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## JISC Project Plan

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## Project Overview

### 1.1 Project Summary

The Orbital project will build on recent JISC-funded work at the University of Lincoln to develop, test and implement a state-of-the-art research data management infrastructure, piloted with the first purpose-built School of Engineering in the UK in over 20 years. Working with the challenging requirements of our Engineering research staff and their industry partners, we will apply our experience and understanding of developing university-wide data-driven services to the implementation of a personalised, scalable, resilient and secure research data infrastructure.

We initially intend to apply a proven approach to the management of institutional data, through the proposed use of MongoDB (a very fast, flexible, schema-less database technology), to create flexible services for capturing, storing, preserving and sharing research data in real time across internal research groups and with external research partners via secure, public APIs made available on our existing <http://data.lincoln.ac.uk> service. A personalised web interface for specific researcher profiles and a public discovery interface will also be developed.

To sustain and broaden the use of this technical infrastructure across the university, we will ensure that the appropriate institutional policy is developed and approved as well as a programme of training and support for academic staff and research students. The project team will include users in the School of Engineering and their external research partners as well as staff from the Centre for Educational Research and Development (CERD), the Library and the university's Research Office, ensuring a very strong and committed project team.

### 1.2 Objectives

We intend to build on our previous work around the deposit, management and access to university research as well as further existing work in which we are building a platform for data-driven services at the university.

Throughout this undertaking, we aim to improve our understanding of the issues around research data management; develop the requisite skills among the university community to better manage research data; re-use and develop some of the underlying tools we have built to provide an institution-wide service for the ingest, description, preservation and dissemination of research data; improve the way we work on such projects, refining our use of agile methods; build capacity for the local development of academic technologies at the university; develop and implement appropriate institutional policy for the deposit, management and sharing of research data; and develop a Business Plan for the university for the long-term sustainability of our research data.

### 1.3 Anticipated Outputs and Outcomes

<b>Output / Outcome Type</b> <i>(e.g. report, publication, software, knowledge built)</i>	<b>Brief Description</b>
A requirements analysis	An analysis of what we require at the University of Lincoln to appropriately capture, manage, preserve and share research data. Will include user stories and a provisional functional specification.
An implementation plan	A document, agreed by the Project Steering Group, which details and justifies our approach to managing research data.
Development and implementation of a pilot OAIS technical infrastructure for research data	This is the main body of technical development, re-using and extending our existing in-house technology platform to develop a pilot technical infrastructure ('Orbital'), which implements the requirements we initially gathered. Our approach is

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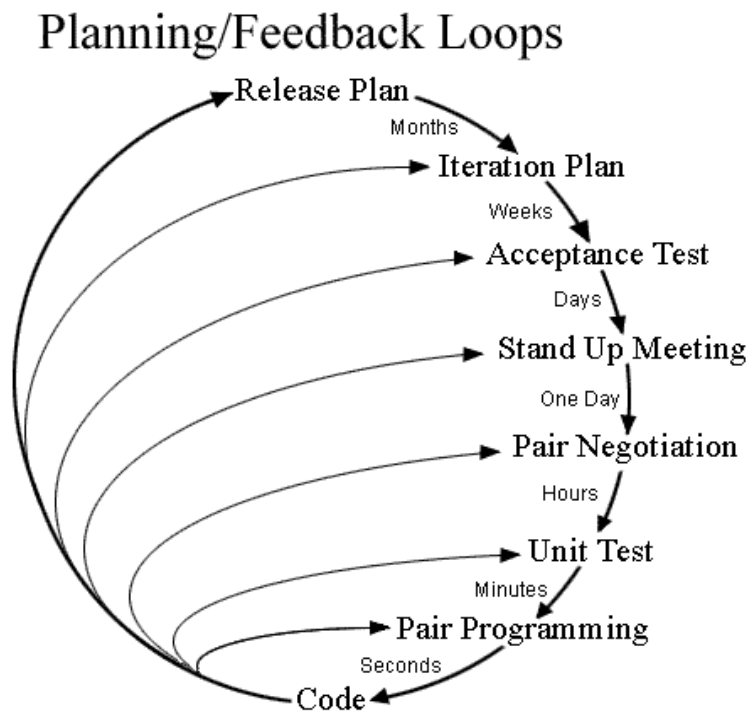
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	agile/iterative, so we anticipate that user requirements will change as we work to deliver this output. We will adopt the OAIS reference model formally and informally as appropriate.
Documented open source licensed code	Where appropriate, the code written throughout the Orbital project, will be open source licensed.
Mechanisms for managing and transferring data between institutional web services	We aim to not only build a pilot infrastructure for managing research data, but also ensure integration with existing services through the use of APIs e.g. EPrints, staff directory, My Calendar, Jerome.
User documentation	Supporting documentation and tutorials for staff/students using Orbital. Includes guidance on deposit, sharing, licensing, etc. as well as documentation for developers and administrators.
Support: Training workshops	A programme of workshops and one-to-one support on the use of Orbital.
An institutional data management policy	A formal institutional policy on the managing of research data, developed with academic input and approved by Snr. Management. Covers all aspects of MRD, including ingest, administration/preservation and dissemination.
A Business Plan for further development of the project outputs	The Business Plan will provide Snr. Management and other stakeholders a clear plan for sustaining the outputs/outcomes of the Orbital project, including the risks and benefits of doing so.
Contact with the DCC and other peer organisations	We have asked the DCC to act as evaluators of our project and also intend to work with them on the interoperability of Orbital and their DPM Online tool.
Contribution to JISC (and other related) events	We will attend and contribute to events related to the JISC MRD Programme through running workshops, offering presentations and delivering papers.
A conference/journal paper	We will submit a paper to a relevant academic conference and peer-reviewed journal.
A website, documenting the progress of the project	We will maintain a project website ( <a href="http://orbital.blogs.lincoln.ac.uk">http://orbital.blogs.lincoln.ac.uk</a> ) that documents the process of running the project as well as its main outputs and outcomes and offers a way for other people to engage in discussion about the project.
Experience/knowledge of the MRD domain	We will gain experience and develop our existing knowledge of managing research data within and outside the university context.
Build capacity and skills for the local development of data-driven services	We aim to demonstrate the value of local development (rather than outsourcing) and adopting a data-driven approach to the design and implementation of our institution-wide web services.
Reflect on and refine our overall agile methodology for project management	We will reflect honestly about the process of running such a project and aim to improve the way we manage such work, providing an enjoyable and productive environment for institutional Research and Development as well as ensuring well managed projects and high quality outputs and outcomes.
Final Project Report	We will write a final project report which reflects and reports on all of the above and is of value to our Stakeholders.

