Scholarly Communication at the University of Mauritius

Case Study Report

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Abbreviations

ACU	Association of Commonwealth Universities
AGORA	Access to Global Online Research in Agriculture
ANDI	African Network for Drugs and Diagnostics Innovation
APC	article processing charge
BOAI	Budapest Open Access Initiative
CASR	Centre for Applied Social Research (UoM)
CBBR	Centre for Biomedical and Biomaterials Research (UoM)
CC	content coordinator
CC-BY-SA	Creative Commons – Attribution and Share Alike
CCRC	Consultancy and Contract Research Centre (UoM)
CERN	European Organisation for Nuclear Research
CET	Centre for Educational Technology (UCT)
CHAT	Cultural Historical Activity Theory
CHED	Centre for Higher Education Development (UCT)
CHET	Centre for Higher Education Transformation (South Africa)
CITS	Centre for Information Technology and Systems (UoM)
Comm	Faculty of Commerce (UCT)
CRIS	Current Research Information System
CS	civil society
CSIR	Council for Scientific and Industrial Research (South Africa)
CV	curriculum vitae
CVD	cardiovascular disease
DLIS	Department of Library and Information Studies (UB)
DOI	digital object identifier
EC	European Commission
EIFL	Electronic Information for Libraries
ERC	European Research Council
EU	European Union
FHSS	Faculty of Humanities & Social Sciences (UNAM)
FoH	Faculty of Humanities (UB)
FoS	Faculty of Science (UoM)
FTE	full-time equivalent
GDP	gross domestic product
GER	gross enrolment ratio
GNI	gross national income
HEI	higher education institution
HERANA	Higher Education Research and Advocacy Network in Africa
HINARI	Health InterNetwork Access to Research Initiative
HoD	head of department
HTML	hyper-text mark-up language
ICT	information and communications technology
IDRC	International Development Research Centre (Canada)
IMF	International Monetary Fund
IOM	International Organisation for Migration
IP	intellectual property
IR	institutional repository
IRLC	Information and Resource Learning Centre (UNAM)
ISI	Institute for Scientific Information

IT	information technology
JISC	Joint Information Systems Committee
JPG	Joint Photographic Experts Group
MECHR	Ministry of Education, Culture and Human Resources
MESR	Ministry of Education and Scientific Research
MICT	Ministry of Information and Communication Technology
MRC	Mauritius Research Council
MTESRT	Ministry of Tertiary Education, Science, Research and Technology
MUR	Mauritian rupee (currency)
NGO	non-governmental organisation
NHS	National Health Service (UK)
NIH	National Institutes of Health (USA)
NIHR	National Institute for Health Research (UK)
NREN	National Research and Education Network
NRF	National Research Foundation (South Africa)
OA	open access
OARE	Online Access to Research in the Environment
OCS	Open Conference System
OJS	Open Journal System
OpenDOAR	Open Directory of Open Access Repositories
PALM	Publishing and Alternative Licensing Model
PAO	Profiling Academics Online
PDF	portable document format
PERii	Programme for the Enhancement of Research Information
PI	principal investigation
PLOS	Public Library of Science
QA	quality assurance
R&D	research and development
RA	research assistant
RC	research coordinator
RCP	research and communication practice
RCUK	Research Council United Kingdom
REF	Research Excellence Framework (UK)
RePEc	Research Papers in Economics
ROAR	Registry of Open Access Repositories
Rs	Mauritian rupee (currency)
RSA	Republic of South Africa
RSS	really simple syndication
SADC	Southern African Development Community
SALDRU	South African Labour and Development Research Unit (UCT)
SAPSE	South African Post Secondary Education
SARUA	Southern African Regional Universities Association
SCAP	Scholarly Communication in Africa Programme
SKA	Square Kilometre Array
SRIF	Strategic Research and Innovation Framework (UoM)
TEC	Tertiary Education Commission
TEI	tertiary education institution
THE	Times Higher Education
TIFF	tagged image file format

TMG	Technology Management Group (UoM)
UB	University of Botswana
UCT	University of Cape Town
UIBR	use-inspired basic research
UNAM	University of Namibia
UNESCO	United Nations Educational, Scientific and Cultural Organisation
URL	uniform resource locator
USD	United States dollar
UTM	University of Technology Mauritius
VC	vice chancellor
VCILT	Virtual Centre for Innovative Learning Technologies (UoM)
VRE	virtual research environment
WoS	Web of Science
YRE	years of research experience

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Executive summary

The problem

African scholarly research is relatively invisible for three primary reasons:

1. While research production on the continent is growing in absolute terms, it is falling in comparative terms (especially as other Southern countries such as China ramp up research production), reducing its relative visibility.
2. Traditional metrics of visibility (especially the ISI/WoS Impact Factor) which measure only formal scholar-to-scholar outputs (journal articles and books) fail to make legible a vast amount of African scholarly production, thus underestimating the amount of research activity on the continent.
3. Many African universities do not take a strategic approach to scholarly communication, nor utilise appropriate ICTs and Web 2.0 technologies to broaden the reach of their scholars' work or curate it for future generations, thus inadvertently minimising the impact and visibility of African research.

Visibility in this context amounts to more than just "accessibility" – it means *digital* accessibility. It means that a scholarly object is profiled in such a way that makes it easily findable by search engines or databases through a relevant search string. Thus, it requires a communications strategy, one of the ingredients missing in many African universities' and scholars' approach to research dissemination.

A key way to enhance Africa's research visibility, reach and effectiveness is by communicating it according to open access principles. Making all African research outputs clearly profiled, curated and made freely available to the public would give African research a higher likelihood of not only shaping academic discourse because it would be more visible to scholars, but of getting into the hands of government, industry and civil society personnel who can leverage it for development.

This approach is already taking root in the global North. In the past few years, major funding bodies in the EU, the UK and the USA have legislated open access mandates, requiring that all research funded by them must be made open access. This will raise the visibility of those regions' research while (comparatively) lowering the visibility of Africa's research, which is not produced under a similar mandate.

However, most of the technologies required for engaging in open access communication are either already available at African institutions, freely available on the internet, or relatively inexpensive to purchase. Most also have access to the same free Web 2.0 technologies that allow individual scholars to enhance their scholarly profiles and collaborative opportunities. But these have not been incorporated into a strategic plan concerning scholarly communication, nor have enough African universities dealt with the skills and capacity challenges that new scholarly communication imperatives demand.

The research

The Scholarly Communication in Africa Programme (SCAP) 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 solutions based on experiences gained in implementation initiatives piloted at these universities. The universities that SCAP engaged were the:

- University of Botswana (UB)
- University of Cape Town (UCT)
- University of Mauritius (UoM)
- University of Namibia (UNAM)

Funded by the Canadian International Development Research Centre (IDRC), the three-year programme built on the findings of previous studies to address the particular challenges faced by African universities as they attempt to align their scholarly communication practices with rapidly evolving global standards in a manner that still reflects their core institutional values. The two questions driving SCAP's research were:

1. What is the current state of scholarly communication in (Southern) African universities?
2. How can the use of ICTs, technology platforms and open access publishing models contribute to the improvement of strategic scholarly communication, and what institutional structures are needed to support such an approach?

To answer these questions, SCAP conducted extensive research at our four partner institutions. At the UoM, we worked with the Faculty of Science (FoS) as our research and pilot site. Over the course of four site visits, we obtained information through "change laboratory" workshops (in which pilot site participants analysed their scholarly communication ecosystems), surveys, interviews, day-recall sessions, casual conversations and ethnographic observation. These research methods provided us with rich data for understanding communication activity at UoM FoS.

This research was informed by Cultural Historical Activity Theory (CHAT), a methodology which encouraged us to view scholarly communication as occurring in an ecosystem, where a change to any element impacts all of the elements in the system. This allowed to us to approach these sites as historically dynamic and culturally complex systems, requiring us to understand them as comprehensively as possible before recommending interventions aimed at raising the visibility of their research outputs.

Research and communication practices

To understand the state of scholarly communication in the UoM FoS, we explored FoS scholars' values, research production, outputs, communication practices, networks and collaboration preferences.

Values

While UoM FoS scholars are motivated to conduct research by both intrinsic and extrinsic factors (such as earning promotion, generating new knowledge and aiding national development), they are most highly motivated by simple personal desire. This is because, as a teaching-oriented university where the production of research outputs remains secondary to the fulfilment of the teaching mission, the motivation for conducting research often has to come from the individual scholars themselves. Also, because UoM's highly centralised administrative structure is relatively weak, it permits scholars to choose whether they want to focus on teaching or research.

Research production

In this context, UoM FoS scholars say that they spend the bulk of their time engaged in teaching-related activities or supervising graduate students. Their heavy teaching commitments are augmented by substantial administrative obligations that they must attend to without the support of departmental-level administrative staff. With so much time taken up by teaching and administrative duties, many say that they do not have enough time for research. A majority of FoS scholars say that they spend less than 20% of their work time involved in research-related activities.

Outputs

The university reward and incentive structure encourages scholars to produce scholar-to-scholar outputs aimed at international peers. It does not give much incentive for the production of scholar-to-community or scholar-to-government outputs.

This is especially true of collaborative work, the normative form of research production within the science faculty. When FoS scholars do produce alternative outputs, however, they tend to come from senior scholars who feel confident about sharing their research with non-academic audiences and who feel free of the "publish or perish" imperative.

This state of affairs is based on the fact that the university has not strategically examined the role that genre plays in impact. UoM appears to take it for granted that scholar-to-scholar outputs comprise the most appropriate outputs for serving the university's mission. While this may be partially true, it also minimises the impact that these outputs will have on broader audiences because they are not written in an accessible style.

Communication

While most UoM FoS staff members do feel motivated to produce research, they are far less responsive to the opportunities that new ICTs offer for disseminating their work.

While the open access movement and availability of free online tools have radically expanded the opportunities for individual academics to profile their work on the web and seek out collaborative partners, most UoM FoS scholars do not take advantage of them.

This means that UoM FoS scholars typically rely on face-to-face contact for disseminating their work, or they leave it to commercial publishing firms to handle it for them. They do not have a strategic dissemination plan that leverages the online platforms that would give greater visibility to their outputs. Nor are they encouraged to do so by UoM, as they receive no rewards or incentives for publishing through open access channels. One of the consequences of this is that UoM research rarely reaches audiences that might most benefit from it, such as policymakers, entrepreneurs or community leaders.

Networks and collaboration

UoM's demographic realities – in which individual scholars are often the lone experts in their fields – impact the ability of FoS scholars to collaborate with each other, hence most of their research peers work at overseas universities. This diminishes the quantity and quality of scholarly communication between faculty members at UoM.

This is largely due to the fact that they lack regular seminar series platforms for sharing their work with colleagues, time to prepare research presentations for collegial engagement and the density of scholars with similar research interests. They prefer, rather, to share their work at international conferences where they are able to meet with scholars who share the same research passions.

While some of these face-to-face interactions at international conferences lead to research collaborations, they are rarely with other African scholars. FoS academics find that they face significant financial and practical obstacles to pursuing research collaborations with African scholars, thus they usually end up collaborating with Northern-based scholars (often with academics who taught at or attended the same overseas graduate schools).

Policy

National and institutional policies also play an important role in shaping UoM FoS scholarly communication practices. Nationally, the Mauritian government has created a tight-knit, integrated set of policies to help transform the island from a material economy into a knowledge economy. It seeks to turn Mauritius into a knowledge hub for the region by embracing technology, innovation, research, collaboration and connectivity. While these policies do not deal directly with scholarly communication per se, they rely on a traditional understanding of what that communication would ultimately entail.

UoM's research strategy is closely aligned with these national research and innovation policies and includes useful strategies for rewarding research production. However, due to multiple disruptions at the highest levels of the UoM administration over the past five years, many of these strategies have gone unimplemented. This helps explain some of the challenges facing the university in terms of open access strategies, rewards and incentives innovations, its institutional culture and research culture.

Open access

Most FoS scholars support open access (OA) principles, even if they rarely go out of their way to ensure their own work is disseminated in an open access fashion. But OA makes sense to them because their scientific disciplines have been shaped by OA practices.

However, it is unlikely that UoM will embrace an OA policy in the absence of a broader national OA strategy articulated by the Ministry of Tertiary Education, Science, Research and Technology (MTESRT), the Mauritius Research Council (MRC) and the Tertiary Education Commission (TEC), the three bodies that guide the national research effort and with which the university aligns its own research priorities. At the moment, these bodies are committed to the idea that research knowledge is best leveraged through a ("closed") industrially oriented patenting and commercialisation approach.

Yet this approach may underestimate the value that university research could have for non-industrial audiences (such as government personnel, community leaders, educators and entrepreneurs), which could leverage that knowledge for developmental purposes.

Rewards and incentives

The university's rewards and incentive policies also fail to leverage the faculty's full research potential because they only influence scholars when they seek promotion. This creates an erratic publishing environment because it does not provide constant pressure to produce outputs with some level of consistency. Furthermore, for scholars who have chosen a more teaching-oriented approach to their careers, it provides almost no incentive to produce research at all. This is compounded by the fact that many scholars feel that they must engage in "excess teaching" to augment their meagre salaries, a decision that takes them away from ("unremunerated") research.

Institutional culture

These policy commitments are administered in an institutional culture that is highly centralised, but also weak. That is, on the one hand, the UoM administration employs a variety of bureaucratic processes that ensure that even the smallest decisions made by academics are referred back to it for official approval. But on the other hand, it has largely vacated the strategic role that it is supposed to play in shaping the policies that drive research and dissemination activity, leaving scholars on their own to decide how much research they would like to produce and how they would like to communicate it.

Research culture

One of the results of this institutional culture is a university research culture that is relatively nascent, individuated and uneven across the faculties. This is because:

- The demographic realities of this small institution – where scholars are often the lone experts in their fields – impact FoS scholars' ability to collaborate together.
- The management provides weak guidance concerning research and communication matters, leaving scholars largely free to choose whether they want to embark on intensive research or more teaching-oriented careers.

- Not only is there very little administrative pressure to produce research, colleagues place very little peer pressure on each other to do so. With research activity so individualised, FoS scholars lack the inclination to share their research with each other and thereby miss opportunities to both support and push their peers.

Infrastructure and capacity

The Mauritian government's vision for a knowledge economy requires a functional, modern, ICT-based infrastructure that can be utilised by an educated population. Tertiary education plays an important role in this vision, as institutions such as UoM are tasked with delivering "one graduate per family" and capacitating large numbers of knowledge workers to turn the island into an innovation hub.

Skills and capacity

While the university is playing its part in ramping up graduate numbers, it is not investing in open access communication strategies for its research outputs, though we believe that this will contribute more substantially to the creation of a "knowledge economy" than the closed communication paradigm under which it is currently operating. However, it is hard to see where the locus of OA activity would be situated at UoM. While the library is often the place where an institutional repository is run, the UoM library is currently focused on different priorities, primarily the support of undergraduate students. The same goes for the Centre for Information Technology and Systems (CITS) which services the university's IT needs. Essentially, UoM likely lacks the skills and capacity to quickly implement a new open scholarly communication strategy.

Implementation initiative

With the insights above gained largely through our various research instruments, SCAP implemented an intervention focused on improving the visibility of participating FoS academics by enhancing their personal online profiles. The initiative therefore focused on profiling individual scholars and their research activities rather than the entire faculty. We hoped that scholars with active online presences would be able to serve as models of networked scientific practice and act as local sources of expertise for helping other scholars develop their own online presence. Some of the insights that we gained from the implementation initiative were that:

- Disciplinary communication practices strongly influence scholars' response to external stimuli and may shape academics' behaviour even more strongly than institutional communication policies or strategies.
- Not all FoS academics are familiar with the concept of social profiling, nor are they necessarily proactive in developing their online presence.
- FoS academics find greater value in aiming their communicative activity toward colleagues in related fields (through ResearchGate) than to the public in general (through the UoM website) or non-discipline colleagues (through Academia.edu).
- e-Infrastructure constraints are not barriers to social media uptake.
- "Visibility" is less important for FoS academics than "networks".

Recommendations

Based on the insights yielded from our research and implementation activities, SCAP believes that four stakeholders can play a key role in improving UoM's dissemination activity, to whom we offer the following recommendations:

To the national government

Design a virtuous research funding cycle in which, for each recognised output produced by a scholar and disseminated in an open access fashion, funds are directed into that scholar's faculty research budget so as to spur further research activities.

Establish a national research repository for the curation and dissemination of all Mauritian research outputs.

To the UoM administration

Mandate that all publicly funded research be made open access.

Create an article processing charge fund to support the publication of OA outputs.

Continue to grow the university research budget.

Pay UoM scholars higher salaries so they do not have to sacrifice their research time by taking on "excess teaching" and so that UoM can become attractive for global scholars.

Establish or identify support service providers who can translate scholars' research for government and community-based audiences.

Reduce administrative duties for academics – such as registering students and invigilating exams – to an absolute minimum so as to open up more research time.

Train and incentivise scholars to use Web 2.0 platforms so that they can share in the responsibility of making their own research more visible.

Establish digital platforms for sharing publication success by UoM scholars.

Collaborate in the construction of short-term regional exchanges for administrators and librarians.

To UoM scholars

Share responsibility with the administration for research visibility. Communicate research findings to the audiences that could best leverage it for developmental purposes.

To research funding agencies

Determine the feasibility of developing a regional megajournal.

Chapter 1.
Programme overview

The Scholarly Communication in Africa Programme (SCAP) was established to help raise the visibility of African scholarship by mapping current research and communication practices in four Southern African universities and by recommending and piloting technical and administrative innovations at these sites based on open access dissemination principles.

SCAP was founded with the understanding that African scholarly research is relatively invisible for three primary reasons:

1. While research production on the continent is growing in absolute terms (Metcalfe, Esseh & Willinsky 2009; Mouton 2010; Tijssen 2007), it is falling in comparative terms (especially as other Southern countries, such as China,[1] ramp up research production), reducing its relative visibility.
2. Traditional metrics of visibility (especially the ISI/WoS Impact Factor)[2] that measure only formal scholar-to-scholar outputs (i.e. journal articles and books) fail to make legible a significant amount of African scholarly production, thus under-estimating the amount of research activity on the continent.
3. Many African universities do not take a strategic approach to scholarly communication, nor utilise appropriate ICTs and Web 2.0 technologies to broaden the reach of their scholars' work or curate it for future generations, thus inadvertently minimising the impact and visibility of African research.

The first challenge listed here speaks to a global phenomenon that is defined by macro-level disparities in resources, infrastructure, capacities and population sizes. These disparities help make sense of Africa's various higher education predicaments, but they

[1] Juliana Chan (2011) Asia: The growing hub of scientific research, *The Asian Scientist*, 3 April 2011. Available at: www.asianscientist.com/features/asia-future-hub-scientific-research/

[2] The Impact Factor – a metric devised by the Institute for Scientific Information (ISI) in the 1960s and now maintained by the Thomson Reuters Web of Science (WoS) – purports to measure the "impact" of a journal within a given academic field and, by proxy, suggest an evaluation of the relative impact of the articles published within it. The Impact Factor is a number representing the average number of citations that a journal's articles collectively receive during a two-year period. Thus if the impact factor for a journal in 2011 is 4, then the articles published in that journal in 2009 and 2010 collectively averaged four citations each in 2011.

cannot be changed by a small research project such as SCAP. Thus, while the SCAP team was always cognisant of this overriding context that structured the scholarly communication possibilities in Africa, we did not focus on tackling them, but rather on the latter two challenges, which were located in our sphere of influence.

The second challenge – concerning scholarly visibility metrics – is also a global phenomenon, but largely confined to the academic community and a matter of intense debate. Traditional scholarly metrics are under threat by funders, research assessment officers, open access publishers and alternative metrics advocates who seek to utilise the capacity of Web 2.0 platforms to gain a more accurate and comprehensive sense of the impact that a scholarly output has (beyond the blunt journal citation aggregations that WoS provides). Because many scholarly outputs from Africa are not published in WoS-listed journals – but rather in a plethora of other outlets – they do not get measured in the prestige-based indices that render so much of African research (including reports, briefs, conference papers, seminar presentations, consultancy work, etc.) invisible.[3] The conclusion that many analysts draw from this is that no research of value is taking place on the continent – an inappropriate conclusion given the limited perspective it provides of African research production. Therefore, in our effort to raise the visibility of African research, we advocated for scholars worldwide to use a more comprehensive, precise and "complementary" set of metrics than those currently used to assess scholarly visibility.

The third challenge – concerning the lack of strategic engagement with scholarly communication by African universities – was the main issue that SCAP hoped to change. This is a challenge located largely within the boundaries of the continent, the product of choices and priorities by African governmental ministers, university managers and academics. As a research and implementation initiative located in Africa, committed to locally appropriate solutions, SCAP decided to intervene at this level where we could have the greatest effect. It was our belief that if we could research and advocate a more strategic approach to scholarly communication, we could not only raise the visibility of Southern African research, but also offer a model to other African universities seeking to do the same. This would be based on strategic policy innovations, open access principles and Web 2.0 ICT platforms.

The universities that SCAP engaged were the:

- University of Botswana (UB)
- University of Cape Town (UCT)
- University of Mauritius (UoM)
- University of Namibia (UNAM)

[3] Mouton (2010: 8) states that "international publication in the ISI-journals (19,154 articles for the total period 1990–2007) only constitutes about one third of total social science scholarship in the [Southern African] region." This corresponds with the ratios given by the University of Namibia in a recent research report that says, "the year under review has seen a total output of 394 publications from the University, 23% of which are peer-reviewed journal articles and 11% are books and book chapters" (UNAM 2009: 6), meaning that 66% of outputs were "other" types (2009: 9), guaranteed to be invisible according to the ISI/WoS index. This high production ratio of non-indexed materials in the region is discussed in more detail in Chapter 5.

Scholarly in/visibility

Scholarly communication comprises a broad range of activities "including the discovery, collection, organisation, evaluation, interpretation, and preservation of primary and other sources of information, and the publication and dissemination of scholarly research" (Cullyer & Walters 2008: 1). In this report, it will largely focus on the communication activities necessary for research collaboration and output dissemination. However, the effectiveness of this communication – especially output dissemination – is shaped by the fact that audience attention is a scarce resource. There are more scholarly outputs produced than can be equally engaged by the academic community, meaning that scholarly outputs are in a state of competition with each other, with some achieving greater "visibility" than others.

According to Abrahams, Burke and Mouton (2010: 22), "visibility is comprised of a number of features including visibility of authors and content through abstracting and indexing databases, through availability in library collections, through web-based publishing, and visibility of research performance as measured through various bibliometric measures such as citation counts and impact factors." It is not simply publication in a journal listed by the Thomson Reuters WoS, which has for a long time been the standard by which visibility is assessed. Rather:

> *Visibility of scholarly communication means that specific knowledge and authored works can be discovered because they are traceable. More importantly, in this regional context, visibility means that research on subjects and themes of local interest should be made public in ways that will enable the relevant actors (researchers, students and development practitioners) to easily identify local research that can be a valuable contribution to society, whether for future knowledge production or for development practice.* (Abrahams, Burke & Mouton 2010: 22–23)

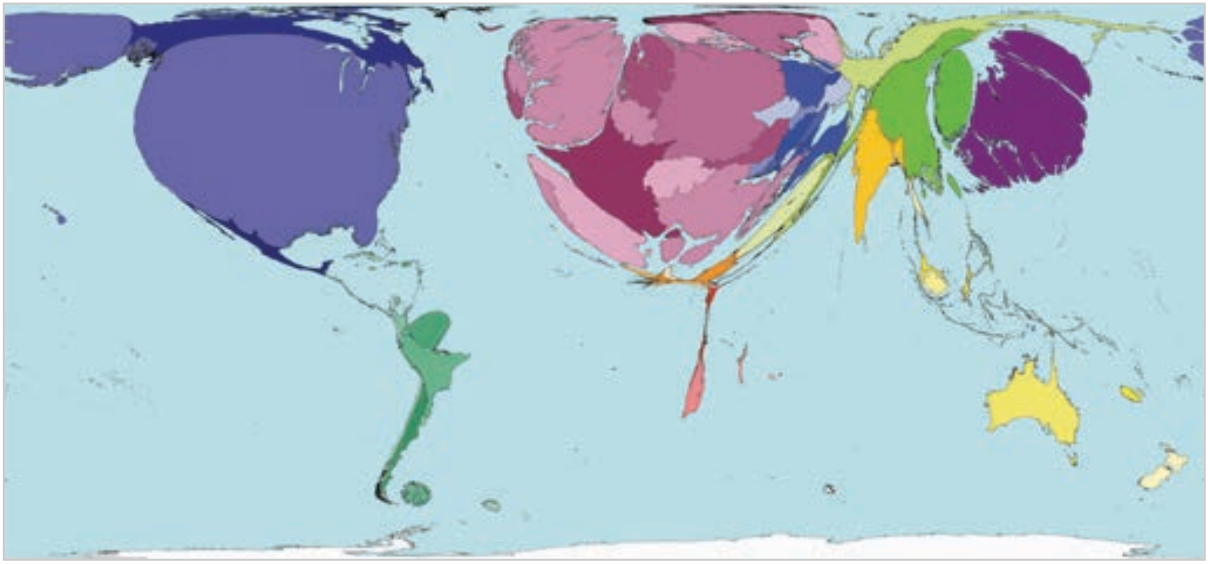
This means that visibility amounts to more than just "accessibility" (such as when an object is available in hard copy at a university library). It means *digital* accessibility. Moreover, it means that a scholarly object is profiled (usually through metadata) in such a way that makes it easily findable by search engines or databases through a relevant search string. Without such metadata, or without the object shared in a format that allows crawlers to search its text (such as PDFs and HTML pages rather than TIFFs and JPGs), then the digital object remains virtually invisible. In those cases, it is technically accessible, but essentially invisible because it is not locatable using standard searching procedures. Thus, visibility requires a communications strategy, one of the ingredients missing in many African universities' and scholars' approach to research dissemination.

This lack of strategy is partially responsible for the disorienting image in Figure 1.1 which visually represents the relative contributions made by each country to global scientific research output as published in ISI-listed journals (in 2001). The fish-eye effect of this perspective squeezes the massive African continent down to the size of a narrow peninsula, thus begging for explanation. However, this startling representation is indicative not of the absence of research activity per se, but of the continent's lack of

representation in "international" journals and its inefficiency at disseminating research findings in a more strategic, representational manner. As Tijssen (2007: 307) points out:

> *It is important to keep in mind that these diminishing shares of African science do not reflect a decrease in an absolute sense, but rather an increase less than the worldwide growth rate. During the last 15 years, African output has in fact risen by 38%, up to some 46,000 articles in 2001–2004.*

Figure 1.1 Representation of global scientific output, by proportion of ISI article production[4]



Chan, Kirsop and Arunachalam (2011: 1) further caution against an over-simplified reading of this cartographic representation, in that "this inequity has led to the misguided notion that little, if any, research of substance is generated in the global South, and that the needs of researchers in poor countries are therefore met solely by information donation from the North."

However, given that this map is based on data from 2001, it likely shows Africa in a "thicker" visual profile than if the numbers were current. It does not account for the explosion of research production from places like China, which would render Africa's profile even "skinnier", despite the continent's absolute increase in high-rated scientific publications.[5] Thus the challenges regarding Africa's visibility remain a persistent concern even as scholarly communication trends evolve.

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[4] The map illustrates the relative proportions of ISI-rated scientific papers published per million people in 2001. This covers articles in physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering, technology, and earth and space sciences. The number of scientific papers published by researchers in the USA was more than three times greater than the number published by the second-most-publishing nation, Japan. Source: www.worldmapper.org/display.php?selected=205 [accessed 2 September 2010]. Image copyright SASI Group (Univ. of Sheffield) and Mark Newman (Univ. of Michigan). Permission has been granted to reproduce this figure under the terms of the Creative Commons Attribution License.

[5] This particular Worldmapper image has not been updated since 2001 according to Professor Mark Newman (private communication), one of the creators of the map. Other evidence that we have drawn from Tijssen (2007) and Mouton (2010) suggests that an updated map would make Africa appear even less visible. Indeed, due to its comparatively low level of outputs in ISI-rated journals, Africa is often lumped into a "rest of the

Furthermore, as Mouton (2010: 6–7) explains:

> *The ISI-journals have a distinct Anglophone bias which leads to poor coverage of Francophone and (to a lesser extent) Lusophone countries in SSA [sub-Saharan Africa]. In addition the ISI's coverage of small journals in developing countries is not good. The latter is a result of the policy of the ISI to include only the highest impact journals in the world which means that many journals in the developing countries (which have small circulation lists and hence restricted readerships) are thereby automatically excluded. All of this means that a significant proportion of African social science is simply not visible in international indexes.*

Hence, because so much African scholarship remains outside of the ISI/WoS index, and because continental institutions and scholars have not applied a cohesive or strategic approach to disseminating outputs, "there is a preponderance of unpublished research, including conference and advocacy papers, technical and consultancy reports, theses and dissertations ('grey' literature) which is not easily accessible because it is generally not held in university libraries or available online" (Abrahams, Burke & Mouton 2010: 29).

Of course, institutions around the world face new imperatives to increase investment in research production and knowledge management. For research institutions, this means adapting a strategic focus on content curation and profiling so as to boost institutional reputation, remain competitive in global institutional rankings, provide support services that academics rely on to conduct research and collaborate internationally, and maintain compliance with grant funder mandates.

For African research higher education institutions (HEIs) there are additional pressures for developing scholarly communication practice and ramping up the institutional content curation effort. For instance, faced with limited research grant funding and constrained by international publishing opportunities, African HEIs must choose whether they want to support local (particularly niche) research by making outputs from that effort freely and openly available. Doing so would encourage the production of local scholarship and ensure that African scholars have access to locally relevant content by authors embedded in the context. But failing to do so would wither nascent research buds on the continent, forcing greater reliance on externally produced research. As Abrahams, Burke and Mouton (2010: 24) point out:

> *Students, researchers and practitioners are likely to cite and utilise authored works from abroad over work from the region because of high versus low visibility in particular areas of study, such as in genetics, education and environmental engineering, where research output is particularly low. Thus, low visibility and low accessibility are major factors in slowing down research production on the sub-continent, thus limiting the application of knowledge for development purposes.*

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world" category in various research impact reports. (See for instance the National Science Foundation's *Science and Engineering Indicators 2012 Digest* section on "Research Outputs: Publications and Patents" at: www.nsf.gov/statistics/digest12/outputs.cfm#1)

The need for research to address development is not unique to the African context, but the links between dissemination, innovation and development increase the imperative (and prospective return) for African universities to profile and curate their own research. In line with this approach, the knowledge production enterprise funded by taxpayers needs to move beyond a "closed" academic enterprise (in which knowledge exchange typically happens on a scholar-to-scholar basis by means of the traditional journal article or book chapter) to an "open" exchange process that includes scholar-to-community and scholar-to-government activities (utilising a broad range of content formats and genres).

Open access for development

A key way to enhance the visibility, reach and effectiveness of African research is by communicating it according to open access principles. By "open access", we mean that scholarly research outputs are made freely available:

> *on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles [and other output types], crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.* (BOAI 2002)[6]

Making all African research outputs clearly profiled (through metadata), curated (on stable digital platforms) and freely available to the public (at no cost to the user) would give African research a higher likelihood of not only shaping academic discourse because it would be more visible to scholars, but of getting into the hands of government, NGO, industry and civil society personnel who can leverage that research for economic growth and development.[7]

According to Chan, Kirsop and Arunachalam (2011: 1), the growing volume of open access resources "provides a far greater degree of freedom for researchers to exchange and collaborate, for knowledge to be translated into useable forms by frontline health workers, and for emerging technologies such as text mining and semantic tagging for faster knowledge discovery to be used." Moreover, research shows that open access publication increases the likelihood that a scholarly output is both read and downloaded at a higher rate than non-open access publications (Gargouri *et al.* 2010).

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[6] A number of groups and organisations – in Budapest (2002), Bethesda (2003) and Berlin (2003) – have defined open access from slightly different perspectives. For a useful discussion of open access, see: Suber (2012); Peter Suber's "Open Access Overview", available at: http://legacy.earlham.edu/~peters/fos/overview.htm; and the OASIS (Open Access Scholarly Information Sourcebook) article, "Open Access: what is it and why should we have it?" Available at: www.openoasis.org/index.php?option=com_content&view=article&id=130&Itemid=390

[7] For example, "The publicly funded Human Genome Project and its freely reusable data generated a massive 141-fold return on investment in economic returns alone [and] 30% more new clinical products than the privately funded, closed genome-sequencing project of the US biotech firm Celera Genomics" (Neylon 2012).

However, at the moment, "many research publications by African researchers, especially those focused on domestic or regional African issues and problems, are not accessible through the modern ICT facilities" (Tijssen 2007: 324). Furthermore, "multiple stakeholders including university presses, libraries, and central IT departments are challenged by the increasing volume and the rapidity of production of these new forms of publication in an environment of economic uncertainties" (Harley 2008: 2).

This means that African universities – many of which are only now beginning to develop research agendas of their own – must also establish new capacity, processes, governance structures, business models and policy frameworks for open access communication. This is not a trivial matter, nor is it easily achieved. Yet despite the burden that a move to a strategic engagement with open access would mean for most African universities, SCAP remains convinced that it must proceed.

Consider the broader open access context in which African scholars must chart their path: in the past few years, major funding bodies in the EU, the UK and the USA have legislated open access mandates, requiring that all research funded by them must be made open access (see Chapter 4 for more details on funder mandates). This will raise the visibility of the North's own research outcomes while (comparatively) lowering the visibility of Africa's research, which is not produced under a similar mandate. The flood of research that will emerge from the North will further marginalise the relatively small volume of outputs coming from Africa. This research will not only be openly shared, but will be curated and described with metadata, making content interoperable, searchable and indexable at unprecedented levels.

These global developments – which will likely be matched in other parts of the world soon – require urgent action from African institutions. SCAP believes that this marks an opportunity for African universities to move beyond playing "catch-up" with the North to leveraging new technologies and approaches to address local ambitions while participating in the international scholarly landscape.

Technology and capacity

Africa's response to this changing communications environment will require not only strategic dissemination policies and open access publishing practices, but appropriate use of new technologies that are reshaping the scholarly communication environment. The advances in ICTs over the past years – such as broadband internet, Web 2.0 platforms and inexpensive digital storage devices – have transformed scholarly communication, yet, to date, many ICT innovations have failed to act as an equalising force in academic collaboration and contribution on the continent. In some ways, they have reinforced familiar global inequalities that resemble a "digital divide" (Fuchs & Horak 2008) between the visible and the invisible.

However, this need not be the case in the future. Most of the technologies required for engaging in open access communication and visibility-raising dissemination are either already available at African institutions, freely available on the internet, or relatively inexpensive to purchase. For instance, many African universities possess high-resolution

scanners, institutional repositories, websites, computers, servers and access to the internet. They also have access to the same free Web 2.0 technologies[8] – such as Academia.edu, ResearchGate, Mendeley and FigShare – that have allowed individual scholars elsewhere to enhance their scholarly profiles and collaborative opportunities. The problem is that these have not been incorporated into a strategic plan concerning scholarly communication. They have been utilised in an ad hoc fashion, often the pet project of a lone innovator, but not part of a systematic approach to an institutional issue. Thus the solution is not simply to have "access" to current technologies, but to have a plan for how to use them.

Moreover, the incorporation of new ICTs into an existing scholarly ecosystem requires the skills and capacity to support and maintain them. This is often lacking at African universities where training efforts focus on other aspects of a job (such as book cataloguing for librarians rather than DSpace metadata capturing of alternative outputs). It is also due to a lack of funding to hire and train new people.

Thus, each of these elements is important for raising the visibility of African scholarship: an open access dissemination strategy, access to and use of Web 2.0 technologies and the human capacity and skills to use them. Each of these exists within reach of most African universities, but only if they are made a priority. The SCAP project was initiated to help achieve that.

Project description

Funded by the Canadian International Development Research Centre (IDRC), the three-year SCAP programme, which commenced in 2010, built on the findings of a number of previous studies and interventions[9] to address the particular challenges faced by African universities as they attempt to align their scholarly communication practices with rapidly evolving global standards in a manner that reflects their core institutional values.

SCAP was a research and implementation initiative that sought to demonstrate, through the use of case studies and the development of a research evidence base, the financial, institutional and technical feasibility of universities in Southern Africa to assume greater responsibility for publishing their research in an open manner. Its central aim was to increase the visibility of African research and scholarly communication.

The primary question driving SCAP's research was:

> *What is the current state of scholarly communication in (Southern) African universities?*

[8] Web 2.0 (or Web 2) in the context of this project refers to advanced internet technology and applications such as blogs, wikis, social networking, bookmarking and RSS (really simple syndication) feeds. These technologies are commonly associated with web applications that facilitate interactive information-sharing, interoperability, user-centred design and collaboration.

[9] At the local level, these included UCT Centre for Educational Technology projects funded by the Shuttleworth Foundation in the period 2006 to 2009, namely the OpeningScholarship project and the UCT Open Educational Resources initiative, as well as other initiatives such as the IDRC-funded PALM Africa project. At the regional level, the programme was strongly informed by prior research and networking activity of the Southern African Regional Universities Association (SARUA) and the activities of the IDRC Open African Innovation Research and Training (OpenAIR) intellectual property research programme.

To answer this, SCAP visited each partner university four times over the course of two years in order to conduct interviews with scholars, librarians and managers, and to gather data through seminars, "change laboratory" workshops and surveys (a process discussed in detail in Chapter 2).

A secondary question driving our research was:

> *How can the use of information and communication technologies (ICTs), technology platforms and open access publishing models contribute to the improvement of strategic scholarly communication, and what institutional structures are needed to support such an approach?*

To answer this, SCAP engaged in a series of institution-based implementation initiatives at each pilot site, stimulating the research environment and observing the results (discussed in detail in Chapter 6).

The specific objectives of the project were to:

1. Map the current status of research dissemination in four selected universities from four Southern African countries.
2. Understand the policy, ICT infrastructure and administrative support systems needed to integrate scholarly publishing and dissemination at these universities.
3. Work with partners from selected universities to support the use of open source platforms that could interface with outputs such as journals, books and conference proceedings.
4. Build capacity in managing and sustaining an integrated scholarly communication system.
5. Explore the costs and benefits resulting from open access communication.
6. Develop complementary metrics that could align quality concerns, recruitment, recognition and rewards systems in order to promote greater access to knowledge.
7. Engage with institutional and governmental policymakers to raise the visibility of African research.

SCAP was originated in response to the need to grow the profile and global competitiveness of African research output. The project's primary concern was with dissemination out of universities, rather than issues around building research capacity. That said, it acknowledged the intrinsic link between research processes and communication, and the importance of examining current scholarly communication policy, practice and infrastructure against the institution's wider cultural historical context.

The complex nexus of issues and the interrelationships between low research productivity, declining annual national expenditure on research and development, and other national and regional factors affecting scholarly productivity has been documented in other studies, such as those by Abrahams *et al.* (2008), ASSAF (2006), Cloete, Bailey and Maassen (2011), Habib and Morrow (2007), Harle (2010), Kotecha, Walwyn and Pinto (2011), Kotecha, Wilson-Strydom and Fongwa (2012), Mouton (2010) and Mouton *et al.* (2008). The SCAP research and implementation process built on this complex-systems approach seeking not only to understand institutional scholarly communication

activity systems across micro (department/faculty/unit), meso (institutional) and macro (national/regional) levels, but also to grasp how these systems have been shaped by historical factors over time.

SCAP operated on the assumption that although African higher education environments faced a myriad of challenges, there was an opportunity to increase the production and visibility of scholarly outputs in Africa through the use of Web 2.0 technologies, digital publishing and curation platforms, and confederated computing and content hosting structures.

But before these opportunities could be harnessed, each institution's scholarly communication ecosystem had to be described, analysed and understood – a process necessitating significant research (the results of which are discussed in Chapter 5). It also required an ambitious advocacy component that required us to engage with university scholars, librarians and managers, as well as other higher education stakeholders in government and civil society.

This report shares the results of SCAP's research and advocacy efforts, describing not only the scholarly communication ecosystem that currently exists at this partner institution, but the opportunities available for raising the visibility of its scholarship. It concludes with a discussion of our research findings and a series of recommendations – aimed at the national government, university management, university academics and research funding agencies – that we believe would enhance the communicative and developmental potential of the university's research.

Chapter 2.
Project components and methodology

The SCAP programme arose from an 18-month scoping process that took place in 2008/2009 under the direction of Eve Gray, an African scholarly communications and open access expert (Gray 2006, 2010; Gray & Kahn 2010; Gray, Trotter & Willmers 2012). Hosted jointly by the Centre for Educational Technology and the Research Office at the University of Cape Town, SCAP was launched in March 2010.

Selection of pilot sites

One of SCAP's first tasks was to identify the three other universities – along with UCT, SCAP's host institution – to participate as partner sites. Though SCAP hoped that our work would be able to impact the discourse on scholarly communication throughout Africa, for practical (financial, logistical and linguistic) reasons, we decided to focus our research on universities in the Southern African Development Community (SADC) region. Through a collaborative process with the Southern African Regional Universities Association (SARUA),[10] SCAP assessed potential university partners against a series of criteria such as level of research engagement, history of dissemination activity, as well as other characteristics such as size and language.

The four institutions in the SCAP sample happened to be in the most research-productive countries in the SADC region according to the Thomson Reuters ISI indexes. As Mouton *et al.* (2008) show, South Africa is the most productive country in the region, producing an average of 80% of all output in SADC for the period 1990–2007 (119 papers per million of population compared to the regional average of 29 papers per million). Botswana was the second most productive country, with 96 papers per million, while Mauritius and Namibia were the only other two countries with productivity levels above the regional average.

[10] SARUA is a regional higher education and vice chancellors forum operating in the SADC region with a strong open access strategic focus. See: www.sarua.org/

Table 2.1 Ranking of SADC countries in terms of ISI papers per million of the population (2007)

Country	Total population millions (2007 est.)	ISI papers (2007)	Papers/million of population
South Africa	47.0	5,505	119.3
Botswana	1.8	172	95.5
Mauritius	1.2	47	39.1
Namibia	2.0	70	35.0
Zimbabwe	12.3	251	20.4
Swaziland	1.1	18	16.4
Malawi	13.6	209	15.4
Zambia	11.5	155	13.5
Tanzania	39.3	492	12.5
Madagascar	19.4	150	7.7
Lesotho	2.1	13	6.2

(Source: Mouton *et al.* 2008)

Despite concerns about the value of the ISI system (which we detail in Chapter 3), these indicators were useful in terms of categorising the study sites in relation to other SADC higher education institutions (HEI) and their apparent research productivity. The fact that SCAP was working with the four most research-productive HEIs in the region meant that we could explore correlations between size, output productivity and capacity in determining how feasible it was for regional institutions to profile the knowledge they produce. Though many differences exist between SADC institutions, if the most productive of these faced visibility challenges, then it stood to reason that the others would face similar problems, perhaps even more acutely.

Once the universities of Botswana, Mauritius and Namibia were nominated, SCAP reached out to their vice chancellors to propose a partnership. We sought to obtain senior management's mandate to engage with its academic community and to create the necessary buy-in for us to research this community's scholarly activity. Institutions were invited to designate research coordinators (RCs) – senior academics with an interest in open access practices – who would facilitate identification of pilot sites within the institution and to appoint research assistants to assist with data collection and other project work.

We believed that it was not feasible, given time frame and resource constraints, to research the scholarly communication practices of academics throughout the entire university; therefore we focused on pilot sites that were (hopefully) to act as microcosms of the institution, allowing us to extrapolate lessons learned and recommendations for sharing with the rest of the institution – and to other African institutions.

We realised that scholarly communication in these contexts would be impacted by varying institutional, disciplinary and cultural norms; we therefore always tried to remain clear as to which structural forces were doing the most to shape a particular

activity. While this minimised our capacity to generalise across all four sites in certain respects, it also allowed us to understand the diversity of these contexts and gain a nuanced sensibility about their challenges and opportunities. With this point in mind, the following served as our pilot sites:

- UB: Department of Library and Information Studies (DLIS) in the Faculty of Humanities (FoH) – 18 members
- UCT: Southern African Labour and Development Research Unit (SALDRU) – an independent research unit in the Faculty of Commerce (Comm) – 32 members
- UoM: Faculty of Science (FoS) – 55 members
- UNAM: Faculty of Humanities and Social Sciences (FHSS) – 77 members

SCAP approached each of the study sites as unique contexts with independent historical legacies and research communication cultures. Therefore efforts were made to ensure parity in project activity across the sites. However, the principal investigation (PI) team acknowledged that the approach to UCT would be slightly different because we were already "embedded" in the institution, a fact that both limited and expanded the kinds of insights we could gain about it.

Moreover, we understood that UCT was atypical in both Africa and Southern Africa. As the highest-ranked university on the continent[11] with a history stretching back to the 1820s,[12] UCT enjoyed significant financial, infrastructural and human capacity advantages over the other three universities. It also boasted a significantly larger academic staff: according to the most recent public figures, UCT[13] had 2,200 academic staff, UB[14] had 877, UNAM[15] had 340 and UoM[16] had 293. Nevertheless, these differences did not invalidate a comparison across institutions, but simply begged for continued recognition of the structural and historical differences that defined them.

The principal investigation (PI) team

SCAP research was led by a PI team based in the Centre for Educational Technology (CET), a department in the Centre for Higher Education Development (CHED) at UCT. This team comprised a research lead, a research officer, a research assistant, the programme manager and the programme director. All research work was undertaken in consultation with RCs at participating sites, but the ability of RCs to formulate and conduct independent research was constrained by the fact that they held academic posts with concomitant teaching and administrative loads. In addition, the RCs had been placed in the role because of their interest in the area, not necessarily their expertise. There was therefore significant capacity development entailed in the exchange between the PI team and institutional research teams.

