



Position Paper 2

National environmental scan of South African scholarly publishing

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List of acronyms

CREST	Centre for Research on Science and Technology
CSPiSA	Committee for Scholarly Publishing in South Africa
DACST	Department of Arts, Culture, Science and Technology
DoE	Department of Education
DST	Department of Science and Technology
DTI	Department of Trade and Industry
HE	Higher education
HEI	Higher education institution
HSRC	Human Sciences Research Council
ICTs	Information and communication technologies
IP	Intellectual property
IPMO	IP Management Office
IPR	Intellectual property rights
JISC	Joint Information Systems Committee
NeDICC	Network of African Data and Information Curation Centres
NIPMO	National IP Management Office
NPHE	National Plan on Higher Education
NSF	National Science Foundation
OECD	Organisation for Economic Co-operation and Development
R&D	Research and development
SciELO	Scientific Electronic Library Online
UCT	University of Cape Town

1. Introduction

The world is in the throes of a revolution that will change forever the way we live, work, play, organise our societies and ultimately define ourselves ... Although the nature of this information revolution is still being determined ... [t]he ability to maximise the use of information is now considered to be the single most important factor in deciding the competitiveness of countries as well as their ability to empower their citizens through enhanced access to information. (South African White Paper on Science and Technology 1996)

In seeking to describe at a national level the impact of information and communication technologies (ICTs) on research communications in South Africa, one has to engage in the first instance with the intensive policy-making efforts that have sought to transform the higher education (HE) sector in the 15 years since the demise of apartheid. This is important, not only because the scale of policy intervention in South African HE has been extensive, but also because the transformation of South African HE post apartheid came at a time of increased awareness of the importance of communication technologies in a global knowledge economy. These two strands come together in a highly interventionist national policy environment for higher education that frames the goals of HE research in the context of development impact in a knowledge economy.

Given that these policy processes have played out over the last 15 years – a time of intensive debate about the nature of the global networked knowledge economy – it is not surprising that there is frequent acknowledgement in South African HE policy formulation of the revolutionary impact of communication technologies and the internet and the promise this offers South Africa. As the government addressed policy development and transformation in the HE sector, it was clear that the question of the use of ICTs was perceived as being of very topical relevance, being identified in a variety of policy documents as a key driver of national growth for South Africa.

At first sight, this could lead to the expectation of a high level of awareness of the transforming impact of the internet on scholarly communications and particularly of the potential for wider access to publicly funded research. It is easy to forget, however, that at the moment that policy implementation began – after the first democratic elections in 1994 – the internet was in its inception, only at the beginning of its phenomenal growth curve. This timing had an influence on the ways in which the potential for ICT use in a globalised world was understood, and this has had a particular impact on the ways in which South African research policy has addressed the question of research communications and publication, which is the focus of this paper.

This paper reviews the national environment for the use of ICTs for research dissemination and publication in the South African HE sector, as part of the OpeningScholarship project at the University of Cape Town (UCT). The project, funded by the Shuttleworth Foundation, addresses the opportunities that new technologies and open dissemination models could offer for enhanced communications and more effective knowledge dissemination in a South African university. Taking UCT as a case study, the project reviews the use of ICTs for scholarly communications for research, teaching and learning, and community engagement in the university against the background of international developments and best practice, and contextualises it in the national policy environment.

The particular focus of this paper is on the ways in which post-apartheid research policy expressed its strategic vision for the public research system and how, in framing national goals for research impact, these policies have responded to the potential for ICT use to enhance effective research communications and publication. A separate paper will explore how the national scholarly publishing infrastructure has responded to policy transformation, to donor intervention and to international developments and how publishing practices have changed in response to technological developments.

The questions that are asked in this paper on ICT developments and research communications policy are:

To what extent have the dissemination models, the media and the distribution channels for scholarly communications and publication in South Africa matched the strategic mission of national and institutional research policies?

To what extent has the country's research policy framework enabled or inhibited effective research dissemination in support of national policies and strategies, both for increased global competitiveness and greater national development impact?

How is ICT infrastructure being used for research publication in South Africa and is this supporting South Africa's research mission?

As changing models of internet publishing and new intellectual property (IP) models have changed the face of research communications worldwide, how has South Africa responded to the potential for online publishing and alternative licensing models to provide more effective dissemination of South African research?

In reviewing South African policy on research dissemination and publishing practice at a national level, this paper will reflect on the OpeningScholarship international environmental survey of the effect of new technologies on research publication, which revealed a rapidly changing research communications environment with a growing emphasis on the public benefit of open access dissemination of publicly funded research. It will interrogate the different discourses that were at play at the time that South African research policy was formulated, how these have influenced the context in which research publishing takes place, and how South Africa is responding to the same influences that are evident in the global environment.

The conceptual framework of South African research policy

After nearly 15 years of democratic government, South Africa has developed a comprehensive research policy framework to overturn the inheritance of a fragmented, racially divided and inequitable apartheid HE system. In this process, it has grappled with two conflicting, though often intertwining challenges: on the one hand, that of transforming the country's research mission to focus on national and African concerns and development challenges; on the other, the repositioning of South Africa as a distinct international research presence after the isolationism imposed by the academic boycott. There are therefore two very different discourses at play: the value-laden language of transformation and national upliftment and the commercial rhetoric framing the role of research in a competitive global knowledge economy. This means that, when it comes to the dissemination and publication of South African research, there are competing paradigms as to how this could contribute to national development and African growth and at the same time contribute to the country's status in a competitive system of global scholarly publishing rankings.

Untangling the different strands of the policy discourse of research communications in South Africa is made more difficult by the continually shifting background of global research communications in the last decade – precisely the period of South Africa's policy formulation – as governments, universities, researchers and librarians have engaged with new technologies. These new technologies have in turn produced new scholarly communication products, with a growth of informal and open communications, including reviews, preprints and working papers, data, blogs, and discussion forums (Maron and Kirby-Smith 2008); and in South Africa, policy papers and research reports produced by a variety of development-focused research units. The US Association of Research Libraries report on Current Models of Digital Scholarly Communications opens with a cogent statement of the difficulty of engaging with these new forms of scholarly communications that resonates strongly with what has happened in the South African context and helps explain the contradictions that

beset South African policy and indeed the ways in which universities tend to approach scholarly communication:

The urge to consider new forms in comparison to the monograph and journal genres that dominate library collections and the consciousness of the Academy is powerful. Yet this frame for interpreting changing practices of scholarly communication carries the risk of falling into a certain circularity of thought – we may acknowledge that scholarly works will change and yet behave as if anything that does not look like a traditional work of scholarship is not a scholarly work; thus the immutability of traditional publishing models becomes axiomatic. Different becomes less by definition. (Maron and Kirby Smith 2008: 6)

This 'circularity of thought' is what happens repeatedly in South African research communications policy. Although there is acknowledgement of a changing digital environment and of the potential power of the internet to enhance the development impact of research, scholarly journals – and particularly journals in the international indexes – are privileged as the most recognised scholarly output, while other forms of publication are downgraded or disregarded. This means that publications such as policy papers, research reports and technical reports are not acknowledged as valid research outputs in the policy framework.

