

Positioning etds in the e-Research arena: a South African case study

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ABSTRACT

E-Research, extensive use of ICT to do research in completely new ways and to create knowledge environments with the capacity for unprecedented global collaboration is fast becoming one of the prominent paradigms of 21st century research. It will have a lasting impact on the way research is conducted and funded and how the results find their way in scholarly communication. National projects are underway in different countries of the world to create the necessary infrastructure to give their researchers a fair chance to compete in this arena.

The paper will report on the South African SARIS project and its recommendations for an e-Research Support Service for South Africa (eRS₃A) indicating the way forward for a developing country in this new dispensation. It will also pose a couple of questions about the future embedding of etd programmes in the e-research enterprise.

1. INTRODUCTION

Posting an etd on the web is the last in a long line of activities that constitute the postgraduate process. It is therefore influenced by everything that happened before. A dramatic change in research practice such as e-research is of importance for the etd community.

2. WHAT IS E-RESEARCH AND WHY DOES IT MATTER?

E-research, e-science, cyber-science are terms that refer to scientific endeavours that are enhanced by information and communication technology (ICT) and an abundance of data. In fact, these two drivers are stimulating the emergence of entirely new research paradigms with new scientific methods, new types of scientific management and the creation of knowledge environments with the capacity for unparalleled global collaboration.

The eResearch paradigm is dependent on an effective support service or cyberinfrastructure containing the following elements that need to work together in an integrated fashion, with adequate security and perpetual and pervasive access ensured (Kim, 2004):

- Computing capacity and capability (supercomputers, clusters, workstations)
- Mass storage (disk drives, tapes)
- Data transmission infrastructure to share large data-streams, datasets and models
- Networking (including optical, wireless, ubiquitous)
- Digital libraries/data bases with sufficient metadata for potential users to find the data and be satisfied of its value and provenance
- Software (operating systems, middleware, domain specific tools/platforms for building applications)

- Services (education, training, consulting, user assistance)
- Access to the global research literature and infrastructure for open access publication

Availability of such a cyberinfrastructure can lead to new modes of knowledge creation and the professional empowerment of scientists and students all over the world. In a presentation given at the ARL's *E-Research and Supporting Cyberinfrastructure* forum held on 15 October 2004 Djorgovski described the four phases of data interaction leading to new knowledge as Data gathering, Data farming, Data mining and Data understanding (Figure 1). Thus can lead to “qualitative changes in the way we do science” and challenges scientists to “formulate genuinely new types of scientific inquiries, enabled by this technological revolution” (Djorgovski, 2005)

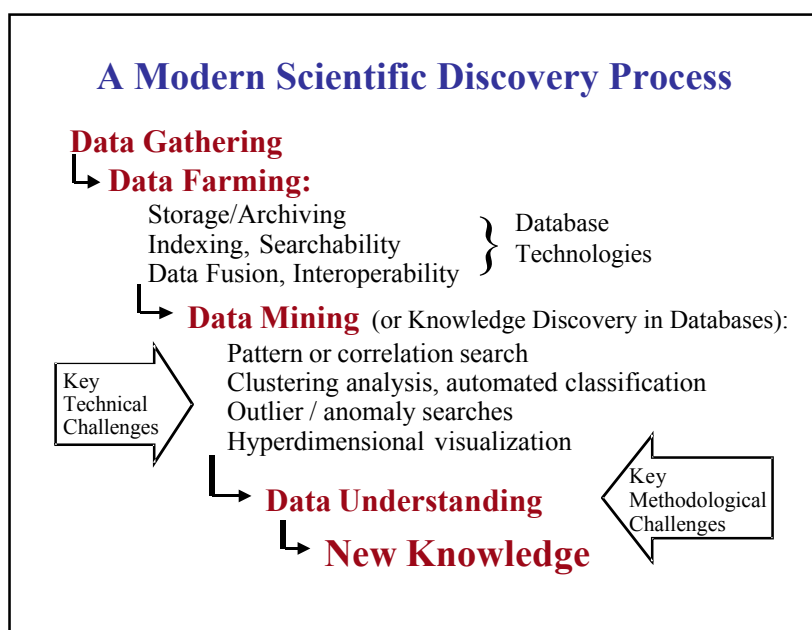


Figure 1: A modern scientific discovery process

3. The South African SARIS Project and its outcomes

3.1 Description

Researchers in developing countries are faced with dramatically improved opportunities for global collaboration but also stand the risk to be left out of the modern research milieu due to inadequate infrastructure. The South African Research Information Service (SARIS) Project started out with an investigation into the declining affordability of access to global research literature. During the investigation the team realised that e-research presents a broader range of support challenges in need of a coherent solution and hence attention shifted to this relatively unknown arena and its implications for South Africa.

