide what to purchase, and cover the first-digital-file production costs. Publishers would then make the monograph available open access in a sub-optimal format, again

⁹⁰ <http://www.oapen.org/home>

⁹¹ <http://oapen-uk.jiscebooks.org/overview/>

with POD and enhanced services or multimedia content available but charged-for⁹². The benefit to publishers and authors of such a system would be to reduce risk, enabling publishers to concentrate on service provision and added value. The benefit to participating libraries is that they would secure access to a value-added version at a discount, as distinct from other organisations and individuals who would have to pay for anything other than the open access version. Whether such a system, or some variant of it, is feasible is not yet clear; but we believe that it is in the interests of the research community to support further experimentation in finding ways to promote the development and use of e-monographs in general, and open access monographs in particular. Until that happens, it is difficult to encompass monographs within the discussion about promoting wider access to publications.

Access and use: gaps and barriers

4.32. In one sense, everyone in the UK can gain access to any of the published findings of research conducted in the UK or worldwide, so long as they are aware of its existence, they have access to the internet, and they (or someone else on their behalf) are prepared to pay for it. Gaps are therefore inseparable from the notion of barriers to access: gaps occur when someone is unable to access and use publications relevant to their work or other needs, because the publication is not available from sources that they are able or willing to use. Some of the barriers that arise include

- ❑ lack of awareness or inability to discover publications that are available;
- ❑ lack of membership of a library that has purchased a licence;
- ❑ lack of access to appropriate hardware and software;
- ❑ content being made available only in an inconvenient format (e.g. in print or a flat PDF file), or only after an embargo period;
- ❑ publications available in a version other than the version of record;
- ❑ content available only in a library, rather than anywhere with internet access
- ❑ a requirement to pay for access an amount the user considers disproportionate;
- ❑ conflict between author or publisher rights and the desired use of the content;
- ❑ digital rights or technical protection technologies that prevent the desired use of the content⁹³.

⁹² For a detailed list of OA monograph publishing models, with examples, see http://oad.simmons.edu/oadwiki/OA_book_business_models. The proposal from Frances Pinter, formerly of Bloomsbury Academic, for library consortia to cover first copy production costs is outlined in a presentation at http://www.slideshare.net/C_C_I/frances-pinterthe-future-of-the-academic-monograph.; and in a video <http://www.youtube.com/watch?v=niyYWVa2w6w>.

⁹³ . *Access to scholarly content: gaps and barriers*, RIN, Publishing Research Consortium and JISC, 2011

4.33. Of these barriers, researchers and others find the lack of licensed access, and a requirement to pay for access to individual items, by far the most irksome. Thus for the purposes of this report, we focus on access and usability free at the point of use. The point was well put by Antonio Panizzi, the future Principal Librarian of the British Museum Library (now the British Library) in 1836:

‘a poor student [should] have the same means of indulging his learned curiosity, of following his rational pursuits, of consulting the same authorities, of fathoming the most intricate inquiry, as the richest man in the Kingdom, as far as books go, and I contend that the Government is bound to give him the most liberal and unlimited assistance in this respect’⁹⁴

Levels of access by sector

- 4.34. *Higher Education.* Access to journals in the HE sector is provided primarily through licences negotiated with seventeen major publishers and a further twenty-two smaller publishers under the National Electronic Site Licensing (NESLi2) initiative administered by JISC Collections⁹⁵. Together those licences cover around 8,000 of the major online journals; and they enable universities to subscribe at discounted prices to titles that were not formerly in their portfolios. Universities decide whether or not to subscribe to licences under the initiative, and the costs to each institution vary according to its size and also to its historic level of expenditure with particular publishers in the past. Some universities still subscribe to their own selection of titles, outside the NESLi2 initiative; and for publishers not covered by the initiative, universities have to negotiate individual deals.
- 4.35. The ‘opt-in’ system inherent in the NESLi2 initiative means that individual universities are in control of decisions about the scope of their collections, and their expenditure. Since the end of the Pilot Site Licensing Initiative in 1998, there has been no attempt at a licence covering the whole HE sector in the UK and funded by top-slicing of funds that would otherwise be distributed to individual universities⁹⁶. There are thus considerable differences in the numbers of publications accessible to staff and students in different institutions.
- 4.36. Current levels of access in the UK are difficult to calculate precisely. But it is clear that researchers and other members of large research-intensive universities and major research institutions (including research-intensive companies in the commercial sector) enjoy the highest levels of access to journal contents. For members of smaller and less-research-intensive institutions, levels of access are considerably lower. Nevertheless, a recent study found that over 93% of researchers drawn from across UK universities and colleges said that they had easy

⁹⁴ Cited in Alberto Manguel, *The Library at Night*, New Haven, Yale University Press, 2006, pp296-7.

⁹⁵ For a description of the NESLi2 initiative, see <http://www.jisc-collections.ac.uk/negli2/>

⁹⁶ There have been recent moves to implement licences that provide access to staff and students in a range of institutions, notably in Scotland under the SHEDL initiative. See Section 7 below.

or fairly easy access to published research papers; and a large majority said that access had improved over the past five years.

- 4.37. But many researchers – especially those in smaller and less research-intensive institutions - complain that they do not have access to a sufficiently-wide range of titles; and a significant minority (5%) describe their current level of access as ‘fairly’ or ‘very’ difficult⁹⁷. A similar-sized minority (5%) also reported a recent difficulty in securing access, the most frequent of which was the need to pay for the article they wanted. Since most were unwilling to pay, they adopted a range of coping strategies, the most frequent of which was to give up and move onto something else.
- 4.38. These findings should be set in a context, however, where levels of satisfaction with access to other kinds of information content, including conference papers, books, technical reports, trade publications, research data and theses – were very much lower; and the difficulties encountered in gaining access to relevant material much more frequent. In sum, levels of access to published research outputs are good in many universities, but far from comprehensive across the HE sector as a whole; there are particular problems with access to conference proceedings and monographs; and the restrictions on use and re-use imposed by publishers limit the ability of researchers to make use of journal contents to best effect.
- 4.39. *Health*. On the basis of the available data from the NHS, surveys undertaken by the Library and Information Statistics Unit (LISU), and estimates from publishers, the *Open Road* report in 2011⁹⁸ estimated that on average across the NHS, about a third of relevant journals were available free at the point of use. That includes core content in the form of full-text databases (not necessarily including current content) procured in England by NHS Evidence (part of the National Institute for Health and Clinical Excellence), as well as print and electronic content procured locally⁹⁹. The estimate should therefore be regarded as tentative.
- 4.40. Staff in the NHS show lower levels of satisfaction than staff in universities with their access to journal articles and other content; and universities with medical schools repeatedly report problems with different systems and levels of access for university and NHS staff. JISC Collections is leading a pilot programme to provide access to content from major publishers to five Academic Health Science Centres (AHSCs) that were established in London, Cambridge and Manchester in 2009. The programme allows the universities at the heart of the AHSCs to extend to their partner NHS organisations access to all their subscribed content from five major

⁹⁷ *Access to scholarly content: gaps and barriers*, RIN, Publishing Research Consortium and JISC, 2011

⁹⁸ *Heading for the Open Road: costs and benefits of transitions in scholarly communications*, RIN, PRC, Wellcome Trust, RLUK and JISC, 2011.

⁹⁹ In Scotland, NHS Education for Scotland provides over 6000 electronic journals approximately 5000 electronic books, and over 20 bibliographic databases both to NHS staff and to social services staff in local authority, voluntary and private sectors, via the Knowledge Network platform (www.knowledge.scot.nhs.uk).

publishers. One of the issues that this initiative confronts is the difference in procurement systems between the HE sector and the NHS.

- 4.41. *Government*. Surveys by LISU and others suggest that there are some six hundred libraries in Government departments and related bodies that subscribe to journals, each subscribing to c500-600 titles. On that basis, the *Open Road* study estimated that on average across central Government and its agencies, some 17% of relevant articles are available free at the point of use. That figure includes those journals and articles that are available on open access terms, and the licensed access to relevant specialist material purchased by agencies such as the Met Office and the Royal Botanic Gardens. Nevertheless, it is clear that access to relevant literature is limited. JISC Collections has had approaches from some Departments which would like to have access to research material, particularly in the areas of social science and economics; but no action has been taken to date. The British Library has also sought to raise awareness among researchers in Government Departments of its holdings of the journal literature and other resources.
- 4.42. Interview evidence from a recent study¹⁰⁰ suggests that lack of access poses problems for many individuals and organisations in the public sector, and that it may mean that advice and inputs to policy-making are delayed or incomplete. The available evidence suggests that licensing and the availability of access free at the point of use in the *local government* sector is minimal, beyond that part of the literature which is available on open access terms.
- 4.43. *Business*. Large R&D-intensive companies, particularly in the pharmaceutical and aerospace sectors, need easy access to relevant journals, and spend considerable sums on licence agreements with publishers. Some of them are also active in securing agreements with publishers to enable them to use text-mining technologies to analyse and process the contents of journals in order to extract relevant information, to manipulate it, and to generate new knowledge and ideas.
- 4.44. For other companies – particularly the large and diverse SME part of the sector – levels of access are much more varied and problematic. One of the key issues is lack of awareness and understanding of the research literature; and of course for many SMEs, articles in journals will relatively seldom be of direct relevance to their work. They tend to rely instead on professional and trade publications, which may themselves on occasion report on the latest findings circulating in the research community.

¹⁰⁰ Rightscom. *Benefits of Open Access to Scholarly Research Outputs to the Public Sector*, Report for the Open Access Implementation Group, , 2012. The study also suggests that researchers in the UK public sector (including the NHS as well as local and central Government) download 21 million articles a year, at a cost in in time and access fees (including PPV) of about £135m; and that increasing the number of articles available on open access terms by 25% would save the public sector £29m a year. But the evidential basis for those calculations is meagre at best. The estimate of 101k researchers in the public sector cannot be reconciled to OECD statistics, nor to the source given for civil service statistics; and the estimates for the number of downloads and for the time spent are based on only 53 responses to a survey for which the response rate is not given.

- 4.45. Small firms are often regarded as driving innovation, although the evidence suggests they perform less innovation than large firms across a range of dimensions. Very few SMEs undertake R&D activities: around 2.7% of those engaged in manufacturing, and 0.6% of those engaged in services¹⁰¹. In certain high technology sectors and in the creative industries, however, SMEs have been important drivers of innovation; and those SMEs that do innovate achieve a higher average return on investment and tend to have better commercial success. The combination of new technologies and increasing consumer demand for bespoke products has allowed SMEs to narrow the innovation gap with large firms. But size still matters, and the risks for SMEs, and the barriers they have to overcome, are more acute than for larger companies. Hence anything that can be done to lower the barriers will be especially helpful to them.
- 4.46. Recent reports¹⁰² suggest that people in the commercial sector find access to trade journals easier than to research journals. Moreover, while access to journals has improved significantly in recent years, those within the commercial sector who regard them as important sources of information for their work report that access on average is variable, with a significant minority saying that it is poor. And more than half report some recent difficulty in obtaining an article relevant to them. Like their colleagues in the HE sector, they PPV arrangements as costly and difficult, although many of them use PPV on a regular basis. ‘Walk-in’ access at a local university is inconvenient and time-consuming, and in any case many universities have found it difficult to implement in an effective way.
- 4.47. *Voluntary sector.* A range of organisations in the voluntary sector have interests in gaining access to research findings, but a recent report¹⁰³ indicates that they tend to rely on reports from research organisations and Government departments more than the research reported in journals. They tend also to rely on intermediaries such as the National Council for Voluntary Organisations who unpack and synthesise research to make it more accessible and pertinent to their needs. Nevertheless, they do make use of journal articles, although it has not been possible to generate estimates of either their expenditure on licences, or the level of coverage.
- 4.48. Cost is a fundamental constraint on the sector’s ability to access research, but the multi-disciplinary interests of organisations in the sector also present a barrier, since it can be hard to decide which journals are the most relevant. Overall, limited access to research literature means that organisations can find it difficult to keep up to date, and that may affect the quality of the services they offer. Such difficulties

¹⁰¹ BIS Economics Paper No. 15, *Innovation and Research Strategy for Growth*, 2011, pp 100-101.

¹⁰² *Access to Scholarly Content: gaps and barriers*, RIN, PRC and JISC, 2011; Mark Ware Consulting Ltd, *Access by UK small and medium-sized enterprises to professional and academic information*, PRC, 2009

¹⁰³ Office for Public Management, *Benefits of open access to scholarly research for VCS organisations*, JISC 2012, forthcoming.

may be exacerbated in some organisations by lack of expertise in assessing and interpreting the latest research findings.

- 4.49. *The general public.* Very few public libraries provide access to journals, and then only to a very small number – such as *Nature* or the *British Medical Journal* - in printed form. For most members of the public, the only way in which they can gain access to journals is through the walk-in service provided by some university libraries¹⁰⁴. During the course of our work, however, a proposal was developed to provide walk-in access to the majority of journals through the public library system. Such an initiative would mark a welcome step-change in access for many members of the public; and we consider in Section 7 how it might operate to best effect.

Access and understanding

- 4.50. Access on its own does not necessarily make for effective communication. Most journal articles, conference presentations and monographs are written in specialist language that even researchers in related disciplines may find difficult to understand or interpret. Researchers in all disciplines, like other professionals, depend on specialist language to communicate their findings precisely and accurately. But some researchers themselves have complained of articles so poorly-written that it is impossible to replicate the work, or in the worst cases fully to understand what is being reported¹⁰⁵.
- 4.51. For non-specialists, the problem is more widespread and more basic. In the early days of journals, the Royal Society's *Philosophical Transactions* were a channel for communication not just between researchers, but also with a wider audience. Nowadays, however, non-specialists face two key problems. First, the huge growth in the volume of research and of journals means that - without effective guidance on the behaviours and norms that underlie the research communications process - it is difficult for non-specialists to navigate their way around the research literature, or to identify authoritative material that is relevant to their needs. There is thus a need for high-quality guidance for non-specialists on the nature, scope and norms used by researchers in publishing their results. We believe that there are opportunities for the development of innovative services here.
- 4.52. Second, as the language in which researchers communicate with each other has become more specialised, so it has become more difficult for non-specialists to understand. Nowadays relatively few of the articles published in journals can be said to constitute effective means of communication with non-specialist audiences. If access to research results is to be increased so that they are understandable and usable by people beyond the research community, research publications need to be accompanied by publications that present research findings in non-specialist language. Funders, universities and learned societies – as well as researchers

¹⁰⁴ For the difficulties associated with access through this route, see *Public Access to Digital Content*, RIN, 2006.

¹⁰⁵ *Access to scholarly content: gaps and barriers*, RIN, PRC, JISC, 2011

themselves - all have roles to play in facilitating and promoting the dissemination and communication of research in this way.

5. Recent Policy Developments

- 5.1. Finding ways to improve the flows of the available stock of knowledge has become in recent years a matter of increasing interest to Governments as well as for organisations involved in funding and conducting research. Such measures are seen as promoting
- ❑ enhanced transparency, openness and accountability, and public engagement with research;
 - ❑ closer linkages between research and innovation, with benefits for public policy and services, and for economic growth;
 - ❑ improved efficiency in the research process itself, through increases in the amount of information that is readily accessible, reductions in the time spent in finding it, and greater use of the latest tools and services to organise, manipulate and analyse it; and
 - ❑ increased returns on the investments made in research, especially the investments from public funds.
- 5.2. For all these reasons, there is an increasing tendency across Government and other bodies, both in the UK and elsewhere, to regard the information generated by researchers as a public good; and to promote the reduction, if not the complete removal, of barriers to access. Such ideas are associated with pursuit of the mutual benefits that can arise from the free movement of goods and services, and, by extension, information; and from open innovation in a world where knowledge is widely distributed, and where much ‘intangible’ innovation activity is underpinned by openness and collaboration. Also associated with such ideas is a recognition that communication and dissemination are integral parts of the research process itself; and a growing acknowledgement that the costs of those processes are a proper call on research budgets.
- 5.3. There is also a recognition, however, that existing barriers should not be replaced by new ones; that moves to promote open access must therefore include measures to ensure that the costs can be met; and that the performance and standing of the UK research community should not be put at risk.
- 5.4. A number of studies in recent years have sought to identify the costs and benefits associated with moves to increase access to the published outputs of research. There are considerable difficulties in gathering the data necessary to underpin such studies; and the modelling on which calculations of costs and benefits are based is complex, involving assumptions which are often controversial¹⁰⁶.

¹⁰⁶ Studies of this kind include *Activities, costs and funding flows in the scholarly communications system in the UK*, RIN 2008; Houghton et al *Economic implications of alternative scholarly publishing models: exploring the costs and benefits*, JISC, 2009; and *Heading for the Open Road: costs and benefits of transitions in scholarly communications*, RIN, RLUK, JISC, Wellcome Trust and PRC, 2011.

- 5.5. But the overall picture seems reasonably clear: that on the most plausible assumptions, significant efficiency savings, and many wider social and economic benefits could be achieved if we were to move *worldwide* to an open access regime, complete with peer review and with effective search, navigation and other value-added services currently provided by publishers, libraries and others. The key policy questions are how to promote and organise such a move; and how such a regime might be organised so that it is sustained by flows of funding to support continued investment and innovation in high-quality services that provide a key underpinning to the success of the UK and other research communities.
- 5.6. In that context, Governments, funders and others have recently announced new measures to promote open access. The European Commission has thus announced that it will take further steps to promote open access in the Horizon 2020 programme¹⁰⁷, moving from the pilot in Framework Programme 7 (which covered c20% of the research funded through that programme) to a position where the EU will require all the publications arising from projects funded under Horizon 2020 to be made available on open access terms. Similarly, the Spanish Government is considering how to implement a law on science, technology and innovation passed in 2011¹⁰⁸ which requires publicly-funded researchers to make the accepted manuscript of published articles available as soon as practicable, and in any case within twelve months. In the US, the proposed Research Works Act, which would have forbidden open access mandates for federally-funded research, was withdrawn in February 2012; and the proposed Federal Research Public Access Act, which would require federal research funding agencies to provide online access to research manuscripts stemming from their funding within six months of publication in a peer-reviewed journal, was reintroduced.¹⁰⁹ The National Science and Technology Council is currently considering how best to increase access to federally-funded scientific research¹¹⁰.

¹⁰⁷ Communication from the Commission to the European Parliament, the Council the European Economic and Social Committee and the Committee of Regions – Horizon 2020 - The Framework Programme for Research and Innovation, 30.11.2011

¹⁰⁸ http://www.congreso.es/public_oficiales/L9/CONG/BOCG/A/A_080-22.PDF

¹⁰⁹ On the RWA and its withdrawal, see the Chronicle of Higher Education, 27 February 2012 (<http://chronicle.com/article/Legislation-to-Bar/130949/>). On the FRPAA, see Science Insider, 10 February 2012 (<http://news.sciencemag.org/scienceinsider/2012/02/lawmakers-reintroduce-public-access.html>)

¹¹⁰ National Science and Technology Council, *Interagency Public Access Co-ordination: a report to Congress on the coordination of policies related to the dissemination and long-term stewardship of the results of federally-funded scientific research*, 2012, available at http://www.whitehouse.gov/sites/default/files/microsites/ostp/public_access-final.pdf. The report notes that the National Science Foundation (NSF) policies are different from the NIH. In response to a requirement in the American Competes Act of 2008, the NSF introduced a requirement for award-holders to provide a Project Outcomes Report (POR) written specifically for the general public. These are posted on the Research.gov website.

- 5.7. In the UK, the Government announced in its *Innovation and Research Strategy for Growth*¹¹¹ in December 2011 a commitment to ensuring that publicly-funded research should be accessible free of charge; and that it would work with partners, including the publishing industry, to achieve that goal. In the light of the discussions in the Working Group, the Research Councils are also now proposing to update and enhance their policies on open access; and the Higher Education Funding Councils are proposing to make open access a condition for the submission of published outputs for any Research Excellence Framework (REF) or similar exercise that follows the forthcoming one which will be completed in 2014.
- 5.8. In the light of developments such as these, it seems likely that the transition towards open access will accelerate in the next few years. The Group's aim is to support that process, but to ensure that policies are implemented in ways that do not disrupt the essential features of a high-quality and continuously-developing research publishing ecology, or the high performance and standing of the UK research community.

Repositories

- 5.9. Funders' and institutional policies relating to repositories have for the most part up to now sought to address publishers' concerns about sustainability and risks to the viability of their journals. They do so by making reference to the restrictions imposed by copyright and other intellectual property rights, by allowing embargos on access and so on. They thus reflect a widespread acknowledgement¹¹² that repositories *on their own* do not provide a sustainable basis for a research communications system that seeks to provide access to quality-assured content; for they do not themselves provide any arrangements for pre-publication peer review. Rather, they rely on a supply of published material that has been subject to peer review by others; or in some cases they provide facilities for comments and ratings by readers that may constitute a more informal system of peer review once the material has been deposited and disseminated via the repository itself.
- 5.10. The restrictions imposed by publishers seem to have succeeded so far in limiting any potential impact on take-up of subscriptions to their journals. The National Science and Technology Council in the US notes that since the introduction of the NIH requirement for publications to be made available in PubMedCentral within twelve months, there has been strong growth in the number of bioscience and

¹¹¹ Cm8329, <http://www.bis.gov.uk/assets/biscore/innovation/docs/i/11-1387-innovation-and-research-strategy-for-growth.pdf>

¹¹² Houghton et al *Economic implications of alternative scholarly publishing models: exploring the costs and benefits*, JISC, 2009; and *Heading for the Open Road: costs and benefits of transitions in scholarly communications*, RIN, RLUK, JISC, Wellcome Trust and PRC, 2011. Houghton suggests that a system of 'overlay journals', which would operate a peer review system, could be implemented to direct readers to the contents of repositories. But it is not clear on what basis such journals could operate, nor how they themselves could be made sustainable.

medical journals, and in their price¹¹³. Whether large-scale access via repositories in other, less-fast-moving, fields would have similarly limited effects on publishers is less clear; and the possible impact of embargo periods of less than twelve months remains a concern for both commercial and learned society publishers¹¹⁴.