The paper will argue that, when it comes to the interface between national policy and scholarly communications, the imperatives of global competitiveness have dominated, marginalising the publication of development-focused research and, as a result, reducing its impact. This is the outcome of a very narrow conception of what constitutes legitimate, 'accredited' research outputs, something that is in turn reflected in academic reward and promotion systems. The metrics used to evaluate research effectiveness are those of the commercially driven world of 'core journals', citation counts and impact factors. In a deeply entrenched academic culture, the primacy of international publication over publication in local journals is seldom challenged in the South African higher education system. Journal articles are given an extraordinary primacy in South African research publication and the effectiveness and impact of the universities' research efforts are judged to a great extent by counts of journal articles published in indexed journals, with a lesser emphasis placed on publication in books and monographs. This in turn determines a substantial funding stream for the universities through a publication reward scheme operated by the Department of Education (DoE).

The discourses of South African research communication policy

Given the comprehensiveness and the speed required of policy interventions for HE transformation to reverse the apartheid inheritance, it is not surprising that there were overlapping and sometimes contradictory policy discourses at play as policy-makers sought to address these issues. It will be worthwhile articulating some of these at the outset to understand the competing concepts and the contradictions of South African research policy:

The language of political symbolism and social contract was used to frame the overarching transformative goals for HE in a democratic South Africa (Jansen 2001). Policy documents tend to articulate overarching goals for racial transformation, redress and the Africanisation of HE as governing principles for the transformation of the system. These act as statements of intent, but leave the universities to implement their own policies in this regard. This strand of national policy has nevertheless provided a powerful push towards the need for universities to address their institutional culture and has tended to favour a conceptualisation of research as a contribution to the public good (Cloete and Maassen 2002). Where this becomes important for scholarly communications is that this value-driven approach has readily led to expressions of disappointment on the part of government for perceived failures of HE research investment to have an impact on the public good. This is in turn interpreted as a failure in the production of recognised 'research outputs' (narrowly defined as journal articles according to the accepted metrics).

The ideas of Michael Gibbon on changing modes of research in the context of globalisation were influential at the time of policy formulation (Gibbon *et al.* 1994; Gibbon 2000). The relevance of Mode 2 research – applied research for public impact – was promoted in the early stages of policy development for a South African HE system that was required to address major national economic and social needs (Kraak 2000; Subotsky and Cele 2004). However, given the period in which this theory was formulated, the discourse is that of a commercially driven knowledge economy and a proprietary IP regime as the way of achieving impact through research outputs. This is an instrumentalist approach in which the impact of research is described as the result of industry/researcher partnerships and joint ventures, something that still remains influential in South African innovation policy. Research publication tends not to feature very much in this discourse, in which the transfer of knowledge takes place face to face in researcher/industry interaction. When it does, the focus is on the production of copyrights in the form of journal articles in globally competitive publications as measurable outputs. How this translates into real research impact for socioeconomic development remains unproblematised.

Acknowledgement of the importance of ICTs and the expanding role of the internet led to repeated statements in policy documents of the central value of ICTs for research in the knowledge economy (Bawa and Mouton 2002; Cloete 2002). In the policy framework, the leverage of intellectual property rights (IPR) and the protection of research outputs through copyrights and patents are seen as the way to produce economic benefits for the country, in spite of a strong emphasis on the democratising potential of ICTs and their ability to reach down into the community.

In spite of government policy on open source software and legislation for the parallel importation of antiretroviral medicines, the question of access to research knowledge did not emerge in the major policy framework. However, from 2005 onwards, government-commissioned research carried out by the Academy of Science of South Africa (ASSAf) has resulted in the acknowledgement of the potential for open access publication and has resulted in a project for the growth of open access journals. However, the focus remains on the traditional publication outputs of journals and monographs. As the importance of internet communications has expanded in the new century, the discourse of the knowledge society has begun to offer the promise of collaborative and non-proprietary approaches to addressing national development needs and the potential for open access publishing models to provide greater impact for research publication (ASSAf 2006; Gray 2008).

Overall, although South African research policy has a strong strand of developmental discourse that articulates the democratic potential of ICTs and the potential for ICT use for the contribution of research to the public good, the open access discourse that one would expect in this context does not emerge, as the policy framework addresses the role of scholarly communications. Rather, the system continually defaults to an idea of the 'immutability of traditional publishing models', mentioned above (Maron and Kirby-Smith 2008: 6), as the only way of achieving research impact.

As Guédon reminds us, this world of traditional 20th century journal publishing is dominated by commercial publishers and driven by commercial interests leveraging a proprietary IP regime for the generation of increasing profits (Guédon 2001b). The communications channels in the 20th century knowledge economy are top-down, with large global corporations controlling the information flow and protecting this control through copyright ownership (Benkler 2003). It is an inequitable environment, which is not favourable to the developing world, but is centred on corporate interests in the dominant knowledge economies of the North. This is manifested in the Thomson Scientific indexes, in which inclusion is entirely at the discretion of one company and in which developing country journals are poorly represented.

Open access publishing and the use of open and flexible copyright licences as they have developed in the first decade of the 21st century, on the other hand, are increasingly being

embraced by international organisations, national governments, donor agencies and universities across the world. This is because they offer greater potential for democratic access to information and knowledge and increased research impact on development (Suber 2009). As Benkler reminds us, the advent of the internet has enabled the decentralisation of communications into a distributed model that allows for a more collaborative and participatory non-market mode of production that operates at the core of the networked economy (Benkler 2003; 2006).

Lessons learned

There might be value in revisiting the conceptual framework of South African research policy in order to incorporate recent developments in research communications in the 21st century networked knowledge society. South African policy is perhaps – ironically – a victim of its recent development and has therefore not undertaken the review exercises that more established policy regimes have. The decentralised, collaborative and non-proprietary models of research communications that have emerged globally in the last five years in particular, could deliver the ambitions for democratic access to research knowledge that are articulated in the South African policy framework. This is currently inhibited by a reversion to a narrower, knowledge economy conceptualisation when it comes to defining how research outputs could contribute to national development.

The governance of research policy in South Africa

The research policy environment is complicated by a division of responsibility for the higher education sector between two ministries. The Department of Science and Technology (DST) (until the separation into two departments in 2004, this was the Department of Arts, Culture, Science and Technology (DACST) is responsible for the management of research at the national level and handles the national research and innovation framework, together with the Department of Trade and Industry (DTI). The DoE is in charge of the management and funding of higher education institutions (HEIs), including their research function. In that capacity, it is the DoE that has created policy within the universities' funding framework for the reward of scholarly publication.

Both the DST and the DoE promote a vision in their policy formulation for a South African HE sector that is Afrocentric and focused on development, promoting social responsiveness in research. This strand of policy acknowledges the importance of collaborative development and the use of ICTs in the context of the knowledge society. However, when it comes to the formulation of innovation policy, articulated most comprehensively by the DST and the DTI in the National System of Innovation, there is a shift of focus to a commercially driven system in the knowledge economy. This is despite South Africa having introduced parallel importation legislation for antiretroviral drugs for the treatment of HIV, since the prices for patented drugs are unaffordably high in the country with the highest level of AIDS incidence in the world. The DoE policy for the reward of scholarly publication, which is the principal driver of research publication in the country aims to position South Africa in an internationally competitive academic environment, in which prestige and rankings are based on individual performance evaluated through journal articles in journals in the international indexes as well as in a list of accredited local journals.

