

# Changing Research Communication Practices and Open Scholarship: A Framework for Analysis

*Laura Czerniewicz, Catherine Kell, Michelle Willmers & Thomas King*

## Introduction

Research by higher education and communications scholars provides growing evidence of the changes taking place in the field of scholarly communication, both as a result of changes in research activity in higher education systems globally (Etzkowitz 2004; Cooper 2009, 2011; Gibbons *et al.* 1994), as well as those offered by the affordances of Web 2.0 technologies (Tenopir 2003; Palmer 2005; Thorin 2006; Procter *et al.* 2010; Weller 2011). There is also growing evidence that the research terrain is becoming more open (Van der Vaart *et al.* 2013). While attention has been paid to how scholarly communication and libraries are changing as part of a larger ecosystem (Pendleton-Jullian 2013), it is less clear how the changing scholarly communication system plays out in actual research practices, as scholars go about their academic work. It is important that academics' research communication practices are explored to complement these system approaches. How do we think about these issues in

“ It is less clear how the changing scholarly communication system plays out in actual research practices, as scholars go about their academic work.

order to investigate and illuminate changing forms of knowledge creation and communication? The project from which this paper is drawn was interested to answer three interrelated questions:

- What are the research communication practices of academics?
- What enables or constrains the flow of research communication within these practices?
- How closed or open are academics' scholarly communication practices?

This paper describes our thinking as we developed the analytical framework that would enable us to answer these questions. The analytical framework was developed from the conceptual framework we used to shape our study through an iterative process with the data collected.

## The study

The broad programme in which this study is located is the Scholarly Communication in Africa Programme (SCAP), which was established to help raise the visibility of African scholarship by mapping current research and communication practices in four Southern African universities and recommending technical and administrative innovations based on experiences gained in implementation initiatives piloted at these universities. At the University of Botswana (UB) our site was the Department of Library and Information Studies, at the University of Cape Town (UCT) our site was largely the Economics Department with a special focus on a research centre linked to that department (the South African Labour and Development Research Unit [SALDRU]), at the University of Namibia (UNAM) our site was the Faculty of Humanities and at the University of Mauritius (UoM) our site was the Faculty of Science.

One of our research strands focused on the research communication practices of academics in each of these sites. It included quantitative and qualitative methods of data collection and aimed to produce "thick descriptions" of research communication practices in each of the study sites. Methods of data collection were aimed at producing "insider

accounts" of day-to-day practices of African scholars as they go about producing, accessing and sharing research. The research methods included a survey<sup>1</sup> for academics in each of the study sites and in-depth, semi-structured interviews with a selection of academics, and day-recall interviews with a small number of those interviewed.

In each of the interviews, we asked academics to narrate three recent research projects they had undertaken; this provided descriptions of a total of 72 research projects. Given that these projects came from different universities in different countries and were based in different disciplines, we needed to develop a framework that would enable us to gain an overview of what is happening in scholarly communication in Southern Africa, without imposing generic models about what should be happening. The analytical framework we discuss below was developed in order to deal with the range of projects and related communication practices.

While the key elements of the conceptual framework were in place before data gathering began, the finessing of the framework was only possible when the data was collected, as this is inevitably an iterative process. For the purposes of this paper with its focus on the development and structure of the analytical framework, we provide illustrative examples drawn from the data.

The basis of the framework lies in three choices that were made within the SCAP project as it went about researching academics' research communication practices:

1. To focus on "practices"
2. To focus on a heuristic of the scholarly communication cycle and how that is

<sup>1</sup> The survey was prepared with reference to a number of recent international studies undertaken on scholarly communication (Houghton, Henty & Steele 2004; Rowlands, Nicholas & Huntingdon 2004; Rowlands & Nicholas 2006; Proctor *et al.* 2010; Palmer, Teffau & Pirmann 2009; Maron & Smith 2008). In particular, we drew on Houghton, Henty and Steele's (2004) study, which focused on three key areas of research activity: communication and collaboration, information search and access, and dissemination and publication. We adapted these three, however, to take account of what we called "stages in the research cycle" (Czerniewicz 2013).

changing as a result of the affordances of Web 2.0 technologies

3. To develop a typology of research projects in a way that cut across disciplines and the pure/applied distinction.

## Practices

The decision to focus on “practices” in “research communication practices” arose from the “practice turn” in the social sciences, and particularly studies in science and technology. Practices can be seen as “arrays of human activity” that are “materially mediated” and “organised around shared practical understanding” (Schatzki 2001: 2, quoted in Palmer & Cragin 2008: 169). This allows a focus on activities rather than on texts, and differentiates our approach from previous models of scholarly communication such as the UNISIST (1971) model, the Garvey-Griffith (1972) model and Björk’s (2006) model, as well as their later reformulations by Hurd (2000) and Sondergaard, Andersen and Hjørland (2003). Each of these models provides heuristics that are process-based and include where texts go and which other groups of people (in addition to academics) take charge of processing and curating material. Texts along a trajectory of dissemination and curation are therefore the key unit in these models, as are the technical channels through which they flow and the spaces in which they are both deposited and communicated.

In our approach the text and its movements were less important than the activities undertaken by the academics and what enabled or constrained their choices in these activities in the wider research culture of each institution. Our work is therefore more aligned with other studies that consider the everyday activities of academics, such as Acord and Harly (2012), who describe how scholars share their work in progress (showing credit, time and personality as significant barriers to change across disciplines). Although we were interested in all their communication practices, we also found useful studies which examine researcher use of Web 2.0 technologies as part of their research practice, such as those by Proctor *et al.* (2010) and Kraker and Lindstaedt (2011). Studies that describe how

researchers find and disseminate research, such as those by Bulger *et al.* (2011) and RIN (2009) were also of value, because we agree with Palmer (2005) that while undertaking research, scholars are both consumers and producers of knowledge, thus their practices would include both access to content, as well as its production and dissemination.

## The research cycle

We understand research communication to take place throughout the research process, rather than only being part of the formal outputs stage, where traditionally results are published as journal articles. Therefore it was necessary to build a “research cycle approach” into our data collection instruments and into the analytical framework (Czerniewicz 2013; Whyte & Pryor 2011). Czerniewicz (2013) identifies key features of “the changing digitally-mediated scholarship landscape” through a “knowledge creation and dissemination cycle” model, which takes the perspective of the research and dissemination activities of academics. The model outlines firstly what she calls “core elements” in the traditional knowledge creation and dissemination cycle as:

- Conceptualisation
- Data collection and analysis
- Articulation of findings
- Translation and engagement

These can be seen in Figure 1 as the grey boxes in the centre of the circle. Czerniewicz describes the activities comprising each of these stages of work and touches on the social relations associated with each activity, the audiences, and the genres through which researchers communicate to these audiences at each stage. She then goes on to outline the ways in which scholarly communication is changing at each stage of this cycle, as, with the advent of Web 2.0 technologies and the affordances offered by digital forms of content and communication, scholarly work can be shared and communicated by scholars directly into the public domain at all stages of the research process.

For the analytical framework, we would need to consider each dimension of the cycle in terms





of how it actually plays out, and with our focus on practices, we would need to look at actual examples. Do academics work on clearly defined research projects? Are they able to deepen the knowledge produced in one project by developing a new research project that will enable this to happen? What happens when they are involved in consultancy and applied work? While this heuristic is instantly recognisable to all researchers across every discipline that works with data (both qualitative and quantitative), there are important differences across disciplines and contexts. How do these differences play out in the messy world of academics trying to plot a path forward as they work to communicate their research? We will address questions such as these by fine-tuning the elements that need to be considered and differentiated at each stage, and will then introduce a typology of forms of research inquiry that emerges from our data.

## Elements of the research cycle and degrees of openness

We fine-tune our framework by elaborating on the three elements that come into play at each stage of the research cycle: social relations, audiences/users and forms of communication. Each of these can be considered in terms of their degrees of openness. We are mindful that openness is a widely used concept appropriated for many discourses, with some authors such as Mulder and Jansen (2013) developing a schema for differentiating and describing forms of openness in education. Openness is generally linked to the rise of social media and Web 2.0. For the purposes of our analysis, it is important not to take a doctrinaire position on openness by referring to closed practices pejoratively and open practices approvingly. Closed may connote private and may be appropriate for specific disciplines; at the same time the digital can close down and limit in ways that the analogue does not. Open can connote invasive or exposed, while of course it can also connote collaboration, transparency and inclusiveness.