Open access journals

- 5.11. With regard to publishing in open access and hybrid journals, one of the key challenges is the lack of systematic arrangements for the payment of the APCs that are charged to authors by open access journals. The Wellcome Trust has been the pioneer in the UK. It provides funding to meet APCs in two ways. For some thirty universities in the UK it provides a block grant to meet APCs for papers arising from Trust-funded research; authors typically then submit to the university research office claims for funds to meet APCs. Researchers in other universities have to submit a claim to the Trust itself, which then supplements the research grant. A key point is that funding can be provided beyond the time when a grant has come to an end. Arrangements are also in place to allocate costs among different funders who are members of the UKPMC consortium (including MRC and BBSRC as well as the major medical research charities) where papers are the result of funding from more than one of them.
- 5.12. Research Councils currently make provision to enable researchers to meet APCs in two ways. First, the costs can be included in grant applications. This method is not always helpful because it is difficult at a stage long before the research project has started to identify what publications it will generate; and because the rules require that the moneys provided should be spent during the lifetime of the grant, whereas results may be published months or even years beyond that point. The second method allows universities to include provision for meeting APCs across the institution when they calculate the full economic costs of the research projects for which they seek grants. But it is not clear how many institutions have found it possible to adopt such arrangements¹¹⁵.

¹¹³ National Science and Technology Council, *Interagency Public Access Co-ordination: a report to Congress on the coordination of policies related to the dissemination and long-term stewardship of the results of federally-funded scientific research*, 2012

¹¹⁴ The Publishing and the Ecology of European Research (PEER) project funded by the EU was set up to investigate the impact of deposit and access via repositories. Results presented at the end-of project conference on 29 May 2012 suggest that providing access to accepted manuscripts via repositories for the short time covered by the study and under current embargo restrictions had little impact on the use of journal platforms. Indeed a randomised trial suggested an increase in downloads from the journal platform; but that may have been the result of improvements in the quality of metadata for papers involved in the study, which increased their findability via search engines and other gateways. <http://www.peerproject.eu/peer-end-of-project-conference-29th-may-2012/> .

¹¹⁵ For an explanation of how such arrangements might work under the full economic costing (FEC)/ transparent approach to costing (TRAC) regime, see UUK and RIN, *Paying for Open Access Publication Charges*, 2009. (<http://www.rin.ac.uk/system/files/attachments/Paying-open-access-charges-guidance.pdf>)

- 5.13. A recent study¹¹⁶ indicates that seven UK universities have established a co-ordinated approach for the payment of APCs, though the precise nature and extent of those arrangements differs from institution to institution. Nottingham has the biggest and longest-established arrangements, and it spent over £318,000 in 2010-11 on APCs for over 260 articles. Some have suggested that the development and implementation of research information systems by universities will ease the linking of research publications to specific research projects and funders, and thus simplify the process of recouping costs from funders. Some intermediaries such as subscription agents are also considering the possibility of managing accounts and handling the administration of APCs¹¹⁷. And the larger open access publishers such as BioMedCentral, PLoS and Hindawi have membership and prepayment schemes to ease the administrative burdens .
- 5.14. Nevertheless, it is clear that difficulties in securing funding to meet APCs is a significant barrier to wider uptake¹¹⁸; and the administrative arrangements add to the difficulties. Even where university funds are available, as at the University of Nottingham, only a small proportion of the papers produced by researchers are published in open access journals: Nottingham authors publish around 3,500 papers in journals each year, and a further 500 conference papers. Simplifying the funding and the payment arrangements is essential if there is to be wider take-up by researchers in all institutions.

Current developments

- 5.15. The various problems and difficulties relating to both repositories and open access publishing outlined above – along with simple inertia – have acted as brakes on moves towards open access. Moreover, for many researchers, the key goal remains to secure publication of their results in the highest-status journal they can manage, in order to secure the credibility and the career rewards that follow from such publications, as well as to maximise readership and impact in their fields. Open access tends to be a secondary consideration, even though the evidence seems to indicate that it leads to increased usage¹¹⁹.
- 5.16. But the policy proposals we have referred to earlier from Government, the Funding Councils, and the Research Councils, together with those expected from the European Union, are likely to give a further push towards open access. We consider the possible impact of these policies in Sections 7 and 8.

¹¹⁶ Stephen Pinfield and Christine Middleton, Open access central funds in UK universities, *Learned Publishing* 21 (2) 2012

¹¹⁷ A dedicated service for that purpose has been launched by Open Access Key: www.openaccesskey.com

¹¹⁸ Dallmaier, Tiessen, Suenje et al, Highlights from the SOAP project survey: what scientists think about open access publishing, available from <http://arxiv.org/ftp/arxiv/papers/1101/1101.5260.pdf>

¹¹⁹ The evidence depends on the reliability and consistency of download statistics from different publication archives. Evidence on whether open access leads to more citations is less even less clear-cut. See PM Davis, 'Open access, readership, citations: a randomized controlled trial of scientific journal publishing', *FASEB Journal*, 25, pp 2129-2134, 2011

- 5.17. There are also signs that initiatives from both established and newer organisations are beginning to make a significant impact on how researchers in the UK and beyond discover, gain access to and manage the published resources that are relevant to their work. We have already noted that the major publishers – subscription-based and open access – are transforming the ways in which articles are presented online, with ever more sophisticated links and interactive features. Many publishers, libraries, and other intermediaries are developing systems to enable them to analyse patterns of usage and impact more deeply; and to present those to their users.
- 5.18. Established players are working together with new ones – such as Mendeley and Zotero – who are developing new services to help researchers to gather, organise and analyse published and unpublished resources more effectively, manage their workflows, and collaborate and share their work with others. There is continued experimentation with user ratings and comments, and the development of ‘alt-metrics’ that measure impact based on readership and re-use indicators gathered from social media and collaborative annotation tools. The sharing of such metrics then acts as a filter in alerting readers to material that may be relevant and important to their work.
- 5.19. New journals open access journals have been launched recently both by established publishers – such as Nature Publishing Group, SAGE, Wiley-Blackwell and Springer – and also by new entrants such as PeerJ¹²⁰ and eLife¹²¹, a new journal to be published as a joint initiative between the Howard Hughes Medical Institute, the Max Planck Society, and the Wellcome Trust. And the SCOAP3 consortium of institutions across the world engaged in high energy physics has recently announced the launch of a tendering process for open access publishing in its subject domain.¹²²
- 5.20. It is important that in the UK and elsewhere we sustain an environment that supports and encourages innovation of this kind from both new entrants and established players; and that innovation serves the interests not just of the research community, but all the other organisations and individuals who are interested in access to publications reporting the results of research.

¹²⁰ <http://peerj.com/>

¹²¹ <http://wellcometrust.wordpress.com/2011/11/07/elife-a-journal-by-scientists-for-scientists/>

¹²² <http://scoap3.org/>

6. Success Criteria

6.1. Our consideration of how best to meet the goal of increased access to published research results and findings in the environment we have described earlier in this report is built around a number of possible mechanisms, and a series of criteria against which to judge their likely success. The success criteria start from a common set of assumptions: that increases in access to the quality-assured findings of research conducted in the UK and across the globe will bring benefits to the UK economy and society of the kind set out in Section 3 above. The criteria themselves therefore describe in outline developments in or features of a research communications system that meets those ends. We discuss each of them in this section, before moving on to a consideration of the possible mechanisms. We are also aware that the criteria differ in kind. Those relating to increases in accessibility (A, B and C) and to high-quality research and services (G and H) describe outcomes in line with our core objectives. Those relating to costs, affordability and financial health (D, E, and F) are matters for attention in the process of developing a sustainable system of expanded access.

A. More UK publications freely accessible across the world

- 6.2. We noted earlier that UK researchers published over 123,000 peer-reviewed articles in journals in 2010, along with large numbers of monographs, reports, conference proceedings and other publications. No systematic attempt has been made to estimate the number of those articles that were immediately made accessible free at the point of use across the world; or even the number that are now accessible in that way. But the analysis in Sections 3 and 4 makes clear that only a relatively small proportion are accessible in any format on open access terms, and even then in many cases after a delay; and that while subscription-based access to major publications is provided to members of well-endowed research institutions, licensed access for other organisations and individuals, especially those outside the HE sector, is relatively meagre.
- 6.3. In order to meet this criterion, a greater proportion – preferably all – of those publications (including those written in collaboration with researchers in other countries) must be made accessible free of charge to anyone, anywhere in the world, who has access to the internet. The key aim, therefore, is to ensure that the results of research conducted in the UK – particularly if that research is publicly funded – should be freely accessible to the individuals and organisations anywhere in the world who may have an interest in them.
- 6.4. This criterion could in principle be met by a number of different mechanisms, or variants or combinations of them: through peer-reviewed open access or hybrid journals; through institutional or subject-based repositories; or through extensions to licensing (though the UK has little influence on licence arrangements overseas). Different mechanisms would have varying implications as to the version of the published findings that would be freely available; how easy it is to find them, and

to navigate from them to related material; and the extent to which they can not only be read, but also analysed, manipulated, combined with other material, and used for a variety of purposes. Full accessibility would imply access to the version of record as published, in XML/HTML formats as well as PDF files, with full functionality and any semantic mark-up where that is provided by the publisher; and the ability to use and re-use the information with as few restrictions as possible.

B. More publications from across the world accessible to the higher education and research sectors in the UK

- 6.5. We have noted earlier that over 1.9m peer-reviewed articles were published in 2010 in c 25,000 journal titles, along with large numbers of other publications. Although the largest and most research-intensive universities and related research institutes have access to large proportions of those publications, no UK university has licensed access to all of them; and among the smaller and less research-intensive institutions, the proportion falls sharply.
- 6.6. In order to meet this criterion, more – preferably all – of the global total of research publications produced each year would have to be accessible to more – again, preferably all – of the members of the HE and research sectors as a whole, including those in smaller and/or less-well-endowed institutions. The key aim here is to ensure that members of the HE and research communities in the UK – students as well as academics – have access free at the point of use to the latest research findings wherever they are published.
- 6.7. Again, the criterion could in principle be met by a number of mechanisms, with varying implications as noted in paragraph 6.4 above.

C. More publications from across the world accessible to other sectors in the UK

- 6.8. For most people and organisations outside the HE sector – the health service; central Government and its agencies; other parts of the public sector including local government; the commercial sector, especially SMEs; the voluntary sector; and the public at large – it is at present often hard to secure access to journals free at the point of use. In order to meet this criterion, steps would have to be taken to make more – preferably all – of the global total of research publications accessible either to members of specific sectors or, again preferably, to everyone in the UK.
- 6.9. Like the previous criteria, this criterion could in principle be met by a number of different mechanisms. But since levels of awareness and understanding of the nature and scope of scientific and research publications is significantly lower outside the HE community and researchers in R&D-intensive businesses and other organisations, measures to increase access will have to be accompanied by a campaign to raise awareness, along with guidance on how to discover and navigate around such publications.

D. Financial sustainability for publishing

- 6.10. The research community, in the UK and worldwide, is supported by systems which provide effective and high-quality channels through which they can publish and disseminate their findings, and which ensures that those findings are subject to rigorous peer review. Effective communication of quality-assured findings and results requires a series of activities that involve significant costs. In order to meet this criterion, arrangements must be in place to enable publishers (whether they are in the commercial or the not-for-profit sector) to meet the legitimate costs of peer review, production, and marketing, as well as high standards of presentation, discoverability and navigation, together with the kinds of linking and enrichment of texts ('semantic publishing') that researchers and other readers increasingly expect. Publishers also need to generate surpluses for investment in innovation and new services; for distribution as profits to shareholders; and – for learned societies in particular – to support scholarly (and a wide range of related) activities for the benefit of their members and the wider communities that they serve. Finally, publishers need to take account of the sustained rise – 3% to 4% a year - in the number of articles submitted to and published by them.
- 6.11. A number of studies have attempted to assess the costs involved in publishing peer-reviewed articles in journals. A report in 2008¹²³ demonstrated that there are considerable variations in costs per article between different journals, depending on the submission numbers; delivery formats (digital-only, print-plus-digital, or print-only); indirect cost structures; the level of surpluses generated by different publishers; and, above all, the rejection rate (i.e., the relationship between the number of articles submitted for peer review and the number that are finally published). Costs per article published, therefore, tend to be much higher for major journals with high submission and rejection rates – that is, those where there is the fiercest competition among researchers to publish their articles - than for those with lower rates¹²⁴.
- 6.12. Subsequent reports also suggest that the costs for open access journals average between £1.5k and £2k¹²⁵, which is broadly in line with the average level of APCs paid by the Wellcome Trust in 2010, at just under £1.5k. The key point here is that no form of publishing is cost-free; and the key requirement is therefore that

¹²³ *Activities, costs and funding flows in the scholarly communications process in the UK*, RIN, 2008. The report estimated that costs per article ranged from c£10k to c£2k, with an average of £2.8k

¹²⁴ The report estimated that costs per article ranged from c£10k to c£2k, with an average of £2.8k excluding the non-cash cost of the time spent by researchers and others in undertaking peer review. Houghton, J et al, *Economic Implications of Alternative Scholarly Publishing Models*, JISC, 2009 produced averages of between £3.2k and £2.3k for subscription-based journals, depending on whether they were published e-only, print-only, or in both formats.

¹²⁵ Houghton J et al, op cit; *Heading for the Open Road: costs and benefits of transitions in scholarly communications*, RIN, PRC, Wellcome Trust, JISC, RLUK, 2011. See also Solomon, D, and Björk, B-Christer, A study of Open Access Journals using article processing charges. *Journal of the American Society for Information Science and Technology*, which suggests an average level of APCs for open access journals (including those published at very low cost in developing countries) of just over \$900. It is difficult to judge – opinions differ – whether costs for open access journals are on average likely to rise as higher status journals join the open access ranks; or to fall as new entrants come into the market.

publishers – whether commercial or not-for-profit - should be able to generate revenues to meet the costs of those services they provide that are valued by researchers and their readers.

- 6.13. Some subscription-based journals – particularly in medicine and the life sciences - generate significant proportions of their income in addition from membership fees, advertising, the sale of reprints, and other sources¹²⁶. Similarly, open access journals may have sources of income other than APCs, in the form of fees from membership schemes and so on. The scale of the market means, however, that advertising and similar sources are unlikely to generate significant amounts of revenue for more than a small minority of journals. Hence business models are likely to be built around moneys provided either by authors or readers, or those who provide funds on their behalf.

E. Costs and affordability for research funders

- 6.14. We have noted earlier that the great majority of funding to support research comes from Government and its agencies – primarily the Higher Education Funding Councils and the Research Councils – along with significant levels of funding from the research charities such as the Wellcome Trust. We have also noted that the overall costs of publishing and providing access to research publications have tended to rise over recent decades, but that they constitute a relatively small proportion of the total costs of research. Nevertheless, this criterion focuses attention on the need to ensure that costs are kept in check, and that the funds to support research communications in general, and increasing access to research publications in particular, are employed to best effect, both during a period of transition and for the longer term.
- 6.15. Assessment of the costs of different mechanisms and scenarios is therefore of critical importance in considering the most effective ways to increase access. We are also conscious of the current constraints on public expenditure, and also the different types of funding mix available in different subject/disciplinary areas. It is unlikely that significant increases in access – particularly to the publications from researchers outside the UK and for the benefit of people outside the HE and research sectors – can be achieved without some additional funding, or diversions from existing funds, particularly during a transition period; but such increases should be subject to a test of cost-effectiveness. We consider these issues further in the following sections.
- 6.16. In that context, we have taken account of the unique position of the UK in the global research communications system. As we have noted, researchers in the UK comprise just over 4% of the global research community; but they are responsible – often in collaboration with others from overseas - for over 6% of the publications produced each year. Hence in comparison with other countries, the UK's

¹²⁶ Advertising is a particularly important for large-circulation journals such as *The Lancet* and *Nature*, but much less so for smaller-circulation niche journals.

production of research publications is disproportionate to its consumption of the publications produced elsewhere. Countries with lower rates of productivity tend, by contrast, to be net consumers of publications. This clearly has implications for the costs borne by different countries in supporting a global system characterised by a complex web of interdependencies.

- 6.17. It has been estimated that under current circumstances, where the subscription model still predominates (that is, where publishing costs are met in the main by readers, or the institutions that employ them), and where access beyond the academic and research communities is limited, the UK meets between 4% and 5% of the global costs of publishing and dissemination¹²⁷. A global shift towards open access publishing funded by APCs is likely to lead to an increase in that proportion. The *cash* contribution from the UK may not rise – under certain optimistic assumptions it might even fall. But that will be the case only if market pressures keep publishing costs, and the level of APCs, in check; and if the UK does not during the period of transition take up open access publishing at a rate significantly faster than the rest of the world. Any significant move to extend licensed access beyond the groups that are currently covered is also likely to require an increase in funding.

F. Costs and affordability for universities

- 6.18. In considering costs to universities, it is important also to consider the roles of different funders of research, and how they might stimulate, or be affected by, changes in the current balance of research publications and business models. Under the dual support system, Government funding for research¹²⁸ is divided into two main streams: the Higher Education Funding Councils provide block grant to universities for research infrastructure and to support their strategic research priorities; and Research Councils provide grants to meet most of the full economic costs of specific projects and programmes of research. Under these arrangements, Funding Councils' block grant plays a major role in meeting the costs of university libraries. But as we have noted earlier, there are no systematic arrangements for the payment of APCs, and that constitutes a significant barrier against the more widespread adoption of open access publishing. Higher levels of adoption will require some modifications to the rules relating to the use of Research Council grants in particular. Moreover, any new arrangements will have to take account of the policies and interests of other funders of research in the public, commercial and voluntary sectors.

- 6.19. Expenditure on academic libraries in total amounted in 2010 to 2.7% of overall university expenditure. For universities as for research funders, there is an

¹²⁷ Those estimates take account of the disproportionate contribution that UK researchers make to the task of peer review. *Activities, costs and funding flows in the scholarly communications process in the UK*, RIN, 2008.

¹²⁸ For an analysis of the funding of research in the UK, see *The Scientific Century: securing our future prosperity*, Royal Society, 2010, page 17; and *Making sense of research funding in UK higher education*, RIN, 2010

imperative to keep costs in check even as the number of publications to which their staff and students want access continues to rise. But the precise impact of any changes in research publications and how they are financed – for the sector as a whole and for individual universities – will depend on three key factors: first, on any associated changes in the arrangements relating to the funds they receive, particularly from the Funding Councils and Research Councils; second, on the profile of individual institutions, in terms of size, research intensity, and mix of disciplines, as well as their current levels of expenditure on the library and its collections; and third, the speed of take-up of open access publishing across the world.

- 6.20. The sums currently paid by individual universities to secure access to journals and books vary widely, and are not necessarily related to size and research intensity: historic as well as current levels of provision may be significant too, not least because the pricing models for the big deals of many publishers still take account of individual universities' levels of subscription in the print era. Patterns of library service provision and staffing levels also vary considerably; and all aspects of library services and expenditure – on content as well as staff – are coming under increasing scrutiny from senior managers in universities. The scope for increases in expenditure on libraries and their contents is generally seen as meagre, if it exists at all; more often, managers are looking for cuts. Few universities, if any, are seeking to extend the range of publications accessible to staff and students by purchasing more licences.
- 6.21. Many universities are also increasingly conscious of the impact that the VAT regime has on their decisions as to the nature and scope of their collections. For while books and journals in print do not attract VAT, e-books and journals do; and universities have only limited scope to reclaim the VAT that they incur on their purchases. This represents a significant barrier against moving towards e-only provision, despite the increases in efficiency that would result, together with lowering of costs, for both publishers and libraries¹²⁹.
- 6.22. For all these reasons, individual universities will examine closely the financial implications for them of moves to increase access, and in particular at how they can avoid increases in costs. They will look at the likely transitional as well as continuing costs of measures to ensure that the university's research is accessible across the world, and that more of the world's research is accessible across the university. An example of the potential impact on an individual university is presented at Annex F.

G. Sustaining high-quality research

- 6.23. One of four principles guiding our considerations is the need to sustain the high levels of performance and standing of the research community in the UK. Its members operate in an ecology which provides high-quality channels through

¹²⁹ See *E-only scholarly journals: overcoming the barriers*, RIN, PRC, JISC and RLUK, 2010.

which they can publish and disseminate their findings; and which helps to ensure that they perform to best standards by subjecting those findings to rigorous peer review. It is critically important that in introducing any changes to the ecology, we do not put those key features at risk.

- 6.24. Learned societies play a significant role in that ecology in the UK, more important than in most other countries. Their central aim is to foster and promote the specific disciplines or subjects they represent, in three key ways: first, by facilitating two-way communication and engagement between researchers, policy-makers, practitioners, and the public at large; second, by nurturing researchers with opportunities for professional development and guidance at key stages in their careers; and third, by fostering a sense of professional collegiality and promoting good practice. Publishing and communicating the results of research are core to the missions of most learned societies, and they publish journals to meet the goal of disseminating high-quality research as widely as possible. Many of the journals published by UK learned societies are among the leading journals in their fields worldwide¹³⁰. They also play a key role in sustaining the level of societies' core activities, and that is of vital importance.
- 6.25. Quality assurance through peer review is enshrined in our terms of reference; and we believe that it is critically important to the users of research – both in the research community and in society at large – that published findings from whatever source, in the UK or worldwide, should be subject to peer review. Otherwise there is the risk that faulty or mistaken results can achieve currency, with damaging consequences. The risks can be especially severe in areas of research where findings may affect health and safety in the population at large.
- 6.26. Peer review is sometimes characterised an imperfect mechanism: it can take a long time and delay the publication of important results; it provides scant rewards for the efforts that researchers – hard-pressed for other purposes – devote to good reviewing; and since it depends on fallible human beings it cannot provide an absolute guarantee against the publication of faulty results. But most researchers regard peer review as overwhelmingly more reliable than other forms of review; and the principle that research publications should be subject before publication to rigorous review by expert peers – whether simply to check the rigour of the research or to assess its significance and likely impact in the field - is of critical importance. It becomes even more important as wider access to research-based publications leads to wider use by non-experts, who must have confidence in the quality assurance of the publication process, if they are to rely on the findings.
- 6.27. Nevertheless, it is important also to distinguish between the principle of peer review and the various ways in which it operates, with different degrees of openness and transparency. A number of approaches have been proposed, and

¹³⁰ The Association of Learned and Professional Society Publishers (ALPSP) estimates that about a third of all peer reviewed journals are published by learned societies, and that in 2006 three-quarters of the top 200 journals were published by non-profit publishers.

experiments undertaken, with the aim of making peer review more effective. These have included measures to make reviewers' names and/or the content of their reports open to authors and to readers; and to seek and publish feedback from a broad user community once an article has been informally disseminated or formally published. Different approaches appear to work more or less effectively in different disciplines, and post-publication review is widely seen as at best a complement to pre-publication review: while it may be useful for controversial or high-profile papers, it works less well for papers of more limited interest, not least because readers are unwilling to devote time to reviewing and commenting when they lack any incentive to do so¹³¹.