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[11] According to the 2012–2013 Times Higher Education World University Rankings, available at: www.timeshighereducation.co.uk/world-university-rankings/2012-13/world-ranking/region/africa
[12] Ages of participating institutions – University of Botswana: 30 (founded 1982), University of Cape Town: 183 (founded 1829), University of Mauritius: 47 (founded 1965), University of Namibia: 20 (founded 1992).
[13] UCT (2012c)
[14] UB Facts and Figures (2013), available at: www.ub.bw/content/id/1989/Facts-and-Figures/
[15] SARUA profile of UNAM, available at: www.sarua.org/?q=uni_University%20of%20Namibia
[16] UoM: History (2011), available at: http://sites.uom.ac.mu/induction/index.php?option=com_content&view=article&id=46&Itemid=1

The SCAP programme was designed around four rounds of institutional site visits to each of the participating sites. These visits allowed the PI team to build institutional relationships, collect research data and formulate a framework for implementation activity. The PI team also gave presentations, ran workshops, conducted interviews and engaged in individual conversations with a wide range of stakeholders on each visit in order to stimulate discussion around scholarly communication.

The site visits also gave the PI team a more nuanced, ethnographic understanding of the lived reality of the pilot academics. Team members were able to see (and sometimes experience) first-hand the administrative, technological and social qualities defining scholarly communication activity at our partner sites. (For instance, by using the internet at some universities, we could see what scholars meant when they complained of low bandwidth; or by trying to source official information from certain universities, we could identify with their scholars' "red tape" woes.)

Methodology

SCAP's overall research design was based on the case study approach. We adopted this so that we could conduct in-depth research at four universities in four countries across different faculties and disciplines and so that we could experiment with a diverse set of intervention strategies. The case study approach allowed us to probe deeply into the different field sites (Flyvbjerg 2011; Mitchell 1984) while at the same time ensuring that some of our data would be comparable across them.

SCAP's methodological approach could be categorised as "developmental intervention-based research", as it went beyond a concern for only data collection to that of research as praxis, aiming to enable participants to understand and change their realities. To help develop capacity and stimulate our pilot environments, the programme incorporated implementation processes for experimenting with new approaches to open scholarly communication that ran alongside our research process.

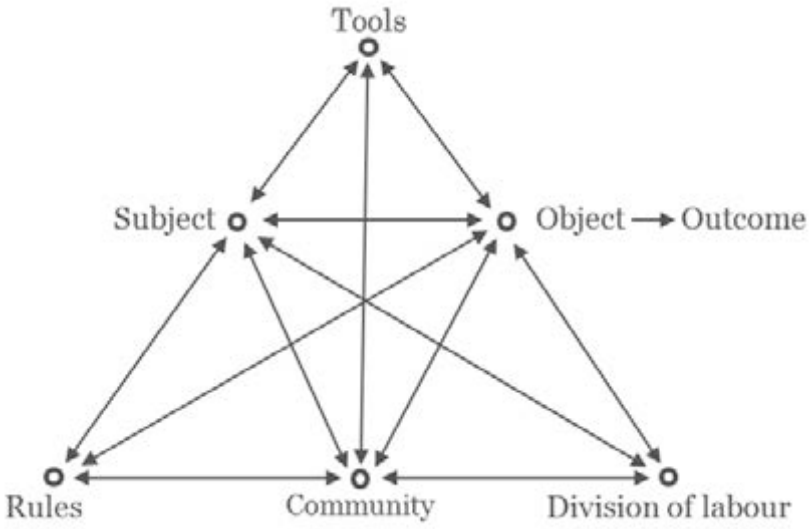
Cultural Historical Activity Theory (CHAT)

SCAP used Cultural Historical Activity Theory (CHAT) to inform our research approach. We chose CHAT because it is useful for identifying obstacles in complex activity systems, especially those that are structured by deep, complicated and sensitive cultural and historical elements.

With its origins in Soviet social psychology in the earlier part of the 20th century – in particular the work of Vygotsky and Leont'ev (Chaiklin & Lave 1993; Daniels 2008) – the key tenets of early Activity Theory is that activity is mediated action and that the social and the technical are mutually constituting. These tenets were then developed by Engeström (1987, 2000; Cole & Engeström 1993) into the CHAT approach that we utilised, which locates the activity systems concept at its centre.

An activity system is a collective formation in which a *subject* (here referring to a group, not an individual) acts purposefully towards the fulfilment of an *object* and a set of *outcomes*. Figure 2.1 shows a representation of an activity system with its constituent nodes placed at distinct points on the triangle.

Figure 2.1 Representation of an activity system in the CHAT tradition



The diagram above represents the different nodes that constitute an activity system. Starting with the top horizontal line, a *subject* seeks to achieve a purpose (the *object*) which will result in an *outcome*. In our research, the subjects were academics seeking to produce and disseminate research (the object) so that they could contribute to national development, secure promotion, comply with an institutional mandate, etc. (outcomes).

During this process, subjects utilise *tools* (the top node) such as computers, books, personal credentials and other artefacts to achieve their purpose. This means that all action is "mediated" by the use of such tools.

Along the bottom horizontal line are three further nodes that also serve to mediate action: rules, community and division of labour. According to Engeström (1996: 67), the *rules* refer to the explicit and implicit regulations, norms and conventions that enable and constrain action within a system. In our context, these *rules* were often disciplinary norms (informal) and institutional policies (formal).

The *community* comprises the people and groups sharing the same general object as the subject. In our context, these were typically funders, colleagues, librarians, managers and students.

Lastly, the *division of labour* refers to the horizontal division of tasks between members of the community and the vertical division of power and status. In the case of academics, the horizontal division involves relationships with peers (inside and outside the university) in the production and communication of research, while the vertical division involves relationships with research and university managers, as well as national research structures. The various non-academics listed in this node also have their own activity systems that are devoted to different objects. These other activity systems exist in fluctuating states of tension and alignment with the first activity system, depending on how they are structured and engaged.

A key virtue of this design is that it presents activity systems as "ecosystems", in which stimulation or change in one node leads to transformations throughout the entire system. For instance, the introduction of new tools (repositories, etc.) or the alteration of rules (policies, etc.) would impact the entire system. Thus, we thought of these activity systems as ecosystems that were unique, dynamic and sensitive to change.

CHAT principles

In CHAT theory, activity systems are defined by five key principles:

1. *Collective activity*: "A collective, artifact-mediated and object-oriented activity system is taken as the prime unit of analysis. Activity systems realise and reproduce themselves by generating actions and operations" (Engeström 2001: 136).
2. *Multi-voicedness*: "An activity system is always a community of multiple points of view, traditions and interests. The division of labour in an activity creates different positions for the participants [and] the participants carry their own diverse histories" (Engeström 2001: 136).
3. *Historicity*: "Activity systems take shape and get transformed over lengthy periods of time. Their problems and potentials can only be understood against their own history" (Engeström 2001: 136).
4. *Contradictions*: Instability (internal tension) and contradictions are the "motive force of change and development" (Engeström 1999: 381). "Contradictions are not the same as problems or conflicts. Contradictions are historically accumulating structural tensions within and between activity systems" (Engeström 2001: 137).
5. *Expansive learning*: "Activity systems move through relatively long cycles of qualitative transformations. As the contradictions of an activity system are aggravated, some individual participants begin to question and deviate from its established norms. In some cases, this escalates into collaborative envisioning and a deliberate collective change effort. An expansive transformation is accomplished when the object and motive of the activity are reconceptualised to embrace a radically wider horizon of possibilities than in the previous mode of the activity" (Engeström 2001: 137).

Change laboratories

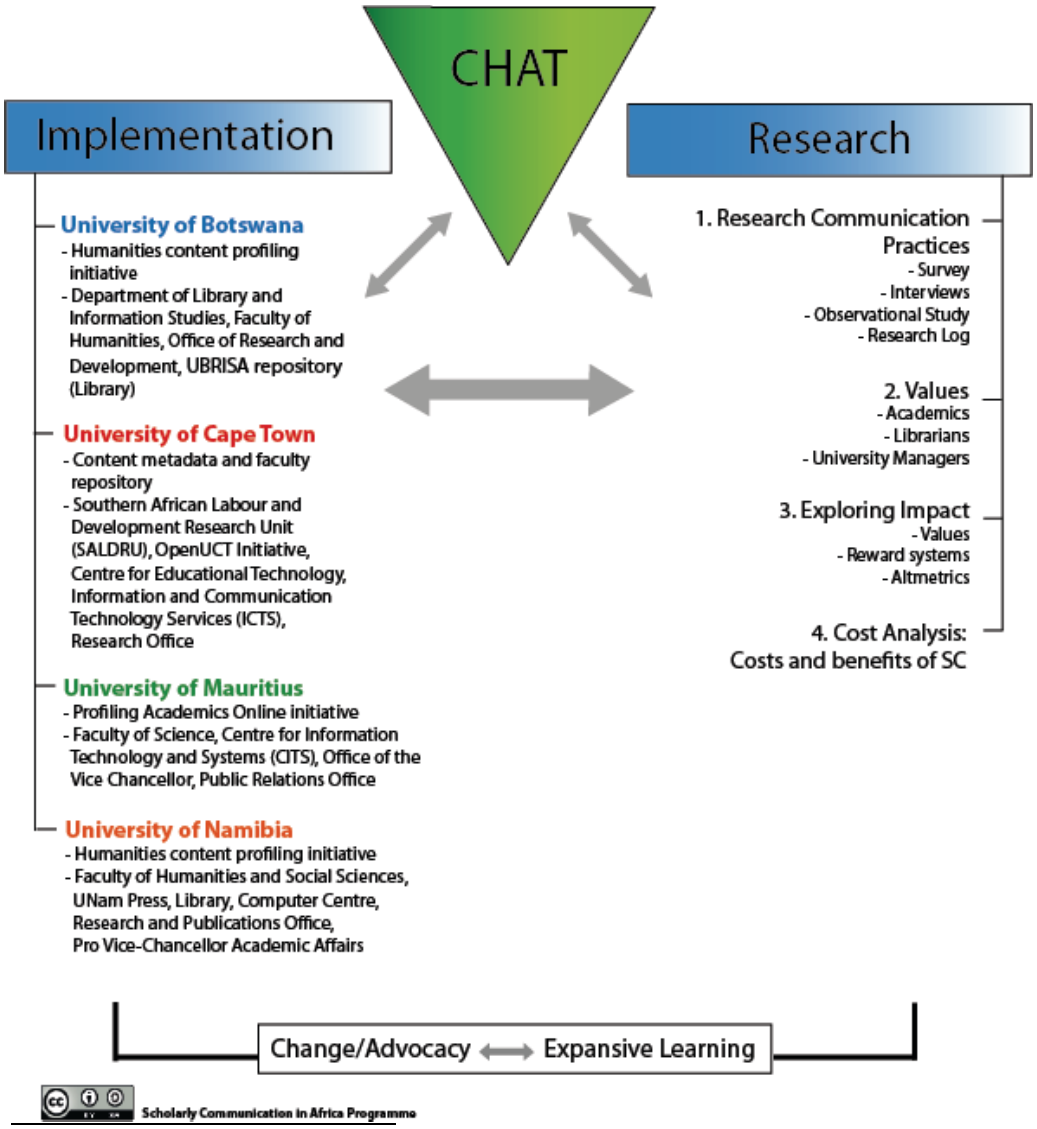
Key to the CHAT methodology are "change laboratories" (Engeström, Miettinen & Punamäki 1999). These are workshop-like events where participants collectively identify contradictions in their activity systems. In this manner, they explore interventions that would align those systems so they can better achieve their object. SCAP took it as axiomatic that each of our pilot sites had misalignments that could be identified and re-aligned so that they could operate optimally. For many change lab participants, the CHAT approach offered a useful method for comprehending the complexity of their scholarly communication ecosystems, inspiring them to look beyond technical (tools-oriented) solutions to their challenges and to consider them from the vantage of each

node and connection.[17] The knowledge we gained from our change labs was contextualised through data from our research strands. Together these generated rich descriptions of the conditions under which scholars conduct and communicate research.

Research components

SCAP's research comprised three interlinked components: expansive learning and change/advocacy; research strands; and implementation initiatives. These components are shown in Figure 2.2. With CHAT at the centre, the four research strands are listed on the right, the four implementation initiatives are listed on the left and the expansive learning element connects the two at the bottom. But as the arrows show, these were mutually constituting components, reflexively influencing each other as they progressed.

Figure 2.2 Diagrammatic overview of the SCAP operational approach



[17] SCAP's adoption of CHAT was unusual in that our study sites did not specifically request interventions around scholarly communication, as typically occurs with CHAT/change lab engagements. In fact, many participants only became aware of the contradictions in their activity systems by exploring them with us.

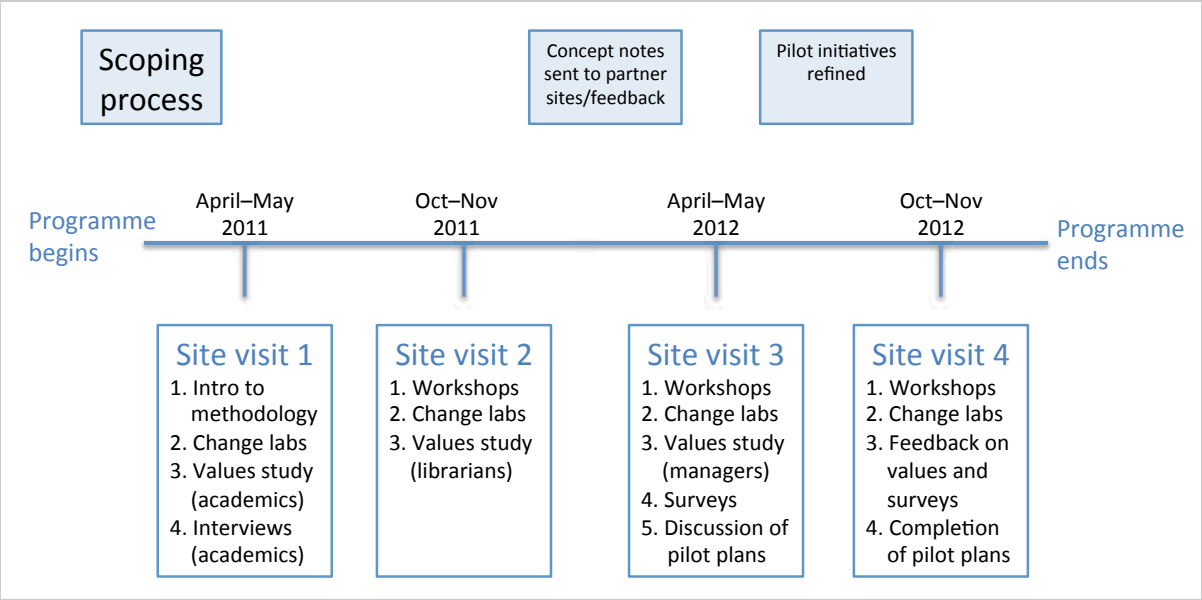
Expansive learning and change/advocacy

The expansive learning component involved SCAP's use of CHAT with its emphasis on conscious stimulation of and reflection on the scholarly communication activity system amongst staff members in each study site. This was implemented through iterative change laboratories, workshops and advocacy work. These CHAT "techniques" animated and integrated the other two components: the research strands that examined the scholarly communication ecosystem in each site and the technology implementation initiatives.

This research component involved rigorous documentation of the participatory processes involved in the change laboratories and site visits. SCAP tried to incorporate the analytical power of CHAT into every activity and interaction. But most pilot site participants' experience of CHAT was most keenly felt in the change laboratory workshops that we held at each institution. It was on those occasions that we explained the CHAT methodology and how its discursive tools could help us to elucidate the pilot site's scholarly communication activity system and develop an intervention that improved its functionality.

At each university, the change lab participants were typically members of the relevant pilot site, although university managers and librarians also attended sessions. Numbers varied between seven and 13, with a small core who participated throughout and others who came and went. The change lab workshops were full-day sessions, contributing to a broader research and advocacy programme during the PI team's week-long site visits. Figure 2.3 shows when we conducted the change labs and how this coincided with other research we were carrying out at the host institutions.

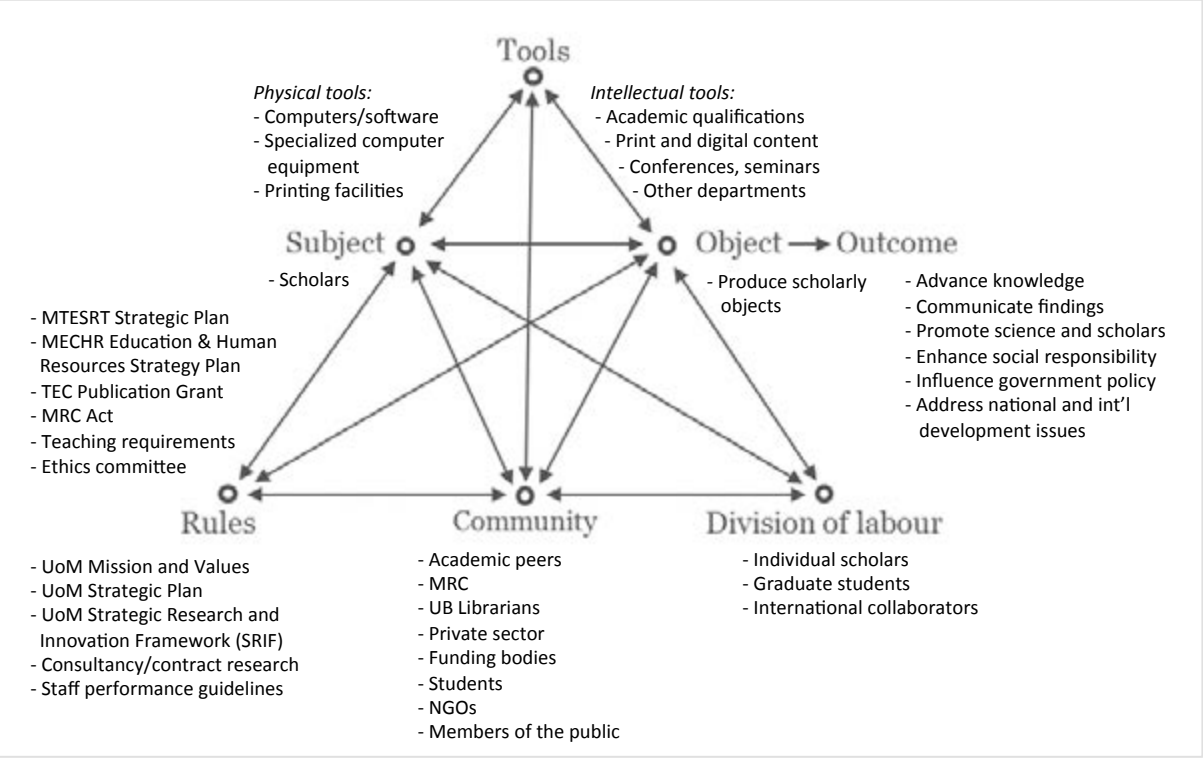
Figure 2.3 Overview of SCAP research and implementation schedule



In the first change lab workshops we held at each institution, we started by introducing the participants to the idea of scholarly communication as an activity system. We explored CHAT principles, discussed the virtues of the CHAT triangle as a heuristic and analytical device, and asked participants to identify areas where there were challenges or tensions in their scholarly communication ecosystems.

In the second workshops, we started populating the activity system triangles with the information given by the pilot participants, identifying the subject, object and outcome of the system, as well as the tools, rules, community and division of labour. Once all of the fields were populated, we started identifying the challenges, contradictions and opportunities within the activity systems so that we could understand where misalignments were occurring and how we could re-align them through an implementation initiative. The data from these workshops gave us a lot of the information we required to write up concept notes for the various implementation initiatives that we ended up pursuing. While most participants initially found this CHAT triangle process awkward, they quickly began to see its descriptive and explanatory power; however, once we established how each node was impact the others, it allowed them to see their work activity in a different light. Figure 2.4 shows a completed triangle.

Figure 2.4 UoM FoS activity system triangle populated with change laboratory material



In the third set of workshops we re-presented the fully populated activity system triangles so that participants could amend and verify them. The PI team also shared the concept notes for the implementation initiatives, eliciting useful feedback in the process.

In the fourth and final set of workshops the PI team presented preliminary findings from the research strands, which enabled a "mirroring" process (i.e. the final stage of the

expansive learning cycle implicit in the CHAT process). By "reflecting" scholars' activity systems to them in a descriptive and analytical fashion, we were able to secure crucial feedback from them for eventually arriving at our concluding findings (which are contained in this report). During that final visit, the participants also assessed the progress of the implementation initiative.

The change laboratory process provided significant data on each site's scholarly communication activity system and proved to be an invaluable forum for engaging with academics, librarians and managers.[18] For many, our workshops provided a much-needed space for participants to be self-reflexive about their scholarly communication activity. A number also took advantage of the episodic attendance of high-ranking managers to share their (often critical) perspectives with administrators with the clout to change policy.

As part of the expansive learning cycle, in addition to the change labs that we conducted, we collected institutional data through the many meetings, conversations and informal interactions we had with institutional stakeholders during our site visits.

Research strands

SCAP's research revolved around four strands: research and communication practice, values, impact and costs. Here we discuss the processes employed to carry out this research and how we integrated the materials in our analysis.

Research and communication practice

The primary question driving our research was "what is the current state of scholarly communication in Southern African universities?" To answer this, we utilised multiple research mechanisms to gather data – namely surveys, interviews, day-recalls, personal observations and informal conversations.

Because of the transformations taking place in the field of scholarly communication – due to changes in global research activity (Cooper 2009, 2011; Etzkowitz 2004; Gibbons 1997; Gibbons *et al.* 1994) and Web 2.0 technologies (Palmer 2005; Procter *et al.* 2010; Tenopir 2003; Thorin 2006; Weller 2011) – we felt it was important not only to establish baseline indicators for scholars' activities, but to examine their day-to-day practices.

We viewed the "practice turn" in the social sciences as offering us an approach that was compatible with our CHAT methodology in that 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).

We also built a "research and dissemination cycle approach" into our data collection instruments so that we could understand our research subjects' scholarly communication practices at each stage of the research and dissemination process. By breaking their activity down into discrete elements of a larger cycle, we believed we could identify how disciplinary norms, output genres, funding circumstances and personal values played

[18] All of our change lab workshops, seminars and formal meetings were digitally recorded and fully transcribed.

into their research and communication practices. It would also help us to identify possible contradictions in their activity systems, while pointing to potential opportunities for improvement. Furthermore, as Palmer (2005: 1140) states, "in the cycle of scholarly communication scholars play the role of both consumer and contributor of intellectual works within the stores of recorded knowledge." Hence we utilised Czerniewicz's (2013) research and dissemination cycle model because it incorporates an understanding of how open access and Web 2.0 technologies are transforming scholarly communication opportunities (which we discuss in Chapter 5).

In the context of that cycle, we also explored what enables or constrains the flow of scholarly communication by seeking to understand what difficulties scholars may experience with regard to access to and searching for scholarly work, as well as their dissemination choices.

This research strand therefore included quantitative and qualitative methods of data collection, aiming to produce "thick descriptions" of these practices in each of the study sites. We hoped to obtain "insider accounts" of African scholars' day-to-day practices as they went about producing, accessing and sharing research.

The first method that we used in this strand was a survey that was prepared with reference to the questions and findings from a number of international scholarly communication studies and surveys (Houghton, Steele & Henty 2004; Maron & Smith 2008; Palmer, Teffeau & Pirmann 2009; Procter *et al.* 2010; Rowlands, Nicholas & Huntingdon 2004; Rowlands & Nicholas 2006). In particular, we drew on Houghton, Steele and Henty'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, however, to take account of our focus on the stages in the research cycle. The survey included the following categories of questions:

- General information
- Research and dissemination activity
- Collaboration and communication
- Information access and searching
- Forms of Web 2.0 engagement
- Faculty attitudes and support

At UoM, the SCAP research assistant administered the survey to 30 academics in the Faculty of Science. The data was coded and cleaned, entered, and analysed within the PI team. The results are reported in Chapter 5.

The second research instrument we used was a semi-structured interview aimed at gaining a more granular feel for day-to-day research practices and what enabled or constrained them. The interviews covered:

- A discussion of their answers to the survey form
- Questions about the individuals' general background and history
- Narratives of three recent research projects or pieces of research that they had undertaken

At the same time, they sought to account for the social and organisational infrastructure within which research projects unfold, in particular the nodes in the activity system. In these narratives academics were encouraged to focus on the stages in the research cycle, such as:

- How the research started and what motivated it
- What it consisted of
- What enabled or constrained the production of outputs from the research
- What forms of interaction and networking were involved
- The uses of Web 2.0 technologies
- Dissemination choices (journal articles or other genres)
- Feedback on these outputs

The CVs of the interviewees were collected, analysed and viewed in relation to the scholarly shadows and footprints research undertaken as part of the third research strand.

The third research method we used in this strand was the "day-recall". This involved visiting a sample of the interviewees 24 hours after the first interview and asking them to narrate everything work-related they had done in those 24 hours, in order to elicit specific critical incidents that might shed light on what enabled or constrained research communication. In some cases this was repeated once more.

At UoM we conducted six interviews, each lasting about an hour-and-a-half. The interviewees were all academics who were seen to be active researchers and who had some understanding of open access issues and of the affordances of Web 2.0 platforms for scholarly communication.

Table 2.2 Total number of participants in SCAP's formal research processes

Interviewees/participants	UB	UCT	UoM	UNAM	Totals
Survey respondents	29	28	30	50	**137**
Change lab participants [1/2/3/4]	12/7/11/11	10/10/7/8	13/8/4/7	13/9/11/11	**152**
Values interviews (academics)	13	6	14	13	**46**
Values interviews (librarians)	5	4	5	3	**17**
Values interviews (managers)	5	5	5	5	**20**
RCP interviews (academics)	5	6	6	7	**24**
Totals	**98**	**84**	**92**	**122**	**396**

Values

The second strand of our research explored the values motivating university academics to conduct and communicate research. Drawing inspiration from a number of recent attitudes and behaviours studies focusing on academics in the global North (Archer 2008; Harley *et al.* 2007; Harley *et al.* 2010; JISC 2012; King *et al.* 2006; RIN 2009,

2010; Rowlands & Nicholas 2005), we sought to understand the foundational values driving research production in the Southern African context.

At UoM, this entailed the PI team conducting focus group interviews with 14 academics, individual interviews with five librarians and individual interviews with five managers. This qualitative research was conducted during the course of the recurring site visits, with the focus group interview lasting about an hour-and-a-half and each in-depth individual interview lasting between 30 minutes and one hour. We recruited informants through convenience sampling (i.e. a process that is "convenient" for the researcher), typically relying on our research coordinator at the university to identify and contact the appropriate people for SCAP to engage.

For each category of university personnel interviewed, SCAP created a set of standardised questions (which were also asked at the other institutions), prompting respondents to reflect on their own and their institutions' research values. Through this, we were able to gather the data necessary for comparing scholars' values across the four universities we profiled. Below is the list of questions that interviewees were asked:

To academics (in focus groups)

- Why do you currently do research?
- Why would you want to do research?
- How much does our African context influence these motivations?
- Are there different motivations driving basic and applied research? Do you feel that these motivations change in a developing context?

To university librarians (individually)

- What role do you currently play in the scholarly communication process?
- What role would you like to play in that process?
- Does the African context influence the role you currently play, or would like to play, in this process?

To university managers (individually)

- Why do scholars at your institution conduct research?
- How does the African context impact their research motivations?
- What challenges do they face in fulfilling their motivations?

Through these questions, we sought to understand not only the values animating the production of local research, but how they were shaped by the African context and its various challenges and opportunities. The questions also formed the basis of sustained discussions concerning a variety of topics that organically arose through the respondents' reflections, such as university rewards and incentive structures, national development imperatives and consultancy work. This material generated data that was useful not only to our values research but to the other research strands as well.

In addition, we were able to obtain values-related information from our change laboratory workshops, surveys, day-recall sessions, interviews, implementation initiatives and personal observations gained through casual conversations and on-site

experiences. The fact that we were able to draw from multiple data sets, each with its own approach, was crucial for allowing us to get a comprehensive and complex view of scholarly values. The results of these values analyses are discussed in Chapter 5.

Impact

Academic research is one of the central concerns in a new, more accountable global academic environment. Traditionally conceptualised as peer-to-peer communication, the impact of a scholarly research object used to be tied solely to its importance in the academic community and not its importance in terms of socio-economic development. This has partly been a technological issue. Until recently the only quantitative measure of research impact was the Thomson Reuters ISI/WoS Impact Factor.[19] It was also due to an understanding of university practice as separate from the civil society and commercial world, and thus subject to a different set of rules. The professionalisation of the sector has brought with it interest from funders and governments about the demonstrable returns from investing in higher education (Power 1997; Raza 2009; Shore & Wright 1999; Strathern 2000).

Technological advancement in tracking tools now permits institutions to track a range of research object performance metrics, from traditional citation counts to downloads, bookmarks, page views and social media reports. Using these new methods, known as Altmetrics (alternative metrics), it is possible to obtain not just metrics and statistics, but to develop usage narratives that show how academic research is being used by civil society, making it possible to demonstrate the value of research to non-academic audiences and to track how it is being used. This information could help institutions to focus on refining their engagement with society, identify areas in which they are succeeding and determine where they could provide the most value to the community.

In order to experiment with Altmetrics in Africa, we initiated an output tracking exercise at our four study sites. Data was collected over a six-month period (May to October 2012) by research assistants at each site who were asked to acquire lists of publication outputs from their respective institutions. The data was examined to identify potential "impact narratives" as well as to identify any interesting or unusual characteristics.

This resulted in two policy briefs spearheaded by Cameron Neylon, a SCAP advisor:

Neylon C, Willmers M & King T (2014) *Illustrating Impact: Applying Altmetrics to Southern African Research*. Scholarly Communication in Africa Programme (SCAP) Brief No. 1 for the International Development Research Centre, January 2014, University of Cape Town. Available at: http://openuct.uct.ac.za/sites/default/files/media/SCAP_Brief_1_Neylon_et_al_Illustrating_Impact.pdf

Neylon C, Willmers M & King T (2014) *Impact Beyond Citation: An Introduction to Altmetrics*. Scholarly Communication in Africa Programme (SCAP) Brief No. 2 for the International Development Research Centre, January 2014, University of Cape Town. Available at: http://openuct.uct.ac.za/sites/default/files/media/SCAP_Brief_2_Neylon_et_al_Impact_Beyond_Citation.pdf

[19] Thomson Reuters, Journal Citation Reports, at: http://thomsonreuters.com/journal-citation-reports/

Cost-benefit

Our fourth research strand focused on the costs of scholarly communication in the African context, as well as the implications of moving to an open dissemination model. We saw this as a useful research effort because we wanted to be able to reduce a technologically and ethically complex proposal into a potentially simpler set of economic denominators that would allow institutions to judge the financial value of such a transition. We understood that for many institutions open access would only be of interest if it were cost-effective.

We explored a number of economic methodologies to help explicate the costs and benefits of African scholarly communication, namely Cost-Benefit Analysis, Cost-Effectiveness Analysis and Cost-Utility Analysis. The initially envisioned process was to uncover institutional financial data during the period October 2011–October 2012. However, the PI team, in consultation with the relevant RC, discovered that institutional financial reporting structures were insufficient for providing the granular detail required for any cost-utilising analysis. Moreover, data confidentiality concerns would have prevented it from being made available even if scholarly communication had been traceable through institutional reporting systems.

We therefore abandoned this line of research (because it was beyond the scope and capacity of the PI team and our partner universities) and instead focused on assessing the relationship between national development priorities, university mission commitments and open access strategies. This culminated in the production of an advocacy document lead by Alma Swan, a SCAP advisor, which showed how open access could support African institutions' desire to contribute to national development imperatives while preserving their intellectual patrimony through digital profiling and curation strategies:

Swan A, Willmers M & King T (2014) *Opening Access to Southern African Research: Recommendations for University Managers*. Scholarly Communication in Africa Programme (SCAP) Brief No. 4 for the International Development Research Centre, January 2014, University of Cape Town. Available at: http://openuct.uct.ac.za/sites/default/files/media/SCAP_Brief_4_Swan_et_al_Opening_Access.pdf

Implementation initiative

SCAP's research design called not only for the collection of data from our pilot sites, but for these sites' active stimulation through customised implementation initiatives (or "interventions") that sought to improve the state of scholarly communication within the sites. Five principle assumptions underpinned these initiatives. They would:

1. Be treated as experiments
2. Address a challenge articulated by project participants and institutional stakeholders
3. Be publishing-oriented, addressing content profiling and dissemination through new tools and technologies
4. Utilise open approaches (including open source software) wherever possible
5. Yield insights that could be extrapolated to the rest of the institution, developed in line with institutional strategy, e-infrastructure and international standards and protocols around interoperability

SCAP scoped and fulfilled the implementation initiatives during our four site visits to the institutions. The first visit aimed to surface the contradictions in the scholarly communication ecosystem, while the three subsequent visits sought to create consensus around the nature of the initiative, identify stakeholders and policy frameworks, and implement the agreed-upon pilot process.

While the formulation process was participatory, the PI team played a considerable role in interpreting and translating the desires of informants into a feasible intervention. This was due to two factors. First, while informants had a clear sense of institutional challenges, they were often unable to articulate desired solutions because they were unaware of the new technologies that might overcome these challenges. Second, the PI team also had the responsibility of protecting the funder's interests and ensuring that the implementation activity adhered to open access principles.

The Faculty of Science (FoS) served as the SCAP pilot site at UoM. After identifying its scholarly communication challenges, needs and desires, our intervention focused on improving the visibility of participating FoS academics by enhancing their personal online profiles. The intervention therefore focused on profiling individual scholars and their research activities rather than the entire faculty. The results of this process are detailed in Chapter 6.

Integration and analysis of data

Through these multiple research strands, implementation initiatives and other information-gathering instruments, we were able to obtain a substantial amount of data for answering our two key research questions. To analyse the data, we utilised the inductive "grounded theory" approach and the "constant comparative" method. The process generally went as follows (although this was not uniform across all data sets):

- Reduce inputs to text (i.e. transcribe change labs and interviews, tabulate surveys)
- Identify and extract assertions from texts (listed initially according to research strand and university).
- Tag assertions with an intuitive notation system that allows us to keep track of their speaker, context of production and university affiliation.
- Code assertions according to thematic categories (which are derived organically from the data).
- Analyse (in narrow focus) meaning of assertions in relation to each other within their thematic category, research strand and university context.
- Frame (in widening focus) implications of assertions from one theme with those of others, helping them make sense of each other, but still within a given strand and university.
- Integrate analytical insights from research strands on a particular university (including from secondary literature and personal observations) to gain a nuanced and comprehensive understanding of the institutional scholarly communication ecosystem.
- Compare integrated analyses from each university, revealing similarities among and differences between the universities' scholarly communication ecosystems, thereby yielding a clearer picture of regional communication practices.

In between these steps, we also stepped back and embarked on a more deductive process, which involved checking our data against key concepts and insights in the relevant secondary literature, as well as exploring "hunches" based on immersion in the sites and the data, which were then tested against the developing themes and frames. This analytical process was largely carried out by the PI team, but once key insights and preliminary findings had been established, they were shared with participants in the pilot sites – especially the RCs – so that they could interrogate, amend or verify them.

Conclusion

Our research methodology ultimately combined a number of approaches so that we could obtain data at our pilot sites from multiple angles. We realised early on that no single approach would yield us the detail that we desired from the institutions; thus, we took multiple, overlapping approaches to the sites so that we could understand them in a comprehensive way.

The first element defining our multifaceted research approach was the fact that we engaged with the pilot sites as "case studies": that is, each of them comprised one of four sites in our broader research effort. Researching these different sites using similar methods and obtaining comparable data meant that they were able to contribute to our comparative synthesis report which offers a view of scholarly communication for the entire Southern African region (Trotter *et al.* 2014). Yet we never forgot that each of these sites bore their own unique histories, traditions and practices; therefore we sought to gain nuanced understandings of each site so that, when we compared them, we were able to grasp precisely where their similarities and differences were located.

The second element of our approach was our use of the CHAT methodology as our primary analytical device. This influenced not only the metaphors that we utilised to assess these sites – thinking of them as activity systems (or ecosystems) – but also the style of engagement that we had with participants. We deployed an important CHAT data-gathering device, the change laboratory, which allowed us to work with university stakeholders to identify contradictions in their scholarly communication ecosystems. In this way, participants were not simply research subjects, but were co-partners in our quest to understand and change their reality. Their "buy-in" to this process was critical to the success of the project as they took a degree of ownership in it.

The third element of our approach was that we were able to obtain a quantitatively rich description of our pilot sites, primarily through the 25-page survey that we had participants fill out, but also through various change lab exercises that we deployed during our site visits. This formed a crucial "objective" layer of data that provided a foundation for cross-comparison between sites.

The fourth element of our approach was that we were also able to obtain a qualitatively rich understanding of these activity systems through our interviews, day-recall sessions, conversations and observations during our four rounds of site visits. We believed that this layer of ethnographically informed information was crucial for us being able to understand the complexity of these sites.

The final element of our research approach, which ended up yielding a number of our more subtle and durable insights, was our use of implementation initiatives to stimulate the pilot sites' activity systems. Through these, we experienced first-hand the bureaucratic, political, social and technical challenges involved in operating in those environments. By bringing money and resources into our engagement, we initiated a much more complicated set of relationships than if we had simply operated as a research programme. This often led to significant discomfort on both sides, but it helped to reveal the "actual", as opposed to the simply "discursive", commitments that both sides brought to the relationship.

Chapter 3.
The University of Mauritius context

In this section, we will analyse the broader contexts shaping activity at the University of Mauritius. First, we will discuss the higher education context in sub-Saharan Africa so as to appreciate how the broader continental environment impacts UoM. Second, we will explore how the Southern African context reflects, and inflects, broader continental conditions with regards to higher education. Third, we will hone in on the Mauritian national setting to understand the most immediate political context shaping UoM. And lastly, we will assess UoM's institutional context, which will give us greater insight into the faculty and departmental discussions later. This four-tier nested approach – analysing the continental, regional, national and institutional settings – will allow us to locate more precisely which contexts shape the different elements of our pilot site's activity system. In each section, we will focus on the context's history, demographics, funding, human capital, infrastructure, research and management, giving us a detailed impression of each. Because this chapter includes a lot of information, readers should feel free to skip to the sections they believe will be most helpful for understanding the later analytical chapters. We have included this thick description here so that readers can have the necessary supporting information for grasping the complexity of this nested ecosystem. Thus it can be read now – drawing down from the macro to the micro – or consulted later as needed.

The African higher education context

One of the key challenges to understanding higher education in Africa is finding reliable, up-to-date statistics and information that render the continent legible for analysis. As Tijssen (2007: 304) states, even getting hold of standard data sets is "often problematic, mainly because official national statistics on magnitude and distributions of resources and research personnel are often missing, outdated, or the existing statistics fail to meet international quality standards and statistical manuals." This means that the image we paint of the higher education sector in Africa will be, to a certain extent, impressionistic

rather than definitive. But the data that is available does provide a clear picture of certain challenges facing this field.

History

Higher education in sub-Saharan Africa is "mainly a post-colonial development" (Mamdani 2011a),[20] though a number of "colleges, university colleges and/or fully developed universities existed before independence in countries such as Sierra Leone, Ghana, Nigeria, Ethiopia, Uganda, Senegal, Rhodesia and Nyasaland … and South Africa" (Mouton 2010: 2). Many of these were established in the final years of the colonial period after World War II and were shaped as "an artifact of colonial policies" (Teferra & Altbach 2004: 2). These institutions trained up small numbers of students to serve in the lower orders of the colonial administration, emphasising subjects that were seen as appropriate to administrative work, especially in the humanities and social sciences.

With the majority of African states gaining independence in the 1960s, the new national governments took a strong interest in higher education institutions (HEIs) as agents of social change and development, leading to the conceptualisation of the "developmental university" (Ajayi, Goma & Johnson 1996). The extent of governments' interest was such that, according to Zeleza (2002: 10), "more schools and universities were established in the first 25 years after colonialism than in a century of imperial rule."

The key question at the time was: how do young universities contribute to "development" in a nascent independent context? Mkandawire (2011: 15) argues that "African governments tended to view universities as intended for the production of 'manpower' necessary to indigenise the civil service. And if they thought about research at all, they wanted research that was relevant to 'development and nation building'." Yet even with this seemingly narrow focus on producing graduates for the civil service (which in many respects reproduced the prior mission of the colonial powers to train up administrative functionaries), the calibre of the scholars that these institutions delivered was quite high. According to Sawyerr (2004: 226), "the 'first generation,' educated mostly in the 1960s and earlier, were generally trained to the highest international standards at public expense, both at home and abroad, and had embarked on academic careers under conditions that respected and provided adequate means for the cultivation of knowledge."

The rapid growth in tertiary education during this early honeymoon period, buoyed by government spending and a strong market for African raw materials, was later stifled by the economic crises of the 1970s that changed how governments and international funding agencies viewed universities on the continent (Mkandawire & Soludo 1998). The problem for many governments was that they "had no coherent development model", so government "steering" of the university turned into outright political "interference and universities became sites of contestation. States and academics became sceptical of the role of universities in development, and higher education came to be seen as a 'luxury ancillary' – nice to have, but not necessary" (Cloete, Bailey & Maassen 2011: xv). Sawyerr

[20] Mamdani (2011a) suggests that the reason why higher education was not developed more robustly during the colonial period was because, "Lord Lugard, Britain's leading colonial administrator in Africa, used to say that Britain must avoid the 'Indian disease' in Africa–that is, the development of an educated middle class, a group most likely to carry the virus of nationalism."

(2004: 226–227) argues that the African scholars who graduated during this period became part of a broader "brain-drain" to the West: "The 'second generation' came of age in the 1970s and early 1980s, when it was still common to supplement local degree work with graduate study abroad. But so harsh were economic conditions at home that almost anybody who could remain abroad after graduating did so."

As a long period of economic stagnation set in, African governments turned increasingly to the World Bank and the International Monetary Fund (IMF) for assistance and loans. These bodies began to impose serious conditionalities on those African states seeking debt relief, making them abide by Structural Adjustment Programmes that significantly reduced government spending.

In response, African governments made substantial cutbacks in tertiary education budgets (Harle 2010), which the World Bank saw as providing less cost-effective benefit than primary and secondary education (Bloom, Canning & Chan 2005). According to Cloete, Bailey and Maassen (2011: xv):

> *spending per student fell from USD6,800 in 1980, to USD1,200 in 2002, and later to just USD981 in 33 low-income sub-Saharan African countries. Lack of investment in higher education delinked universities from development, led to development policies that had negative consequences for African nations, and caused the closure of institutions and areas of higher education that are critical to development.*

This pervasive reduction of funding, resources and opportunities characterised almost two decades of higher education in Africa. Sawyerr (2004: 226–227), describing the generational cohort emerging from this period, states that:

> *by the mid-1980s, access to opportunities for study abroad, especially in Europe, had so diminished that most had to undertake their entire education, from first degree to doctoral studies, at home. This occurred at a time when the range and currency of library holdings, as well as the quality of teaching and research at most African universities, were in decline. It is this "third generation," currently staffing our universities, that has borne the brunt of these severe declines.*

African economies have largely recovered since that period, but the revival in the higher education sector has been challenged by rapid demographic growth within each country, especially by the number of secondary school-leavers who demand access to higher education (Teferra & Altbach 2004). But African governments, universities and international funding agencies have learned from the policies of the recent past, pledging to make higher education and research a greater priority moving forward.[21]

[21] According to Cloete, Bailey and Maassen (2011: xv–xvi), "During the 1990s and early 2000s some influential voices (including the World Bank) started calling for the revitalisation of African universities and for linking higher education to development. Ahead of the UNESCO World Conference on Higher Education in 2009, a group of African education ministers called for improved financing of universities and a support fund to strengthen training and research in key areas."

Demographics

Sub-Saharan Africa's population of 874 million is serviced by over 500 universities.[22] However, this is a relatively small number of universities to handle such a large population. According to UNESCO (2012: 2), "with its average gross enrolment ratio (GER) in tertiary education of just 6% … sub-Saharan Africa lags behind the rest of the world where ratios range between 13% in South West Asia and 72% in North America and Western Europe, though the ratios for most developing regions are between 20% and 40%." Moreover, due to the previous focus on primary and secondary education – combined with a rapidly growing continental population – massive numbers of school-leavers are seeking entry into higher education. In response, governments have placed significant pressure on universities to increase enrolment rates (Harle 2010) and to retain a greater portion of students in postgraduate education, such that these have become key figures for institutional and national-level reporting. With an annual growth rate of 8.4%, nearly twice the global average of 4.3%, the growth rate since 1970 has seen a 20-fold increase in the number of students enrolled (UIS 2010).

There are currently about 3 million students attending African HEIs. Unlike in the rest of the world, where females tend to enrol at a higher rate in tertiary studies than males, male enrolments in African HEIs remain slightly greater than female. The ratio between male and female students is about 1:0.68 (UIS 2010: 3). But this is changing as more females enter the sector each year.

The majority of students in sub-Saharan Africa attend public institutions, but a substantial number are now enrolled in private higher education institutions (PHEIs). According to Varghese (2009: 3), "private higher education is one of the fast expanding segments of higher education in Africa. In 2009, there were around 200 public and 468 PHEIs in Africa", although most of these institutions are small in size and in total account for less than one-third of total enrolments. The majority (53%) of these institutions are based in French-speaking areas of the continent (Varghese 2009), provide business-related courses and are located in urban areas. There is also a substantial number of faith-based PHEIs – the highest-growing component of PHEIs in the last decade (Karram 2011) – run on a non-profit basis and supported by international denominational bodies that provide higher education with a religious focus. These tend to be less market-driven than other PHEIs and offer liberal arts and humanities courses from a Christian or Islamic perspective.

Funding

The economic situation in many African countries makes it difficult for governments to provide increased funding for higher education (Teferra & Altbach 2004), even as student enrolments soar. Spending as a percentage of gross domestic product (GDP) ranges from 0.1% (Lesotho) to 0.9% (South Africa), averaging around 0.7%, though rarely coming close to the 1.3% that characterises the expenditure of high-income nations (OECD 2012). This means that with this level of spending, sub-Saharan African countries can only provide tertiary education to a tiny fraction of their citizens compared to

[22] For a list of all African HEIs (including North Africa), see: www.webometrics.info/en/Ranking_africa

developed nations (5% vs over 60%). In terms of total education expenditure, the legacy of underfunding for the higher education sector persists – most countries spend between 10% and 20% of their total education budgets on tertiary education, still focusing on primary and secondary education.