Furthermore, practices can rarely be categorised in a binary way as closed or open; it is useful to

analyse them along a continuum. The concept of degrees of openness is not new; it has been used in relation to open educational resources by Gray, Hodgkinson-Williams and Willmers (2009) who note too that it has been used for open economies and open-source software. It has also been used for open research (RIN 2010), open science (Whyte & Pryor 2011) and most recently for open data (Acuna 2013) and for massive open online courses (MOOCs) (Totschnig 2013).

### Social relations

In our framework, social relations within the stages of the research cycle involve the following:

- Power relations, including North/South relations
- Networks, including social networks
- Nature of relationships, including positioning as recipients or as contributors.

Power relations in research projects are relevant for knowledge production in terms of who speaks and who is silent, whose voice is heard and in what form. These are deeply shaped within the histories and cultures of the institutions and countries within which the universities are situated. Bourdieu (1998), for example, describes how in France, academic gate-keeping occurs through the control of junior scholars' time in study and acceptance of papers for publication. Halbert (1998) uses Bourdieu's concepts of capital and habitus to explain how knowledge is produced and legitimised, as well as to explore the changing dynamics and tensions within the scholarly communication system.

Power relations are also to be considered in terms of North/South relations, especially relevant in this study where many of the academics collaborate with colleagues from the global North, and where the potential exists for global inequalities to be replicated. Social relations in the realm of communication practices must touch on these relationships, as well as on who is able to publish where (see for example Chan, Kirsop & Arunachalam 2011; Czerniewicz & Wiens 2013).

FIGURE 1 Traditional scholarly communication cycle

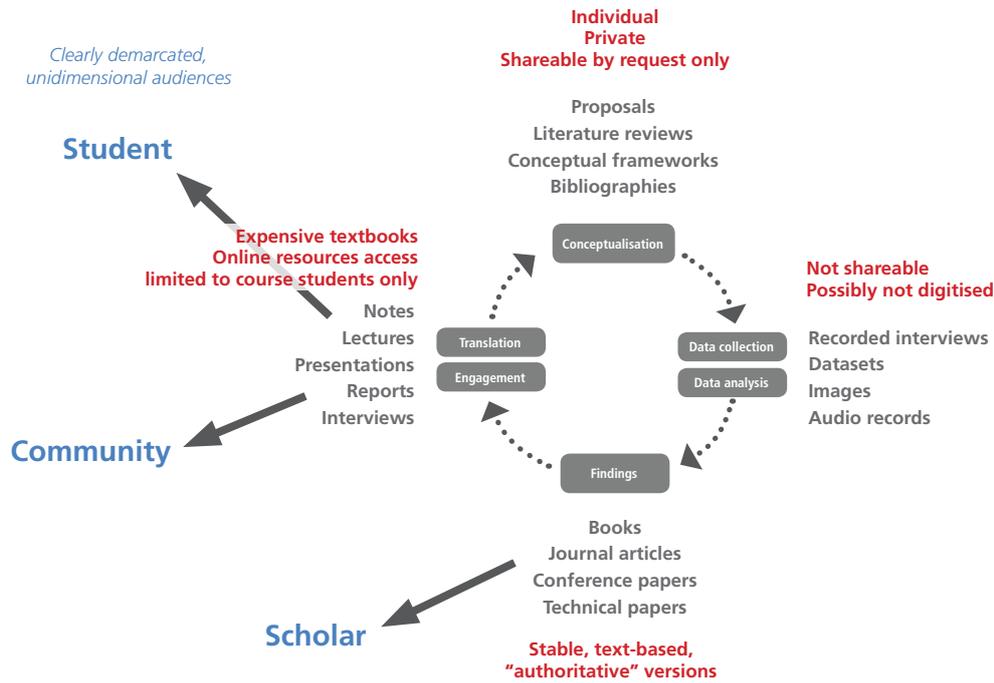
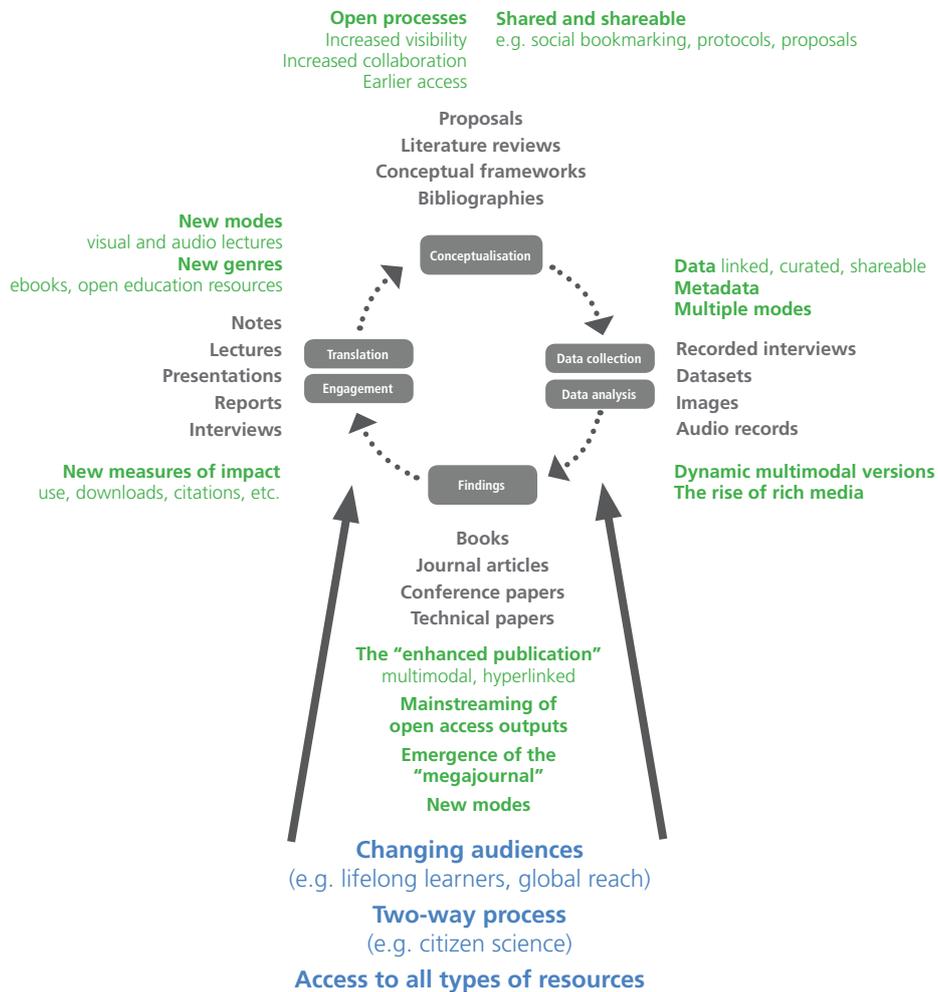


FIGURE 2 The changing scholarly communication cycle





These relations extend to the kinds of networks academics have access to, from the most limited within their own departments or universities, extending nationally and regionally, and beyond to global networks. What role do these networks play in their research communication possibilities and practices? Intertwined with this is the role of social media networks, whether they exist at all and what role they play. These digitally mediated social networks allow individuals to construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system (Boyd & Ellison 2007).

The element of social relations in our framework therefore refers to relationships of power and control in how research is done; rather than focusing on products, it focuses more on processes, interaction and relationships. Much of the work on changing such relationships is being undertaken under the auspices of open research or open science. Open research generally refers to openness in the sense of increased visibility and transparency. Open research, enabled by digital content and ease of online collaboration, is characterised by greater collaboration among researchers and by content being shared throughout the research cycle (from proposal, to datasets, to early sharing of findings etc.). By making research available, it supposes increased and increasingly distributed collaboration, and more opportunities for participation.

Degrees of openness for social relations in research therefore refer to the extent of collaboration on a research project: the continuum extends from no collaboration → some collaboration → much collaboration.