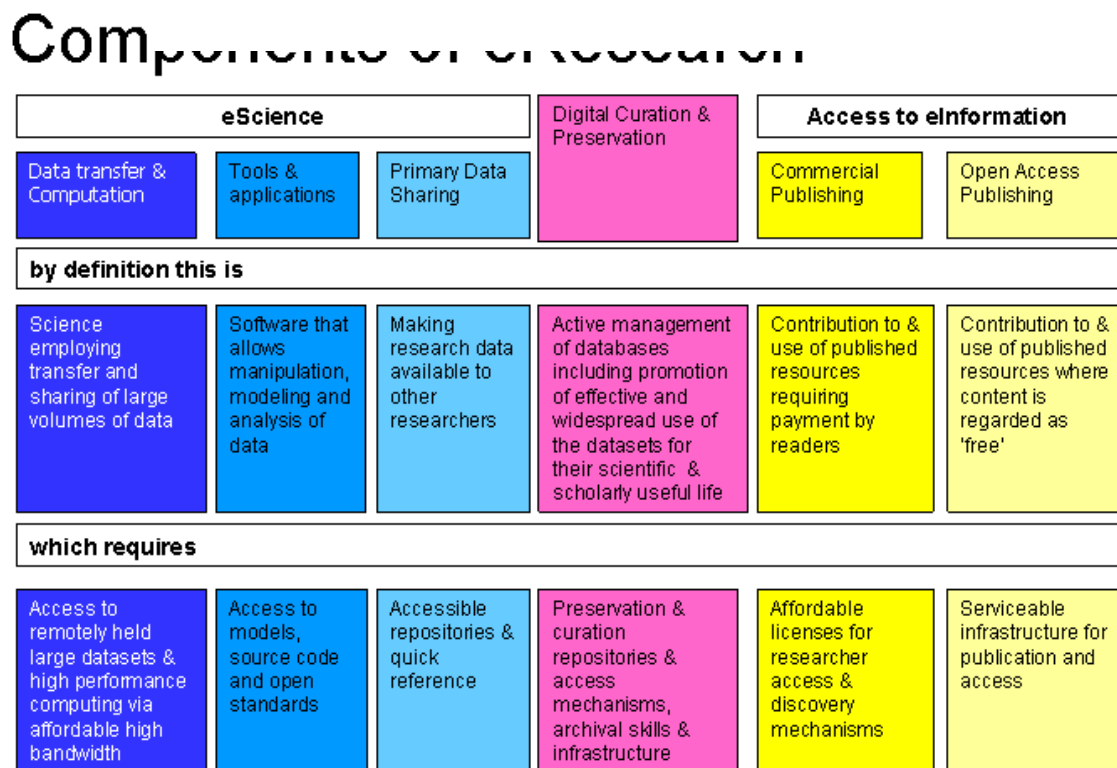
Wide-ranging discussions with the South African research community as well as with counterparts in Britain, Australia, the USA, Brazil and Indonesia revealed a very rudimentary South African e-research scene: initiatives are fragmented and under resourced. It was obvious that a well coordinated eResearch support system will be needed to ensure cost-effectiveness and efficiency.

3.2 SARIS Recommendations

The SARIS interpretation of the eResearch paradigm is illustrated in Figure 2. Provision is made for three main trends:

- Sharing computation capacity between remotely situated researchers,
- The need to make better use of expensively created databases by “*the active management and appraisal of data over the life cycle of scholarly and scientific interest*” is the basis of a new field of endeavour called Digital Curation (Burnhill, 2004), plus the ability to transfer vast volumes of data,
- Scholarly discourse now takes place on the dual playing field of Commercial Publication and Open Access.