The lack of higher education funding has predictable consequences. Many African institutions lack adequate facilities, particularly laboratories and scientific equipment (Urama *et al.* 2010). Library subscriptions do not always cover the full range of publications desired by their academics. Scholars are often unable to pursue a broad range of research topics, especially those requiring international travel.

Tight funding can also result in relatively low salaries for the staff, which often encourages them to seek external sources of financial support, such as through private tutoring, after-hours instruction (at other private colleges) or consultancy research. For instance, consultancies offer resources that financially strapped institutions may not be able to provide and offer attractive stipends for work that is primarily quantitative and answer-orientated in nature (King 2006). Sometimes these consultancies contribute to national development (Sawyerr 2004), but according to Mamdani (2011b: 1), they can also divert from the construction of a long-term, sustainable research culture towards a market-driven, short-term and externally controlled research environment, where academics are reduced to "native informers". The level of external, private and international research funding may end up undermining African institutions' ability to set their own research agendas and nourish deep theoretical and intellectual research development. Despite this, most African universities want their academics to engage in consultancy work because it brings revenue into the institution.

The relatively low levels of higher education expenditure are mirrored by the low levels of research and development (R&D) expenditure across the continent. According to the African Science, Technology and Innovation Indicators Initiative (ASTII 2010: 8–9):

> *R&D activities in Africa are to a large extent financed by international donors and other foreign sources. Among the countries surveyed, Mozambique is currently the most dependent on foreign donors, in that more than 50% of its R&D is financed from abroad, followed by Mali (49.0%), Tanzania (38.4%), Senegal (38.3%) and Malawi (33.1%). By contrast, Nigeria and Zambia show very low dependence on foreign funding. In countries such as Ghana, South Africa and Malawi, the business enterprise sector accounts on average for 40% of R&D funding, while in most other countries its share of funding is less than 10%.*

Human capital

In conjunction with these financial challenges, most countries face both a relative and absolute lack of skilled professionals to drive development internally. They are able to staff their governmental and civil service bureaus, as was intended by the creation of the higher education system, but the best and the brightest often migrate abroad, seeking greater incomes, opportunities or political stability. This is the well-known "brain drain" phenomenon. The consequences of the export of African labour are not universally

negative (UNESCO 2012), but with up to 30% of African scientists lost due to out-migration (Crush & Pendleton 2012; Mouton *et al.* 2008; Te Velde 2005), African countries are forced to rely to a great extent on international "experts" for pursuing their development goals. It has also meant that many African institutions suffer from endemic staff shortages, as Tettey (2009: 13) relates:

> *Academic staff shortage has become a huge challenge for African universities, and no respite seems to be in sight. In fact, observers of the higher education scene on the continent unanimously identify this issue as one of the most critical challenges to the mission of these institutions. They contend that, if urgent concerted action is not undertaken soon enough to address the problem, the African academy will not only lose its ability to produce the requisite number of personnel to support the countries' human resource needs, but the quality of intellectual life will continue to erode.*

This is reinforced by low levels of postgraduate enrolment at African universities, a fact that threatens to prolong the continent's skills shortage indefinitely.

Infrastructure

The provision of various types of infrastructure across Africa – roads, buildings, electricity connections – is patchy, though universities tend to be located in better-resourced urban areas where certain basic standards are usually met. The key infrastructural challenge in the higher education sector is access to broadband internet.[23]

Compared to the developed world, internet access in Africa is frequently more expensive and at a lower bandwidth (Fuchs & Horak 2008; Harle 2010; Oyelaran-Oyeyinka & Nyaki Adeya 2004). Moreover, Africa's internet penetration percentage of 15.6% is less than half of the global average of 34.3%.[24]

However, the provision of broadband internet has improved significantly in recent years, particularly as a result of two new undersea fibre-optic cables[25] that were laid along the east coast of Africa in 2009. The establishment of national research and education networks – fibre-optic backbones dedicated to the academic and research sector – in many African countries has also served to extend internet provision and boost much-needed computation capacity for research. The UbuntuNet Alliance, established in 2006 as a central coordinating network for these network structures, has played a significant role in supporting the development of terrestrial broadband and interconnectivity

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[23] Former UN secretary general Kofi Annan believes that ICTs have become such a core infrastructural component for full engagement with contemporary economies that "being cut off from basic telecommunications services is a hardship almost as acute as deprivation of jobs, food, shelter, health care, and drinkable water." Annan K (1999) Speech at the ITU Telecom Opening Ceremony. 9 October 1999. Available at: www.itu.int/itunews/issue/1999/09/telec99.html

[24] Internet World Statistics (2013) Internet Usage Statistics for Africa. Available at: www.internetworldstats.com/stats1.htm [accessed 26 February 2013]

[25] The SEACOM cable connects Djibouti, Kenya, Tanzania, Mozambique and South Africa to Europe and India while the TEAMs cable connects Kenya to the United Arab Emirates. These operate at a bandwidth capacity of 1,280 gigabits, dramatically increasing internet speeds as users connect to content that is typically hosted in Europe or North America.

between these national networks and with international networks outside the continent (Harle 2010).

Nonetheless, there is "a digital divide, not only between rich and poor countries, but also within nations" (InfoDev 2008: 23). Thus, within Africa, internet penetration can be as low as 1.1%, as it is in Ethiopia, or as high as 35% in Mauritius.[26] Within countries, urban populations often enjoy reasonable internet access with the widespread presence of internet cafes while rural access is far less common (Nyambura-Mwaura & Akam 2013).[27]

In academia, African universities have greatly improved their internet connectivity, albeit from a low base (Echezona & Ugwuanyi 2010), but they remain generally slower than universities abroad (Barry *et al.* 2008). The historically low levels of ICT provision have hampered the development of skilled ICT professionals at African universities, especially in libraries which should be at the forefront of the digital revolution (Mutula 2008). Students often have to deal with limited computing resources, broadband access and internet-use training, compounded by a lack of familiarisation with computers during primary and secondary schooling.

This low provision of bandwidth has limited scholars' engagement with online platforms that would enhance their academic profiles, broaden their research networks and open up new collaborative opportunities with scholars elsewhere.

Research

As discussed in Chapter 1, research production in sub-Saharan Africa has been growing over the last decade (at least with regard to ISI/WoS-rated journal articles), but it has been declining as a proportion of global outputs. This means that African research production is improving in absolute terms, but becoming less competitive in comparative terms. The positive increase is due to African governments' reinvestment in higher education as a site for development-enhancing activity. Moreover, many African universities have moved beyond their traditional teaching-oriented mandates to include research missions that encourage local scholars to produce more published outputs. They have also strengthened the size and profiles of their graduate programmes so as to build greater research capacity internally. This is a slow and uneven process, but these changing institutional norms are impacting every university on the continent.

In the sub-Saharan region, South Africa and Nigeria dominate WoS-listed research production (Adams, King & Hook 2010) while Tanzania is the most prolific producer in East Africa. Nevertheless, this research output is extremely low compared to that of the developed world; in 2008, the Netherlands alone produced approximately 27,000 ISI-ranked papers, nearly 50% more than the sub-Saharan total (Adams, King & Hook 2010).

Moreover, as Harle (2010) points out, substantial investment in journal access and associated areas of training and capacity-building has also raised Africa's research

[26] International Telecommunication Union (ITU) ICT Facts and Figures 2013, available at: www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx
[27] For Africa bandwidth maps, see: www.africabandwidthmaps.com/

potential. Through donor-supported and collaborative initiatives, academics in many universities now have free or subsidised access to current and back issues archives. The Programme for the Enhancement of Research Information (PERii) has negotiated access to over 18,000 full-text journals (a further 7,000 are abstract only), while the Health InterNetwork Access to Research Initiative (HINARI) offers over 6,400; the Access to Global Online Research in Agriculture (AGORA) offers 1,278 and Online Access to Research in the Environment (OARE) offers over 2,990. While it is difficult to calculate the total number of free or discounted titles available to some African institutions, Harle (2010: 5) confirms that the total figure is certainly substantial, stating that "Kenyan libraries, which before the advent of affordable e-resources had collections averaging 3,000 print journals, now have an average of 35,000 titles via online access. Moreover, they have made average savings of 80% in their budget, while receiving over tenfold the number of titles."

Management

Historically, the strong interest taken by post-colonial African governments in tertiary education has led to a close (and sometimes contentious) working relationship between universities and their governments. This has often been due to competing notions of what role the university should play in society. While both parties have typically believed that the university should serve national development at some level, they have often disagreed about what constitutes "development" and the best means to achieve it. According to Lindow (2011: 89):

> *Universities strive to be partners to government in the name of development, but their relationship to the state is in fact complicated. If universities are indeed bound up in a pact with government and society, they must also shine a light of critical inquiry on the relationship between the two—a role which sometimes puts academics at odds with authorities, in Africa and elsewhere around the world.*

However, in many African countries where civil society remains generally weak and the local universities lack meaningful autonomy, higher education institutions often resemble branches of the civil service (training up workers and loyally supporting the government) rather than sites of independent and critical thought (an ideal that many scholars hold). Zeleza (2002: 16) critiques this situation, explaining that:

> *Governance structures often mirror those of the state, partly because, in many cases, senior university administrators are state appointees, who in turn appoint unit heads down the administrative hierarchy. The decision-making process tends to be discretionary and authoritarian, which is manifested through recruitment, screening, promotions, allocations of work loads, provision of leave and sabbaticals, scaling of staff, gate-keeping, policing and closures of campuses, surveillance, sexual harassment, and the administration of welfare facilities. Research is often enmeshed in patron–client networks, and it is employed as a weapon for punishing radicals, rewarding sycophants, and settling scores. Faculty is also sometimes*

> *humiliated and harassed through the use of accounting procedures. In short, authoritarianism, corruption and discrimination on ideological, intellectual, national, ethnic, religious and gender bases are quite widespread in institutions dominated by the academics themselves. This breeds censorship and encourages the "brain drain" of those, usually younger scholars, able to find greener pastures elsewhere, locally or abroad.*

The Task Force on Higher Education and Society (2000: 62) reinforces this picture of state-controlled institutions, stating that "with the government in many countries having assumed the power to appoint and dismiss the Vice Chancellor, governance in the universities has thus become a purely state-controlled system .... There are countries where even deans and department heads are also appointed by government and where heads of institutions change with heads of government."

That said, the structure and practices of university management do not derive from the example of national governments alone, but through the institution's constant comparison with and reference to international norms. The standards set by other universities have a powerful effect on how research agendas are set, how administrators evaluate academics and how they go about improving research productivity.

Conclusion

It is tempting to interpret this history negatively, as a period of lost opportunities and strategic mistakes. Indeed, we could provide significant evidence to support such a conclusion. As Zeleza (2002: 10) reminds us, "today, Africa remains the least educated continent in the world, able to provide higher education to only 3.5% of the college-age population, as compared with 60% in the industrialised countries."

Even more troubling, some scholars believe that education in Africa has irrevocably damaged Africans' psyches and "souls", a process started by the colonisers and continued by the inheritors of independent state power. According to Nyamnjoh (2012: 129–130):

> *In Africa, the colonial conquest of Africans – body, mind and soul – has led to real or attempted epistemicide – the decimation or near complete killing and replacement of endogenous epistemologies with the epistemological paradigm of the conqueror. The result has been education through schools and other formal institutions of learning in Africa largely as a process of making infinite concessions to the outside – mainly the western world. Such education has tended to emphasise mimicry over creativity, and the idea that little worth learning about, even by Africans, can come from Africa. It champions static dichotomies and boundedness of cultural worlds and knowledge systems.*

Nevertheless, it is worth remembering that, despite the ups and downs of this history, Africa has progressed significantly since independence, especially in terms of literacy:

> *Since 1960, the putative year of African independence, only 9% of the African population was literate, rising to about 50% three decades later. Taking the*

> *sub-Saharan region alone … enrolment ratios rose from 45% in 1965 to 74% in 1995 for primary schools and 5% to 35% for secondary schools. The rapid expansion of education not only led to a massive improvement in the African human capital stock, it also laid the institutional basis for the social production of African intellectual capacities, communities and commitments.* (Zeleza 2002: 10)

Africa's prospects have also drastically improved according to numerous other indicators:

- In 1960, there were only about a dozen HEIs that black Africans could attend, but in 2013 there were over 500.
- There has been a 20-fold increase in higher education enrolment since 1970 (Chien & Chiteng 2011: 6).
- While higher education was almost completely male-dominated at the end of colonialism, today the region enjoys substantial levels of female participation.

Education in sub-Saharan Africa is recovering from a long period of neglect and, along with many other institutions in the region, is experiencing considerable difficulties. However, the region is also taking important steps to improve the situation. One of the more impressive areas in this regard is Southern Africa, where conditions are such that they challenge any casual understanding of the "African context" and provide a greater appreciation for the diversity of circumstances on the continent.

The Southern African context

While within the geographical boundaries of sub-Saharan Africa, Southern Africa (here defined as the countries within the Southern African Development Community, or SADC) conforms to some of the above issues while deviating in others. Home to 14 countries[28] and 253 million people, the region hosts 54 universities and makes a significant contribution to continental research production (though only a marginal one to the global literature). As the four SCAP study sites were all located in Southern Africa, it is valuable to consider the region's specific context, both to avoid the all-too-common problem of writing about "Africa" as an undifferentiated, essentialised monolith and to develop a more concise understanding of the geopolitical environment in which the four study sites are located.

Southern Africa spans South Africa in the south to the Democratic Republic of Congo (DRC) in the north, and includes the south-eastern Indian Ocean islands of Madagascar, Mauritius and Réunion. It contains the continent's biggest economy (South Africa), its most innovative economy (Mauritius[29]) and the four most unequal countries in the world (Namibia, South Africa, Botswana and Lesotho[30]).

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[28] SADC member states: Angola, Botswana, the Democratic Republic of the Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe.
[29] Global Innovation Index 2013, available at: www.globalinnovationindex.org/content.aspx?page=data-analysis
[30] Kevin Lincoln (2011) The 39 Most Unequal Countries in the World, *Business Insider*, available at: www.businessinsider.com/most-unequal-countries-in-the-world-2011-10?op=1

History

Southern Africa follows the general pattern of post-colonial tertiary education development, with the significant exception of South Africa. While the majority of the region's universities were established after the 1960s, many of South Africa's most highly ranked universities were established in the first two decades of the 20th century. As such, the country has been a centre of academic excellence and attracts many students from throughout the region. These universities were able to avoid the crisis in sub-Saharan African higher education due to the presence of national funding capacity, a fact that has contributed to South Africa's regional dominance in research production.

Demographics

Southern Africa's tertiary enrolment rate was 6.3% in 2012, comprising 1.3 million students, 51% of whom were female (Wilson-Strydom & Fongwa 2012: 19). Within the region the gender profile is mixed: Lesotho, Mauritius, South Africa, Namibia and Swaziland follow the global trend of higher female enrolment, while the other SADC countries conform more to the general African trend for greater male participation in tertiary education. These figures are comparable with African higher education enrolment in general. The majority (84%) of tertiary education is based on contact-tuition (Wilson-Strydom & Fongwa 2012: 18) and is largely urban in nature.

Funding

Within the region there is a large differentiation in terms of national expenditure on education, which is not directly correlated with educational outcomes. Lesotho, for example, spends 13.4% of its GDP on education and fares second "in respect of the availability of scientists and engineers for research and development" (Richards 2008: 4) yet ranks lower than South Africa in terms of innovation, in 117th place vs South Africa's 54th (Global Innovation Index 2012).

Research funding in the region is generally low, and heavily dependent on international funding agencies:

> *A very substantial 42% of all respondents from SADC (RSA excluded) indicated that they source between 70 and 90% of their research funding from overseas compared to only 6% of South African respondents. The responses very clearly show the dependence of SADC scientists on international funding for their research; and conversely how little domestic funding is available for research. We should also point out that this picture is even worse if one keeps in mind that the scientists in our sample were identified because they are the most active and productive scientists in their fields in their countries.* (Mouton 2010: 23)

Excluding South Africa, which spends 0.9% of its GDP on R&D (DST 2013), the average regional expenditure is closer to 0.3%. Institutions themselves often struggle to provide sufficient funding for their academics' proposed research budgets, contributing to short-term, introspective and derivative research work.

In such a funding environment, consultancies offer an attractive alternative for researchers struggling with inadequate institutional and national funding systems, and "more than two thirds of all academics in the fourteen SADC countries regularly engage in consultancy" (Mouton 2010: 15). As with sub-Saharan Africa in general, the influence that consultancy work exerts on Southern African research agendas can be seen in both positive and negative lights – offering on the one hand the opportunity to conduct well-funded and relevant research, while on the other taking time away from basic or theoretical research, and locating executive control over the region's research agenda outside of the academic community itself. Even national governments have comparatively little control over the shape of public science (Mouton *et al.* 2008).

Human capital

The "brain drain" problem so common in sub-Saharan Africa is also felt in Southern Africa, but with the caveat that, along with international emigration, there is also a good deal of intraregional migration, mostly to South Africa. Student migration can be as high as 87% and 65% in Botswana and Namibia, respectively, while "South Africa has the highest inbound mobility rate with nearly 50,000 foreign students studying in the country in 2005" (Mouton 2010: 20).

The brain drain phenomenon has historically been driven by multiple factors, including the declining quality of life across Africa from the late 1970s to the early 1990s, the lack of knowledge-intensive industry to provide desirable employment, the deterioration of the higher education sector, political instability and the lack of local postgraduate programmes (Barclay 2002; Mouton *et al.* 2008).

Infrastructure

Although SADC has the "most pervasive regional terrestrial fibre network" (SADC 2012: 27) on the continent, its access to and use of bandwidth is relatively low compared to global standards. "An average of only 4% of the SADC region's population are internet users today" (SADC 2012: 21). "These generally low levels of internet penetration, are partly the result of the high cost of access, combined with low income levels, and the lack of fixed line infrastructure, combined with the relatively short period that lower cost wireless internet services (mainly 3G and WiMax) have been available in major urban areas" (SADC 2012: 22). Furthermore, with regards to the average growth in internet penetration, the SADC region is "falling behind compared to the rest of the world (although it is ahead of the average for Africa as a whole)", with the "region being almost 10 years behind the world average" (SADC 2012: 22).

In contrast to the low level of internet users, mobile telephony usage rates are quite high. "Encouraged by the early introduction of prepaid services (which now account for 80–90% of subscribers in the region), mobile uptake stood at an average of 60% of the population in 2010" (SADC 2012: 18). However, this figure "obscures fairly large variations (about 5 times) between SADC Member States, with the DRC and Malawi at only around 20% penetration while Seychelles, Botswana and South Africa are over 100% (due to the use of multiple SIM cards)" (SADC 2012: 18).

While the universities that we profiled enjoyed reasonable access to the internet and could enhance their scholarly communication activities even with their present level of access, the low levels experienced by other members of the population decreased the educational potential of the internet, especially at the basic education level.

Research

Although Southern Africa research production is impressive by continental standards, most countries in the region still produce fewer than 1,000 ISI/WoS-ranked publications per year, with only Tanzania and South Africa producing more prolifically (Kotecha, Walwyn & Pinto 2011). Productivity per full-time-equivalent (FTE) researcher varies across the region, ranging from Namibia and South Africa producing close to 0.8 WoS-ranked publications per researcher per year and Botswana and Zimbabwe averaging close to 0.6 per researcher per year, to the DRC, producing very little ranked research (Kotecha, Walwyn & Pinto 2011). Even the higher performing countries in the region underperform relative to the developed-country average of 1.2–1.5 WoS articles per FTE researcher per year. Within the region, South Africa dominates: of the approximately 11,000 research publications reported in the region in 2009, some 9,000 were produced by scholars in South Africa.

PhD qualifications are another metric of national research development. In 2010, the region produced 1,546 doctorates, of which only 125 were outside South Africa, which "accounts for 89% of PhDs in the region" (Kotecha, Walwyn & Pinto 2011: 12). Aside from Mauritius and South Africa, which produce between 0.3 and 0.4 PhDs per FTE researcher per year, the production of new doctorates is very low. In general, the education profile is biased towards undergraduate studies, as explained by Wilson-Strydom & Fongwa (2012: 38):

> *The regional graduation profile is even more heavily skewed towards undergraduate qualifications, with 79% of graduations being at the undergraduate level, 15% at postgraduate level, 6% at the masters level and only 1% at doctoral level. If the South African data are removed, the proportion of undergraduate graduations increases to 88%, postgraduate graduation below masters level is 5%, and masters and doctoral qualifications together represent 5% of the total.*

South Africa's dominance in PhD production is partly due to internal intellectual migration. As many universities lack capacity for postgraduate supervision, South Africa is an attractive destination for regional postgraduate students. As PhD qualifications are strongly correlated with research production (Cloete, Bailey & Maassen 2011), the region's lack of endogenous PhD development is therefore a negative factor in intensifying research, especially the development of local epistemologies.

Management

In many Southern African countries, the establishment of national universities coincided with independence and was one of the markers of a functioning, independent nation-

state. In this environment, "the major purpose for establishing universities in these countries was, and still is, for the institutions to play a pioneering role in addressing problems of poverty, social disorganisation, low production, hunger, unemployment, illiteracy, disease, that is, the problems of underdevelopment" (Mosha 1986: 1).

As such, universities (especially in single-university countries) have always been strongly aligned with national governments. Academic freedom was even seen in some cases as "a petty bourgeois claim, a sort of luxury that poverty- and crisis-ridden societies cannot afford" (Sall 2001: 1). Yet this remains a situation in flux, as academics continue to voice concerns about the perceived detrimental effects of government interference in the academic enterprise, calling for universities to exert greater control over their own work.

Conclusion

As this brief description of the Southern African context makes clear, the region shares many of the features of the continental higher education picture, yet diverges from it in significant ways as well. This is mainly due to the presence of South Africa, an outlier that skews the numbers and generates substantially more capacity and opportunity for the region compared to what the continental figures would suggest. However, the small population sizes and high levels of political stability in the other countries SCAP profiled (Botswana, Mauritius and Namibia) have also made the region a more robust and productive educational environment, comparatively speaking. With this in mind, we can now turn to the national context shaping this particular partner university.

The Mauritius national context

As a tiny island in the middle of the Indian Ocean, Mauritius boasts a unique geography, demography and history. Shaped by British colonialism like a number of other Southern African countries, it has nonetheless distinguished itself since independence as a politically stable and economically productive nation. Originally a low-income, agriculture-based (sugar) economy, it then transformed itself into a light industrial (textile) and services-based (tourism) economy and now seeks to evolve yet again into an important player in the "knowledge economy". Strategies to enhance higher education and research form a core part of the process the country is employing to reach that goal.

History

Before Mauritius gained its independence in 1968, the island nation was characterised by high levels of underdevelopment, reliance on primary industry (largely sugar cane farming), an oligarchic social structure with European-descended citizens owning most of the island's capital, and a heterogeneous working population of African, Malagasy, Chinese and Indian descent. At independence, the island had the highest population density in Africa, a rapidly growing youth population and ethnic tensions that made it a "strong candidate for failure" (Subramanian & Roy 2003: 1). However, the nation was able to sustain high rates of GDP growth of 5.9% per year, compared to an average 2.4% across the rest of Africa (Subraiman & Roy 2003: 3), diversify its economy, and maintain inclusive democratic participation and governance.

In 1968, the only tertiary institution that existed within the newly independent nation was the University of Mauritius (UoM). Since then, the tertiary education sector has transformed significantly and now includes 74 public and private tertiary education institutions. Tertiary education in the public sector is provided by UoM, the University of Technology Mauritius, the Mauritius Institute of Education, the Mahatma Gandhi Institute, the Rabindranath Tagore Institute, the Mauritius College of the Air and the Fashion and Design Institute. Within the private sector, there are 50 private institutions and 76 awarding bodies that deliver tertiary-level programmes locally; most, if not all, of these programmes are offered through franchise agreements with overseas institutions, who provide programme materials and/or tutorial support (TEC 2011: 1)

Demographics

The Republic of Mauritius has a population of approximately 1.3 million, a per capita GDP of USD14,594, and a Human Development Index of 0.737.[31] Education is seen as crucial to long-term government planning, and "a graduate in every household" is a key goal in developing a skills-based economy (MTESRT 2013).

There are currently 74 institutions of higher education in Mauritius, up from 65 in 2010.[32] The Gross Tertiary Enrolment Ratio is 45%, with 14% of the 45,969 students currently enrolled in postgraduate programmes (TEC 2013). However, more than a third (33.6%) of Mauritian students are enrolled in international universities (Mahlaha 2012: 51).

Table 3.1 Mauritian indicators

Population	1.3 million
Size	2,040 km² (twice the size of Hong Kong)
Public universities	2 (plus 9 other public HEIs)
Human Development Index	0.737
Gini coefficient	39
Gross National Income per capita	USD14,594
Gross Tertiary Enrolment Ratio	45%

With the government's desire to transform Mauritius into a knowledge economy by 2025 (TEC 2013), the higher education system plays a central role in helping achieve this goal. The number of tertiary education institutions and the number of students in this sector has grown in line with this ambition. According to the TEC (2013: 15–16):

> *the number of Mauritian students enrolled and based locally increased from 14,312 in 2000 to 39,074 in 2012, while the number of Mauritian students*

[31] Mauritius Human Development Index (2012), available at: http://countryeconomy.com/hdi/mauritius
[32] TEC Review of the Tertiary Education Sector 2011/2012, available at: http://tec.intnet.mu/tesm_rvw.php

> *studying overseas went up from 2,423 to 9,460 over the same period. The objective is to further increase access of Mauritians to tertiary education, in line with the policy of one graduate per family, so as to attain enrolment of 68,000 students by 2025 or a net enrolment increase of 18,000.*

After reaching a peak of 11,248 Mauritian students studying overseas in 2008, the number has declined to 9,460 in 2012. This was likely due to the economic recession that started in 2008 rather than a growing interest in local education opportunities, but as Mauritius ramps up its capacity in this regard, it will likely be able to retain more of its nationals. But the government hopes to do more than just increase its own local tertiary enrolment rates; its "target is to reach an enrolment of 100,000 international students by 2025" (TEC 2013: 21). This will be a real challenge, given that, in 2012, the island hosted only 10,000 foreign students (TEC 2013: 10).

Funding

The government spends 13.3% of its budget on education, amounting to 3.65% of national GDP. Undergraduate students do not pay student fees, but postgraduate and diploma students pay full price.

The majority of funding for research and publication in Mauritius is distributed by the Mauritius Research Council (MRC) and the Tertiary Education Commission (TEC), under the aegis of the Ministry of Tertiary Education, Science, Research and Technology.

The MRC promotes and coordinates the government's investment in research. It provides funding through research grant schemes that prioritise issues of national interest, namely biomedical and pharmaceutical research, ICTs, land and marine use, energy and waste management, and science, technology and education. It also supports research commercialisation and industrial–academic relationship building. According to the MRC website, "the Council currently has fourteen (14) different funding schemes which are classified under the following categories":

- Research Grant Schemes
- Innovation and Commercialisation Schemes
- Research Support Schemes
- Capacity Building/Award Schemes[33]

The TEC is responsible for allocating funds to each of the various Mauritian HEIs, including UoM. It has its own guidelines for funding and thus provides various schemes, grants and scholarships to researchers and students.[34] It also provides research funding to experienced scholars (those with 30+ years of experience) through a programme of research funding for short-term (under two years) projects. According to the TEC (2013: 25):

[33] MRC Funding Schemes, available at: www.mrc.org.mu/funding_schemes
[34] For a description of the TEC's budgetary processes with regard to funding Mauritian HEIs, see: http://tec.intnet.mu/fundteis_fund.php

Research in publicly funded tertiary education institutions is almost wholly funded by Government, whose expenditure on research over the period 2000 to 2011 has increased almost three times from Rs 7.3m to Rs 22m. The Tertiary Education Commission also finances some 15 full-time MPhil/PhD Scholarships, 15 Part-time Bursaries and for 2 Postdoctoral Fellowships undertaken at the University of Mauritius and University of Technology, Mauritius. It launched a Research Grant Scheme in 2009/10 inviting candidates of Mauritian nationality who have more than 30 years' experience in specific fields to conduct research. The Commission also operates a Publication Grant Scheme, targeted for staff of the tertiary education institutions as well as researchers, in general.

Human capital

Over the next decade, the government hopes to have "one graduate per family" and a Tertiary Enrolment Rate of 72% by 2020 (TEC 2013). In the meantime, it has already set an impressive standard for the region with its proportion of PhDs. In SADC, "only South Africa and Mauritius have a PhD qualification rate of above 0.3 PhDs/FTE/year" (Kotecha, Walwyn & Pinto 2011: 29).

At the staffing level, the higher education sector "employs a total of some 2,700 persons on a full-time basis, of which around 400 work in private institutions. Overall, 30% of the employees are academic, 35% administrative, 15% technical/paraprofessional and 15% services/maintenance cadres. The number of employees working in the publicly funded institutions hover around 2,300."[35]

Infrastructure

Mauritius has a relatively high penetration of both mobile and fixed-line telephony compared to other SADC countries, with approximately 30 fixed lines per 100 population and 100 mobiles per 100 population (SADC 2012). Its internet penetration rate is 35%, just above the global average of 34.7% and more than twice the African average of 15.6% (Internet World Stats 2012).

As will be discussed in greater detail in Chapter 6, Mauritius compares favourably with SADC peers in terms of internet connectivity and upload and download speeds. However, developed countries continue to outperform it by a good margin. Furthermore, as an island nation, Mauritius remains dependent on a single cable for its international connectivity in the form of the South Africa Far East (SAFE/SAT-3) cable. This means limited international network redundancy.

[35] TEC (2012) Review of the tertiary education sector 2011/2012, available at: http://tec.intnet.mu/tesm_rvw.php

Research

While UoM is the primary research body in the country, a number of other research institutes and centres also focus on researching specific areas of national importance, or supporting it in some fashion:

- Albion Fisheries Research Centre
- Agricultural Research and Extension Unit
- Centre for Applied Social Research (CASR)
- Food and Agricultural Research Council
- Mauritius Research Council (MRC)
- Mauritius Oceanography Institute
- Mauritius Sugar Industry Research Institute[36]

These non-university entities enhance the diversity of the island's research environment, creating opportunities for researchers who want to apply their talents locally. Most of this activity is overseen or coordinated by the MRC (2009) which has identified ten research and funding priorities:

- Biomedical and pharmaceutical research based on indigenous resources
- Information and communication technologies
- Land and land use
- Manufacturing technology
- Ocean technology and marine resources
- Social and economic
- Water resources
- Waste management
- Science and technology education
- Energy efficiency and renewable energy[37]

The MRC not only supports the research bodies listed above, but also provides funding through competitive grants. For instance, "during the financial year 2008/2009, MRC had processed thirty six research applications. Thirty new projects were approved bringing the research portfolio to 349 with project value of Rs 133 millions. The total number of projects has increased from 52 to 349 implying an average of 32 projects per year. The project value has risen from Rs 20.6m to Rs 133m entailing that the council spent nearly Rs 12m on average each year" (MRC 2009: 29).

Of these projects, about a quarter of the funding went to UoM-related research: "Academia, which includes the University of Mauritius and the University of Technology, are the major collaborating partner with a contribution of 27% in research work as at 30 June 2009" (MRC 2009: 31).

Beyond these indicators, it is difficult to ascertain exactly the level of research production at the national level, but according to Wilson-Strydom and Fongwa (2012: 44), the island's two public universities combined to produce 188 peer-reviewed journal articles,

[36] Mauritius Science Portal (2013), Research Institutions in Mauritius, available at: www.gov.mu/portal/sites/nsp/research/institution.htm
[37] Mauritius Research Council (MRC), available at: www.mrc.org.mu [accessed 14 October 2013]

one peer-reviewed book, seven book chapters, zero patents and 45 other items in 2010. The vast majority of these came from UoM faculty members.

Management

The Ministry of Tertiary Education, Science, Research and Technology (MTESRT) is the premier higher education administration body within the country (Ramtohul 2012). Established in 2010, one of the primary goals of this body is to increase the tertiary enrolment ratio in order to support the goal of "one graduate per family" by 2020.[38] The goal is aimed at supporting high-skills industries by increasing the number of Mauritian graduates. It also hopes to increase its gross enrolment ratio from 45% in 2009 to 70% by 2020.[39]

The Tertiary Education Commission (TEC) acts as the governing body for higher education in Mauritius. Commissioned in 1988, it serves as an accreditation and qualifications body, and works to ensure that Mauritius complies with international standards. It serves as the funding body for Mauritian public institutions.

The Mauritius Research Council (MRC), established in 1992, serves as the national body providing guidance on research, science and technology. Its stated goals are to "generate relevant new knowledge; to pioneer, coordinate and exploit research for societal benefit; and to act as a professional agency of Government, advising on future development."[40] (These three bodies are discussed in more detail in Chapter 4.)

Conclusion

Despite its small size and remote location, Mauritius punches well above its weight on most education and technology indicators when compared to its African neighbours. Though internet connectivity is not at levels of the developed world, it is good for the region, with decent levels of broadband, mobile and landline penetration. These technological foundations augur well for the island's ambitions to become a knowledge hub in the region by the next decade. This is supported by a solid national research infrastructure, in the form of the MTESRT, MRC and TEC, which provide invaluable diversity for advanced research opportunities. The centrepiece of the higher education and research system remains UoM, the flagship institution in the country.

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[38] Guillaume Gouges (2011) Minister outlines hub plans, *University World News*, 2 October 2011, available at: www.universityworldnews.com/article.php?story=20111001152158418

[39] Figures given in speech by Dr Rajeshwar Jeetah, the Mauritian Minister of Tertiary Education, Science, Research and Technology at the International Conference on Higher Education And Economic Development, Port Louis, Mauritius, 3 September 2012. Available at: http://tertiary.gov.mu/English/Documents/September%202012/int-conf.pdf

[40] MRC, see: www.mrc.org.mu/about_the_council

The University of Mauritius institutional context

Set in the central part of the island in Reduit, UoM remains the largest provider of tertiary education in the country, with almost a quarter of all national tertiary enrolments. It is now just one of many HEIs to choose from, but its relatively long history, its consistent government support, its flagship status and its solid level of international connectivity through administrative and faculty networks make it an important education institution for scholars throughout the region. However, while it shares certain similarities with other African and Southern African universities (as discussed above), its location in a politically stable and economically productive environment has offered it many advantages that others do not have. This will likely continue for some time. However, its relative isolation geographically, as well as its small size demographically, limits the kinds of ambitions that it can reasonably have. The university reflects these challenges. Of the four institutions that SCAP profiled, UoM was the smallest in terms of student and staff numbers, a fact that impacts its competitiveness regionally and globally.

History

UoM was established in 1969, shortly after independence, growing from its origins as the College of Agriculture. Originally established with three schools (Administration, Agriculture and Industrial Technology), it has since expanded to include the Faculties of Agriculture, Engineering, Law and Management, Science, and Social Studies and Humanities. Over the past decade, it has seen rapid expansion, growing at an average student enrolment rate of 10% annually. The university serves as the primary research-producing body in the country, with most other tertiary institutions in Mauritius focusing on teaching.

In the early 1970s, UoM was focused almost solely on teaching, but then slowly developed into what can be called a "research-informed" university in the 1980s. That is, scholars were given mild encouragement to conduct and publish their own research, especially in the sciences. Significant funding from the World Bank made research facilities available early on, leading to noteworthy improvements in research capacity. Coupled with the rising numbers of staff PhD holders, the university has expanded its research mission and offered more post-graduate programmes for UoM students. Today, UoM hopes to move past its "research-informed" status to that of a "research-intensive" institution.

Demographics

UoM has 11,395 students, of which 26% are enrolled for part-time studies and 10% are enrolled for postgraduate degrees. More than half of the students are female. According to Bunting and Cloete (2012: 58), UoM's "head count student enrolment grew from 5,300 in 2000/2001 to 9,900 in 2009/2010. Its undergraduate enrolment grew at an average annual rate of 7.2% over the full period of 2000/2001 to 2009/2010." These growth rates are in line with the government's mission to place higher education at the centre of its knowledge and innovation development plans. To teach and supervise these students, the university employs about 260 full-time academics.

Table 3.2 University of Mauritius indicators

Faculties	Agriculture Engineering Law and Management Science Social Studies and Humanities
Academic staff numbers	± 260
Academic:administrative staff ratio	± 1:3.7[41]
Enrolment	11,395 (less than 10% are postgraduates)
Student:staff ratio	32:1 (TEC 2012)
Female:male student ratio	1.31:1
Total expenditure	MUR 734 million (USD23,8 million)
Total research income	MUR 1,846,245 (USD59,556)
Production of ISI/WoS-Index journal articles (per annum)	0.13 per academic staff member per annum average (Bunting & Cloete 2012)
Library volumes	167,000
Print journals Electronic journal subscriptions	30,000 bound volumes ScienceDirect package and others
International rankings: Times Higher Education (THE) Quacquarelli Symonds Shanghai Jiao Tong University Webometrics	 Not listed Not listed Not listed 3,714 (59th in Africa)

UoM academics use English in their formal communication and in much of their daily interactions with students. This is the official language of the country and the university, but it is not the first language of most people on campus, who speak Creole (75–80%) or Mauritian Bhojpuri (15–25%) at home. This impacts communication in uneven ways, sometimes hindering it (if any of the parties has difficulty with it) and sometimes enhancing it (if the language provides access to a concept that is not well formulated in other known languages).

Funding

According to the UoM Annual Report (UoM 2012), the university's research expenditure in 2011/2012 amounted to MUR 35.5 million (± USD1.2 million) out of an institution-

[41] According to the UoM Finance division, there were 260 academic staff members and 713 non-academic staff members (a 1:3.7 ratio) during this time period (UoM 2012: 103).

wide expenditure total of MUR734 million. This equals about 5% of the university's total expenditure. As part of this, "in order to encourage further research, each Faculty was allocated one million rupees so as to carry out viable research projects emanating from the UoM Research Week 2011" (UoM 2012: 3). The vast majority of the university's expenses goes to staff salaries, comprising 76% of total expenditure (2012: 103).

As we will see, the university's research budget is an important source of funding for many UoM research projects. However, the availability of funding from other national sources (such as the MRC) is also crucial, especially for more expensive projects which the university would not be able to finance. Scholars are also encouraged to seek their own funds through international networks and private consultancy work.

Human capital

As of 2009/2010, 45% of UoM's roughly 260 academic staff held doctoral degrees and 44% held masters degrees (CHET 2012: 11). While 50% is considered a desirable benchmark by many, the university's growing proportion of PhD holders has encouraged it to start more of its own PhD programmes on campus. Thus, in terms of graduate degrees produced, UoM greatly increased its outputs in 2010/2011, with a 25% increase in Masters degrees awarded and a 42% increase in PhDs (UoM 2012).

Infrastructure

The TEC audit report (2012: 62) stated that "it is evident that the University's teaching and learning infrastructure is ageing or even lacking, particularly for laboratory-based studies. The Audit Panel heard examples of equipment that is old or outdated, an insufficient number of instruments such as microscopes, a lack of chemicals, and the lack of a generator at the FoA [Faculty of Agriculture]." Facing such challenges and a corresponding lack of funds to rectify this quickly, many science scholars outsource certain elements of their data collection processes (which may require expensive equipment) to overseas universities that have the equipment and capacity to do so. This is standard practice in the sciences, but it is not ideal for developing scientific research capacity.

Moreover, internet provision at UoM has lagged behind the improvements in the country's growing bandwidth capacity. This poses a problem for scholars involved in programmes requiring high bandwidth or high-performance computing, and portends significant difficulties in international collaborative research that involves sharing large amounts of data.

At UoM, communication activities are supported by both the Virtual Centre for Innovative Learning Technologies and the Centre of Information Technology and Systems (CITS), with the latter providing internet connectivity to the campus as well as most of the ICT systems support. CITS is often used by academic staff for a variety of research purposes, from purchasing specific software, to establishing video-conferencing and internet connectivity at seminars/workshops. CITS also provides the university with a wide range of ICT systems to support communication activities, including Google

emails for staff and students, the university website, an online staff profile system, and online applications for admissions, staff recruitment and module registration.

Research

Because there is no national scholarly outputs repository or list of all research produced nationally, it is difficult to establish the level of research production in the country. In the absence of such numbers, other studies have had to rely on the ISI journal publications lists, which typically under-report research production in developing countries. Thus, according to the numbers available to Bunting and Cloete (2012: 30), UoM scholars produced 36 peer-reviewed research outputs in 2007. Updates to this data suggest that in the following year, 2008, that number dropped to 26 publications. That would be 1 in 10 UoM scholars producing peer-reviewed research outputs in that year. Taking the analysis further, "the average ratio is 0.12 [peer-reviewed publications per year per scholar], which implies that Mauritius' permanent academic staff would produce on average one research publication every eight years" (CHET 2012: 12).

As we have argued in the opening chapter, these numbers grossly underestimate the amount of research production that goes on in African institutions, because they focus solely on measuring outputs in "prestigious" journals rather than the many that are not listed in the Thomson Reuters Journal Citations Report. In our data (which we discuss in Chapter 5), we found that UoM FoS scholars produced far more than one research output every eight years, but they were not necessarily published into WoS-rated journals. For a more accurate picture of research production, the UoM Annual Report (2012) provides better evidence of the quantity and diversity of outputs.[42]

One of the journals not on the WoS lists is the *University of Mauritius Research Journal*, one of the publication outlets for UoM scholars. During the 2011/2012 academic year, "76 requests for publication in the *UoM Research Journal* were received. Among these, 49 pertained to papers presented at the UoM Research Week 2010/2011. From 1 August 2011 to 31 July 2012, 27 articles were accepted for publication in the *UoM Research Journal* among which 14 emanated from the UoM Research Week" (UoM 2012: 15).

Management

The bureaucratic nature of UoM's operational systems has been noted in several studies (TEC 2012; Manraj 2013). One major issue is the abundance of administrative and support staff: of the 879 permanent staff employed in 2009/2010, only 225 were academic staff (Cloete & Bunting 2012). This abundance, however, did not translate to smooth administrative processes, such as the purchasing of new equipment:

> *Despite departments and faculties submitting proposals for replacement of equipment, and despite the applications being approved for funding, the bureaucratic procedures and delays that characterise the procurement process are both frustrating and demotivating. There appears to be no clear*

[42] See especially p. 76–82 of the UoM Annual Report 2011–2012, which lists the Faculty of Science publications for the year, available at: www.uom.ac.mu/aboutus/AnnualReport/2011_2012/07FOS.pdf

> *University-level process to determine priorities for procurement of new equipment. It was explained that the Public Procurement Act 2006 has brought in more detailed public procurement processes. Consequently, the purchase of items requiring approval of the Public Procurement Office is quite lengthy. However, even items that do not need this approval can take time to purchase.* (TEC 2012: 63)

Complicating the situation considerably is the reported lack of administrative staff during institutional audits:

> *The Audit Panel heard repeated comments of a shortage of administrative staff, although the aggregate ratios of academic to administrative staff suggest a very high number of administrative staff. There is a suggestion that the number of administrative positions includes people such as those who work on the University farm. The Audit Panel suggests that UoM meet urgently with TEC to explain the breakdown of administrative staff, to ensure that the figures used by TEC reflect an accurate situation.* (TEC 2012: 46)

As a result, there seems to be both an overabundance of administrative staff, yet a shortage of administrative capacity. "Excessive centralisation" (Manraj 2013: 10), in which the upper administration decides on issues that could be better handled by individual faculties, was proposed as one of the core problems in the system. This poses serious concerns about institutional flexibility and the ability of UoM to adopt new practices and processes.

Compounding this, the vice chancellor's (VC) office has seen a high turnover rate over the past few years, with the latest VC summarily dismissed in mid-2013. He lasted in the post only about a year. These disruptions in the top office have led to certain research strategies remaining unimplemented as the university waits for stable, strategic leadership.[43]

While this may describe the general situation at the university, it has tried to rationalise and streamline its approach to research management. The management and diffusion of research is governed by the Office of the Pro-Vice-Chancellor for Research, Consultancy and Innovation (Pro-VC RCI), which oversees a number of operational committees that deal with the implementation of research policies and procedures, coordinating research and providing facilities and funding for university research. It also runs the Consultancy and Contract Research Centre (CCRC) and the Centre for Applied Social Research (CASR). The CCRC aims to encourage academic staff to undertake consultancy and to establish closer links with industry while CASR designs, carries out and interprets rigorous research studies within the field of public policy.

[43] Guillaume Gouges (17 Aug 2013) Controversy as university fires vice-chancellor, *University World News*, available at: www.universityworldnews.com/article.php?story=20130816180045660

Amongst other things, the Office of the Pro-VC RCI is responsible for managing:

- MPhil/PhD research
- Scholarships/bursaries: University/MRC/TEC
- Internal and external research grants including travel grants and academic staff development scheme
- UoM research journals and publications
- Consultancies and contract research projects through CCRC
- Intellectual property rights through the CCRC
- Incubators, university companies, spin-off companies, start-ups
- The Publications Committee[44]

Nevertheless, as we will discuss later, the managerial scene at the university has been in turmoil over the past few years with the VC's office in constant churn. The multiple changes in leadership in a short space of time have created great uncertainty in the administration, a problem that was further complicated with the recent dismissal of the latest VC. This problem could undo a lot of the otherwise excellent features of the university, especially as they relate to research and communication.

Conclusion

UoM remains a university deeply shaped by its teaching-oriented heritage. And while it sees itself as now moving from a "research-informed" status to a "research-oriented" one, the information above suggests that it may take some time before this is achieved. As the flagship university in the country, it is indeed taking on more research responsibilities and slowly growing a sense of research dynamism, but so long as scholars are faced with burgeoning undergraduate numbers, they will continue to have strong teaching obligations. This, of course, contributes to the government's desire of increasing the number and proportion of graduates in the country. Teaching is an absolute good, one of the university's greatest contributions to society. But given the growing human capacity that this has created, it makes sense to leverage that by stressing the production of more local research. The questions that emerge from the data above include:

- Are current funding levels appropriate for enhancing research?
- Can scholars increase their research outputs if they have more students to teach and supervise?
- Will the focus on research "production" lead to more scholarly visibility if academics can only publish their outputs in channels that are not recognised by the major scholarly indices?
- Can an administrative structure that is centralised but weak create the efficiencies necessary for ramping up research production and dissemination?