These two visions of a higher education research system – as part of a competitive and economically driven global knowledge system or as a South Africa/Africa-focused social contract – should not be mutually irreconcilable, but in fact, partly as a result of the fragmentation of research policy responsibilities in the HE sector, and partly as a reflection of ideas current at the time of policy development, they co-exist in uneasy contradiction (Bawa 2005: 66; Posel 2005: 71). The DoE has arguably not clearly defined the HE sector's role in implementing its research vision, and Bawa and Mouton argue that the 'economistic vision of

the role of science in society' in the roll-out of the DST's innovation policy has therefore dominated research implementation (Bawa and Mouton 2002: 304).

To complicate things further, however, the DST has also, in the last five years engaged in the development of policies for open access research publication (Gevers and Mati 2006) and for access to publicly funded data that move in the opposite direction, towards open access research communications in an integrated ICT environment.¹

Lessons learned

While South African research policy promotes an Afrocentric and democratic vision for higher education's contribution to the national good, this potential is undercut by a reliance on a commercially driven vision of the research contribution. There could be benefit, across the various ministries that govern research policy, in investigating in more depth the role that open innovation and open research dissemination models could play, alongside commercial models, in delivering the range of development and transformation outcomes being sought from HE research.

A brief review of the formulation of South African research policy as it relates to scholarly communications will aim to track these differing but often intertwined strands as they affect the HE system. This paper argues that, in contrast to the dominant policy directions for scholarly publishing, open access publication would sit very well within the country's ambitions for an Africa-focused and developmental research agenda, as would the inclusion of collaborative and non-commercial research approaches.

2. Research publication policy in South Africa – the Department of Education

The DoE is the government ministry with overall responsibility for the HE sector and, as such, has been responsible for formulating the size and shape of the post-apartheid HE system. The question of research publication is only a small part of this overall policy framework, but is nevertheless a key and strategic part of the overall aim of DoE policy, which is 'to redress past inequalities and to transform the higher education system to serve a new social order, to meet pressing national needs, and to respond to new realities and opportunities' (DoE 1997 1.1).

¹ For an overview of the development of access to data policy, see the proceedings of the 1st African Digital Curation and Management Conference, convened by the DST and ASSAF in February 2008. (<http://stardata.nrf.ac.za/nadiccc/programme.html>)

Table 1 Department of Education policies and legislation

Year	Policy documents and legislation	Purpose
1997	Education White Paper 3: Programme for the Transformation of Higher Education	The result of a consultative process; provides for the transformation of HE to achieve redress and reflect the changes in a new democratic order.
1997	Higher Education Act 101	Establishment of a single coordinated HE system; regulation of HE; creation of the Council on Higher Education, funding framework, quality assurance system. Aims at transformation, redress, academic freedom and democracy.
2001	National Plan on Higher Education	Gives effect to the vision of the White Paper; stresses the importance of ICT development; quotes Manuel Castells on the importance of the knowledge society; and aims at the development of high-level research capacity.
2002	Language Policy for Higher Education	Encourages the development of a multilingual HE system in which language is not a barrier to access and performance.
2005	Policy for the Measurement of Research Output in Higher Education Institutions	Aims to promote research and outputs to meet national development needs; provides for a substantial financial reward system for the publication of journal articles, books and refereed conference proceedings, paid to the universities; aims not to reward all research outputs, but to 'enhance productivity by rewarding the major outputs'. In the case of journals, which are the most generously rewarded, this is for articles published in journals in the ISI and IBSS indexes and a list of local journals accredited by the DoE.
2005	Ministerial Statement on Higher Education Funding 2005-6 and 2007-8	Provides funding framework for different categories of HE funding, including research output grants (publications and postgraduate degrees).

In the Draft National Plan for Higher Education (NPHE), drawn up in 2001 to implement the provisions of the White Paper on Higher Education (1997), the impact of information technologies in a globalised world is spelled out at the outset. Acknowledging changes as fundamental as those initiated by the industrial revolution, the document identifies 'knowledge and the processing of information' as 'the key driving forces for wealth creation and thus social and economic development.' (DoE 2001: 4). The 'thus' in this formulation is telling: it appears that it is wealth creation that will drive social transformation in a trickle-down process, rather than there being a separate evaluation of the potential of research dissemination for social and development impact.

Research outputs and 'applied research'

In Section 5 of the NPHE, which deals with research, the pre-eminent importance of developing ICT skills and capacity in a global economy is once again stated at the outset. Interestingly, the emphasis here is on the power of research, driven by ICTs, to deepen democracy, creating communities of scholars and transcending geographical and disciplinary boundaries (DoE 2001: 61). The document acknowledges the rapid changes taking place and the new opportunities that are emerging. It stresses the potential for collaborative research across disciplines and national boundaries, 'contributing to the global accumulation of knowledge and plac[ing the] nation amongst those who have programmes of knowledge generation' (NPHE 2001: 61). This policy brief sounds potentially like an introduction to the desirability of open access for democratic research access and participation. However, the DoE policy takes another direction, which it is worth exploring in some detail, as it reveals the fundamental tensions that underlie South African research publication policy and that inhibit it from embracing a more open approach to research dissemination.

After stating the importance of information technology and knowledge generation, the National Plan expresses disappointment in the delivery of research capacity and output in the HE system. In particular, a decline in 'publication outputs' is identified as cause for concern. It is interesting in a document that is aligned to a policy framework that insists on the importance of the national development impact of research that this decline is attributed to an increase in 'strategic and applied research, with the emphasis on socioeconomic and industry-related issues.' (61). In other words, research that addresses the very development needs that are repeatedly cited as a desirable output of the HE system are here dismissed as a sign of failure in the system.

The line of argument that produces this result makes some interesting assumptions. Citing research provided by the University of Stellenbosch SA Knowledgebase in the Centre for Research on Science and Technology (CREST)² that there had been 'a shift towards more health and applied science research and a shift from general humanities research to applied social science research', the report goes on to lament a perceived decline in basic research. It states that the outputs of applied research 'are not published in accredited journals or in other formally recognised output measures' (61) (perhaps missing the point that such formal recognition is in fact determined by the department itself). In other words, unless the results of socially responsive research are published in formal publications that are accredited by the department, they are not recognised as being of any value – and the department currently only recognises journals, scholarly books and conference proceedings.

This appears to be a catch-22 situation. While national policy demands that the universities contribute through their research to national development – and universities are criticised if they fail to achieve this goal – the publications that would be the most effective means of mediating research results for development impact are disregarded. What is more, this narrow view of what constitutes valid research output ignores the expanded horizon of

² <http://academic.sun.ac.za/crest/>

scholarly communication in the 21st century. It also ignores the potential for expanded conceptions of research communications in a networked digital world to affect social and development needs in ways that traditional and formal publication genres have not been able to do. This is witnessed in increasing attention being paid to national and international policies for access to research and by the adoption of open access licences and expanded and open research publication programmes by leading international universities such as Harvard, Stanford, California and MIT (Suber 2009).