Whyte and Pryor (2011: 207), referring to the sharing of resources in their study of researcher perspectives of open science, suggest that this continuum moves from the most closed, *private management* (sharing within a research group) to *collaborative sharing* (sharing between members of a consortium) to *peer exchange* (sharing on the understanding that disclosure or reuse have conditions attached, between members of a researcher's network of peers) to *transparent*

*governance* (disclosure to an external party according to a publicly accountable code) to *community sharing* (access or reuse limited to identifiable members of a research community) to *public sharing* (sharing where resources are made available for access by any member of the public), with this last being the most open.

The collaboration may refer to both scholars and non-scholars, with one-way and two-way communication.

Also relevant is *when* in the research cycle research is shared: early in the cycle or later in the cycle. While the current system is set up for late disclosure, studies have shown that greater openness leads to larger numbers of related studies, including studies by researchers who came from outside the initial area of study. They have also found that open studies have more commercial benefits in the long term (COED 2009). Some of these ideas, suggesting change, are mapped in green in Figure 2.

### Users/audiences

In exploring this element of our framework, we need to consider to whom scholars communicate their research and what is the nature of the uptake of the research. We are therefore seeking a more dynamic notion of scholarly communication than the simple sender–receiver model, one that is more closely aligned with the notion of practices and in which audiences do not simply receive research but are actively involved in “uptake”. Traditionally scholars' main audiences have been other scholars and their publishing decisions and outputs have been based on this, with print-based technologies affording this relationship. The internet opens up and extends the concept of both users and audiences. In the narrowest sense, the most conventional way this happens is through the publishing of findings in toll-access journals, reaching only those who have the resources to pay for access to them. Through open access publishing (either Green or Gold) all outputs are available to those who have internet and can extend the potential audience to society at large, meaning that research can be taken up in ways not anticipated by academics.

This framework categorises the following audiences for scholarly communication:<sup>2</sup>

- Scholar to scholar
  - Scholar to student
  - Scholar to community
    - » Government
    - » Scholar to industry
    - » Scholar to civil society
- (See further detail in Gray, Hodgkinson-Williams & Willmers 2009.)

Audiences in each case may be singular or multiple. Critical to this notion of user-group/audience is the way in which the rewards and incentive systems of universities function to ensure that scholar-to-scholar forms of communication are valued. As shown in Figure 1, rewards and incentives occur only in the final stages of the traditional cycle.

In addition, the notion of audience in a digitally mediated “read–write” milieu is challenged to mean a two-way conversation with the audience “talking back” in the form of comments and discussions, and indeed even circumventing the scholars entirely (Gillmor 2004). Seely Brown and Adler (2008) suggest that such a culture of participation involves tinkering, building, remixing and sharing, terms not generally appropriated by the academy.

### Forms of communication

With this element of our framework we take into account the forms in which scholars communicate their research. First, we consider the fact that almost the entire output of current highly valued academic research communication worldwide takes place through the linguistic *mode* of communication, largely through the written word, and to a lesser extent through speech. There are, however, other modes of communication and some theorists are arguing that these are challenging the privileged status of the written word (Kress

& Van Leeuwen 2001) These include visual, iconic, aural, gestural and embodied and spatial modes of communication, amongst others, as well as the multimodal, in which these modes of communication mix.

Second, we need to consider the *genres* through which research is communicated. Most simply, genres refer to the specific academic outputs that are produced and that are valued. Halbert (1998) notes that the most highly regarded in the scholarly communication system are dissertations, which provide entry to an academic field, and journal articles, which are relevant for promotion, with others being more peripheral. Yet each genre has different roles and legitimacy that are being challenged as the environment changes. It becomes relevant then to consider whether these are working papers, pre-prints, final authoritative versions and so on. These are mapped on the diagrams above as the ring of terms in grey and associated with the six stages of the cycle, for example, literature reviews, journal articles, reports and interviews.

Third, the concept of *means* of communication in our framework links closely with our second element of users/audiences and enables us to refer to types of platforms and technologies for communicating and their affordances of commentary and engagement. They may indicate the affordances of the technology expressed as modes of representation. These afford different relationships, and in effect, different types of openness. These may be:

- *One-to-one*: One writer, one reader, no affordance of commenting or changing (e.g. printed journal article or conference proceedings)
- *One-to-many/many-to-one*: Enables commentary and conversation (e.g. blog, Facebook)
- *Many-to-many*: Both readers and writers are contributors and participants (e.g. wiki).

Genres, platforms and technologies include intellectual property provision and rights. A consideration of genres in an open scholarship terrain would evaluate how openly available the research output was in terms of its legal status.

<sup>2</sup> Each of these groups is related to what Etzkowitz (2004) calls the triple helix (scholar–industry–government) and Cooper (2009) elaborates further by introducing a fourth helix (community). This, of course, is very relevant in the Southern African context where universities tend to be viewed as needing to play significant and strategic roles in national development.



This would mean an assessment along a continuum from most closed or restrictive (with full copyright, all rights reserved), to increasingly accommodating through the various forms of creative commons (or similar license) to CC-BY, CC-0 and public domain with no rights reserved.

With the research communication cycle and the three elements to consider at each stage of the cycle now in place, we move on to show how a further part of our framework enables us to make more fine-grained distinctions about the types of research that are undertaken.

## Research types

To better understand scholarly communication practices at our four sites, we sought to gain a deeper understanding of the nature of the scholarship itself – the actual research undertaken by scholars in Southern African universities and what enabled or constrained the flow of communication of research. If we were to make claims about the array of outputs that eventuate from projects, we needed to understand what kinds of projects lend themselves to what types of outputs, and what kind of outputs are more likely to be communicated in circuits outside of the usual ISI-ranked journals. The idea of types was helpful, given the diverse disciplinary contexts within which our study sites were situated and the diverse research practices of the academics within these disciplines and sites. A typology enabled us to make a situated and fine-grained analysis of the histories, objectives, outcomes, available resources and social relations of which particular pieces of research and communication around these are composed.

Boyer's (1990, 1996) definition of scholarship provides a valuable meta-level framework for understanding different types of scholarship. It distinguishes between the scholarship of:

1. Discovery
2. Integration
3. Application/engagement
4. Teaching.

However, we realised we needed more fine-grained ways of distinguishing between the actual types of investigative inquiry that belong in each of these types of scholarship. We found that it may be more productive to outline possible modes or types of knowledge production or “ways of making knowledge” (Griffiths 2004: 14) which may then “lend themselves” to a greater or a lesser extent to forms of scholarly communication. Such types may then be somewhat discipline-specific, although blurring and overlap would be expected. We settled on Griffiths' (2004: 14) typology of five types of research projects, each a general type of knowledge production.<sup>3</sup> But we adapted this, drawing on Cooper (2009, 2011). All quotes in the following section are from Griffiths (2004: 715–717).

1. The *discovery* of “generalisable explanations or theories”. Often thought about as curiosity-driven research and mainly thought about as “pure basic research” (Cooper 2009, 2010), this type is “characterised by a high degree of codification of the knowledge base”, a high degree of “consensus about appropriate questions, methods and analytical frameworks”. Programmes of inquiry can take quite specialised narrow forms and are often undertaken by teams with specialised disciplinary expertise. This type is what is often known as empirical research. In Southern African universities it is very difficult to do this kind of high-level research because of lack of capacity and funding.
2. This type can be called “interpretive inquiry”. It focuses on the “*interpretation* of phenomena rather than the search for generalisable explanations”. Here, the “knowledge base is less settled ... knowledge advance is not necessarily progressive and may even have the appearance of being cyclical in nature”, “methodological principles at work here might be described as hermeneutic or subjectivist”

<sup>3</sup> Griffiths calls these “modes of knowledge production” (2004: 13). However, since the work of Gibbons *et al.* (1994) and Gibbons (1997) on shifts from mode 1 to mode 2 knowledge production has been widely used in South Africa, and because we refer to modes of communication as one of our three elements to consider in our cycle, we use the term “type” rather than “mode” when referring to Griffiths' (and our own) work in order to avoid confusion.

and such projects are often undertaken by individuals or pairs.