## 1.4 Overall Approach

We will use an **agile** approach to developing Orbital, relying on regular, active input from users, working iteratively on short 1-2 week code sprints.

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*Planning and feedback loops in Extreme Programming.*

To support this methodology, we use a tool-set incorporating Codeigniter, a PHP development framework, Github<sup>1</sup>, a distributed source-code repository and Pivotal Tracker<sup>2</sup>, for project and personal task management. For this project, we will also use our institutional Get Satisfaction account for supporting and managing user feedback and requests<sup>3</sup> and Zen Desk for long-term support.<sup>4</sup> Each of these tools is integrated at the API level, allowing us to easily tie user feedback to project tasks and to the development of code in a way that is transparent.

We will use other collaborative software such as our project blog and Google Docs. We will ensure that key documents are carefully considered by our Steering Group.

Because we use an 'agile' approach to project management, much of our work will be performed iteratively, relying on close engagement with our users. Therefore, the requirements analysis, technical development, documentation and dissemination of the deliverables are largely on-going throughout the project. However, as per JISC's required deliverables, a requirements analysis and implementation plan will be produced within the first four months of the project.

We will recruit two developers. The Lead Developer post has been filled internally by Nick Jackson. A further developer will join Nick in month seven.

Dissemination will be both informal and formal. Community engagement will be on-going throughout the project through our project blog and Twitter accounts. More formal dissemination will take place through the use of Press Releases, workshops, case studies, conference and journal papers.

Formal evaluation of the project will take place at six-month intervals by Dr. Mansur Darlington of the ERIM project<sup>5</sup> and Martin Donnelly at the Digital Curation Centre, who have agreed to help us undertake this.

<sup>1</sup> We maintain both private and public repositories on Github <https://github.com/lncd>

<sup>2</sup> e.g. see our public tracker for the Jerome project <https://www.pivotaltracker.com/projects/250373>

<sup>3</sup> <http://www.lincoln.ac.uk/universityoflincoln>

<sup>4</sup> <https://support.lincoln.ac.uk/home>

<sup>5</sup> <http://www.jisc.ac.uk/whatwedo/programmes/mrd/rdmp/erim>

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We have allowed four months for our Literature Review and evaluation period, when we look closely at the work of previous MRD Programme project outputs as well as other related literature around the implementation and standards for digital archives (e.g. OAIS). Due to the relevance of the ERIM project outputs to our own proposed project, the design of our pilot infrastructure will be based around a review of the analysis, synthesis work and recommendations of the ERIM project, in discussion with university Librarians, Engineering staff and their research partners. The ERIM project has synthesised much of the research relating to research data management for the discipline of Engineering, and we aim to show a clear development of their analytical work in the development of our own policy and technical infrastructure.

Critical to the success of the project are:

1. The production of the requirements analysis, based on a literature review and the gathering of user stories;
2. The technical implementation of the Orbital system, which satisfies the requirements analysis;
3. The approved institutional policy which provides overall governance of the way the Orbital system is understood and used by researchers;
4. The training programme and supporting documentation to assist staff in using the Orbital system.

## 1.5 Anticipated Impact

Impact Area	Anticipated Impact Description
Research practices	Researcher's data management practices will change, supported by technologies that encourage new processes in the administration and dissemination of data.
Internal auditing	Greater oversight and analysis of research data created by researchers will be possible.
Research governance	Improved methods of auditing research undertaken by the university will be possible, enabling greater cross-disciplinary work.
Integrated services	Research data management will be integrated into existing systems, such as staff profiles, the institutional repository, blogs and calendars. Towards a Virtual Research Environment.
FOI compliance	Will make FOI requests easier to respond to or unnecessary.
Open Data	Will promote and enable the production of public data sets.
The innovation cycle	Will embed new technologies and culture change among professional staff at the university and lead to further innovation in our services.
Recruitment	Will build capacity for local development of innovative services
Staff skills	Will improve staff skills and experience
Culture change	Will change the research culture of the university by improving the tools available for managing and sharing data.
Technology choices	Will influence future choices in technologies (both locally developed and outsourced).
HE sector R&D	Contributes to innovative R&D in the HE sector
Public Sector data management	Contributes to innovative R&D in the Public Sector
Efficient re/use of resources	Demonstrably re-uses and builds on previous work, both funded and non-funded projects.

## 1.6 Stakeholder Analysis

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Stakeholder	Interest/Stake	Importance
Research staff/students	Improvements to research environment. Transparency around data management. Support and training in research data management. Improved processes for meeting funder data management requirements.	High
University of Lincoln	Improved systems integration. Improved opportunities for inter-disciplinary research. Efficiencies gained through re-use of previous work. Provision of new infrastructure and policy framework. Improved grant application support services.	High
Other HEIs	Case studies of researcher practices and requirements. Documented open source code for developing a similar infrastructure. Well documented project website offering insight into developing and piloting a data management infrastructure. Re-usable, CC licensed training materials.	Medium
JISC	Value for money, in terms of re-use of previous JISC-funded work. Provision of open source code for re-use by the sector. Distinctive case studies and a well-documented project website. Showcase of innovative use of new technologies (e.g. OAuth, HTML5, MongoDB).	High
Public	Value for money, in terms of re-use of previous JISC-funded work. Access to open, linked data via <a href="http://data.lincoln.ac.uk">http://data.lincoln.ac.uk</a>	Low

## 1.7 Related Projects

The Orbital Project re-uses a number of technologies we have developed on previous projects and continue to work on in some way. It builds directly on the following previous JISC-funded projects, where we have gained experience in developing and implementing university-wide data-driven services.

