Original citation:

Permanent WRAP url:
http://wrap.warwick.ac.uk/52815

Copyright and reuse:
The Warwick Research Archive Portal (WRAP) makes this work of researchers of the University of Warwick available open access under the following conditions. Copyright © and all moral rights to the version of the paper presented here belong to the individual author(s) and/or other copyright owners. To the extent reasonable and practicable the material made available in WRAP has been checked for eligibility before being made available.

Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge. Provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

A note on versions:
The version presented here is a working paper or pre-print that may be later published elsewhere. If a published version is known of, the above WRAP url will contain details on finding it.

For more information, please contact the WRAP Team at: publications@warwick.ac.uk
Towards a generic research data management infrastructure

1Simon Collins, 1Lorraine Beard, 3Jon Besson, 2June Finch, 3Mhorag Goff, 1Peter Halfpenny 3Tom
Grahame, 1Mary McDerby, 2Meik Poschen, 2Rob Procter
1Research Computer Services, University of Manchester
2Manchester eResearch Centre, University of Manchester
3John Rylands University Library, University of Manchester

1 Introduction

Until recent years, a focused and centralized strategy for the annotation, storage and curation of research
data is something that has not been widely considered within academic communities. The majority of
research data sits, fragmented, on a variety of disk structures (Desktops, network & external hard drives)
and is usually managed locally, with little interest paid to policies governing how it is backed up,
disseminated and organized for short or long term reuse.

Recognition of how current practices and infrastructure present a barrier to research, has resulted in several
recent academic programmes which have focused on developing comprehensive frameworks for the
management and curation of research data1,3. Many of these frameworks (such as the Archer suite of e-
Research tools1), however, are large and complex, and have an overreliance on new and novel technologies
making them unwieldy and difficult to support.

The paper discusses the development of a simpler framework for the management of research data through
its full lifecycle, allowing users to annotate and structure their research in a secure and backed up
environment. The infrastructure is being developed as a pilot system and is expected to work with data
from approximately a dozen researchers and manage several Terabytes of data. The technical work is a
strand of the MaDAM (Manchester Data Management) project at The University of Manchester which is
funded by the JISC Managing Research Data Programme.1

2 System Requirements

The requirements for the data management system were based on interviews and feedback from a variety of
groups within Manchester University’s Medical and Life Science Departments (Poschen et al., 2010).
These groups were chosen on a variety of criteria, which included the quantity and diversity of their
research data, whether they are representative of typical practice within their field, and the level of time and
commitment they were willing to pledge to the project. The resulting project groups include members from
standard and electron microscopy (EM) and from a neuropsychiatry group involved mainly with MRI
analysis

The below represents a summary of users’ high level requirements for a data management infrastructure:

– Provide a centralized and backed up storage area of research data
– Provide read/write access to data amongst defined groups in a secure way
– Organize data in a way that removes redundancy (ie the need to store the same data in multiple places)
– Allow the structured annotation of research data to provide context to the data
– Allow the search and dissemination of data
– Provide a system simple enough for users to pick up and utilize without structured training.

These requirements may sound fairly basic, however, none of them are satisfactorily addressed in the
researchers’ current infrastructure. Initial studies indicate that, subject to successful embedding in everyday
research practices (Goff et al, 2010), infrastructure that could manage the above in a sound and
comprehensive way would bring significant benefits to researchers and University as a whole. Moreover,
the above requirements are very generic, and thus it was established fairly early on that infrastructure that
delivered the above functionality in a flexible way could easily be rolled out to research groups beyond
those that took part in the pilot study. The finalized technical requirements, therefore, do not refer to any

1 http://www.jisc.ac.uk/whatsdo/programmes/mrd.aspx
piece of functionality that is specific to EM or MRI research protocols, but describe a more generic data management infrastructure.

As time with end users is limited, the project team has adopted an iterative, prototyping-based development approach, based upon continued and focused engagement with users (Poschen et al., 2010). We anticipate that 2 or 3 prototypes will be developed before the requirements are evolved and distilled into a relatively stable and definitive form. At present, the prototype is being developed using Oracle’s Application Express toolkit which allows rapid development of the web based systems on top of an Oracle database, together with a modified Apache server. Once the design has been finalized, the final solution may be deployed via this technology or another, more open source route.

At the time of writing, the team is in the process of developing the second prototype based upon feedback from a user evaluation workshop involving the first prototype.

3 Software Architecture & Functionality

The components of the data management infrastructure are shown in figure 1. It is essentially a 2 tier system comprising of an upstream web based / RDBMS solution which will look after short to medium term management of research data and a long term archiving solution based on Fedora Commons digital repository which has already successfully utilized in Manchester’s eScholar project.

![Fig 1. Architecture for the MaDAM data infrastructure.](image)

Functionally, the data management infrastructure is a cross between simple LIMS (Laboratory Information Management System) and a CMS (Content Management System). It will provide a web interface (see Fig 2) for end users, allowing them to define and create hierarchical entities (in much the same way as a window explorer) and then annotate these entities and upload data next to them. Example entities may be “Experiment”, “Sample” and “Publication”. Data management tools will also allow users to define templates to tag information next to the entities, enabling them to add context to the data and to search and disseminate the data in future. Users will be able to assemble discrete groups on a project basis allowing read / write access to data. The infrastructure will be built so it can robustly and securely deal with the high file throughput of large files (the scratch storage area will be used as an overflow for large database uploads.
which will be processed via background services). Users may move and tag data around the system to remove problems with redundancy and to allow flexible relationships between entities (for example, an experiment may then belong to many projects). Where feasible, users will also be able to browse and preview image (and other) data.

A subset of the data in the database will be archived in the University’s eScholar repository, through the SWORD API4. This API will be bidirectional so that archived data may be loaded back into the upstream system. Policies determined as part of this project will govern exactly which data gets absorbed into the eScholar repository. The infrastructure will support the definition of natural subsets for data archival, such as all data associated with a certain project, or all data associated with an accepted publication (it may then be possible, for example, to tie the scholarly depositions in the University eScholar system back to the raw data in the upstream MaDAM system).

4. References
Goff, M et al., 2010. Understanding the impact of disciplinary practices upon emerging modes of research collaboration: a case study of Biomedical researchers. Submitted to AHM
Poschen, M. et al., 2010. User-Driven Development of a Pilot Data Management Infrastructure for Biomedical Researchers. Submitted to AHM.

2https://www.escidoc.org/JSPWiki/en/Overview
3http://islandora.ca/
4http://www.swordapp.org/