[44] UoM Pro-VC (RCI), Research, Consultancy and Innovation Welcome. Available at: www.uom.ac.mu/provcrci/RCI/welcome.htm

These are some of the questions that we aim to answer in the remainder of this report. But we will have to utilise a lot more than the impressionistic image received from the numerical data. We will have to look closely at the policies, the values and the research and communication practices that help make sense of the background information provided above.

In sum, this chapter has attempted to situate UoM within its continental, regional, national and institutional contexts. We have deliberately inserted it into the broader higher education landscapes of sub-Saharan Africa and Southern Africa, the two geopolitical units that most analysts would reference when thinking about scholarly communication challenges and opportunities in Mauritius. This is important because the island shares a number of similarities with its continental and regional neighbours while also deviating from them in a number of ways. For scholars and funders studying scholarly communication ecosystems, this is critical, because it is tempting to lump Mauritius within a broader context without appreciating its uniqueness. And yet it is always useful to compare the country to its neighbours to understand its relative level of performance and whether there are any collaborative opportunities between them. In this way, we have tried to avoid reifying Africa into "Africa" (the monolithic construct) so that we can appreciate the complexity of understanding scholarly communication at all of these nested levels.

Chapter 4.
The UoM scholarly communication policy landscape

In this chapter, we will provide a snapshot of the policy landscape shaping UoM research and communication activities. We will do so by viewing this landscape from three different vantage points: the international context, the national context and the institutional context. Through this nested approach, we will get a clearer idea of how the university's scholarly communication activities respond to their surrounding policy environment. Through a thick description of this landscape, we will be able to offer some light analysis concerning institutional scholarly communication, though this chapter mainly serves to set the stage for a more comprehensive analysis of the relationship between scholarly communication practices and the policy environment in later chapters.

The international context

The scholarly communication policy environment in Southern Africa remains highly influenced by academic norms established in the global North. This is not only due to the historical foundations of the universities themselves – derived from British models in the cases we studied – but the nearly hegemonic position that European and North American universities enjoy in setting global academic standards. This helps to explain why, even though Northern and Southern universities are often animated by different values and missions, their scholarly communication methods are largely the same, even if those divergent missions might be better served by different communication strategies.

The scholarly communication norm up until recently has been characterised by three prevailing features. In this "traditional" model, scholarly communication is:

- Disseminated primarily through journal articles, books and book chapters, thus equating to scholar-to-scholar communication
- Published by third-party commercial publishers that charge subscription fees (for institutions) or purchase costs (for individuals) to access their publications
- Often assessed according to a work's Impact Factor, the metric purporting to

measure a work's prestige and "importance" based on the average citation rate the publishing journal's articles collectively achieved during a two-year period

However, these normative standards are in a massive state of flux as the open access (OA) and alternative metrics movements challenge the utility of the traditional scholarly communication model and the arithmetic sensibility of the Impact Factor. These challenges emanate largely from within the institutions of the global North, but they also shape Southern scholarly communication opportunities, offering new possibilities for greater visibility and social "impact".

Open access goes mainstream

Over the last five years, global scholarly communication discourse has changed dramatically, moving from a discretionary consideration in academic research activity to an integral component of that process. In many ways, this is due to the achievements of the open access movement, which gained the scholarly, institutional and governmental support necessary to move from the activist fringe to the mainstream. This transition was signalled by the raft of policies adopted by major research-funding bodies, which required that all research funded by them was made open access, such as:

- European Commission[45]
- European Organization for Nuclear Research (CERN)[46]
- European Research Council (ERC)[47]
- Max Planck Society[48]
- Research Council UK (RCUK)[49]
- UK government[50]
- UK Department of Health (NHS/NIHR)[51]
- UNESCO[52]
- US government agencies[53]
- US National Institutes of Health (NIH)[54]
- World Bank[55]

[45] European Commission MEMO/12/565 (17/07/2012) Open access to scientific data – Communication and Recommendation – background, available at: http://europa.eu/rapid/press-release_MEMO-12-565_en.htm?locale=en
[46] CERN Scientific Information Service, Supporting Open Access Publishing, available at: https://oldlibrary.web.cern.ch/oldlibrary/OpenAccess/PublicationPolicy.html
[47] Open Access Guidelines for researchers funded by the ERC, available at: http://erc.europa.eu/sites/default/files/document/file/open_access_policy_researchers_funded_ERC.pdf
[48] Open Access and the Max Planck Society, available at: http://edoc.mpg.de/doc/help/mpg_oa.epl
[49] RCUK Policy on Open Access, available at: www.rcuk.ac.uk/research/outputs/
[50] Finch J (2012) *Accessibility, Sustainability, Excellence: How to Expand Access to Research Publications*. Report of the Working Group on Expanding Access to Published Research Findings: The Finch Group. Available at: www.researchinfonet.org/wp-content/uploads/2012/06/Finch-Group-report-FINAL-VERSION.pdf
[51] Statement on DH/NIHR-funded research and UK PubMed Central, available at: www.nihr.ac.uk/files/pdfs/OpenAccessPolicyStatement.pdf
[52] Swan A (2012) *Policy Guidelines for the Development and Promotion of Open Access*. Paris: UNESCO. Available at: http://unesdoc.unesco.org/images/0021/002158/215863e.pdf
[53] John Holdren (22 February 2013) Memorandum for the Heads of Executive Departments and Agencies, available at: www.whitehouse.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf
[54] NIH Public Access Policy Details: http://publicaccess.nih.gov/policy.htm

With these major funders[56] requiring that their research outputs to be made freely available to the public, scholars and universities have had to think beyond the traditional scholarly communication paradigm, a reality with which our partner universities in Southern Africa were just beginning to grapple.

Another key implication of these mandates is that while some funders such as the European Commission focus their open access requirements on traditional scholarly outputs (such as peer-reviewed journal articles), others such as the World Bank require it for all types of research outputs (including reports, working papers, policy briefs, data, etc.), thereby broadening the very notion of what constitutes scholarly communication. SCAP argued for this enlarged approach to scholarly communication throughout its engagement with Southern African universities, but it will likely only become a mainstream proposition through the continued production and dissemination of such alternative outputs by the scholarly community in response to incentives such as funder mandates and institutional reward systems.

Along with these funders, many universities have also adopted open access policies governing the dissemination of their faculty members' research outputs, including Concordia, Dartmouth, Duke, Edinburgh, ETH Zurich, Harvard, MIT, Princeton, UC Berkeley and the University College London.[57] These universities are contributing to a groundswell of institutionally based action endorsing open access principles.

While funder mandates have given a major financial and policy incentive for scholars to communicate their research openly, the growth of open dissemination platforms (such as OA journals and institutional repositories) has also made such a choice more feasible. For instance, according to Laakso and Björk (2012), between 2000 and 2011, the number of open access journals has grown significantly, as has the number of articles published in an OA fashion. In 2000, 744 open access journals published 20,700 articles. In 2011, 6,713 full open access journals published approximately 340,000 articles. Each year, the proportion of open access articles rises by about 1%, totalling approximately 17% of the 1.66 million articles listed in the Scopus journal article index in 2011. The fact that many smaller OA journals are not even featured in indexes such as Scopus or the Web of Science suggests that the proportion of OA publishing is even higher than often recognised, a fact that confirms the considerable impact that OA outlets are having on scholarly publication (Laakso *et al.* 2011).[58]

This growth has been matched by the expansion of open access IRs where universities curate, profile and disseminate their scholars' research, some of which has been formally published elsewhere. According to the Open Directory of Open Access Repositories (OpenDOAR), the number of IRs worldwide has increased from 128 in December 2005 to

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[55] World Bank Open Access Policy for Formal Publications, available at: http://documents.worldbank.org/curated/en/2012/04/16200740/world-bank-open-access-policy-formal-publications

[56] For a more comprehensive list of funder open access mandates from BioMed Central, see: www.biomedcentral.com/funding/funderpolicies

[57] For a list of universities worldwide with open access policies from BioMed Central, see: www.biomedcentral.com/funding/institutionalpolicies

[58] For an incisive summary of Laakso and Björk's article, see Ben Mudrak (10 November 2012) New study tracks growth of open access publishing, *AJE Expert Edge*, available at: http://expertedge.journalexperts.com/2012/11/10/new-study-tracks-growth-of-open-access-publishing/

2,454 in October 2013.[59] This includes 81 repositories currently in Africa (3.3% of the global total)[60] of which 69 are located in sub-Saharan Africa (40 of these are in Southern Africa). The proliferation of repositories worldwide offers new possibilities for universities to take greater control of their scholarly communication destinies.

These two dissemination mechanisms – open access journals and open access IRs – are the subject of an intense debate concerning which platform offers the most viable, sustainable and affordable OA dissemination mechanism going forward. This debate is known as that between the "gold route" and the "green route".

According to the Joint Information Systems Committee (JISC), the *gold route* involves "publishing in a fully open access journal or website. Subjected to the same peer-review procedures as a traditional journal, the open access journal will usually be available online. Authors may need to pay for their work to be published, although this is very rare as it is often provided for by the research grant. Some institutions even pay these fees out of a central fund to account for the differences between research councils."[61]

The *green route* involves "self-archiving in a repository". While this can lead to logistical challenges (such as getting scholars to upload their own materials), "repositories offer a number of benefits. They increase the availability of some published journal works with restrictions on reprinting or text mining, and may enable work to be propagated across the internet and used for novel applications. Repositories also allow authors to keep track of who is downloading their data."[62]

While SCAP believes that there are merits to both approaches, we did not promote one over the other in our engagements with our partner universities. We were more interested in helping to establish an open access ethos where scholars, managers and librarians could identify and pursue OA strategies in line with their own interests and capacities. Because of this, during the course of our research and interactions with these universities, project participants became attuned to the ways in which international open access trends were impacting scholarly communication opportunities.

Revised approaches to assessing impact

Another key debate shaping international scholarly communication discourse and the policies that universities use to assess their own academics' research revolves around the value and utility of the Impact Factor, a common performance assessment metric. The Impact Factor is a number representing the average number of citations that a journal's

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[59] Growth of the OpenDOAR Database – Worldwide, available at: www.opendoar.org/onechart.php?cID=&ctID=&rtID=&clID=&lID=&potID=&rSoftWareName=&search=&groupby=r.rDateAdded&orderby=&charttype=growth&width=600&height=350&caption=Growth%20of%20the%20OpenDOAR%20Database%20-%20Worldwide

[60] OpenDOAR Proportion of Repositories by Continent – Worldwide, available at: www.opendoar.org/onechart.php?cID=&ctID=&rtID=&clID=&lID=&potID=&rSoftWareName=&search=&groupby=c.cContinent&orderby=Tally%20DESC&charttype=pie&width=600&height=300&caption=Proportion%20of%20Repositories%20by%20Continent%20-%20Worldwide; see the distribution of repositories worldwide through this dynamic Google map from Repository66, available at: http://maps.repository66.org/; see also the Registry of Open Access Repositories (ROAR), available at: http://roar.eprints.org/

[61] JISC, Gold and green: The routes to open access, available at: www.jisc.ac.uk/whatwedo/topics/opentechnologies/openaccess/green-gold.aspx

[62] Ibid.

articles collectively receive during a two-year period. Thus if the Impact Factor for a journal in 2012 is 1.5, then the articles published in that journal in 2010 and 2011 collectively averaged one-and-a-half citations in 2012. The point of the Impact Factor – devised by the Institute for Scientific Information (ISI) in the 1960s and now known as the Thomson Reuters Web of Science (WoS)[63] – is to measure the "impact" of a journal within a given academic field and, by proxy, suggest an evaluation of the relative impact of the articles published within it.

For university managers, the Impact Factor offers a handy "objective" means for estimating the quality and "impact" of a scholar's publication. For instance, during a scholarly assessment exercise (such as for promotion), managers can utilise the Impact Factor to help them gauge the level of contribution that a scholar is making to his or her field. Because there are tens of thousands of journals published globally, and because it is difficult for managers otherwise to evaluate the quality of a scholar's output, the Impact Factor provides a seductive shorthand for helping with that process.

However, in the digital age, where individual articles, chapters and books (or any digital scholarly object) can be tracked and measured through internet technologies, the traditional Impact Factor seems to obscure as much as it reveals. As a tool from the print era, it remains wedded to an outmoded citation-averaging technique (at the journal rather than the article level); it narrowly defines impact as citation rather than use (meaning that it privileges an insular form of scholarly impact rather than a broader notion including social, developmental or industrial impact)[64] and it renders countless research outputs invisible because it excludes thousands of journals (many from the global South) from being considered for an Impact Factor score.[65]

Because of these problems, the Impact Factor has been heavily criticised by scholars (Clobridge 2012; COAR 2012; Ernst 2010; Lawrence 2008; Lehmann, Lautrup & Jackson 2003; Patterson 2009; Rossner, Van Epps & Hill 2007; Seglen 1997; Vanclay 2012), leading many of them to express their collective dissatisfaction by writing and signing the San Francisco Declaration on Research Assessment (DORA) in 2012. The primary recommendation it makes is: "Do not use journal-based metrics, such as Journal Impact Factors, as a surrogate measure of the quality of individual research articles, to assess an individual scientist's contributions, or in hiring, promotion, or funding decisions."[66]

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[63] Thomson Reuters Web of Science (WoS), available at: http://thomsonreuters.com/web-of-science/

[64] The ISI/WoS rankings are often taken as a proxy for development impact. For example, in an important report into the research effectiveness of African universities, the three output indicators used were graduation rates, production of PhDs and publication of journal articles in ISI journals. The latter metric was justified as follows: "ISI-referenced publications represent a narrow notion of research output, but it is what makes it a flagship university and its academics part of the global knowledge community" (Cloete, Bailey & Maassen 2011: xx). A useful critique of this reasoning can be found in this reflective piece: Sam Wineburg (26 August 2013) Choosing real-world impact over Impact Factor, *The Chronicle of Higher Education*, available at: http://chronicle.com/blogs/conversation/2013/08/26/choosing-real-world-impact-over-impact-factor/?cid=cr&utm_source=cr&utm_medium=en

[65] Thomson Reuters WoS does not monitor all journals published worldwide, but just a selected list of 12,000 journals which it considers "top tier international and regional journals in every area of the natural sciences, social sciences, and arts and humanities." This list excludes thousands of journals from the developing world. For more information on "The Thomson Reuters Journal Selection Process", see: http://wokinfo.com/essays/journal-selection-process/

[66] San Francisco Declaration on Research Assessment (DORA), available at: http://am.ascb.org/dora/

Furthermore, the UK's Research Excellence Framework (REF) – the influential research assessment exercise of British HEIs – has dropped Impact Factors from its evaluation process: "No sub-panel will make any use of journal impact factors, rankings, lists or the perceived standing of publishers in assessing the quality of research outputs. An underpinning principle of the REF is that all types of research and all forms of research outputs across all disciplines shall be assessed on a fair and equal basis."[67]

Meanwhile, as scholars and managers start to move away from the Impact Factor, new opportunities are emerging to assess an output's "impact" in a more precise and comprehensive manner. The most important of these is the alternative metrics (or Altmetrics) movement,[68] which promotes the use of data-harvesting technologies that allow computer programmes to track digital scholarly objects as they are cited, downloaded, viewed, liked, tweeted, bookmarked and shared.[69] This permits scholars and managers to get a far clearer understanding of an output's impact and use than the blunt journal-level Impact Factor citation metric. Altmetrics allows for the evaluation of any type of digital scholarly object (journal article, conference paper, policy brief, ebook, etc.) while the Impact Factor is confined to formal journal articles. Moreover, alternative metrics allow scholars to gain a far deeper insight into how their outputs are being used and shared, leading to them being able to tell "impact stories"[70] that detail the real-world effects of their research (which has become a growing component of academic performance assessments).

While the alternative metrics movement is not yet as mainstream as the open access movement, it is creating new options for the many who seek to do away with or replace the Impact Factor. However, in the Southern African context in which we conducted our research, we found that these discussions were not as robust as they were in the global North. The Impact Factor remained a powerful assessment tool for scholars and managers. But through our advocacy work, we were able to raise an awareness of these competing scholarly measurement paradigms, an awareness that will likely grow as article- (or object-) level metrics become more common worldwide.

The national context

In emerging economies, such as those in Southern Africa, governments expect their universities to play a key role in national development through the production and dissemination of knowledge. This desire is revealed in policy statements by government ministers, in university mission statements and in the social discourse concerning the role of universities in emerging economies. This is also true in Mauritius where research and national development are meant to go hand-in-hand.

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[67] Research Excellence Framework 2014 – Frequently Asked Questions, available at: www.ref.ac.uk/faq/all/
[68] The global Altmetrics movement was largely born out of the Public Library of Science's (PLOS) work in pioneering article-level metrics in 2006. This shift to a different locus of measurement opened the doors to wide-scale interrogation of previous metrics and exploration of new tools and methodologies which became mainstream in 2011/2012. For more on the ethics and rationale behind the movement, see "Altmetrics: A manifesto", available at: http://altmetrics.org/manifesto/
[69] The most popular services for this are provided by Altmetric, available at: www.altmetric.com/
[70] ImpactStory, one of the services that emerged from the altmetrics movement, provides scholars with a variety of usage statistics that allows them to construct a narrative interpretation of their work's impact, available at: http://impactstory.org/

Nationally, the Ministry of Tertiary Education, Science, Research and Technology (MTESRT), the Mauritius Research Council (MRC) and the Tertiary Education Commission (TEC) are the bodies driving higher education, research and innovation. Their primary ambition, as we will see in the policies and statements below, is for the island nation to be transformed into a "knowledge based economy". To make this happen, the government has been pushing for greater education, research, innovation, collaboration, connectivity and capacity. In this section, we discuss the role of two bodies (the MTESRT and the MRC) and two policies (the TEC Publishing Grant Scheme and the Education and Human Resources Strategy Plan 2008–2020) that shape the scholarly communication landscape for university scholars.

Ministry of Tertiary Education, Science, Research and Technology

As the ministry in charge of higher education in Mauritius, MTESRT seeks to make the vision of a knowledge-based economy a reality by 2022, by:

- Extending the 24/7 concept to tertiary education
- Attracting renowned tertiary educational institutions
- Reaching the objective of one graduate per family
- Setting up a one-stop shop for tertiary education
- Reviewing the existing legal framework for intellectual property rights
- Preparing an Action Plan on Research and Development
- Giving a new drive to science popularisation and sensitisation[71]

The previous iteration of this ministry, called the Ministry of Education and Scientific Research (MESR), produced a document in 2006 entitled *Developing Mauritius into a Knowledge Hub and Centre of Higher Learning,* which explains the role that HEIs should play in moving the country towards a knowledge economy:

> *The Government has decided that, henceforth, knowledge-based industries will be an increasing source of value added for the economy and a significant component of the new economic model. To that end, it is promoting a Knowledge Hub agenda in which tertiary education will be given greater prominence especially in the fields of Science and Technology, Information and Communication Technologies, Skills Development and in Research & Development in Applied Sciences.* (MESR 2006: iv)

This desire has important implications for scholarly communication, in that a knowledge economy is premised on the easy flow of information and ideas, unconstrained by legislative, technical or financial obstacles (except perhaps for commercial purposes, as with patented knowledge). Thus the government has placed great emphasis on reducing the impact of these various obstacles. But because it is also keen to exploit the commercial potential of knowledge production, it has not yet stressed an "open" approach to knowledge. It focuses more on person-to-person connectivity and

[71] See the MTESRT values and mission statements at: http://tertiary.gov.mu/English/AboutUs/Pages/Mission-and-Vision.aspx

collaboration. This fact dictates the current strategies taken by UoM, which aims to be a "knowledge hub", but not necessarily an open knowledge portal. The difference in metaphors – between hub and portal – illustrates the thinking behind the HEI sector's approach to scholarly communication.

Mauritius Research Council

The ministry's strategic vision is complemented by the MRC, which serves to: promote and coordinate national investment in research, advise the government on scientific and technological policies, initiate research and development policies, and encourage commercial utilisation of research and development results in the national interest.[72]

In terms of scholarly communication, the MRC is keen to facilitate knowledge exchange between researchers and industry for exploiting commercial applications that will lead to national development. For UoM scholars, the university itself provides support services for just such knowledge transfer (discussed below). But many scholars also say that, when they receive MRC funding, they are encouraged to present their findings to government personnel in various research and innovation fora. Thus, unlike in many other countries in Southern Africa, Mauritian scholars enjoy a certain level of access to government and industrial players for disseminating their research.

TEC Publication Grant Scheme

The other relevant higher education agency working under the guidance of MTESRT is the TEC, a qualifications and accreditation body that also allocates government funding to Mauritian HEIs such as UoM.

According to the TEC's Strategic Plan 2007–2011, its vision is to "Make Mauritius the Intelligent Island of the Region in the Global Village" while its mission is to "Position Mauritius in the Region as a world-class Knowledge Hub and the gateway for post-secondary education" (TEC 2011: 5). All of this is in line with broader government objectives. But as a funding body, the TEC also promotes scholarly communication in a more direct way. The most pertinent mechanism it employs to do this is the Publication Grant Scheme, which is "targeted for staff of the Tertiary Education Institutions as well as to researchers in general", providing "up to Rs 25,000 for the publication of books and research materials."[73] This is not the major scholarly communication pathway for most scholars, but it does represent an important funding opportunity for researchers who want to communicate their ideas through printed books.

MECHR Education and Human Resources Strategy Plan 2008–2020

The Ministry of Education, Culture and Human Resources (MECHR) is the ministry in charge of basic education, but also a key policymaker in the broader education and training landscape. It produced the *Education and Human Resources Strategy Plan*

[72] For more on the MRC's activities, and its mandate under the MRC Act, see: www.mrc.org.mu/about_the_council/mrc_act.
[73] The TEC Publication Grant Scheme, available at: http://tec.intnet.mu/resrch_pubgrnt.php

2008–2020 (MECHR 2009), which locates tertiary education and research within the broader island economy and educational environment. According to the report, "the main objective for the tertiary education sub-sector is to make Mauritius a Knowledge Hub to serve the Region and a Centre for Higher Learning and Excellence" (MECHR 2009: 112). The document shares how research must contribute to the knowledge economy, how it should be attentive to industrial requirements and how it should be curated and disseminated.

> *As an important driver of the knowledge economy, the tertiary education sub-sector will need to lay greater emphasis on research than is the case presently. All the TEIs [tertiary education institutions] will be expected to have their Research Plan which is aligned to national priority needs and to adhere to the National Research Ethics Guidelines as well as a code of ethics for research. Interdisciplinary research between institutions including the private sector will be encouraged. Further, industry and the business community will be solicited to provide financial support in the form of grant/contract research to academic staff/postgraduate students to help solve specific issues or innovate in their respective sectors. In parallel, the TEIs will be called upon to diversify their research sourcing through competitive bidding and commissioned research. A database for ongoing and completed research projects in the TEIs will be maintained and disseminated. The TEIs will also be accountable for periodic self-evaluation of their research.* (MECHR 2009: 116)

Not all of these goals are at equal levels of fulfillment yet, especially regarding research maintenance and dissemination, but the government has done well in its desire to connect academia and industry for the sake of sharing the responsibility of contributing to national development. The plan suggests why this is so important to policymakers:

> *To ensure the success of the knowledge hub, efforts will be undertaken to strengthen the linkages between tertiary education, government and industry. Knowledge hubs generate new basic knowledge of relevance to many industries, as well as applied knowledge that is directly and immediately relevant to local industries. They also capture knowledge generated elsewhere, nationally or internationally, and develop this further to meet specific local needs. TEIs will be called upon to design their programmes with the assistance of industry.* (MECHR 2009: 117)

In sum, Mauritian national education policies stress the importance of innovation, the knowledge economy, research for development, and interdisciplinary cooperation. Collectively, these national policies, strategies and programmes help explain why scholarly communication plans at UoM are focused so much on collaboration, consultancy, connectivity and commercialisation rather than, say, openness, non-traditional outputs or alternative metrics (the issues currently dominating the scholarly communication discourse in other parts of the world).

The institutional context

At an institutional level, UoM's official scholarly communication approach is very much in line with national strategies. It is best expressed in the UoM mission and vision, the UoM Strategic Plan 2006–2015, the UoM Strategic Research and Innovation Framework 2009–2015, the consultancy and contract research programmes on campus and the academic staff performance assessment guidelines.

UoM Mission and Vision

At the heart of the university's mission is a commitment to scholarly "dissemination" to both Mauritians and the international community: "The core mission of the University is the creation and dissemination of knowledge and understanding for the citizens of Mauritius and the international community."[74]

This is further inflected by the university's vision, which imagines its role as a connective one globally: "The University of Mauritius aspires to be a leading international university, bridging knowledge across continents through excellence and intellectual creativity."[75]

These sentiments are in line with the government's desire for the island to become a regional knowledge hub and a space characterised by high levels of collaboration and connectivity. As high-level statements, they are meant to offer a broad guiding framework for the various strategies and plans that emanate from them. But as assertions aimed at capturing the spirit animating the university, they comprise important ideals against which the institution's performance can be measured.

UoM Strategic Plan 2006–2015

The University of Mauritius Strategic Plan 2006–2015[76] provides the roadmap that the institution is currently using to fulfil its mission and values. It is comprised of six strategic directions:

1. Knowledge creation
2. Knowledge diffusion
3. Investing in resources
4. Quality culture and good governance
5. National, regional and international collaborations
6. Community outreach

Each of these strategic directions contains a number of sub-goals and strategies, three of which deal with scholarly communication at some level, though somewhat indirectly.[77]

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[74] UoM, Mission and Vision of the University, available at: www.uom.ac.mu/ABOUTUS/INTRODUCTION/missionvision.html
[75] Ibid.
[76] The UoM Strategic Plan 2006–2015, available at: www.uom.ac.mu/ABOUTUS/StrategicPlan/index.htm
[77] For instance, though the "knowledge diffusion" objective concerns scholarly communication in its broadest sense, it is more about opening the doors of higher education to more students, thereby "diffusing" UoM's knowledge more extensively to Mauritian and international students. This sense of communication is outside the purview of this study.

Within these six objectives, the three relevant sub-goals relate to e-learning systems, technological capacitation and collaborative networking (UoM 2006):

(a) Foster innovative e-learning systems

- Develop more e-programmes
- Enhance IT support and infrastructure
- Provide e-learning tools to staff
- Provide internet connection in lecture rooms
- Provide laptops, PDAs to staff
- Develop training programmes for both staff and students to enhance their e-skills
- Equip the university with modern mechanisms for communication: wireless communication (Wi-Fi), computer networks, multimedia, content portals, search engines, electronic libraries, etc.
- Incorporate e-learning technology (web-enhanced, blended learning approaches) in Programmes of studies to enhance student experience
- Provide a wider spectrum of options from asynchronous to synchronous learning
- Provide incentives for staff to develop and use innovative e-learning systems

(b) Increase provision for state-of-the-art technologies

- Promote e-conferencing with foreign partners
- Develop a department-wise facilities and equipment master plan based on a needs assessment
- Explore the benefits of introducing the biometrics system
- Optimise resource utilisation through sharing of equipment and through internal and external partnerships
- Support the Excellence Park in its research enterprise
- Provide reliable access to information and network services on and off campus
- Enhance IT infrastructure to promote efficiency and productivity
- Database Management System for administrative processes

(c) Reinforce networking role

- Strengthen existing partnerships at local, regional and international levels
- Develop new strategic partnerships
- Exploit our assets, geographical, infrastructural and linguistic, to act as focal link between Africa and Asia
- Set up a “staff alumni” and redynamise student alumni
- Database of UoM graduates on website
- Enhance student and staff exchange programmes

While these goals and strategies are important for enhancing the dissemination of Mauritian-produced knowledge, they do not speak to some of the core issues that define current debates around scholarly communication, such as openness, dissemination formats and metrics. The strategies listed above deal with technology development, infrastructure capacitation, skills training, collaboration (both virtual and physical) and

networking. SCAP supports all of these desires (and would have recommended them if they were absent), but as we will discuss later, technology and networks do not always achieve their developmental potential if they are constrained by inappropriate policies, paradigms or incentives.

UoM Strategic Research and Innovation Framework 2009–2015

The Strategic Research and Innovation Framework (SRIF) 2009–2015 is a key mechanism by which UoM plans to achieve the commitments made in the Strategic Plan 2006–2015 discussed above. It consists of four primary objectives:

1. Foster and grow an active research culture that inspires discovery and innovation with emphasis on research of excellence that is world-significant.
2. Strengthen interdisciplinary and collaborative research through increasing the number of functional and strategic internal and external links.
3. Build future research and research capacity.
4. Increase research income from external sources to support more research broadly.[78]

These goals stem mostly from a desire to ramp up UoM's research intensity, effectiveness and commercial viability. This would appear the next logical step in the institution's development. As the SRIF's Executive Summary states, "from this research-informed base, the University is now well underway to become a research intensive institution."[79] These goals are similar to the other national and institutional policies listed above, which seek increased research production, capacity, collaboration and industrial utility.

While all of these are worthwhile objectives, none of them interrogate the traditional forms of scholarly communication on which they appear to rest. They take for granted that these objectives can be achieved through either a conventional scholar-to-scholar communication model that is largely mediated by high-impact international journals, or a consultancy contract model in which the university's research is bound up in the intellectual property regimes of industrial partners. In both cases, this impacts the ability

[78] The four objectives of the UoM SRIF 2009–2015 include a number of specific strategies to achieve them. UoM will seek to achieve the first objective by: nurturing UoM research "stars"; promoting team research through specialised "excellence parks", laboratories and units; increasing and diversifying research funds; improving research quality and impact; conducting research quality assessments; increasing citations by raising the profile and accessibility of UoM research; rewarding excellence in research; developing outreach activities aimed at enhancing the research and innovation culture nationwide; encouraging the organisation of research events; and developing pathways to ventilate UoM research findings. It will seek to achieve the second objective by: identifying emerging interdisciplinary priority areas with special focus on potential income-generating research and consultancies; establish incentives to support multi-discipline research; integrating disparate research activities into the core research endeavours of the university; promoting high-impact collaboration with other leading universities worldwide; developing search criteria for next and future generation researchers (especially from the Mauritian Diaspora) to lead collaborative research. It will seek to achieve the third objective by: promoting a vibrant research environment which attracts and retains the best researchers; managing research effectively; emphasising quality research training; attracting outstanding research students or researchers, new talents; and training the next generation of research leaders to the best international standards. It will seek to achieve the fourth objective by: putting in place mechanisms, processes, incentives and support structures that will enhance the university's ability to attract research grant funding, contract research and consultancies; stimulate knowledge transfer and commercialisation. See the text of the SRIF here: www.uom.ac.mu/provcrci/Research/ResearchStrategy.html.

[79] UoM Strategic Research and Innovation Framework (SRIF) 2009–2015 Executive Summary, available at: www.uom.ac.mu/provcrci/research/ResearchStrategy/EXECUTIVESummary.pdf

of the university's research to gain visibility, enhance development and reach a broader audience that might be able to utilise it for social or developmental purposes.

Moreover, these ambitious plans require a stable university leadership structure to provide consistency of promotion, application and assessment (of the plan), all of which have been missing in the last number of years at UoM. As discussed in Chapter 3, the university's managerial structure has been in a state of flux – with repeated leadership transitions in the vice chancellor's office – thereby impacting the ability of the institution to achieve its own research objectives.

Consultancy and Contract Research Centre

One of the key structures at the university to promote its research and commercial ambitions is the Office of the Pro-VC for Research, Consultancy and Innovation.[80] Under its management falls the Consultancy and Contract Research Centre (CCRC), the major node through which UoM scholars deal with consultancy and contract research work. According to its website, "the CCRC is involved in pre-award contract negotiation in the finalisation of agreements in collaboration with the Registrar's office for legal clearance, project management of research during implementation, management of intellectual property rights generated by research, licensing and technology transfer of research output, and finally project wrap-up and closure."[81] It also markets the research services of the university to industry players and the government. It claims that, "since its creation in 1998, the CCRC has successfully managed to completion over 500 projects including studies, reports and training programmes commissioned from the University by the private sector and public sector as well as regional and international organisations. These projects vary from consultancy projects to multidisciplinary contract research projects of national importance."[82]

Beyond the CCRC's marketing of the university's research skills, UoM scholars can also look for consultancy opportunities themselves by engaging the Consultancy Watch Unit, which helps "faculty staff identify and develop consultancy opportunities. A watch is carried out by the CCRC on all invitations to tender bids (local, regional or international). A selection mechanism has been established to select a project team to respond to the bids."[83]

To deal with thorny IP issues, the CCRC "manages intellectual property rights generated by university research, licensing and technology transfer."[84] It tries to enhance the position of the university and the country by leveraging IP for development. Moreover, "in order to promote a wider use of Patent Information Services by researchers on campus, the CCRC puts at their disposal on the intranet a database of patent documents

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[80] Office of Pro-VC for Research, Consultancy and Innovation, available at: http://vcampus.uom.ac.mu/rci/
[81] Consultancy and Contract Research Centre (CCRC) expertise and services, available at: www.uom.ac.mu/provcrci/CCRC/ExpServices/welcome.htm
[82] Consultancy and Contract Research Centre (CCRC) profile of experience and expertise, available at: www.uom.ac.mu/provcrci/CCRC/ExpServices/profile.htm. A list of UoM's completed consultancy engagements are listed here: www.uom.ac.mu/provcrci/CCRC/ExpServices/CompletedProjects.pdf
[83] Consultancy and Contract Research Centre (CCRC) Consultancy Watch Unit, available at: www.uom.ac.mu/provcrci/CCRC/Process/cwu.htm
[84] Consultancy and Contract Research Centre (CCRC) expertise and services, available at: www.uom.ac.mu/provcrci/CCRC/ExpServices/welcome.htm

of Espace Globalpat", a collection that "represents a most comprehensive patent library for any university/institution/company and contains nearly all the world's patent literature since 1971."[85] At a minimum, this helps researchers avoid duplicating research that has already been patented.

Lastly, UoM scholars have access to the Technology Management Group (TMG), which aims to:

- Attract industrial managers to engage in collaborative research
- Attract potential funders of, or buyers of, UoM research
- Promote industry research that could make them more competitive
- Coordinate interactions between the University and Industry
- Manage the interests of industrialists in the academic world
- Foster linkages with the Industry and small and medium-sized enterprises[86]

With these useful services available on campus, UoM scholars are well-positioned to meet the government's desire to leverage research through industrial engagement.

Academic staff performance assessment guidelines

While the various national and institutional plans and policies establish the general conditions under which UoM research is conducted, for individual scholars, the most important policy shaping their actions at a personal level is the UoM *Academic Staff Performance Assessment Guidelines,* which delineate the rewards and incentives attached to their research activity. Beyond the various moral and ethical imperatives surrounding the country's and institution's desire for research production, these guidelines help scholars understand what benefits they can expect personally for carrying out research. This is a crucial point, as these policies represent the university's key source of leverage in influencing the quantity and quality of institutional research activity.

We will discuss the rewards and incentives of the assessment guidelines in more detail in Chapter 5, but for now it is important to note that these guidelines form a crucial part of the scholarly communication policy landscape for UoM scholars. It is the one policy that directly answers to their personal (or "selfish") desires (such as social status, greater funding opportunities, a positive salary adjustment, etc.). It is based on a simple point system in which various types of scholarly outputs are allocated a numerical value that is then weighted according to whether the output is considered of a "very high category" (1 x full marks), "high category" (0.8 x full marks) or "average category" (0.6 x full marks) and totalled to give assessors a raw score to grade them. This process does not happen continuously, nor even annually, but when a scholar decides to apply for promotion, which may happen after a few years in a given rank.

The point system rewards the publication of internationally published books, journal articles, book chapters and refereed papers in conference proceedings over those

[85] Consultancy and Contract Research Centre (CCRC) IP and technology transfer, available at: www.uom.ac.mu/provcrci/CCRC/Process/IPTechTrans.htm
[86] UoM Technology Management Group (TMG), available at: www.uom.ac.mu/provcrci/Research/TechMgtGp.html

published nationally (by a 2:1 margin) and provides mild recognition for alternative outputs such as reports, technical papers, briefings and so forth.

From SCAP's perspective, the major piece missing from this promotion policy is any strategic concern for dissemination practices beyond a traditional understanding of scholarly communication. Scholars are rewarded for publication, but without any regard to whether it is open or closed. The policy trusts commercial publishers to disseminate their scholars' work, failing to take into account that most of those publications may end up only accessible to other scholars with university journal subscriptions. Essentially, while the policy pushes for research publication, it does not imaginatively try to use the act of dissemination to achieve national development goals by making sure that UoM reaches the broadest possible audience in the most open fashion.

Conclusion

In this chapter, we have tried to provide a snapshot of the policy landscape shaping UoM research and communication activities. As we have seen, the international context is being radically reshaped by the open access movement which has been embraced by numerous funders, institutions and scholars. It is turning conventional understandings of scholarly communication on its head. The global context is also being informed by provocative demands for a new type of scholarly metrics, one that goes beyond the traditional Impact Factor toward an alternative or complementary metrics that leverages the data-generating capacity of the internet. These alternative metrics seek to broaden the social and developmental meaning of a scholarly output's "impact."

At the Mauritian national level, we have seen that the government has created a tightly focused set of policies and plans related to transforming the island from a material economy to a knowledge economy. Its policies seek to turn Mauritius into a knowledge hub for the region by embracing technology, innovation, research, collaboration and connectivity. While these policies do not deal directly with scholarly communication (at least as we have defined it here), they rely on a traditional understanding of what that communication would ultimately entail. This has an important knock-on effect for the university context where research is produced.

At the institutional level, scholarly communication is imagined as fitting into the broader national objectives surrounding research production, but it does not establish how the traditional scholarly communication model either helps or hinders UoM research in achieving these objectives. Indeed, in the rest of this report, we will challenge this conception by arguing that, if the university wants its research to have the kind of developmental effects it desires, it needs to consider utilising new communication techniques, especially open ones.

Chapter 5.
Research & communication practices

SCAP's research examines the scholarly communication ecosystem at four Southern African universities in order to address the primary research question: What is the current state of scholarly communication in African universities?

To answer this question at the University of Mauritius (UoM), we focused on the scholarly communication ecosystem of the Faculty of Science (FoS), the SCAP pilot site.

From an ecosystems perspective, the faculty is a useful unit of analysis for understanding scholarly communication because it reveals the values, norms and practices specific to the relevant discipline (science), while at the same time offering crucial insights into the values, norms and practices of the entire institution (UoM). A departmental focus would be too narrow (since most of its practices are structured by scientific norms) and an institutional focus would be too broad (since it is shaped by the multiple disciplinary norms within the faculties), but a faculty focus provides the necessary access to both micro and macro fields of operation.

The key virtue of the ecosystem approach for understanding scholarly communication is that it is based on the principle of interconnectivity (Benkler 2006; Cronin 2003; Friedlander 2008; Maron & Smith 2008). Every feature of the ecosystem is connected to every other in a web of mutual responsiveness, a fact that has crucial implications for the analysis of that system, and for any proposed intervention into it. The SCAP team was interested in both of these possibilities.

This chapter describes and analyses the UoM FoS scholarly communication ecosystem. It does so by assessing the faculty's profile, temporal obligations, values, research production and dissemination activities, rewards and incentives, and perceptions of the African context. Most of the chapter is concerned with detailing the elements of this ecosystem and how scholars act within it, providing a "thick description" of this particular environment. The rich details that we provide – full of both numerical and textual evidence – allows for some important analytical opportunities, but it will also continue laying the foundations for our analyses in the later chapters.

Faculty profile

FoS comprises 55 permanent academics, of whom 33 are male and 22 are female (a 3:2 ratio). Of them, 47 (85%) hold PhDs and 8 hold MScs or MPhils. While a number completed their graduate studies in Mauritius, a significant number did their PhDs abroad at universities in France, the UK, Canada, Hong Kong, Australia and India.

Age

UoM FoS academics are mostly middle-aged. Of the 30 faculty members who completed our survey, 28% are 31–40 years old and 62% are 41–50. Only 7% are over 50, and none are above 60 – a profile that scholars said matched the broader faculty reality. While only 3% are 20–30 years old, the fact that more than 90% are under the age of 51 (of which almost a third are under 41) suggests that the faculty will enjoy a relatively stable cohort in their "peak years" for a long time to come.

Years of research experience

Aside from 7% of the FoS staff who said that they have less than 5 years of research experience (yre), all of the other five-year bands were represented almost equally: 6–10 yre (27%), 11–15 yre (20%), 16–20 yre (27%), 20+ yre (27%). This gives a nice balance to the faculty, with members who have senior and junior levels of research experience.

Positions

Of the 55 faculty members, a full 75% are senior lecturers or above. Only 25% are lecturers. The largest group are associate professors who comprise 40% of the total. This defies the typical pyramid shape of positional hierarchy in many institutions where the top positions comprise a relatively small proportion of the total. The UoM FoS numbers are:

- Lecturers: 14 (25%)
- Senior lecturers: 13 (24%)
- Associate professor: 22 (40%)
- Professors: 6 (11%)

According to FoS respondents, the reason for this top-heavy positional profile is because many of the staff were hired in the early years of building the faculty, providing years of mostly teaching service to the university. Over time, they were rewarded not only with the prescribed annual salary increases, but also promotion. Two decades ago, promotion was not so rigidly tied to one's publication record, though it is more so now. Thus more than 50% of the FoS members are associate professors or full professors, a fact that places younger scholars in a challenging circumstance: to join these high ranks, they must be able to show that they have outstanding publication records because, otherwise, these ranks are already oversubscribed.

Salary scales

Compared to their southern African counterparts, UoM academic staff are paid relatively low salaries, a fact that they noted to us repeatedly. Here are their monthly salary scales:

- Lecturer: MUR27,750–54,600 (USD893–1,757)[87]
- Senior lecturer: MUR44,100–66,600 (USD1,419–2,124)
- Associate professor: MUR59,400–78,000 (USD1,912–2,510)
- Professor: MUR93,000 (USD2,992)

If we factor in the 13th cheque that they receive in December, their annual salaries[88] in USD are:

- Lecturer: USD11,609–22,841
- Senior lecturer: USD18,447–27,612
- Associate professor: USD24,856–32,630
- Professor: USD38,896

While these salaries are padded by a number of benefits[89] – such as car loan tax breaks, private health care subsidies and paid vacations – their cash value remains far below that of the other universities SCAP profiled. For instance, at UB, an experienced lecturer could earn more than a full professor at UoM, claiming up to USD40,800 per year; at UNAM, an experienced senior lecturer could earn the same as a UoM professor, earning up to USD37,241; and at UCT, a first-year assistant lecturer would earn more than a UoM professor, claiming USD41,540.

Of course, the cost of living is different in these countries, reducing the direct comparability of these numbers, but they do indicate how "local" or "global" their salary standards are. At UCT, where the administration wants to be able to attract international scholars, the salary scale is set in line with global standards. At UoM, however, which appears happy to employ local scholars, the salary scale is suited to a relatively immobile academic cohort, one that comes from and will remain in Mauritius.[90]

Given the government's desire for the nation to become a regional innovation hub – characterised by high levels of connectivity and collaboration – UoM's low salaries will likely dissuade internationally mobile scholars from joining its ranks.

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[87] On 11 August 2013, 1 USD was worth MUR31.

[88] A lecturer starts off at an initial basic salary of MUR23,200 per month and is paid an annual monthly increment of MUR800 on top of this salary (i.e. s/he gets MUR24,000 per month in the second year). When s/he reaches MUR28,000 per month, the increment is MUR1,000. The top salary is MUR54,600. A 13th month of basic salary is paid in December.

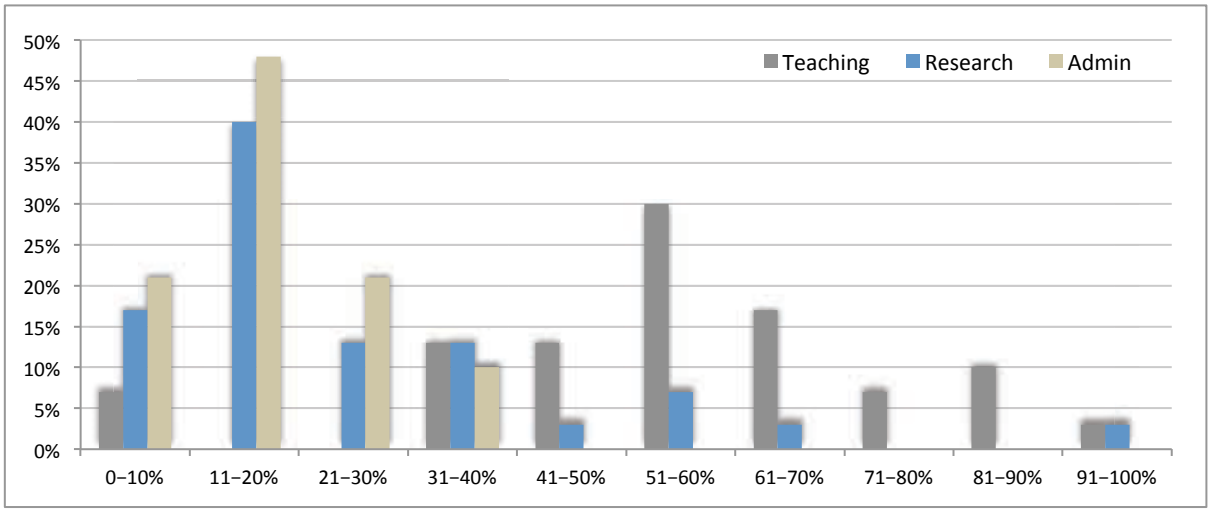
[89] At some point, the lecturer starts to receive benefits such as a 70% remit on duty tax when buying a car. This goes to 100% for senior lecturers. A monthly amount is paid by UoM to cover 90–100% of the car loan. Although public health care is free, UoM pays for part of a private health plan. Staff receive 21 paid sick leave days per year. The university pays for 11 days of unclaimed sick leave days per year and 5 days at 1/2 rate. There are 25, 30 and 35 paid vacation days, depending on the scholar's duration of service. UoM also pays for vacations, either nationally or abroad, depending on one's salary and their length of service. At retirement, scholars get a lump sum of about 20 times their last basic salary. Then they also receive 50% of their last basic salary as a monthly pension.