Lessons learned

As a result of the circularity of an argument that asks for development impact from research yet disallows development-focused research communications, the national research effort appears to undermine its own effectiveness. A move beyond the 20th century knowledge economy model for scholarly communications to an expanded understanding of the potential of a wider range of open access research outputs might help resolve this dilemma.

Development-focused research communications

There seems to be an implicit acceptance among policy-makers that the publication of journal articles and scholarly books in itself will produce socioeconomic development impact. This ignores the fact that journal articles in international journals have a very narrow reach in a country like South Africa, where even university libraries have difficulty affording them. Moreover, these publications, which are written for scholar-to-scholar communications are not always accessible to non-specialists. Lastly, the genre of the (short) journal article is designed to deliver information of scholarly developments in an abridged form to fellow specialists and would not suffice for informing development initiatives.

South Africa is, however, rich in publications that address development needs. There are a large number of research groupings in the universities that address policy and development issues. Research institutes such as the School of Government and the Institute for Poverty, Land and Agrarian Studies at the University of the Western Cape, the Wits Institute for Social and Economic Research at Wits University, the South African Labour and Development Research Unit and the Child Health unit at UCT, to name but a few, produce a range of policy papers and research reports targeted at other academics, policy-makers and government. Public intellectuals provide translation of important research findings aimed at making research outputs more widely accessible. Collaborative research groupings, across disciplines, institutions and countries engage in a variety of communicative efforts, using blogs, wikis and the exchange of research papers. Development-focused research units translate research findings into training materials and manuals. However, researchers in these units complain that they do not get recognition for the publications that they do produce, but are pressurised to produce journal articles.

One issue in relation to these research activities and their outputs is whether this research deserves the 'applied research' tag that is used dismissively in the NPHE discussion of research outputs. A finding of the OpenScholarship project at UCT is that one of the major strengths of the university's research excellence is the ability of researcher and research units to conduct high level basic research that is informed by and translates into social and development impact. In other words, basic research and applied research are not mutually contradictory; rather, the application of basic research to the resolution of development challenges appears to be one of the strengths of South African research.

Most of these research units place their publications online on their university websites. Although this means that these publications are available, they are not easily accessible, as they can be hard to find and do not benefit from the meta-tagging that would make them readily discoverable by search engines.

Lessons learned

As a result of a narrow understanding of what constitutes valid research outputs, there appears to be a reduction in the effectiveness in the research communications system. This results in the diminished impact of a high volume of development-focused research publications that are not rewarded nor supported in the system. Many of these are produced by leading scholars, undermining complaints by some academics that these are not peer reviewed and should therefore be disregarded.

In a national research system that aims at advancing the public good, there would be an advantage in broadening the definition of what constitutes recognised and rewarded research outputs, aligning this with the strategic mission of South Africa's research enterprise.

This research could be given greater exposure and considerably increased impact with support for the provision of digital platforms or repositories that could provide for the curation and more effective dissemination of the publications being produced. This would in turn mean more effective impact for publicly funded research.

Research publication policy

The NPHE acknowledged weaknesses and limitations in its policies and procedures to measure higher education research outputs, including 'lack of recognition given to certain research outputs such as policy reports and technical reports'; the outdated list of local journals; and 'a lack of response to new knowledge systems' (DoE 2001: 62). A review was promised, but when the DoE delivered its policy on research dissemination in 2003, it paid only lip service, in its preliminary comments, to the need 'to sustain current research strengths and to promote research and other outputs required to meet national development needs' (DoE 2003: 3). For the rest, the provisions for the reward and recognition of research publications were little changed from earlier policy provision.

The DoE research publication policy rewards peer-reviewed publication in journals appearing in the Thomson Scientific and IBSS indexes, and a somewhat problematic list of locally indexed journals, in part inherited from the apartheid era (Gevers & Mati 2006). This is unusual, compared with other countries, in that the department pays a substantial subsidy to universities whose academic staff publish in these 'recognised' publications. Although peer-reviewed books and conference proceedings accepted by an evaluation panel are also recognised and rewarded, they have a lesser weighting in terms of financial rewards. The level of subsidy for a journal article in 2008 was R90 000.00 (\$9 000.00) and the subsidy is paid to the university at which the author is based, without any requirements as to how it should be spent.

The wording of the policy insists on 'originality' – suggesting rewards for individual rather than collaborative effort – in spite of the emphasis in the broader research policy provisions on collaborative effort between university departments and between different institutions. The target audience is identified as 'other specialists in the field', again focusing on dissemination only within the scholarly community, rather than on delivering R&D and Innovation development goals. The document starts by taking into consideration 'the changing modes of disseminating research and output, such as electronic publication' (DoE 2003: 4), but the details of its provisions are clearly geared primarily to print publications. For example, print copies of all research outputs are required to be submitted to the department, even when the publication is digital.

There is as yet no policy provision in support of open access publication, nor any financial provision for the payment of author fees for those journals that require it. There is no recognition of the fact that the international journals that are recognised and privileged in this policy are in the hands of large commercial enterprises in the US and Europe and are subject to steeply rising subscription costs year on year, nor of the commercial ownership of the most highly regarded journal index, the Thomson Scientific index (Guédon 2001b).

Most importantly, there is no sign in this policy framework of an acknowledgement of the need for the universities nor the state to play any active role in research publication. This is a 'free rider' system in which the assumption is that publication will be provided by an outside publisher. Nor is there any recognition of the ways in which scholarly communications are changing in an increasingly digital research environment globally.

The impact on the universities

The fact that the DoE pays generous subsidies to the universities, primarily for the publication of journal articles in 'accredited' publications, has a distorting effect on both the research and publication patterns of academics and the institutional policies of the universities. In an attempt to access the (generous) funding available for publication, universities are scrambling to put in place promotion and reward systems to encourage a high output of journal articles from their academic staff, with a standard requirement being the publication by each academic of a set number of 'accredited' journal articles a year.

This is in contrast to the UNESCO warning that countries should not treat index scores as rigid reference points, rather than 'concentrating on the actual problems of the fields studied' (UNESCO 2005: 161). Even more, it runs counter to the bemused statement of Eugene Garfield, the creator of the Science Citation Index that 'we never predicted that people would turn this into an evaluation tool for giving out grants and funding' (quoted in Steele, Butler & Kingsley 2006).

A serious risk of this high-pressure drive for inclusion in recognised publications is the distortion of research priorities, as academics direct their research towards topics with a strong chance of publication in international journals rather than those identified as institutional and national priorities (Benkler 2006). The emphasis in this system is on the status of international rankings rather than on the quality of the content and its appropriateness to the strategic research goals of the university or the country as a whole. It is not surprising, therefore, that the universities and their faculties and departments tend to put pressure on academics to publish in journals in the international indexes rather than in locally accredited publications.

The drive to publish in an existing list of journals is, in addition, leading to overload for the journals concerned, while important new research areas face a dearth of suitable publication outlets. At the same time this emphasis on 'accredited journals' creates a disincentive to develop new journals, a real need in a transforming South Africa that is responding in innovative ways to changing visions of collaborative, interdisciplinary research. There is, for example, a need for a journal on educational technology from a southern African perspective, but it is difficult to attract good authors to publish in publications that are not accredited, which in turn compromises the potential for getting such a new publication accredited.