- 6.28. It is important, therefore, that there should be continuing monitoring and evaluation of peer review practices, and experimentation to seek improvements; and we support the recommendations of the House of Commons Science and Technology Committee to that effect¹³².

H. High-quality services to readers

- 6.29. Readers need help to discover information that is relevant to their needs and to navigate their way around the ever-increasing variety and volume of research publications. It is impossible for anyone to read and absorb all the publications that might be relevant in other than the most narrowly specialist fields of study. Hence the growing interest in machine-to-machine services. Readers have also come to expect the development of new services that enable them to interact with the content to which they have access, with enhanced links to other sources of information, and services that enable them to interrogate, manipulate and organise the content presented to them on a variety of platforms.
- 6.30. Publishers, libraries, aggregators and other intermediaries invest considerable sums in developing and implementing such services, and new entrants have added significantly to the range that is now available to readers. It is critically important that the research communications eco-system should continue to provide opportunities and incentives for new entrants to develop new services in this way. For as technology moves forward, readers will continue to demand more, and it is therefore crucial to sustain an environment that promotes innovation, investment in the infrastructure, and continued improvement in services.

¹³¹ It is worth noting, however, that post-publication peer review is the norm for Internet specifications and Web standards documents — RFCs (Requests for Comments) published by the Internet Engineering Task Force (IETF) and Candidate Recommendations published by the World Wide Web Consortium (W3C) — where the whole purpose of the initial publication is to make these documents available for post-publication peer review for a specified period of time, during which comments and criticisms from any interested parties are received and acted upon, before the new standards are formally agreed and published. Shotton, D, 'The Five Stars of Online Journal Articles – a Framework for Article Evaluation', *D-Lib Magazine*, 18 (1/2), 2012.

¹³² House of Commons Science and Technology Committee, *Peer review in scientific publications*, HC 856, 2011

Summary

6.31. We have noted in our discussion of the success criteria outlined above that each of them could be met in a number of different ways: none of them points unambiguously in one direction. We present a summary assessment of how different mechanisms might help to meet each of our success criteria in Annex D.

7. Access Mechanisms

7.1. We have identified three core mechanisms through which access to research publications can be increased: open access publishing, extensions to current licensing arrangements, and repositories. Each of them has a number of variations in nature and scope, and we discuss those variations, as well as the advantages and disadvantages of the three mechanisms in this section.

Open access journals

7.2. The key features of the current open access publishing landscape have been outlined earlier in Sections 3 and 4:

- i. the launch of open access journals published by new entrants to the market such as PLoS and BioMedCentral
 - ii. the response of established publishers, with the launch of their own open access journals and, more commonly, of ‘hybrid’ journals operating on a mix of subscriptions and APCs for open access publication
 - iii. take-up which currently runs at between c5% and c8% of the global total of peer-reviewed articles published each year, with higher levels in science, technology and medicine, and lower levels in social sciences and humanities
 - iv. the relatively low levels of take-up until now of the open access option offered in most hybrid journals
 - v. the large open access publishers funding their journals through APCs which currently average between £1k and £2k, alongside a long tail of small publishers which publish one or two journals, many of which charge no APCs at all
 - vi. the recent growth of ‘repository’ journals which publish any articles which pass a peer review test of methodological rigour, regardless of the significance of the results
 - vii. the ability of open access journals, since they receive the bulk of their revenues before publication, to be less restrictive than subscription journals about rights of use and re-use of their contents.
- 7.3. For open access and hybrid journals, as for all journals, unit costs depend on a number of factors, including the rejection rate, frequency of publication, the average length of articles, and the amount of editorial material they provide in addition to research articles. All these factors therefore have an influence on the level of APCs; and journals considering a move from subscription-based to open access publishing, have to take careful account of them. The rejection rate is the most important influence in most cases, but for many journals, the amount of commissioned content that they provide – review articles, book reviews and so on which would not attract revenues in the form of APCs – will also be an important

consideration. And in setting APCs, publishers will take account of the levels already set in the open access market as well as their current cost base and their status and reputation. One option could be to make research articles open access (funded by APCs), but to charge for access to the editorial content, reviews and so on. That is the basis on which some major journals such as the *British Medical Journal* already operate.

- 7.4. Among the large open access publishers, APCs for journals published by PLoS for 2011-12 range from \$2,900 for *PLoS Medicine* and *PLoS Biology* to \$1,350 for the ‘repository’ journal *PLoS One*; and APCs for journals published by BioMed Central range from \$630 to \$2,620. For the Hindawi Publishing Corporation, APCs range from \$300 to \$1500¹³³. The high-status journals published in hybrid format by Cell Press, on the other hand, charge an APC of \$5,000 for articles published on open access terms¹³⁴.
- 7.5. The average level of APCs paid by the Wellcome Trust under its open access policy in the first three months of 2011 was £1,422; and the University of Nottingham paid on average £1,216 in the academic year 2010-11. How sustainable such averages would be if open access were to become more widespread among journals with high rejection rates, as well as in the humanities and social sciences, is not clear. There could be upward pressure on prices as such journals adopt an open access option; but on the other hand market competition could keep APCs low. Despite this uncertainty about the future, the evidence to date indicates that in the current market place it is possible for at least some open access journals to operate on a financially-sustainable basis.
- 7.6. Hence it is not surprising that a number of publishers of major journals, including learned societies such as the Institute of Physics, have already established open access journals, or moved to a hybrid model for at least some of their publications. Few have established fully open access journals as yet, however, in the humanities and social sciences; and take-up of the open access option in hybrid journals in those disciplines has been very low. Indeed, a report¹³⁵ on the journals published by a number of leading societies in the humanities and social sciences in the US found that factors including the rates of publication and of rejection of submitted manuscripts, the length of articles, and the large amounts of material – such as book reviews – that would not attract an APC, meant that a move to fully open access journals would be unsustainable: the level of APCs would be too high, and it was not clear whether funds would be available to meet them.
- 7.7. Recent analysis of some leading social science journals published by learned societies in the UK¹³⁶ leads to similar conclusions, especially where – as is common with many of the journals published by societies - a large proportion of

¹³³ Some Hindawi journals charge no APC at all. <http://www.hindawi.com/apc/>

¹³⁴ <http://www.cell.com/cellpress/FundingBodyAgreements>

¹³⁵ Mary Waltham, *The Future of Scholarly Journals Publishing Among Social Science and Humanities Associations*, 2009

¹³⁶ Confidential information provided to the secretariat.

the current subscription income comes from overseas. Hence the suggestion that open access might apply only to the research articles published, not to the reviews and other material. Another suggestion is that open access might be restricted to the UK (together with those developing countries that already enjoy access under one of the Research for Life¹³⁷ and similar schemes), in which case the level of APC would be much lower, and potentially sustainable. Such a move would not, of course, meet the objective of increasing global access to UK research outputs.

- 7.8. A third suggestion is that instead of charging an APC once an article has been accepted for publication, journals should levy a fee when authors submit an article. Submission fees are already quite common in certain disciplines, notably economic and finance journals and in some areas of the life sciences. A recent report¹³⁸ found that there could be benefits to publishers in certain cases (particularly for journals with high rejection rates) to switch to such a model, not least in enabling them to set APCs much lower than they would otherwise have to be. But the risks, particularly those involved in any transition, are seen by publishers to outweigh the perceived benefits. Moreover, the advantages offered by submission fees do not provide publishers and authors – who might decide, after paying for peer review not to proceed to publication - with direct incentives to change to open access. From the perspective of authors and of funders, the financial risks of submitting an article for publication would become greater under such arrangements. We have therefore not considered submission fees as an option in our deliberations.

Policies and arrangements for payment

- 7.9. We have already noted (Section 4) that policies and arrangements for the payment of APCs are unsystematic and ill-understood, and that they are thus a major barrier to the adoption of open access publishing. We therefore welcome the proposals to address this issue that are emerging from discussions with the Research Councils. The precise policies and processes have still to be worked out, but it is essential that they should allow flexibility to universities, so that they can establish their own policies and procedures for the payment of APCs; if they do so, they will provide a significant stimulus to open access publishing.
- 7.10. It is envisaged that universities should respond to the proposed new policies and arrangements from the Research Councils with policies of their own to establish open access publication as the primary means of publishing and dissemination, with dedicated institutional funds to support it. If universities are allowed sufficient flexibility in the use of moneys from the Research Councils, Funding Councils and other sources, the new policies may be adopted both for research projects funded by the Research Councils or other external funds, and also for the research that has no dedicated source of funding, where the costs are met from the

¹³⁷ HINARI in medicine, AGORA in agriculture, OARE in environmental sciences, and ARDI in development and innovation. <http://www.research4life.org/>

¹³⁸ Mark Ware Consulting Ltd, *Submission Fees: a tool in the transition to open access?*, Knowledge Exchange, 2010

university's block grant and other resources. In pursuing this path, universities will have to consider, and to consult carefully with their staff, about the precise policies and arrangements that they put in place. For while there are advantages in making researchers and others more aware of the costs of the publication process, they are likely to be nervous about the implication that universities will have significantly greater influence on the specific channels they use to publish and disseminate their work. Moreover, in managing publication funds, universities will have to work together with authors, and in line with the principle of academic freedom, in making judgements about the potential for publication in journals with different levels not only of status, but of APC: cost of publication will thus be a significant consideration for the first time on a large scale and across all disciplines.

- 7.11. In establishing new arrangements, it will also be important for funders, universities and publishers to work together on three key issues. First, policies and procedures should be agreed and implemented for the high proportion of articles that are produced by authors from more than one institution (often several), and often with multiple sources of funding. Nearly half (46%) of the peer-reviewed articles with a UK author published in 2010 also listed an author from overseas. No clear policy stance has yet emerged for dealing with the growing proportion of publications that are produced in this way. If open access publishing is to grow significantly, all those involved – authors, institution, funders and publishers – need to have clear guidelines on how responsibility for the payment of APCs is to be allocated, or shared, in the various circumstances that can arise with co-authorship; and on the arrangements for payment.
- 7.12. Second, the transaction costs involved with payments for the 120k articles published by UK authors each year must be minimised, with arrangements for aggregating payments wherever possible and appropriate. Universities, funders and publishers should work together on this, with support from subscription agents and others such as JISC Collections as appropriate. Membership and similar schemes may also have a role to play here.
- 7.13. Third, all players in the research communications landscape will have to work together to establish policies and arrangements for dealing with publications by researchers with no institutional affiliation, and no sources of funds from which to meet APCs. This is likely to be a particular issue in areas of the social sciences and humanities where the tradition of the independent scholar remains strong. PLoS, BioMedCentral, Hindawi and other open access publishers already have arrangements under which complete or partial waivers of APCs are provided to authors who do not have the funds to meet them.

Costs

- 7.14. The costs to the UK of a significant speeding-up of moves towards publishing in open access journals will depend on a number of factors. Modelling undertaken by Cambridge Economic Policy Associates (CEPA) in 2010 for the *Open Road* study has been revised and updated for the purposes of this report. The new modelling

takes account of the latest estimates of the numbers of articles published by UK authors and worldwide in 2010: 123,594 and 1,935,954 respectively¹³⁹. The starting point for the analysis presented in a series of tables in Annex E is that APCs are set at a level – an *average* of c £1,450 – similar to that currently being paid by the Wellcome Trust. It is important to stress that the adoption of such a starting point does not amount to a recommendation; rather, it is simply a point from which the analysis of possible scenarios can begin.

- 7.15. The comparisons in the tables start also from the same assumption used in the ‘gold’ open access scenario in the *Open Road* report: that c23.3% of all articles published annually across the world are published under gold open access terms, and that all countries adopt publication of research in open access journals at the same rate. Two further limitations to the modelling should be noted.
- i. The model assumes that the costs of subscriptions will fall in proportion to the increase in the number of articles published open access; it is likely, however, that during the transition to open access, universities and other organisations will maintain subscriptions even as their expenditure on APCs rises. This will occur especially if a significant proportion of open access articles are published in hybrid journals, where much of the content will remain accessible only to subscribers.
 - ii. The model is not dynamic; it compares costs against the starting point set in relation to funding and the numbers of articles produced in 2010, and does not seek to model changes over time (it takes no account, therefore, of the annual rise in the number of articles produced worldwide each year, currently running at between 3% and 4%).
- 7.16. While bearing in mind all the points outlined above, it is important to note how the modelling indicates that, at the level of APCs currently being paid by the Wellcome Trust, a significant shift to open access journals could be cost-neutral for the HE sector as a whole – although not necessarily for individual institutions - in the UK. For the modelling indicates that if open access publishing funded by APCs were to cover up to a quarter of the total of articles published each year in the UK and worldwide, the costs to the HE sector in the UK would be minimal, and that there would be cost savings in other sectors of c£5m a year, *so long as* the average level of APCs were to remain at c£1,450 or lower, and the rest of the world was not too far behind the UK in take-up. We consider some other scenarios below.
- 7.17. Savings to the HE and other sectors, of course, would be achieved in the main through reduced revenues to publishers, including learned societies. As we have noted earlier, there may be upward pressure on prices as open access becomes more widespread among prestigious journals with high rejection rates and thus higher costs. But market competition may tend to counteract such pressure, and

¹³⁹ Elsevier, *International Comparative Performance of the UK Research Base 2011: a report for the Department of Business, Innovation and Skills*, 2011.

since the proportion of articles published in journals with very high rejection rates is relatively low, their impact on the average level of APCs is likely to be correspondingly small.

7.18. Nevertheless, we have considered a number of variations to our model, and the impact on the costs and/or savings to the HE and to other sectors. The tables in Annex E examine four sets of possible variations to the starting point for analysis described above:

- i. changing the average level of APCs by between 10% and 50%;
- ii. changing the level of take-up of open access publishing both in the UK and the rest of the world from 23.3%, considering levels between 10% and 50%;
- iii. allowing for lower levels of take-up of open access publishing in the rest of the world, as compared with the UK;
- iv. taking account of the high-proportion (c46% in 2010) of articles published by UK authors which included also an author from overseas, and varying the proportion of UK-authored articles for which the full cost of the APC would be borne in the UK.

7.19. The tables indicate that under all but two variations from the point at which the analysis starts (thus only if the level of take-up in the rest of the world were to be as low as 40% or less of the UK rate), there would be cash savings to individuals and organisations outside the HE sector, resulting in the main from reduction in revenues for publishers. Those cash savings would be in addition to the wider benefits such organisations would receive as a result of higher levels of access to journals. But several of the variations would lead to increased costs for the HE sector.

- i. If the average level of APCs were to be c£2,175, rather than £1,450 (i.e. 50% higher than the starting point for our analysis), the HE sector would face additional costs of £11m a year, on top of the £175m currently being spent on journals and providing access to them. There would still, however, be savings to other sectors.
- ii. Varying the level of take-up of open access publishing in the UK and the rest of the world, so that it reaches 50% of the global total of articles published each year, would have no impact on costs to the HE sector, so long as the average level of APCs remained at c£1,450. But the cash savings to other sectors would rise significantly, to nearly £16m a year.
- iii. If as a result of measures to accelerate the transition to open access publishing, the level of take-up were to be significantly higher in the UK than in the rest of the world, there is the risk that the UK, and the HE sector in particular, would bear significant costs, while reaping only some of the benefits. Articles from UK authors would be made available around the world open access; but UK universities and other organisations would still

have to pay for access to a significant proportion of articles published by overseas authors. In broad terms, if just under a quarter of UK-authored articles were to be published open access, but only 5% of articles in the rest of the world, the HE sector in the UK would face additional costs of c£17m a year, and organisations in other sectors which produce research articles would also face additional costs, amounting to c£3.5m.

- iv. If UK institutions were to have to pay the full APC for only some of the articles produced by UK authors in collaboration with researchers in other countries, the costs to the HE sector could fall significantly. It is estimated¹⁴⁰ that of all the articles published with a researcher from the UK listed among the authors, around 65% have someone from the UK listed as the corresponding author (which may serve as a proxy for the lead author). Reducing by 15% the proportion of all UK-authored articles for which a UK body should pay an APC (that is, for around a third of the articles where there is also an author from overseas), would reduce costs to the HE sector by nearly £4m a year as compared to the case from which our analysis starts¹⁴¹.

7.21. It will be clear from this analysis that the costs to universities of a significant acceleration in the transition to publishing in open access or hybrid journals depend critically on assumptions on four factors:

- i. the average level of APCs;
- ii. the extent to which the UK is ahead of the rest of the world in adopting open access publishing;
- iii. the number and proportion of articles with overseas as well as UK authors for which UK institutions would be required to pay an APC; and
- iv. the extent to which during the transition to open access, universities and other organisations are able to reduce their expenditure on subscriptions even as their expenditure on APCs rises (a factor which is not covered in the modelling).

7.22. Under optimistic assumptions about levels of take-up and payment of APCs overseas, where the pace of change in the UK is matched in the rest of the world, and a proportion of the costs of APCs for articles co-authored with researchers in other countries is offset by funders and institutions in those countries, the costs to the HE sector of moving to open access publishing for 50% or more of research articles would at worst be minimal. There could even be cash savings for the HE sector, again *so long as* the average level of APCs is £1450 or lower. And our modelling suggests that even with less optimistic assumptions, the cost savings to organisations in other sectors would be substantial. The essential risk borne by the

¹⁴⁰ Elsevier estimate based on analysis of the SCOPUS database

¹⁴¹ There would of course have to be clear guidance on the issues we highlight in paragraph 7.12 above.

HE sector would be that it would be unable to reduce its expenditure on subscriptions at the same rate as it increased its expenditure on APCs.

- 7.23. Under more pessimistic assumptions about take-up, with rates of adoption twice as high in the UK as in the rest of the world, the costs to the HE sector would be significant, particularly if the average level of APCs were to be high too. Our modelling suggests that if APCs were on average £2.2k, half of all UK-authored articles were published open access, but only a quarter in the rest of the world, and the UK paid the full APC for all articles with a UK author, the additional cost to the HE sector could be over £70m a year.
- 7.24. In a middle ground, we have modelled a scenario under which the average level of APCs is c£1.75k, the rates of adoption in the UK are (at least for a transition period) as much as twice those in the rest of the world, and the UK secures contributions from overseas towards the costs of APCs for at least half the articles published with international co-authors. Our estimate is that the additional costs to the HE sector if half of all UK-authored articles were to be published in open access or hybrid journals under this scenario would be of the order of £38m a year, allowing in addition to the figures presented in Annex E for some ‘stickiness’ in costs as universities have to maintain their expenditure on big deals and other licences even as their expenditure on APCs rises.
- 7.25. The cost implications for *individual universities* will vary, as we noted earlier, according to the extent to which they can recover the cost of APCs from the Research Councils and other external funders of research; their size and research-intensity; their mix of disciplines; and their current expenditure on the library and its contents.
- 7.26. The establishment at universities such as Nottingham of funds to meet APCs has led to some attempts to assess the point at which such funds might become financially sustainable for different universities¹⁴². But the scope for reducing expenditure on subscriptions without compromising levels of access is currently very limited; hence unless universities can recover their expenditure on APCs through the full economic costs they seek from research funders in grants for research projects¹⁴³, their publication funds at present represent a drain on university resources.
- 7.27. That picture would change dramatically if the Research Councils were to establish, as they have signalled, new and flexible funding arrangements to meet APCs, especially if they were to stimulate other major research funders to act similarly. The essential point here is that the new arrangements should provide a sound basis on which universities could establish publication funds: and if all funders were to meet the full costs of APCs, the net cost to the university would be nil. But it is critically important that universities should be given sufficient scope to establish

¹⁴² Swan, A (2010) *Modelling Scholarly Communications Options: Costs and Benefits*, JISC, 2010.

¹⁴³ *Paying for Open Access Publication Charges*, RIN and UUK, 2009.

their own policies and funding arrangements, which will provide incentives for them to shift funds from library budgets to the payment of APCs, and to bear down on the cost of those payments.

- 7.28. That flexibility is particularly important in allowing universities to deal with publications arising from the large proportion of research, particularly in the humanities and social sciences, which is undertaken without any dedicated funding from external sources. In that case the university would still have to meet the costs of APCs from QR block grant and other sources available to it; and for a university where a high proportion of research is in the humanities and social sciences, the cost implications could be significant. An analysis of the impact on a research-intensive university is presented at Annex F.

Extensions to licensing

- 7.29. Subscriptions for licences for journals are the only route through which users can get access free at the point of use to the articles they publish that are not accessible either through a repository or through an open access or hybrid journal. Institutions from across all sectors in the UK paid in 2010 some £150m for such licences. Licensed access has increased enormously in the past decade, but as we saw in Section 4, it remains patchy across the UK, particularly outside the HE community and some parts of the large corporate and health sectors. The licensing system currently falls far short of providing ‘universal access’ to all citizens and organisations in the UK. However, since UK researchers are responsible for only 6% of the global total of such articles, and an immediate or even rapid global shift to a wholly open access environment seems unlikely, licensing will remain a key route to access at least for the short to medium term. In order to increase access, therefore, it will be important to secure some extensions to current licensing regimes.
- 7.30. There are three key dimensions to any such extensions to licensed access: the numbers of individuals and organisations within and across different sectors who have access to licensed content; the volumes of content – both journals and articles¹⁴⁴ - to which they have access; and the rights that users have once they gain access to the content. We consider each of those dimensions below.

Higher Education

- 7.31. No single university purchases licensed access to all the c25k journals and the 1.9m articles published worldwide each year. Staff and students in the largest and most research-intensive universities enjoy licensed access to a high proportion of them, especially those covering the subject areas in which they are active. For staff and students of other institutions, however, the amount of content to which they

¹⁴⁴ It is important to note that the profile of journal titles and articles is skewed: roughly a third of titles are responsible for 80% of published articles; and 50% of titles for 90% of articles. Steven Hall (2010): A commentary on ‘The economic implications of alternative publishing models’, *Prometheus: Critical Studies in Innovation*, 28:1, 73-84

have access varies considerably, in accordance with the funds they have made available for the necessary licences (Section 4).