[90] According to Kotecha, Wilson-Strydom and Fongwa (2012: 53), in 2009/2010, the UoM and UTM academic staff complements collectively comprised 308 Mauritian nationals and only 8 non-nationals (none of which were from SADC).

Time spent on teaching, research and administration

UoM FoS scholars say that they spend the bulk of their time engaged in teaching-related activities (timetabling, prepping, lecturing, marking, advising, invigilating, etc.), as well as supervising graduate students and acting as internal and external examiners of theses. The median indicator from their survey responses is that these activities comprise about 60% of their work time. As Figure 5.1 shows, there is a good deal of diversity within the faculty as to the teaching load, with 33% of respondents reporting that teaching takes up less than 50% of their time and 67% of respondents saying that it takes more than half of their work time.

Figure 5.1 UoM FoS respondents' self-reported teaching, research and administrative time (%) (N=30)



One of the reasons why these teaching proportions are relatively high – given the bold research ambitions of the government and the university – is because scholars feel compelled to augment their low salaries through "excess teaching". That is, they take on extra teaching opportunities, piling on the teaching hours to enhance their income.

While most scholars understood that this was a perfectly rational response given their financial challenges, they also acknowledged that it acted as a serious brake on the development of a robust research culture at the university. As one scientist lamented:

> *If you look at the young people who are joining the university, they are just being lumped with hours and hours of teaching. How can you expect these people to join forces, to do research, to identify thematic areas for research? And one policy of this university is to allow people to do excess hours of teaching. So why should I bother myself doing research when I have problems getting published, getting funding, or teaming up with people, when I can easily make up a lot of money doing excess hours? There's a big budget for the university going into excess hours. This would have been used more judiciously in recruiting new staff and enlarging the base in terms of competencies.*

These heavy teaching commitments are augmented by substantial administrative obligations (self-reported as comprising about 20% of scholars' time, on average). FoS scholars say that they not only have to navigate a byzantine bureaucratic nexus (which some jokingly compared to India's "Licence Raj" of the 1970s), but they must do so without the support of departmental-level administrative staff. The secretarial pool exists at the faculty level, meaning that many basic tasks – which at other universities would be handled by departmental administrative assistants – must be handled by the scholars themselves. Many FoS academics feel that this is a waste of their time and talent, reducing their ability to contribute to the "knowledge economy" that the government desires. One scholar complained:

> *We have registry but not admin support. This is why things are very haphazard. I will be frank: I don't have a printer. I have one at home but not here. I format my own exam papers. I had an overseas visitor here and he was amazed that we had to do that. There are people but they say this is not their job. We don't know whose job it is to do this.*

This challenge extends to many aspects of scholars' activity, especially those that require any level of engagement with students. For instance, many courses require that undergraduates take part in a Student Work Experience Programme, which involves them completing a work placement in the state or private sector for six weeks before they graduate. For scholars, organising these placements can take a serious amount of time and energy: negotiating with the host organisations, liaising with the students, managing the tiny amounts of money involved (such as students' transport allowances) and writing final reports on the placements. But scholars say that they receive no administrative help for these tasks (which would be better handled by an administrative professional rather than a research scientist).

With so much time taken up by teaching and administrative duties, many scholars say that they do not have enough time for their research. A majority (57%) say that they spend less than 20% of their work time involved in research-related activities (reading secondary literature, interviewing subjects, carrying out lab experiments, writing articles, etc.). This is lower than most would prefer and many have to use evenings and weekends to conduct or write up their research.

One problem that complicates this is the fact that teaching and research can often feel like conflicting priorities. As one scholar said, "if you are doing quality teaching at a certain level, it necessarily will impact on the time available to do good research." Considering the proud teaching tradition at the university, many scholars feel loathe to allow their teaching standards to slip even if that ends up reducing the amount of time that they can spend on research. Others state this more cynically, suggesting that there's no interior conflict, but simply disinterest in such activity: "In my department a lot of the staff, especially the senior ones, they don't have the research mind-set. They don't want to do research. They're happy with what they're doing."

Values

To better understand scholarly communication practices at UoM, we started by trying to grasp academics' motivations for conducting research and publishing their findings. Essentially, we wanted to know what values underpinned their research and communication activities.[91]

This is a foundational question, one that is usually taken for granted in the literature on scholarly communication. Other studies, which usually focus on scholars from the global North, tend to assess academics' attitudes towards research-*related* issues such as peer review (Harley *et al.* 2007), dissemination outlets (Harley *et al.* 2010; King *et al.* 2006; RIN 2009, 2010; Rowlands & Nicholas 2005), journal quality (Regazzi & Aytac 2008), digital and Web 2.0 technologies (RIN 2010; Rowlands, Nicholas & Huntingdon 2004; Rowlands & Nicholas 2006; Schauder 1993), open access publishing (RIN 2009) and academic identity (Archer 2008).

These valuable studies shed light on scholars' attitudes toward elements of their research and communication practices, but they do not get at the more basic question of why the scholars conduct research in the first place. In Africa, where most universities have only recently incorporated a research mission into what have long been teaching-oriented institutions, the question of why scholars conduct research is a pertinent one, and the answers cannot be assumed. Moreover, the purpose of university research on the continent is shaped by more than just the desires of the scholars themselves, but by those of the national government, the institutions' managers, overseas funders, local NGOs, students and community stakeholders. All of these diverse interest groups impact how scholars view the research enterprise.

Based on numerous interviews, surveys, conversations and observations (described in Chapter 2), SCAP found that the main reasons why UoM FoS scholars conduct research are (in order of importance) to:

1. Achieve satisfaction by acting in accord with personal desires
2. Earn points toward promotion
3. Generate new knowledge
4. Act in accordance with their sense of academic identity
5. Feel joy through making a contribution [and] obtain indirect financial rewards
6. Aid national/community development [and] enhance teaching
7. Observe the dictates of their job description

[91] According to Schwartz, all values are defined by the following six qualities: (1) Values are beliefs linked to emotion; (2) Values are desirable goals motivating action; (3) Values transcend specific actions or situations; (4) Values serve as standards or criteria; (5) Values are ordered by importance relative to one another; (6) The relative importance of multiple values guides action (2012: 3–4). As trans-situational abstract goals that form part of a hierarchically ordered system, values are distinguished from "concepts like norms and attitudes, which usually refer to specific actions, objects, or situations" (Schwartz 2007: 1), and need not be hierarchically ordered. Examples of such values include power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity and security (Schwartz 1994: 22). In this report, the term values will be used in a slightly more open way, beyond universal abstractions such as benevolence and security, though such deeper values will often underpin the more concrete value expressions noted here in the university context.

These motivations would be familiar to scholars at most universities, though the importance accorded to each would be influenced by the contextual factors shaping the institution, such as its history, infrastructure, wealth and mission. The significance and uniqueness of UoM's research values become clear, however, when we analyse them in greater detail and compare them to the values held by scholars at other Southern African universities.

In analysing scholarly research values, it is useful to assess to what degree they are based on intrinsic or extrinsic motivations. A significant psychological literature explicates the virtue of this approach (Kreps 1997; Ryan & Deci 2000; Teo, Lim & Lai 1999; Vallerand *et al.* 1992) and here we will use it to get a nuanced understanding of not only UoM scholars' values, but also the "institutional culture" (Bergquist & Pawlak 2008) that shapes it and the "research culture" that is produced by it.

To aid our analysis, in Figure 5.2 we have plotted UoM scholars' values according to their level of importance for motivating research (x-axis) and the degree to which these values arise from intrinsic or extrinsic motivations (y-axis). We have then further divided the intrinsic–extrinsic continuum into the three loci of motivation that are most relevant in the university context: the managerial (extrinsic), the collegial/social (mixed extrinsic and intrinsic) and the individual (intrinsic). This trifurcation offers a more precise delineation of scholars' motivational sources at UoM.

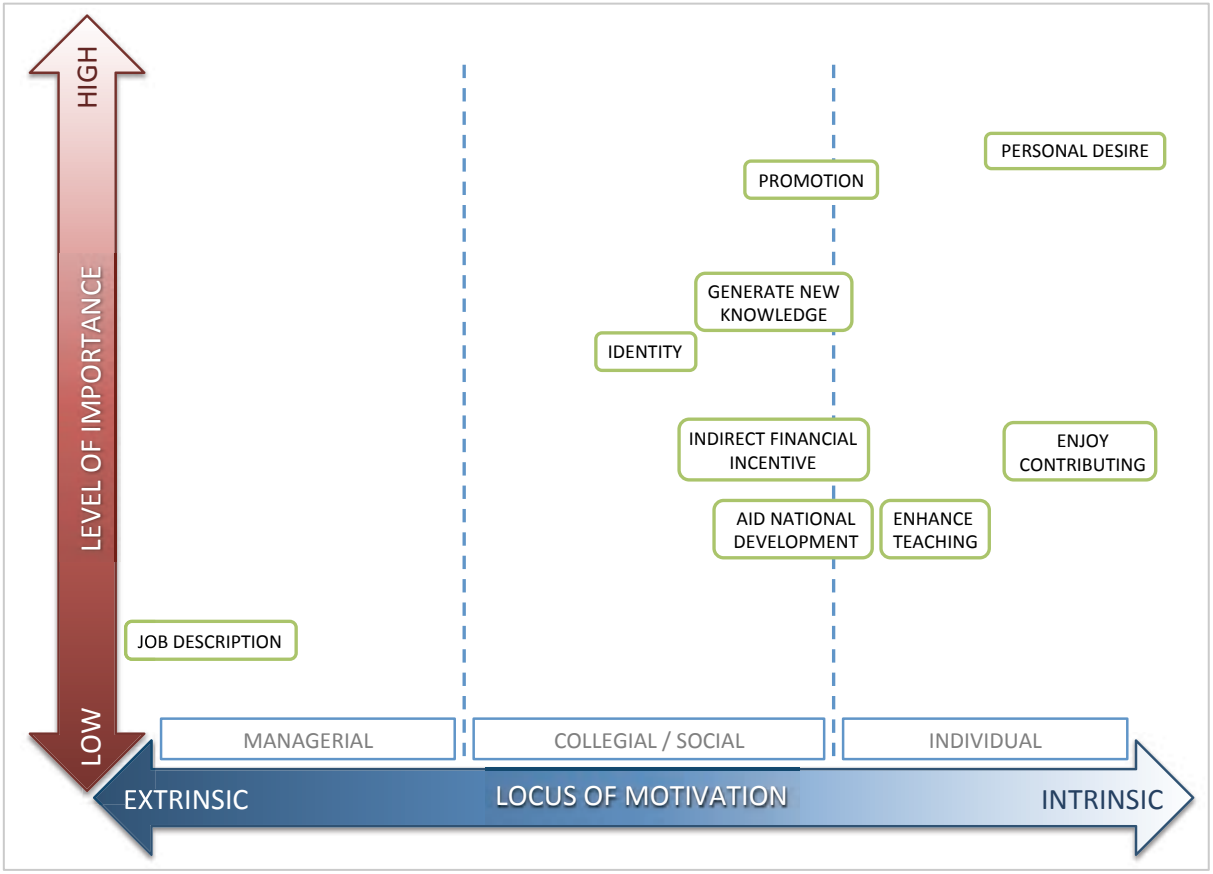
On one end of the continuum, purely extrinsic motivations emanate from the university management. These are the values of the administration that are communicated through formal mechanisms such as institutional mandates (policies) and job descriptions (contracts). When scholars respond to these managerial incentives, their responses can be described as acts of *compliance*, in that their behaviour aligns with external requirements but without any sense of personal buy-in.

On the other end of the continuum, purely intrinsic motivations emanate from within the individual. They express a scholar's idiosyncratic desires, revealed internally as feelings of joy, integrity, virtue and increase. Intrinsically motivated scholars enjoy the research process as an end in itself. When scholars respond to this interior motivation, their responses can be described as acts of *congruence*, in that their behaviour aligns with their own personally held values and desires.

In the middle of this continuum is a space where extrinsic and intrinsic motivations meet; where, in the university context, external collegial and social demands structure internal personal desires. This occurs because the individual scholar identifies with and feels a member of the collegial or social group defining the value. When scholars respond to this motivation, their responses can be described as acts of *conformity*, in that their behaviour aligns internal desires with externally structured values.

The diagram in Figure 5.2 shows that while UoM FoS scholars are motivated to conduct research by both intrinsic and extrinsic factors, personal desire has the greatest overall importance for spurring research production in FoS.

Figure 5.2 Values motivating UoM FoS scholars to conduct research (aggregated and ranked)



This motivational structure makes sense for a couple of reasons. As a teaching-oriented university where the production of research outputs remains secondary to the fulfilment of the teaching mission, the motivation for conducting research often has to come from the individual scholars themselves. If they want to do it, they will be rewarded, but if they do not, they will not be penalised. Thus the choice is theirs to make. Moreover, UoM's highly centralised administrative structure is also relatively weak, permitting a good deal of autonomy to scholars who are allowed to choose whether they want to focus their careers on teaching or research production.

However, as we will discuss later, it is difficult to substantiate and sustain a dynamic research culture based on a highly intrinsic motivation system. Personal desire is an important part of any strong research culture, but it is too prone to fluctuations to act as the cornerstone of a deep and abiding research culture. It needs to be balanced by other more extrinsic motivators (which UoM currently lacks).

The second most important factor for motivating research in the FoS is the scholarly desire for promotion, a value that is also highly rated at other Southern African universities. On the diagram, we located promotion on the line between collegial and individual motivation because promotion not only satisfies an intrinsic desire for greater financial reward, but also elevates the prestige of the scholar in the eyes of their peers according to a status structure derived from collegial norms and traditions. As a motivating factor, promotion is one of the most ubiquitous, durable and reliable means

for encouraging any type of behaviour, including research. Each person we interviewed was able to tell us exactly how many publications they needed to produce in order to be eligible for promotion. But they were also cognisant of how one's duration in a position impacted their chances. As one stated, "before you can be promoted to another level they will expect you to have stayed in a particular level for a number of years."

Third, many FoS scholars want to "generate new knowledge" through their research, a relatively intrinsic motivation, but structured by their field of inquiry and the various "gaps" it contains for a scholar to fill. As one scholar stated, "there are lots of questions we need to answer and yet there is not much research." Curiosity is the emotion driving the pursuit of this value.

Fourth, UoM FoS scholars want to live up to the standards that characterise their scholarly identity. This is an idealised and contested notion, but many scholars orient their actions according to the assumed terms of that identity (Archer 2008). As one scholar stated concerning his desire to conduct research, "As an academic, it's part of your … not duty … but you can't call yourself an academic if you're not engaged in research." This taken-for-grantedness of the research mission forms part of the conception of a "true" scholarly identity that the more prolific researchers at UoM hold, but it is not the case for all. Others still see it as secondary to their teaching mission.

Fifth, many FoS scholars seek the indirect financial incentives that research offers, usually in the form of conference and travel funds. It offers them an opportunity to disseminate their work prior to publication, get feedback from their peers, seek out new collaborative partners and travel outside of Mauritius.

Ranked equally with this motivation, UoM FoS scholars also enjoy the simple act of making a contribution, especially to their field. They like the idea that their work will have value and utility for others.

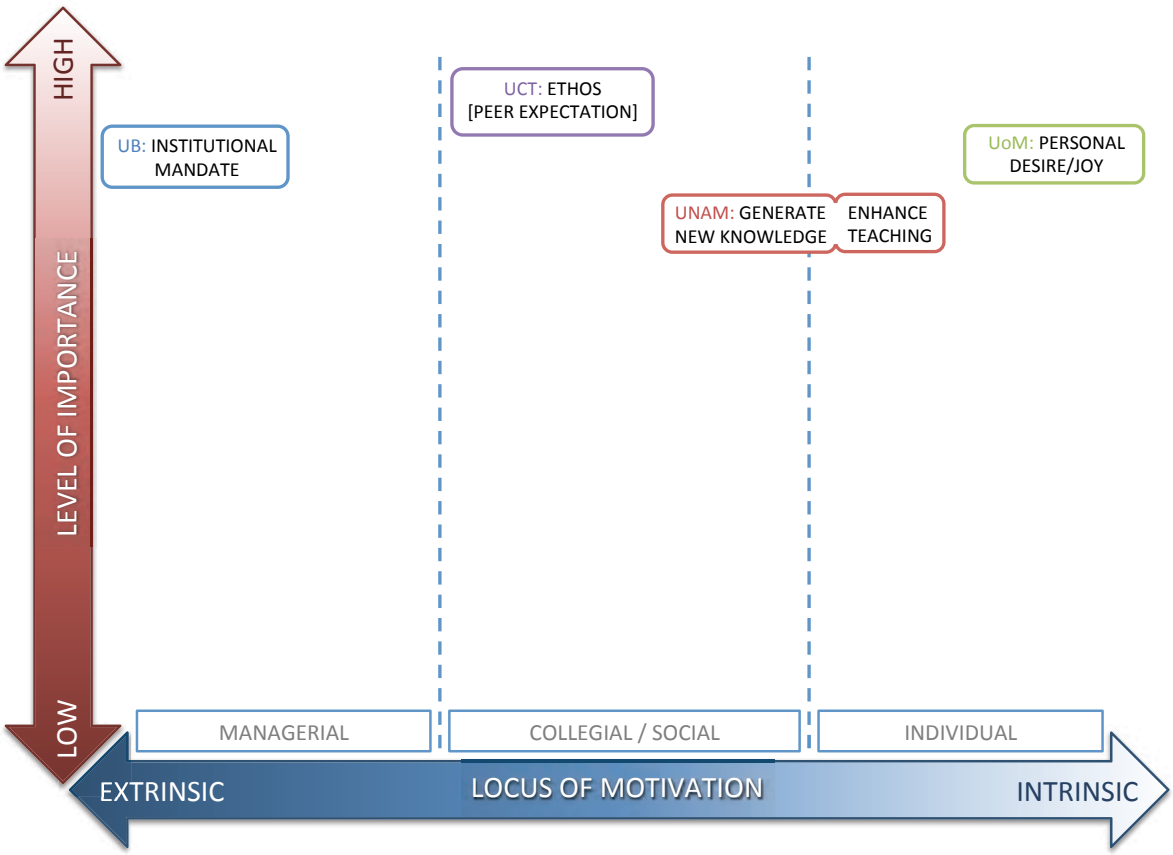
The sixth most important value motivating research is its ability to enhance teaching by allowing academics to stay current in their field and to learn new ideas through research activity. With a strong teaching heritage – and the continued heavy teaching loads that scholars face – the primary audience for many of their research ideas is their students, some of whom assist in their research and publication activities. We located this value on the line between social and individual motivation because most of the desire to "enhance" this aspect of their work derives from themselves as individuals, and to a certain extent by their students. Since the administration evaluates teaching performance more according to quantity (hours) rather than quality, scholars' desire to improve it emanates largely from themselves, with feedback from their students helping structure their efforts.

Tied with the desire to enhance teaching, many FoS scholars would like their research to "aid national development" in some fashion. As one scholar shared, "There is also this aspect of aligning it with the needs of the country and a strong emphasis is now laid on that, because we still are a developmental university. So whatever research we conduct, we have, to some extent, to align it to the needs of the country. So, many people are actually engaged in applied research rather than the more fundamental aspects of research."

Lastly, scholars are motivated by their job description, a highly extrinsic factor.

However, it is important to remember that this ranking of motivations is based on an aggregation of the entire faculty's desires. It does not reflect the values of any particular individual who would likely rank their personal desires quite differently. But this analysis allows us to make fruitful cross-faculty and cross-institutional comparisons.

Figure 5.3 Primary values motivating research at UB FoH, UCT Comm, UNam FHSS and UoM FoS



If we compare the UoM FoS research values profile to other southern African universities, it becomes clear how unique it is. Figure 5.3 shows the top motivating factors for research at UB, UCT, UNAM and UoM (in the different faculties we profiled). At UB FoH, the institutional mandate is the primary research motivator. It is a highly extrinsic managerial value. At UCT Comm, peer expectation predominates, as the production of research is seen as part of the social ethos. It is a mixed, but extrinsically leaning, collegial value. At UNAM FHSS, the desire to generate new knowledge and enhance teaching comprises the two key principles driving research in the still largely teaching-focused university. It is an intrinsically leaning social and individual value. And at UoM, personal desire drives research production. It is an intrinsic, individual value.

This comparison shows that, even though these universities share a number of similarities in terms of geography, history and mission, their differences are sufficient enough to create significant diversity in how their scholars respond to the question of research motivation.

Open access

As part of our values research, we also tried to gauge UoM FoS academics' feelings about open access dissemination, thus we asked them to indicate their level of agreement with the statement "African scholarship should be freely available on the web." Of the survey responses given, 60% agreed strongly, 26% agreed, 7% disagreed and 7% said they were not sure. These numbers suggest a very strong level of support for OA principles in the UoM FoS.

But this support is mainly in the abstract. For the most part, UoM FoS scholars do not go out of their way to assure that their own publications are disseminated in an OA fashion, nor do they appear to be very familiar with the debates about OA. The primary reason why OA makes sense to them is because scholarly communication within their scientific disciplines has long been shaped, in part, by what we now consider OA principles (such as pre-print file sharing). Within astrophysics, for instance, the arXiv pre-print repository has been a space where scientists share their work with each other, but in an open manner, allowing anyone to download their articles. In health sciences, the PubMed Central site has been shaping scholarly communication norms for many years now. Some UoM FoS scholars have published their outputs on sites such as these.

Thus, as beneficiaries of this open norm within their own fields, UoM FoS scholars see the advantages of this approach. However, since many of these dissemination innovations were constituted for practical reasons (rather than as part of an OA "movement"), they do not define or circumscribe FoS scholars' own dissemination choices. Rather, when considering where to publish their own materials, they are more interested in the Impact Factor, prestige and appropriateness of the publication than its OA policies. In their reckoning, if the journal happens to be OA, then that is great; if it is not, then that is also fine. It just so happens that science has been relatively progressive in promoting open scholarship in general, hence FoS scholars' positive attitude about OA assertions and ideals.

However, the term "open access" has come to be associated with negative connotations for some, especially concerning article processing charges (APCs), peer review deficiencies and plagiarism. (We provide examples of these further on in this chapter.) Some FoS members have been surprised when, having had a paper accepted by an OA journal, they were then asked to pay an APC (something which the university does not support through its budget). With their low personal salaries, most cannot afford to pay such charges, and thus negatively associate OA with APCs. As one scholar noted, "I don't know whether people would like to pay to publish unless they have support. They don't have any mechanism here at the university to encourage people to use open access."

This sentiment is further complicated by some who worry about the credibility of anything that is published on the internet, conflating the mass of unfiltered public information on the web with peer-reviewed academic materials, simply because they are disseminated through the same platform. Also, a few scholars who believed that their work had been "stolen" or plagiarised were sceptical of OA, believing that scholars lost

their rights over open work.[92] We can therefore describe their perception about OA as mostly positive, but uncommitted.

Research and dissemination cycle

Having established the faculty's demographics, their motivations for conducting research and their feelings regarding open access, we can now their scholars' research production and dissemination practices. To help us understand these, we consulted a number of other scholarly communication models (Björk 2007; Garvey & Griffith 1972; Houghton *et al.* 2009; Hurd 2000; Sondergaard, Andersen & Hjorland 2003; UNISIST 1971), many of which had been theorised prior to the revolution in online digital communication, the mainstreaming of open access ethics and the proliferation of Web 2.0 technologies. But because global scholarly communication norms have been evolving so rapidly over the last few years, we decided to use Czerniewicz's (2013) research and communication cycle model because it incorporated an understanding of these important developments.

Czerniewicz (2013) compares the "traditional" (closed, scholar-to-scholar) research cycle to the digitally mediated, open access model that is shaping the current global scholarly communication landscape. Both are based around the same four core elements – conceptualisation, data collection and analysis, articulation of findings, and translation and engagement – and both include similar types of intellectual inputs (literature reviews, conceptual frameworks, etc.) and research outputs (books, journal articles, etc.). But the key difference is that, in the new model, scholars are able to communicate elements of their research during every step of the research cycle through various digital platforms, from the conception phase onwards. They no longer have to wait until every facet of the project has been completed before they start sharing their thoughts, processes and findings through various online mechanisms (blog posts, tweets, comments, etc.).

The key virtue of the Czerniewicz model is that it views scholarly research as occurring along a cyclical, rather than a linear, path, as so much of scholarly work involves retracing one's own steps through prior research data. Scholars revisit their materials and spin off new outputs, travelling around the research and dissemination cycle multiple times before moving to new projects and cycles. It also has the virtue of presenting contemporary dissemination activity as "radiant", pushing scholarly objects outward towards multiple audiences (scholars, students, industry, civil society) at each point along the cycle. This updated understanding of the research and dissemination cycle allows us to assess UoM activities from a unique vantage point.

[92] Interestingly, the personal circumstances around which their work was "stolen" or plagiarised had nothing to do with it being OA or not. They simply failed to publish their research findings before other "rival" scholars – who were familiar with their work – did. Those rivals were then able to reap the rewards (acclaim, funding, etc.) of having stated these arguments first publicly, while they were not. Ironically, these scholars could have better protected their ideas by actually publishing them first in an OA outlet, thereby securing their copyright.

Figure 5.4 Traditional research and communication cycle (Czerniewicz 2013 – CC-BY-SA)

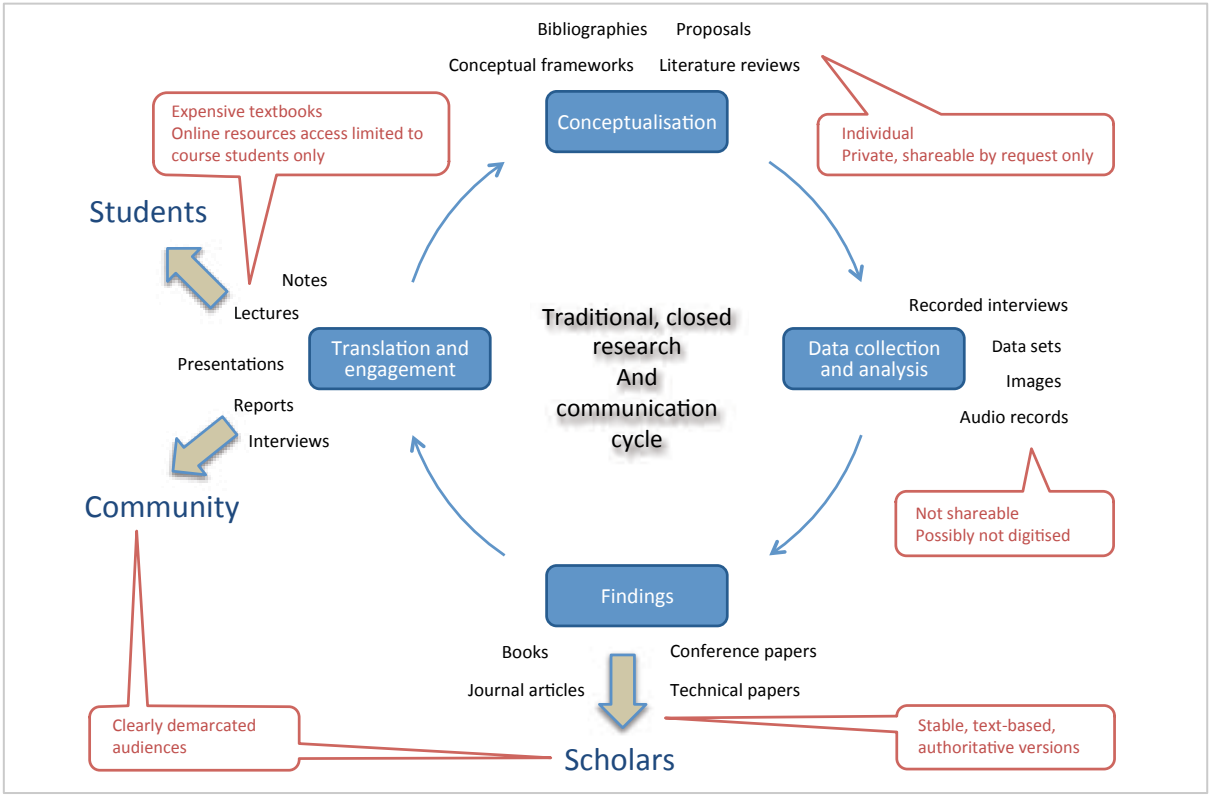
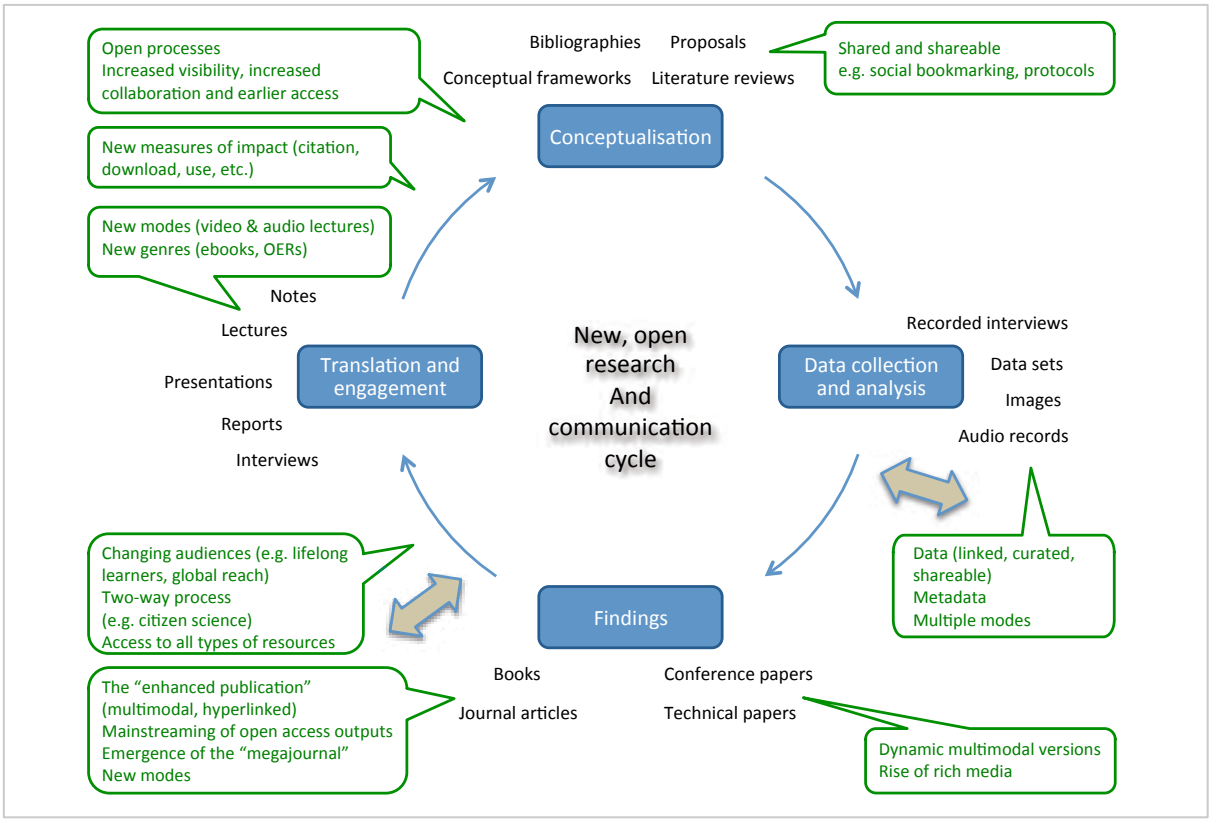


Figure 5.5 New research and communication cycle (Czerniewicz 2013 – CC-BY-SA)



Conceptualisation

During the first step of the research and communication cycle, scholars conceptualise the issue that they will explore through their proposed research. This process entails not only serious intellectual work (thinking through the various aspects of a potential research project and imagining possible processes, problems and outcomes) but also important planning work (ensuring the plan is feasible and worthwhile from a theoretical, practical and financial point of view).

As part of the intellectual process, this involves engaging with the relevant secondary literature to establish whether a new project would have analytical value and make a contribution to the field. Such engagement not only ensures that one's research does not duplicate previous research, but it is generative of new ideas in itself, usually offering new dimensions to a research concept.

As part of the planning process, this not only involves determining where the research should take place (lab, in the field, etc.) and who should be invited to collaborate in the process, but it also involves determining how much funding is required to conduct it and which funders should be engaged to obtain such funding (if necessary).

For the purposes of this discussion, we will focus less on the creative processes that UoM FoS scholars engage in during their conceptualisation activities and focus rather on the practical elements of their research and communication practices. These relate to scholars' use of print and electronic materials, their online search behaviour and their utilisation of various funding opportunities.

Print and electronic materials usage

To understand the types of scholarly materials that FoS scholars engaged during the conceptualisation process, we explored their usage of print and digital materials. What became immediately apparent was that they continued to rely on both. When asked to rate the importance of certain print materials to their research, they rated international journals at the top (87% "most important"), followed by international books (67%), conference papers (60%), local journal articles (43%), pre-prints (41%), grey literature (33%) and national books (30%).

This bias toward international print sources is probably best explained through demographics and relative levels of production: the amount of "international" scholarship available is enormous compared to the relatively small amount of "national" scholarship available from Mauritius, a country with a small population. Though most of the national literature will be highly relevant for local issues, it will not be greater than the cumulative amount of materials generated elsewhere that are also relevant. (Some scholars also suggest that the "international" category is more prestigious than the local, national one, which may also raise those materials' sense of importance, though this is not likely to be the decisive factor when it comes to uptake.)

The same holds true for electronic materials. International journal articles (90% "very important") are the most accessed e-category by far, with conference papers (52%) and conference presentations (48%) a distant second and third. Considering the dearth of

electronic journal publications emanating from Mauritius, this focus on international items is simply a practical response.

However, many academics indicated that they faced many difficulties accessing journal articles due to the university's limited journal subscription package, a serious factor constraining their research. As one scholar explained, "The library has a reasonable package, but I'd say 20–25% of the papers we need we cannot get." To deal with this, many activate their international networks and simply ask their overseas colleagues to download the desired articles for them. "If I need any of those, I liaise with my colleagues overseas and they send me the articles." This was the refrain from many of the staff, though they admitted that this was sometimes "embarrassing, because I have to ask them."

Such behaviour is not officially sanctioned, of course, as it is likely "illegal" and because the university does have an office through which academics can purchase journal articles that are not available through their library subscription. But in our interviews, the only scholar who made use of this service was someone who had earned his PhD in Mauritius and therefore lacked the overseas contacts necessary for asking for download assistance. He said that he purchased about one article every six months. Other scholars refused to use the service, however, mocking it as "archaic" because "it takes six weeks" to get an article after it has been requested. That was just too long for most.

But the university is in a conundrum regarding journal subscriptions. Cutting-edge research requires that scholars have access to a vast number of journal titles, yet this is a costly proposition and only worth the investment if that knowledge is accessed with great frequency and utilised to great effect. The problem has been this: the government purchased Elsevier's ScienceDirect package for the university, which grants it access to over 11 million journal articles and book chapters. The government hoped this would meet the scholars' research needs and that they would use it frequently. But this has not been the case. Scholars and managers both admit that the university has not accessed the ScienceDirect package with the frequency that was expected, raising the question of whether the service is worth the cost. The answer to this question depends on whether this lack of usage is due to scholars not conducting much research, or because they're conducting *so much* research that they have to keep going beyond the package's limitations. From the government's perspective, it is likely the former; from many FoS scholars' perspective, it is the latter. No doubt this will remain an important debate going forward as the country and the university try to ramp up their research efforts.

Search behaviour

UoM FoS scholars say that they use academic databases most often (74%) for finding e-content. This is followed by searching through aggregated journals (47%), Google Scholar (43%) and pre-print repositories (40%). This is a common pattern of usage in institutions that do not subscribe to large numbers of journals, but rely on package subscriptions with a few big publishing firms. Thus, unlike at UCT where scholars use Google Scholar more often because they are reasonably confident of being able to download whatever materials are listed, UoM FoS scholars have to rely on databases where they know that the journals they are searching through can be accessed through the university's subscription service. This makes the promiscuous search results of Google Scholar less

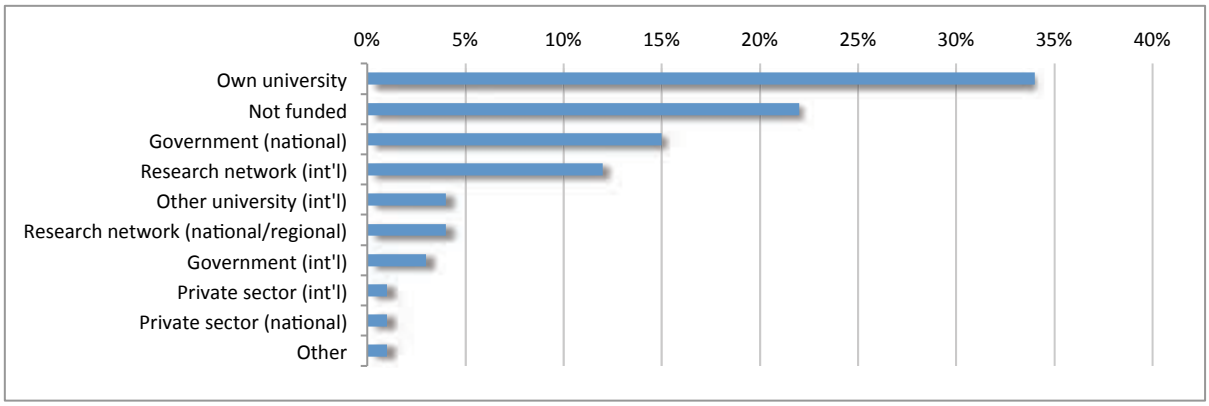
attractive, as it is likely to include numerous links to articles that they cannot download without paying a fee.

Funding sources

During the conceptualisation phase, most FoS scholars must consider seeking funding for their new projects. Whether they obtain it, and from whom, has a significant impact on how they end up conceiving of their research, how they conduct it and how they disseminate their findings.

According to our survey respondents, the majority of projects in which FoS scholars participated over the last two years were funded by the university (34%), not funded (22%), funded by the national government (15%) or funded by international research networks (12%) (Figure 5.6). The role of other international universities, foreign governments and the local and international private sector was comparatively smaller (each less than 5%). This, of course, does not reveal the size of the financial contributions made by each category, but it gives a sense of the most likely sources of funding for FoS research.

Figure 5.6 Sources of funding for UoM FoS respondents' research projects over the past two years



These results suggest that the university provides an important base of support for FoS research activity. Though many academics complain about the bureaucratic procedures involved in accessing these funds, they acknowledge that the university's research fund remains the first choice for many of their projects, especially if they are conceived and run at the university. The outputs that emanate from this funding are subject to university communication policies, which state a preference – but not a mandate – for them to be published in high impact international journals (and, if possible, made commercially viable through patenting and industry linkages). They are not placed under any open access mandate, though some end up being disseminated through OA channels.

More than a fifth of research projects over the past two years were also unfunded. This could mean that funding was either unnecessary for conducting the research (such as researching a mathematics problem) or that the project was based on research that had already been done. These would likely result in articles, book chapters or conference papers deriving from an established data set, and thus requiring no new funding. In some contexts, such a proportion of unfunded research would signal that funding is limited (a

sign of a stunted research environment), but in more dynamic contexts, it might mean that scholars are producing numerous outputs over a stretch of time based on a prior research effort that still remains useful. UoM scholars describe scenarios that depict a mix of both realities.

The government is also a significant source of support for FoS research, through the Mauritius Research Council (MRC), the Tertiary Education Council (TEC) and the Ministry of Tertiary Education, Science, Research and Technology (MTESRT). All of these combine to create a relatively robust national research infrastructure, useful not only for the university, but also for other universities on the island and affiliated research centres. These funders often require that scholars not only produce traditional scholarly communication outputs (journal articles, etc.) from their research, but that they share it with the funders themselves and interested colleagues. They do not require open access dissemination, but they are keen to make sure that governmental and industrial personnel gain access to relevant research. A number of scholars that we interviewed had given such report-backs as a result of national funding.

Lastly, the solid level of participation in internationally funded research projects (through international research networks) speaks to the quality of connectivity that some scholars enjoy globally. UoM enjoys a good, stable reputation, especially in the Indian Ocean and African region where international collaborators occasionally seek research partners. Compared to many of their regional peers, UoM would be considered an excellent partner site for an international project. These projects will often be large in scale, though the Mauritian scholars' contributions to them might be narrow or targeted. Such projects usually lead to their collaboration in a number of multi-authored outputs, as well as the fine-tuning of local results for personal publication. The scholarly communication policies for these projects are often determined by the funders, who – if they are major players such as the EC, UN or World Bank (as discussed in Chapter 4) – may require that the outputs be published in an OA fashion.

But, as one scholar noted, many outputs are the product of multiple funding streams: "You are doing some synthesis and you get that work done in one project, but you use part of the material in another project, so it all boils down to managing the projects and what counts is that at the end of the day you produce results."

Despite this, a number of the scholars say that it is difficult to obtain funding because of the heavy bureaucratic requirements involved in the application process. For those who work at the university on a contract basis, the challenge is even greater, as one scholar who had previously worked abroad shared:

> *Very few bodies will fund you if you are working on contract. When I got my position overseas, they tell you they've got a package: you will do maybe 30% teaching, 70% research, and you've got the lab already and the university will provide you with a starting sum of money for research. But this kind of thing does not exist here, unfortunately. It's more like research is a second priority and it's more like it's a teaching-based university.*

Profile of the Centre for Biomedical and Biomaterials Research (CBBR)

In the words of a CBBR academic:

"The CBBR was approved by the University Council in April 2011 and designated a Centre of Excellence by African Drugs and Diagnostics Innovation (ANDI) in October that year. We are the first in the Indian Ocean region and first to be set up from within a university. When we got the designation I went to the VC and said 'how can this university recognise excellence, because you say you are happy about this but how do you demonstrate it?' So he said 'well, what are you asking for?' I said 'Well, I'm asking for a building.' Because you can't have a Centre if you are getting diluted in one department. We need to be visible. I want it to be visible not only in the country; at times we are better known outside our country, but I have great ambitions.

I have always been striving for good quality. We want to get the best out of the research and all our publications are for the highest journal; this is what we aim for. I think it is very important that we are not seen from the North as beggars. I'm sorry to say the term. I think we need to show people that they can partner with us because they will gain from our science. The challenge is not to send one of our students to the USA or Europe or South Africa or Japan for a post-doc, the challenge is to get those people coming to see us … knowing they come here not because Mauritius has got sandy beaches and so on, but because they know that we are doing good science.

I do not like the division between pure and applied science, where if you take a pure approach you can't also take an applied approach. We've been getting away from those terms for a long time. I prefer the term use-oriented research, which is a mix of pure and applied, where you are building on research capacity and trying to innovate as well. [In terms of the disciplines] we are working at the interface of materials, health and biosciences.

Funding comes from both the UoM and the ministry, but we do not ask the UoM to actually fund the research. We look for scholarships for our students at national level and we are heavily engaged in convincing the private sector to invest in research. We are also heavily engaged in national and international collaborations. Last week we were successful in a grant application together with a big group on Réunion Island. We have also partnered with South Africa and benefitted indirectly from SA's National Research Foundation funding. We managed to get funding from the National Science Foundation here in Mauritius to run a joint workshop with US academics, bringing together 11 US professors and one from SA. And after that we were able to mount an online course in biomaterials with input from all these people. We've also managed to run similar things with the University of Geneva around pharmaceutical applications. So we are now willing to open these to the whole of Africa, so that people can register through UoM and get access to these courses online."

Data collection and analysis

The second phase of the research and communication cycle entails data collection and analysis. It also opens up opportunities for sharing preliminary findings and data publicly, prior to formal publication. For FoS scholars, this usually involves experiments in a laboratory, various testing procedures, interviews or surveys, followed by analysis. It would also entail some level of engagement with tools and technologies that help process that data into results that can be analysed.

For the purposes of this discussion, we will focus less on the actual research processes that UoM FoS scholars engage in during their data collection activities and focus rather on the tools and technologies that mediate them. Within our ecosystem framework, tools form a crucial node in the FoS scholars' research and communication activity system. It also comprises the element in this phase that determines at what level of research scholars can engage. We will also discuss whether FoS scholars utilise this time to share research information prior to publication or whether they prefer to withhold such knowledge until after it has been formally vetted.

Tools and technologies

FoS academics require heavy investments in equipment to be able to do their research. Many say that while they enjoy decent access to equipment on campus (or on the island), they are limited when it comes to very expensive or new equipment. To carry out research that requires highly sophisticated technologies beyond the university or country, they must tap into international scientific networks, outsourcing elements of their data collection. This is not an unusual arrangement in the scientific community, but it adds another layer of complexity and time to local research projects. It was one of the more common complaints by FoS scholars, that they desired more laboratory and specialised equipment to allow them to carry out original experiments and produce more cutting-edge findings.

However, most FoS scholars have become accustomed to the technological limitations that they face, becoming experts at scouting out resources in different departments and faculties. One explained, "For example, this department has equipment X; this department has equipment Y; so instead of me looking for funds to buy equipment I can liaise with other colleagues." This same approach is taken internationally as FoS academics access globally dispersed equipment for the sake of advancing their research projects. (For instance, a chemistry professor may need a chemical analysed through a special spectrometer that is not available locally, but only in another country. He or she can ask for assistance from colleagues in the relevant lab and incorporate that information into their research.)