Global imbalances in the international citation indexes

The research publication system favoured by the DoE's policy is particularly disadvantageous to developing countries – the top four countries in the Thomson Scientific indexes, for example produce 84% of the articles concerned, while 163 other countries account for the rest (King 2004: 314; see also Chan & Costa 2005: 142; Willinsky 2006: 181).

The only African country on King's list of the top 100 countries in the Thomson Scientific indexes is South Africa. In 2000 it was ranked 29 out of 31 and had just 0.5% of the articles in the combined Thomson databases, and 0.15% of the most cited papers (King 2004: 314; Gevers & Mati 2006: 1), a figure that had declined over the preceding decade (DACST 2002: 32). In 2005, South Africa published 35 journals that were accredited in the Thomson Scientific and IBSS indexes. Of these, 21 were in the Thomson and 12 in the IBSS indexes,

and two more appeared in both. Other African countries fare much worse: Egypt and Kenya had one journal each (Gevers & Mati 2006: vi).

The bias of the Thomson Scientific and IBSS journal databases is clearest in those places where knowledge is most likely to be regional. Steele, Butler and Kingsley (2006) make it clear that there are specific subject areas which suffer from a lack of coverage as a result. Much of the social science and humanities research carried out in African countries has, by its very nature, a national or even regional focus, which means that literature relating to it is unlikely to appear in the international indexes.

Lessons learned

The narrow focus of the publication outputs recognised and rewarded in the research publication policy and the preference for international over local publication risks having a distorting effect on the research priorities and the ability of South African research to impact on national and regional priorities. It is also undermining the flexibility in the system that would allow it to be responsive to the needs of new subject areas and new research approaches.

ASSAf proposals for research publication, which are being implemented with the assistance of the DST (see below) address some of these issues, through the creation of and national support for a stable of quality-controlled national journals hosted on a digital platform, available open access and tagged for national and regional impact measures.

The recognition of a wider range of publications, in line with the changing profile of research communications in a digital world, could provide more responsiveness and flexibility in the system and deliver greater responsiveness to the Afrocentric and development-focused vision of research policy.

3. The Department of Science and Technology – R&D and Innovation Policy and its impact on research communications

Where the DoE is responsible for the HE system only, the DST has oversight of the entire national Science and Technology environment. Like the DoE, the DST places an emphasis on the need to combine national development with global competitiveness. Merging the language of economic competitiveness and social empowerment, the White Paper on Science and Technology framed it thus in 1996:

The ability to maximise the use of information is now considered to be the single most important factor in defining the competitiveness of countries as well as their ability to empower their citizens through enhanced access to information. (DACST 1996)

The White Paper acknowledges the growth of interdisciplinary research and of applied research. The vision is for 'knowledge that is collaboratively created within multidisciplinary and interdisciplinary research programmes directed to specific problems identified within social and economic systems' (DACST 1996). There is a recognition of challenges posed in producing the policy, technological, funding and organisational requirements to deliver this vision and of the forward-looking vision that would be needed in times of very rapid technological change.

A forward-looking approach of this kind would presumably have to engage also with the shift from proprietary, commercially driven systems of the knowledge economy to the non-proprietary peer production models and open systems described by Benkler as a feature of the 21st century global networked society (Benkler 2003; 2006). However, in spite of statements such as this of the power of enhanced access to information, the main legislative, policy and strategy interventions by the DST appear to be underpinned by a

vision of an innovation system modelled on Korea and driven by patent registrations and copyrights.

Table 2 Department of Science and Technology policies and legislation

Date	Policy documents and legislation	Comments
1996	White Paper on Science and Technology	Builds on the idea of a system of innovation; based on a vision of participation in a democratic culture with employment produced through a competitive economy.
2002	South Africa's National Research and Development Strategy	Aims to achieve mastery of technological change; increase investment in SA's science base; create an effective S&T system.
2008	The Ten-Year Plan for Science and Innovation	Sets ambitious targets for substantial growth in research investment, production of postgraduate degrees, patents and copyrights, aimed at economic growth.
Date	Legislation, policy and strategy documents	Comments
1996	White Paper on Science and Technology: Preparing for the 21 st century	An integrated system of S&T and innovation; collaborative partnerships for national development; multidisciplinary problem-solving; more inclusive and consultative approaches; advancement of knowledge for national development; and innovation for economic growth, equity and social development.
2002	South Africa's National Research and Development Strategy	Manages the transition from apartheid S&T priorities to a system that focuses on human resource and economic needs, increased local control of a developing knowledge base, IP protection for biodiversity and TK.
2008	The Ten-Year Plan for Science and Innovation	Aims to drive the SA system towards a knowledge economy model in which the dissemination of knowledge leads to economic growth. Sets targets for the growth of the Science and Innovation system in SA, with ambitious targets for increased postgraduate degrees and research outputs. Aims for high levels of patent registration and uses the metrics of publication counts in accredited journals. Equates citation intensity and national wealth; harvests technology from publicly funded research and puts it to use in a non-profit model for poverty alleviation; creates a knowledge hub of social science research in southern Africa
2008	Intellectual Property Rights Act	Bayh-Dole-style legislation for the commercial exploitation of research; creation of a National Intellectual Property Management Office; enforced

	registration of patents for research innovation
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The DST's view of the information society

In DST policy, the information society is perceived as a tool for empowerment of communities and a social equaliser, elaborated as a social contract focused on an 'African Renaissance' vision:

A South African vision of the information society should seek to ensure that the advantages offered by the information revolution reach down to every level of society and achieve as best a balance between individuals and social groups, communities and societies as is practically possible. (DACST 1996)

Equity is an important thread of the DST's policy on the information society, globally, regionally and within South African society. This is a forward-looking vision, considering when it was written, but it is undercut by a utilitarian view of what the information society offers ('providing household services') and this emerges in anxieties not only of being left behind in a rapidly accelerating technological revolution, but also of the risk of global trade imbalances if South Africa opens up its resources. It is perhaps the latter anxiety that has fuelled a drive for IP protection for traditional knowledge resources.

This incipient vision in the White Paper of the potential of a networked information society sits side by side with a view of knowledge generation that warns against adopting 'too economic a viewpoint', stressing instead the importance of a scientific regime that values basic research and its practical application. What does not seem to have been fully realised at this early stage of policy-making was the empowering potential of open knowledge systems or of open publication models.

However, reviewing policy and strategy development in the DST, it becomes clear that any view of a networked society built upon open research communications for maximum development impact has been persistently marginalised by a powerful knowledge economy discourse. This insists upon patent registrations and, to a lesser extent, journal publication counts as the metrics for success in the commercialisation of research.

Innovation policy

Innovation development is a central platform of DST policy. In the proposals for managing the implementation of the Innovation Strategy in the NRF's Business Plan for 2008/09 and the DST's *Ten-Year Plan for Science and Technology: 2008-2018*,³ publication and research dissemination again have a very low profile. Dissemination and research outputs appear only as a matter of mechanical counts: number of reports, journal articles and other publications, and patents registered.