As Griffiths notes, while the above two coincide with Boyer's (1990, 1996; Boyer Commission 1998) scholarship of discovery, a third maps more neatly onto Boyer's scholarship of application and his later concept of the scholarship of engagement:

3. This type can be called "*applied inquiry*" and is characteristic of vocational or applied fields like engineering, education, social policy, health care and built environment. Such knowledge production is understood to be useful in addressing conflicts, tackling problems, as well as meeting the needs of client groups. Research of this type makes use of knowledge derived from the first two and is therefore sometimes viewed as eclectic or derivative. Griffiths argues that these are potentially distinct ways of making knowledge, with their own methods and tests of validity. Rigour is derived from relatively direct feedback loops that generally apply when knowledge is being tested in the context of application.

While Griffiths does not outline a type specifically related to consultancy research, which involves the provision of expert advice to clients, he explores how the third type outlined above, applied inquiry, overlaps with consultancy work. Work of this nature is often a source of friction amongst academics and managers, with part of the tension "revolving around whether consultancy generates 'new knowledge'<sup>4</sup> or is applying accepted ideas and principles to particular cases" (Griffiths 2004: 717; see also Mamdani 2011). Griffiths (2004: 718) argues:

*While the legitimacy of the former is widely accepted, many academics are much more suspicious of the latter within the university setting, especially if the public availability of the findings is restricted by the terms of the contract with the clients.*

However, Griffiths argues that "the clarification

and reworking of basic concepts, the testing out of ideas and methods and the application of accepted principles to new contexts" may well "constitute valid new knowledge production of this third, applied kind" (ibid.: 718).

4. This type draws on Boyer's idea of *integration*, which involves placing discoveries in a wider context, synthesising knowledge from both "discovery" research and aspects of applied inquiry. We suggest that Cooper's (2009, 2010) work is a useful elaboration of the integration type with the concept of use-inspired basic research (UIBR), emphasising the primacy of basic disciplinary work, but seeing it as "embedded in use-orientation" (Cooper 2009: 104). Another useful concept relevant to this type of research that Cooper offers is that of the "fourth helix", following Etzkowitz's (2004) "triple helix" of university-industry-government or U-I-G engagements. This helix extends the aspects of universities' missions referring to development beyond the traditional and narrow dimension of economic development to one that includes social-economic-cultural development. It is particularly useful to African universities, which emphasise social development, as do the governments of the countries in which they are located (Gray, Trotter & Willmers 2012).
5. A further type relates to Boyer's scholarship of teaching and involves critical inquiry into how learning can be promoted. The scholarship of *teaching and learning* (SOTL) has burgeoned in the past decade in the global North, as well as in many parts of the South, including the universities in which SCAP worked. Griffiths argues that the value of this work is not in doubt, more in question is whether it can be regarded as a distinct type of knowledge production or whether it is better seen as a particular form of applied knowledge production.

## Illustrative examples of the framework in practice

Applying these general principles to the 72 research projects described in our study, we first categorised

<sup>4</sup> In fact, Cooper (2010) states strongly that consultancy work does not involve the production of new knowledge.



the projects into the above types, and then considered the research practices associated with the types in relation to the scholarly communication cycle, with specific reference to the different stages of the cycle and each of the three elements (social relations, users/audiences and forms of communication). A point to note, however, is that our use of the concept of “research projects” in our survey and interviews brought to light the fact that the majority of academics interviewed across all four of our study sites do not necessarily work on clearly defined research projects with beginnings (involving for example writing proposals and accessing funding), middles (involving collection, analysis of data and articulation of findings) and endings (translation and engagement) as presented in Czerniewicz (2013). The neat stages of the research “cycle” are messy in reality. Projects were highly diverse. Some were not funded (very common in the four research sites), some were offshoots of other pieces of work that resulted in a publication, some arose out of teaching work and work undertaken by students, some were based on huge collections of empirical data, while others were based simply on “desktop” research.

A second point to note is the importance of context – the history and culture of each of the four institutions studied, and to a lesser extent the history and culture of the countries in which they are located. Even though these universities and the basic features of the types of research they engage in and research cycles that they go through share a number of similarities in terms of overall geography, history and mission, their differences are sufficient enough to create significant diversity in how their scholars respond to the research endeavour. Much of this is detailed in the Country Case Studies produced by the SCAP project and any further consideration is beyond the scope of this paper.

### Project types

Across the four universities we were, however, able to categorise ten projects as discovery inquiry, sixteen as interpretive, ten as applied with a further four as direct consultancies, fourteen as integrated and four as SOTL. There were also five projects that straddled interpretive/applied; five that straddled applied/consultancy; and six that straddled other

combinations. We also identified one further type that we called infrastructural projects and which we explain further below. There were two such projects.

While most of the discovery projects were based in a faculty of science, there were examples of discovery projects in an economics department, as well as in a geography department of a faculty of humanities. While most of the interpretive projects were in a faculty of humanities and a department of library sciences, there were examples of interpretive inquiry projects in a faculty of science as well as in a department of economics. In the history and context of Southern Africa each type has a distinct flavour, which may be different from the same types categorised in a Northern context. An example of this would be the difficulty in getting funding for discovery projects, given the imperative and pressures to focus on developmental needs. This may explain the higher number of integrated projects amongst the 72.

In the following section we present a vignette exemplifying each type of project drawn from across disciplines and sites. We keep the narrative nature of the account to show the broader contextual features and challenges with which scholars are engaging, but we broadly follow the outline of the research cycle in each vignette. Implicit in each of the vignettes are telling accounts of aspects of our three elements (social relations, users/audiences and forms of communication), as well as our concept of degrees of openness in each of these elements.

### Discovery

First is a vignette of a project of the *discovery type*, showing the challenges faced by an academic working in Mauritius.

Mauritius has recently become one of the Southern African partners hosting the Square Kilometre Array (SKA) project, which will build the most powerful telescope ever built. Mauritius already had expertise in radio telescopes through the Mauritius Radio Telescope (MRT), which was a collaborative project with an Indian academic, started 25 years ago. The academic currently in charge of this work is an astrophysicist. He says:

*Much of what I've been doing over the past six or seven years is developing hardware and software. So here [showing photo on computer] you can see my students are building an antenna and these images show solar flares. The sun has a corona and if you change the wavelength you can move up and down in the corona and you can see most of the activity is taking place here. This is part of another project, where I am collaborating with someone in Switzerland, and someone in India.*

*After the MRT was set up 25 years ago, I went away and did my PhD at Cambridge and when I got back they had done about three-quarters of the observations. I then worked on the data reduction with five students who have got their PhDs from that. So hopefully, if we manage to get a PhD student, in three years' time we can reduce the data from the first telescope completely, while we are putting the new one in place. We are uploading data in real time 24 hours a day through an automated process. The thing is, the last paper we managed to write on this data was in 2010, but I just don't get the time to write the papers. Last night I received a message to say that about 15 metres of the telephone line between here and the telescope have been stolen, so we can't get the data uploaded, and we've had a lot of copper theft from the cables as well. But I phoned the guys at the telescope and they reported that we had some solar flares. I sometimes enter those onto this website called spaceweather.com. But I'll only be able to write the papers on all this data if I can manage to get a new PhD student.*

Other discovery-type projects undertaken by individual academics were noted in mathematics (typically unfunded and undertaken individually or with one co-author), biochemistry (involving teamwork, funding and international collaboration) and economics (involving teamwork, use of existing datasets and international collaboration).

## Interpretive

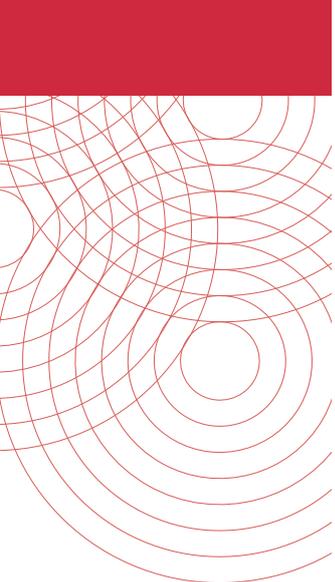
Our next example is typical of *interpretive inquiry*, from the Department of Library and Information Sciences at UB.