- 7.32. The past three years have seen a growing interest in the UK in licensing models under which access is provided not to a single university, but to a consortium. Such models are reasonably common in a number of other countries, including the US and Scandinavia¹⁴⁵. But the deals negotiated nationally by JISC Collections under the NESLi2 initiative operate on an opt-in basis: individual universities decide whether or not to take up the licence at the price offered. One of the difficulties in implementing a consortium model where access is shared across all members is the allocation of costs between institutions which may differ in size, research-intensity, and subject profile¹⁴⁶.
- 7.33. In Scotland, however, libraries for all nineteen HE institutions launched in 2009 a consortium scheme under which they have jointly purchased licences currently covering nearly two thousand journals from eight publishers. The apportionment of costs for the different licences between the Scottish HEIs is based on the historic expenditure of each institution with each publisher. Whether this apportionment model would be sustainable if joint licences were to cover a significantly larger number of publishers and journals is not yet clear. Similarly, it is widely assumed among librarians and others in the HE sector in the UK as a whole that reaching agreement on cost allocations across the much larger number of all the universities in England, for example, would prove extremely difficult.¹⁴⁷
- 7.34. Nevertheless, the success of the SHEDL experiment has stimulated discussion about the scope for similar consortia to be established covering groups of universities in other parts of the UK; and renewed discussion about the merits of licence arrangements which provide access for the whole of the HE sector. There have been initiatives of this kind in a number of countries, including Germany, Ireland and Canada¹⁴⁸. The widespread view among university librarians in the UK, however, is that the apportionment between them of the costs of such licences would best be achieved by top-slicing of their universities' block grants from the

¹⁴⁵ See, for example, OhioLink in the US (<http://www.ohiolink.edu/about/>), and the BIBSAM consortium in Sweden (<http://www.kb.se/bibliotek/centrala-avtal>)

¹⁴⁶ John Cox and Albert Prior, *Bloc Payment Methods for Online Journals Agreement: Models for redistribution of costs*, 2010 ([http://www.jisc-collections.ac.uk/Documents/Reports/BLOC%20PAYMENT%20APPORTIONMENT%20REPORT%20\(PUBLIC%20VERSION%20FOR%20WEBSITE\).doc](http://www.jisc-collections.ac.uk/Documents/Reports/BLOC%20PAYMENT%20APPORTIONMENT%20REPORT%20(PUBLIC%20VERSION%20FOR%20WEBSITE).doc))

¹⁴⁷ http://scur1.ac.uk/WG/SHEDL/about.html#shedl_about. For an early evaluation of the SHEDL initiative, see *One Year On: Evaluating the initial impact of the Scottish Higher Education Digital Library*, RIN 2010,

¹⁴⁸ In Ireland, Science Foundation Ireland (SFI) and the Higher Education Authority (HEA) provide funds to support a national electronic library (IREL) (see <http://www.irelibrary.ie/about.aspx>); in Germany, the Deutsche Forschungsgemeinschaft (DFG) has since 2004 given financial support for the purchase of licences for journals and a range of databases and e-book collections for the whole HE sector (see http://www.dfg.de/en/research_funding/programmes/infrastructure/lis/digital_information/library_licenses/index.html); and in Canada, the Canadian Research Knowledge Network operates as a consortium of 75 research-led institutions, whose members are committed to licensing a broad portfolio of research content from multiple vendors (see <http://www.crkn.ca/home>)

Funding Councils. Such top-slicing would run counter to the policies – supported by successive Governments as well as by universities themselves – of funding universities in full and allowing each of them to manage expenditures as it sees fit. In the absence of top-slicing, other arrangements might involve universities’ agreeing – as they have done in Scotland – to put amounts equal to their current expenditure on journals into a central pot¹⁴⁹.

- 7.35. Publishers have indicated that they could provide licences for the whole HE sector for access to all the content currently accessible only to large research-intensive universities. They estimate that such licences would cost an additional 5-10% on top of the amounts currently being paid by the sector. The additions to current prices charged by individual publishers in order to extend their licences in this way would depend, of course, on the extent of their current coverage, as well as on any modifications to current rights of use and re-use. An extension of licensed access across the whole sector, however, would bring undoubted benefits to researchers in less-well-endowed universities, although the *Open Road* report¹⁵⁰ suggests that the unit costs of the increased amounts of access (for a sector which already enjoys high levels of access) are high compared with other possible routes.

The health sector

- 7.36. The provision of licensed access to journals for the NHS is complex, with a range of local as well as central initiatives; and we noted in Section 4 the estimate that on average across the NHS, only about a third of relevant journals are available free at the point of use.
- 7.37. Many people in the NHS – doctors and other medical staff but also student doctors and nurses – also have an affiliation to a university; and a significant proportion of the content purchased for them by the NHS is available to them also via their university, though usually on a different platform, with different arrangements for access. On the other hand, the amount of content accessible through NHS licences is significantly lower than that for the HE sector.
- 7.38. There would be undoubted benefits from increasing and rationalising arrangements for licensed access across the health sector, with greater co-ordination between the NHS and the HE sector. There have been attempts over many years to achieve greater co-ordination, but the different procurement systems in the two sectors present a challenge for those seeking that end. Nevertheless, the two sectors in Scotland are currently planning to work together to examine the scope for collaborative purchasing as a key step towards creating a unified access system.
- 7.39. Estimates provided by publishers for the *Open Road*¹⁵¹ study indicated that licensed access to relevant journals for the whole NHS could be provided at

¹⁴⁹ For an analysis of the cost-apportionment models used by various consortia, see John Cox and Albert Prior, *op.cit*

¹⁵⁰ *Heading for the Open Road*, RIN, JISC, Wellcome Trust, PRC and RLUK, 2011

¹⁵¹ *Ibid.*

relatively modest additional cost of around £1m a year. The report suggests that the benefit-cost ratios would again be modest; but the benefits would nevertheless be real, especially for those NHS staff who need access to the latest research publications and who struggle at present with access to a limited amount of content on different platforms.

Other sectors

- 7.40. Outside the HE and NHS sectors, the provision of licensed access to significant numbers of journals is common only in large R&D-intensive companies. The survey and other evidence we have considered (Section 4), together with data on the number of ‘turnaways’ on publishers’ platforms (that is, the number of people who view the abstract of an article but then decline to purchase access to full text)¹⁵² indicate that PPV arrangements at current prices are not an adequate substitute for licensed access free at the point of use.
- 7.41. During the period of transition to publishing in open access and hybrid journals, extensions to licensed access for the benefit of individuals and organisations in the public, voluntary and business sectors in the UK, would bring significant benefits in increasing the flow of knowledge and thereby in stimulating growth and innovation.
- 7.42. There are many attractions to the idea of a national licence to provide online access to all journals for everyone in the UK, although some risks as well, which is probably why no major nation has implemented such a scheme. We have concluded that such a licence is unlikely to be practicable, and that the costs would probably be high. The only known example of such a national licence scheme is the Iceland Consortium for electronic subscriptions (hvar.is), which provides access to over 17,000 full-text journals through every computer in the country that connects to the internet through an Icelandic internet service provider¹⁵³. The agreement is made through an aggregator, not with primary publishers, with most of the content embargoed for a year after publication; and the model is unlikely to be scaleable for the UK.
- 7.43. Nor would it be straightforward to develop and implement licences that would cover large sectors of the UK economy and society: there would be considerable problems in defining different sectors and their boundaries; the risk of disputes as to which organisations fell within or outside the definitions; and the likelihood of leakage of content beyond the sectors covered by each licence. Nevertheless, in order to increase access for key groups of people and organisations who have an interest in research and its results, some extensions to current licensing arrangements would clearly be desirable, and could bring real benefits. We believe that there should be continuing discussions between publishers, representative bodies for key sectors, libraries and other organisations with relevant expertise

¹⁵² The data on turnaways is difficult to interpret, but the numbers are very large.

¹⁵³ See <http://www.hvar.is/sida.php?id=154>

(such as JISC Collections) to consider the terms and costs of broader licence agreements; and possible sources of funding.

- 7.44. Two specific proposals have emerged from our discussions. The first would address the needs of those small companies and other organisations that are research-intensive and have close relationships with universities, including spin-out companies. Under the current licences negotiated under the NESLi2 initiative, the staff of such companies are not eligible for desktop access to content licensed by the university with which they have a relationship. But it is unlikely that the companies can afford large licence packages themselves, or the high cost of PPV. The proposal is that on the basis of an agreed definition of small businesses engaged in research and development¹⁵⁴, and in return for a relatively small extra fee, publishers might allow a university to provide access to researchers in such enterprises. The university itself could then decide how it would seek to recoup from the companies concerned the additional costs involved in the licence. Such a move would be in line with the recommendations of the Wilson Review on ways to improve collaboration between universities and business¹⁵⁵.
- 7.45. The advantages of such an approach would be that the staff in such enterprises would benefit from efficient and low-cost access; universities would strengthen their partnership with those enterprises; both would strengthen their contribution to research, innovation and economic growth; and the publishers would secure a small increase in revenue, with the potential for greater increases as the businesses grew.

Public libraries

- 7.46. The second proposal is that the major subscription-based publishers should license public libraries throughout the UK – and perhaps in addition those learned society libraries that are open to the public - to provide access to peer-reviewed journals and conference proceedings at no charge, for ‘walk-in’ users on library premises. Provision through public libraries in this way would enhance the walk-in access already available via university libraries¹⁵⁶ and would enable anyone to have access to peer-reviewed research literature at their local public library. At a time when public libraries are under severe pressure such a move will help to strengthen their position in the communities they serve, and lead to increased usage and value. It would have an immediate effect in extending access to the great majority of journals for the benefit of everyone in the country. Hence the proposal has been warmly welcomed by representatives of the public library sector.

¹⁵⁴ Such a definition might start from the EU definition of a micro enterprise, with 10 staff or fewer, and a turnover of 2m euros or less.

(http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide_en.pdf)

¹⁵⁵ Sir Tim Wilson, *A Review of Business-University Collaboration*, 2012,

<http://www.wilsonreview.co.uk/wilson-review/wilson-review.pdf>

¹⁵⁶ Publishers are required to allow walk-in access through university libraries as a requirement of NESLi2 licences; but access provision by libraries is patchy, and take-up small. See *Public access to licensed journals held in academic libraries*, RIN 2006.

- 7.47. Walk-in access would not, of course, meet the demand for access at any time and anywhere. But access free of charge to any user of a public library would provide real benefits to many people who at present face considerable barriers if they want to find authoritative information about research relevant to their interests and needs. At the very least it would be a valuable – and free - supplement to the current access options of PPV from the publisher’s platform, document delivery services such as those provided by the British Library, and other services such as DeepDyve.
- 7.48. It is proposed that this public library initiative should run for an initial period of two years, in order to gather and analyse data on demand and usage; and publishers hope to extend the service at the end of the two years if it has not led to any damaging loss of core revenues. The precise terms of what will be provided – whether access will be restricted to screens on library equipment, restrictions on copying to other devices, access to printing, and related matters – and issues such as discoverability and whether access will be provided to all content via a single platform, have yet to be worked out. A working group of representatives of public libraries and of publishers has been established to consider these issues, and how the proposal can be implemented to best effect.
- 7.49. If the initiative is to achieve its full potential impact, it will need to be accompanied by the development of clear guidance and advice for both users and the staff in public libraries on the nature and scope of journals and their contents, and on how to navigate to relevant articles. A clear marketing strategy will also need to be developed and implemented to ensure that those who are interested in gaining access to journals are aware of the initiative¹⁵⁷. With all those measures in place, the initiative is likely to have a major impact.

Content coverage

- 7.50. In considering extensions to current licensing arrangements, it is important, as we noted earlier, to consider the amounts and proportions of content, as well as the sectors, that are covered. There could be a natural tendency in seeking to extend the numbers of *people* who have licensed access to focus attention on the larger publishers who control the majority of *content* in the form of journals and articles. It will be important, therefore, to put measures in place to protect the interests of large numbers of smaller publishers – with journals that are valuable in their fields – who would find it more difficult than their larger colleagues to engage in negotiations on extending their licence agreements to cover more people and organisations; and to make sure that as many people as possible have access to as wide a range of journals as possible, including those published by the smaller publishers.

Costs

¹⁵⁷ Experiments in the Netherlands to provide access through libraries to SMEs have proved disappointing mainly, it is thought, because they received very little publicity.

- 7.51. The costs of extensions to current licensing in the UK would depend on the scope of the extensions. Our estimate is that licences for access to the great majority of journals for the whole HE sector in the UK would cost £6-12m a year on top of what is currently being paid by universities and other HEIs; and that licences for relevant journals for the whole NHS would cost £1-2m in addition to what is currently being paid.
- 7.52. We have not attempted to estimate the additional costs - on top of the c£35-40m currently being paid by organisations outside the HE sector - of licences to cover other sectors such as Government and the public sector; voluntary organisations; or business in general and small and medium-sized enterprises (SMEs) in particular. We believe, however, that the costs could be relatively high, not least because publishers would seek in their pricing for sector-wide licences to protect themselves against the loss of potential for additions to their revenues from individual organisations within the relevant sectors. Hence it is important that key representative bodies for the public, business and voluntary sectors should work with publishers to identify the business case for sector-wide licences, including the possible sources of funding to support them. And we believe that there may be scope for negotiating trade-offs between increased revenues for publishers from extended licences on the one hand, and the amounts paid in APCs for articles published open access on the other. (See Section 8)
- 7.53. The costs to the public purse of the two proposals that have emerged from our discussions, however, would be minimal. For the provision of access to micro enterprises via universities, individual universities would be able to recoup the cost by charging a fee for access that would be free at the point of use. For the public library initiative, most of the costs would be borne by the publishers, but there would be a need to produce some guidance and promotional material to raise awareness of what is being provided.

Repositories

Institutional repositories

- 7.54. Repositories come in a number of forms, as we noted in Section 4. Most universities in the UK now have an institutional repository, though there are considerable differences in size and scope of holdings, and levels of usage. The policies of neither research funders nor universities themselves have yet had a major effect in ensuring that researchers make their publications accessible in institutional repositories as a matter of routine: levels of deposit as yet remain low, and for journal articles in particular, most of the records in institutional repositories tend to consist of metadata rather than full text.
- 7.55. Hence the impact of institutional repositories in increasing access to research publications has so far been limited, despite the best efforts of repository managers and others; and without further active measures from funders and universities, that seems unlikely to change. Such measures could well be warranted, however, since

set-up costs have already been incurred, and the evidence suggests that operating costs are modest. And for universities, there are benefits in providing a showcase for their research, and a mechanism for creating a central record of publications and other outputs.

- 7.56. Institutional repositories make use of a number of different software platforms, which means that users encounter different platforms and interfaces, and that cross-searching and navigation can be difficult. Most UK repositories nevertheless comply with the Open Access Initiative Protocol for Metadata Harvesting (OAI-PMH), which allows basic metadata to be harvested to support discovery and navigation services. Repository content is increasingly exposed to and harvested by Google and other search engines; but the kinds of search and navigation functionality provided by services such as Web of Knowledge¹⁵⁸ or SCOPUS¹⁵⁹, and by other more specialised services, are not available for those seeking material in repositories; search and navigation facilities are very limited by comparison.
- 7.57. There are a number of international initiatives to improve interoperability between repositories, through organisations such as the Confederation of Open Access Repositories (COAR)¹⁶⁰ and DL.org¹⁶¹. At a European level, the Driver project¹⁶², the second phase of which ended in December 2009, established a pan-European infrastructure for digital repositories, offering a range of sophisticated functionalities for researchers. Driver sought to “establish the successful interoperation of both data network and knowledge repositories as integral parts of the E-infrastructure for research and education in Europe.” Building on this, the OpenAIRE¹⁶³ initiative supports the development of a network of repositories; it provides a portal for access to resources stored in these repositories, and guidance to ensure that repositories are compliant with a set of Europe-wide standards, especially relating to metadata (in order to facilitate cross-searching and harvesting). It works within the context of the EU’s open access pilot in the FP7 Framework programme, and the European Research Council’s Guidelines for Open Access.
- 7.58. In the UK, JISC has funded¹⁶⁴ demonstrator projects on interoperability, aimed at developing “realistic scenarios regarding repository use [with] a range of computer-computer interfaces between repositories and related services and

¹⁵⁸ A citation indexing and search service with web linking provided by Thomson Reuters. For UK education, the service is mediated through MIMAS at the University of Manchester, <http://wok.mimas.ac.uk/>

¹⁵⁹ A bibliographic database service provide by Elsevier, <http://www.scopus.com/home.url>

¹⁶⁰ <http://www.coar-repositories.org/>

¹⁶¹ <http://www.dlorg.eu/>

¹⁶² <http://driver-repository.eu/>

¹⁶³ <http://openaire.eu/>

¹⁶⁴ <http://www.jisc.ac.uk/whatwedo/programmes/reppres/interoperabilitydemos.aspx>

systems.” In 2009, JISC also funded a project¹⁶⁵ to investigate interoperability between repositories and online library catalogues. More recently, it has funded an Open Access Repository Junction¹⁶⁶ “to scope, build and test a deposit broker tool to assist deposit into, and interoperability between, existing repository services.” This is intended to simplify workflows for authors and publishers who wish to deposit material in more than one repository. JISC has also worked on interoperability issues with analogous bodies in Germany, the Netherlands and Denmark through the Knowledge Exchange, which includes an interoperability of digital repositories (IDR) working group¹⁶⁷.

- 7.59. The repository metadata landscape remains confusing, however, and the UK repository community in universities does not have a clear understanding of the requirements arising from initiatives such as OpenAIRE, and the Common European Research Project Information Format (CERIF). JISC is therefore working with RCUK and others on guidance to institutional repositories on an enhanced metadata set¹⁶⁸.

Subject repositories

- 7.60. The issues for subject-based repositories tend to be rather different. They have had a significant impact in a number of subject areas including physics (through ArXiv), and the life sciences and medicine (through PubMedCentral and UKPMC). The most successful repositories have been able to develop good search and navigation facilities, but these remain a challenge for others that have fewer financial resources to invest in such services. Overall there remain many gaps in the provision of subject-based repositories; many subject areas lack them entirely, or have only small-scale repositories which have not reached the critical mass to make them effective routes to access for more than a relatively small band of enthusiasts.
- 7.61. It is important, moreover, to note the characteristics of the most successful repositories. In physics, ArXiv operates in the main as a pre-print repository, where researchers deposit and gain access to draft papers *before* they are submitted to journals for peer review and publication. The repository and the journals thus co-exist, each with their distinctive roles. In medical and biological sciences, PubMedCentral and UKPMC have been established by the major research funding agencies in their domain in the UK and the US as key mechanisms to support their access policies; and for the funders of UKPMC, that service sits alongside their support for open access publishing. Again, the repository operates in tandem with

¹⁶⁵ Duncan Birrell et al, Online Catalogue and Repository Interoperability Study (OCRIS), http://ie-repository.jisc.ac.uk/430/1/OCRIS_Report.pdf

¹⁶⁶ <http://edina.ac.uk/projects/oa-rj/index.html>

¹⁶⁷ <http://www.knowledge-exchange.info/Default.aspx?ID=290>

¹⁶⁸ RIO Extension: Mapping Repository Metadata Requirements: http://www.jisc.ac.uk/whatwedo/programmes/di_researchmanagement/repositories/rioextension.aspx

publishers, who undertake the bulk of the work in depositing their publications in UKPMC.

Funders' policies

- 7.62. The UK Research Councils and other major funders such as the Wellcome Trust require any peer-reviewed publications arising from work they fund that are not published in open access or hybrid journals to be made accessible via a repository as soon as possible. The policies vary in detail, and among the Research Councils, only the MRC currently specifies a maximum embargo period, of six months; the other Councils require deposit and access in compliance with licensing and copyright arrangements. There are differences also in requirements as to precisely what is deposited: the submitted manuscript, the accepted manuscript, or the published paper.
- 7.63. Research Councils' current policies have been in place since 2006. Given the timing of applications and awards, the average length of grants, and the delays before publication, it is only in the last couple of years that assessing compliance has been feasible on any kind of systematic basis. The Councils have recently established systems for comprehensive reporting on publications and other outputs¹⁶⁹, and it should be possible to check compliance levels systematically from next year. The evidence suggests, however, that rates of compliance are at present generally low. The Councils have been considering how to consolidate their policies, and they have recognised – as they have been required to do by Government¹⁷⁰ – the need to make more efforts to raise awareness of their policies across the HE and research communities. Proposals have been circulated which include a requirement that publications should be made freely accessible either immediately upon publication, with unrestricted rights of use and re-use, where an APC is paid; or, where an APC is not paid, within six months (twelve months for publications arising from work funded by the AHRC and the ESRC, at least for an interim period,).

Publishers' restrictions

- 7.64. For open access publishers which receive their revenues in the form of APCs before articles are published, repositories arouse few concerns: they regard them as complementary channels for disseminating the articles, and hence allow access to them via repositories as well as via their own publishing platform. Subscription-based publishers, on the other hand, tend to regard repositories as rival channels and as a threat to their subscription revenues and thus to the viability of their journals. They have therefore responded to the rise of repositories with a range of policies that reflect those concerns. Most impose a range of constraints, in the form of embargos, restrictions on what version of a paper can be deposited, and on the

¹⁶⁹ Some Councils, such as ESRC, established such systems some years ago.

¹⁷⁰ *Innovation and Research Strategy for Growth*, Department for Business Innovation and Skills, 2011, page 77. <http://www.crossref.org/crossmark/index.html>

uses that can be made of it. Those restrictions serve to limit – as they are intended to do – the usefulness of what is made available to readers via repositories. Hence as we noted in Section 4, evidence as to any potential impact on the viability of journals arising from the access provided via repositories under current restrictions is as yet not clear; journal publishing has continued to grow in recent years.

- 7.65. As to what version of a paper that can be deposited, relatively few subscription-based publishers allow the version of record – that is, the version finally published, with the functionality associated with links and semantic mark-up – to be deposited and made accessible. Those few that do – as, for example with the *British Medical Journal* – allow such deposit only after an embargo period¹⁷¹. Most other publishers allow either the submitted or the accepted (after peer review) manuscript to be deposited; and policies vary as to which of those two it should be¹⁷². Some of the major publishers co-operate with the NIH by depositing in PubMedCentral versions of the articles they publish, but with a disclaimer making clear that what is accessible there is not the version of record, which remains accessible only from the publisher's site. Highlighting the status of different versions of the article in this way is now complemented by the CrossMark service¹⁷³ which puts a kitemark on the version of record in its most up-to-date form.
- 7.66. Funders have in general sought embargo periods of twelve months, and publishers of subscription-based journals are very concerned at any moves to reduce that period, believing that it would lead to a loss of subscriptions that would put the viability of their journals at risk. The concerns focus on the half-life of journals in terms of downloads: the length of time it takes the articles in each volume to reach half the number of downloads they will reach in total. Some major publishers have supplied us with figures which indicate half-lives varying from two-and-a half years in fast-moving fields such as computer science to eight years in mathematics.
- 7.67. Publishers have also noted that the availability of articles via the large subject-based repositories such as ArXiv and PubMedCentral tends to reduce the number of downloads from publishers' own platforms. That tends to increase the cost-per-download ratio for universities and others who pay for subscriptions for licensed access to the relevant journals via the publisher's platform; and since that ratio is being used increasingly when universities review the journals to which they subscribe, some publishers are nervous about loss of subscriptions. On the other hand, evidence from the PEER project suggests that providing access to articles via repositories with high-quality metadata may lead to a marginal increase in

¹⁷¹ Hence relatively few versions of record are available directly through institutional or subject repositories.