But this lack of locally available equipment has a knock-on effect when it comes to growing the quality of local research. For example, one scholar told us that it took two years to purchase and install a piece of equipment that cost only MUR30,000 (less than USD1,000). Because it took so long, the student who had required the equipment for a project was forced to make alternative arrangements and had to utilise information from public databases rather than doing the lab tests personally. While this shows adaptive

thinking on the student's part to find another source of research data, it represents a lost opportunity for the student to conduct original research by producing a new dataset.

While the situation is slowly improving at UoM, there were numerous complaints from academics about procurement processes and how they felt stymied by an administration that did not take their research needs seriously. Indeed, even when scholars have the funds to buy equipment, the university's bureaucratic requirements can jeopardise the entire research effort. A CBBR academic discussed how the procurement process works – or doesn't work, in this case – because of the red tape that must be dealt with along the way:

> *I fight with the procurement system. I have the money but I have to wait for six months for my chemicals to come in. Machines are another big problem. I send the specifications, but they will consider it only if I have money in my account. So if I have funds, what happens? They are going to start working on quotations from five or six companies. This will take three or four weeks. They send in the quotations; I have the prices. If it is more than MUR80,000 it goes to the quotation committee and this takes about three or four weeks. We're not even buying now; we're just considering to buy. And the funds are here, the funds are here! Once the quotation committee has agreed to one company, then the request is sent to that company. This will take three months. And the money is there, I have the money! I can buy it online, but I'm not allowed to. The same for consumables. Now this is a big issue. If I have one, two, three, four, five needs, three are given to supplier A, two to B, five to C, six to D, on the basis of the prices. When are they going to deliver? A has delivered, B hasn't delivered; C has delivered, but D has not. So for my experimentation I need A, B, C, D plus E. I have to wait for A + B + C + D + E to deliver everything to be able to start any kind of work. This will take six months to one year.*

This scholar suggested that these convoluted bureaucratic processes were due to a lack of trust in academics to make their own procurement decisions: "We are university professors; we're working; we have a budget to manage; we are quite big enough to manage our budget." But the onerous procurement procedures give the opposite impression from the administration.

These challenges make some scholars encourage students to study elsewhere if they want to do serious research. One mentioned that this was one of the reasons why he sent his students to Réunion: "Everything is there. You want something; it's at your doorstep in 24 hours. And the North gets to do very exciting work because they have the facilities. I was in [France] last week. I gave a conference there and I did some work in the lab where I used to be a student. Things are so easy; you want something; you send an email; the next day it's there in the lab."

What is important to note here is that, while UoM will likely face funding challenges for expensive equipment for the foreseeable future, the administrative processes to handle those situations where funding *is* available requires serious rethinking. The procurement problems that scholars face in this regard seems unnecessary, the product of an

administrative culture that is better suited to ensuring regulatory compliance rather than meeting the needs of researchers in a timely, efficient manner.

Circulation prior to publication

A majority (80%) of UoM FoS respondents say that they "sometimes" or "often" circulate their drafts, pre-prints, working papers, or datasets prior to publication, mostly by distributing them to fellow project members or incorporating them into their teaching. They also, though with much less frequency, share such pre-publications with their colleagues at the university (during Research Week, for instance) and wider academic networks on the island (through various other research fora). But they almost never circulate these materials to the general public or the government.

There is a slight correlation between scholars' age and their likelihood to share prior to publication, with more senior academics likely to do so than junior ones. This is probably because senior scholars are more likely to belong to stable research networks that they can share with while junior scholars are still in the process of establishing them.

Still, most of them agree that one of the key reasons why they do not share more of their work with colleagues prior to publication is a lack of opportunities to do so. Many seminar series have faltered in the past due to heavy teaching commitments by the staff; if scholars are going to make the effort present a pre-publication draft of their work to their peers, they usually prefer to do so at international conferences.

Articulation of findings

The third phase of the research and communication cycle entails scholars' presentation of findings to other scholars. This usually involves the writing and publication of peer-reviewed journal articles, book chapters, books and conference papers (an output type that can straddle the pre- and post-publication line). It is the time when scholars share their research findings with their peers through formal communication mechanisms. For many scholars – and university reward and incentive structures – it marks the imagined culmination of the scholarly research and dissemination process because academics are assessed by colleagues and managers (for promotion) according to the quantity and quality of these outputs.

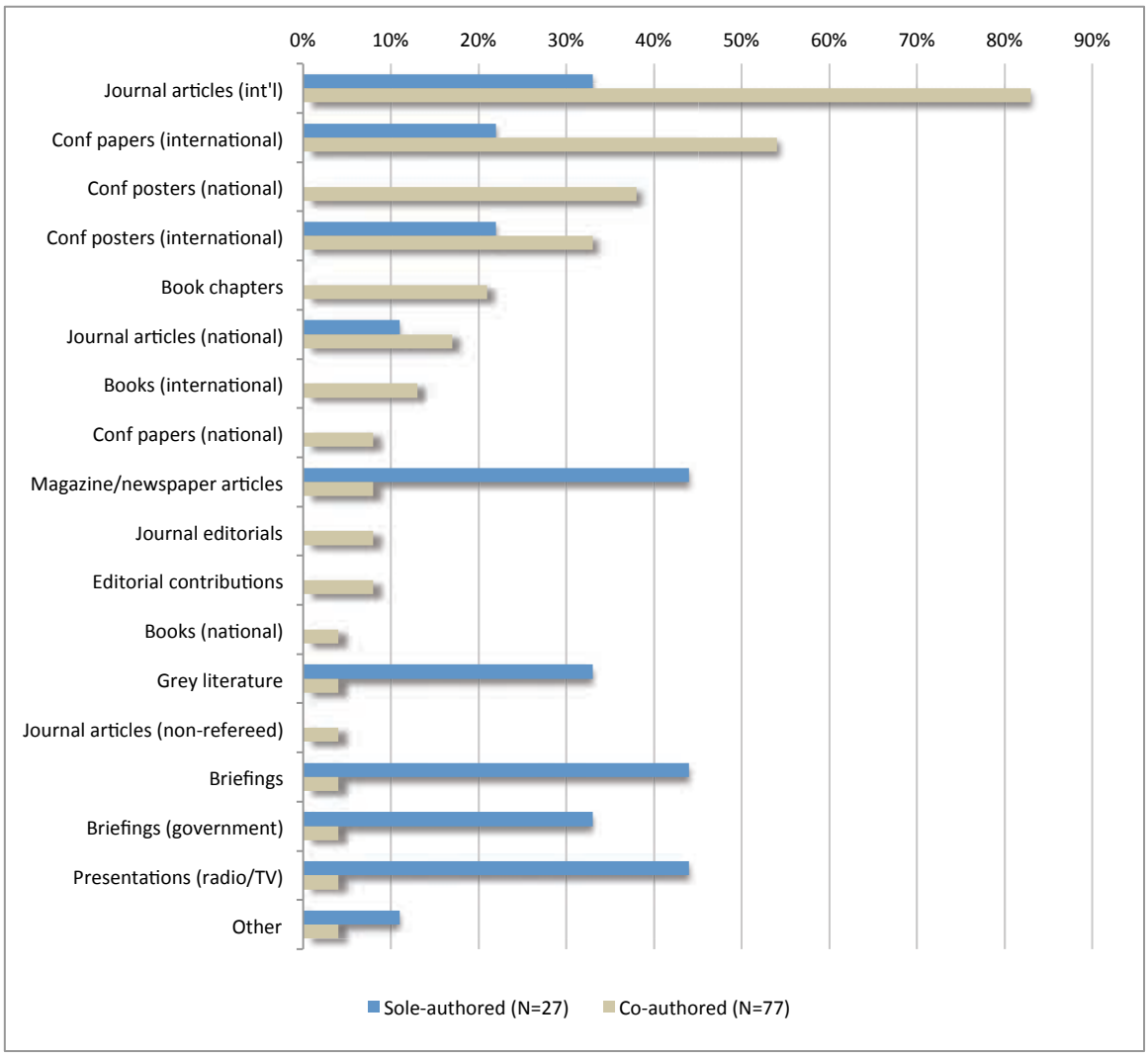
For the purposes of this discussion, we will focus less on the constitution of those findings or the various "impacts" that they may have had on their respective fields and focus rather on the output types that they produce, their online dissemination activities and the composition of their research and dissemination networks. These form crucial elements in the third phase of the cycle.

Output types

Of the 104 outputs that our UoM FoS survey respondents reported producing over the past two years, 27 were sole-authored and 77 were co-authored collaborative pieces (a 1:4 ratio). This contrasts with the high sole-authored proportions from the UB FoH (4:1) and UNAM FHSS (3:1), suggesting that the high levels of collaboration in the UoM FoS conform to a disciplinary norm.

Regarding co-authored outputs, 83% of FoS respondents say that they produced international journal articles during the past two years, followed by international conference papers (54%), national conference posters (38%), international conference posters (33%), book chapters (21%) and national journal articles (17%) (Figure 5.7). This shows that international journal articles are the main vehicles of scholarly communication for FoS members.

Figure 5.7 UoM FoS respondents' production of research over past two years, by percentage of outputs



For sole-authored outputs, most would be considered "alternative" outputs by our definition, mainly briefings, magazine/newspaper articles and radio/TV presentations (44% for each category). Very few FoS scholars produced traditional formal publications as sole authors. Indeed it appears that co-authorship is the norm for formal outputs, while alternative outputs (which have little or no impact on promotion opportunities) are the norm for individuals who want to share some aspect of their work beyond the academic community. This form of communication will be discussed in the next section.

This FoS publication profile makes sense given: the scientific disciplinary norms that structure the faculty's communication activities; the historical, geographic and demographic realities that mildly privilege international communicative engagement over national engagement; and the reward and incentive structure that places a high premium on international peer-reviewed publications.

Online dissemination activities

For many scholars, publication marks the end of their research dissemination efforts. They leave all profiling, curation and future dissemination of their article to the publisher and move on to the next project. This is a caricature, of course, but it is true that many FoS scholars do not make strategic decisions about ensuring that their work is available online or open access.

When asked whether some or a lot of their research was available on the internet to the general public, 73% of FoS survey respondents said yes, 13% said only "a small selection" was available and 13% said "none" was online.

This level of online availability matches the positive support that FoS scholars have for open access dissemination. However, when these scholars explained how those outputs were made available online, their responses revealed that this was not due to any strategic act on their part, but was rather just a happy coincidence that the journal that they published in was OA. As we have discussed above, most FoS scholars choose publication outlets based on Impact Factor, prestige and thematic appropriateness, with their OA policies ranking much lower in consideration. But because certain disciplines within the sciences have a number of high-volume publishing platforms that are OA (such as arXiv and *PLOS ONE*), the chances that their outputs end up in an OA publication are relatively high.

Some scholars mistakenly reported that their outputs were available to the public when in fact, as they revealed in their written answers, they were published in commercial journals with subscription paywalls. In our definition, this is not OA dissemination because it is not free to the user.

Nevertheless, FoS scholars believe that they have been able to achieve this solid level of public availability despite lacking a number of technologies to help them achieve this outcome. For instance, UoM does not have an institutional repository where faculty outputs are curated, profiled and disseminated. The UoM website provides almost no details about or links to its staff's research outputs. Neither has the national government invested in a national profiling technology that would showcase the country's research.

A crucial complicating factor in this discussion is the fact that many FoS scholars appear reluctant to "put themselves out there" online due to:

- A culturally informed sense of personal modesty (not wanting to call attention to themselves)
- An ambivalence about the quality of their research ("being exposed")
- An anxiety about having no control over how they might be represented on the internet
- A worry that others may steal their ideas/data (especially if still in gestational form)

- A fear of offending their research subjects, many of whom they might continue to encounter on the small island (as when health research reveals high levels of obesity in a particular region or village, embarrassing the research subjects and negatively impacting the researcher's reputation)
- A concern for damaging one's own reputation in a small country where "everyone knows each other" and can influence your future prospects
- A minimalist communications strategy (where dissemination is achieved through reading a paper at a conference, or perhaps allowing a journal to publish it, but nothing further)
- A teaching- rather than research-oriented approach to scholarship (which speaks to one's sense of academic identity, as a "teacher" rather than a "researcher")

To illustrate this reluctance, one academic discussed a politically sensitive research study that had bearing on whether a group of people might decide to claim compensation from the government. "If the press got hold of this, it's very damaging and then the ministry will come and say to us, 'you know, we trusted you with this and this is what you said to the papers', and they would have to explain and it would look bad."

Indeed, a number of scholars shared their concerns about the political implications of their work and how it could affect them personally. "Here everything is political; ministers are very susceptible about their image and they want to be seen to be doing a good job", scholars must therefore think twice before making their work highly visible online.

However, for the most part, FoS scholars are keen for their work to be available online. But one challenge that stands in the way is the cost association with some open access publishing channels. A number of important OA journals in the sciences charge article processing charges (APCs) to cover their costs. This can be a shock for scholars at UoM where there is no institutional APC fund or policy, and where the scholars themselves are paid relatively low salaries and thus cannot absorb the costs themselves.

For example, one scholar shared an ambition to publish in the PLOS megajournal, which not only enjoys a high Impact Factor, but is fully open access. "The two reviewers said they found [my paper] interesting, but were not happy about the methodology and they offered me the chance to rewrite. I was very discouraged. It took me a long time to submit to PLOS and they asked for the financial contribution [APC] and we don't have money for publications. It wasn't a funded project anyway." Thus, the scholar walked away from the opportunity to resubmit due to the APCs, though "I was happy that the editor had found it interesting."

A short while later, the scholar submitted the article to the *UoM Research Journal*, but then withdrew it shortly thereafter because "no one reads it! I had a paper there on a very relevant topic for Mauritius and no one had read it, and it's very hard to find if you do a search. So I prefer a more visible journal, so I thought if I published it in this online journal people may find it useful."

The scholar then gave it to a new online Mauritian journal called the *International Journal of Medical Updates*: "At least with *IJMU*, whether people value it or not, they are going to read the research and look at the problem here in Mauritius …. People say

the UoM journal has a higher impact, but it can't because you can't find the journal anywhere. But if you search for *IJMU* you'd find it's got greater visibility and I'm getting cited much more."

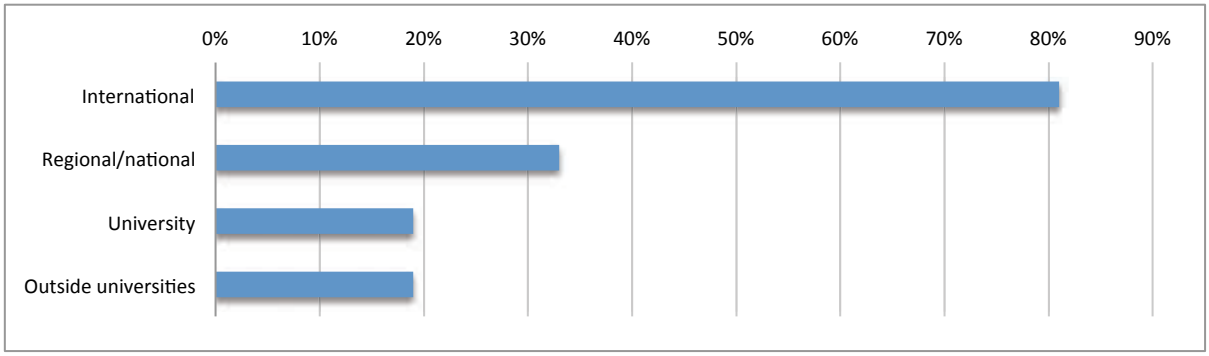
Another challenge to online dissemination emanates from the government's desire that UoM scholars patent their discoveries so that they can be exploited commercially. For instance, the CBBR filed a patent related to a method for the development of specific materials for drug delivery. The academic concerned said that this was the first time that the university had filed a patent and that this now paved the way for others to do so as well. At the same time, it meant that scholars had to be careful with what they shared online lest it impede future patenting efforts. He summed up the situation: "So open access is very good but you have to be very careful."

When we asked scholars whether they have access to their colleagues' research outputs from UoM, 59% of our survey respondents said "yes", with "personal contact" being the top reason why they had such access. This was followed by access through the *UoM Research Journal*, where many scholars have posted at least one output. Thus, this shows that scholars can overcome the lack of public academic engagement with each other through personal sharing, though their interest in each other's work remains comparatively low.

Research and dissemination networks

This relative disinterest in each other's work helps explain the answers we received when we asked our FoS survey respondents, "Do you feel part of a broader research network or community of scholars?" – 72% said yes and 28% said no. This is a relatively high rate of affirmation given the history and heritage of the institution. However, of the 72% who said yes, the highest number said they feel a sense of belonging to an "international" network (81%) compared to a regional network (23%) or to colleagues within the university (13%) or people outside of the university system (13%).

Figure 5.8 Location of research networks for UoM FoS respondents



This distribution can be explained by the fact that, as a small university, many of the academics are the only experts on the campus in a particular field. While a number of scholars may work in the Physics department, for instance, each of them will specialise in quite different areas, making it difficult for them to collaborate on research projects. Thus UoM FoS scholars tend to lack the density of connections both within the university

and within the country to create a deep sense of research belonging. As one scholar explained, "Perhaps the community is too small; one might be the only person in the faculty doing research in a specific area. So there really aren't any real communities that develop around very specialised research areas."

For historical and cultural reasons, those networks are not so much regional as they are international. Many FoS academics obtained their PhDs overseas, with France as a particularly important site for postdoctoral study and early career work. However, as the faculty enhances its skills base and offers more PhD programmes and supervision, it is likely that fewer Mauritians will travel overseas for their postgraduate studies. This has implications for scholars' ability to network, as many of the international networks that they currently enjoy revolved around their overseas PhD departments. These were lively and enduring networks as academics continued to collaborate and publish with members of their postgraduate institutions.

Scholars also cited crucial networks with South African and Indian universities, though they tended to view these as "international" rather than "regional" networks. Through these, they were able to get students involved in exchange programmes, participate in collaborative projects, attend conferences and interact with research and funding organisations. Similar networks were also mentioned with colleagues in the UK, USA, Hong Kong, China and Réunion (France).

In addition, FoS requires that external examiners (for UoM student projects) be present at student presentations and view the student's work, which provides further networking opportunities. Once personal links have been established, interactions around research often follow. This is exactly what happened for one FoS scholar:

> *The government had said we needed to explore [a research problem] and so a couple of student projects were started, and one student got a scholarship to look at the issue. Then there was a visitor, a professor, who came from the UK and said, "Oh we do a lot of work on this issue. I'll put you in touch with Professor BS from the UK." So, she's never been here but she's been looking at our data and she found that a bigger picture emerged from this.*

This somewhat random collaboration resulted in a journal article, co-authored by the UoM academic, the student and the UK academic.

But the collaborations can also be quite complex, combining academic, funding and industrial connections in the project matrix. In one instance, the CBBR participated in a clinical trial with advanced molecular studies built into it, involving collaboration with the University of Réunion, a group in Los Angeles and a private sector partner in Japan. The technical laboratory work was completed in Réunion, where UoM PhD students spent six months doing the molecular work. To keep each other abreast of all work and results, the UoM team exchanged about 10–12 emails per day with their LA counterparts and engaged with the Réunion colleagues even more frequently, copying each other in on everything. This collaboration has led to a durable regional/international network for some FoS members and students.

However, many FoS scholars lamented the fact that they do not have this "connected" feeling within the university, though they acknowledge that the simple lack of population density – and therefore researcher numbers on campus – made it necessary for them to turn outwards for such connections. Indeed, some indicated that there was more of a sense of competition than collaboration locally:

> *When I was abroad I was raised with the idea of collaborating. Here, instead of collaboration people view it from a competitive angle. There are colleagues that want to achieve, then you say, "Oh my God, if I collaborate with him he will get the points, he will go higher than me." But everybody has their own way. I will do my piece; he will not know what I am doing. He writes his paper, he gets put up for promotion. But it's improving slowly, little by little. We have a research group now and seminars. But there are still many who just view it in the quantitative way [by numbers of publications].*

For this reason – and the historical, geographic and demographic reasons given above – UoM scholars were more likely to feel part of an "international" network (81%) than any of the scholarly cohorts that we profiled during our work.

Translation and engagement

The fourth and final phase of the research and communication cycle entails translation and engagement. This is the process of sharing one's research beyond the academic community – with students, policymakers, community leaders, industry personnel, etc. – in an accessible language and format.

This work is often unacknowledged in university reward and incentive structures (which focus primarily on scholar-to-scholar communication), though it provides one of the most productive and direct mechanisms for university research to impact national development imperatives. It shortens the feedback loop by which scholarly research gets into the hands of government ministers, community organisers and business entrepreneurs, all of whom may be able to use it for enhancing social welfare, growing the economy or spinning off new innovations.

For the purposes of this discussion, we will focus on the extent to which UoM FoS scholars utilise free web 2.0 technologies to share their research and enhance their scholarly visibility, and then discuss how they engage with broader audiences by popularising their research.

Web 2.0 sharing

There are a number of freely available Web 2.0 technologies, or "social media", that would allow UoM scholars to overcome certain obstacles that derive from their context (such as geographical isolation from other international academics) and achieve goals that are important in a developing research environment (such as enhanced collaboration opportunities with others). However, these tools do not yet play an important part in the UoM FoS scholarly communication ecosystem.

We conducted a "shadows and footprints" exercise to determine FoS scholars' engagement with Web 2.0 technologies on the internet.[93] A "shadow" is a person's passive online profile that is created without any special effort on that person's part. It is usually made up of random bits of information drawn from events (conference attendance) or organisational contributions (to an academic professional association) that is made available on different websites. It is also generated by aggregators such as Google Scholar, which create an impression of a scholar's productivity and impact based on the number of citations it can connect to a scholar's articles or books. For many academics – both in Southern Africa and the global North – the only information available about a scholar comes from the shadows they have cast on the internet through their normal activities. They have not engaged with the internet in any strategic way to determine what the public learns about them and their work (Brown 2011; CIBER 2010; RIN 2009, 2010).

In contrast, a "footprint" is the actively made profile created by a scholar on personal websites, departmental webpages, social media platforms (LinkedIn, Facebook and Twitter) and scholarly profiling sites (Academia.edu, ResearchGate and Mendeley). For many scholars internationally, this simply means giving their CVs to a university web administrator to upload onto their departmental webpage. But for the more proactive, it means engaging in a concerted effort to present a coherent narrative of their research interests and activities, plus a list of (and links to) their research outputs. It may also mean a more regular form of personal communication to the public through tweets, shares and blog posts.

The only Web 2.0 tool that UoM FoS scholars use with any frequency (48%) is LinkedIn. As a free profiling service, LinkedIn's perceived "seriousness" makes it one of the easier Web 2.0 tools for FoS scholars to embrace, even though they do not use it with any intensity (boasting few connections). Other social media platforms, such as Facebook and Twitter, are used much less, a fact that corresponds with the globally low level of scholarly engagement with such Web 2.0 technologies (RIN 2010; Ware & Mabe 2010). Elsewhere, while scholars acknowledge the potential these social media have to enhance collaboration (Gu & Widén-Wulff 2011; Morgan, Campbell & Teleen 2012; Pearson 2010), many also see it as frivolous, lacking quality control and unnecessary for successful scholarly dissemination (RIN 2010). This is replicated in FoS academics' low use of scholarly networking sites, such as ResearchGate (14%), Mendeley (7%), Academia.edu (7%) and Google Scholar personal profiles (7%). Thus, at least as revealed through these various profiling services, UoM FoS scholars cast a very light "footprint" on the internet.

The same is true of their scholarly "shadows", especially those produced by the university's website. Though each department has a website on the UoM site where faculty members can profile their own work – or where the administration could provide such information – only 21% of UoM FoS scholars have even basic details about themselves on personal pages. The picture that emerges is that UoM FoS scholars are essentially disengaged from Web 2.0 social and scholarly technologies.

[93] This research was carried out in September 2012 and may have changed slightly since then.

Given that these virtual technologies offer FoS scholars the opportunity to overcome a number of the challenges facing them regarding scholarly networking, collaborating and sharing from their isolated position in the Indian Ocean, it may appear ironic that they do not use them more often. But in reality, they have ways of dealing with these challenges, typically by relying on more traditional methods of collaborating and networking, by keeping in touch with colleagues abroad from their graduate student days, by meeting new colleagues at conferences and by maintaining those relationships by phone or email. Considering the temporal investment involved in learning new social media technologies to achieve these ends, FoS scholars prefer to use more familiar forms of "real" (as opposed to "virtual") social networking.

Many simply do not see the point in such Web 2.0 engagement. One academic said: "I need to get publications. Nowadays people with ten publications are not getting promoted to senior lecturer. If you want to get promoted to associate professor you will need maybe twenty. You will need funded research. How am I going to do that? My aim in getting publications would be to get promoted, not really to raise my profile, not really to market myself."

Others are also worried about their online security: "I'm a bit worried about safety on the web. I don't know, they may change my profile or play a joke or something. Someone here once put up some false information on the net. I feel a bit concerned about who's reading what. I thought I should do it [put a profile on LinkedIn] but I'm sort of a more private person …. I mean, do I really need to project myself?"

Popularising research

The priority for most FoS scholars is to share their research with other scholars through formal publication channels; however, some scholars – usually senior academics – say that they make it a point to share their work with the general public as well. This is not part of any faculty communication strategy that is officially recognised, just a result of the personal volition of senior scholars who have developed a high level of expertise in a topic and feel confident enough to share it publicly. As one professor noted:

> *When a paper is published, I make it an absolute point to contact newspapers, particularly some reporters with whom I have a good rapport. I say, "Look, this paper's out and I'll make a little summary." I can translate in what way it can actually be of interest to a wide audience, not the scientific audience but a wide audience and they say, "OK, well if you want an article on that, I can give you photos." I do this sort of thing …. Previous to that, I was asking the university to make press releases. But I spent six months and haven't gotten an answer …. We are actually developing a good link with one newspaper in particular. They have even made almost a regular weekly section for the paper every Friday …. So every week we have one article coming up now in the press.*

At the moment, FoS scholars' production of these alternative outputs is ad hoc, based on the personal discretion of individual academics. This is revealed in Figure 5.7, which shows a strategic differentiation between co-authored publications (mostly formal) and

sole-authored publications (often in informal "alternative" formats). A substantial proportion of FoS survey respondents said that, in the past two years, they had produced sole-authored briefings, magazine/newspaper articles and radio/TV presentations (44% for each category). What becomes clear through the distribution of co- and sole-authored publication activity, however, is that co-authorship is the norm for their formal outputs, while sole authorship is more common for alternative outputs (which have little or no impact on promotion opportunities). Alternative outputs are a "nice to have", but not a "necessity".

Some academics expressed mixed feelings about embracing the role of the "public intellectual" by writing for newspapers, appearing on TV and so on. These feelings echoed those listed above about their reluctance to share their work online. While scholars agreed that this might not be ideal, they suggested that it was still better than the relationship that they had with government policymakers, which was virtually non-existent. Many respondents said that they produced research which they believed would be useful for policy development, but they were unsure how to go about communicating it with the relevant representatives. Even worse, they did not know whether the government was actually even interested in what university researchers had to say because they believed that UoM research was not taken as seriously as that conducted by foreigners.

While these perspectives were common in the FoS, where scholars enjoyed a measure of job protection regardless of whether the government noticed their work or not, the scholars in the CBBR – a new scientific research centre in which the government has a practical and financial stake – go out of their way to communicate their work publicly (and therefor justifying the government's investment in the venture).

CBBR scientists said that they were committed to "popularising science". The two that we spoke to had written numerous articles for Mauritian newspapers and given many TV and radio interviews about their work. One shared, "You know this is a French concept – the 'université populaire' – so one talk I gave recently in French was on science as the 'cultural glue of the nation', as you would say in English."

Not only do they write on the content of their work but they also write about research and innovation. One example was an invited article on innovation for the newsletter of a European hub which was then re-published in an international chemistry journal.

Thus, FoS scholars are more likely to produce alternative outputs if they feel free of promotion concerns, if they feel that they are experts in their field with a contribution to make to the general public, and if they feel that popular exposure of their research will enhance support for their ongoing projects. But they will do this alone, typically, in their own time outside of the research group in which they likely carried out their research.

Research types

While the research and dissemination cycle provided us with a model for understanding crucial elements of the scholarly communication process in the UoM FoS, we also found it useful to understand how the types of research outputs that the scholars were producing were impacting their communication activities. To do this, we drew on

typologies developed by Boyer (1990, 1994; Boyer Commission 1998), Etzkowitz (2004), Griffiths (2004) and Cooper (2009, 2011), settling on a framework comprised of five types of knowledge production (Griffiths 2004: 714):

1. Discovery inquiry (pure basic research)
2. Interpretive inquiry
3. Applied inquiry (pure applied research)
4. Integration research (including use-inspired basic research)
5. Critical inquiry into teaching and learning

This typology is helpful in differentiating academics' various research practices since each implies varying orientations to the four key stages of research production and dissemination (Czerniewicz 2013).

When asked how many research projects they have been engaged in over the past two years, 38% of UoM FoS survey respondents said one, 24% said two, 20% said three, and 17% said more than three. This splits the faculty between 62% engaged in one or two projects and 38% involved in three or more.[94]

In the following section, we will describe selected research project examples drawn from in-depth interviews with FoS scholars. These provide a look at the various types of research projects that they have carried out in the past two years while also illuminating how these "type" distinctions impact communication activity.

Discovery inquiry (pure basic research)

Discovery inquiry is a type of research that is usually associated with a strong disciplinary base in the sciences (most often involving team work) and comprises the collection of empirical data in the search for "generalisable explanations or theories" (Griffiths 2004: 715–717). It is also referred to as pure basic research.

This is one of the most common types of research approaches for FoS scholars, who are often engaged in team-structured experiments and tests. It best describes the work carried out by the faculty's astrophysicists who utilise the Mauritian Radio Telescope (MRT), for instance, to conduct cosmological research. This research does not always have social, commercial or developmental application, but it helps answer basic questions that scientists have about the universe. (And in this instance, the capacity that this research has developed was helpful in securing the island as a partner country in the continental Square Kilometre Array (SKA) consortium.)

This type of research usually leads to scholar-to-scholar outputs in the first instance. Because the questions to which the research is directed often emanate from a problem or

[94] Though it is impossible to say whether our survey results on this question represent a level of research productivity – as a single project might entail as much work as multiple smaller ones – it allows for some speculation on the matter if the UoM data is compared to other data sets. With a 62:38 ratio between scholars who have been involved with two or fewer projects vs three or more projects over the past two years, UoM FoH staff members have been involved in more projects than their UNAM FHSS colleagues (72:28 ratio), but fewer than those in the UB FoH (50:50 ratio) and UCT Commerce (32:68 ratio). Moreover, during our research, it became clear that scholars had different understandings of the term "research project". This made any neat or easy comparisons within the faculties, let alone across them, difficult.

debate within a particular scientific field, scholars feel most compelled to share their results with colleagues through formal publication (usually journal articles). However, if the results shed light on something of more general interest, then it could be translated for dissemination to the public through op-eds or radio/TV interviews. In the case of the MRT and the SKA, FoS scholars have made some efforts to publicise their work since this astronomical research connects them to the largest African scientific collaboration in history.

Interpretive inquiry

Interpretive inquiry is a variant of discovery inquiry, more often undertaken by lone researchers in the social sciences and humanities, involving "the interpretation of phenomena rather than the search for generalisable explanations" (Griffiths 2004).

Interpretive research projects were also undertaken within the FoS, although these were not funded and the academic engaged in them indicated that they were seen as low status in the faculty: "If you'd asked me ten years ago about qualitative research, I would have thought 'oh my God!'" While this research is not considered as prestigious within the faculty, during the length of a career it will become an option as scholars consider different types of research projects beyond discovery inquiry.

Applied inquiry (pure applied research)

Applied inquiry is research for addressing pre-specified problems, sometimes at the behest of a client. It is characteristic of vocational or applied fields such as engineering, education, social policy, health care and built environment. Research of this type often makes use of knowledge derived from discovery and interpretive inquiry and is therefore sometimes viewed as eclectic or derivative. Also referred to as pure applied research, this type overlaps with consultancy research.[95]

Many FoS scholars engage in applied research projects, some of which derive from consultancy contracts with government ministries or international agencies. Most of these appear governed by confidentiality agreements that do not permit academic publication. After explaining one such project, an academic stated, "I would not publish on that. I don't think it would be ethical to publish anything that I've done as the consultancy. I would [have to re-do the study] and use similar techniques in a different setting."

This type of research can entail communication with other scholars, but just as often it will entail a one-to-one relationship with the contracting agency that hopes to use the research for its own purposes. Depending on the contractor and the research insights, the

[95] Consultancy work is often a source of friction amongst academics and managers, "revolving around whether consultancy generates 'new knowledge' or is applying accepted ideas and principles to particular cases" (Griffiths 2004: 717; see also Mamdani 2011a). Griffiths (2004: 718) argues that "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, "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."

results of this research can lead to broad social benefits and development or to various commercial innovations, even if the research remains proprietary. This is certainly what the government of Mauritius hopes will happen when it encourages academia–industry linkages through its various innovation policies.

Integration research (use-inspired basic research)

Integration research involves placing discoveries in a wider context, synthesising knowledge from both discovery inquiry and applied inquiry. It is compatible with Cooper's (2009, 2011) notion of "use-inspired basic research" (UIBR) in the Southern African context, which emphasises the primacy of basic disciplinary work, but seeing it as embedded in use-orientation (Cooper 2011).[96]

In a developing world context, this type of research is the most useful, as it creates knowledge that makes a theoretical contribution to a field (which gains scholars prestige) and it creates knowledge that can have practical application in society (which makes the research relevant for development, one of the key missions of the university).

A number of FoS research projects achieve this aim of being of scholarly and social importance. One CBBR project, financed by the MRC, was aimed at the fact that Mauritius is a "world champion" in cardiovascular disease (CVD), with 35% of its population dying from CVD. The research group first examined Mauritian teas, finding that they were extremely rich in polyphenolics. The group then proposed to do a randomised controlled clinical trial looking at the effect of the teas on various markers for CVD stress. This was a first for Mauritius and involved a year and a half of data collection and analysis, with blood tests for 260 people taken every month. The tests were done using equipment in the university laboratory and then checked by a private laboratory. The conclusion reached was that: "Black tea consumed within a normal diet contributes to a decrease of independent cardiovascular risk factors and improves the overall antioxidant status in humans" (Bahorun *et al.* 2012). As a result, one student completed her PhD through this project. Five publications came out of it – our journal articles in high impact journals and one book chapter. In addition, a number of TV and radio interviews took place, as well as symposia and public talks. These focused on the studies, the data and the need for a balanced diet. Finally, the *New York Times* mentioned the project in an article and this was then picked up by Fox News in the USA.[97]

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[96] The concept of UIBR, as discussed by Cooper (2009, 2011), is central to a positive vision of where research in Southern African universities could be directed. Contrary to the prognosis of Gibbons *et al.* (1994) around changes in universities worldwide from mode 1 to mode 2 knowledge production which paints a picture of an inevitable trend towards the dilution of disciplinary work in favour of research orientated to "real-world" problems addressed through trans-disciplinary and transient teams focused on particular objects, the UIBR concept portrays a renewed role for the deep disciplinary expertise of university-based scholars who take forward basic scientific work at the same time as they keep their eyes on the real-world problems to which their research may be addressed. Cooper's work provides in-depth and empirical work on university-based projects in South Africa that are managing to do this.

[97] UoM (2012) Fox News cites research on effects of black tea consumption in reducing risk factors for heart disease, *UoM Newsletter*, 25 June 2012, available at: http://uomnews.wordpress.com/2012/06/25/fox-news-cites-research-on-effects-of-black-tea-consumption-in-reducing-risk-factors-for-heart-disease/

Currently, the PI teaches two modules that draw substantially on the research outputs from this project, sharing the published papers with the students.

In another example of use-inspired research, the CBBR tried to patent its research findings, in line with the general wishes of the university and the government for innovative research to be protected under such a legal regime. However, because it was not considered commercially important in the Mauritian context, the scholars went forward with publishing the work in international journals: A Swiss heart surgeon had been visiting Mauritius every year as part of an NGO that does heart operations. He had been using the polymers and engineering them for the applications that he needed. The surgeon approached a UoM academic suggesting that they collaborate on a specific class of biodegradable polymers, known as polyester ethers, suggesting that the UoM group try to see how improvements could be made to develop this material that could be used as rings in valve repairs. The CBBR found a student to do this as a PhD (after raising a scholarship from the Mauritius Tertiary Education Commission) and worked on developing a new family of polyester ethers, for the first time in the world. The university was approached to work on filing a patent, but this did not happen. According to the CBBR scholar involved, "We were told there was no money available to go into patenting, that it was not the problem of the day. So we were not able to patent it and I kept the results, blocked everything for about a year and a half. But in our academic world you can't just block results, because someone might do something before you. So we immediately sent the results to the number one journal in our field and it was published in two weeks."

These examples show the value of use-inspired basic research in the eyes of the public and the academic community and may represent the most developmentally impactful form of research in the Mauritian context.

Critical inquiry into teaching and learning

Critical inquiry into teaching and learning is a type of reflexive research aimed at education practice that aims to improve how learning takes place. This scholarship of teaching and learning 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.

This research is typically meant to be shared with other scholars and university personnel so as to re-shape their educational practices. It may have relevance beyond the academy in the basic education sector, but it is largely for the benefit of scholars so that they may reflect on their teaching techniques.

Rewards and incentives

The last element of the UoM FoS scholarly communication ecosystem to explore is the rewards and incentives system that, in part, guides scholars' research production and dissemination. The values analysis discussed above shows that scholars have multiple, and often quite personal, reasons for why they conduct research, but the official rewards and incentives policies represent a crucial leverage point for influencing the trajectory, quantity, quality and impact of that research.

SCAP considers the following as rewards and incentives:

- Financial remuneration, including research subsidies, patents and royalty payments, direct financial rewards such as research awards, etc. (Taylor 2003: 16)
- Increased research budgets, including conferencing budgets and travel expenditure
- Greater choice in postgraduate research supervision
- Greater choice in terms of research focus, methodology, and outputs
- Decreased teaching and administrative responsibilities (Smart 1978: 408)
- Invitation to prestigious academic societies, boards, review or policy groups
- Formal (institutionally driven) recognition from colleagues and peers (Moses 1986)

UoM scholars are incentivised in only a few of these categories. At the national level, the MRC sponsors the Best Mauritian Scientist Award, which provides a cash prize component of MUR200,000 (USD6,451), a stipend of MUR50,000 (USD1,612) to be used for visiting overseas institutions and an award ceremony.[98] This is a useful form of recognition, but according to scholars, does not have a great impact on their research and dissemination decisions. One of the CBBR scholars received the first award.

At the institutional level, the UoM Strategic Research and Innovation Framework (2009) commits to "reward excellence and achievement in research" (UoM 2009: 9) through:

- Financial remuneration, such as prizes for "outstanding accomplishments in research", "new prizes and awards to best researchers on campus" and the creation of a "UoM Research Excellence Award" (UoM 2009)
- Increased research funding, including provision for overseas workshop and conference attendance (UoM 2009)
- Reduced teaching and administration load to active researchers
- Formal recognition, such as "profiling the achievements of UoM researchers" and "publication awards for quality papers" (UoM 2009)

These are all excellent proposals except for the fact that FoS scholars say that they are not implemented. One of the reasons why implementation has been incomplete is because of the fluctuations in the top levels of the administration. The former VC who helped spearhead these strategies has resigned, but a new institutional champion has yet to emerge to drive the implementation of these strategies.

Because of the shifting fortunes of various institutional strategies, the primary reward and incentive structure that UoM scholars respond to is the official promotion policy. As our values discussion showed, this acts as a highly motivating factor in spurring FoS research. For promotion consideration, scholars are assessed according to three criteria: teaching, research and service (to the university, the profession and the community). Table 5.1 shows the relative weightings that each category can receive, depending on the preferences of the promotion candidate. The relative value of teaching for promotional purposes declines with rank while the research and service components go up.

[98] MRC (2011) Best Mauritian Research Award, at: www.mrc.org.mu/Documents/Schemes/BMSAba5.pdf

Table 5.1 Promotion assessment guidelines at UoM

Promotion	Teaching	Research	Service
Lecturer to senior lecturer	30–50%	30–50%	10–20%
Senior lecturer to associate professor	20–30%	45–55%	20–30%
Associate professor to professor	10–20%	55–65%	20–30%

To assess scholarly research, the promotion policy uses a point system in which all types of scholarly outputs are allocated a numerical value ,which is weighted according to whether the output is of a "very high category" (1 x full marks), "high category" (0.8 x full marks) or "average category" (0.6 x full marks) and totalled to give assessors a raw score to grade the applicants. The applicant can argue for the category into which he or she thinks a publication falls, usually relying on indices such as the WoS rating of the journal in which an article is published (if there is one), the level of importance that a particular set of conference proceedings has to one's field, etc.

With regard to format types, the point system rewards the publication of internationally published books, journal articles, book chapters and refereed papers in conference proceedings over those published nationally (by a 2:1 margin) and provides mild recognition for alternative outputs such as reports, technical papers, briefings and so forth.

While this system tries to encourage scholars to publish in international outlets, some scholars are said to stack up their publications in the local *UoM Research Journal,* which has a high acceptance rate for submitted papers (about 60%). Though publication in the journal earns less points on the assessment scale than more "international" or "prestigious" journals, over time scholars can rack up a number of articles there and earn promotion up to the level of senior lecturer (but not quite associate professor, which requires some international publications, nor professor, because such applicants must demonstrate exceptional international contributions through high-impact journals).

Some scholars complain about this strategy, suggesting that those who do this are taking advantage of a weak spot in the UoM promotion system. One said:

> *When you talk to researchers here it's really just a count, one, two, three and however many citations … So you lose the creative aspect. It's a meaningful process where you're doing something that will help someone else, not just for the sake of writing a paper, so many papers they are just empty of meaning! And they just cut and paste, modify it a bit. I don't want to end up like that, but the system here just looks at your output in a quantitative fashion. They say they're doing it in a qualitative fashion but that's not true.*

Nevertheless, this leads to a situation in which publication is often erratic, achieved only when scholars seek promotion. It does not provide the constant pressure to produce outputs annually because there is no recognition for temporal consistency. And for scholars who have chosen a more teaching-oriented approach to their careers, it provides little incentive to produce any research at all. The system of "excess teaching" discussed

previously exacerbates this problem, tempting academics into doing more teaching to augment their salaries, leaving less time for research.

> *Of course salaries are not high and any excess teaching is most welcome because research is not rewarding [financially]. I don't get one cent if I publish a paper in* Nature. *I don't get one cent if I am supervising. I came up with the top ten PhDs, not one cent. So where's the motivation when you can earn up to three, four, five hundred thousand Rupees per year in excess teaching?*

Moreover, some scholars suggest that there is no real penalty for not conducting research (if you are not seeking promotion) because teaching remains scholars' "real" obligation:

> *Your performance is measured based on your teaching, and maybe your administration, how far you've been able to successfully run the teaching programme for maybe two years. But even if you do have publications it's no big deal … If the research doesn't get done the university doesn't bother. If the teaching doesn't get done the university bothers.*

Of course, for those scholars who do seek promotion, the reward and incentive structure motivates them well enough to publish. This is the case for the majority of FoS scholars. But a few suggested that, because FoS has promoted so many of its members to associate and full professorships (over 50%), it has increased the publication requirements for getting promotion. As one complained, "I need to get publications. Nowadays people with ten publications are not getting promoted to senior lecturer. If you want to get promoted to associate professor you will need maybe twenty. You will need funded research. How am I going to do that"?

However, the key question to ask about the rewards and incentives structure is not just whether it is resulting in the desired quantity and quality of research outputs, but whether it is having the impact that the university and the government want them to have? For instance, are FoS outputs helping to:

- Achieve the nation's goal of becoming a regional innovation hub?
- Usher in a knowledge economy?
- Spur national and social development?

According to a number of scholars we interviewed, their research does do some of these things, or at least it could if it were more visible, or if they reached the right audiences. The problem is that most outputs end up in scholar-to-scholar communication channels with long feedback loops, meaning that they circulate within a relatively bounded academic sphere for a long time until they are either forgotten or accepted as "knowledge", thereby entering a broader public sphere of communication.

In many cases, this long feedback loop makes sense because it is useful for ideas to be vetted by colleagues who can critique, refine and enhance them. But the long feedback loop can also add an unnecessary delay to the dissemination of good ideas to members of the public – including government ministers, civil society organisations, entrepreneurs,

community activists, students and industrial players – who could leverage them for developmental purposes in their own contexts.

There are three ways in which the scholarly communication feedback loop could be shortened so that non-academics can engage with scholarly research. The first is to promote one-on-one relationships between scholars and other audiences that allow for them to explore ways to leverage the research for development, financial gain, etc. This is a method that UoM encourages, especially through its Consultancy and Contract Research Centre (CCRC), which connects academics with industry personnel. There is great benefit in this, at least for the potential partners involved, but it is a fairly "expensive" undertaking, because it requires significant investments (in time, infrastructure, contacts, etc.) by the CCRC to achieve even a small number of lucrative connections. Even more, it's aimed almost exclusively at academia–industry relationships, but not on academia–government or academia–civil society connections that could lead to crucial policy developments or social innovation opportunities.

The second approach is to publish scholarly research in an open access fashion so that anyone with an internet connection can access and read it. This is the approach that many developed-world scholars are taking, often informed by changing government and funder policies. There are costs involved in this approach too, but they tend to be spread out within an institution. More importantly, the public benefit of open access is literally immeasurable because it is impossible to determine in advance the impact that a piece of scholarly research can have for a business, community or NGO that could never have afforded to conduct the research. Also, open access allows for the "law of unintended consequences" to open up new opportunities for research, as different people utilise the research in their own unforeseen ways. This is one of the reasons why SCAP encouraged UoM to embrace OA dissemination because it offers an egalitarian, progressive and ethically appropriate method of communicating research to the nation and the world, much of which was publicly financed in the first place. Thus OA has the potential of shortening the scholarly feedback loop down to the time that it takes for a computer user to search for, find, and download an article.

