Criteria and evaluation of research data repository platforms @ the University of Pretoria, South Africa

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Library Services
University of Pretoria

Project team
UP IT: Karin, Yzelle, Herman
UP Library: Isak, Johann, Heila
Agenda

- Project Scope & project team
- Research data lifecycle
- E-Research Framework
- Product Investigation
- Criteria & evaluation
- Recommendations
- Next Steps
- Documents produced
Project Scope

The scope of the project was to evaluate products (commercial and open source) which could be utilised as a Research Data Repository Platform as part of a total Research Data Management (RDM) solution at UP.

A total RDM solution include all phases of the Research data life cycle, but for the repository solution, the focus was thus on identifying a potential solution for the “Dissemination” phase of the research data life cycle.
RDM Repository Project Team

Business Sponsor – Prof Stephanie Burton (VP: Research)

ITS Sponsor – Andre Kleynhans (Deputy Director: ITS)

**Project Team members:**

ITS Project Manager and Business Analyst – Karin Meyer

ITS Infrastructure Architect - Dr Yzelle Roets

ITS eResearch Support Manager – Herman Jacobs

Library Services: Senior IT Consultant – Isak van der Walt

Library Services: Assistant Director: RDM – Johann van Wyk

Library Services: Deputy Director: Strategic Innovation – Dr Heila Pienaar
DATA FLOW within the RESEARCH DATA LIFE CYCLE

- Preservation
- Dissemination
- Research in Process
PROCESSES within the RESEARCH DATA LIFE CYCLE

Research in Process

- Giving Access to Data
- Re-using Data
- Preserving Data
- Creating Data
- Processing Data
- Analysing Data
- Dissemination
eResearch Framework

Administration Systems (People Soft)

Research Administration

Research-in-Process Phase

Instruments e.g. myTardis

Other Data Sources

Data Collection Engine

Compute Nodes

Storage Pool

Data Visualisation

REPOSITORY +

e.g. FigShare

Preservation

Storage

Dissemination Phase

Preservation Phase
Product Investigation Methodology

Finalisation of product evaluation criteria
• Consulted with various stakeholders
  • Library and ITS staff
  • External stakeholders at the NEDICC workshop held at the CSIR
  • Peer Universities
• Utilised various selection criteria from other institutions e.g. Leeds University, Texas Digital Library and the RDA RPRD IG Matrix ([http://tinyurl.com/RPRD-matrix](http://tinyurl.com/RPRD-matrix)) selection criteria as a basis and adapted it according to UP specific requirements.

Product Short Listing
Products were short listed based on the following:
• Product scan of products being used internationally, and
• Most commonly used products at universities similar to UP (size and research activity).

Product Evaluation
• UP’s formal Request For Information (RFI) process was followed
• Product evaluation criteria list was compiled and send to short listed vendors together with standard RFI documentation
• The requested information was received from the vendors and prepared for scoring, and
• Products were scored and evaluated.
Evaluation Criteria