¹⁷² The Royal Society of Chemistry, for example, requires deposit of the accepted manuscript, while the Royal Statistical Society requires it to be the submitted manuscript.

¹⁷³ <http://www.crossref.org/crossmark/index.html>

downloads from the publisher's site¹⁷⁴. Nevertheless, a survey of librarians conducted by the Association of Learned and Professional Society Publishers¹⁷⁵ indicates that if embargo periods were to be reduced to six months, 10% of them would cancel all science, technology and medicine (STM) journals, and a further 34% would cancel subscriptions to some of them; the figures for arts, humanities and social science journals were 23% and 42% respectively.

- 7.68. Such evidence has reinforced the concerns of subscription-based publishers who may be, for whatever reason, unable to make a rapid move to open access publishing, that a reduction in the allowable embargo period to only six months, especially if combined with a requirement to eliminate any restrictions on use and re-use, would put the viability of their journals at severe risk¹⁷⁶.

Use and re-use rights

- 7.69. We noted earlier that access is not just about the ability to read a publication, but about what users can do with the content: to analyse and manipulate it; to shift it from one format to another; to re-use and re-purpose it in many different ways to facilitate the creation of new knowledge. Use and re-use rights depend to a significant extent on the formats in which content is made available: the range of potential uses of a PDF file, for example, tend to be more limited than for content that is made available in HTML or XML. Word-processed text files in repositories may thus be much less 'useful' to users than more advanced formats. The key for researchers and many other users is that published content should be accessible in formats that are as easy to manipulate as possible; and that any restrictions on what they can do with the content should be minimal, if they exist at all. Researchers want the maximum freedom to use the latest tools and services to make the best use of the information to which they have access.
- 7.70. But for subscription-based publishers, re-use rights may pose problems. Any requirement for them to use a Creative Commons 'CC-BY' licence¹⁷⁷, for example, would allow users to modify, build upon and distribute the licensed work, for commercial as well as non-commercial purposes, so long as the original authors were credited¹⁷⁸. Publishers – and some researchers – are especially concerned about allowing commercial re-use. Medical journal publishers, who derive a considerable part of their revenues from the sale of reprints to pharmaceutical companies, could face significant loss of income. But more

¹⁷⁴ See Ian Rowlands et al, *PEER usage study findings*, presented at PEER End of Project Results Conference, Brussels, 29 May 2012. One suggestion is that the improvements to metadata involved in the project meant that articles were easier to find through search engines and other gateways.

¹⁷⁵ Linda Bennett, *The potential effect of making journals free after a six month embargo*, ALSPS and the Publishers Association, 2012

¹⁷⁶ They note further that the draft regulations recently laid before Parliament under Section 11(6) of the Legal Deposit Libraries Act 2003 allow access to digital works deposited in the legal deposit libraries to be delayed for up to three years.

¹⁷⁷ For an explanation of Creative Commons licences, see the Glossary.

¹⁷⁸ See <http://creativecommons.org/licenses/by/3.0/>

generally, commercial re-use would allow third parties to harvest published content from repositories and present them on new platforms that would compete with the original publisher¹⁷⁹.

Costs

7.71. Since most universities in the UK have now established a repository, the costs of so doing may be regarded as sunk, although there will be a continuing need for investment and improvement¹⁸⁰. A recent estimate of the annual operating costs puts them at between £26,000 and £210,000¹⁸¹, depending on the size of the university and its research community. As to subject repositories, the 2012 budget for ArXiv in the physics community is \$589,000¹⁸², and the current cost for the NIH's administration of PMC is put at \$3.5-4.0 m. The annual running costs of UKPMC (excluding the support it receives from the US National Library of Medicine in ingesting articles from publishers) are c£600,000. It is important to note, however, that cost effectiveness depends critically on usage: the numbers of items uploaded into the repository, and downloaded from it. And it has recently been noted that "the limited resources devoted to repository management make it difficult to enhance services" with a detrimental effect on both efficiency and effectiveness¹⁸³. The costs to universities of running fully-effective repositories thus remain unclear.

¹⁷⁹ That might offer scope for innovation by third parties including new entrants; but such innovation would put at risk the journals on which any new innovative services would depend.

¹⁸⁰ A recent study for the PEER project found it impossible to determine set-up costs for repositories, since there were large degrees of internal cross-subsidisation, and adequate records had not been kept. But since set-up costs for institutional repositories have largely been met for the HE sector in the UK, the lack of adequate cost information may be of little relevance. See, Centro ASK, Università Bocconi, *PEER Economics report*, 2011, available at http://www.peerproject.eu/fileadmin/media/reports/PEER_Economics_Report.pdf

¹⁸¹ Swan, A, op cit. A survey by the Association of Research Libraries in North America puts the annual running costs of institutional repositories at between \$8,600 and \$500,000.

¹⁸² Ricky Erway, *Lasting Impact: Sustainability of Disciplinary Repositories*, OCLC, 2012

¹⁸³ Centro ASK, Università Bocconi op. cit.

8. Conclusions and Recommendations

- 8.1. The research communications system is in a period of transition towards open access. We believe that, at its simplest, this is a shift from a reader-pays to an author-pays system, which in turn requires a shift in publications processes and business models. The aim of our recommendations is to accelerate that process, but in an ordered way; and to sustain while it takes place what is most valuable in the complex ecology we have described. It is critically important also to sustain an environment which promotes innovation from both established players and new entrants, especially in key areas we have identified, including linkages between publications and underlying data, the publication of monographs, and experimentation in the mechanisms of peer review. Achieving those goals depends on concerted action from universities, funders and publishers, as well as researchers themselves. The process will be complex, since when we set the available mechanisms against the criteria for success we presented in Section 6, it became clear that no single one of them can provide a satisfactory means of achieving all of our objectives, at least for the foreseeable future. We reach that conclusion for a number of reasons.
- 8.2. First, research and its publication are international activities: as we have noted at several points in this report, researchers in the UK collaborate with colleagues overseas, but they are responsible for only about 6% of the nearly two million articles published across the globe each year. It is entirely appropriate in the public interest that the UK should, as one of the leading research nations in the world, take a lead in adopting policies that maximise access to research undertaken in the UK, particularly when that research is publicly-funded. Such policies in themselves, however, will have little impact in improving access to the great majority of publications produced by researchers in the rest of the world.
- 8.3. Second, it is of the utmost importance during the transition to sustain the world-leading status and performance of the UK research community. That success is underpinned by the support that researchers receive from learned societies in the UK, and by systems to ensure that they have effective and high-quality channels through which they can publish and disseminate their findings. These are key elements in an ecology of international co-operation and competition that helps researchers to perform to the best standards, not least by subjecting their findings to rigorous peer review. Those key elements must not be put at risk.
- 8.4. Third, periods of transition almost invariably bring with them additional costs. It is unlikely that significant increases in access – in the amount of quality-assured content that is available free at the point of use, and in the numbers of people and organisations to whom it is available – can over the next few years be achieved cost-free. During the transition, it is essential to sustain the key and valuable features of the research communications system; and the key players in that system require revenues to support their core activities. But the costs must be sustainable

for funders too. That poses a particular challenge when there are severe constraints on public expenditure.

- 8.5. We are also conscious that the interests of different groups of stakeholders and players in the research communications landscape do not necessarily coincide.
- i. *Researchers* are interested in speedy and effective publication and dissemination of research publications. As authors they are interested in securing publication in high-status journals which maximise their chances of securing high impact and credit for the work they have done, and their chances of winning the next research grant. As readers and users they are interested in speedy access, free at the point of use; ease of navigation; and the ability to use, and re-use, content with as few restrictions as possible.
 - ii. *Universities and other research institutions* are interested in maximising their research income and performance, while bearing down on expenditure. The larger research-intensive universities already enjoy (and pay for) access to the majority of the journals relevant to their work; but they could face additional costs as a result of a shift to author-side payments. Less research-intensive universities could see reductions in costs as a result of such a shift.
 - iii. *Research funders* are interested in securing the maximum impact from high-quality research, and thus in ensuring that publications arising from work that they fund are widely accessible – across the global research community as well as all other communities that may have an interest in the results – with as few restrictions as possible. Like universities, they are also interested in bearing down on costs.
 - iv. *Libraries* – in the HE sector in particular – are interested in maximising the number of journals and other research publications they can provide for their readers, at the lowest possible cost. Librarians have been in the vanguard in seeking to limit increases in the costs of journals, and in promoting the development of repositories. They are also developing their roles in providing new services to researchers in an information environment that has changed fundamentally in the last decade.
 - v. *Publishers* come in many different guises: those that publish thousands of titles and those that publish one; the commercial and the non-commercial; university presses and learned societies; and open access and subscription-based, with many operating both models. All are interested in sustaining and developing services for the effective publication and dissemination of research publications that are underpinned by peer review. Subscription-based and open access publishers operate different business models; but both are interested in securing the revenues that enable them to offer high-quality services to authors and to readers/users. For subscription-based publishers, developments such as repositories – particularly if embargo periods and other restrictions on use and re-use rights are reduced – pose risks that cause

them great concern, because this can undermine business models by preventing them recouping their costs. For open access publishers, such developments are essentially immaterial because they recoup their costs up-front through APCs; repositories simply provide an additional channel for the dissemination of the articles they publish.

- vi. *Learned societies* are interested in sustaining their support for the publication and dissemination of high-quality research, but also their work for public benefit in promoting and supporting scholarship in the disciplines they represent, and in helping to ensure that the UK sustains a strong international presence in those disciplines. Any risks to the surpluses they secure through their publications imperil also the wider activities of the societies in question, which publication surpluses are used to fund.
- 8.6. There are tensions clearly between the interests of different players; and in the complex ecology we have outlined, it is not surprising that each of the possible mechanisms for achieving our goal of increased access has its own strengths and weaknesses. In the course of our work we developed a grid to analyse the strengths and weaknesses of the three mechanisms, and a version of that grid is presented in Annex D. We consider the issues in more extended form in this Section.
 - 8.7. It is important also to stress that the mechanisms are not mutually exclusive: as we have noted, journals can work effectively with repositories, particularly the subject-based ones. Indeed, some key policy issues revolve around the relationships between repositories and subscription-based journals on the one hand, and open access journals on the other.
 - 8.8. It is clear to us that in moving towards the goal of increased access combined with sustainability and research excellence, our analysis points to the need for a shift in policy and funding arrangements. We are already seeing a shift from articles and journals supported by funds provided on behalf of readers to those where funds are provided on behalf of authors. Publications supported by author-side payments remove most of the barriers to access, as well as the restrictions on rights of use and re-use that are inherent in the subscription-based business model.
 - 8.9. Both subscription-based publications and the versions that are accessible via repositories are subject to copyright and other restrictions which mean that they are available for access, printing and download for non-commercial research and private study only. Readers may not automatically search, scrape, extract, deep link or index the articles; and they usually have to apply specially for permission for text and data mining. As ‘semantic publishing’ and the tools and services that enable researchers and others automatically to organise and manipulate content develop further and become more widely available, it will become more important to ensure that users have the rights to exploit these new technologies and services.
 - 8.10. Our key conclusion, therefore, is that a clear policy direction should be set to support the publication of research results in open access or hybrid journals funded

by APCs. A clear policy direction of that kind from Government, the Funding Councils and the Research Councils would have a major effect in stimulating, guiding and accelerating the shift to open access. Nevertheless, the transition across the world is likely to take a number of years. During that period, all three of our mechanisms – licensing and repositories as well as open access and hybrid journals - will remain in play. Measures to increase access will therefore have to include the more effective use of all three; and it is important that progress on all fronts should be carefully monitored.

Open access journals

- 8.11. Open access and hybrid journals are already a significant part of the research publishing landscape (though the same is not yet true for monographs). Open access journals overall are growing, albeit from a small base, at a faster rate than traditional subscription-based journals. Measures to facilitate and stimulate take-up of the option to publish in such journals would bring significant improvements in access to publications arising from UK research; and that would bring benefits to people and organisations both in the UK and the rest of the world. A particular advantage of open access journals is that publishers can afford to be more relaxed about rights of use and re-use
- 8.12. The draft policy proposals now emanating from the Research Councils clearly have those goals in mind. They would require that publications resulting from the research they support should be made accessible as soon as possible, free of charge, to anyone who wishes to read them; that such access should be to the version of record, as provided on the publisher's platform; and that access should come with as few restrictions as possible on rights of use and re-use. If they are accompanied by arrangements for more flexible use of research funds to pay for publication, these proposals would remove a major barrier to publication in open access or hybrid journals.
- 8.13. The Funding Councils are also developing proposals under which they would require that in any REF or similar exercise after 2014, the publications submitted for assessment should be freely accessible so far as possible. Taken together, these new policies will, so long as funding is provided to meet APCs, stimulate a significant shift towards publication of research in open access or hybrid journals in the next few years.
- 8.14. Publishers who respond to these policy developments by moving successfully to the open access or hybrid model will be able to give immediate access to the version of record, with full functionality and rights of use; and to sustain their investment in high-quality peer review, marketing, discovery and navigation, preservation and other services that meet the needs of both authors and readers. A move to open access publishing will of course involve significant costs and risks, as well as operational and policy challenges that will need careful handling. The risks and challenges will be acute for leading journals with high rejection rates, where the level of APCs is likely also to be high.

- 8.15. The challenges will also be acute for many learned societies which rely on surpluses from high-status journals to fund their scholarly and related activities. The surpluses that societies earn from the publication and distribution of successful journals across the world play a vital role in supporting their activities in the UK. Many societies rely on such surpluses for half or more of their income. Recent studies indicate that 90% of some societies' journal subscription and licence income comes from overseas; and that the great majority of the benefit that societies provide through their non-publishing activities accrues to the UK¹⁸⁴. If they can make the shift to open access journals on a sustainable basis, learned societies should also be able to maintain many of the services they provide to the research community. We consider these issues further in the following section.
- 8.16. The challenges do not rest wholly, however, with publishers and learned societies. All parties – funders, universities, and researchers as well as publishers and learned societies – will have to work together to address key issues relating to collaborative research and publication, arrangements to constrain transaction costs, and arrangements for the support of unaffiliated authors. Overall, however, we believe that open access publishing can offer a sustainable mechanism for increasing access, while sustaining high quality research and high-quality services to readers. In seeking to maximise access to the UK's research publications free at the point of use for the benefit of the greatest number of potential users, we are clear that a policy direction set towards promoting the publication of research articles in open access or hybrid journals is the right course to take.

Licensing extensions

- 8.17. Since it is clear that licensing will continue to play an important part in the research communications system worldwide for some time to come, effective measures to increase access must include, at least for the short to medium term, extensions to current licensing arrangements. In the short term, indeed, such extensions are the only way to increase access free at the point of use to publications by authors from overseas. Such extensions should aim to increase both the numbers of people and organisations who have licensed access to research publications in the UK, and the numbers of publications accessible to them.
- 8.18. As we noted in Section 7, although the idea of national licences for the whole UK population has some attractions, we do not believe that it is either practicable or affordable in current circumstances. But there is scope for rationalising and extending licensed access in ways which would bring significant benefits to people and organisations in a range of sectors.
- 8.19. In the higher education sector, there is growing interest in developing a licence regime which would provide access to a large core of journals for all universities. Such a move would bring real benefits for staff and students in many institutions.

¹⁸⁴ Sue Thorn et al, 'Learned societies and open access: key results from surveys of bioscience societies and researchers' *Serials*, 22(1), 2009; Sally Morris et al, 'Learned society members and open access' *Learned Publishing*, 22 (3), 2009

The costs would be relatively modest, although since the largest and most research-intensive institutions enjoy access to the great majority of journals already, the benefit-cost ratio would be relatively modest too.

- 8.20. In the health sector, there is scope for increasing and rationalising arrangements for licensed access across the NHS, and greater co-ordination with the HE sector. Again, providing access to all relevant journals for all those who work in the NHS would cost relatively little on top of what is already spent on licences.
- 8.21. Extending current licensing arrangements in sectors beyond higher education and the NHS would bring undoubted benefits too. Extensions to cover the various organisations in large sectors of society and the economy such as central and local Government, business (especially SMEs) and the voluntary sector would raise some difficult practical issues, and the costs could be relatively high. Nevertheless, we believe that publishers, representative bodies for key sectors, libraries and other organisations with relevant expertise should work together to consider the terms and costs of broader licence agreements; and possible sources of funding. It will be important in such discussions to ensure that extended access is not restricted to the titles of the large publishers, but includes also the many journals – many of them highly valuable in their fields – published by smaller publishers including learned societies.
- 8.22. In the meantime, we strongly recommend that the two proposals that have emerged during the course of our discussions should be taken forward. First, JISC Collections should explore with publishers and universities the scope for introducing licences which would allow members of R&D-intensive SMEs to gain online access to journals which are currently accessible only to members of a university. That would make a real difference to researchers and others in micro-enterprises that cannot afford large licence packages themselves.
- 8.23. Second, we warmly welcome the proposal to provide walk-in access to journals in public libraries, and perhaps also some learned society libraries too. Much of the detail is still to be worked out. But so long as the initiative is accompanied by effective marketing, and by guidance for both librarians and users on the nature of journals and their contents, and on how best to navigate to relevant material, it will have an immediate effect in extending access for the benefit of everyone in the country. It will also help to strengthen the usage and value of public libraries in the communities they serve.

Repositories

- 8.24. The evidence suggests that – beyond the relatively narrow range of subjects and disciplines that support large-scale repositories – the impact of repositories on researcher behaviour has so far been limited. Moreover, the UK on its own can do little to increase access via repositories to the great majority of global publications that are produced by researchers in other countries. Unless there are significant moves overseas, much of the research published by researchers from China, North

American and other major research nations may remain accessible only on payment of a subscription or PPV charge.

- 8.25. Nevertheless, measures in the UK to encourage the further development and use of repositories could lead to significant improvements in access to publications and reports arising from UK research. The benefits would be perceived within universities in facilitating research management, in providing a showcase for research outputs and expertise, and in providing a mechanism for the management of research data. Perhaps more important for our purposes would be the benefits arising from access to research results for those, outside higher education and the large R&D-intensive companies, who cannot afford large subscription packages. One of the keys to achieving such benefits is effective co-operation between repositories and publishers, such as is already evident, for example, in the case of UKPMC.
- 8.26. We recognise, however, that there are tensions between the interests of subscription-based publishers and those promoting the use of repositories. The terms of the relationships between repositories and publishers are thus particularly important because - for all the reasons outlined in the previous section and elsewhere in this report - it is unlikely that either institutional or subject-based repositories could *by themselves* provide a satisfactory model for a research communications system that involves the effective publication and dissemination of quality-assured research findings. In a digital world where ‘everything is miscellaneous’¹⁸⁵ users need an array of services to provide effective signals to help them navigate to the publications that are most relevant and important for their purposes, and of the highest quality. Quality assurance through peer review, coupled with the wide range of discovery, navigation, linking and related services provided by publishers and other intermediaries are thus of critical importance to both authors and users of research publications.
- 8.27. As we have noted earlier, open access journals secure their revenues to support such services at the point of publication, through their APCs. Hence it is relatively straightforward for them to co-operate with repositories which simply provide an additional channel – alongside their own publisher platform - for access to the articles they publish.
- 8.28. Subscription-based publishers, on the other hand, recoup most of the costs of such services through the fees they charge for licences to gain access to journals and articles precisely on their own platforms. Other channels for access are rivals, not complements to those platforms. Hence they impose restrictions on access via repositories – embargo periods, restrictions on the version of the article that can be deposited and its functionality, and restrictions on rights of use and re-use – in order to preserve their licence revenues and the viability of their journals. As we noted earlier in this report, such restrictions seem to have been effective in limiting the usefulness of repositories, and hence any potential adverse impact on journals

¹⁸⁵ David Weinberger, *Everything is Miscellaneous: the Power of the New Digital Disorder*, 2007

in the form of subscription cancellations. But publishers have strong concerns about the possibility that funders might introduce further limits on the restrictions on access that they allow in their terms and conditions of grant. They believe that a reduction in the allowable embargo period to six months, especially if it were to be combined with a Creative Commons CC-BY licence that would allow commercial as well as non-commercial re-use, would represent a fundamental threat to the viability of their subscription-based journals.

- 8.29. We cannot resolve all these tensions. But we endorse the conclusion of the *Open Road* report¹⁸⁶ that policy-makers should be cautious about pushing for reductions in embargo periods and in other restrictions on access to the point where the sustainability of the underlying publishing model is put at risk. If dedicated funding is not provided to meet the costs of APCs, and researchers cannot therefore publish in open access or hybrid journals, we believe that it would be unreasonable to require embargo periods shorter than twelve months. On the other hand, where successful accommodations can be reached, as in the relationships between publishers and large subject-based repositories such as PubMedCentral and ArXiv, each can work alongside each other in an environment where they each have distinctive roles; and the repositories can become an important feature in the daily workflows of researchers and others interested in research results.
- 8.30. For universities, it would make sense to exploit the institutional repositories they have established to best effect. Further investment is required to develop an infrastructure which supports easy discovery and navigation across repositories and their contents. In order to address these problems, we recommend that further steps should be taken to develop
- i. more effective interoperability, metadata standards, and search and navigation facilities;
 - ii. interaction between funders, publishers, universities and research institutions in facilitating deposit of publications;
 - iii. linkages between repositories and research information management systems; and
 - iv. awareness and use of repositories and their contents by people and organisations beyond the research and HE communities, especially those with poor levels of access at present.
- 8.31. With the benefit of further investment to develop the infrastructure in this way, and better co-ordination between funders, universities and publishers, repositories could have a valuable role to play not just within universities, but also in a number of areas of the broader research communications landscape. These include

¹⁸⁶ *Heading for the Open Road: costs and benefits of transitions in scholarly communications*, RIN, PRC, Wellcome Trust, RLUK, JISC, 2011

- i. Preserving and providing access to research data, and working with publishers to ensure that there are effective links between publications and underlying or related data
 - ii. Providing a mechanism not just for access but for the long-term preservation of many different kinds of digital content, including research publications in those cases where – as is sometimes the case with smaller publishers – publishers’ own arrangements for preservation are at present unsatisfactory. It is important, however, that the implications of such a role should be considered carefully, and that repositories should ensure that they develop and implement robust preservation arrangements
 - iii. Providing access to grey literature (see Section 2) in the form of reports, working papers, technical specifications and other material that is often not readily-available from other sources. Repositories also provide a valuable mechanism for providing access to theses and dissertations. The role of repositories in disseminating such material beyond the academic world could be particularly useful, and steps should be taken to promote the use of repositories across constituencies where awareness of their existence is currently very low.
- 8.32. In all these ways, we believe that repositories could and should perform an important part of the landscape of research communications, complementary to that of publishers and their publications. But achieving that complementarity will require careful attention to all the matters outlined above. Policies relating to embargos and other restrictions on access to published material will require especial care; otherwise, the underlying publishing model will be put further at risk.