In 2007-8, we undertook the **LIROLEM** project, a 'start-up' project, which led to the creation of our EPrints Institutional Repository.<sup>6</sup> Since the implementation of this service, it has allowed us to reach all research-active staff in the university through an active advocacy and training programme, resulting in Lincoln now being in the top 50 most populated Institutional Repositories in the UK (out of 124).<sup>7</sup> In September 2010, we formally mandated<sup>8</sup> that all staff should place their research outputs in the repository. Furthermore, we also use EPrints for all internal reporting of research activity to the university's Executive Board. The repository project began as an R&D project in the Centre for Educational Research and Development (CERD) and is now managed by the Library, with a dedicated Steering Group who report to our Research Committee. A further outcome was the setting up of the Lincoln Academic Commons, which provides information about Open Access, OER, Open Data and Creative Commons licensing.<sup>9</sup>

The **Total Recal** project<sup>10</sup> was a six-month project funded by JISC's Flexible Service Delivery programme. Originating as an R&D project in CERD, the project built 'My Calendar', now a university-wide, student-centric service, which will be rolled out and supported by central ICT Services in October 2011. Space-time data has been exposed in an open, standardised format, allowing us to build a calendaring service which aggregates timetables, room-bookings, library book return dates, assignment dates and any other space-time data into a store we call **Nucleus**.

More recently, we have completed the **Jerome** project, a six-month rapid innovation project led by the Library and funded under the JISC Discovery programme. The Jerome project has explored new ways of exposing, searching and using Library information, allowing us to aggregate our different

<sup>6</sup> <http://eprints.lincoln.ac.uk>

<sup>7</sup> <http://roar.eprints.org/1392/>

<sup>8</sup> <http://research.blogs.lincoln.ac.uk/2010/03/30/use-of-repository-to-become-universal-practice-at-lincoln/>

<sup>9</sup> <http://commons.lincoln.ac.uk/>

<sup>10</sup> <http://totalrecal.blogs.lincoln.ac.uk>

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resource collections into Nucleus, which provides data to Sphinx, a single searchable index for the Jerome discovery tool.<sup>11</sup> As well as developing a modern, scalable and very fast, personalised library discovery tool,<sup>12</sup> we have also released over 250,000 bibliographic records under a CC0 license and offer an open API for this data on <http://data.lincoln.ac.uk>

Each of these projects has extended our experience in developing and implementing university-wide web services in the following innovative ways.

1. The implementation of the Institutional Repository allowed us to **embed** the use of a research management tool across the university, thereby ensuring that our research active staff and Snr. Managers understand the importance and benefits of well managed, preserved and accessible research outputs.
2. We developed Nucleus, a **data store** running on MongoDB, a schema-less NoSQL database. Following the Total Recal and Jerome projects, Nucleus currently holds over 750,000 institutional data objects, such as bibliographic records, repository records and timetable events.<sup>13</sup> The Orbital project will effectively develop an infrastructure for research data management built around ('Orbiting') Nucleus.
3. The development of an OAuth 2.0 Single Sign On (SSO) **access** system for the university web-services<sup>14</sup> has allowed us to provide a seamless and personalised user experience across different services.
4. The development of our Common Web Design (CWD) HTML5/CSS3 presentation framework, offering fast, consistent **user interfaces** for our web services across conventional and mobile devices.<sup>15</sup>
5. The development of <http://data.lincoln.ac.uk>, which provides **documented APIs** to our data, with inherent authentication and permissions management.<sup>16</sup> Deposit interfaces permit the automatic collection (and enrichment via third-party open data sources) of appropriate metadata and data-description schemas.
6. The development of the Jerome **discovery** tool, which provides an integrated, personalised search tool for disparate institutional bibliographic data collections. We anticipate that our research data will form a discrete collection accessible via further development of Jerome.
7. The development of the Lincoln Academic Commons, an information resource on the benefits of **openness**, including the creation and use of open data.

Having developed this infrastructure for previous projects, we will now extend our experience to the domain of research data management during the Orbital project. We intend to re-use and develop some of the underlying tools we have built to provide an institution-wide service for the ingest, description, preservation and dissemination of research data, which is informed by the OAIS reference model.<sup>17</sup>

## 1.8 Constraints

Orbital is a pilot project with the School of Engineering. Within the scope of this project, we do not expect to engage with researchers from other disciplines, although we welcome input from researchers, where it helps us achieve the objectives of the project. The broader project of engaging research staff outside and beyond the School of Engineering, is a long-term objective and we will be developing a Business Case for the university as part of the Orbital project.

We do have an anticipated technical approach (see below), which we are committed to on a number of other projects and therefore we are very keen that this approach can also be applied to the Orbital project.

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<sup>11</sup> <http://sphinxsearch.com/about/sphinx/>

<sup>12</sup> <http://jerome.library.lincoln.ac.uk/>

<sup>13</sup> <http://blog.totalrecal.org/2010/07/28/why-nosql/>

<sup>14</sup> <http://alexbilbie.blogs.lincoln.ac.uk/2010/04/06/auth-lincoln-ac-uk/>

<sup>15</sup> <http://alexbilbie.blogs.lincoln.ac.uk/2011/03/23/introducing-common-web-design-v3-0/>

<sup>16</sup> <http://blog.totalrecal.org/2010/11/26/this-isnt-your-grandmothers-api-permissions-control-layer/>

<sup>17</sup> <http://public.ccsds.org/sites/cwe/riids/Lists/CCSDS%206500P11/CCSDSAgency.aspx>



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## 1.9 Assumptions

We assume that the project is 18 months long and will be run as a close collaboration between the Centre for Educational Research and Development (where the Project Manager works), the Library (where the Lead Researcher works) and the Online Services Team (where the Lead Developer works). This has worked well for us in the past. These three personnel are key to the success of the project. We also assume interest and engagement from researchers in the School of Engineering, who have committed staff time to the project.

We have also made certain technical assumptions around the use of MongoDB, OAuth, etc. which we will investigate further during the early stages of the project.

We assume that we will receive support from colleagues outside the project team and have secured senior support for the project to help enable this.

We assume that this is a pilot project and should lead to a Business Case for further adoption across the institution but is not expected to be used outside the School of Engineering during the course of the project. We will, however, invite input from potential other users in general.