The DST's *2008/2015 Strategic Plan for Research and Innovation* sets increased targets for increases in research output and publication counts and very high increases in patent registrations as a measure of innovation success. This is framed in a vision of Mode 2 research, in which HEIs would need to engage directly with industry in multidisciplinary and problem-orientated institutes, the aim of government involvement being to manage the various interactions that take place in order to generate creativity and wealth creation. The policy is enlightened in its insistence upon flexibility and mobility as features of innovation, which in turn is conceived of as a site for the promotion of national coherence and integration; however this is persistently undercut by a commercialised and proprietary approach to the outputs of innovation interventions.

3 <http://www.dst.gov.za/publications-policies/strategies-reports/The%20Ten-Year%20Plan%20for%20Science%20and%20Technology.pdf>

Research for innovation in this vision encompasses the practical effects of applied research in providing real benefits to society and the underpinning knowledge generation of cutting edge basic research, which is 'transferable to almost any environment where high level analytical and problem solving competence is required'. (DST 1996: 2) The 'general production and transmission of knowledge' and teaching and learning activities are both seen as underpinning the innovation system. In other words, the conceptualisation of research in innovation policy and in the broader science and technology policy framework of the DST seems susceptible to an integrated view: that basic research, applied research and teaching and learning are part of a continuum rather than separate silos.

In the intervening period between the White Paper and the time of writing this report, however, innovation policy implementation in the DST has moved towards an intensely patent-driven strategy. The DST's strategy development appears to have been informed by a view that the health of a national innovation system is to be judged by its level of patent registrations. The particular model that has been chosen is Korea, where rapid economic growth has gone alongside steeply increasing patent registrations and increased output of journal articles in the indexed journals. This model does not appear to take account of the considerable differences between the two countries, their regional contexts and their industrial strategies. The DST's ten-year strategy plan for 2008-2018 (DST 2007) identifies dissemination as critical to the delivery of South Africa's research and innovation mission but defines dissemination as industry/researcher partnerships and relies on a count of copyrighted journal articles and patents as the recommended metric for ensuring its impact. An assumption is also made of a link between citation impact and wealth generation, as the strategy document draws on an analysis in *Nature* between citation intensity and national wealth. (DST 2007: 7).

There are some glimpses of a different approach – for example in proposals for a 'knowledge hub' for social science knowledge for poverty alleviation, However, even in areas like climate change and neglected diseases which have become important sites for open innovation internationally and for open access initiatives like the US Federal Government's legislation for open access to research publications from research funded by the National Institutes of Health, there is no engagement in the DST strategy with this potential.

This strategic thinking is in contrast, for example, to the recommendations made in the Australian Productivity Commission Report, which provides a detailed analysis of how research and innovation goals could best be reflected in dissemination policy and practice, suggests that pragmatic choices be made of a wide range of dissemination strategies, and demonstrates that open dissemination might often be more effective than patenting and copyrights ([Productivity Commission](#) 2007; Gray 2007). The research carried out for the Commission provided a cost benefit analysis of effective research dissemination and drew a link between open research dissemination of a range of outputs and growth in national GDP (Houghton *et al.* 2006).

Lessons learned

In an international climate in which the effectiveness of patenting is coming into question, particularly in developing countries, and open innovation models are proving effective in public health, genomics and climate change, there are benefits in researching the potential for open innovation in a South African context, alongside the government's plans for proprietary models for the commercialisation of publicly funded research.

The value of linking open access research publication does not appear to have been recognised as an adjunct to innovation efforts and a way of making more broadly available research results capable of encouraging innovation.

The Intellectual Property Rights from Publicly Financed Research and Development Act of 2008

One outcome of the knowledge economy innovation thinking in the DST has been the formulation of Bayh-Dole-style legislation, passed in late 2008 as the Intellectual Property Rights from Publicly Funded Research and Development Act.

The first draft of this piece of legislation was extremely stringent and restrictive, limiting the right to publish any research results until the patent potential of the research had been established. It also provided disciplinary procedures against academics (and students) who failed to patent innovations that were in any way patentable. After submissions from the universities and other interested parties, a revised draft was considerably toned down but still depends upon a default assumption that the way to gain economic benefit from research is through patenting and IP protection. This appears to mean that any academic or university deciding to use open access or collaborative approaches to derive benefit from research might be required to justify that decision to the university concerned or to government or forgo that opportunity if there is any potential for a patent registration.

The Act requires all publicly funded institutions (which includes all universities) to have an IP Management Office (IPMO) and provides for the creation of a National IP Management Office (NIPMO). It provides for the IP in all patentable inventions to reside in the university. If a university does not want to patent a particular invention, then the right passes to the NIPMO. Only if the national office does not want to patent an invention do the rights pass back to the researcher concerned.

This legislation – and indeed the DST's Innovation Strategy – is built on a widely held belief that the Bayh-Dole Act has made US universities and their researchers rich and helped fuel the growth of the USA. However, this view is challenged by evidence that the Act has resulted in financial benefits for very few universities and the registration of a large number of upstream patents has resulted in patent thickets that have impeded innovation rather than helping it (Kapczynski *et al.* 2005; Toomey 2007). As So *et al.* point out, a number of developing countries – from South Africa to China to Brazil and Malaysia – have passed similar legislation without rigorous review of the effectiveness of this 30-year-old legislation in the US:

We believe government-supported research should be managed in the public interest. We also believe that some of the claims favoring BD-type initiatives overstate the Act's contributions to growth in US innovation. Important concerns and safeguards—learned from nearly 30 years of experience in the US—have been largely overlooked. Furthermore, both patent law and science have changed considerably since BD was adopted in 1980 [9,10]. Other countries seeking to emulate that legislation need to consider this new context. (So *et al.* 2008)

This legislation might well also have a negative impact on research publication. The Act requires that the IP in research funded by the state or state research bodies is owned by the university where the researcher is employed. Researchers have to disclose any potential invention before publishing in any way – through presentations, blogs, websites, or journal articles, or even the submission of a thesis to examiners. Given the vagueness of South African legislation on what constitutes an 'invention' this could have a seriously chilling effect on publication if researchers are nervous of transgressing these provisions.

Moreover, this Act cuts across the thinking of a number of major international organisations that argue that access to and the sharing of research information can often be of greater benefit than commercialisation. It is interesting to note, for example, that the NIH and the Wellcome Trust are both major funders of health research in South Africa and both require open access deposit of the research publications that they fund. The Bill and Melinda Gates Foundation asks for AIDS vaccine research that it funds to be made openly available rather than incurring the delays involved in patenting.

The restrictive approach of this legislation is in contrast to interventions by the DST in the development of open access approaches to research dissemination, both with a strong focus on the use of ICTs for effective research communications. The DST commissioned research from ASSAF on a strategy for scholarly publication in South Africa and is an active participant in and sponsor of a programme for access to data from publicly funded research.

Lessons learned

This legislation is backward looking, in that it draws on a piece of legislation that is more than 20 years old and whose effectiveness has increasingly been brought into question. The effectiveness of patent registrations is by no means proven as a way of commercialising research in a country like South Africa. A better balance between the approach taken in this legislation and the open and collaborative innovation models being developed in the context of a 21st century networked society would perhaps deliver a wider range of innovation impacts from South Africa's research efforts.