- **Functional / Business criteria**: Deposit and Upload; Re-Usability; Identity and Access Management; Reporting; Discovery; Preservation
- **Non Functional**: Repository Architecture; Data Management; Data Governance
- **Technical aspects**: Back-end Management; Integration; Infrastructure
- **Vendor specific**: Support, Training, Usage of Product
- **Performance requirements**
- **Integration requirements**
<table>
<thead>
<tr>
<th>Unique ID</th>
<th>Requirement Description</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>DU-1</td>
<td>Offer customisable metadata schema as per research area or discipline (including mandatory fields).</td>
<td>H</td>
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<tr>
<td>DU-2</td>
<td>Offer the indexing of metadata.</td>
<td>H</td>
</tr>
<tr>
<td>DU-3</td>
<td>Offer sufficient support for geospatial and journal article metadata. Support association of single or multiple files with one metadata record.</td>
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<td>DU-4</td>
<td>Upload and store metadata at a data object level, where a data object is a folder that contains one or more files.</td>
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<td>DU-5</td>
<td>Support multiple file types and formats of data, e.g. MS Excel 2007, MySQL database, raw data file from a Campbell CR10 data logger, any multimedia, etc.</td>
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<tr>
<td>DU-6</td>
<td>The system should have a simple process for uploading large (multi-TB) data sets, potentially consisting of thousands of files. Must have the ability to upload large data sets (e.g. 2MB, 2 GB, 1 TB).</td>
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<td>DU-7</td>
<td>Support controlled lists against some metadata fields, either held locally or drawn from an external source e.g. Subject vocabularies.</td>
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<td>DU-8</td>
<td>Support customisation of out-of-the-box help text and provide context sensitive feedback for the depositor e.g. Highlight missing metadata fields, file upload failure alert.</td>
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<tr>
<td>DU-9</td>
<td>Accommodate workflow where data needs to be destructed with an approval process and audit trail.</td>
<td>L</td>
</tr>
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<td>DU-10</td>
<td>Researchers must be able to submit data to repository themselves.</td>
<td>H</td>
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<tr>
<td>DU-11</td>
<td>Process of submitting data to a repository from other systems/instruments.</td>
<td>H</td>
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<tr>
<td>DU-12</td>
<td>Ability to batch upload data into a repository.</td>
<td>H</td>
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<tr>
<td>DU-13</td>
<td>Third party must be able to upload dataset on behalf of researcher.</td>
<td>H</td>
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<tr>
<td>DU-14</td>
<td>Support generation / labelling of persistent unique identifiers for datasets including DOIs.</td>
<td>H</td>
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<tr>
<td>DU-15</td>
<td>Ability to support the submission of data at any research stage (i.e. Initial Data, Working Data, Final Data Stages) to the repository.</td>
<td>M</td>
</tr>
<tr>
<td>DU-16</td>
<td>Explain how user interface customisation is achieved.</td>
<td>H</td>
</tr>
<tr>
<td>DU-17</td>
<td>Out-of-the-box user interface intuitive (easy to use) to users.</td>
<td>M</td>
</tr>
<tr>
<td>DU-18</td>
<td>Out-of-the-box user interface meets accessibility requirements, e.g. W3C WCAG 1.</td>
<td>H</td>
</tr>
<tr>
<td>DU-19</td>
<td>Assignment of Intellectual Property (IP) rights and multiple content licensing options with terms and conditions exposed clearly human and machine re-users is possible, such as copyright and creative commons (CC).</td>
<td>H</td>
</tr>
</tbody>
</table>

Table 1: Deposit and Upload functional criteria
## Shortlisted Products & RFI Feedback

<table>
<thead>
<tr>
<th>Product</th>
<th>Vendor / Implementation Partner</th>
<th>RFI Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSpace</td>
<td>Atmire</td>
<td>Received information on criteria list, proposed implementation options and its associated cost.</td>
</tr>
<tr>
<td>Figshare</td>
<td>Digital Science</td>
<td>Received information on criteria list, proposed implementation options and its associated cost.</td>
</tr>
<tr>
<td>Islandora</td>
<td>Discoverygarden</td>
<td>Received information on criteria list, proposed implementation options and its associated cost.</td>
</tr>
<tr>
<td>Dataverse</td>
<td>Harvard University</td>
<td>Received insufficient information on criteria list, implementation options and cost.</td>
</tr>
<tr>
<td>PURR</td>
<td>Purdue University</td>
<td>Failed to respond to RFI.</td>
</tr>
<tr>
<td>Redbox</td>
<td>Queensland Cyber Infrastructure Foundation (QCIF)</td>
<td>Received information on criteria list, but Redbox is only a meta data repository and not a data repository.</td>
</tr>
</tbody>
</table>
## Implementation options with most important advantages / disadvantages – Option 1

<table>
<thead>
<tr>
<th>Option</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| Option 1 - Locally hosted (both application and storage are locally hosted at UP) | • UP not dependent on internet for access to application  
• UP able to manage own data  
• Compliance to legal issues regarding data, i.e. POPI Act  
• Risk of security is lower (control own storage) | • Resources to be provided (includes Infrastructure and Human resources for application and storage) which increase cost  
• Required skills set (e.g. web skills) is limited or not currently available in ITS  
• UP bandwidth will cause restrictions, i.e. indexing of site  
• Open source product - no legal entity/responsible company for assistance, support, enhancements, new releases, etc. |
## Implementation options with most important advantages / disadvantages – Option 2