## 1.10 Risk Analysis

Risk Description	Probability (P) 1 – 5 (1 = low 5 = high)	Severity (S) 1 – 5 (1 = low 5 = high)	Risk Score (PxS)	Detail of action to be taken (mitigation / reduction / transfer / acceptance)
Staffing	1	2	2	As always, there is a minor risk that team members may be absent during the project due to illness, but this will be mitigated by close collaboration on work packages and sharing of responsibilities as is typical of agile methodologies. The recruitment of developers is low risk as we anticipate the Lead Developer position to be filled internally at the start of the project and have six months to ensure the recruitment of the second Developer. We will liaise with our colleagues in HR to ensure that the first post is advertised internally as soon as we receive notice of project funding.
Lack of engagement from primary users	2	3	6	The Orbital project has commitment not only from Engineering staff but also the PVC for Research who is a Prof. of Engineering. However, clearly active research staff have various commitments to various projects and their availability is limited. We have

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				been realistic about the amount of engagement we expect to receive from our research staff and will mitigate this by engaging with their research students as well as research staff outside the School of Engineering if necessary. The Snr. User to the Project is the Head of the College of Sciences and we expect that he will help us to engage research staff across the STEM disciplines during the course of the project.
Lack of engagement from industry consultants	3	2	6	Similarly, our research and industry partners are also committed to various projects as well as their primary responsibilities of work and their availability is limited. We have been given a commitment from staff at Siemens and aim to demonstrate the benefits of engaging with the project early on. We will mitigate any lack of external engagement by seeking the advice of our Engineering colleagues who work closely with Siemens and can help negotiate the engagement we need. Finally, through consulting with experienced research staff, we should be able to anticipate many of the requirements and issues that external users would bring to the project.
Intractable concerns around data security	4	2	8	For this pilot project with the School of Engineering, a main concern is around the security and IP management of commercially sensitive, 'near-market' data. We will mitigate this concern by consulting with Siemens, one of our main commercial consulting partners, so that mechanisms are put in place by our Security Analyst during the development of our framework that ensure we meet their requirements with regard to the security and long-term management of such data.
Resistance to cultural change among academic	3	3	9	For the duration of this pilot project, we do not anticipate

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staff				<p>this being a significant risk as the project user-base is clearly defined and a firm commitment from all levels of research staff has been given. However, our aim is to demonstrate the value of the project across the university, particularly among STEM subjects to begin with. Long-term, a lack of engagement among staff is a risk, which we intend to mitigate by securing high-level support from the Heads of Colleges and Deans, as well as the PVC of Research, who is the Project Director. Institutional change does take time and we are not expecting significant cultural change across the institution within the scope of this project (18 months). We have experience rolling out the Institutional Repository and understand the methods of promoting take up of a new technology. Our work on producing guidance, training workshops and a programme of support of staff will also help mitigate this risk.</p>
Lack of support from Snr. Faculty staff	1	3	3	<p>This is very unlikely and within the confines of this pilot project, we have no concerns here. However, lack of support from other Snr. Staff such as those on the Research and Enterprise Committee and in other Colleges, although unlikely, would present long-term problems in the take up of the project outputs. We will mitigate this by regularly reporting to the Research and Enterprise Committee so that they feel they have a stake in the project, and will engage Research Directors from across the Colleges who are advocates for improvements to the research culture of the university and can help promote the role of Orbital in improving the university's 'Virtual Research Environment'.</p>
Intractable concerns around legal issues	2	2	4	<p>Although unlikely, this may prove to be an issue given the commercial nature of research</p>

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				that our Engineering staff undertake. However, the greater risk lies in developing a rights management framework that is suited to the various types of data we expect to manage with Orbital. We will mitigate this risk by working closely with our IP Manager, who is a member of the project Steering Group and seek advice from JISC and other universities participating in the MRD Programme.
Technical	2	3	6	We have worked on a number of previous projects, which has given us confidence in our proposed approach, but there are still areas specific to the domain of research data management, which we need to investigate more thoroughly. Through close and regular engagement with the JISC community as well as undertaking formal evaluations involving the ERIM project and DCC, we hope to receive valuable peer-review from established experts in this domain. From the point of view of our ICT systems, many of the technological and related cultural changes (e.g. the use of No-SQL rather than relational databases) are being worked through and positively demonstrated in our work on Total Recall/My Calendar and Jerome.
External suppliers	1	1	1	There are currently no external suppliers to the project. It may be that we decide to buy in third-party Certification, but this does not present a significant risk to the project.

### **1.11 Anticipated Technical Approach**

Subject to our requirements analysis, we anticipate re-using a number of technologies we have implemented in past JISC-funded projects, including MongoDB, a database used by companies such as Craig's List, FourSquare, the New York Times, the Guardian and LexisNexis. A document-oriented 'NoSQL' database such as MongoDB, offers us flexibility in that it will accept any data object (e.g. tabular data, survey results, images) without the need to develop a schema beforehand. In our experience, MongoDB, combined with the Sphinx search engine and Memcache, is also extremely

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fast<sup>18</sup> and allows us to develop simple, attractive APIs upon which we can expose to the Orbital discovery tool (alongside bibliographic data from our Library catalogue and records from our institutional repository) and make this data available via access-controlled APIs on <http://data.lincoln.ac.uk>. In terms of long-term management and preservation, MongoDB also offers the benefit of being 'schema-less' so that data doesn't become fixed in a schema that could have to undergo several changes during its lifetime.<sup>19</sup> Overall, our approach will be to develop a set of flexible, data-driven web services rather than a single application.

Initial access to the data will be licensed-based and where restricted, access will be token-based using the open source OAuth 2.0 Single-Sign-On framework that we developed for the Total Recall project.<sup>20</sup> This approach is extensible and allows us to easily integrate with SAML and Shibboleth-based applications. Based on past experience, we anticipate being able to offer fine-grained access to individual people, both internal and external to the university where necessary, providing access to individual datasets or portions of data-sets (e.g. specific rows/columns) through APIs or a web user-interface. The ingest of data could be enabled through the provision of a web user-interface, polling networked storage drives, and RESTful APIs for the import of common data formats such as CSV, XML, JSON and SQL, with an option to use the SWORD2 protocol for publishing to the data store. We also expect to use <http://lincn.eu>, our URL shortener and link proxy, which enables us to gather real-time analytics. We will publish documented source code for this project available under an open source license (e.g. GPL3 or BSD-style) early in the project roadmap, inviting peer-review by other developers.

Further consideration will need to be given to:

1. The ability to register the existence of and/or ingest externally hosted data (i.e. held by research and commercial partners)
2. The technical requirements for automatically capturing in real-time large sets of experimental data from various domain specific software
3. The requisite procedure for ethical checks (e.g. data protection, commercial sensitivity). A robust method of rights management which recognises the various IP interests and contracts around the use of Engineering data
4. Curatorial functions, such as cataloguing and disposal procedures including long-term preservation of access through integration with the Institutional Repository
5. A framework for ensuring the preservation of data and associated metadata (e.g. OAIS Information model)
6. Certification for data security, meeting commercial partners' requirements.