4. The DST and open access policy initiatives

Open Access research publication strategy – the Academy of Science of South Africa

The 2006 *Report on a Strategic Approach to Research Publishing in South Africa*, commissioned by the DST and produced by ASSAf (Gevers & Mati 2006), was an indication that there is a commitment among South African policy-makers to engage with the question of research dissemination, in spite of the overall conservatism of South Africa's approach to scholarly publication. The report provides a detailed analysis of the state of scholarly publishing in South Africa, at least as far as 'accredited publications' are concerned. The focus is on journals – reflecting the preoccupations of the broader research policy environment. The scope of the investigation was expanded in 2008, however, with the commissioning of a report for the DoE on the criteria for the accreditation of scholarly books and chapters in books, due for delivery in the first half of 2009.⁴

This report is invaluable as a detailed study of the fragmented world of journal publication in South Africa both from the perspective of authors and where they publish and that of the local journal publishing scene. The research addressed two questions:

Whether, in the wake of the closure of the state-subsidised Bureau for Scientific Publications, there should be state subsidy for the publication of learned journals in the interests of intellectual exchange.

Whether all the articles receiving subsidy from the state system deserved to receive recognition, given a wide variation in quality.

The Academy was concerned about the impact of globalisation, which has resulted in the neglect of national and regional journals. While the number of articles published by South African authors in ISI journals has increased, it reported, the number of South African journals included in the index has remained static. This represents a damaging decline in nationally and regionally focused research outputs.

The statistical analysis in the report focuses on South African publications in the Thomson indexes, reflecting the preoccupation with the need for the country to reverse its apartheid-era isolation and demonstrate its participation in global ranking systems. The recommendations of the project do, however, include a number of communicative efforts that could broaden the scope of research dissemination. The report acknowledges that it 'cannot only look backwards at a fast-vanishing system of international and local journals, publishing huge numbers of articles submitted (at no cost) by authors, reviewed (at no cost) by other scientists, and sold back to the scholarly community at increasingly exorbitant cost, through

4 Publication of this report is scheduled for November 2008.

library and/or personal subscription' (Gevers & Mati 2006: 8). The report therefore concludes that it is essential that there be 'strategic management of national publication policy which is aimed at the future, and not the present or the past' (102).

The key recommendations of the report are for a concerted effort for the growth of local publications, investment in ensuring the quality of South African publications and the harnessing of technology, through a 'gold route' open access journal publishing model to ensure their visibility, reach and impact.

The report recommends that the Academy should function as a supporting and quality control body for scholarly publishing; and that an open access journal publishing initiative should be undertaken with financial support from government, including the publication of open access journals and the development of a national system of open access research repositories. The proposal is that 'the Department of Science and Technology takes responsibility for ensuring that Open Access initiatives are promoted to enhance the visibility of all South African research articles and to make them accessible to the entire international research community.' 'Gold route' open access journals, it is proposed, should be 'funded in significant part through a per-article charge system (linked in the case of higher education institutions to an agreed fraction of output publication subsidies' together with the maintenance of print subscriptions (Gevers and Mati 2006: 118).

Implementation of the report's recommendations

Implementation of the recommendations of the ASSAF Report started in mid-2008, with the financial support of the DST. A National Journal Editors' Forum has been formed and met for the second time in October 2008. A rolling peer review system for scholarly journals has commenced based on the criteria that have been developed for editorial quality management, and an agreement has been reached with the Scientific Electronic Library Online (SciELO) in Brazil for partnership in the management of a national platform for open access journals.

What is important about these developments is that they recognise the importance of publishing activities and recommend support for the production of scholarly publications in HEIs. Equally, the ASSAF intervention focuses on quality evaluation of research publications rather than mechanical counts of the number of publications in accredited journals. Given the lack of support for publication efforts – other than authorship – in South African universities and given the preference for international publication, these are important moves.

What the report does achieve is extremely valuable – brokering the recognition that research dissemination is strategically important, and that it needs government recognition and support if it is to become a national asset. Taken together with its very sound open access recommendations, this initiative might be a vital staging post on the way to a more radical policy initiative that could move beyond the journal paradigm to a wider conception of what development-focused research publication could look like.

The creation of a national platform for scholarly publishing

The ASSAF report calls for the DST to assume responsibility for driving an initiative for national and international cooperation in developing a 'non-commercial, expanded, diversified and more inclusive international listing and indexing system for research journals, including those published in developing countries' (Gevers & Mati 2006: 119). The ASSAF Committee on Scholarly Publishing in South Africa has established a task team to investigate the best ways to create a national platform for the publication of high-quality, open access journals in the country. The task team responsible for this part of the project implementation visited SciELO in Brazil in 2008, resulting in the creation of a partnership for the creation of a SciELO South Africa journal platform. This platform will host those journals

that have been screened by peer groups of journal editors and have been accepted as publications of sufficient quality to form part of a national stable of journals.

Starting with the South African Journal of Science SciELO South Africa will manage the hosting of these journals on a national open access platform that will provide a comprehensive tagging system to enable the tracking of national and regional impact factors. This intervention will be funded by the DST and the funding will include support for the publication of the journals concerned.

This is a significant intervention in a number of ways:

- It provides national government support for scholarly publishing activities;
- It harnesses the potential of ICTs and open access to provide effective distribution of South African research publication.
- It embodies support at national government level for the implementation of an open access scholarly publishing programme, an important move away from the commercially based competitive paradigm that dominates most research publication policy in the country.
- It invests in the creation of a system for measuring local and regional impact factors, reducing the reliance on an inequitable global citations system.
- It embodies South-South collaboration of a kind that could well be extended in Africa and across other developing and second economy countries.

The Committee for Scholarly Publishing in South Africa (CSPiSA) has a schedule that should see rapid implementation of the recommendations and, it is hoped, an equally rapid improvement in the quality and status of South African scholarly publications. While the common wisdom in the north tends to be that the most effective route to open access publishing is through 'green route' repositories containing pre- and post-print journal articles published in major journals, this intervention acknowledges the need for developing countries to develop journals in areas of national and regional importance, something that is neglected in the global environment. In South Africa, the ASSAF proposals include a plan to create a federated system of repositories, with assistance for the creation of a central repository for institutions that cannot afford their own repository. This, however, takes second place to the establishment of a powerful stable of open access journals to create a profile for South African research.

Lessons learned

This intervention has demonstrated the potential for the use of digital publication and open access to profile the research output of a developing country and ensure its impact as well as its competitiveness in the global arena. It has also made a case for government support for scholarly publishing in a context where commercial publication is unlikely to be sustainable.

What still remains, however, is investigation into how to support the creation of new journals and what technical platforms could help support the creation of a wider range of publications, including new conceptualisations of what research communications could look like in the online world of 21st century research.

Access to data from publicly funded research

In September 2007, the DST convened a high-level two-day workshop on access to research data. South Africa has observer status at the Organisation for Economic Co-operation and Development (OECD) and has been invited to participate with enhanced status as a possible prelude to full membership – something that would be a major boost to

the country if it were to come about.⁵ The workshop was designed to address South Africa's response in relation to the *OECD Declaration, Principles and Guidelines on Access to Research Data from Publicly Funded Research*.