*[Another] area that I did some research on was the role of archives in shaping up national identity, how archives can be used to identify a people. In most cases, especially our African archives, they are not complete or they are one-sided. They only tell the story of administrators and not the ordinary, common people. So the extent to which these archives can be relied on to document national identity is really very limited. One has to combine it with other sources like oral traditions. So that is an aspect that we have been working on.*

*It's just one of those things that come up and you get excited about. When the conference organisers in the Netherlands who know my work asked me to present a paper, I said, "Well, I think this could be an area of interest." There was a similar conference taking place at that time on "Archives without Borders". So my main interest was how can we use archives to discuss "archives without borders" when we know within our African context [that] boundaries as they exist today were a colonial creation. So you find when you talk of national identity when using the archives it becomes irrelevant because this people, their cultures, their traditions, cut right across and you find, well, archives and national identity in as much as we may use a kind of European standard for measuring what constitutes a national identity. It does not quite fit within our African context. So that was my argument. [So that led to another] piece of research I did early this year on archives and settlement of colonial disputes.*

*I had no funding for this research; I just did it by myself, mostly online, through the library and through correspondence with other researchers, sharing ideas with colleagues in Nairobi and Ghana. I was funded by the Netherlands government to go and present*





*the paper, otherwise it is not possible to get to overseas conferences with our funding. The PowerPoint presentation was then published online and the actual papers have now been edited and should be coming out in the form of a book. I use these a lot with my students as there are very few publications by African scholars, so we encourage our students to use our publications as much as possible.*

### Applied

The *applied* type of project included a wide range of pieces of work, which were mostly unfunded or funded by the university. Some examples of these were projects in “standards in commercial records-centres”, “hybrid libraries and e-governance” and “payment for environmental services for small-scale farmers”. The following example from Namibia was a particularly interesting applied project. We characterise this project as an applied project rather than a consultancy, since it was open-ended research and the academic was free to publish it as she wished after writing the report. It then led to a second project and the invitation to participate in a third related project.

NZ, staff member in the Faculty of Humanities at UNAM did this project while she was working on her PhD in Cape Town. Someone forwarded her the outline and so she applied. The project involved a Namibian case study of whether there is a differentiated impact of climate change in gender and whether there is a differentiated vulnerability. It was commissioned by an international philanthropic foundation.

NZ had a research assistant in Namibia who did the literature review and selected the field site. Then she travelled from Cape Town back to Namibia to do the fieldwork, which consisted of surveys, group discussions, key informant interviews and life histories. She wrote up the report in two weeks – a week for the first draft; then it went to a content editor and then another week and “everyone was happy with it.” She sees it as one of her best products. First, a set of briefings was published from it. Then she presented it at COP 15 in Denmark; at that time the briefings

were widely distributed and then shortly after that the report came out. All of these outputs were disseminated electronically. She said that she still gets emails from people asking her about the work from those methods of dissemination. The report has made a name for her, even though she sees it as one of the easiest pieces she has ever done. She was also invited to prepare two-page pieces on the work for several international newsletters:

*If you just google my name and “gender” it’s widely coded and referenced. And I have seen, when I went to COP 17, it’s like every paper written on gender and climate change referenced it.*

She has not published academically from the work, although she was given permission to do so. She feels she only really started publishing last year. Up until then:

*I was just doing research reports. I didn’t have a mentor. I just felt like it was qualitative and who would accept this paper? So this year, I submitted a paper to the second issue of the faculty journal. It’s just a general [paper] on gender, culture and climate change. In the conclusion I said the paper established a link and that further research has to focus on that, so that people don’t have to say where is the evidence base, where are the numbers of women and so on?*

In 2011 the UNDP approached NZ to work on a follow-up project, which was a national vulnerability assessment on gender and climate change. This took the form of a report involving a desk review with government consultation, which also made use of all of the data and findings from NZ’s earlier work. The project generated policy briefs.

*The Minister of the Environment took most of them to the National Climate Change Fair and said she was very happy with the project. So now there are further expectations. These involve putting together a proposal for a three-year funded project to be piloted with research components attached to each objective.*

With regard to the earlier project NZ said:

*Because it's a national study, if I could just have gender-disaggregated data on a lot of things, then I could really add a lot of evidence there. The study ended up being focused on rural communal areas because that's where a lot of background information is. I could say almost nothing on urban areas or commercial areas because [the studies and the data] are not there. Because they are only now starting with this research policy and there is no repository. I'm sure there would be masters and PhD theses, but we have this habit of holding on to it; we don't want to share. Even with my PhD I was really struggling [to get access to information]; there were people who didn't want to give it to me. It's government data but they didn't want to give it to me; it's really, really a struggle.*

#### *Integrated or UIBR type*

There were a number of interesting examples of the *integrated* or *UIBR* type projects. These were found mainly in research centres in the Faculty of Science at UoM (CBBR) and in the Faculty of Commerce at UCT (SALDRU). We describe one project here because of its complexity, showing the scientific and mathematical work needed to produce high-quality journal articles, while at the same time making the findings accessible to a wide range of other audiences and doing training on working with these datasets.

AW is a lecturer in the School of Economics at UCT with his time currently bought out by the National Income Dynamics Study (NIDS), which is based at SALDRU. NIDS is a project of the Presidency and is a nationally representative panel survey that is implemented every two years. SALDRU tenders for the work and subcontracts the fieldwork. Waves are undertaken every two years and the data is downloaded in real time. It is then checked for quality, cleaned, made into publication format and taken to public release every two years.

AW had recently completed his PhD thesis using mathematical statistics to address issues related

to the quality of Statistics SA data for the study of income distribution. He explains NIDS as a very broad instrument that can be used by social scientists across the board and has a strong public mandate since it's funded by taxpayers' money. He explains:

*Only at masters level do the UCT students get the training to do rigorous work with this dataset. One of the conditions of the contract with the Presidency is to create training programmes to increase capacity of institutions and individuals to use the data. So I run a number of training courses; however, the level of mathematics needed to participate is very high. That is why I am working to develop an open educational resource on this training, so that it can be easily available on the internet.*

Further outputs available from the current round of the survey were as follows. The dataset was made available on the internet at no charge and can be accessed by anyone anywhere in the world. It is therefore available as open data, provided the person accessing it registers with Data First. Staff in the School of Economics then prepared six thematic research reports based on the findings from their own analysis of the data. These covered labour markets, wealth, education, health and subjective well-being. These were presented to South Africa's National Planning Commission and a range of other government departments in the form of PowerPoint presentations accompanied by hard copies of the thematic reports. Each thematic area was then presented to different government groups, like the Department of Basic Education, and overall presentations were made to other universities, as well as within UCT itself. In addition, one overall "glossy" summary document was produced of the six thematic area reports and distributed at the Carnegie Conference. The six thematic reports and an overview paper are likely to be published as a special edition of a local economics journal:

*It's the South African journals we want; it's public, the whole idea of promoting the South Africanness of this thing.*



AW's specialisation is the methodological issues in panel surveys related to income and wealth. He explains that:

*SALDRU and Economics staff keep in touch with an international network of academics and researchers who do panel surveys. It's important because methodology and methodological literature flow from that network. South Africa is a long way from everything, so those networks are really important. But methodology is something that is exclusive to academics; it's like if you understand the maths you can do the work, and with NIDS there are very few people who can do the methodological work. So there is a skill shortage, which is why it's very important to invest in the training; it's for South Africa, as well as for the rest of Africa.*

For the Carnegie Conference, AW presented two papers. He did an interpretation of the data on wealth and inequality, situating it in terms of the international literature and discourses about inequality. He felt that academics have a responsibility to guide the debate about inequality, that having a high Gini coefficient carries implications that are very controversial. He also did a paper on housing transitions.

### Consultancy

An example of a *consultancy project* undertaken at UB shows up both the positives and negatives of this type. This was just one of the four direct consultancy projects we collected, as well as the five further applied/consultancy projects. While the academics working on the project described below considered this a powerful learning experience and were very pleased with the outputs, they were unable to publish academically on the work because of the terms of the consultancy contract.<sup>5</sup>

<sup>5</sup> A number of African scholars see the diversity of outputs as a negative development, proof of the diversion of academics' talent away from their core mission (which would include writing peer-reviewed journal articles rather than reports for NGOs, funding agencies and government departments). Mkandawire (2011: 19) comments that "The aid establishment today commands much of the intellectual resources devoted to development through its own research

This project was undertaken as a consultancy for a parastatal centre.