Although the Orbital project places emphasis on the handling of third-party and commercially sensitive data, our approach to authentication, rights management and granular access controls will ensure that all data that is available or mandated for public and open access, will be made easily accessible through a public web interface and through APIs documented at <http://data.lincoln.ac.uk/documentation.html>

## 1.12 Standards

Name of standard or specification	Version	Notes
HTML	5	
CSS	3	
PHP	5	
Javascript		
XML	1	
OAuth	2	

<sup>18</sup> <http://jerome.blogs.lincoln.ac.uk/2010/07/23/engage-ludicrous-speed/>

<sup>19</sup> <http://blog.mongodb.org/post/1200539426/archiving-a-good-mongodb-use-case>

<sup>20</sup> <https://github.com/alexbilbie/CodeIgniter-OAuth-2.0-Server>

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JSON		
SSL		
HTTP		

### 1.13 Intellectual Property Rights

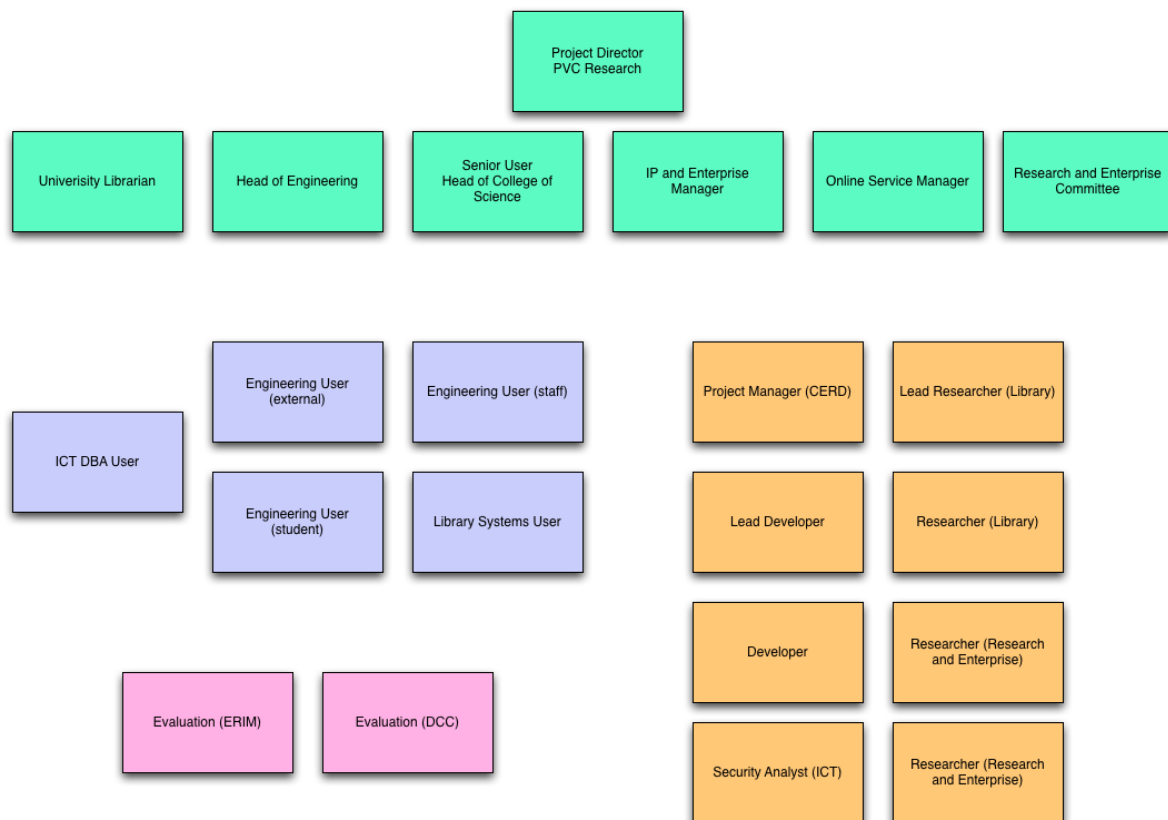
All project documentation, policy documents and training materials will be made available under a CC-BY license. Code will be licensed under an open source license and we will seek advice from OSSWatch on this matter. Data managed by the pilot infrastructure will be subject to copyright and licensing specific to the dataset, although we will seek to ensure some publicly accessible data is available to demonstrate the functionality of the web interface and APIs.

## 2 Project Resources

### 2.1 Project Partners

We do not have any project partners. However, we do have a commercial consulting user on the project, from Siemens (see below).

### 2.2 Project Management



#### Steering Group

Project Director: Prof. Paul Stewart (PVC Research, Prof. of Mechanical Engineering)

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Senior User: Prof. Andrew Hunter (Head of the College of Sciences)  
Dr. Jill Stewart, Acting Head of the School of Engineering  
Ian Snowley, University Librarian  
Dr. James Murray, IP & Academic Enterprise Manager  
Tim Simmonds, Online Services Manager

Also reporting to the university Research and Enterprise Committee, comprising the Research Directors of each School.

### Project Team

Project Manager: Joss Winn, Centre for Educational Research and Development  
Lead Researcher: Paul Stainthorp, Library  
Lead Developer: Nick Jackson (appointed 10/2011)  
Developer: To be appointed 03/2012  
Researcher: David Young, Research and Enterprise Office  
Researcher: Annalisa Jones, Research and Enterprise Office  
Researcher: Bev Jones, Library  
Security Analyst: Mark Smith, ICT

### Users

Library Systems: Chris Leach  
Engineering: Prof. Chris Bingham  
Engineering: PhD student  
Engineering (external): Stuart Watson  
ICT (data team): Lee Mitchell

### Evaluation

Dr. Mansur Darlington (ERIM Project)  
Martin Donnelly (DCC)