A mixed model

- 8.33. In sum, our conclusion is that, in order to maximise access for the greatest number of people to the greatest number of research publications, while sustaining high standards of usability, and the quality of the services provided to the UK research community, a number of measures are needed:
- i. a clear policy direction should be set towards support for publication in open access or hybrid journals, funded by APCs, as the main vehicle for the publication of research, especially when it is publicly funded;
 - ii. the Research Councils and other public sector bodies funding research in the UK should establish more effective and flexible arrangements to meet the costs of publishing in open access and hybrid journals;
 - iii. support for open access publication should be accompanied by policies to minimise restrictions on the rights of use and re-use, especially for non-commercial purposes, and on the ability to use the latest tools and services to organise and manipulate text and other content;

- iv. during the period of transition to open access publishing worldwide, in order to maximise access in the HE and health sectors to journals and articles produced by authors in the UK and from across the world that are not accessible on open access terms, funds should be found to extend and rationalise current licences to cover all the institutions in those sectors;
- v. the current discussions on how to implement the proposal for walk-in access to the majority of journals to be provided in public libraries across the UK should be pursued with vigour, along with an effective publicity and marketing campaign;
- vi. representative bodies for key sectors including central and local Government, voluntary organisations, and business should work together with publishers, learned societies, libraries and others with relevant expertise to consider the terms and costs of licences to provide access to a broad range of relevant content for the benefit of consortia of organisations within their sectors; and how such licences might be funded;
- vii. future discussions and negotiations between universities and publishers (including learned societies) on the pricing of big deals and other subscriptions should take into account the financial implications of the shift to publication in open access and hybrid journals, of extensions to licensing, and the resultant changes in revenues provided to publishers;
- viii. universities, funders, publishers, and learned societies should continue to work together to promote further experimentation in open access publishing for scholarly monographs;
- ix. the infrastructure of subject and institutional repositories should be developed so that they play a valuable role complementary to formal publishing, particularly in providing access to research data and to grey literature, and in digital preservation;
- x. funders' limitations on the length of embargo periods, and on any other restrictions on access to content not published on open access terms, should be considered carefully, to avoid undue risk to valuable journals that are not funded in the main by APCs. Rules should be kept under review in the light of the available evidence as to their likely impact on such journals.

8.34. In pursuing these recommendations, we believe that all the key stakeholders in the UK can work together to develop an agreed approach; and that collectively they can take a lead internationally, and help to shape the debate and the direction of policy. Indeed, this will be essential if the UK is to maximise the likelihood that other countries with significant levels of research publications put similar policies and systems in place. It will also be essential to sustain close dialogue and monitoring of progress both in the UK and overseas, so that key issues and any unintended consequences during the transition years are identified early, and that remedial action can be taken where necessary.

Costs

- 8.35. We noted earlier that it is unlikely that increases in access can be achieved without cost, although they will be modest in comparison with the amounts spent on other aspects of the research process. Some of the costs will be one-off, in setting up new policies, systems and services, others will continue for the medium term. The study for the *Open Road* report¹⁸⁷ estimated that the transition costs to universities and other research institutions in the UK, as well as to publishers, of a significant shift towards greater access using any one of the three mechanisms we have considered¹⁸⁸ would amount to between £2.5m and £7.0m in one-off costs (the highest for open access journals, the lowest for repositories); and between £0.2m and £4.0m a year (the highest for repositories, the lowest for licence extensions) in continuing costs. Much of those costs related to the time to be spent in negotiation, consultation, advocacy and monitoring.
- 8.36. Using all three mechanisms to increase access during the transition period as we recommend will give rise to transition and development costs, as well as continuing system costs, for each mechanisms. We consider each of them below.

Open access journals

- 8.37. We noted in Section 7 that the cash costs to the Research Councils and the HE sector – and to the UK as a whole – of a shift to publishing research articles in open access journals depend on four key factors:
- i. the average level of APCs;
 - ii. the extent to which adoption in the UK is on average ahead of the rest of the world;
 - iii. the proportion that is met from UK sources of the costs of APCs for articles with overseas as well as UK authors; and
 - iv. the extent to which universities and other organisations can reduce their expenditure on subscriptions even as their expenditure on APCs rises, and the speed of that shift.
- 8.38. It is impossible to reach firm conclusions on any of these points. And on the level of APCs in particular, it would be wrong for us to make any recommendation as to what an appropriate level should be: a market has already been established by the existing open access journals, and competition in that market is likely to intensify as a result of the measures we recommend, as the move towards open access gathers pace, and as more leading journals offer the hybrid open access option. But some high-status journals, with correspondingly high rejection rates and other cost drivers, are likely to charge APCs much higher than the average currently being paid. Nevertheless, it is clear that under almost any plausible scenario, there

¹⁸⁷ Op.cit

¹⁸⁸ The licence extensions considered were restricted to the HE sector and the NHS.

would be significant cost savings to a wide range of organisations and individuals outside the HE sector. For the HE sector itself, the picture is more complex.

- 8.39. Under optimistic assumptions about levels of take-up, with adoption of open access publishing at the same levels in the UK as in the rest of the world, and with other countries meeting a reasonable share of the costs of APCs for articles resulting from international collaboration, the costs to the HE sector would be minimal. There could even be cash savings, *so long as* the average level of APCs is £1450 or lower. As we noted in Section 7, however, under more pessimistic assumptions about levels of take-up, where the UK is significantly ahead of the rest of the world in adopting publication in open access or hybrid journals, and with APCs on average at a higher rate, the additional cost to the HE sector could be over £70m a year.
- 8.40. A mid-range set of assumptions is based around APCs on average at c£1,750, adoption in the UK at twice the level in the rest of the world, and the UK meeting half the costs of APCs where there is at least one overseas author. In that case, if half of all articles produced by UK researchers were to be published in open access or hybrid journals, we estimate that – allowing in addition to the figures presented in Annex E for some ‘stickiness’ as universities have to sustain high levels of expenditure on subscriptions even as their expenditure on APCs rises - the additional costs to the HE sector would be of the order of £38m a year.
- 8.41. The costs to individual universities will depend on all the factors outlined in paragraph 8.37 above, but in addition on each institution’s size and research-intensity, as well as its subject profile and the proportion of its research activity that is funded from external sources. The latter will be critical in underpinning a university’s ability to meet the costs of APCs out of the research grants and contracts it wins (see Section 7).

Licence extensions

- 8.42. The costs of extensions to the current range of licences will depend, as we noted in Section 7, on the number of additional people and organisations, and of journal titles, covered by the extensions. Our estimate of the cost of extending and rationalising current licences to cover the whole HE and health sectors is around £10m a year. We have not attempted to estimate the cost of extensions to other sectors, though we believe they could be relatively high, given the relatively low levels of licensed access at present outside HE and health. As we noted in Section 7, the public library initiative implies at present no substantive cost to the public purse.

Repositories

- 8.43. The costs of establishing institutional repositories in most universities in the UK have largely been met already. But developing the repository infrastructure in the ways we have outlined (with better interoperability, linking and so on), and further development of individual repository platforms, will require significant additional

investment, of perhaps £3-5m. Running costs estimated to be between £26k and £210k for each university (depending on the size of the university and its research community) are already being met. But if institutional repositories are to reach the scale and to develop the services that will attract significantly more users, and more broadly if they are to fulfil the kinds of role we have suggested, it is likely that running costs will have to rise beyond current levels¹⁸⁹.

Summary

- 8.44. It will be clear that any estimates of the total costs of increasing access through all three mechanisms as we suggest are subject to a great deal of uncertainty. Our best estimate is that achieving a significant and sustainable increase in access, making best use of all three mechanisms, would require an additional £50-60m a year in expenditure from the HE sector: £38m on publishing in open access journals, £10m on extensions to licences for the HE and health sectors and £3-5m on repositories, plus one-off transition costs of £5m. Those estimates may be set in the context of Government expenditure on research and development (£10.4bn in 2009-10) or of the expenditure on research by the Research Councils and Higher Education Funding Councils (£5.5bn). Indeed, we believe that the costs are modest in order to accelerate the move from a research communications system which is becoming increasingly unsustainable as a result of the economic, technological and social changes which we have highlighted in this report. Moreover, while any estimates of the benefits that will accrue to the UK economy and society are similarly subject to much uncertainty, it is clear that the benefits will be real and substantial. In short, we believe that the investments necessary to improve the current research communications system will yield significant returns in improving the efficiency of research, and in enhancing its impact for the benefit of the UK.
- 8.45. But we do not believe that it would be reasonable to expect universities and related research institutions to meet all of the additional costs of the fundamental change we recommend without support from the public purse and other sources. Funds to allow for the necessary additional expenditure could be released in a number of ways: through the provision of additional money from the public purse; by moves to reduce the burden on VAT levied on e-journals; by diversion of funds from other features of the research process towards the costs of publication and dissemination; or by bearing down on the costs of publishers and other intermediaries. We believe that there is scope to release funds through all those routes, and we share the Wellcome Trust's firm contention that publication and dissemination should be regarded as an integral part of the research process itself, and should be funded as such.
- 8.46. But we also believe that it is important to look at the costs of publication, dissemination and access in the round, taking full account of the costs borne by, and the revenues supplied from and to, all the agents in the system; and that there

¹⁸⁹ As we have noted, the annual running costs of UKPMC are around £600k; and that does not include the costs of ingest of articles deposited by publishers.

should be greater transparency on these issues. Thus in the context of the mixed model we recommend for the medium term, universities and funders should expect to be able to use their market power as purchasers to bear down on the costs to them of both APCs and subscriptions. One of the key advantages of open access publishing is that it brings greater transparency to the market, with competition on price as well as the status of the journals in which researchers wish to publish. Both are important, and we expect competition to intensify on both fronts. It is equally important, however, that funders and universities should make a firm commitment to ensuring that a high-quality publishing system is sustained and enhanced to underpin – and to maximise the benefits that are derived from – the world-leading performance of the UK research community: cost-effectiveness, not cheapness, should be the aim

Dependencies and risks

- 8.47. Our recommendations amount to a balanced package of measures to be taken to increase access to research publications and to accelerate the transition to open access publishing. They involve some compromises and trade-offs on the part of each of the key players and stakeholders in the research communications system; and it is important therefore that no single measure should be taken in isolation. For we are clear that effective and sustainable progress depends on continuing co-operation and good will between all the parties.
- 8.48. It is important also to stress the risks we have noted in the course of this report: risks for universities, funders, libraries, publishers, learned societies, for researchers, and not least for the success and standing of the UK and its research community. The first area of risk we highlight concerns the importance of maintaining a high-quality, sustainable publishing system that disseminates quality-assured research findings, and provides high standards of service to both authors and readers. We lay stress on this because we believe that such a system is a fundamental part of the ecology of research and the contribution it makes to society and the economy both in the UK and in the rest of the world.
- 8.49. A second area of risk relates to the achievability of real and effective increases in access to those publications, and of an accelerated transition to open access publishing funded by APCs. As we have stressed throughout this report, there are limits to what can be achieved in the UK alone, since although it is a leading research nation, its researchers are responsible for only a relatively small minority of the world's publications. Effective increases in access – and moves towards open access publication – depend in large part on actions in other countries.
- 8.50. A third area of risk relates to costs, particularly during a transition period that is likely to last for some years. The transition will not be cost-free, especially for the UK as an early adopter. Our judgement is that the costs will not be huge, but we cannot be precise, since too many variables remain uncertain. Hence it is important that the costs are shared by all the key players in the system.

- 8.51. A final area of risk relates to the likelihood that for a period the UK will be ahead of much of the rest of the world in the adoption of open access publishing. This will need to be closely monitored, since the risks relate not just to costs for UK universities and research funders, but also to the substantial part of the research publishing business that is based in the UK, and the essential support it provides – not least through learned societies – to the performance of the UK research community.
- 8.52. But the biggest risk is to do nothing. We are in a period of rapid change in research publishing, and further change is on the way. As a result, current systems, policies and funding regimes have become unstable. We need to embrace and manage the change, and the risks associated with it; while seeking to sustain and develop what is valuable in a continually evolving system.

9. Implementation

- 9.1. Implementing our recommendations will require changes in policy by all the stakeholders in the research communications eco-system. More broadly, what we propose implies cultural change: a fundamental shift in how research is published and disseminated. That in turn implies a need to provide incentives but also to explain why change is necessary. The open access movement has had some success in raising awareness; but most members of the research community pay relatively little attention to the issues we highlight in this report, or the possible impacts on them and their work. Greater efforts are needed to increase awareness and understanding of these issues among researchers, and the reasons for the changes we propose.
- 9.2. But it is not just researchers – both as producers and consumers of research publications – who will face challenges. Policy-makers, funders, university managers, librarians, publishers and other intermediaries – indeed, all those who have a stake in the effective publishing and dissemination of research – need to develop a closer and shared understanding of their interlocking and interdependent roles; and to work together to find ways to make current arrangements work better. Shared dialogue about how best to promote innovation and cultural change is essential in the interests of all. Furthermore, since our recommendations are presented as a balanced package, it is critical that they are implemented in a balanced and sustainable way. That will imply continuing close contact and dialogue among representatives of each of the key groups: Government and funders; universities, research institutions and their expert librarians; publishers; and learned societies.

Government and research funders

- 9.3. A shift in policy towards the support of publication in open access or hybrid journals is at the heart of our recommendations. Nevertheless, for the reasons we have set out in this report, we believe that at least for the short to medium term, the Government, the Research Councils and the Higher Education Funding Councils should seek increases in access through all three mechanisms – open access journals, extensions to licensing, and repositories. They will need to consider how best to fund increases through the mixed model we recommend. As we noted above, funds could be released in a number of ways: through the provision of additional money from the public purse; by diversion of funds from the direct support of research towards the costs of publication and dissemination; or by bearing down on the costs of publishers and other intermediaries. We believe that it should be a mix of all three. But a clear commitment to meet the costs of an innovative and sustainable research communications system is essential.
- 9.4. In order to provide effective support for publication in open access and hybrid journals, funders should work together to ensure that transparent and flexible arrangements are put in place to meet the costs of APCs, and they should not

assume that all APCs will be at the level currently charged by some of the larger open access journals such as PLoSOne. The arrangements should allow universities to build up from both Research Council and Funding Council grants, as well as other sources, funds to meet those costs. Any rules relating to the use of such funds should be as flexible and light touch as possible, and should seek to minimise transaction costs. Funders should also offer as much flexibility as possible to universities on the payment of APCs for publications arising from collaborations across institutional and geographical boundaries, where more than one funder is involved, and where no external source of funding has been provided.

- 9.5. Through the Funders Forum, the Government, the Research Councils and the Higher Education Funding Councils should also work together to discuss with other funders in the public, charitable and business sectors how best to promote and fund increases in access through publication in open access and hybrid journals.
- 9.6. In order to increase access in the short to medium term, we also recommend that the Government and research funders should work together with universities and with publishers to extend and rationalise current licence arrangements for higher education and the NHS. We believe it should be possible at modest cost to provide access free at the point of use to the great majority of journals for the benefit of all staff and students in both sectors. Government should also work together with all the interested parties, including university finance officers, to find ways to reduce the burden of VAT payments for e-journals, and thus to reduce the disincentive to eliminate the wasteful costs of producing journals in both print and digital formats.
- 9.7. Government should also facilitate discussions between representative bodies in the public, business and voluntary sectors on the one hand, and publishers on the other, to find ways of developing licence agreements to provide access to relevant journals and other content across key parts of those sectors which do not currently enjoy such access; and ways of funding such agreements.
- 9.8. A key issue for funders, requiring careful consideration, will be the precise configuration of policies relating to the role of repositories. We see repositories fulfilling a subsidiary, but important role, for the short to medium term alongside open access journals and extensions to licensing. But it is important that they do so in a sustainable way, in the interests of the research communications system as a whole. That will require further investment in developing the UK-wide infrastructure of repositories. JISC may have a significant role to play here in its work to enhance integration and interoperability.
- 9.9. Policies relating to embargo periods and other restrictions on the versions of articles that are published in subscription-based journals and which are made accessible via repositories - and on the uses that can be made of them - will need especially careful consideration. We understand the aspiration for rapid and unrestricted access, and we recognise that embargo periods and other restrictions serve to limit access. Hence we understand the case for keeping such restrictions to

the minimum. Nevertheless, we endorse the conclusion of the *Open Road* report that policy-makers should be cautious about pushing for reductions in embargo periods and other restrictions on use and re-use to the point where the sustainability of the underlying publishing model is put at risk.

- 9.10. Where appropriate levels of dedicated funding are provided to meet the costs of open access publishing, it is reasonable to expect that researchers should adopt open access as the default mode of publishing their findings. In that case, it may be reasonable for funders to require that embargo periods are shorter than twelve months. Such a requirement would need, however, to be phased in over a period of time which allows journals to develop open access routes where they do not already exist.
- 9.11. Where dedicated funding is *not* provided to support open access publications, and therefore researchers are unable to use this route, we believe that it would be unreasonable to require that embargo periods are shorter than twelve months. For in that case, with no direct funding support for an open access publication, it would be unreasonable to put the sustainability of subscription-based journals at risk. Moreover, in subject areas where the half-life of the articles in each issue of a journal is several years, there may be a case for a longer period
- 9.12. These issues are of particular importance for UK learned societies, as they seek ways to sustain their high-status journals, and also their scholarly and related activities. They are critical for the humanities and social sciences too, where open access has made relatively little progress to date, and there are doubts as to whether high-status open access journals are sustainable. We believe that there is considerable scope for the development of open access routes in these disciplines, and we do not wish to see a division over the longer term between those disciplines that embrace open access and those that do not. However, since the pace of change may be slower in some disciplines than others, subscription-based journals are likely to remain a significant part of the landscape for some time to come, alongside the development of open access via repositories. But embargo periods that are too short will put the journals at severe risk. Government and funders should therefore be wary of pushing too hard, too fast.
- 9.13. For all the reasons we have highlighted above and in the rest of this report, we recommend that the Government should take a lead in the European Union and in other international forums in promoting moves towards open access in the way we recommend in this report. A key goal should be to sustain continuing development of an environment that supports and encourages innovation from both established players and new entrants, in the interests of researchers and all who have an interest in the results of their work.

Universities

- 9.14. Universities have a key role to play in implementing our proposals. Some universities have already adopted policies to promote or require open access for

research publications, either via repositories, or (less frequently) through open access publishing funds. It is likely that most universities will respond to changes in Research Council and Funding Council policies by developing and implementing their own policies and systems to promote and support open access, each in accordance with their individual institutional missions and profiles.

- 9.15. First, universities should establish funds to meet the costs of APCs for open access publishing. A key source of the moneys to flow into such funds will be the amounts identified to support APCs in the grants received from the Research Councils and other funders such as the Wellcome Trust. But universities will need to identify other sources in order to meet the costs of APCs for publications that result from research not supported by such funders. Institutions that receive QR block grant from one of the Funding Councils could use that grant – as well as other resources available to them - to establish publication funds; and they could link provision for APCs through publication funds to transfers from library budgets, as the need for subscriptions falls. But there will be a time lag – because big deals typically last for three years, but also because the UK is likely to be ahead of the rest of the world in take-up of open access publishing - before there is significant scope to reduce expenditure on subscriptions without cutting the number of journals and articles to which their staff and students have access.
- 9.16. The size of the fund will be related to projections as to the amount of research income that the university expects to receive, in research grants and from other sources; the number of articles and other publications expected to be produced and for which an APC – in full or in part – might be required; and the average level of the likely APCs. There may be a need for a large contingency in the early years, as new policies and arrangements begin to take effect.
- 9.17. Universities will need to consider carefully, and to consult with their staff about, the policies and procedures surrounding publication funds. For researchers will be nervous about the implications of giving university and departmental managers a greater say in where and how researchers publish their work: the differences in cost of publishing in one journal rather than another will for the first time (outside those domains where page charges are a common feature of publishing) become a significant issue in decision-making. Universities should therefore consult with their staff and develop policies and procedures to set up and administer funds to meet the costs of APCs. Issues they will have to consider will include
 - i. whether they should promote publication in open access journals as the principal or default channel for all research publications
 - ii. the amount to be taken from QR and other sources (in addition to Research Council and Wellcome Trust grants) to establish the institutional fund for the payment of APCs

- iii. whether a single fund is to be established and administered centrally, or a series of funds for each school or faculty; and where responsibility for the administration of the fund(s) will lie
 - iv. the criteria to be adopted in deciding on the journals in which publications should be placed, especially in a context where price becomes a consideration
 - v. how support for publication should be integrated with other aspects of research management, for example the development of research capacity, and support for early-career researchers
 - vi. policies and procedures relating to the provision of funds to support publication of articles judged to be not of the highest quality
 - vii. policies relating to payment of APCs when articles are published in collaboration with researchers from other institutions
 - viii. how to minimise transaction costs while maintaining proper accountability.
- 9.18. Second, universities should through Universities UK (UUK), the Russell Group, the 1994 Group, the University Alliance, Million +, and Guild HE consider, in concert with their funders, the NHS, and representatives of publishers, the case for rationalising and extending current licensing arrangements. The aim should be to provide licensed access to the great majority of relevant journals across the whole of the HE and health sectors, so long as that can be achieved at reasonable cost.
- 9.19. Third, universities should continue to develop their repositories so that they provide effective means of enhancing links between published research and underlying data; of preserving a wide range of digital material for which satisfactory preservation channels do not otherwise exist; and of providing and enhancing access to reports, working papers and other grey literature produced by researchers, and also to dissertations and theses.
- 9.20. Finally, universities should work with publishers and with JISC Collections to examine the feasibility of providing licensed access to small research-intensive businesses and other organisations with which they have close relationships.
- 9.21. We envisage that UUK and the mission groups will provide forums for universities to consider all these issues collectively, and that they will offer advice and guidance on them. Nevertheless, specific policies and procedures will be tailored to the needs of individual institutions, in accordance with their profile and mission.