The components were grouped in two major subsets, eScience and Access to eInformation, with Digital Curation Services fitting between them, the left side concerned mainly with data, the right dominated by textual information (Page-Shipp, 2005).



Researcher Requires: Perpetual access, Curation, Training, Marketing

Supplier must ensure: Security - Access, Authorization, Authentication

Figure 2: The components of e-Research

A web services framework was proposed as an interface for service delivery ensuring that all researchers could gain access in a personalized manner. Components could be integrated in an organisation’s portal. Isolated researchers, or those in poorly resourced institutions, could gain access via a portal accessed from any Internet service point, be it public library or Internet Café.

Access to the support service should thus be web-based and offer the researcher access to:

- A single, user-friendly, access point to a family of repositories for data, digital objects and publications that would act, inter alia, as a record of research outputs.
- Online content, including commercial and open access information resources available by affiliation with alerting services and federated searching capabilities
- A pay-per-view facility for any other resources
- Easy communication with colleagues and other interested researchers

- Electronic Communities of Practice/Curiosity
- Assistance in submitting large databases/streams to SANReN (the national equivalent of Internet2, AREN, GéANT) for transmission to colleagues and co-workers anywhere in the world, and in receiving such databases/streams
- Online Research Support Tools, for data and information/reference management

To accommodate all these elements a proposal was made for a sophisticated and technologically advanced eResearch Support Service for South Africa (eRS₃A) infrastructure that can manage, deliver, stimulate and reward. It should be pre-competitive and be driven by a passion for *Team South Africa* to support world-class performance by South African researchers in the Information Society.

The objectives of such a service would obviously need to be:

1. To engage in the development of eResearch infrastructure that will establish standards, coordinate the innovative skills of the role-players in the system and distribute the benefits optimally to all participants.
2. To manage investment in the development of the SA Knowledge Infrastructure for eResearch.

Figure 3 outlines such a managed eResearch infrastructure that meets these objectives and makes maximum use of existing entities, rather than creating new ones. It incorporates clear roles and a set of responsibilities that include:

- Stimulating innovation and identifying appropriate innovation projects
- Obtaining project funding
- Feeding successfully completed projects into the service delivery component
- Accountability to the South African research community (Page-Shipp et al, 2005).

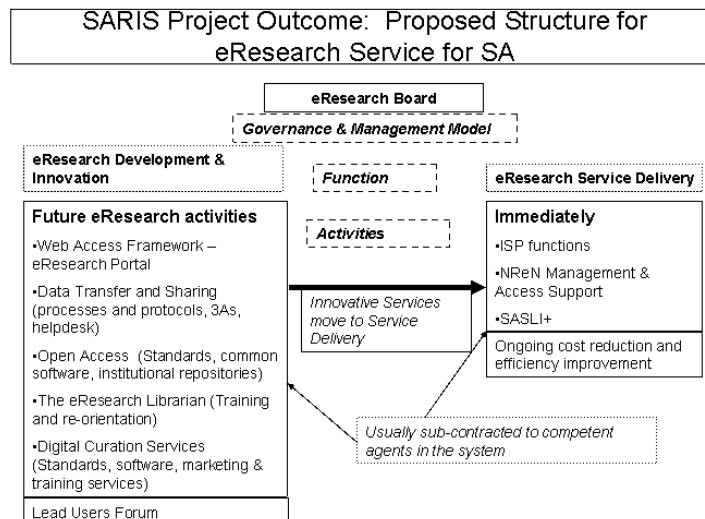


Figure 3: Proposed structure for eResearch support service for SA – a governance and management model

4. E-RESEARCH AND ETDS

The ETD community needs to take an active interest in the e-research phenomenon in order to interact with it in an intelligent way. Two questions are briefly explored and a plan is discussed for enhancing the postgraduate research process in South Africa.

4.1 Question 1: Does the participation of postgraduate students in e-research have implications for their theses and dissertations?

At the *E-Research and supporting cyberinfrastructure* forum Djorgovski made the comment “Journals (and books?) are obsolete formats; [they] must evolve to accommodate data-intensive science”. (Djorgovski ,2004) The same may be said of theses and dissertation, even etds.