## 2.3 Project Roles

Team Member Name	Role	Contact Details	Days per week to be spent on the project
Joss Winn	Project Manager	<a href="mailto:jwinn@lincoln.ac.uk">jwinn@lincoln.ac.uk</a>	0.3FTE
Paul Stainthorp	Lead Researcher	<a href="mailto:pstainthorp@lincoln.ac.uk">pstainthorp@lincoln.ac.uk</a>	0.3FTE
Nick Jackson	Lead Developer	<a href="mailto:nijackson@lincoln.ac.uk">nijackson@lincoln.ac.uk</a>	1.0FTE
To be appointed	Developer		1.0FTE
David Young	Researcher	<a href="mailto:dyoung@lincoln.ac.uk">dyoung@lincoln.ac.uk</a>	0.05FTE
Annalisa Jones	Researcher	<a href="mailto:anjones@lincoln.ac.uk">anjones@lincoln.ac.uk</a>	0.05FTE
Bev Jones	Researcher	<a href="mailto:bjones@lincoln.ac.uk">bjones@lincoln.ac.uk</a>	0.05FTE
Mark Smith	Security Analyst	<a href="mailto:mnsmith@lincoln.ac.uk">mnsmith@lincoln.ac.uk</a>	0.025FTE
Chris Leach	User - Library	<a href="mailto:cleach@lincoln.ac.uk">cleach@lincoln.ac.uk</a>	0.05FTE
Chris Bingham	User - Engineering	<a href="mailto:cbingham@lincoln.ac.uk">cbingham@lincoln.ac.uk</a>	0.05FTE
To be determined	User (PhD) - Engineering		
Stuart Watson	User – Engineering	<a href="mailto:watson.stuart@siemens.com">watson.stuart@siemens.com</a>	0.05FTE
Lee Mitchel	User – ICT (DBA)	<a href="mailto:lmitchell@lincoln.ac.uk">lmitchell@lincoln.ac.uk</a>	0.05FTE
Tim Simmonds	ICT liason	<a href="mailto:tsimmonds@lincoln.ac.uk">tsimmonds@lincoln.ac.uk</a>	0.05FTE
Mansur Darlington	Evaluator	<a href="mailto:ensmjd@bath.ac.uk">ensmjd@bath.ac.uk</a>	4 days
Martin Donnelly	Evaluator	<a href="mailto:martin.donnelly@ed.ac.uk">martin.donnelly@ed.ac.uk</a>	4 days

Joss Winn: **Project Manager**. Joss works in the Centre for Educational Research and Development and has been Project Manager on a number of JISC-funded projects (JISCPress, ChemistryFM, Total Recal, Linking You). He will manage the Project and report

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to JISC, the Steering Group and other Stakeholders. Joss has worked in digital archiving for almost ten years. He joined the University to work on the implementation of the Institutional Repository. Prior to this, he was the Audiovisual Archivist for Amnesty International and prior to that, worked as a Moving Image Archivist for the National Film and Television Archive. In 2006, he attended the ULCC's week-long Digital Preservation Training Programme.<sup>21</sup>

Paul Stainthorp: **Lead researcher**. Paul is Electronic Resources Librarian and manages all of the University's electronic library resources and systems including the Lincoln open-access repository (EPrints) and resource discovery tools. In 2011, he project-managed the Jerome project and Lincoln's contribution to the JISC-funded LIDP project (with the University of Huddersfield). Paul will lead on the literature review and examine existing guidance and practice, leading the Requirements Analysis and contributing to the Implementation Plan, preservation and access requirements, the impact of technology, and the project evaluation.

Nick Jackson: **Lead developer**. Nick has worked on a number of university-wide services, including My Calendar, Jerome, Posters,<sup>22</sup> Get Satisfaction and Zen Desk. He will act as Systems architect and lead programmer on the Orbital project.

A 1.0FTE **Developer** will join the Lead Developer after six months to assist on the technical development of the implementation plan.

David Young: **Researcher**. David is the Senior Research Facilitator in the University's Research Office. He will investigate and advise on integration with an EPrints-based Current Research Information System (CRIS).<sup>23</sup> He will also assist with the preparation of supporting documentation, training materials and policy development.

Annalisa Jones: **Researcher**. Annalisa is a Research Facilitator in the University's Research Office. She will assist with the preparation of supporting documentation, training materials and policy development.

Bev Jones: **Researcher** (Preservation and metadata). Bev is a cataloguer for our EPrints Institutional Repository and will assist Paul in the literature review, requirements analysis and implementation plan.

Chris Leach: **User**. Chris is the university's Systems Librarian and will act as a technical user on the project to ensure that the infrastructure developed is appropriately integrated and embedded in the Library's overall provision.

Prof. Chris Bingham: **User**. Chris is Prof. of Energy Conversion and will act as the principle School of Engineering user in the project and as a liaison with other Engineering staff and research students. He works on a wide range of funded research projects and works closely with Stuart Watson on STA-RMS. A PhD student will act as a **student user** from Engineering.

Lee Mitchell: **User**. Lee is a Database Administrator at the university and will act as a technical user on the Orbital project, ensuring that the technical outputs of the project are embedded into the university services and cascading support and training to ICT colleagues.

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<sup>21</sup> Joss blogged about his experience here: <http://digitalpreservation.wordpress.com/>

<sup>22</sup> <http://posters.lincoln.ac.uk/all>

<sup>23</sup> <http://www.rsp.ac.uk/events/repositories-and-cris-systems-working-smartly-together/>



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Mark Smith: **Security Analyst**. Mark is the University's Information Security Manager and a Certified Information Systems Security Professional (CISSP). Mark will ensure that the project implementation meets all requirements in terms of security and liaise with Siemens' IT staff on the transport and storage of external partner's data. He will also ensure the research data management infrastructure meets any external certification that may be required.

## Steering Group

Prof. Paul Stewart, **Project Sponsor**, PVC for Research and Founding Head of the School of Engineering; Prof. Andrew Hunter, **Senior User**, Head of the College of Science, Prof. of Computer Vision and Artificial Intelligence; Dr. Jill Stewart, Acting Head of the School of Engineering; Ian Snowley, University Librarian; Dr. James Murray, IP & Academic Enterprise Manager; Tim Simmonds, Online Service Manager; The university Research Committee, comprising the Research Directors of each School. The Project Manager will report to the Steering Group on at least a quarterly basis.

## External Consultancy

Stuart Watson (Siemens): **User**. Stuart is Head of Remote Monitoring and Diagnostics at Siemens, Lincoln, and a partner on a number of research projects with Engineers at the University of Lincoln. He also leads the development of Siemens' Turbo-machinery Applications Remote Monitoring System (STA-RMS) for the extraction and analysis of operational and maintenance data from their turbines. He will act as a consulting commercial user to the project and as a liaison with other Siemens staff.