*This was a huge project that we won the tender for and it was administered through the university. I worked in an interdisciplinary team including an economist and colleagues from human resources. We first did two parts of it. We had to do an inception report involving an extensive literature review, and then find a methodology that had the necessary rigour to produce the results. So we had both quantitative and qualitative backgrounds in the team and we included a basic econometric model, so it was very rigorous. We did not publish any articles from this, but they made our work available through their portal. The outputs from this project were many. There was the actual report. Then there was a popularised small strategy, which we had to present to a national conference of the centre. There was also a government brief and a media brief. We had to speak to the media about the work. At the national one they bring everyone in the country involved with that issue together to discuss it. I'm happy with these outputs, except the outputs to academia, because we haven't produced something that our peers can see. That is what any researcher here will tell you, when you get a consultancy it doesn't get to your peers. I asked the head of the team two years ago why we don't get a waiver to publish but we just haven't done that. So that is the only missing link. But in terms of what the purpose was we fulfilled it, because it was directed at government.*

There were also a number of research projects on the scholarship of teaching and learning, but we

---

agenda, through the consultancy industry and through its selective support of research programmes and epistemic communities in developing countries. The reward system that the aid establishment dominates favours the report over the peer-reviewed journal paper. Many academics inside and outside have been drawn into this system as they move freely through the revolving door linking academia, the consultancy industry, philanthropic organisations and international financial institutions. In the process, institutions of learning have, as in the colonial period, been harnessed to the task of remote management of the African continent."

will not detail these. These included projects around adoption of new technologies by academic staff, the development and use of open educational resources and the needs of distance-learning students.

### *Infrastructural projects*

After classifying the projects, we identified one further type of research project, which seemed worthy of identification as a further separate type. We call this an *infrastructural type* of project, as it involves an academic giving their time to set up research infrastructure, which will then be used by other academics, for further discovery-type research, as well as for further methodological research. The academic involved will be able to continue doing and publishing their own research using this infrastructure (and may end up focusing more on methodological issues), but will have invested a huge amount of time without clear rewards. Two examples of this are the building of the telescope mentioned in Mauritius and the setting up of a facility for storing, curating and making accessible survey data for use by the public in an organisation within UCT called Data First. It is possible that universities in the North are already moving towards more of their research projects taking this form. Both the UoM telescope project and the Data First project have fascinating histories as to why these two universities should have been able to move towards such meta-level projects.

### **Applying the research cycle model and its elements**

In this final section we contrast two of the projects listed above and illustrate how the three elements of social relations, users/audiences and forms of communication can be considered at each stage of the cycle.

#### *A discovery project*

With regard to the stages of the cycle and the question of degrees of openness, the telescope project provides us with an interesting glimpse into future possibilities, at the same time as it makes us deeply aware of the constraints on academics.

*The conceptualisation stage:* While we have called this a discovery project, we have indicated above how it shades into what we have called an *infrastructural type* of project, which we argue involves academics in setting up what can be seen as metaprojects that provide the empirical data for other scholars to then use for their discoveries, as well as for further discovery-type research on methodological issues. In this case, the UoM astrophysicists are deeply involved with the actual physical building and maintenance of the telescope, against tremendous odds and at personal cost.

Conceptualisation of the new telescope and participation in the SKA has been a process that has taken close to a decade, and in the case of the partnership with Mauritius, was entirely linked with both the geographical position of Mauritius, as well as the previous experiences of the academics concerned with the three earlier telescope projects. Each involved significant international linkages with India, Switzerland, South Africa, as well as numerous other countries belonging to the partnerships. The documentation around the setting up of the SKA project has been open and transparent throughout. The actual building of the telescope provides a fascinating glimpse into a form of open science, as one academic interviewed moved constantly between numerous online platforms, containing academic articles accessed through, for example, arXiv, technical specifications and open datasets, as well as communicating by phone and an open source email platform with partners in Brazil who were facing similar challenges in making technical decisions about how the telescope should be grounded and what kinds of foundations it needed.

At the same time, managing the technical process of building from a university base presents tremendous challenges. Another academic working on an integrated project said that “procurement” was his greatest challenge. Furthermore, the UoM library has rather limited subscriptions to scientific journals and when articles are not available, academics have to ask for them to be purchased through a special office and this process can take six weeks – he exclaimed that this system was “archaic!” The astrophysicist indicated, however, that he mostly managed to get around this



problem through open access journals and shared datasets.

The international networks have been carefully built and nurtured. But the power relations are not easy, as much of our other data on Mauritius shows. A quote from another Mauritian academic working on an integrated project puts it tellingly:

*I think that what is very important is that we're not seen from the North as beggars; I'm sorry to say the term. But I think we need to show people that they can partner with us, because they will gain from our science. The challenge is not just to send our students to the USA or Europe or South Africa or Japan for a postdoc, but to get those people coming to see us ... knowing that they come here not because Mauritius has got sandy beaches [or, we might add, clear skies] and so on, but because they know that we are doing good science.*

*Data collection and analysis, and articulation of findings:* Once the telescope is set up much of the data collection can be automated and much of it is quickly entered digitally into online global shared platforms. Vast quantities of data are thus generated. This data is housed and curated in many different platforms, some of which are open (see the mention of the site called spaceweather.com) and some of which are less open. The users/audiences for “scholarly communication outputs” are thus varied, and are many-to-many. The vast networks that underlie the partnerships all contribute data simultaneously. The academic interviewed is thus both a constant consumer and producer of data outputs.

More difficult is managing to reduce this data. As we saw in the vignette, the academic was concerned to find a PhD student who could work on the remaining data from the old telescope before the new one comes online. Finding and funding a PhD student in Mauritius has tended to be fraught with problems, although with new funding streams opening up this situation may improve. The academic interviewed had a maximum teaching load, which was doubled since much of his

teaching was of necessity practicals. In the first half of his one-hour interview he said on four occasions “if I can get a student [I can do this]”, but without a student, managing to write papers on this data was close to impossible. This meant that, although he was building part of the infrastructure for the SKA, he would not easily be able to progress from senior lecturer to associate professor.<sup>6</sup>

*Translation and engagement:* The first type of engagement is with the immediate scholarly community and this happens at all stages of the cycle, in practices involving both the consumption and production of data, analysis and findings through open access platforms and genres. This is therefore scholar-to-scholar communication.

The second type of engagement, involving some extent of translation, is scholar-to-student communication. The UoM Faculty of Science relies extensively on postgraduate students to do the hard work on projects. This is not dissimilar to faculties of science in other universities; however, the extent of reliance is, and the willingness to co-publish with students may be unusual.<sup>7</sup> Academics at UoM make substantive use of their own papers in postgraduate teaching, as well as at third-year level, where substantial research projects are produced by students.

Scholar-to-government communication also takes place around the telescope project. The government cannot make direct use of, for example, data on solar flares; however, it can make substantial mileage from the fact that Mauritius is a key partner in the SKA, for example. This form of communication involves not so much the communication of findings but rather the translation of processes for public relations purposes. The academic concerned had written a number of short briefings, including being pictured

<sup>6</sup> There are many reasons that lie deep in the history and culture of the university that contribute to this situation. The SCAP country case studies show that UoM has a tradition of valuing teaching over research, and that this is only just starting to change.

<sup>7</sup> Academics in the Economics Department at UCT who drew on the work of students, stated that masters students could do the “crunching of data” but seldom did the analysis or writing.

with the South African Minister of Science and Technology visiting the site of the telescope.

There were no forms of scholar-to-industry communication in this project, but substantive forms of scholar-to-community communication became evident, with the posting of data on [www.spaceweather.com](http://www.spaceweather.com) being a good example. The possibilities for connecting with open science and citizen science initiatives with this project are excellent and have strong precedents in the varied forms of current scholarly communication and the general commitment to openness.

### *An applied project*

The vignette of the applied project from UNAM presented above also demonstrates interesting but very different degrees of openness emerging from a research project. As indicated above, we could have categorised this as a consultancy since it was wholly funded by the international philanthropic institution. However, since it was seen as open-ended research with no conditions imposed as to publishing, we have categorised it as an applied project. The academic in this case is in her mid-thirties and has a promising research career ahead of her, largely as a result of her hard work and her strategic way of engaging in what are largely applied and consultancy projects, through the Multidisciplinary Research Centre (MRC) at UNAM. Her strategic awareness around the MRC arose from the fact that she had actually been employed there before getting her Humanities Faculty appointment in the Department of Geography, History and Environmental Sciences.