<table>
<thead>
<tr>
<th>Option</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 2 - Hybrid (application is cloud hosted, while the storage is locally hosted)</td>
<td>• Collaboration with other institutions in future is easier&lt;br&gt;• No additional resources (HR or infrastructure) are required for the application&lt;br&gt;• Legal entity exist i.e.. the application&lt;br&gt;• Geographic redundancy&lt;br&gt;• High availability on the UP front end – no bandwidth constraints&lt;br&gt;• Meta data as well as data will be always available, searchable and able to be indexed&lt;br&gt;• UP will be in control of their IP (control own storage)&lt;br&gt;• Risk of security will be lower (control own storage)</td>
<td>• Resources to be provided which includes infrastructure and human resources for storage as well as RD, backups, access control, cooling, etc.&lt;br&gt;• Required skills set (e.g. web skills) is limited or not currently available in ITS&lt;br&gt;• Indexing of site dependent on UP’s bandwidth</td>
</tr>
</tbody>
</table>
## Implementation options with most important advantages/ disadvantages – Option 3

<table>
<thead>
<tr>
<th>Option</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| Option 3 - Fully cloud-based (both the application and storage are cloud hosted through the vendor) | • Collaboration with other institutions in future is easier  
• No additional resources (HR or infrastructure) are required for the application  
• Legal entity exist i.e. the application  
• Geographic redundancy  
• High availability on the UP front end – no bandwidth constraints  
• Meta data as well as data will be always available, searchable and able to be indexed  
• UP will be in control of their IP (control own storage)  
• Risk of security will be lower (control own storage) | • UP does not have control of IP (governance and accessibility to UP’s data is in the hands of the vendor)  
• Possible future sanctions against some countries may result in some users from other parts of the world not being able to reach UP’s repository  
• Growing running cost as UP will have to pay for up-and downloading as well as storage of data |
### Product Evaluation Results

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Figshare</th>
<th>Islandora</th>
<th>DSpace</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BEEE</strong></td>
<td>All products and associated vendors/implementation partners are internationally based, therefore no weight was assigned in the scoring exercise.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirements Criteria (incl functional, non-functional, vendor)</td>
<td>85% fit</td>
<td>96% fit</td>
<td>65% fit</td>
</tr>
<tr>
<td>Pricing</td>
<td>CONFIDENTIAL</td>
<td>CONFIDENTIAL</td>
<td>CONFIDENTIAL</td>
</tr>
<tr>
<td>Preferential criteria: Hybrid Option (option 2)</td>
<td>100% Fit</td>
<td>10% fit – only available through huge custom development which poses huge risks to UP.</td>
<td>0% Fit</td>
</tr>
<tr>
<td>Preferential criteria: Consortial pricing</td>
<td>100% Fit</td>
<td>0% fit</td>
<td>0% fit</td>
</tr>
</tbody>
</table>
Recommendations

The following is recommended for implementing of a Research Data Repository platform solution at UP:

• **Figshare** should be considered as the product of choice
• Implement the **Hybrid** implementation option with the application being cloud hosted and a local storage of 20Tb to start with
• Local storage can be supplemented in future with Cloud storage
• Storage should be investigated in line with the total eResearch initiative and framework of UP
• A business owner needs to be identified to be responsible for a total RDM implementation
• Implementation of a Research Data Repository platform will require a significant increase in Human and Infrastructure Resource components, and
• Consortial pricing can be kept in mind for the future and was not used as a determining selection criterion.
Next Steps

• Appoint a Business owner(s) for a total RDM solution
• Investigate tools that can support the Research-in-Process phase, e.g. myTardis
• Finalise storage solution (eg. African Research Cloud)
• Business Case to secure resources (financial and human)
• Implementation of repository solution
• Training of researchers & library staff
Gap analysis: Figshare (obtained 0 on these criteria)

**Functional criteria:**
- Must be able to change data formats, although most formats are agnostic.
- Auto-generate preservation metadata, e.g. PREMIS.
- Ability to migrate files in datasets to new/other formats over time.
- Be compliant with the OAIS (Open Archival Information System) reference model.

**Non-functional criteria:**
Offer de-duplication of data, metadata

**Disadvantages:**
- The annual subscription fee for Figshare is relatively high
- Customisation is not possible as it is a proprietary product
- The proprietary product aspect also limits the look and feel customisation of the product to reflect more of UP’s footprint, and
- No local support exists within South Africa.
Context Diagram: Research Data Management

Admin/Identity providers

Other/Research Related Systems

RDM Solution

Dissemination (Repository)

Data can be open for public access or embargoed for public use within the repository, preservation system, researcher profile, ORCID and DOI.

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Documents

• UP Research Data Repository Evaluation
• UP Research Data Management Business Requirements Specification
• Executive summary
• RDM Project Progress Feedback
• Context Diagram for RDM
• Islandora, Figshare, Redbox, DSpace, Dataverse, PURR requirements criteria feedback documents
Still a lot of ground to cover
Thank You