The third approach is to make sure that scholarly ideas and research results are communicated to the public in a format that is accessible to them intellectually. For instance, due to government ministers' time constraints, policy briefs are often the best format for communicating a set of ideas to them. For NGOs and community organisations, reports are useful because they offer the evidence necessary for making informed decisions, but without them being shrouded in relatively insider academic debates. And for the public, op-eds, briefing papers, blog posts, and radio and TV interviews are often the most easy-to-consume formats of knowledge. This typically involves an act of "translation" from the jargon-laden academic research output into broadly accessible language. However, these are usually considered beyond the scope of a rewards and incentive policy, treated as "extra" activities that are "good", but not worth incentivising officially. At UoM, they are considered very marginal scholarly outputs. But this type of communication often has the greatest opportunity to impact social policy and development because it gives useful research knowledge to the public in a way that it can understand.

With these points in mind, it is worth asking again whether UoM's rewards and incentives are achieving the impact that it wants. The promotion policy focuses on rewarding scholars for publication without any regard to whether it is open or closed, disseminated to the public or not. The policy blindly trusts commercial publishers to disseminate their scholars' work, failing to take into account that most of those publications will only be accessible to other scholars who have university subscriptions to the relevant journals (many of which UoM cannot even afford).

To put the question visually (Figure 5.9): UoM's values should inform its mission; its mission should inform its policies (rewards and incentives); and its rewards and incentives policies should yield the impact that it desires. But do the rewards and incentives actually lead to the impact that the university says it desires?

In our findings and recommendations, we suggest that the university must look at its dissemination practices more closely if it wants to achieve the kind of national and international impact that it desires.

Figure 5.9 Visual representation of rewards and incentives' relationship to values, mission and impact

With the above discussion in mind, SCAP asked UoM FoS scholars, "What incentives could increase your production and dissemination of research outputs?" They responded primarily with these answers:

- Reduced teaching and administrative load
- Increased funding for research projects and conference travel
- More facilities, especially laboratory space and equipment
- Better journal access
- Peer recognition

These responses suggest that while promotion is a useful tool for promoting research, other types of incentives would be useful as well, especially if they are actually implemented.

We also asked UoM FoS scholars, "What incentives could increase your production and dissemination of *less-traditional* research outputs (i.e. other than books or journal articles)?" They responded:

- Greater recognition in the official promotion policy
- Financial incentives
- Access to more electronic journals
- Reduced teaching loads
- The establishment of an APC fund
- The development of Memoranda of Understanding between institutions for data

These suggest that scholars are not averse to producing alternative outputs and reaching out to a non-academic public, but they would want official recognition and other quite practical incentives for these efforts.

The African context

The preceding discussion of UoM FoS scholars' research and communication practices is underpinned by a broader set of conditions that can be called "the African context". Such a term threatens to reify what is in fact a dynamic, diverse and differentiated environment, but it is a useful term for UoM scholars who are often forced to reflect on their particular circumstances due to the comparisons that they – and outsiders – often make between academic reality in Africa and the global North (the primary reference point for international academic norms and standards).

During our research, we asked UoM scholars, librarians and managers, "How does the African context impact UoM research?" We did not define what the African context was, but let them define it through their answers. But a problem quickly surfaced when we realised that most interviewees did not view Mauritius as being within the "African context". They recognised the island's nominal and political affiliation with "Africa", but its geographical distance from the continent and its demographic distinctiveness (more resembling India than Africa) made it difficult for them to identify their own challenges as being subsumed under a broader African context. For them, "Africa" was defined by a series of particular understandings that did not exactly describe their reality. They considered Mauritius as much "apart" from Africa as it was "a part" of it.

When we modified the question slightly to, "How does the African context, or the Mauritian island context, shape research and research motivations?", respondents provided a number of answers that helped us see how their particular geographical, historical, cultural and demographic environment impacted their research.

Their responses tended to fall into three categories – deficits, challenges and opportunities. First, UoM personnel identified a number of deficits that, to them, characterise the Mauritian context of research. Most of these revolve around the impact of a general lack of funding and the unsatisfactory distribution of knowledge between African countries. Many scholars complained that, "A major obstacle is the funding. Our budget doesn't allow us to buy as many books as we would like to or even subscribe to journals. Sometimes we put in a request for a journal, but we don't have the funds." The result is that scholars are stuck with outdated or insufficient information on the topics they are researching. As a librarian shared, "the library budget is very low. The price [of journals and articles] keeps on rising and the library budget is the same, so you can't purchase all the journals, let's say the current information. And that's when it comes, it's poor information."

This lack of funding reduces the quantity and quality of knowledge and equipment (for scientific lab experiments) and it minimises the opportunities for collaboration and exchange with other African countries. As one librarian explained, "We should have links with more African universities or even with other universities in the Indian Ocean region, but unfortunately, through lack of funds, we can't do anything, such as more training and exchange. In the past we used to have [these types of opportunities], because personally I

went to UK three times – only to UK." This reveals a conundrum, in which the lack of funding not only reduces intra-continental exchange, but makes it more likely that the exchange will be almost solely through North–South channels.

The challenges that UoM personnel cited context to marginality, invisibility and local cultural sensibilities. In this case, marginality is directly related to Mauritians' sense of geographical isolation, "like a dot in the ocean." Their distance from major academic centres makes some of them "feel excluded from that community", while others lament this fact "because it's by ventilating ideas with peers that you really get to another level." Without these communicative opportunities, UoM research ends up being more invisible than it should be.

Many UoM scholars also believe that certain local cultural sensibilities impact research and communication practices in a negative way. On the one hand, as one scholar shared:

> *Being a small country where people tend to know one another means that you have a lot of personal issues. Lots of personal conflict sometimes which can hinder the contact of meaningful research because some people tend to be favoured over others. I mean, I have examples in front of me all the time. For some people [their research proposals are] approved straight away and for others you have ten thousand questions asked … it's a lot of hidden things.*

On the other hand, because the academic community on the island is small (a fact that is replicated in the FoS), it lacks the density necessary for sustained high-level research production. "There's no sense of urgency … the lack of positive stress … the lack of connection or people or big enough groups to actually start generating strategies and ideas and things like that." This lack of peer pressure means that "many people are quite happy just depending their whole life in academia with barely any papers published."

The Mauritian context provides opportunities for scholars to make an impact not only on national development through their work, but to science more broadly. They see their teaching activities as benefitting the nation, and much of the research they conduct has a bearing on development, whether it relates to health issues (such as treating diabetes), chemistry (identifying fossil-fuel pollutants in the soil) or biology (wildlife management). With the support of MRC funds that are devoted to research projects promoting national research goals, FoS scholars believe that they can make a significant contribution to their small island home.

At the same time, a number of scientists are keen to look beyond Mauritius and engage international scholars in research that is of global value. As one scholar shared:

> *We aim for the highest journals. 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 and so on, but because they know that we are doing good science.*

Conclusion

While FoS is the most productive faculty at UoM in terms of research outputs – boasting an internationally trained academic staff, many of whom are world experts in their fields – they work in a largely teaching-oriented institution where research comprises just one of many scholarly activities and where local collaboration remains rare due to a lack of specialists in the same fields. Governed by a centralised, but weak administration, scholars are free to determine their own level of research productivity based on the intensity of their personal desire. But this freedom is limited by heavy administrative burdens that make it difficult for them to get even basic things done quickly or efficiently. However, while the high level of autonomy that scholars enjoy allows them to pursue research on their own terms, it also leads to an ad hoc research culture, characterised by highly variant levels of research excellence. This carries over to the question of scholarly communication, in which the institution provides little strategy or guidance in how scholars should communicate their research in an optimal, open fashion. While some senior scholars make it a point to share their findings with the public through non-academic channels, most are content to direct their outputs only to fellow colleagues through traditional publishing formats. The rewards and incentives structure that shapes such communicative behaviour does not give greater recognition to outputs that are open vs closed, meaning that a lot of the research produced by FoS scholars remains unavailable to governmental, civil society and industrial personnel who might be able to leverage it for their own – or broader social – purposes.

It was in this unique context that SCAP embarked on an implementation initiative to increase the visibility of FoS academics' research and collaborative opportunities – an intervention that we discuss in the following chapter.

Chapter 6.
The SCAP implementation initiative

SCAP's research design called not only for the collection of data from our various pilot sites, but the active stimulation of them through customised implementation initiatives (or "interventions") that sought to improve the state of scholarly communication within them. Five principal assumptions underpinned these initiatives. They would:

1. Be treated as experiments.
2. Address a challenge articulated by project participants in pilot sites and other institutional stakeholders.
3. Be publishing-oriented, addressing content profiling and dissemination through new tools and technologies.
4. Utilise open approaches (including open source software and publishing platforms) wherever possible.
5. Yield insights that could be extrapolated to the rest of the institution, developed in line with current institutional strategy, e-infrastructure, and international standards and protocols around interoperability.

SCAP scoped and fulfilled the implementation initiatives during our four site visits to the institutions. The first visit aimed to surface the contradictions in the scholarly communication ecosystem, while the latter three visits sought to create consensus around the nature of the initiative, identify stakeholders and policy frameworks, and implement the agreed-upon pilot process.

While the formulation process was participatory, the PI team played a considerable role in interpreting and translating the desires of informants into a feasible intervention. This was due to two reasons. First, while informants had a clear sense of institutional challenges, they were often unable to articulate desired solutions to them because they were unaware of the new technologies that might overcome these challenges. Second, the PI team also had the responsibility of protecting the funder's interests and ensuring that the implementation activity adhered to open access principles.

The Faculty of Science (FoS) served as the SCAP pilot site at UoM. We had initially considered locating our pilot activity within a department, but due to their small sizes in the FoS, we decided against this. Moreover, the larger faculty size allowed us access to a wider range of outputs, both in number and type.

Additionally, FoS has consistently been one of the more prolific research-producing entities within the university, which itself is the most prolific research producer in the country. We hoped that an intervention that promoted research visibility in one of the more productive faculties in the institution would provide an example to other faculties and units, promoting general visibility of Mauritian scholarship.

In this chapter, we will examine the process and results of our implementation initiative at UoM. We will do so by identifying scholarly communication challenges at the university, determining the focus of our intervention, putting the initiative into action, assessing our findings, then considering what lessons were learned through this engagement.

Identifying scholarly communication challenges

Through our early change laboratory workshops, surveys, interviews and conversations at UoM, we aimed to establish the primary scholarly communication desires and challenges within FoS. These were to help us determine the implementation initiative that we planned to pilot with the faculty. During our research, we found that three challenges stood out for FoS members: collaboration, networks and profiles; low bandwidth levels; and low levels of existing dissemination activity.

Collaboration, networks and profiles

As discussed in Chapter 4, the Mauritian government aims for the island to become a "knowledge hub" in the region, a space characterised by dense collaboration and networking activities. This desire – which requires substantial investment in ICT technologies – matches that of the university and FoS scholars. They recognise that virtual collaboration has become an academic norm through the globalisation of communication networks (Monge & Contractor 2003) and is crucial for future research activity in Mauritius (see Figures 6.1 and 6.2), where low numbers of scientific specialists require that they look beyond their borders for collaborative partners.

To be clear, collaboration occurs across *networks* of two or more people and increasingly is *virtually conducted* rather than face-to-face. This bears particular relevance for Mauritian scholars, given their geographic isolation and low funding for international travel. However, entry into a network is not always guaranteed or automatic; and networks are typically subject to the dynamics of the status and power relations of their constituents. The chances of gaining access to a network are typically increased if the aspiring entrant has something to offer/exchange (either to other constituents in the network or to the network itself), and if the aspiring entrant can provide tangible, verifiable credentials to confer their perceived value to the network (often expressed as 'social capital' in the theory of social networks) (Bourdieu 1985; Lin 2001; Portes 1998).

Figure 6.1 Scientific collaboration – global perspective (Beauschesne 2011)[99]

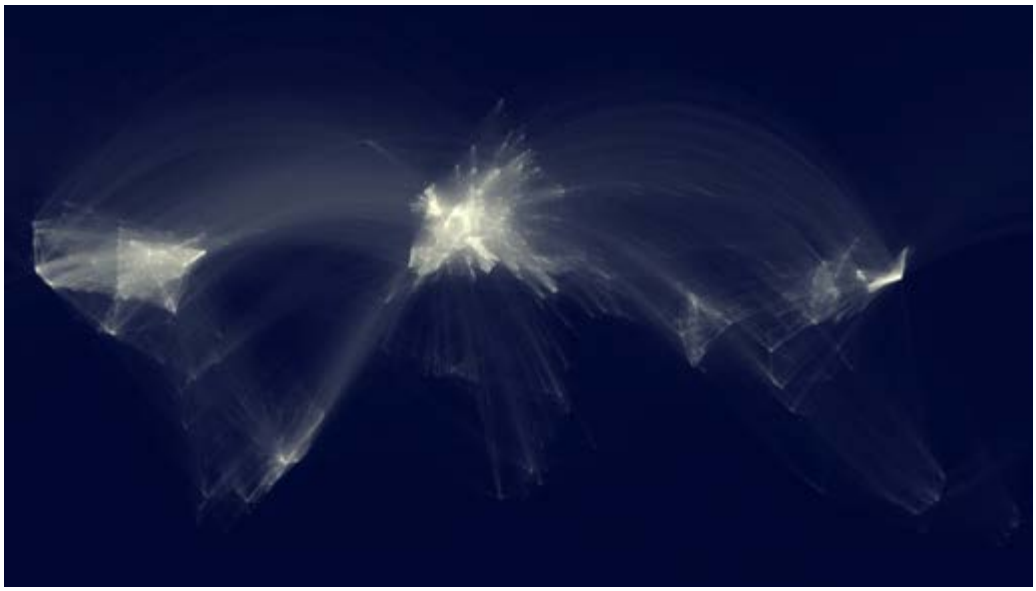
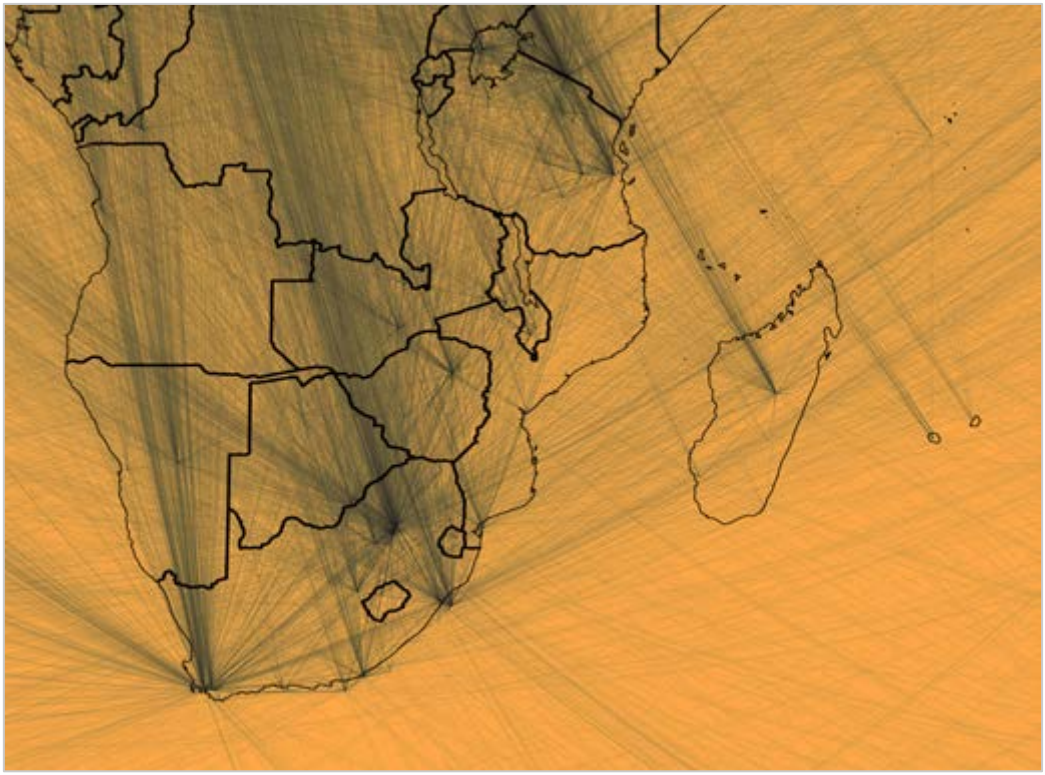


Figure 6.2 Scientific collaboration – Mauritius in perspective (Beauschesne 2011)



[99] Based on data compiled by Olivier Beauchesne who aggregated scientific collaboration between cities from 2005–2009 using the Elsevier bibliographic database. Olivier Beauchesne (2011) Map of scientific collaboration between researchers. http://olihb.com/2011/01/23/map-of-scientific-collaboration-between-researchers

From an academic point of view, there are five types of academic communication networks that are likely to be pursued for collaborative purposes:

1. *Academic networks*: scholar-to-scholar, for the purposes of knowledge-sharing and creation
2. *Academic–industry networks*: scholar-to-industrial partner, for the purposes of knowledge creation in the form of innovation
3. *Academic–government networks*: scholar-to-government personnel, for the purposes of policy and development
4. *Academic–civil society networks*: scholar-to-community, for the purposes of advocacy and development
5. *Funding networks*: scholar-to-potential research funder (e.g. philanthropies, science councils and national and supra-national agencies), for the purpose initiating research projects

Given the importance of collaboration to FoS scholars – many of whom need to collaborate with overseas scholars in order to share and compare data in their specialised fields – SCAP believed that an academic profiling exercise aimed at increasing the online visibility of FoS scholars would assist them in finding collaborative partners in international research institutions, and in so doing enhance the possibility of accessing international scholarly networks. Once a network had been joined, it was hoped, academics participating in the proposed intervention would be able to collaborate more frequently and effectively with other regional and international researchers.[100]

Limits on broadband connectivity

When SCAP initially engaged with UoM scholars, many complained about the low bandwidth that then prevailed on the island, jeopardising their research prospects and hindering the nation's desire to move towards a "knowledge economy". This situation improved during our three years partnering with UoM, but its comparative bandwidth capacities still remain an issue if UoM is to leverage its research for developmental gain.

The Mauritian government reports that the ICT sector in Mauritius, until recently a nascent industry, is now the third pillar of the Mauritian economy with a GDP contribution nearing 6.8%, a turnover of USD1 billion and directly employing more than 16,000 people.[101]

In order to assess a typical telecommunications network, it can be divided into four parts (Twinomugisha 2010):

1. International connectivity (typically via fibre-optic cable or satellite)
2. National connectivity (also referred to as the "backbone")
3. The access network or "last mile" connection
4. The organisational network (in this case the on-campus network at UoM)

[100] e-Infrastructure plays an enabling or limiting role in being able to profile effectively online. It was beyond the scope of the programme to tackle UoM's e-infrastructure challenges. The implementation initiative was designed with these possible limitations in mind.
[101] Mauritius Ministry of Information and Communication Technology, ICT sector, available at: http://mict.gov.mu/English/AboutUs/Pages/ICT-Sector.aspx

In terms of international connectivity, Mauritius compares favourably with its SADC peers in terms of upload and download speeds[102] (see Figure 6.3). However, it compares negatively compared to developed countries that have invested in the knowledge economy as a driver of growth and prosperity (e.g. Finland's average download speed in February 2012 was 13 times faster than that of Mauritius). Furthermore, Mauritius as an island nation remains dependent on a single cable for its international connectivity in the form of the South Africa Far East (SAFE/SAT-3) cable (see Figure 6.4).[103] This means limited international network redundancy because of the dependence on a single cable for connectivity.

Figure 6.3 Comparative international download speeds, January 2012[104]

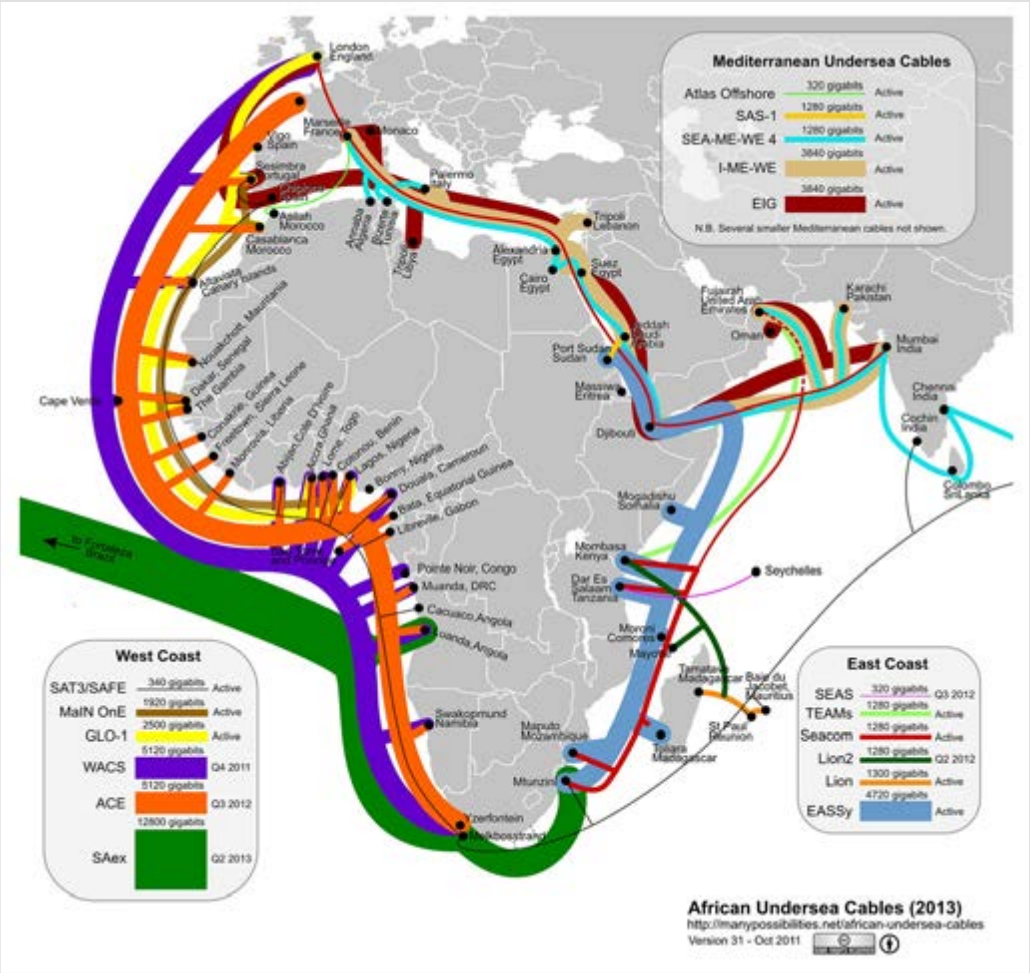
In terms of the national backbone and last-mile connectivity, the Mauritian telecommunications sector is a duopoly of Orange (a subsidiary of Mauritius Telecom) and Emtel. Both offer 3G and ADSL connectivity to their customers. According to Mauritius Telecom (2012: 11–12):

> *Access to broadband has been improved through lower tariffs for both business and residential customers, as part of Mauritius Telecom's commitment to aligning its strategy with that of the Government's vision of Broadband Mauritius. Mauritius Telecom is setting the pace in the region in*

[102] See Ookla internet speedtest, available at: www.ookla.com/
[103] The Lower Indian Ocean Network (LION) cable owned and operated by France Telecom-Orange (and its subsidiaries) connects Madagascar, Réunion and Mauritius, but still relies on the SAFE cable for global connectivity beyond the three island nations. LION-2 is planned for Q2 of 2012 and will link Mauritius to the EASSy cable network that makes landfall in Kenya. See: hwww.cablemap.info/
[104] Source: Data from Net Index by Ookla, created on Google Public Data website, available at: www.google.com/publicdata/

the transition from narrowband to broadband and IP (Internet Protocol) services. The Company is continuously upgrading its IP-based network to offer increasingly mobile and convergent services and provide high-performance voice, data, video and multimedia services. The Company is gradually migrating to the Next Generation Network (NGN).

Figure 6.4 African undersea cables present and planned to 2013[105]



FoS scholars told us that, despite favourable access speeds compared to SADC peers, connectivity was not optimal at the institutional network level. The lack of computational power and limited on-campus internet broadband pose major obstacles at UoM. In particular, the state of e-infrastructure inhibits collaborative research and causes delays in the production and dissemination of scholarly output. Scholars frequently brought up the issue of connectivity during site visits. UoM's connectivity issues were especially pressing for researchers involved in high-performance computing and other intensive data-sharing research activity. Some scholars indicated that they preferred to use their

[105] Steve Song (2011) *African Undersea Cables in 2013*, available at: www.flickr.com/photos/ssong/6220166808/in/set-72157625051406818. For continuous updates on the state of African undersea cables, see: http://manypossibilities.net/african-undersea-cables/

own personal internet connections for part of their work, due to the frustrating slowness of UoM's network.

Given the current duopoly in the Mauritian telecoms sector and the country's current dependency on the SAFE cable, what is encouraging is the Mauritian government's commitment (at least at policy level as expressed in its National Broadband Policy 2012–2020) "to facilitate the provision of affordable, accessible, universal access to broadband infrastructure and services to promote the social and economic opportunities made available by broadband in order to ensure the best possible conditions under which Mauritius can grow further as a knowledge-based society" (Government of Mauritius 2012: 28). What is less encouraging is the absence of any policy goals to increase access at tertiary institutions – the policy document makes mention of policy goals in this regard at primary and secondary schools but seems to restrict the role of tertiary education to training ICT professionals. This correlates with the claims of the Mauritian government's limited spending on infrastructural development at UoM (Bailey, Cloete & Pillay 2011).

Low levels of existing dissemination activity

The faculty contained a number of internationally collaborative academics, many of them specialists in their respective fields. Due to the low absolute number of researchers and their divergent academic portfolios, often an individual specialist would be the only local expert in her or his field. Thus, collaborative networks, especially with researchers from Europe, America and India, were both desirable and necessary for academic workflow, especially with regard to multi-authored research publication, a norm in many scientific fields.

During our first change laboratory workshop, many FoS scholars questioned the value of OA publication practices because they believed they had personally been well served by traditional scholarly communication activities. A number of scholars were already publishing in high-impact journals in collaboration with international experts. This was reinforced by the institutional performance management system which rewarded international publication higher than local publishing channels (such as the *UoM Research Journal*).[106]

However, due to the disciplinary norms of some science fields, many scholars were already engaged in open sharing. They had deposited their papers in subject repositories such as arXiv,[107] or were engaged in large-scale data sharing as, for example, astronomers. Thus, research and information-sharing had been a part of certain faculty members' scholarly practice prior to the implementation initiative, though they had not identified it with an open access ethic.

[106] Research Journal of the University of Mauritius, available at: http://vcampus.uom.ac.mu/rci/resjournal/
[107] arXiv.org e-Print archive, available at: http://arxiv.org/

Determining a focus for implementation activity

During our first change lab in May 2011, FoS participants identified five possible areas of focus for an implementation initiative:

1. Proposing a new system for valuing research
2. Profiling research
3. Producing scholarly outputs for the broader public
4. Facilitating the development of a regional publisher
5. Developing a virtual research collaboration platform

At the heart of these proposals appeared to be a desire to remove some of the barriers created by Mauritius's isolated geographic location and to ramp up the extent to which regional and international collaboration with other researchers occurs.

Thus, we initially explored the prospect of establishing a virtual research environment (VRE) as a technological intervention. This was seen as a useful way to support scientific collaboration in the institution, both locally and nationally. We researched the prospects of installing a VRE and consulted with a number of experts in this regard. We then engaged with the UoM ICT Director and his colleagues on implementing a VRE, but it soon became clear that this intervention would be beyond the scope, feasibility and time-frame of the project for the following reasons:

- There was no existing VRE expertise at UoM, a fact that mitigated against its future viability. SCAP worked on the principle of establishing institutional partnerships and supporting already existing programmes or expertise as far as possible.
- The SCAP PI team did not have any prior experience with VREs, thus we believed that, coupled with UoM's lack of expertise, it would take too much time to get the skills and expertise necessary for a successful intervention. It was more practical to choose another option.
- VRE solutions are discipline-specific, meaning that it would not benefit the entire faculty, just certain departments.

Thus we continued to explore other possibilities for addressing the needs expressed by FoS participants. In the end, after further consultation with FoS members we decided to implement a scholarly profiling initiative to facilitate greater international collaboration for the scholars, answering one of their key desires.

The Profiling Academics Online initiative

SCAP's intervention focused on improving the visibility of participating FoS academics by enhancing their personal online profiles. The intervention therefore focused on profiling individual scholars and their research activities rather than the entire faculty. We did this, in part, due to the belief that empowering individual academics would facilitate a "bottom-up" scholarly communication engagement that would avoid straining the university's administration. We assumed that the institution would receive an indirect benefit from the increased visibility of its academics. In the longterm, we hoped that scholars with active online presences would be able to serve as models of networked

scientific practice and act as local sources of expertise for helping other scholars develop their own online presence.

The Profiling Academics Online (PAO)[108] initiative recommended that scholars engage with a suite of free online tools to enhance their personal visibility by creating personal academic profiles, using social media to engage with global scholarly discourse and to list their scholarly outputs. The following tools were selected based on their popularity and functionality within the international academic community, of which we asked FoS academics to use those they felt were most appropriate for their goals:

- *Mendeley* – a free reference manager and social network that assists academics in organising their research, collaborating with others online and discovering the latest research. Intervention: create a Mendeley profile and list all academic outputs.
- *Google Scholar* – the de facto online search engine for academic articles. Intervention: ensure articles appear in Google Scholar search results and improve the rankings of these articles.
- *LinkedIn* – a networking platform for more than 225 million professionals worldwide. Intervention: create a LinkedIn profile and list academic outputs as well as awards and achievements.
- *ResearchGate* – a professional network of researchers and scientists with 3 million members. Intervention: create a ResearchGate profile and use the tools available to foster collaboration with other scientists.
- *Slideshare* – a website for sharing presentations, documents and videos.
- *Academia.edu* – a platform for academics to share research papers. More than 4.6 million scholars use Academia.edu to share their research, monitor analytics around the impact of their research, and track the research of academics they follow. Intervention: create a Academia.edu profile and use the tools available to foster collaboration with other scholars (if this is more suitable than ResearchGate).
- *About.me*, *Wordpress* or similar – a simple, self-managed web page that will profile academics and act as a gateway to their other online profiles. Intervention: create a personal webpage to list publications and describe research interests.
- Any other *new online technologies* that may emerge during the course of the project or to which the project participants may introduce the SCAP research team.
- *Social media* – sites such as Facebook, MySpace and Twitter allow scholars to reach out to other scholars at a social level and "push" their research through status updates, comments, likes, shares and tweets. Blogs also offer a similar potential, though requiring a greater investment in time.
- *Publications and other academic output* – Integral to any academic's profile are the "traditional" publications they produce, be they books, book chapters, journal articles, conference papers or professional articles. In addition, SCAP acknowledges the potential value of other outputs: data sets, laboratory notes, interviews, creative works, etc.[109] Inevitably, therefore, creating a more visible online profile of any academic will entail introducing him or her to new online publishing channels in order to provide links from their profile to these academic outputs.

[108] Francois van Schalkwyk (2012) *Profiling Academics Online (PAO) Toolkit*, available at: www.slideshare.net/scap_uct/pao-scap-toolkit

[109] We suggested that if scholars lacked a platform for profiling their research outputs, they could use the free online service FigShare: www.figshare.com

Due to capacity constraints – specifically the absence of an embedded scholarly communication professional in the institution – the PAO initiative was designed to accommodate no more than ten participants from FoS. The research assistant attached to the UoM SCAP team acted as the primary agent in this process, supporting academics in the creation of their online profiles.

Phase 1: Articulation of concept and gaining buy-in of institutional stakeholders

During the third site visit in May 2012, FoS staff were invited to a seminar in which they were briefed on Web 2.0 technologies, open access concepts and practices and new forms of measuring scholarly impact.[110] They were then introduced to the PAO initiative, and volunteers were requested from the change laboratory participants. Ten members of the faculty signed up to participate.[111] A ten-step process was developed in conjunction with an external consultant, of which the first four steps were mandatory. They were also informed that the local research assistant would be available to assist them in the process of creating and maintaining their online profiles. The initial step in this process was providing an up-to-date curriculum vitae to the PI team and research assistant to serve as a reference document for uploading content to the appropriate platforms.

Participants were asked to complete their profiles by the end of June 2012, and to update them and add content as regularly as was feasible.

Phase 2: Creation of online profiles and collection of baseline visibility metrics

The second phase of the programme began after the third site visit, in which the PAO consultant conducted an assessment of the pre-existing online visibility of participants. This data was used as a baseline to help track the progress of the initiative in improving visibility. The information was gathered via desk review during July and August 2012. Included in the baseline assessment were:

- The existence of a personal page on the university website
- Existing profiles on LinkedIn, Google Scholar, Mendeley, ResearchGate, Academia.edu and other discipline-specific online platforms
- The existence of a personal web page or blog
- The number of publications indexed by Microsoft Academic and Google Scholar
- The existence of a Twitter account
- Participants' position in the results of a Google search of their name and of keywords describing their field of expertise
- H-index scores and number of citations as calculated by Google Scholar and Microsoft Academic

[110] Francois van Schalkwyk, presentation on tools and technologies for developing online academic profiles at the University of Mauritius, 8 May 2012, available at: www.slideshare.net/scap_uct/profiling-academics-online-12982575

[111] The initial group of ten dropped to nine after one participant left the university. This group still constituted close to 20% of the faculty staff, however, and contained academics who were relatively active in publication compared to the faculty average.

In December 2012 a second assessment was conducted using the same criteria as in the baseline evaluation in order to establish a change in each participant's online visibility. In addition to recording whether a participant had a profile or not on a particular platform, the December assessment also sought to measure whether there was any online activity during the six-month period.

Phase 3: Presentation of findings to FoS

During the final site visit in January 2013, the findings of the PAO initiative were relayed to participants and other FoS members during the final workshop. At the same time, follow-up interviews were conducted with a selection of PAO participants, as well as with some faculty members who attended the seminars but who did not participate in the PAO initiative.

Implementation initiative findings

At the end of the programme, academics showed the greatest activity on LinkedIn (75%), ResearchGate (75%) and Google Scholar (66%). There was little or no engagement with Academia.edu, Twitter, departmental websites, personal web pages or blogs.

Four of the most prolifically publishing scholars were selected to assess the extent to which their publications were listed online and whether an increase in the listing of their publications (combined with their online profiles) led to an increase in their H-Index scores and number of citations. The determination of which four academics to include in this analysis was done based on the publication lists submitted by the participants to the research team. Analysis through Google Scholar and Microsoft's academic platform – tools capable of tracking citations and H-index scores by academic – showed an increase in both counts for participating academics.

The scholars who volunteered for the PAO initiative were not proactive about creating their own online profiles. While an explanatory guide on electronic profiling was produced for their use, scholars were slower than expected in sharing their curricula vitae and creating their own accounts. Numerous follow-up visits by the UoM research assistant were required for movement in this area. Time constraints were the only reason listed for the slow activity; at no point did participants express discouragement with the new technologies or find them difficult to navigate. When publication lists were acquired, they were typically incomplete, especially with regard to URLs and DOIs for online publication. This is an indication of the inadequacy of current personal curation systems.

Scholars were selective in developing online profiles that spoke to a specific, identified need. For instance, participants created and maintained profiles on ResearchGate with far greater interest than on Academia.edu. This was due to the fact that ResearchGate appeared to cater better to the scientific community, with a proportionally greater representation of researchers in biology, chemistry and medicine (whereas Academia.edu appeared better suited to those in the humanities and social sciences).

Lessons learned

SCAP was able to test a number of assumptions through this implementation initiative and yield important insights regarding the UoM FoS approach to scholarly communication. These include:

Lesson 1: Open access initiatives must work to develop a comprehensive understanding of a target site's historical and contemporary research activity before beginning OA advocacy. This is especially important in the case of small, geographically isolated or otherwise marginal institutions.

Lesson 2: Disciplinary communication practices strongly influence scholars' response to external stimuli (Reale & Seeber 2010) and may shape academics' behaviour even more strongly than institutional communication policies or strategies (as was the case with FoS academics).

Lesson 3: Not all academics are familiar with the concept of social profiling, nor are they necessarily proactive in developing their online presence. Thus it is advisable for intervention projects to embed capacity in the form of a content officer – such as a graduate student or IT-skilled personnel – who can assist scholars with this process.

Lesson 4: FoS academics find greater value in aiming their communicative activity toward colleagues in related fields (through ResearchGate) than to the public in general (through the UoM website) or non-discipline colleagues (through Academia.edu). This was reinforced by their complete disinterest in blogs, personal webpages and Twitter – tools for mass (rather than directed) communication.

Lesson 5: e-Infrastructure constraints are not barriers to social media uptake. FoS scholars never cited inadequate bandwidth as an obstacle to engagement with online profiling tools, which require very little bandwidth.

Lesson 6: "Visibility" is less important for FoS academics than "networks". While participants were interested in collaborating and sharing with their peers, they were less concerned with the more abstract notion of visibility. Profiling platforms were not seen only in terms of their ability to promote visibility, but more as new paths for targeted collaboration or problem-solving. Furthermore, academics did not have an intuitive grasp of how to leverage their online profiles to maximise visibility (such as including high-impact key words to raise their page rank according to a given search string).

Chapter 7. Challenges, contradictions and opportunities

A key element of SCAP's research was to identify the main challenges, contradictions and opportunities in UoM FoS scholarly communication ecosystem, especially regarding the dissemination of digital research outputs (articles, conference papers, reports, etc.). By working with FoS as our pilot site, we were able to assess elements of this ecosystem as they pertain to faculty and institutional concerns. In this chapter we provide an analysis of this multi-level ecosystem that not only reflects UoM scholars' reality, but offers critical and constructive insights for moving the discussion forward concerning the promotion of optimal scholarly communication at the university.

By "optimal" scholarly communication, we mean the dissemination of digital outputs that are open access (free to the user), visible (quickly findable on the internet), profiled and curated (typically on an institutional repository), understandable to audiences that would most benefit from the knowledge contained within them, aligned with the mission and values of the university and the country, ambitious and original, adequately funded (by the university or another funding body), recognised by the author's colleagues and university as valuable, and of a high quality. This is an admittedly particular understanding of what constitutes optimal scholarly communication – and will hopefully add to the debate on such – but for the sake of the following discussion, this is what we mean by it.

Challenges

The challenges most impacting the UoM FoS's scholarly communication ecosystem are those of institutional culture, research culture, funding and access, e-infrastructure and marginalisation. In this discussion, a "challenge" is defined as a crucial factor in the scholarly communication ecosystem that inhibits the optimal production and dissemination of research. A challenge can be a durable feature of that system (such as funding constraints) or an ephemeral one produced during a transitional phase (such as

a nascent research culture), but each stands as an obstacle to optimal scholarly communication, and it is not easily remedied through the actions of any one agent (management, scholars, government personnel, etc.). Challenges are often the inadvertent by-product of a broader social, political, educational or financial concern – such as the global economic recession – or the rapidly changing requirements of the ICT landscape. Typically, there is little that the institution itself can do in the short term to overcome these challenges, but through long-term strategic planning and implementation, they can ameliorate them and, in some cases, transform them into opportunities.

Institutional culture

UoM scholars and managers describe the university's "institutional culture" as highly centralised, but also weak (Manraj 2013). On the one hand, the administration employs a variety of bureaucratic processes which ensure that even the smallest decisions made by academics are referred back to it for official approval ("red tape"), thereby "centralising" authority at the institution. But on the other hand, it has largely vacated the strategic role that it is supposed to play in shaping the policies that drive research and dissemination activity, leaving scholars on their own to decide how much research they would like to produce and how they would like to communicate it. In the words of one FoS academic, "the university is more concerned with dealing with day-to-day running rather than having time to focus on the strategic planning."

Part of this can be explained by the institutional instability that has beset UoM over the past few years caused by the unforeseen resignation of a popular vice chancellor (VC) in early 2012, followed by the dismissal of his replacement less than a year later for unknown reasons.[112] This has had an unsettling effect on the administration and has essentially frozen the implementation of a number of research strategies that were developed under the former VC (which we will discuss below). This type of paralysis can happen in centralised yet weak administrative structures that are rendered leaderless. Since authority radiates from the top in such organisations, they do not perform well without a credible figure placed there (in this case, too many figures have been put there: UoM has had five VCs in the last four years). The middle and lower management strata, which could otherwise have stepped in to make sure that the university's research strategies were still being implemented, were not empowered to take such initiative. The result has been that the chaos of the VC's office has been replicated in the maintenance of the research strategy.

Another reason why the university has a centralised yet weak institutional culture is because of its historical development. One scholar shared that "they put in all the administrative structure first and then said, 'Well, then we need professors.' So from the beginning itself, it was very centralised." This has led to what some complain is a skewed ratio between academic and administrative staff. "I just give you as number. At the university there are about 1,000 people employed. Only 250 are academics. The rest is

[112] Guillaume Gouges (17 Aug 2013) Controversy as university fires vice-chancellor, *University World News*, available at: www.universityworldnews.com/article.php?story=20130816180045660

mainly bureaucracy." Even worse, this has lead to a skewed relationship between the academics and the administration. As one scholar lamented:

> *There is actually a big gap between the academic and the management level. They don't know what we do and what are the problems that we're faced with. Because we are in the field working directly with students and students are our first line of contact, but they don't know our reality. They just have an idea, but they don't have the detailed explanations.*

There are benefits, however, to this centralised, weak administrative arrangement. Even though academics often need to seek managerial permission to make even mundane decisions, they are nonetheless relatively autonomous in how they carry out their work, construct their careers and approach research and dissemination. Many scholars appreciate the latitude that this affords.

But when it comes to the changing imperatives surrounding scholarly communication in the digital, open era, the administration's lack of a strategic vision makes it difficult for the university to operate according to an integrated research and communication plan that leverages open communication practices. Moreover, with the government's and the university's desire to turn Mauritius into an "innovation hub" for the region, it may be difficult for the university to act as a powerful engine of innovation when its own internal structure is designed to limit personal innovation and risk-taking.

Research culture

One of the results of the institutional culture described above is that the university's research culture is also relatively nascent, individuated and uneven across departments and faculties. This is due to three reasons.

First, the demographic realities of this small institution – in which scholars are essentially the lone experts in their particular fields – impact the ability of FoS scholars to collaborate with each other. Most scholars who have the same research interests as UoM academics work at overseas universities. This diminishes the quantity and quality of scholarly communication between faculty members at UoM, reducing the development of a robust and dynamic on-campus research culture. As one scholar summed up, "The small size of the department and the faculty means that scholarly communication within the department and faculty is quite individualised. There simply is no critical mass." This fact alone, over which scholars and administrators have little power, may act as a critical brake on creating an effective research environment.

Second, because the administration provides weak guidance concerning research and communication matters, scholars are largely free to choose whether they want to embark on intensive research careers or be more teaching-oriented. Though the promotion policy does require that faculty members show proof of research activity, many suggest that there are ways of finessing these requirements and still getting promoted. As one scholar stated, "promotion is not transparent. One can earn the points necessary for promotion and not get promoted, and vice versa, not getting enough points, but still be promoted." But even if this is the case, scholars only seek promotion a few times in their careers,

meaning that the motivation that this process should have on research activities is made manifest only intermittently. Research production relies heavily on the personal volition of the scholars themselves – a highly fluctuating and inconsistent variable in the development of a stable research culture.

Third, not only is there very little administrative pressure to produce research, there is also very little peer pressure from their own colleagues to do so. With research activity so individualised, FoS scholars lack the inclination to share their research with each other and thereby miss opportunities to both support and push their peers. This is a major challenge because, when an environment is characterised by high peer expectations to produce research, scholars usually conform to those norms regardless of the administration's strength or weakness, and regardless of their fluctuating personal motivations. Until the UoM FoS can energise a sense of peer expectation between colleagues, it will be difficult to maximise their research talents.

Funding and access

Echoing a common challenge across many African universities, FoS scholars also complain that there is a relative lack of funding, which impacts the types of research they can pursue and the types of resources they can access. For instance, according to one scholar, "The MRC has got only 10 million rupees [USD322,581] per year to fund research", an amount that has to be doled out amongst multiple competing project proposals. The university itself also has a limited research budget, which shapes how ambitious a scholar can be in conceptualising a project.

This is compounded by the limited funds for activities such as conference travel. According to one scholar, the conference travel fund is usually exhausted within six months, thus it is impossible to go to conferences that come up after that, until the next funding tranche comes in. This reduces the networking opportunities that FoS scholars desire with overseas colleagues. As one scholar noted, "If we had the funding to travel, I don't think that geographical barriers would be an issue."

Lastly, it is challenging to access certain intellectual resources owing to the small library budget. As one librarian shared, "A major obstacle is the funding. Our budget doesn't allow us to buy as many books as we would like to or even subscribe to journals. Sometimes we get a request for a journal, but we don't have the funds." Scholars try to overcome this challenge themselves by leveraging their personal connections, but "if you do not have a contact [at a well-resourced overseas university], it's impossible to get the right research papers." In response, the government has financed an expensive institutional subscription to ScienceDirect, which hosts a number of important science journals, but found that scholars were not using it very much. The administration concluded that FoS academics were not using it because they are not conducting research. But the scholars themselves say that it does not include the most appropriate journals in their field, hence their lack of use. So the challenge continues.

e-Infrastructure

The university enjoys access to a certain level of e-infrastructure – such as the basic requirements for computers and broadband internet – but when it comes to the technologies necessary for enhancing scholarly communication, that access is either lacking or achieved without any corresponding strategy for it.[113]

For instance, UoM does not have an institutional repository, one of the standard technologies that universities can utilise to curate, profile and disseminate their scholars' research. The establishment of such a dissemination platform, however, requires significant human capacity as well as a clearly articulated strategy, a locus for that technology and a workflow process. In this case, the lack of a communications strategy explains the absence of the institutional repository and means that, if the university hopes to enhance scholarly communication without it, UoM must seek alternative options that either leverage national or regional capabilities or incentivise individual scholars to make their own work more visible.

The university also does not employ the open source Open Journal Systems platform for publishing its *University of Mauritius Research Journal*. This means that, even though the journal allows some of its articles to be downloaded for free in an OA fashion, it lacks many of the features that would make the journal more attractive, visible and easy to use.