*The conceptualisation stage:* The academic had no involvement in the conceptualisation stage, since the terms were set by the commissioning group. It is not clear whether the academic would have asked different questions had she had some involvement with conceptualisation:<sup>8</sup>

<sup>8</sup> It was interesting to note that of the number of academics at UNAM and UB involved in consultancy work and gaining most of their substantive research experience (other than their PhD studies) through consultancy work, none questioned the terms of specification of the projects. At UCT, however, a number of academics indicated that they

*We've been doing research consultancy work because of lack of funding. Sometimes you end up doing more consultancies and maybe working on one piece of applied research. Sometimes we work with international partners; at least that is better because then you're not doing it for a client, it's just for academic enquiry.*

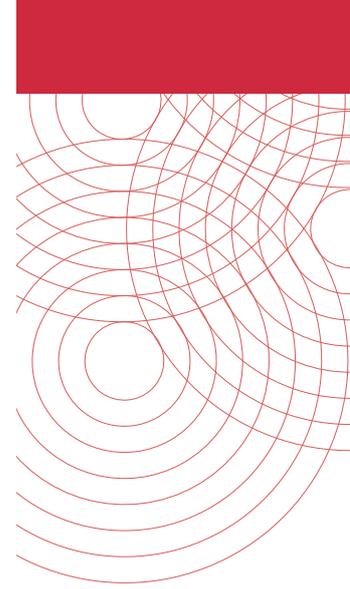
Conceptualisation led to a contract with the individual concerned and the research assistant.

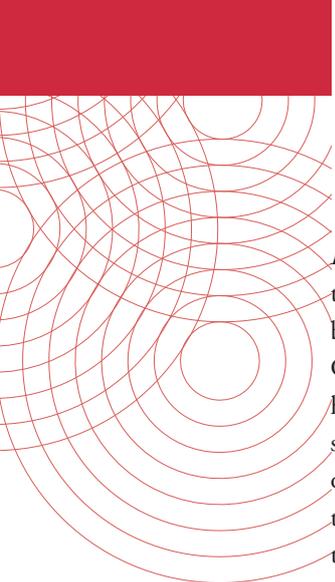
*Data collection and analysis:* This stage only involved the academic concerned, the research assistant and the group of people being researched. Accessing journal articles is very difficult, and the academic often asks someone she knows in the UK to download particular articles for her and email them, so that she can bypass the library system. In addition, when she is at home, she cannot easily access what the library does have, because of internet and log-in problems. So there are serious constraints on her ability to frame her work and analyse her data. Furthermore, she spoke at length about the difficulties in accessing Namibian data in her subject area. As we saw in the vignette, she felt that there was insufficient demographic information and quantitative material in general. Even getting the data that is there in government offices proves to be difficult as a result of gate-keeping. All of this made her anxious about the work going into the public domain.

*Articulation of findings:* She explained that she was in a very good position to write the report since she was working on her PhD at the time and this really sharpened her writing and analytical skills. Since then she feels that these have declined, largely as a result of her excessive teaching loads and the lack of research opportunities that are not consultancy work.

---

would not necessarily want to publish academic articles from consultancy work that they had done, since they did not feel the terms of specification of the research problems were appropriate for academic research projects. A number also indicated that they thought that those commissioning consultancies often were not clear about what they wanted from the consultancy.





*Engagement and translation:* She was very clear that the translation of the report into popular briefings has had a big impact. Being able to go to COP 16 in Denmark with these briefings enabled her to raise her profile considerably, much more so than if she had written an academic article on the findings. She was bemused herself about the fact that the commissioning agency had put them up on a website and that this had led to the citations that she mentioned. Many of these would, however, have been in the work of non-governmental groups. However, the briefings also made an impact on government in Namibia. She says:

*Yes, [my research] has to [be useful to government and communities]; I have to see it really contributing directly to development, whether community or something; I don't just want to do abstract kind of research. You are theorising and then it's journals and it's just there, but you want to get acknowledged and that understanding you used it to do this for development.*

## Conclusion

In conclusion, we have presented an analytical framework for researchers' communication practices, which we developed in an iterative process between the initial conceptual framework that informed SCAP's research questions, and the process of grappling with data from four different research contexts and disciplines. The framework includes the following components: the heuristic of the research cycle with its six stages (conceptualisation, data collection, data analysis, articulation of findings, translation and engagement) and three components of social relations, users/audiences and forms of communication, each of which can be analysed on continua of degrees of openness. These components can then be nuanced with the typology of research projects that cuts across the more traditional disciplinary and pure/applied categories with the five types being discovery, interpretive, applied, integration and SOTL. Our data allowed us to enrich and expand this typology with a sixth type – the infrastructural project.

An analytical framework must obviously be applied with due consideration to the unique histories and cultures of each institution studied and the national context in which it exists. Yet we believe that our framework allows for a rich and nuanced account of researcher communication practices as they are transforming, moment by moment; as the nature of research changes globally, moment by moment; and as the world of Web 2.0 offers at the same time as it coerces, new ways of communicating the very special form of knowledge that academic research is all about.