Publishers

- 9.22. Publishers have indicated that they will work together with the Research Councils, the Funding Councils, universities and others to ensure that the shift towards publishing in open access and hybrid journals supported by APCs can be implemented effectively; and with repositories to help them to provide an effective complement to the journals and articles made available on publishers' platforms.

- 9.23. Publishers of subscription-based journals will face a number of challenges in the mixed model environment we recommend. Many of them are already considering a transition towards open access publishing, including hybrid journals. But in the new environment, that will become a much more urgent issue. The new policies and procedures we are supporting and promoting put the UK in the vanguard of moves towards open access, and we have stressed the need for international action. But subscription-based publishers will have to decide whether to respond to the initiatives in the UK by providing an open access option for those journals where it is not currently available, or to shift at least some of their journals wholly to open access, on what timescale, and at what level of APC. They will have to reach difficult judgments as to the pace of change – in the UK and the rest of the world - in the different disciplines they cover. They will also have to consider the risks inherent in decisions on whether – and if so when and how – to move to an open access or hybrid model.
- 9.24. Decisions on how best to proceed may be particularly difficult for publishers – learned societies prominent among them – of prestigious journals in the humanities and social sciences, where rates of publication and other factors may mean that APCs have to be set at a relatively high level. All learned societies will have to consider the risks associated with moves to open access, and the extent to which they rely on their publishing revenues to support their wider activities. Some publishers, especially in the humanities and social sciences, may decide to retain their subscription-based journals for some time to come. Although understandable that approach is not risk free; as more publications internationally are on an open access basis, the remaining subscription-based journals could find it more difficult to attract the best papers, with long term implications for their income as well as their quality.
- 9.25. A large-scale shift to open access publishing will also require publishers to develop – in consultation with their customers in universities and other research institutions, and also with other intermediaries such as subscription agents – more efficient arrangements for the payment of APCs on a much bigger scale than hitherto, in order to minimise transaction costs. They should also consult with other players in the research communications landscape on such matters as the arrangements for the payment of APCs for publications with authors from different countries and institutions; and for reducing or waiving APCs where authors are not affiliated to an institution that can meet the cost on their behalf. It is also essential that – particularly where the hybrid model is adopted – effective measures are put in place to ensure that readers and institutions are made aware that the journals in question, or specific articles within them, are accessible free of charge. Publishers should also provide clear information about the balance between the revenues provided in APCs and in subscriptions to hybrid journals.
- 9.26. All publishers should continue to experiment with ways to add value to their content in key areas including moves towards ‘semantic publishing’ and linkages

between research articles and underlying data. They will also need to consider the extent to which they can reduce or eliminate current restrictions on rights of use and re-use. Publishers of open access and hybrid journals should be able to adopt a relaxed attitude to such restrictions. For subscription-based content, however, the issues are more complex, and it would not be reasonable to expect publishers of such content to adopt a CC-BY or similar licence which would allow commercial re-use of the content they publish. Subject to any legislative changes following the Hargreaves review, all publishers will have to consider what arrangements they will put in place to make their content available for text and data mining.

- 9.27. In seeking to extend licensed access to their journals, all subscription-based publishers should commit themselves to support for the proposal to provide on-site walk-in access to the great majority of journals through public libraries. Discussions are already under way with representatives of public libraries on how to make that initiative work to best effect. We trust that those discussions will be concluded speedily and successfully.
- 9.28. Subscription-based publishers should work alongside representatives of universities, JISC Collections and the NHS to consider the feasibility and cost of licences to cover the whole of the HE and health sectors; and of licences that would allow universities to provide access to SMEs with which they have a working relationship. More broadly, they should consult with the representative organisations for the public, voluntary and business sectors on the scope for licences that would cover a range of organisations in those sectors, including the costs and how they would be met.

Learned Societies

- 9.29. Learned societies which publish journals will have to consider all the issues for publishers outlined above. But since most of them are considerably smaller than the large commercial publishers, and they generally operate with small reserves, they are less able to change business models speedily. The risks for them during a transition period that may last for some years thus tend to be greater. The problem may be especially acute for some societies that run high-status journals where the majority of revenues come from readers and their institutions overseas, but the majority of their authors are from the UK.
- 9.30. At a fundamental level, societies will have to consider how best to fund their scholarly and other activities, and the extent to which it is prudent to rely on the surpluses generated by publishing. It would be wrong to over-protect societies and their publications, or to favour them over other publishers. But funders and policy makers should be aware of the risk that any policies that may undermine the viability of subscription-based journals may also endanger the core activities of key learned societies, and the support they provide to the UK research community and its work.

An implementation strategy

- 9.31. Our report and recommendations envisage a sustained and complex period of transition, during which there will be a mixed economy with a range of channels to publication, and for access to publications. A wide range of publishers – commercial and not-for-profit, including learned societies – will continue to offer subscription-based titles, but also an increasing number of hybrid and fully open access journals; and the use of repositories is likely to grow.
- 9.32. We stress that our mixed model represents a balanced approach to increasing access to research publications. Implementation will be an intricate process, and transition to a fully open access world will take a number of years. If the mixed model is to develop over the next few years in a sustainable way, it will require co-ordination and the active engagement of funders, universities, publishers and learned societies, as well as Government. No single interest or stakeholder group in isolation can deliver a sustainable system, or manage all the risks associated with rapid change and transition.
- 9.33. In order to sustain the confidence of all parties and stakeholders, it will be important during this process to gather reliable, high-quality indicators on the key features of the changing landscape, relating, for example, to costs, the take-up of different publishing strategies and their outcomes, and the return on public funding. Such indicators might include expenditure on APCs and subscriptions; average levels of APCs paid in the UK; the degree to which subscription budgets are switched to pay APCs; the proportion of UK and overseas publications that are published open access; and the number that are available in institutional or subject repositories. The precise configuration of the indicators, and the methodologies for gathering and analysing them, should be agreed between publishers, funding bodies, and representatives of the research community. But there will be need for co-ordination, starting with the identification of a neutral body which can work in the public interest, with the confidence of all parties and at minimal cost to gather and analyse the data. JISC may have a role to play here.
- 9.34. The key point is that formal arrangements should be put in place to monitor the process of transition, to ensure such co-ordination and active engagement from all the key parties, and to consider appropriate measures as issues arise. Such arrangements could take a number of forms: a standing group of key representatives, or a commitment to regular review, again involving all parties. But we are clear that some formal arrangements are essential, and at the very least we propose that the Group should reconvene in a year's time to assess progress. The risks to the performance and standing of the UK research community are too great to be allowed to drift through lack of appropriate attention. The continuing development of an effective and sustainable research communications system is too important to be left to chance.

Annex A: Terms of Reference and Membership

1. Purpose

The purpose of the group is to provide a means through which representatives of the HE sector, research funders, the research community, scholarly publishers, libraries and other interested parties can examine how most effectively to expand access to the quality-assured published outputs of research; and to propose a programme of action to that end.

2. Status

The working group will be independent of Government, but its activities, findings and recommendations will be considered by Government. Initial findings may be reflected, as appropriate, in the Research and Innovation Strategy to be published by Government in the autumn of 2011.

3. Scope

The group's work will focus on scholarly publications in the form of journal articles, conference proceedings and monographs. It will take account of parallel work relating to research data and other outputs being conducted by the Government Office for Science Funders' Forum and by the Royal Society. So far as appropriate, it may consider issues as to the relationships and links between scholarly publications and underlying data.

4. Working principles

The group will adopt an evidence-based approach to its work. So far as possible it will work collaboratively and will seek to achieve consensus. Where that is not possible, it will seek to identify precise points of difference.

5. Issues and objectives

The group will take account of and consider work that has already been, or is being, undertaken on issues relating to its purpose and objectives. Where necessary, it may commission additional work to clarify key issues.

The group will

- i. appraise the current landscape of access to the published findings of research in the UK and other major producers and consumers of research;
- ii. identify the key goals and guiding principles that should underlie public policy on publication of and access to research findings;
- iii. in the light of the guiding principles, likely technological and other relevant developments, identify the possible routes and mechanisms in order to achieve the key goals, and the associated costs, risks and benefits;
- iv. assess relevant policies and practice, and likely developments, in other countries; and
- v. propose a programme of action for all interested parties in the UK.

6. Timing

The group will meet c 4 times, and produce a report in spring 2012.

Working Group Members

Dame Janet Finch, DBE (Chair)	Professor of Sociology, University of Manchester
Simon Bell	Head of Strategic Partnerships and Licensing, British Library
Dr Laura Bellingan FSB	Head of Science Policy, Society of Biology
Robert Campbell	Senior Publisher, Wiley Blackwell
Professor Peter Donnelly FRS	Professor of Statistical Science, University of Oxford and Director of the Wellcome Trust Centre for Human Genetics
Dr Rita Gardner CBE	Director, Royal Geographical Society
Professor Martin Hall	Vice Chancellor, University of Salford and Chair, Open Access Implementation Group
Steven Hall	Managing Director, IoP Publishing
Robert Kiley	Head of Digital Services, Wellcome Trust
Wim van der Stelt	Executive Vice President Corporate Strategy, Springer
David Sweeney	Director, Research Innovation and Skills, HEFCE
Phil Sykes	Librarian, University of Liverpool and Chair, Research Libraries UK
Professor Adam Tickell	Pro-Vice-Chancellor (Research and Knowledge Transfer), University of Birmingham
Drs Astrid Wissenburg	Partnerships & Communication and Deputy CEO, ESRC, and chair of the RCUK Knowledge Transfer and Economic Impact Group
Ron Egginton OBE (Observer)	Research Base Directorate, Department for Business Innovation and Skills
<i>Secretary</i>	
Dr Michael Jubb	Director, Research Information Network

Sub-group on Licensing

Professor Martin Hall	University of Salford (Chair)
Sam Beale*	Technology Strategy Board / Rolls Royce
Lorraine Estelle*	JISC Collections
Steven Hall	IoP Publishing
Vicky Jones*	HEFCE
Phil Sykes	University of Liverpool
Professor Adam Tickell	University of Birmingham
Alicia Wise*	Elsevier

Sub-group on Open Access Publishing

Professor Adam Tickell	University of Birmingham (Chair)
Dr Laura Bellingan	Society of Biology
Ian Carter*	University of Sussex / Chair of the Association of Research Managers and Administrators
Dr Rita Gardner	Royal Geographical Society
Rhodri Jackson*	OUP
Robert Kiley	Wellcome Trust
Stephen Pinfield*	University of Nottingham
Wim van der Stelt	Springer
Mark Thorley*	RCUK

Sub-group on Repositories

Phil Sykes	RLUK / University of Liverpool
Juan Bicarregui*	RCUK
Robert Campbell	Wiley Blackwell
Ian Bannerman*	Taylor and Francis
Vicky Jones*	HEFCE
Alison Henning*	Wellcome Trust / UKPMC
Professor Jon Saunders*	University of Liverpool
Wendy White*	University of Southampton

Annex B: List of Abbreviations

AHRC	Arts and Humanities Research Council, one of the seven Research Councils in the UK
ALPSP	Association of Learned and Professional Society Publishers, an international association of not-for-profit publishers, based in the UK
APC	Article Processing or Publishing Charge, the fee charged for publication charged by open access and hybrid journals
ARL	Association of Research Libraries, an association of 126 research libraries in the United States and Canada
BBSRC	Biotechnology and Biological Sciences Research Council, one of the seven Research Councils in the UK
BMC	BioMedCentral, and open access publisher of over 220 journals, owned by Springer Science+ Business Media
BMJ	A journal, formerly called the British Medical Journal, published by the BMJ Group, a wholly owned subsidiary of the British Medical Association
CC-BY	A copyright licence developed by the Creative Commons organisation under which users are allowed to share content and create derivative works, even for commercial use, so long as attribution is given
CEPA	Cambridge Economic Policy Associates, an economic and financial policy advisory business based in London
CERIF	Common European Research Information Format, a set of standards for information about different elements in the research process, developed with the support of the European Commission
CNRS	Centre National de la Recherche Scientifique, the largest government research organisation in France, under the supervision of the Ministry of Higher Education and Research
COAR	Confederation of Open Access Repositories, an association of repository initiatives launched in 2009
DASH	Digital Access to Scholarship at Harvard, a central open-access repository of research by members of Harvard University
DfG	Deutsche Forschungsgemeinschaft, a German research funding organisation which supports research in science, engineering, and the humanities
DOAJ	Directory of Open Access Journals, a website maintained by Lund University which lists open access journals
DOI	Digital Object Identifier, a character string used to identify an object such as an electronic document uniquely. Metadata about the object is stored in association with the DOI name and may include a location, such as a URL, where the object can be found. The DOI for a document is permanent, whereas its location may change
ESRC	Economic and Social Research Council, one of the seven Research Councils in the UK
EU	European Union, the confederation of 27 member states in Europe

FP7	The EU's seventh framework programme for research and technological development: the EU's main instrument for funding research in Europe, running from 2007 to 2013
GDP	Gross Domestic Product, the market value of all final goods and services produced within a country in a given period
GERD	Gross Expenditure on Research and Development, the OECD's measure of total intramural expenditure on research and development performed on the national territory during a given period
HE	Higher Education
HEFCE	Higher Education Funding Council for England, the agency which distributes public money for higher education to universities and colleges in England
HTML	HyperText Markup Language, the main markup language for web pages
JISC	Formerly the Joint Information Systems Committee, an agency that support post-16 and higher education and research by providing leadership in the use of information and communications technology in learning, teaching, research and administration. It is funded by the UK higher education funding councils
LISU	Library and Information Statistics Unit, a research and information centre for library and information services, based at Loughborough University
MRC	Medical Research Council, one of the seven Research Councils in the UK
NESLi2	Formerly the National Electronic Site Licensing Initiative, the national initiative for licensing online journals on behalf of the higher and further education and research communities in the UK
NHS	National Health Service, the publicly-funded health services in the UK
NIH	National Institutes of Health, the primary agency of the United States government responsible for biomedical and health-related research
NLM	National Library of Medicine, a division of the NIH which runs the National Center for Biotechnology Information (NCBI), which houses biological databases (including PubMed and PubMed Central) that are freely accessible on the internet
OAI-PMH	Open Access Initiative Protocol for Metadata Harvesting, a protocol used to harvest (or collect) the metadata descriptions of the records in an archive so that services can be built using metadata from many archives
OAPEN	Open Access Publishing in European Networks, a collaborative initiative to develop and implement a sustainable open access publication model for academic books in the humanities and social sciences. OAPEN-UK is a parallel project gathering evidence to help stakeholders make informed decisions on the future of open access scholarly monograph publishing.
OECD	Organisation for Economic Co-operation and Development, the international economic organisation of 34 countries founded in 1961 to stimulate economic progress and world trade
PDF	Portable document format, a file format used to represent documents in a manner independent of application software, hardware, and operating systems
PLoS	Public Library of Science, a not-for-profit publisher of open access journals that began operation in 2003. Its seven journals include PLoSOne, which now publishes more articles than any other journal in the world.

PMC	PubMedCentral, a free digital database of full-text scientific literature in biomedical and life sciences, developed by the U.S. National Library of Medicine as an online archive of biomedical journal articles
POD	Print on demand, a printing technology and business process in which new copies of a book or other document are not printed until an order has been received, which means books can be printed one at a time
PPV	Pay-per-view, payments for a service under which readers can gain access to journal articles
QR	Quality-related research funding, provided to support the research infrastructure necessary for universities in the UK to conduct research, including permanent academic staff salaries, premises, libraries and central computing costs
R&D	Research and development, creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications
RCUK	Research Councils UK, a strategic partnership between the UK Research Councils, its work undertaken by employees of the seven Councils who use the term RCUK only when engaging in joint action
REF	Research Excellence Framework, the successor to the Research Assessment Exercise, a method of assessing the research of UK higher education institutions. The first REF exercise will take place in 2014 to assess research that has taken place during the period 2008–2013.
RePEc	Research Papers in Economics, a database of working papers, preprints, journal articles and software components relating to research in economics
RFC	Request for Comments published by the Internet Engineering Task Force
SHEDL	Scottish Higher Education Digital Library, a regional consortium purchasing agreement that provides staff and students in all Scotland's universities access to electronic journals published by a number of publishers
SMEs	Small and medium-sized enterprises. In Europe, there are three broad parameters which define SMEs: micro-entities are companies with up to 10 employees; small companies employ up to 50 workers, whilst medium-sized enterprises have up to 250 employees.[1] SMEs are also defined as firms with either revenues of €10–50 million or a balance-sheet total of €10–43m
SOAP	Study of Open Access Publishing, a study funded by the EU to describe and analyse models of open access publishing
SPARC	Scholarly Publishing and Academic Resources Coalition, an international alliance of academic and research libraries developed by the ARL 1998 which promotes open access
SSRN	Social Science Research Network, a website devoted to the rapid dissemination of scholarly research in the social sciences and humanities
STM	Science, technology and medicine. Also used as an abbreviation for the International Association of Scientific Technical and Medical Publishers
UCL	University College London
UKPMC	UK PubMed Central, an on-line database that offers free access to biomedical and health research information, based on the model of PubMedCentral in the US

URL	Uniform resource locator, a specific character string that constitutes a reference to an internet resource
UUK	Universities UK, the representative organisation for the UK's universities
VAT	Value Added Tax, a tax on the consumption of goods and services in the EU
XML	Extensible Markup Language, a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable

Annex C: Glossary of terms used

Basic and applied research

The commonly-used definitions of research derive from the *Frascati Manual* which sets out the methodology for collecting statistics about research and development. The Manual is published by the Organisation for Economic Co-operation and Development.

The key definitions are

- ❑ *Basic research* is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- ❑ *Applied research* is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- ❑ *Experimental development* is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

Most of the research that is reported in the journals that are the focus of this report is either basic or applied research.

Creative Commons

Creative Commons is a not-for-profit organization that enables the sharing and use of creativity and knowledge through easy-to-use copyright licenses that provide a simple, standardized way to give the public permission to share and use creative work on conditions that authors and creators choose. The licences are built around four sets of conditions:

- ❑ *Attribution (by)*, which allows users to copy, distribute, display and perform the work and make derivative works based on it only if they give the authors credit in the form they prescribe
- ❑ *Non-commercial (nc)*, which allows users to copy, distribute, display, and perform the work and make derivative works based on it only for non-commercial purposes
- ❑ *No Derivative Works (nd)*, which allows users to copy, distribute, display and perform only verbatim copies of the work, and not any derivative works based on it
- ❑ *Share-alike (sa)*, which allows users to distribute derivative works only under a licence identical to the licence that governs the original work

The conditions may be combined in a number of ways, reflecting the conditions the creators wish to impose. The CC-BY licence imposes the fewest conditions, although there is also a CC Zero licence under which creators waive all copyrights and related interests that they may have over a work.

Journals

The journals that are the focus of our report are referred to by various terms, including academic journals, learned journals, scholarly journals and scientific journals. The key point

is that they publish peer-reviewed articles reporting on the results of research across all disciplines. They often contain other material, including reviews, news, and correspondence.

They are published by a wide range of publishers: large commercial organisations such as Elsevier, Springer and Wiley-Blackwell; learned societies such as the Biochemical Society or the Royal Geographical Society in the UK, or the American Institute of Physics in the US; and university presses including Oxford University Press and Cambridge University Press. Journals owned by learned societies may be published on their own account or on their behalf by commercial, university press or other learned society publishers.

The main business models for journal publishers are

- ❑ subscription-based, where revenues come mainly in the form of payments from libraries for licences to gain access via the publisher's platform
- ❑ open access, where revenues come mainly in the form of article processing or publishing charges (APCs) paid by or on behalf of authors. But some open access journals are supported by grants or by voluntary efforts, and charge no fee
- ❑ hybrid, where journals that operate under the subscription-based model provide an option for open access publication upon payment of an APC, in which case the article will be made openly accessible, free of charge, immediately upon publication.

Open Access

There are a number of interlocking strands to the open access movement:

- ❑ access without payment to a version of a publication via a repository, often after an embargo period. This strand is often called *green* open access
- ❑ access without payment to the version of record of a publication via the publisher's own platform. This strand is often called *gold* open access
- ❑ the removal of the payment barrier, so that users have a right to read some version of an article. This is often called *gratis* open access
- ❑ the removal of most if not all of the restrictions on the use and re-use of articles. This is often called *libre* open access.

These strands are not distinct, and they can interlock in various ways: thus versions of the articles available on publishers' platforms may also be accessible via one or more repositories.

Versions of articles

As an article proceeds through drafts from the authors to publication, it goes through a number of versions. The National Information Standards Organisation in the US, and the Association of Learned and Professional Society Publishers have set a standard nomenclature for these versions

- ❑ *Author's Original*: any version of a journal article that is considered by the author to be of sufficient quality to be submitted for formal peer review by a second party.
- ❑ *Submitted Manuscript Under Review*: any version of a journal article that is under formal review managed by a recognized publishing entity. The entity recognizes its responsibility to provide objective expert review and feedback to the author, and,

ultimately, to pass judgment on the fitness of the article for publication with an “accept” or “reject” decision

- ❑ *Accepted Manuscript*: the version of a journal article that has been accepted for publication in a journal
- ❑ *Version of Record*: a fixed version of a journal article that has been made available by any organization that acts as a publisher by formally and exclusively declaring the article “published”
- ❑ *Corrected Version of Record*: a version of the Version of Record of a journal article in which errors in the VoR have been corrected
- ❑ *Enhanced Version of Record*: a version of the Version of Record of a journal article that has been updated or enhanced by the provision of supplementary material.