Some scholars and librarians also suggest that "the lack of adequate affordable bandwidth" hinders scholars' research efforts, though this appears to have been improved recently.

In some ways it is premature to identify e-infrastructure gaps in the absence of a communication strategy against which to assess them, but it is clear that they will remain a challenge until they are addressed.

Marginality

A final challenge that Mauritian scholars face is geographic, demographic and academic marginality. By virtue of their relative isolation on an island in the middle of the Indian Ocean, as well as their political affiliation with Africa, Mauritian scholars remain not only distant from the major population and education centres of Eurasia and North America, but lack the density of numbers necessary to shape the agendas of their disciplines. This is not something that they spend much time worrying about, but they do understand that it causes certain difficulties in collaborating with international scholars, in researching topics beyond their island, and in enhancing the visibility of their publications.

Contradictions

While the UoM FoS scholarly communication ecosystem faces the challenges listed above, it is also beset by a number of "contradictions", those elements within the system that hinder it from operating optimally, usually in a directly oppositional manner. Unlike

[113] The UoM Research Strategy addresses itself more toward research production than dissemination, as discussed in Chapter 4.

challenges, which are typically obstacles that emanate from broader social, political or financial contexts, contradictions emerge from within the activity system and can be remedied from within it.

The primary mechanism by which we identified contradictions in the UoM scholarly communication ecosystem was by assessing it through the CHAT triangles that we employed during our change lab workshops. This was an intensive process that allowed SCAP and the academics to explore every node of their activity system, evaluating whether there were any misalignments ("contradictions") in it that could be addressed.

Some of the contradictions we identified were likely temporary by-products of UoM's transition from a teaching university to a research university. In this period of flux, new tensions and stresses have been placed on the scholarly communication ecosystem, placing a number of processes in opposition with each other. But these contradictions could become more permanent if they are not dealt with soon. Ideally, these contradictions would stop forming obstacles in the activity system and rather perform as "productive tensions" that lead to higher levels of research productivity, innovation and dissemination (a concept we will explore below).

In this section, we will discuss three key contradictions currently impacting the UoM FoS scholarly communication ecosystem: teaching and administration vs research, articulation vs implementation, and scholar-to-scholar communication vs scholar-to-community/government communication.

Teaching and administration vs research

UoM has been a teaching-oriented university for most of its history, but over the last decade it has tried to ramp up its research production so that it helps transition the country to a "knowledge economy" where Mauritius acts as an "innovation hub" for the region. FoS has been central to that transition, producing about 80% of research outputs at the university. However, while the university has identified strategies for enhancing research production, it has not reduced its commitment to the teaching enterprise. This has led to a challenging situation for many academics who feel that they are still expected to be full-time teaching staff while at the same time dealing with new research demands. Because teaching remains the core service that academics provide the university, they feel torn between these two duties.

For many scholars, the teaching load means that there is simply not enough time in the day for research. As one shared, "When you do 270 hours of lectures [per year] and other hidden time spent on teaching activities, there is not much time left for writing papers." For others, the mental and emotional toll that teaching has on scholars renders them unfit for productive research activities:

> *We have 270 hours annually [to teach]. And the tutorial and practical, the number of hours are divided by two. So if you do 10 hours of practical, it would be counted as 5 hours. So it means that sometimes you can be doing something like 325 hours annually, so when you have done three, four, five hours a day, you're burnt out, you don't want to write something.*

In sum, "Teaching requirements impact on research massively. We have far too much teaching to do …. We don't have teaching assistants as well to help us."

However, teaching is not the only burden. FoS scholars say that the amount of time taken up by administrative work also hinders their research opportunities. We heard multiple respondents say that "red tape" was reducing their research effectiveness. As one scholar stated, "You have to go through too much paperwork" to do research and accomplish normal academic tasks. He then offered a real example of how these bureaucratic requirements impact daily activities:

> *My technician wants a document spiral bound, but he has to write a letter – going through the Head of Physics, going through the Dean of Faculty, going up to the Registrar and then coming back – for him or her to do the spiral binding. It's absurd. You take this document, you go outside to the shop which is next to the university and pay 25 rupees, but to do that in the university, you have to go through this.*

Part of the reason for this situation is simply the accumulation of bureaucratic processes that centralise power while at the same time decreasing efficiency. But another part of the reason is because, despite the large administrative staff numbers at the university, they are not located in positions that help academics with their own administrative needs. "We have to do everything ourselves. It's very heavy administration, which is a problem." A scholar explains the impact that this has on the sense of trust, respect and creativity for a researcher:

> *We do a lot of hidden work, which is not computed in our total workload. As a head of department, I have no clerical staff, no administrative staff …. Not a secretary, not a typist. We heads – we academics – have to type our own letters and then we're expected to publish. You all the time have to justify what you're thinking, whereas you would think that academics within a university which is performing … I mean, our students are graduating, all other programmes are externally examined and no major problems. So we are performing … You would expect academics from such an institution to have their judgment respected and valued. But it's not always the case. I'm not saying never the case, but it's not as much the case as it should be, let's just say. And that, I think, impacts a lot on your creativity, because as academics we are basically thinkers and we need time to think, we need time to think to develop research projects, we need to sit and think about the data that we generate, we need time to sit and write papers and I don't think the university actually encourages that and I don't think authorities outside the university realise that and recognise that, which they should.*

Of course, teaching and administration form a key part of an academic's obligations, but it appears that the university is structured in such a way as to maximise these obligations over research, which it claims it is trying to encourage. However, this contradiction between teaching and administration vs research need not last forever, though to change it will require a massive restructuring effort within the university.

At the moment, this state of affairs constitutes a contradiction, but in the future, if the administration is able to align its activities with scholars, then the obligations of teaching, administration and research will simply exist in a productive tension with each other, as they do in many other universities globally.

Articulation vs implementation

While the university has not yet written a communications strategy for the research its scholars produce, it has developed useful strategic plans covering a number of related areas, including research production, innovation and development. The two primary documents are the UoM Strategic Plan 2006–2015 and the UoM Strategic Research and Innovation Framework (SRIF) 2009–2015 (discussed in greater detail in Chapter 4). Both documents align university strategy with that of the national government, which wants to see local research feed into industry and innovation. Thus, the core mission of the university is "the creation and dissemination of knowledge and understanding for the citizens of Mauritius" which it plans to achieve through fostering "research to sustain economic development and growth" (UoM 2009).

Unfortunately, while many of the guidelines provided in these strategy documents are desirable and would contribute to achieving the university's goals, they are not yet implemented. Here we will focus on those strategies that would have the most impact on rewarding and incentivising research production and dissemination.

According to FoS scholars that we interviewed, the following proposals have yet to be implemented with any real substance.

From the SRIF:

- Research prizes in recognition of outstanding accomplishments in research.

From the UoM Strategic Plan:

- Encourage staff by providing performance-related incentives/rewards scheme.
- Create alternate paths for promotion.
- Give credit for projects involving community development.
- Partner with community sector organisations to further socially desirable goals.

These are notable proposals and would go a long way in helping the university realise its research and innovation goals. But the fact that they are not implemented begs the question whether the university has the capacity or political will to do so. As we have mentioned before, the university has recently gone through a difficult leadership transition, which unsettled any consistency that might have developed in implementing these strategies in the past. Indeed most scholars felt that these strategies are now in doubt until the new VC chooses whether to adopt them as his/her own, or whether to establish new strategies.

The problem going forward will be trying to develop a coherent, integrated dissemination policy to complement the various research and innovation strategies while at the same time assuring that, once written, they are implemented consistently.

Scholar-to-scholar vs scholar-to-community/government communication

The strategies discussed above seek to encourage research that is developmentally relevant, industrially and commercially viable and politically useful (for policy purposes). This ambition takes research far beyond the confines of the academy and reaches out to new audiences in the community, in industry and in government. However, it is one thing for scholars to produce research that would be relevant for different audiences, but quite another to communicate that research to them. The problem is that scholarly communication traditionally takes place between peers through journals, books and conference papers, most of which are never accessed by non-academic communities for two reasons: such outputs are not addressed to them, and are not written in a style that is accessible; in addition, they are often locked behind publisher pay walls, limiting the scope of readership to university staff who have subscriptions. It is much easier to desire that scholarly work speak to broader community, industry or governmental needs than it is to develop the incentives, structures and opportunities for that to occur.

At the moment, the university's promotion guidelines favour the production of scholar-to-scholar outputs through books, journals and conference proceedings. While policy briefs, reports and op-eds – the types of outputs that are most likely to be read by non-academics – are given mild recognition in the promotion policy, it is not at the level that would change the traditional scholar-to-scholar focus of research outputs.

Moreover, aside from senior scholars who have developed a reputation for expertise in their fields, many scholars do not know how they would begin to share their specialised knowledge with non-academics, even if that knowledge was useful to them. They often have no training in how to write accessible briefs, reports or op-eds. Nor do they know how to get in touch with the relevant governmental or community liaisons who would be interested in their work. Essentially, platforms for connection between scholars and these other audiences would need to be established, especially between scholars and community leaders and also government leaders (as the university does have a formal office for connecting scholars with industry partners).

The challenge for the university will be to accept the value of this type of communication beyond the academy. After all, it is scholar-to-scholar communication that determines the prestige and success of UoM in the eyes of international peers. But the major deficiency of scholar-to-scholar communication is that it involves long feedback loops which reduce the impact current research will have on society today. It would be useful for the university to try to shorten those feedback loops where possible by encouraging scholars to communicate their work beyond the academy to a broader set of audiences. These shortened feedback loops would help Mauritius become a hub of innovation as it desires.

Opportunities

With these challenges and contradictions in mind, it is now important to consider the aspects of UoM's scholarly communication ecosystem that are working well. The CHAT methodology allows us to do this because it not only shines a light on an ecosystem's contradictions, but also illuminates areas of alignment (thereby allowing site members to leverage them and improve the functioning of the system as a whole). This is not only

strategically sensible, but also allows us to move beyond any sense of Afro-pessimism that can start to creep into a discussion about African universities' "challenges" and "contradictions." UoM is already making crucial strides in transitioning from a teaching to a research university, though the process remains fraught and incomplete, especially in the context of scholarly communication.

In this section, we identify promising "alignments" that arise from an analysis of the UoM FoS activity system. We will do so by looking at the opportunities afforded by research infrastructure, open access and the university's "gateway" status.

Research infrastructure

One of the most important elements shaping the UoM FoS scholarly communication ecosystem is the robust research infrastructure surrounding it, namely the presence of the national-level Ministry of Tertiary Education, Science, Research and Technology (MTESRT), the Mauritius Research Council (MRC) and the Tertiary Education Council (TEC). These bodies provide multiple interfaces and funding mechanisms for FoS scholars to access for the sake of pursuing research projects. Their functions and policies are described in more detail in Chapters 3 and 4, but here it is sufficient to note that they provide Mauritian scholars with a major advantage over scholars in countries that lack these diversified research support entities. It allows them to take a more ambitious approach to their research since they are not limited to seeking funds from the stretched university research budget. For a small country, with a population the size of a medium-sized municipality in most other contexts, the scope of the government's commitment to research and innovation is extensive.

These three bodies – along with the university – have developed mutually reinforcing research policies and strategies that aim to transform Mauritius into a knowledge economy by 2025. Their impressive level of internal policy alignment amplifies their collective capacity, but it also means that their non-engagement with open access principles has essentially closed off the entire island from these global trends. While the TEC acknowledges the growing importance of open educational resources worldwide, it stops short of adopting any such principles for itself (TEC 2013: 16).

Considering the collective leverage that these bodies bring to the policies they embrace, they should reconsider whether research knowledge is best leveraged for development through the ("closed") industrially oriented patenting and commercialisation approach, or whether research knowledge is best leveraged for development in an "open" approach (able to reach government, industry and community agents) that would help bring about the "knowledge economy" more quickly, precisely because it involves all Mauritians in the process rather than just industry.

Open access

Though the government and the university have not yet embraced OA policies, FoS scholars are largely positive about its merits. They not only see the benefits it provides them when they seek other scholars' research outputs online, but they also see how it increases the download and citation rates of their own work. And while their perspective

is largely shaped by their own disciplinary norms (which incorporate OA mechanisms to a certain extent), the university could leverage FoS scholars' positive disposition toward OA as it considers new research and communication strategies.

It could start by placing the *UoM Research Journal* under an OA mandate so that it would become a more attractive dissemination vehicle for scholars, raising the visibility of its own outputs. At the moment, the journal acts as a publisher of last resort for many FoS scholars, even though it could be a very powerful publication channel on the island. Not all of the journal's papers can be downloaded, so it is not clear whether the journal operates according to an OA policy. It is also not curated and profiled optimally, making it less visible than it should be. As it follows a traditional print journal format (with volumes and issues), it is failing to use internet technology in a way that would free the journal from the limitations associated with print-based production cycles. The journal could embrace OA and publish a host of different output types so that it would not only reach a scholarly audience, but all of the other audiences on the island that crave useful knowledge.

Thus, while there are serious e-infrastructure challenges to making OA communication a reality at UoM, it possesses both a positive sentiment toward OA (at least within FoS) and an in-house publication channel that could reach out to broader communities.

Gateway status

Some of the features that make Mauritius marginal also make it interesting for international collaborative partners. Its remote island status, its affiliation with Africa, its unique demography, and its status as a "middle-income" country make Mauritius an attractive site for various projects and multi-site research activities. The university is central to this attractiveness because of its solid reputation and the quality of its scholars (many of whom graduated from overseas institutions).

Many FoS academics discussed with us the international collaborations in which they have been involved. Some were the result of prior research connections, but many were initiated due to a foreign research project's desire to work with a UoM scholar who could do a portion of research locally that would feed into a comparative international study. Thus UoM enjoys something of a "gateway" status for overseas scholars seeking to collaborate with academics in either tropical island locales or Africa.

The administration is well aware of this fact and has brokered innovative partnerships with French and Indian universities regarding research and training collaborations. Ambitious researchers in FoS have also taken advantage of the opportunities this affords. With the government's desire to turn Mauritius into an "innovation hub", it appears that the university's desires are in alignment with that of the nation.

Conclusion

This discussion of the challenges, contradictions and opportunities characterising the UoM FoS scholarly communication ecosystem reveals an institution in transition. It is slowly trying to ramp up its research production and make the university a centre of research innovation. This process is not without its difficulties, as we have seen. The

biggest challenges revolve around creating a robust research culture within the institution that could regulate more consistent production of outputs, reducing the demands that teaching and administration have on those who want to do research, and thinking strategically about dissemination in a way that yields the maximum impact. Despite these challenges and contradictions, there are real opportunities for growth and development that scholars and managers can leverage, such as the country's research infrastructure, scholars' positive open access sentiments and the university's "gateway" status.

Chapter 8.
Key findings

In seeking to answer our two research questions concerning the state of scholarly communication at four Southern African universities, and how information and communications technology (ICTs) and open access (OA) publishing models can improve that state with appropriate institutional support, SCAP has amassed a substantial amount of data on the University of Mauritius's (UoM) research and communication practices, its policy landscape and its level of e-readiness. We have analysed that data in the previous chapters, but here we condense that analysis down into a single chapter where we present our key findings.

Before we begin, however, it is worth foregrounding a foundational assumption that we have confirmed through our research, which we now restate as a finding:

➔ *Finding 1. UoM scholarship is comparatively marginal and invisible in the global context of academic research production.*

This coincides with the literature that shaped our initial assumption, that scholarly research from Africa is relatively marginal and invisible in the broader context of global research production. This is also true of Mauritius and its flagship research institution, UoM. With a small population, a tiny higher education sector, a modest financial base and a tertiary education system that has, until recently, focused on teaching rather than research, Mauritius struggles to achieve distinction through traditional academic indices (such as WoS-rated journal article production).

This general condition of marginality and invisibility is due to both external and internal factors. Externally, the wealth and productivity of Northern institutions (and increasingly other Southern ones in China, India and Brazil) simply dwarf the research potential of smaller countries such as Mauritius, a fact that will not change soon. However, it is also influenced by internal factors which, if altered, could increase the reach, prestige and relevance of Mauritius' research.

In this chapter, we highlight the key findings from our research into UoM's scholarly communication ecosystem, as they pertain to UoM's research and communication practices, its policies and its infrastructure and capacity. These comprise the "internal factors" influencing the visibility of UoM scholarship and offer points of contact for interventions that seek to improve them.

Research and communication practices

To understand the state of scholarly communication at UoM, we focused on the research and communication practices of the Faculty of Science (FoS). SCAP's research and pilot site. However, the various research instruments that we used to obtain information crossed institutional, faculty and departmental levels, shedding light on each in turn. Thus some of our insights are applicable to the whole institution while others can only speak to the faculty level. We will be as explicit as possible about the scope of each finding so that readers can see the complexity of this nested ecosystem.

Values

To get a full picture of scholarly communication practices at UoM, we started by trying to grasp academics' motivations for conducting research and publishing their findings in the first place. Based on numerous interviews, surveys, conversations and observations with members of UoM FoS, we found that FoS scholars were motivated by both extrinsic (mandates) and intrinsic factors (personal desire), but that the personal desire is currently the most important.

➔ *Finding 2. The foremost reason why UoM FoS scholars conduct research is personal desire.*

This is a highly intrinsic motivating factor, ranking much higher amongst UoM FoS members than those at the other SCAP pilot sites. This makes sense for a couple of reasons. As a teaching-oriented university where the production of research outputs still remains secondary to the fulfilment of the teaching mission, the motivation for conducting research often has to come from the individual scholars themselves. If they want to do it, they will be rewarded, but if they do not, they will not be penalised. Thus the choice is theirs to make. Moreover, the centralised administrative structure is relatively weak, allowing a good deal of autonomy to scholars who are allowed to choose whether they want to focus their careers on teaching or research production.

This is an important finding because it is not clear whether such a highly intrinsic motivator can substantiate and sustain a dynamic research culture. While personal desire is an important part of any strong research culture, it is too prone to fluctuations to form the cornerstone of a deep and abiding research structure. It needs to be balanced by other more extrinsic motivators as well, such as peer expectation (which UoM currently lacks).

Another key finding that emerged from our values research concerned scholars' own desire for visibility. Initially, SCAP assumed that all scholars wanted their research

outputs to be visible, as it accorded with our understanding of what comprised a "typical" academic identity. However, we soon learned that not all Southern African scholars want their work to be visible.

➔ *Finding 3. Some UoM FoS scholars want their work to remain invisible.*

For a number of personal, social, cultural and professional reasons, some UoM FoS academics revealed that, though they want their research production to count towards achieving promotion, they would prefer that their research – or at least some portion of it – remains unseen. The reasons they give for this stem from:

- A culturally informed sense of personal modesty (not wanting to call attention to themselves)
- Ambivalence about the quality of their research ("being exposed")
- Anxiety about having no control over how they might be represented on the internet
- Worry that others may steal their ideas/data (especially if still in gestational form)
- Fear of offending their research subjects, many of whom they might continue to encounter on the small island (as when health research reveals high levels of obesity in a particular region or village, embarrassing the research subjects and negatively impacting the researcher's reputation)
- Concern for damaging one's own reputation in a small country where "everyone knows each other" and can influence your future prospects
- A minimalist communications strategy (where dissemination is achieved through reading a paper at a conference, or perhaps allowing a journal to publish it, but nothing further)
- A teaching- rather than research-oriented approach to scholarship (which speaks to one's sense of academic identity, as a "teacher" rather than a "researcher")

While most UoM FoS scholars are keen to share their research with the world, some nevertheless have valid reasons for why they would not to make their work highly visible.

Research production

UoM FoS scholars say that they spend the majority of their time engaged in teaching-related activities (timetabling, prepping, lecturing, marking, advising, invigilating, etc.). They also say that they shoulder significant administrative duties. This would be fine for a teaching-oriented institution, but for one that seeks to become a research university, this hinders UoM from achieving the goals of its new research mission.

➔ *Finding 4. Heavy teaching and administrative loads hinder research production in UoM FoS.*

This is likely true of all the faculties at UoM, not just the FoS. In fact, this finding conforms to the image presented by other studies of African higher education which show that scholars across the continent are burdened by similar challenges. This is not helped by the fact that many FoS scholars sign up for "excess teaching" to augment their

meagre salaries, taking time away from research opportunities. Indeed, the simple lack of time has a considerable impact on whether African scholars can pursue research projects, or whether they can do so with any regard for quality and consistency.

Many UoM FoS scholars who are able to make time for research either seek funding from the university or work on projects that do not require any funds.

➔ *Finding 5. The majority of UoM FoS scholars' research is either funded by the university or unfunded.*

This means that the university provides useful support for university researchers financially. Indeed, the university is often the first port of call for those seeking research funds. However, academics also carry out unfunded research, either because they are revisiting data from a prior project, or because they chose to work on a more derivative piece of analysis because they could not source funding.

Beyond this, the government is also a significant source of support for FoS research, through the Mauritius Research Council (MRC), the Tertiary Education Council (TEC) and the Ministry of Tertiary Education, Science, Research and Technology (MTESRT). For larger, more complex research projects, these bodies often serve as primary funders.

Outputs

The university reward and incentive structure encourages scholars to produce scholar-to-scholar outputs aimed at international peers. It does not give much incentive for the production of scholar-to-community or scholar-to-government outputs, a fact that is mirrored in the FoS scholars' actual outputs.

➔ *Finding 6. UoM FoS scholars tend to focus on producing scholar-to-scholar outputs, especially international journal articles and conference papers.*

This is especially true of collaborative work, the normative form of research production within the science faculty. When FoS scholars do produce alternative outputs, however, they tend to come from senior scholars who feel confident about sharing their research with non-academic audiences and who feel free of the "publish or perish" imperative.

➔ *Finding 7. UoM FoS scholars who produce alternative outputs – briefings, reports, op-eds and public presentations – tend be individual senior scholars who are largely free of promotion concerns.*

This state of affairs is based on the fact that the university has not strategically examined the role that genre plays in impact. UoM appears to take it at face value that scholar-to-scholar outputs, such as books and journals, comprise the most appropriate outputs for serving the university's mission. While this may be true in some respects, it also minimises the impact that these outputs will have on broader audiences because they are not written in an accessible style.

Communication

While UoM FoS staff members are relatively motivated to produce research outputs, they are far less responsive to the opportunities that new ICTs offer for disseminating their work. For the most part, they confine their communication activities to traditional modes, such as publishing in international journals, reading their papers at conferences and incorporating insights from their research into classroom teaching. While the open access movement and availability of free online tools have radically expanded the opportunities for individual academics to profile their work on the internet and seek out collaborative partners, most UoM FoS scholars have yet to take advantage of them.

➔ *Finding 8: Most UoM FoS scholars do not utilise social media technologies in their scholarly work because they lack knowledge about them, training in how to leverage them and the time to be able to incorporate them into their research and dissemination practices.*

This means that UoM FoS scholars typically rely on face-to-face contact for disseminating their work, or they leave it to commercial publishing firms to handle that for them. They do not have a strategic dissemination plan that leverages the online platforms that would give greater visibility to their outputs. Nor are they encouraged to do so by UoM, as they receive no rewards or incentives for publishing in open access journals. One of the consequences of this is that UoM research rarely reaches audiences that might most benefit from it, such as the government, development NGOs or community leaders.

➔ *Finding 9: FoS scholars rarely communicate their findings to government.*

This is unfortunate, especially since many claim that their work could have broader developmental application. But this challenge of connecting with audiences outside the academy is compounded by their reliance on scholar-to-scholar communication strategies which lengthen the feedback loops that scholarly ideas have before being taken up by society. If they took a more strategic, open access approach to dissemination, they would be able to reach non-academic target audiences more quickly, shortening the feedback loop to social actors.

UoM FoS scholars are quite positive about the merits of open access dissemination, as OA has informed certain aspects of their disciplinary norms. However, because OA already shapes their disciplines, many remain unreflective about its strategic value, thus do not insist on it if they engage a publisher who does not disseminate in an OA fashion.

➔ *Finding 10: Most UoM FoS scholars are positive about the merits of open access communication, but neither they nor the university has an OA dissemination strategy that would capitalise on this sentiment.*

Networks and collaboration

The demographic realities of this small institution – in which many individual scholars are essentially the lone experts in their particular fields – impact the ability of FoS scholars to collaborate with each other. Most of their research peers work at overseas universities. This diminishes the quantity and quality of scholarly communication between faculty members at UoM.

➔ *Finding 11: UoM FoS scholars do not network, collaborate or share much with each other.*

This is largely due to the fact that they lack regular seminar series platforms for sharing their work with colleagues, the time to prepare research presentations for collegial engagement and the density of scholars with similar research interests. They prefer, rather, to share their work at international conferences where they are able to meet with scholars who share their research passions.

While some of these face-to-face interactions at international conferences lead to research collaboration, they are rarely with other African scholars. They find that they face significant financial and practical obstacles to pursuing research collaborations with African academics and usually end up collaborating with Northern-based scholars.

➔ *Finding 12: UoM FoS scholars collaborate extensively with international peers.*

Indeed, as we found through our implementation initiative, scholarly "visibility" was less important for FoS academics than "networks". While participants were interested in collaborating and sharing with their peers, they were less concerned with the more abstract notion of visibility. Profiling platforms were not seen only in terms of their ability to promote visibility, but as paths for targeted collaboration or problem-solving.

Research culture

These research, communication and networking conditions at UoM have developed what we can call a "nascent" research culture. UoM and FoS are taking strides in developing a more robust academic core based on a research imperative, but this will take time.

➔ *Finding 13: UoM's research culture is best described as nascent.*

This description is warranted for several reasons, but primarily because:

- There is a low level of networking, collaboration and communication between colleagues, even within the same FoS space.
- There is a low sense of peer expectation regarding collegial research production (i.e. colleagues do not put pressure on each other to publish).
- There is a comparatively low participation rate in journal review editorial boards, meaning that UoM FoS scholars are not shaping their fields so much as following what others are doing.

This description is likely to change in the near future as the university continues to invest further resources into the research mission, but it provides a clear snapshot of this transitional moment in the university's history.

Policy

This transition is occurring as a result of the desire of the government and the university administration that UoM have more of a research focus. They want UoM to be a central player in transforming the island into a knowledge economy in which it operates as a knowledge hub in the region. This would move UoM away from the teaching-oriented mission that has defined it since its establishment after independence. To achieve this, both bodies have articulated various strategies that are supposed to incentivise research production, innovation and collaboration. This is an important start, but it has been hindered by the fact that a number of the key provisions have yet to be implemented.

➔ *Finding 14. The UoM management has articulated good strategies for enhancing the production of research, but it has failed to implement them.*

This disconnection between policy and action could, over time, hinder the transition of UoM from a teaching to a research university, and lock academics into a more closed form of scholarly communication than if they were incentivised to share their work openly.

This would be a shame for another reason: UoM has developed a series of mechanisms to encourage scholars to produce developmentally relevant research. Indeed, UoM's mission and research funding criteria mirror that of the national government's developmental priorities, putting them in harmony in this regard. Most UoM FoS scholars agree with these priorities and thus try to remain cognisant of them as they pursue research topics. The key question, however, is: when they produce those outputs, do they reach beyond the scholarly community to enhance development in a more comprehensive way? At the moment, most FoS outputs are geared to an academic audience and disseminated through academic channels.

Institutional culture

In some ways, this disjunction is a product of UoM's institutional culture, which is characterised by a highly centralised administrative structure that is nevertheless quite weak.

➔ *Finding 15. UoM's institutional culture is highly centralised, but also weak.*

Thus, on the one hand, the administration employs a variety of bureaucratic processes that ensure that even the smallest decisions made by academics refer back to it for official approval ("red tape"), thereby "centralising" authority within the institution. But on the other hand, it has largely vacated the strategic role that it could play in shaping the

policies structuring research and dissemination activity, leaving scholars on their own to decide how much research they would like to conduct and how to communicate it.

Open access

UoM FoS scholars are largely positive about the merits of open access dissemination. They are familiar with this type of communication through their own disciplinary norms, but they also see the value OA would have – not only allowing them to gain access to more materials, but more people being able to access their own research. This is a sentiment that the university could leverage as it considers new research and innovation strategies. As of yet, it has not adopted any OA policies or strategies.

➔ *Finding 16. UoM has not articulated any open access policies for scholarly communication.*

This is a major oversight, especially when OA could contribute to the university reaching its research, development and innovation goals, broadening the visibility and impact of its research outputs. However, it is unlikely to do so in the absence of a national open access strategy articulated by the MTESRT, MRC and TEC, the three bodies that guide and fund the national research effort and with which the university aligns its own research priorities. At the moment, these bodies have embraced a research communication strategy based on the idea that research knowledge is best leveraged for development through a ("closed") industrially oriented patenting and commercialisation approach. Hence they encourage UoM scholars to collaborate with industry as much as possible and to look for patenting and commercialisation opportunities.

Yet this approach may underestimate the value that university research could have for other non-industrial audiences (such as government personnel, community leaders, educators and entrepreneurs), which could leverage that knowledge for social and developmental purposes. Indeed, an open approach to knowledge dissemination, which allows all Mauritians to engage with locally produced research, may usher in the knowledge economy even sooner than if that knowledge is reserved for industrial use.

Infrastructure and capacity

At the heart of this vision for a knowledge economy is a functional, modern, ICT-based infrastructure that can be utilised by an educated population. Tertiary education plays an important role in this vision, as institutions such as UoM are tasked with delivering "one graduate per family" and capacitating large numbers of knowledge workers to turn the island into an innovation hub.

National research infrastructure

One of the most important elements shaping the UoM FoS scholarly communication ecosystem is the robust research infrastructure surrounding it, namely the MTESRT, the MRC and the TEC. These three bodies, each which promotes research and scientific endeavours in its own, yet complementary, fashion, provides multiple interfaces for UoM

FoS scholars who seek to produce research. For a small country with a tiny population, the scope of the government's commitment to research and innovation is massive.

➔ *Finding 17: The MTESRT, the MRC and the TEC play a crucial role in supporting UoM FoS research.*

UoM e-infrastructure

The university enjoys access to a certain level of e-infrastructure, but when it comes to the technologies necessary for enhancing scholarly communication, that access is either lacking or achieved without any corresponding strategy. Thus UoM does not have an institutional repository – a key technology for curating, profiling and disseminating scholarly research. It does not utilise Open Journal Systems (OJS) for producing its *UoM Research Journal*; neither does it have an overarching communications strategy to guide how such technology would be used.

➔ *Finding 18. UoM lacks both the e-infrastructure for optimising scholarly communication and the strategy for utilising it.*

Strategy

While the university does not have a targeted set of dissemination policies, it does have strategies for ramping up research production. Unfortunately, many of them remain unimplemented, in part, because of the institutional instability that has beset UoM through multiple changes of leadership in the vice chancellor's (VC) office over the last five years. This has had an unsettling effect on the administration, which essentially froze the implementation of a number of research strategies.

➔ *Finding 19. The regular changes in leadership in the VC's office have interrupted the institution's ability to implement its strategic commitments.*

Skills and capacity

Due to the traditional mode of scholarly communication that the university remains essentially locked into, it is difficult to say that it would be able to transition to a more open access mode of communication quickly, given the way that it has allocated skills and capacity across the institution. At the moment, it is hard to see where the locus of OA activity would be situated at UoM. While the library is often the place in which an institutional repository and OJS are run, the UoM library is currently focused on different priorities, namely the support of undergraduate students. The same goes for the Centre for Information Technology and Systems which services the university's IT needs. It is not currently optimised to handle a new scholarly communication imperative such as running an institutional repository.

Moreover, our implementation initiative revealed that FoS scholars feel that they do not have enough time or incentives to adapt their scholarly communication practices toward

an OA model and few have developed the personal capacity necessary for engaging OA strategically. As a result, it is difficult to assess the skills and capacity of UoM in the absence of an institutional communications strategy. It is likely that these skills would have to be developed if an OA vision were adopted.

➔ *Finding 20. Because UoM has never had an open access vision for scholarly communication, it has yet to develop the skills and capacity that would be necessary for establishing it.*

Conclusion

UoM is in the process of trying to transition from a teaching-oriented institution to a research-oriented one. This is in line with the government's desire that the island evolves into a knowledge economy and become an innovation hub in the region. University research contributes to that vision and, as the flagship university in the country, UoM will play an important part in helping realise it. But most of the policies that govern this transition are aimed at increasing the *production* of research, but not necessarily enhancing the openness of its *dissemination*. In the perspective of the government and the university, scholarly outputs should speak to other scholars or be transferred to industry partners that can leverage it for commercial gain.

While this approach has its merits, it is based on an industrial conception of knowledge that tries to control or contain it through closed communication channels, patent regimes and one-to-one transfer relationships. In this scenario, knowledge is produced by university scholars, made available to an elite strata of other scholars around the world (through academic journals) and, where possible, shared with a local industrial partner who can commercialise it. This approach treats knowledge as something so precious that it must be controlled and it imagines that the consumers of this knowledge are exceedingly few, limited to academics and industrialists.

This contrasts to the open form of dissemination that SCAP has encouraged UoM to embrace. We believe that open scholarly communication will help establish a more durable foundation for a truly comprehensive "knowledge economy", because in this approach, everyone is considered a potential consumer and sharer of knowledge. And while knowledge is still treated as something precious, the open approach seeks to broaden (rather than circumscribe) its impact by giving it freely to everyone (government personnel, teachers, entrepreneurs, community activists, civil society organisations, etc.), not only scholars and industrialists (who are mistakenly assumed to be the only audiences who could find, or increase, its value). In a world that is becoming increasingly networked, in which more and more people can access knowledge through the internet, it makes sense to open up scholarly knowledge to them as well (especially if the research was paid for by public funds), rather than securing it for small numbers of scholars and industry players.

This is a major strategic consideration and one that SCAP hopes the university and the various national research bodies will reconsider: will the knowledge economy come to fruition through closed or open communication approaches?

This is just one of many concerns that the university needs to deal with. Beyond the question of open vs closed communication strategies, our research into the UoM FoS scholarly communication ecosystem revealed that the university faces a number of challenges in meeting the goals that it has set for itself.

First, with regard to its desire to increase research production, many FoS scholars carry heavy teaching and administrative burdens that decrease the time they have for research. Compounding this, their low salaries encourage them to seek income-generating opportunities (such as "excess teaching"), which undercut the time they can devote to research. The rewards and incentive structure for producing research outputs really only applies to the period when scholars seek promotion, thus limiting its impact on increasing the volume and consistency of research production throughout a scholar's career. Moreover, some academics do not want their research to be visible.

Second, with regard to disseminating scholarly outputs, FoS academics focus on sharing scholar-to-scholar outputs through international journals and conference papers. This is what the university's rewards and incentive policies prioritise, and it conforms to the norms of their own discipline. Thus it is not surprising that FoS scholars do not regularly produce "alternative" outputs that would reach out to non-academic audiences (including the government, with whom they say they almost never communicate). And while they enjoy international networks with overseas colleagues, they do not feel part of a scholarly community on campus, as the density of scholars within their own fields is too low to create synergies between them. Most express positive sentiments about the merits of open access communication, but they do go out of their way to assure that their own work is OA. This is reinforced by their lack of interest in using Web 2.0 technologies to personally raise their scholarly profiles and the visibility of their work.

Third, with regard to the institutional context that shapes their activities, UoM's centralised, but weak, administration often creates unnecessary inefficiencies through excessive red tape. This has been exacerbated by the disruptions in the VC's office (through constant changes in leadership), which created administrative uncertainty regarding the implementation of various research strategies. However, the university is tightly integrated with the mission and values of the national research infrastructure (MTESRT, MRC and TEC), thus aligning its efforts with that of the government. This is a beneficial reality in most respects, except for the fact that, because they have collectively taken a non-open access approach to scholarly communication, none have invested in the technical capacity, ICT infrastructure or policy innovations necessary to keep up with the scholarly communication trends shaping the rest of the world.

Despite these challenges, SCAP does believe that Mauritius, with the help of UoM (and FoS in particular), could become a knowledge economy by 2025 and act as an innovation hub for the region. The country possesses all the talent and ambition necessary for this to become a reality. With this in mind, we offer recommendations to the government, university, science faculty and research funders for enhancing scholarly communication at UoM in the next chapter.

Chapter 9. Recommendations

To optimise scholarly communication at the University of Mauritius (UoM), the SCAP team believes that there are four stakeholders that can play a dynamic role in improving UoM's dissemination activity: the national government, the UoM administration, UoM scholars and research funding agencies. Each of these groups contributes to research and communication practices at the institution, thereby impacting the potential visibility of UoM scholars' research outputs. In this chapter, we provide recommendations tailored to each of these stakeholders, with an eye towards enhancing research production, open dissemination and regional collaborative opportunities.

To the national government

Extend the national research infrastructure

Design a virtuous research funding cycle (similar to the SAPSE system in South Africa) in which, for each recognised output produced by a scholar and disseminated in an open access fashion, funds are directed into that scholar's faculty research budget for the sake of both rewarding and incentivising the future production of open access research.

Establish a national research repository for the curation, profiling and dissemination of Mauritian research outputs, combining outputs from the UoM with all other universities and national research centres.

To the UoM administration

Enhance the institutional research culture

Continue to grow the university research budget so that it meets and accelerates the demand for research funds.

Offer a reduction in teaching time to scholars who demonstrate ambitious research activity.

Establish digital platforms for sharing publication success by UoM scholars. Use website profiles, email circulars and other communication opportunities to tell stories that develop a collegial environment in which research, open dissemination and peer expectation (the social pressure to engage in research) is prized.

Pay UoM scholars higher salaries so they do not have to sacrifice their research time by taking on "excess teaching" just to augment their meagre salaries; higher salaries will make the university more competitive and attractive for international scholars to work at.

Incentivise open dissemination

Develop an open access policy which mandates that all publicly funded research be made open access, either through publication in open access journals, or through the payment of article processing charges (APCs) in traditional or hybrid journals.

Create an APC fund to support the publication of open access outputs.

Run all UoM-affiliated journals – especially the official University of Mauritius Research Journal – *on the Open Journals System and make them open access.*

Induce academic staff to create personal profiles on their departmental webpages in which they include a brief biography, research interests, classes taught, memberships and publications.

Provide support services for scholarly communication

Establish or identify support service providers who can translate scholars' research for government and community-based audiences (i.e. condensing journal articles into accessible policy briefs).

Enhance the faculty-level research culture

Reduce administrative duties for academics – such as registering students and invigilating exams – to an absolute minimum to free them for academically productive pursuits. Allow graduate students to handle such tasks, if possible.

Train and incentivise scholars to use Web 2.0 platforms so that they can share in the responsibility of making their own research more visible.

Leverage regional expertise

Collaborate in the construction of short-term regional exchanges for administrators and librarians. This would allow them to be immersed in other contexts in which they can learn new skills and approaches through interaction with senior hosting staff members. They would be responsible for producing an output from their experiences and sharing it with staff members at home.

Invest in regional journal production opportunities.

Incentivise regional research collaboration through enhanced funding and recognition for SADC-based activities.

To UoM scholars

Raise personal visibility

Share responsibility with the administration for research visibility. Communicate research findings not only to the communities that the research may concern, but also communicate it to the audiences that could best leverage it for developmental purposes.

To research funding agencies

Determine the feasibility of developing a regional megajournal. Prepare costings for launching one new OA megajournal (in the style of *PLOS ONE*). The study should include consideration of: how to provide publishing services (hosting, editorial services, peer review management); researcher interest and willingness to take on the new challenges involved; readiness of research funders to support the venture in terms of cash and of support for the principle and the practicalities involved; how this journal can be made viable and how it should be sustained and supported.

Fund research into a meta-level analysis of all "open" activities (open access, science, data, educational resources, etc.) both in the region, and within the agency's funding umbrella, so that points of intersection can be explored in future projects.

Appendix 1. Profiling Academics Online (PAO) implementation schedule

FoS = Faculty of Science | FoSPs = FoS Participants | FvS = François van Schalkwyk
MW = Michelle Willmers | RA = Research Assistant | UoM = University of Mauritius

Phase	Description	Deadline	Owner
Phase 1: Research and concept document	Approval of concept document by UoM	30 April 2012	MW
	Secure stakeholder participation	30 April 2012	UoM
	Finalise budget	30 April 2012	FvS
	Baseline study of visibility metrics of preselected participants	3 May 2012	FvS
	Outline steps/processes in creating online profiles	30 April 2012	FvS
	Selection of articles and other resources for the PAO toolkit	30 April 2012	MW & FvS
Phase 2: Presentation, selection and briefing	**Site Visit May 2012**	May 2012	MW
	Presentation of PAO to FoS and discussion on the process	8 May 2012	FvS
	Selection of project participants	8 May 2012	FvS & MW
	Briefing of FoSPs and identification of participants for pilot phase	9 May 2012	MW & FvS
	Distribution of PAO toolkit	10 May 2012	MW & FvS
Phase 3: Pilot phase	RA introduces self to FoSPs and offers help to create offline CVs	10–31 May 2012	RA
	Collect relevant information from FoSPs and update offline CVs	31 May 2012	RA
	Conduct baseline visibility metric for new FoSPs	31 May 2012	FvS/RA
	Provision of 3G access to selected FoSPs	8 June 2012	RA
	Commencement of PAO activities at institutional level	1 June 2012	FoSPs & RA
Phase 4: Assessment	Assessment of progress amongst FoSPs in creating online profiles and of impact of such profiles	8 October 2012	FvS

Phase 5: Sharing impact and lessons learnt	**Site visit October 2012**	October 2012	MW
	SCAP to present findings to FoS	October 2012	MW & FvS
	SCAP to present findings to institutional leadership	October 2012	MW & FvS
	Presentations by two leaders in the field on their observations on the PAO intervention and suggestions on ways forward	August/Sept/Oct 2012	MW
	Feedback from FoSPs on PAO	October 2012	RA
Phase 6	Final report	March 2013	MW & FvS

Appendix 2. Proposed steps to follow in creating an online profile

This appendix provides instructions for creating an online academic profile. It is not necessary to follow all of the steps in order to create an online profile. Completing just some of the steps below will be an adequate start. However, the more of the steps you follow, the more integrated and impactful your online profile will be. While the initial time required to complete all of the steps below may seem high, little time is required to maintain your online profile once it has been created. Steps marked with an asterisk (*) are suggested as the minimum number of steps required to create an effective online profile. For steps marked with a ^ sign, refer to the toolkit for more detailed instructions.

Step 1*: Chronicle your professional achievements and outputs

Update existing curriculum vitae (CV), paying particular attention to the inclusion of the following information:

- Specialisation and field of interest.
- List of published outputs (e.g. journal articles, chapters in books, monographs) including URLs of where these publications are on the web (e.g. publisher's website, journal subscription database, etc.). Should multiple URLs exist for a particular publication, select the one that provides the most information and the greatest level of access to the publication.
- List of unpublished outputs (e.g. conference papers/presentations, poster presentations, data sets, lab notes, concept papers, etc.) including URLs of where these publications are on the web (e.g. university/faculty/department repository or website, conference website, personal website, etc.). Should multiple URLs exist for a particular publication, select the one that provides the most information and the

greatest level of access to the publication.
- List of talks, seminars, lectures, training courses, etc., along with details of the audience.
- List of current and past academic projects.
- List of key academic and non-academic people with whom you have collaborated.
- List of memberships held.
- List of awards and achievements.
- List your current/existing online profiles.

Step 2*: Make your unpublished scholarly outputs available online

Scholarly outputs are not only limited to journal articles; they could include lab notes, presentations, professional articles, teaching resources and more. There are several options for making your outputs available online. How you make the publications available should be determined by the copyright agreements with the relevant publisher in the case of published works, as well as by your institution's policy on intellectual property. Some possible options include the following:

- Publish to the university/faculty/department repository or website.
- Publish to the website of the project from which the publication emanated.
- Publish on your personal website.
- Publish to subject-specific repositories.
- Publish on GRIN (www.grin.com/en/), SCRIBD (www.scribd.com/), Slideshare (www.slideshare.net/), PLOS Currents (http://currents.plos.org/) or similar.

Step 3 [optional]: Update your CV's publications list to include the URLs for the publications now available online

Step 4 [optional]: Create short URLs for your publications using Goo.gl

Goo.gl URL shortener creates a shortened URL link of your existing URLs. This is both useful for tweeting a link and for the tracking features that the service provides. As a goo.gl user, you can log in to your Google account to view URL history, traffic sources, referrers and visitor profiles for countries, browsers and platforms. (If you do not have a Google account, you should set one up before using the service.) → http://goo.gl

Step 5^ [optional]: Create a Mendeley account

Mendeley is a free reference manager and academic social network that assists academics in organising their research, collaborating with others online and discovering the latest research. By joining Mendeley, you will be able to search over 100 million papers in the world's largest crowd-sourced research catalogue; get related research, refine your search to full-text PDFs and add papers to your library; read up on new topics, find ongoing research, follow curated bibliographies and get involved in discussions in public groups; create an academic profile, upload your papers and publicise your research; find interesting contacts or public groups related to your field or area of interest.
→ www.mendeley.com/

- Create a Mendeley profile using the information in your updated CV.
- Download and install Mendeley Desktop.
- Create a collection of your publications.

Step 6*^: Create a Google Scholar account

Google Scholar is the de facto online search engine for academic articles. Ensure that articles appear in Google Scholar search results and improve the rankings of these articles. → http://scholar.google.com

Step 7 [optional]: Create a LinkedIn account

LinkedIn is a network of more than 135 million professionals worldwide.
→ www.linkedin.com

Step 8^ [optional]: Create a Twitter account

Twitter is a real-time information network that connects users to the latest stories, ideas, opinions and news, both personal and academic by finding *relevant*, compelling accounts and following the conversations. → www.twitter.com

Step 9 [optional]: Create a blog

Blogs can be used by individuals, groups, projects or departments to encourage debate, to share best practice, to test new ideas and to keep others up to date with news and events.

Step 10*: Create a personal home page (or update your existing personal home page)

Use About.me (http://about.me), Academia.edu (www.academia.edu/), Wordpress (www.wordpress.com) or a similar website creation platform to create a simple, self-managed web page that provides a brief profile and integrates your other online profiles on a single page.

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