Dr. Mansur Darlington is a Research Officer in the Design Information & Knowledge Group of the Engineering I/d/MRC at the University of Bath. He was a Principal Investigator on the JISC-funded ERIM project and will act as an external **evaluator** of the Orbital project during the analysis and implementation planning stage.

Martin Donnelly, Curation Research Officer at the Digital Curation Centre. He will act as an external **evaluator** of the Orbital project during the development and implementation stage. We are keen to ensure API interoperability with the DMP Online tool where possible and will liaise with Martin as the APIs are developed. The DCC will spend less than five days on this activity and therefore will contribute this to the project from their core funding.

## 2.4 Programme Support

# 3 Detailed Project Planning

## 3.1 Evaluation Plan

Timing	Factor to Evaluate	Questions to Address	Method(s)	Measure of Success
03/11/2011	Project Initiation	Is the project well-established? Has recruitment been successful? Has the website been set up? Do team members understand the	Feedback from Project Team. Feedback from Steering Group. Feedback from JISC.	The project is on schedule and the team is actively engaged. Recruitment has been successful. The website is fully

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		purpose of the project and their role? Have we satisfied our funder's initial requirements? Is there a roadmap for the project that people are aware of? Has the Steering Group approved the Project Plan?		established and being used. The Steering Group is satisfied with progress. JISC is satisfied with progress.
On-going	Community Engagement	Are we clear about who our community is composed of? Are we reaching them effectively? How are they engaging with our work? Are we employing effective and appropriate methods of engagement (e.g. conferences, journals, workshops, seminars, website, social media, discussion groups, forums). Are we able to measure the impact of our engagement? What is the project learning from this engagement?	Conference participation, journal paper submissions, workshops, seminars, an active website, use of social media, active participation in discussion groups and other forums	Web analytics, social media engagement, conference attendance, discussion list contributions, journal paper submissions, knowledge exchanges/transfers.
02/2012	Literature Review	Has the review been extensive? Has the review been peer-reviewed by other team members? Has the review been peer-reviewed by our community and external stakeholders? Does the review contribute to the Implementation Plan in a practical, focused way? Has the review been conducted in a scholarly way? Is the methodology clear? Can it be published as a piece of research? Does the review provide clear evidence for our approach to the project/Implementation Plan? Have we engaged with and sought the advice of the MRD community?	Review by Project Team. Publish on project website. Submit to relevant newsletter/journal. Solicit feedback from Programme Manager and other experienced MRD community members (e.g. DCC).	Feedback from reviewers. A useful contribution to the Implementation Plan and overall project direction and learning experience.

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		What has the project learned from this work?		
On-going	Gather user requirements	Are we engaging our users effectively? What stake do they have in the project? Are we engaging with them regularly/iteratively? Have we identified 'proxy users'? How are we gathering our 'user stories'? How does our development cycle reflect our engagement with our users? Are we flexible/agile? Are we open to changing requirements? Are we employing a variety of methods to gather user requirements (interviews, questionnaires, observation, workshops, etc.)? What is the project learning from this work?	Interviews, questionnaires, surveys, workshops, informal meetings.	Active contribution from users. Useful contributions from users. Comprehensive number of user stories to base development on. A well-formed requirements analysis with lots of user input.
03/2012	Create initial requirements analysis	Do we have a clear basis from which to start development? Are the user stories effectively represented in our analysis? Does the analysis identify the types/category of user? Does the analysis identify methods of acceptance testing? Does the analysis identify our constraints? Does the analysis estimate the work involved (i.e. 'story points')? What is the project learning from this work?	Synthesise user stories and literature review.	The creation of a useful and thorough requirements analysis that can form part of the Implementation Plan.
05/2012	Assess data sources	What are the common attributes of the data sources? What are the common methods by which we access the data sources? What issues/challenges have been found? How can they be resolved? What are the	Synthesise evidence from user stories and literature review.	The creation of a useful and thorough assessment that can form part of the Implementation Plan.

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		security/privacy/IP implications? What is the project learning from this work?		
02/2012	Evaluation of standards and technologies	How have we demonstrated that the technologies and standards we intend to use are appropriate? What are the strengths and weaknesses of our anticipated choice of technologies and standards? What evidence can we show which justifies our choice of technologies and standards? Have we discussed our choice of technologies and standards with our community and external evaluators (ERIM/DCC)? What examples can we give where our recommended technologies and standards are being similarly used elsewhere? What is the project learning from this work?	A study of the available technologies and standards, drawing from the Literature Review, Requirements Analysis and data assessment where appropriate. Review by external evaluators (ERIM/DCC).	The creation of a useful and thorough evaluation of technologies and standards that can form part of the Implementation Plan.
04/2012	Create Implementation Plan	Is the Implementation Plan comprehensive? Does it have the agreement of the project team? Has it been signed off by the Steering Group? Does it take into account the assumptions, constraints, risks and objectives of the project? Is there a clear roadmap? Is it flexible to change with changing circumstances/user requirements, etc.? Is it a useful document for external Stakeholders? Are the concerns/interests of all Stakeholders addressed? Is it sustainable beyond the life of the project? Are the available resources	Synthesise the work done on user requirements, assessment of data sources, technical study and literature review. Evaluation by external Stakeholders and evaluators (ERIM/DCC/JISC).	Approval by Steering Group.

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		sufficient to deliver the Plan? What is the project learning from this work?		
01/2013	Develop policy	Have all appropriate Stakeholders been engaged in the development of the Policy? Has the Policy been signed off by the Steering Group? Is the Policy relevant to all university research? Does it apply to all research staff and students? Is the Policy useful? Has the Policy been reviewed by external evaluators (DCC)?	Review existing policies developed by other institutions. Consult with DCC. Work with project team to draft policy that will be approved by the Research and Enterprise Committee and PVC Research.	Approval by the Research and Enterprise Committee and PVC Research.
On-going	Technical development	Is development going according to the Implementation Plan? Do we have the right tools to be productive? Are the development cycles on track? Are users being regularly engaged? Are we responding to user requirements in an agile way? Are development staff co-operating and working well together? Is the workspace suited to the development work? Are development staff feeling energised? Are development staff clear about their responsibilities? Is code being well documented? Is code being licensed and published for public review? Is code being thoroughly tested? Are we deploying regularly and incrementally? Are we integrating our work with existing services where appropriate? Are we planning for future development? Do we need any formal Certification for our work? What is the project learning from	Employ an agile method to software development. Regular face-to-face communication within team to check on progress. Regular deployment of working code for user feedback. Publish open source code for review by other developers. Publish blog posts which discusses the development and solicit comment.	Working code. Positive user feedback. Achieving roadmap set out in Implementation Plan.