- Students who take part in e-research produce datasets, software and models which need to be preserved
- The relationship with the static data “snapshot” included in the etd with other dynamic datasets needs to be managed
- Intellectual capital issues become even more important for students whose postgraduate work forms part of big collaborative research projects and it needs to be managed carefully.

4.2 Question 2: How does one preserve the vitality of a meaningful e-research process in the final output?

Increasingly web sites act as “laboratories” for humanities research. Sometimes the research is taking place for all (or at least some) to see as in *Surviver Cyber* (<http://hagar.up.ac.za/catts/ole/oro/index.htm>). *Outfoxed* (<http://getoutfoxed.com/>) is the implementation side of Stan James’s master’s thesis at the University of Osnabrück. He has the following to say about the web site: “Note that this is an evolving document, and will certainly grow and change as my thesis proceeds.” (James, 2005)

Equally prevalent are the numerous postgraduate blogs. The web site PhDweblogs.net lists 297 blogs reporting the experiences of postgraduate students. Some of them report on the author’s studies and contain work-in-progress documents.

These are dynamic processes that cannot be adequately described in a conventional thesis or dissertation, especially for a generation of students who regard the Internet as a source of information. Decisions need to be taken regarding the preservation of these web sites.

4.3 Suggestions for enhancements to the South African research portal to accommodate the needs of postgraduate students, their supervisors and universities’ research administration functions.

The South African postgraduate research enterprise suffers from the same lack of resources, unevenly distributed over a system that needs to be far more effective. A similar *Team South Africa*, pre-competitive approach should be applied to the challenge of producing postgraduate research at a faster pace. This functionality could be added to the national research portal and made available for all postgraduate students irrespective of their affiliation. The objective would be to relieve the administrative burden of universities and to afford supervisors more time to mentor young researchers and to facilitate their entry into invisible colleges.

An integrated environment that will deal with everything between the registration of a postgraduate project up to an etd on the web should be developed. To be accepted and used on a wide scale such a service will have to be a one-stop shop for postgraduate students, it should allow enough flexibility for personalization, it should be very simple to use and should take care of the three A’s, access, authentication and authorization, up front. Elements to be included would be

- Shared work space for students and supervisors

- All university requirements available at the point of need
- Guidelines for postgraduate research and thesis writing
- A work flow that will keep the student on track from project registration to a final etd on the web
- A management process that will keep track of the progress of the students in a department, school or faculty
- A work flow that will push work-in-progress to all stakeholders
- Links and functionality related tot funding bodies
- Information on ethics and a plagiarism detection service
- Referencing and bibliography building software
- Discipline specific tools such as web-based polling engines and tools for doing surveys and data processing
- Discipline specific links to suppliers of lab materials and other necessary resources
- Reservation services for campus resources
- Access to the portal's management system for journal articles. This could include lists of suitable journals for publishing searchable according to certain parameters, articles in progress and in press with track of submissions and their status, publishers submitted to, success rate, commentaries. Over time this may lead to a publishing profile for an individual, a department or a school.

5. CONCLUDING REMARKS

The etd community is well positioned to spot new trends in research and research management and should leverage this position to gain support for etd programmes as part of national e-research initiatives.

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7. REFERENCES

Burnhill, P. 2004. Personal communication. Dr Peter Burnhill is the Acting Director, Digital Curation Centre, Edinburgh, UK.

Djorgovski, S. J. (2004) Virtual observatory, cyber science and the rebirth of libraries. Retrieved 17 June, 2005, from <http://www.arl.org/forum04/djorgovski.html>

James, S. (2005) What is outfoxed? Retrieved June 17, 2005, from <http://getoutfoxed.com/about>

Kim, S. (2004) Cyberinfrastructure: enabling new research frontiers. Retrieved 17 June, 2005, from <http://www.arl.org/forum04/kim.html>

Page-Shipp, R.J., Hammes, M., Pienaar, H., Reagon, F., Thomas, G., van Deventer, M.J. & Veldsman, S (2005). eResearch support services: responding to a challenge facing the South African research and information communities. (In press)

Survivor cyber (2002). Retrieved June 17, 2005, from <http://hagar.up.ac.za/catts/ole/oro/index.htm>