Another reason for the workshop was that the DST had, shortly before, considerably increased its strategic research and development (R&D) targets for the next decade, as a way of increasing South Africa's international competitiveness. To achieve this, the number of postgraduate degrees, and the levels of research output will need to grow radically in the next decade. The DST targets were linked at the workshop to open approaches to knowledge and information sharing – Owen Njamela, from the Chief Directorate, R&D Investments at the DST, said that an aim of the workshop was to establish what it would take to create a really effective data-sharing system in South Africa.

Speakers at the workshop argued that there are legitimate limitations to openness in research data – limitations such as official secrets, personal privacy and the proprietary rights of private sector research. However, the default option should be that restrictions on open access should be the exception rather than the rule, and invoked only with good reason. This, it was argued, is particularly important when data have been developed from publicly funded research. Locking up data in proprietary systems increases the fragmentation and the cost of access to it; open access makes data available across disciplines and countries, allows for automated knowledge discovery, improves the potential for verification and accuracy, and facilitates North-South and South-South transfer.

There are strategic reasons for ensuring that research data is properly disseminated and curated in South Africa. As the [ASSAf Report on Scholarly Publishing in South Africa](#) made clear, South Africa needs to increase its research visibility, needs to grow its output of high-quality publications and attract a younger cohort of scholars (Gevers & Mati 2006). As the ASSAf programme increases the output of local journals, links will need to be created between scholarly publications and underlying data sets if the maximum benefits are to be gained from research investment.

The Minister of Science and Technology, Dr Mosibudu Mangena, emphasised in his opening speech at the 2008 Digital Curation Conference that there are important reasons for increasing access to and coordinating research information. These included, he said:

- Reuse of data for new research, including collection-based research to generate new science.
- Retention of unique observational data which is impossible to recreate.
- Retention of expensively generated data which is cheaper to maintain than to re-generate.
- To Enhance existing data available for research projects.
- For compliance with legal requirements.
- To validate published research results.
- For use in teaching.

The minister identified issues that would have to be dealt with in the implementation of an open data policy in South Africa, as they had been identified in the initial planning workshop:

The role of government in data management and provision of access would have to be considered, and roles and accountability determined.

⁵ See the opening speech of the Minister of Science and Technology at the 2008 Digital Curation Conference <http://stardata.nrf.ac.za/nadiccc/programme.html>.

Institutions would have to have data management policies in place before they receive funding.

The general mindset on data sharing, which is not part of the country's culture, would have to be changed.

South African scientists would have a responsibility to collaborate with Southern African Development Community countries on data management.

The minister said that there are a number of data sharing initiatives already under way in South Africa: for example, the Council for Scientific and Industrial Research's Satellite Applications Centre, the South African Environmental Observation Network, the SA Data Centre for Oceanography, Statistics South Africa, and the Chief Directorate: Surveys and Mapping of the Department of Land Affairs, as well as in bioinformatics.⁶ He argued for integrated management of data and research information across nations, institutions and disciplines, for the sake of greater impact and efficiency from research investment.

Lessons learned

This is a welcome intervention that should help position South African research well for participation in global research initiatives. What remains is for the institutions to engage with the ICT platforms and policies that are needed to maintain an integrated and interdisciplinary digital research environment, to keep South African research up to speed with international developments and generate maximum impact and efficiency in return for research investment.

Cyberinfrastructure for South African research

The 'access to data' initiative draws attention to a gap in South African policy: the provision of an integrated policy framework in our universities for the use of ICTs for research and data curating, as well as for teaching and learning. Similar requirements were recently spelled out in a workshop convened by the Joint Information Systems Committee (JISC) from the UK together with the National Science Foundation (NSF) in the USA (Arms and Larsen 2007). Australia has also addressed the issue in its Accessibility Framework policy:

The Accessibility Framework will be an agreed system-wide approach for managing research outputs and infrastructure so that 'they are deliverable, accessible and shareable' in order to improve the quality of research outcomes, reduce duplication, and better manage research activities and reporting. (Productivity Commission 2007: 229)

Today most research information is produced digitally, and unless this information is made available, research effort can be wasted or duplicated. Moreover, the volume of data available means that information needs to be made available in a way that allows digital analysis and retrieval in formats that are machine readable (Arms and Larsen 2007). The development of such an infrastructure requires coordination at national and institutional levels. This is important from the point of view of research dissemination, not only because of the need to disseminate data effectively, but also because in the highly automated and interdisciplinary environment of 21st century research there need to be links between publication and data, allowing for an interpretive layer between the two.

Organisations such as CODATA, the International Council for Science (ICSU) and Science Commons are working together to launch a Global Commons for Science Initiative to devise and promote new normative and legal structures for the exchange of data. As part of this process in South Africa, the Network of African Data and Information Curation Centres (NeDICC) is being created in partnership between the Meraka Institute and the HSRC to preserve research outputs, to make data, analysis and findings available to future users, and

6 <http://stardata.nrf.ac.za/nadicc/programme.html>

to develop adherence to global best practice on data management in the major national research bodies.

Lessons learned

The creation of an integrated cyberinfrastructure for research is something that requires a long-term view that will take account of the need for the development of ICT infrastructure and policies at institutional and national levels. The country has already initiated a number of collaborative multinational research ventures and its commitment to Africa-wide research collaboration should also encourage an approach that accepts the need for integrated online research communications.

A question is whether South Africa should look to the creation of a national-level institution for research into the ICT needs for scholarly communications and research, like JISC in the UK.

5. Conclusions – research policy and effective dissemination

There is a serious mismatch between the development goals of South Africa's research and innovation policies and the publication reward system, which places international prestige over local needs. Research and innovation policy places a strong emphasis on the contribution of HE research to national development – social, economic and political upliftment – whereas policy that rewards research publication is centred on personal advancement in the commercially driven international scholarly rankings – and public benefit is forgotten.

Research and publication policy wavers between a recognition of the need for collaborative, non-proprietary research dissemination to achieve social benefits, and a market-driven approach that depends upon patents and copyright to gain economic benefit from research investment. Both approaches do, however, seek to tackle the question of the local impact of research and the need for universities to ensure that research investment produces benefits in the national economy and society.

Within academe there is an additional dilemma, caused by the conservatism entrenched in the system, particularly among academics who have performed well in the existing environment and are therefore likely to be at or near the top of the HE hierarchy. These academics see the publication system as a locus of university values and a central site of quality delivery. The damage is done, however, not because this traditional publishing system is valued – it has its place in any university system – but because it is asserted to be the *only* publishing system that is valued and supported.

Policy reforms can happen only when there is some consensus on the issues involved and a basis of support in the stakeholder communities concerned. In the case of research dissemination policy and the impact of information technology, studies have revealed that, despite pockets of academics who are aware of the potential of new technologies and open access, there is, among the majority, a general lack of knowledge and a number of misperceptions about these issues ([De Beer 2005](#); Ouya 2006). While awareness is growing, there needs to come a 'tipping point' where there is a sufficient weight of consensus to drive change.

There is currently no coherent and wide-ranging national policy for research dissemination or for open access and the impact of South African research is diminished as a result. Projects such as the ASSAf intervention and the initiative for access to data from publicly funded research augur well, but there needs to be a more consolidated and coherent approach across government departments to investigate ways of ensuring that research reaches where it is needed.

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