Annex D – Summary of Success Criteria and Mechanisms

	More UK publications freely available globally	More global publications accessible in UK HE	More global publications accessible to non-HE	Financial health of publishers and learned societies	Costs to HE	Costs to research funders	Sustain high-quality research	Sustained or enhanced services to readers
Open access journals funded by APCs	Significant improvement in access to version of record beyond the HE and large corporate sectors, so long as the UK can establish effective funding arrangements	Only if there is a global movement towards publication in open access and hybrid journals	Significant improvement in access to <i>UK</i> publications; global publications only if there is a global movement towards open access. Navigation and discovery systems continue to be developed by publishers/secondary publishers	Transition costs; but potentially a sustainable business model for publishers so long as they can attract enough authors at a fee sufficient to meet their costs, along with a surplus for reinvestment, or for transfer to support society activities	Transition costs in setting up systems. Continuing costs (or savings) depend on level of APCs, extent to which UK in advance of rest of world, and payments for internationally co-authored publications. Winners and losers among universities, depending on how funders support OA, and how much research they produce without external funding.	Shift of costs between FCs and RCs in public sector. Additional costs for charitable funders. Wellcome estimates costs at c 1-2% of research funding	Incentives for innovation from publishers in services to authors. Incentives for universities and funders to promote quality over quantity in publications. Risk of reductions in choice, and in the standing of UK research, if high status journals are too expensive or cannot make the transition to APCs.	Access to the version of record. Incentives for innovation and for new entrants to publishing market
Licence extensions	More access <i>in UK</i> , depending on the scope of the extension.	Significant improvement for less-well-endowed HEIs if there are licences covering the whole HE sector, depending on how many titles are inside such agreements. Risk that national licences could reduce access to titles not covered by such agreements, including many associated with learned societies	Improvements, potentially significant, depending on amount of new funding provided; and (hence) on how many titles, and how many sectors of society/economy covered; whether access is via the desk top or via libraries	Increased revenues for those publishers/titles covered by extensions, at low cost (reduced transaction costs). Reduced ability to increase their revenues further through subscriptions in sectors where there is already a saturated market. Risks to publishers not covered by extended agreements.	Depends on trade-off between no. of titles covered, increase in subscription charges from publishers, and extent to which research-intensive universities prepared to subsidise rest of sector.	Possible request for funds to meet additional costs for HE sector. Extensions to other sectors will require funding from other public sources.	High-quality services to authors and peer review standards sustained. Some risk of increase in barriers for new entrants into the market, if there is reduction in competition for new customers.	Access to the version of record with full functionality. Sustained infrastructure of services for readers; but some risk of loss of incentives for innovation.

	More UK publications freely available globally	More global publications accessible in UK HE	More global publications accessible to non-HE	Financial health of publishers and learned societies	Costs to HE	Costs to research funders	Sustain high-quality research	Sustained or enhanced services to readers
Repositories	Significant improvement in access outside HE and large corporate sectors (but not necessarily to version of record with full functionality) through enforcement of funder and university mandates. Embargos on access may encourage publishers to support and facilitate deposit, but diminish utility for readers. Improvements in access to UK-authored grey literature.	Only if there is a global movement towards mandates and their enforcement. Embargos and restrictions on access to the version of record, with full functionality, diminish utility for readers.	Significant improvement in access to <i>UK</i> publications through enforcement of mandates; global publications only if mandates introduced and enforced overseas. Improvements needed to navigation and discoverability. Embargos and restrictions on access to the version of record, with full functionality, diminish utility for readers.	Risk to publishers and learned societies from subscription cancellations. Risks diminished through enforcement and length of embargos and restrictions on access to the version of record with full functionality.	Costs to individual institutions of sustaining repositories (costs of setting them up largely sunk, but need for continuing development). Sector costs (through JISC and others) of developing and sustaining UK infrastructure for navigation, preservation etc	JISC costs for infrastructure for navigation, preservation etc.	Risks (if publishers lose revenue) to the service that publishers provide to authors, including peer review and accessibility of different routes to publication. Hence risks to standing of UK research base. Increased access to high-quality research reports offset to some extent by risks in mixing up content that has and has not been subject to peer review.	Access not necessarily to version of record. Risk (if publishers lose revenue) to discovery and navigation systems they currently sustain. Need for innovation in development of the discovery, navigation and preservation infrastructure for different kinds of content.

Annex E



**TRANSITION TO THE OPEN ROAD
GOLD SCENARIO MODELLING UPDATE**

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INTRODUCTION

Research Information Network (RIN) has commissioned CEPA to provide analysis of the costs to the UK of transitioning to a situation where there is a greater proportion of author-side payments or “Gold Open Access”. This analysis is a follow-up to previous work by RIN, CEPA and Mark Ware (i.e. the *Heading for the Open Road* report, hereafter referred to as ‘OR Report’).

In response to similar work which has been undertaken by other stakeholders, this note carries out additional sensitivity analysis on the Gold Scenario in the OR Report.

There are two key conceptual differences between the results in this note and those in the OR Report:

- First, the sensitivities here have been based on UK article output and funding in 2010, as opposed to a forecast 2015 Baseline (in the OR report), which itself was dependent on a series of assumptions.
- Second, we have set the starting point article processing charge (APC) at the ‘breakeven’ point for academic institutions (as opposed to all institutions in the OR report). This means that the sensitivities are concerned with the point at which it is possible that UK academic institutions would become indifferent (at the margin) between subscriptions and author-side payments.

Notwithstanding these changes, all of the caveats relating to the Gold Scenario modelling set out in the OR Report apply here. (For example, the breakeven points relate to ‘average’ institutions; and the analysis of costs assumes that publishers reduce subscription prices in proportion to the increase in Gold OA articles).

The sensitivities covered in this note are:

Sensitivity 1	Sensitivity 2	Sensitivity 3	Sensitivity 4
The level of article processing charge (APC)	The level of Gold uptake in the UK and globally	The level of Gold uptake in rest of world versus UK	The % of corresponding authors from the UK

ASSUMPTIONS

Assumptions that we have used to define the Gold OA Scenario in this note, which differ from those in the OR Report, include:

- Number of articles produced.** As requested by RIN, we have updated the model inputs to reflect two estimates, from a recent BIS commissioned report, for article production:
 - The UK produced 123,594 articles in 2010.
 - The world produced 1,935,954 articles in 2010.¹⁹⁰

¹⁹⁰ Both of these figures are taken from ‘[International Comparative Performance of the UK Research Base](#)’, A report prepared for the Department of Business, Innovation and Skills (BIS), Appendix F: Supplementary Data, page 26.

These figures are roughly 20% higher than those previously assumed in the OR Report 2010 baseline (98,280 for UK and 1,576,218 for the world).

- b) **Library costs.** In the OR Report we used top-down estimates of *total* library costs to calculate the *per article* library costs which were used in the model. In light of the assumed increase in articles produced (see (a) above) and the desire to keep total library costs consistent with the OR Report, we made the *per article* library costs have been reduced in order to leave *total* library costs unchanged.
- c) **Subscription costs from 'other' organisations.** The model splits costs between academic institutions (RLUK, HEC, etc.) and other organisations (government and independent/corporate libraries). In the OR Report we assumed that these 'other' libraries had access to a specific number of articles/journals. Having increased the number of articles produced in the 2010 baseline, we adjusted the model to ensure that the number of subscriptions for 'other' organisations remained constant (i.e. didn't increase).

Given these changes to the modelling assumptions (and the conceptual differences referred to above), the estimates in this note differ from those presented in the OR Report. The 2010 estimates against which the sensitivities are compared are shown in Table 0.1 below.

Table 0.1: UK 2010 publishing and distribution funding

	Cost Category	2010
Academic Institutions	Author-side payments	11.1
	Subscriptions	112.0
	Access Provision	52.1
	Transition costs	n/a
	Total	175.2
Others	Author-side payments	2.8
	Subscriptions and other revenues ^[1]	67.5
	Access Provision	51.4
	Transition costs	n/a
	Total	121.7
Annual Total		296.6

For ease of reference, *Table 0.2* provides details of the key assumptions in the OR Report cost modelling that relate to the Gold Scenario. The same assumptions are used in the Gold Scenario modelled for the purpose of this note.

Table 0.2: Key cost-related assumptions that affect the Gold Scenario

Input	Discipline (location)	2015 Baseline ¹⁹¹	Gold Scenario
Article allocation – Share of articles published via APCs	S/T/S (UK and Global)	5.4%	15%
	M (UK and Global)	12.8%	40%
	A/H (UK and Global)	1%	5%

RESULTS - SENSITIVITIES

For our sensitivity analysis, our starting point is the updated Gold Scenario (hereafter referred to as the ‘Central Case’). As stated in Section 1, we run sensitivities based on:

- **The level of article processing charge (APC).** The variations are the percentage change from the APC, set at the level where academic institutions breakeven, in the Central Case, and we consider sensitivities of $\pm 10\%$, $\pm 20\%$ and $+50\%$ of this figure.
- **The level of Gold uptake in the UK and rest of the world.** This sensitivity considers the impact from changing the level of Gold uptake globally (i.e. by the same proportion in both the UK and the rest of the world). In the Central Case the level of Gold uptake is 23%, which is a weighted average of Science and Technology articles (15% open access), Mathematics (40%) and Arts and Humanities (5%). We consider average levels of Gold open access ranging from 10% (i.e. lower than the Central Case) up to 50%.
- **Gold uptake in rest of world versus the UK.** This sensitivity explores the impact on the UK of the rest of the world moving to a lower proportion of author-side payments than the UK.
- **Percentage of UK-produced articles with a UK corresponding author.** As stated above, UK article production (i.e. published article having at least one UK author) is 123,594 in 2010, but some of these articles may not have a UK corresponding author. If we assume that author-side payments will be made by the corresponding author only, then a reduction in the percentage of UK corresponding authors would reduce the costs to the UK. An estimate arising from the BIS study, but unpublished, is that 65% of UK article production has a UK corresponding author listed.

The Central Case that we have used in the report is one in which the APC is set a level at which there is a zero impact on academic institutions (on average).

¹⁹¹ Estimates from Björk 2010.

Table **0.3** below provides an explanation of each of the cost categories shown in our results. These categories are consistent with the OR report.

Table 0.3: Explanation of Cost Categories

Cost Category	Description
Total average annual net cash costs	<p>Costs that will occur both now (as of 2015) and in perpetuity. These include:</p> <ul style="list-style-type: none"> • Transition Costs. The additional ongoing cash costs incurred under the <i>transition</i> to the Gold Scenario, which are split between academic institutions and other organisations. This includes the costs of advocacy, marketing, communications and information provision regarding Gold open access at each institution. • Steady state costs. Ongoing cash costs of the scholarly communication system, which are split between academic institutions and other organisations. Costs include: <ul style="list-style-type: none"> ○ Publication & Distribution costs. Peer review management and editing of articles received, composition of approved articles into journals, marketing, and transportation of journals to libraries and other buyers. ○ Access provision costs. Activities carried out mainly by libraries to make journals accessible to end users: Procurement, receiving and indexing, archiving, management and administration, IT systems, and library storage.
20-year NPV Costs and Savings	<p>This calculation takes the future stream of net costs over a 20 year period (starting in 2015), and determines the net present value of those future costs/savings by discounting their value at 3.5% per year.¹⁹²</p>

Some additional notes to consider in relation to the cost categories:

- Costs are split between academic institutions (e.g. RLUK, etc.) and other organisations (government, corporate and independent libraries).
- NPV stands for 'Net Present Value'.
- Figures exclude 'transaction costs' ('one-off' costs of moving to the Gold Scenario as they are not ongoing).
- Figures exclude 'non-cash costs' (peer review 'time' costs, and user search/print costs).

¹⁹² The discount rate of 3.5% (real) is taken from the HM Treasury Green Book. This differs from the 6.8% used in the OR Report which was a real rate of 6.8% and chosen to remain consistent with Houghton (2009).

Sensitivity 1 - Level of APC

Table 0.4: Results of sensitivity 1 (figures in £,m)¹⁹³

	Cost Category	Central Case	Sensitivity 1: APC				
			- 20%	- 10%	+ 10%	+ 20%	+ 50%
Academic Institutions	Author-side payments	22.0	17.6 (-4.4)	19.8 (-2.2)	24.2 (+2.2)	26.4 (+4.4)	33.0 (+11.0)
	Subscriptions	-18.7	-18.7 (0)	-18.7 (0)	-18.7 (0)	-18.7 (0)	-18.7 (0)
	Access Provision	-3.5	-3.5 (0)	-3.5 (0)	-3.5 (0)	-3.5 (0)	-3.5 (0)
	Transition costs	0.2	Constant at £200k for academic institutions				
	Total	0.0	-4.4 (-4.4)	-2.2 (-2.2)	2.2 (+2.2)	4.4 (+4.4)	11.0 (+11.0)
Others	Author-side payments	5.5	4.4 (-1.1)	5.0 (-0.6)	6.1 (+0.6)	6.6 (+1.1)	8.3 (+2.8)
	Subscriptions and other revenues ¹⁹⁴	-9.5	-9.8 (-0.3)	-9.6 (-0.2)	-9.3 (+0.2)	-9.1 (+0.3)	-8.6 (+1.2)
	Access Provision	-2.1	-2.1 (0)	-2.1 (0)	-2.1 (0)	-2.1 (0)	-2.1 (0)
	Transition costs	0.8	Constant at £800k for Others				
	Total	-5.2	-6.7 (-1.4)	-6.0 (-0.7)	-4.5 (+0.7)	-3.8 (+1.4)	-1.7 (+3.5)
Annual Total	-5.2	-11.1 (-5.8)	-8.1 (-2.9)	-2.3 (+2.9)	0.6 (+5.8)	9.4 (+14.6)	
20-year NPV Net Total	-76.9	-162.7 (-85.8)	-119.8 (-42.9)	-34.0 (+42.9)	9.0 (+85.8)	137.7 (+214.6)	

Points to note are as follows:

- Even in the Central Case other sectors of the UK economy (“Others”) make significant savings (c£5.2m). This reflects the fact that the non-academic institutions (i.e. the Others’ produce a small number of articles that they would have to pay for in the Gold Scenario – and this cost is small relative to the savings that they make from not having to pay subscription fees. The APC would have to increase significantly, well over 50%, for this group to incur cash costs from a global shift to author-side payments.
- Variation in APC can have a fairly significant impact on UK academic institutions annual cash costs. If the APC rises by 20%, UK academic institutions annual net costs will rise by £4.4m. However, for the UK as a whole some of these cash costs are offset by

¹⁹³ Note, some values may not add due to rounding.

¹⁹⁴ Other revenue includes: Pay per view, reprints, memberships fees & individual subscriptions, and advertising.

savings in the other sectors of the economy. The ‘Others’ save £3.8m, meaning that the additional costs to the UK are only £0.6m.

- If the APC was 50% greater than the academic institution breakeven point then costs to the institutions would be £11.0m more than the Central Case, with Others’ savings only offsetting this by £1.7m.

Sensitivity 2 - level of Gold uptake in the UK and rest of the world

Table 0.5: Results of sensitivity 2 (figures in £,m)

	Cost Category	Central Case	Sensitivity 2: level of Gold uptake in the UK and rest of the world			
			10%	30%	40%	50%
Academic Institutions	Author-side payments	22.0	3.2 (-18.9)	31.6 (+9.6)	45.9 (+23.8)	60.1 (+38.1)
	Subscriptions	-18.7	-2.7 (+16)	-26.9 (-8.2)	-39.0 (-20.3)	-51.1 (-32.4)
	Access Provision	-3.5	-0.5 (+3)	-5.0 (-1.5)	-7.2 (-3.8)	-9.5 (-6)
	Transition costs	0.2	Constant at £200k for academic institutions			
	Total	0.0	0.2 (+0.2)	~0.0 (-0.1)	-0.2 (-0.2)	-0.3 (-0.3)
Others	Author-side payments	5.5	0.8 (-4.7)	7.9 (+2.4)	11.5 (+6)	15.0 (+9.5)
	Subscriptions and other revenues	-9.5	-1.4 (+8.1)	-13.6 (-4.1)	-19.7 (-10.2)	-25.8 (-16.3)
	Access Provision	-2.1	-0.3 (+1.8)	-3.0 (-0.9)	-4.3 (-2.3)	-5.7 (-3.6)
	Transition costs	0.8	Constant at £800k for Others			
	Total	-5.2	~0.0 (+5.2)	-7.9 (-2.6)	-11.8 (-6.5)	-15.7 (-10.4)
Annual Total	-5.2	~0.0 (+5.3)	-7.9 (-2.7)	-11.9 (-6.7)	-16.0 (-10.7)	
20-year NPV Net Total	-76.9	1.3 (+78.2)	-116.7 (-39.8)	-175.7 (-98.8)	-234.7 (-157.8)	

Key points to note are as follows:

- Varying the level of Gold uptake does not have a significant impact on academic institutions’ net costs, because the APC has been set at the academic institutions breakeven point. For example, an increase from 23% (in the Central Case) to 50% causes a small change in annual academic institutions’ net costs (a saving of £0.3m). However,

the savings for Others is much greater, £15.7m when the level of Gold uptake is set at 50%.

- Substantial savings are made in access provision as the level of Gold increases. This results from libraries undertaking fewer activities in relation to procurement of journals and administration.

Sensitivity 3 - Level of uptake in rest of world versus UK

Table 0.6: Results of sensitivity 3 (figures in £,m)

	Cost Category	Central Case	Sensitivity 3: Level of uptake in rest of world versus UK			
			80%	60%	40%	20%
Academic Institutions	Author-side payments	22.0	22.0 (0)	22.0 (0)	22.0 (0)	22.0 (0)
	Subscriptions	-18.7	-15.2 (+3.5)	-11.7 (+7.1)	-8.1 (+10.6)	-4.6 (+14.1)
	Access Provision	-3.5	-2.8 (+0.7)	-2.2 (+1.3)	-1.5 (+2)	-0.9 (+2.6)
	Transition costs	0.2	Constant at £200k for academic institutions			
	Total	0.0	4.2 (+4.2)	8.4 (+8.4)	12.6 (+12.6)	16.8 (+16.8)
Others	Author-side payments	5.5	5.5 (0)	5.5 (0)	5.5 (0)	5.5 (0)
	Subscriptions and other revenues	-9.5	-7.7 (+1.8)	-5.9 (+3.6)	-4.1 (+5.3)	-2.3 (+7.1)
	Access Provision	-2.1	-1.7 (+0.4)	-1.3 (+0.8)	-0.9 (+1.2)	-0.5 (+1.6)
	Transition costs	0.8	Constant at £800k for Others			
	Total	-5.2	-3.1 (+2.2)	-0.9 (+4.4)	1.3 (+6.5)	3.5 (+8.7)
Annual Total		-5.2	1.1 (+6.4)	7.5 (+12.7)	13.9 (+19.1)	20.2 (+25.5)
20-year NPV Net Total		-76.9	16.7 (+93.6)	110.4 (+187.2)	204.0 (+280.9)	297.6 (+374.5)

Key points to note are as follows:

- If, as this sensitivity shows, the rest of the world has a lower uptake of author-side payments compared to the UK (i.e. a lack of global participation) the increase in costs to the UK is potentially very large. For example, if the rest of the world only has 20% of the UK's level of Gold uptake, UK annual costs increase by £25.5m relative to the Central Case.

- Looking at the annual costs by group, around two thirds of these increased costs are incurred by academic institutions. Author-side payments do not change (as expected) from the Central Case, but subscription costs increase significantly as the rest of the world's level of author-side payment reduces.

Sensitivity 4 - UK corresponding authors

Table 0.7: Results of sensitivity 4 (figures in £,m)

	Cost Category	Central Case	Sensitivity 4: UK corresponding authors as % of articles with UK authors			
			85%	75%	65%	55%
Academic Institutions	Author-side payments	22.0	18.2 (-3.9)	16.0 (-6.1)	13.8 (-8.3)	11.6 (-10.5)
	Subscriptions	-18.7	-18.7 (0)	-18.7 (0)	-18.7 (0)	-18.7 (0)
	Access Provision	-3.5	-3.5 (0)	-3.5 (0)	-3.5 (0)	-3.5 (0)
	Transition costs	0.2	Constant at £200k for academic institutions			
	Total	0.0	-3.8 (-3.8)	-6.0 (-6.0)	-8.2 (-8.2)	-10.5 (-10.6)
Others	Author-side payments	5.5	4.5 (-1)	4.0 (-1.5)	3.4 (-2.1)	2.9 (-2.6)
	Subscriptions and other revenues	-9.5	-9.5 (0)	-9.5 (0)	-9.5 (0)	-9.5 (0)
	Access Provision	-2.1	-2.1 (0)	-2.1 (0)	-2.1 (0)	-2.1 (0)
	Transition costs	0.8	Constant at £800k for Others			
	Total	-5.2	-6.2 (-1)	-6.8 (-1.5)	-7.3 (-2.1)	-7.9 (-2.6)
Annual Total	-5.2	-10.0 (-4.8)	-12.8 (-7.6)	-15.6 (-10.3)	-18.3 (-13.1)	
20-year NPV Net Total	-76.9	-147.8 (-70.9)	-188.3 (-111.4)	-228.8 (-151.9)	-269.3 (-192.4)	

Key points to note are as follows:

- In 2010 it is assumed that UK authors contributed to approximately 123,600 articles. Based on the BIS study's estimate of 65% for corresponding authors the UK would make a large net savings, of £15.6m, in comparison to the 2010 baseline (an increase in savings over the Central case of £10.3m). These savings are split relatively evenly between academic institutions (£8.2m) and others (£7.3m).
- If there were a greater number of corresponding authors, or a greater number of UK authors funding APCs, the savings would fall. For example, if UK authors funded 85%

of articles they contributed to then the annual savings to the UK would be £10m (£4.8m greater than in the Central Case). Over 60% of these savings (£6.2m) would be to Others.

- The proportion of savings to academic institutions increases as the number of corresponding authors falls. This reflects the fact that the majority (over 80%) of articles produced in the UK are by authors in academic institutions.

- **COMBINED SENSITIVITY**

Assumptions:

- APC 20% higher than central case;
- UK Gold uptake is 50% (weighted average across different subjects);
- Rest of the world Gold uptake is 25% (i.e. half of the UK);
- UK pays for 75% of articles containing UK authors (i.e. 75% corresponding authors).

Table 0.8: Results of additional sensitivity (figures in £m)

	Cost Category	Central Case	Sensitivity
Academic Institutions	Author-side payments	22.0	53.7 (+31.7)
	Subscriptions	-18.7	-22.6 (-3.9)
	Access Provision	-3.5	-4.2 (-0.7)
	Transition costs	0.2	Constant at £200k for ac. institutions
	Total	0.0	27.1 (+27.1)
Others	Author-side payments	5.5	13.4 (+7.9)
	Subscriptions and other revenues ¹⁹⁵	-9.5	-11.0 (-1.5)
	Access Provision	-2.1	-2.5 (-0.4)
	Transition costs	0.8	Constant at £800k for Others
	Total	-5.2	0.7 (+5.9)
Annual Total		-5.2	27.8

¹⁹⁵ Other revenue includes: Pay per view, reprints, memberships fees & individual subscriptions, and advertising.

	Cost Category	Central Case	Sensitivity
			(+33.0)
20-year NPV Net Total		-76.9	409.1 (+486.0)

Notes:

- In central case, Academic Institutions are cash neutral.
- May be rounding errors

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