## References

- Acuna A (2013) Six degrees of openness, Keynote presentation at JISC/ British Library Discovery Summit, 25 February 2013, available at <http://www.slideshare.net/JISC/6-degrees-of-openness>
- Bourdieu P (1985) The forms of capital. In JG Richardson (Ed.) *Handbook of Theory and Research for the Sociology of Education*. New York: Greenwood
- Boyd D & Ellison N (2007) Social network sites: Definition, history, and scholarship, *Journal of Computer-Mediated Communication* 13(1)
- Boyer EL (1990) *Scholarship Reconsidered: Priorities of the Professoriate*. New York: The Carnegie Foundation for the Advancement of Teaching
- Boyer EL (1996) The scholarship of engagement. *Bulletin of the American Academy of Arts and Sciences* 49(7): 18–33
- Boyer Commission on Educating Undergraduates in the Research University (1998) Reinventing undergraduate education: A blueprint for America's research universities. SUNY–Stony Brook
- Bulger M, Meyer E, De la Flor G, Terras M, Wyatt S, Jirotko M, Eccles K & Madsen C (2011) Reinventing research: Information practices in the Humanities Research Information Network. RIN. Available at: [www.rin.ac.uk/system/files/attachments/Humanities\\_Case\\_Studies\\_for\\_screen\\_2\\_0.pdf](http://www.rin.ac.uk/system/files/attachments/Humanities_Case_Studies_for_screen_2_0.pdf)
- Chan L, Kirsop B & Arunachalam S (2011) Towards open and equitable access to research and knowledge for development. *PLoS Medicine* 8(3): 4. Available at: <http://dx.plos.org/10.1371/journal.pmed.1001016>
- Committee for Economic Development Digital Connections Council (2009) Harnessing openness to improve research, teaching and learning in higher education. Available at: [www.ced.org/pdf/Harnessing-Openness-to-Improve-Research-Teaching-and-Learning-in-Higher-Education.pdf](http://www.ced.org/pdf/Harnessing-Openness-to-Improve-Research-Teaching-and-Learning-in-Higher-Education.pdf)
- Cooper D (2009) University-civil society (U-CS) research relationships: The importance of a “fourth helix” alongside the “triple helix” of university–industry–government (U-I-G) relations. *South African Review of Sociology* 40(2): 153–180
- Cooper D (2011) *The University in Development: Case Studies of Use-Oriented Research*. Cape Town: HSRC Press. <http://www.hsrcpress.ac.za/product.php?productid=2286>
- Czerniewicz L (2013) Power and politics in a changing scholarly communication landscape. Paper presented at the 34th Conference of the International Association of Scientific and Technological University Libraries (IATUL), Cape Town, April 2013. Available at: <http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1982&context=iatul>
- Czerniewicz L & Wiens K (2013) The online visibility of South African knowledge: Searching for poverty alleviation. *The African Journal of Information and Communication* 13. Available at: <http://link.wits.ac.za/journal/AJIC13-Czerniewicz.pdf>
- De Roure D (2013) Social machines of science and scholarship. Keynote presentation at the Joint Conference on Digital Libraries (JCDL), Indianapolis, 25 July 2013. Available at: [www.slideshare.net/davidderoure/social-machines-of-science-and-scholarship](http://www.slideshare.net/davidderoure/social-machines-of-science-and-scholarship)
- Etzkowitz H (2004) The evolution of the entrepreneurial university. *International Journal of Technology and Globalisation* 1(1): 64–77
- Gibbons M, Limoges C, Nowotny H, Schwartzman S, Scott P & Trow M (1994) *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: Sage
- Gibbons M (1997) What kind of university? Research and teaching in the 21st century. 1997 Beanland Lecture. Melbourne: Victoria University of Technology. Available at: [www.uws.edu.au/\\_data/assets/pdf\\_file/0017/405251/Gibbons\\_What\\_Kind\\_of\\_University.pdf](http://www.uws.edu.au/_data/assets/pdf_file/0017/405251/Gibbons_What_Kind_of_University.pdf)
- Gillmor D (2004) The read-write web. In Gillmor D, *We the Media-Grassroots Journalism by the People, for the People*. Sebastopol, CA: O'Reilly. Available at: <http://oreilly.com/openbook/wemedia/book/index.html?PHPSESSID=547d75a64e8ed1f9d1a29b18c439573c>
- Gray E (2010) Access to Africa's knowledge publishing development research and measuring knowledge. *The African Journal of Information and Communication* 10(2009/2010)
- Gray E, Hodgkinson-Williams C & Willmers M (2009) The Opening Scholarship Project: Executive summary, Centre for Educational Technology, University of Cape Town. Available at: [www.cet.uct.ac.za/files/file/OS/ExecutiveSummary/Final.pdf](http://www.cet.uct.ac.za/files/file/OS/ExecutiveSummary/Final.pdf)
- Gray E, Trotter H & Willmers M (2012) Scholarly communication in Africa: Aligning strategy and technology for increased visibility of Southern African research. Paper presented at Emerging African ICTD Research: Learning from Africa, at the International Association for Media and Communication Research (IAMCR) conference at the University of KwaZulu-Natal, Durban, 16–19 July 2012
- Griffiths R (2004) Knowledge production and the research–teaching nexus: The case of the built environment disciplines. *Studies in Higher Education* 29(6): 709–726
- Halbert M (1998) An analysis of the internet as a proposed medium for scholarly communication using concepts from Lyotard and Bourdieu. Available at: [www.service.emory.edu/~mhalber/Research/Paper/internet.doc](http://www.service.emory.edu/~mhalber/Research/Paper/internet.doc)
- Houghton JW, Henty M & Steele C (2004) Research practices and scholarly communication in the digital environment. *Learned Publishing* 17(3): 231–249
- King CJ, Harley D, Earl-Novell S, Arter J, Lawrence S & Perciah I (2006) *Scholarly Communication: Academic Values and Sustainable Models*. Berkeley: UC Berkeley Center for Studies in Higher Education. Available at: <http://escholarship.org/uc/item/4j89c3f7>
- Kling R & McKim G (2000). Not just a matter of time: Field differences and the shaping of electronic media in supporting scientific communication. *Journal of the American Society for Information Science* 51(14): 1306–1320. Available at: <http://doi.wiley.com/10.1002/1097->

- 4571%282000%299999%3A9999%3C%3A%3AAID-ASI1047%3E3.0.CO%3B2-T
- Kraker P & Lindstaedt S (2011) Research practices on the web in the field of technology enhanced learning. *Proceedings of the ACM WebSci'1*. Koblenz, Germany
- Kress G & Van Leeuwen T (2001) *Multimodal Discourse: The Modes and Media of Contemporary Communication*. London: Arnold
- Mamdani M (2011) Africa's post-colonial scourge. *Mail & Guardian online*. Available at: <http://mg.co.za/article/2011-05-27-africas-postcolonial-scourge>
- Maron N & Smith KK (2009) Digital scholarly communication: A snapshot of current trends. *Research Library Issues* 263(April): 10–20. Available at: <http://publications.arl.org/rli263/21>
- Mkandawire T (2011) Running while others walk: Knowledge and the challenge of Africa's development. *Africa Development* 36(2): 1–36
- Mulder F & Janssen B (2013) Opening up education. In Jacobi R, Jelgerhuis H & Van der Woert N (Eds) *Trend Report: Open Education Resources 2013*. SURF, Netherlands. Available at: [www.surf.nl/en/knowledge-and-innovation/knowledge-base/2013/trend-report-open-educational-resources-2013.html](http://www.surf.nl/en/knowledge-and-innovation/knowledge-base/2013/trend-report-open-educational-resources-2013.html)
- Palmer C (2005) Scholarly work and the shaping of digital access. *Journal of the American Society for Information Science and Technology* 56(11): 1140–1153
- Palmer CL, Tefteau LC & Pirmann CM (2009) Scholarly information practices in the online environment: Themes from the literature and implications for library service development. Dublin, Ohio: OCLC. Available at: [www.oclc.org/programs/publications/reports/2009-02.pdf](http://www.oclc.org/programs/publications/reports/2009-02.pdf)
- Pendleton-Jullian A (2013) Towards designing an ecosystem of change for the future of the American research library. Presentation at American Research Libraries Membership Meeting, Chapel Hill, 1 May 2013
- Procter R, Williams R, Stewart J, Poschen M, Snee H, Voss A, Asgari-Targhi A (2010) Adoption and use of Web 2.0 in scholarly communications. *Philosophical Transactions of the Royal Society* 368(1926): 4039–4056
- Research Information Network (RIN) (2009) Patterns of information use and exchange: case studies of researchers in the life sciences. Available at: [www.publishingresearch.net/documents/RINPatterns\\_information\\_use-REPORT\\_Nov2009.pdf](http://www.publishingresearch.net/documents/RINPatterns_information_use-REPORT_Nov2009.pdf)
- Research Information Network and NESTA (2010) Open to all? Case studies of openness in research. London: Research Information Network
- Rowlands I, Nicholas D & Huntingdon P (2004) *Scholarly communication in the digital environment: what do authors want?* London: CIBER. Available at: <http://discovery.ucl.ac.uk/12298/>
- Rowlands I & Nicholas D (2006) The changing scholarly communication landscape: An international survey of senior researchers. *Learned Publishing* 19(1): 31–55. Available at: <http://discovery.ucl.ac.uk/157933/>
- Rowlands I & Nicholas D (2005) Scholarly communication in the digital environment: The 2005 survey of journal author behaviour and attitudes. *Aslib Proceedings* 57(6): 481–497. Available at: [www.emeraldinsight.com/10.1108/00012530510634226](http://www.emeraldinsight.com/10.1108/00012530510634226)
- Seely Brown J & Adler R (2008) Minds on fire: Open education, the long tail, and learning 2.0. *EDUCAUSE Review* 43(1): 16–32
- Tenopir C (2003) *Use and users of electronic library resources: An overview and analysis of recent research studies*. Washington DC: Council on Library and Information Resources. Available at: [www.clir.org/pubs/reports/pub120/pub120.pdf](http://www.clir.org/pubs/reports/pub120/pub120.pdf)
- Thorin S (2006) Global changes in scholarly communication. In HS Ching, PW Poon & C McNaught (Eds.) *eLearning and Digital Publishing*. New York: Springer-Verlag
- Totschnig M (2013) Degrees of Openness in Massive Open Online Courses (MOOCs). Presentation at eMadrid Conference, 17 May 2013. Available at: <http://es.slideshare.net/emadridnet/2013-05-17-uned-emadrid-mtotschnig-grados-apertura-mooc?>
- Van der Vaart L, Van Berchum M, Bruce R, Burgess M, Hanganu G, Jacobs N, Lecarpentier D, Pinfield S & Stokes P (2013) 'Open' as the default modus operandi for research and higher education. European Network for Co-ordination of Policies and Programmes on e-Infrastructures. Available at: <http://e-infranet.eu/wp-content/uploads/2013/03/e-InfraNet-Open-as-the-Default-Modus-Operandi-for-Research-and-Higher-Education.pdf>
- Weller M (2011) *The Digital Scholar: How Technology is Transforming Scholarly Practice*. London: Bloomsbury
- Whyte A & Pryor G (2011) Open science in practice: Researcher perspectives and participation. *The International Journal of Digital Curation* 1(6)