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		this work?		
03/2013	Develop training materials and workshops	Have users been engaged in the development of the materials/workshops? Are all types of users accounted for? Have we sought advice from other Professional Services (e.g. HR)? Are the materials suitable for licensing as OERs? Is the programme of support integrated into the overall institutional staff development provision? Is support adequately resourced?	Engagement with users. Review by project team. Review by HR colleagues.	Well documented, useful materials for all types of users of Orbital. A planned training programme for research staff and students.
03/2013	Develop Business Plan	Does the Business Plan accurately reflect the achievements of the Project? Does the Plan take account of the current institutional environment? Is the Plan realistic? Has the Plan been approved by the Steering Group? Has the Project Team been properly consulted during the writing of the Plan? Does the Plan take into account the MRD environment in the Sector? Does the Business Plan take into account any existing policy and initiatives in the HE sector? Are there initiatives already in place that support the Plan?	Write a Business Plan, based on the experience of running the project and delivering its objectives. Gain approval of Business Plan from Steering Group.	Acceptance of Business Plan by Research and Enterprise Committee. Acceptance of Business Plan by PVC Research. Acceptance of Business Plan by Executive Board.

### 3.2 Quality Assurance

Output / Outcome Name	Implementation Plan	
When will QA be carried out?	Who will carry out the QA work?	What QA methods / measures will be used?
03/2012	Lead Researcher/ Lead Developer/ Project Manager	Synthesises external evidence-based sources from the Literature Review; based on documented user requirements; based on assessment of data sources, technologies and standards; subject to external evaluator's review; uses jargon free language, available in

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		accessible formats; subject to Steering Group approval.
<b>Output / Outcome Name</b>	Development and implementation of an integrated pilot OAIS technical infrastructure for research data	
<b>When will QA be carried out?</b>	<b>Who will carry out the QA work?</b>	<b>What QA methods / measures will be used?</b>
On-going	Lead Researcher/ Lead Developer/ Project Manager	Apply well understood agile project management methods (see 1.4 Overall Approach). Apply the principles behind Agile software development ( <a href="http://agilemanifesto.org/principles.html">http://agilemanifesto.org/principles.html</a> ), including regular unit testing. Maintain public source code, issue tracker and mailing list.
<b>Output / Outcome Name</b>	An institutional data management policy	
<b>When will QA be carried out?</b>	<b>Who will carry out the QA work?</b>	<b>What QA methods / measures will be used?</b>
01/2013	Lead Researcher/Project Manager	A review of existing data management policies in use across the sector. Solicit feedback from research staff. Evaluation by DCC. Approval by Research and Enterprise Committee. Approval by Steering Group.
<b>Output / Outcome Name</b>	Support/guidance/training	
<b>When will QA be carried out?</b>	<b>Who will carry out the QA work?</b>	<b>What QA methods / measures will be used?</b>
03/2013	Lead Researcher/Project Manager	Review existing data management support programmes created elsewhere. Solicit user feedback. Consultation with HR/Staff Development colleagues. Uses jargon free language. Is licensed as OER and subject to review and modification. Produced in consultation with DCC.

### 3.3 Dissemination Plan

Timing	Dissemination Activity	Audience	Purpose	Key Message
On-going	Blogging	Public/External and Internal Stakeholders/Project Team/Users	Provide regular updates and reflections on the Orbital project.	To offer general information about the progress of the project.
On-going	Public Project Management	Public/External and Internal Stakeholders/Project Team/Users	Offer a transparent view of the running of the project and its outputs at all stages of production. (i.e. source code via Github, task management via Pivotal Tracker, user feedback via	We welcome peer-review and engagement at any time and recognise that we have much to learn from others.

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			Get Satisfaction).	
On-going	User engagement	Orbital pilot users	To ensure that our users remain at the core of the project and committed stakeholders. So as to receive useful and representative requirements for the project.	Users are at the heart of the project.
11/2011 & 04/2013	Press Releases	Media organisations/public	To promote the innovative work of the university and the skills and experience of the staff.	The University of Lincoln is committed to developing and maintaining an innovative, productive and useful research environment.
10/2011 & 04/2013	Articles in Staff Magazine	University of Lincoln staff	To inform all staff at the university of Lincoln about the project and seek their feedback.	We are committed to supporting research and researchers at the university.
On-going	MRD networking	MRD community	To seek reciprocal peer-review and collaboration. The proposed use of some of the technologies we have chosen (MongoDB, Sphinx, OAuth, HTML5), are quite new to the HE sector and should provide some valuable case studies for other institutions.	We are doing innovative work that could be of value to you.
04/2012 & 10/2012	Project reports	MRD community/research data management professionals	To inform the community about the work we are doing and seek peer-review and opportunities for collaboration.	A summary of the project to-date.
On-going	Conference/journal paper(s)	MRD community/research data management professionals	To seek reciprocal peer-review and collaboration.	Our Research and Development is of scholarly interest and undertaken with rigour.



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04/2013	Reflective video	MRD community/public	As a way to reflect informally on lessons learned.	"What we learned in a nutshell."
11/2012	Workshop	University of Lincoln staff	To allow staff to learn more about the project outputs and how they might help in rolling out the system to other research disciplines.	We value your interest and participation in the project.

### 3.4 Exit and Embedding Plans

Project Outputs/Outcomes	Action for Take-up & Embedding	Action for Exit
Literature Review	Dissemination through project website and JISC MRD mailing list. Synthesised into Implementation Plan.	CC-BY licensed review, available from our Institutional Repository, linked to via our project website.
Implementation Plan	Dissemination through project website and JISC MRD mailing list. The basis for development of Orbital system.	CC-BY licensed review, available from our Institutional Repository, linked to via our project website.
Development and implementation of an integrated pilot OAIS technical infrastructure for research data	On-going user engagement. Development of support/guidance/training for users. Development of institutional policy, supporting the use of the infrastructure. Oversight and approval by Research and Enterprise Committee (including Faculty Research Directors). Oversight and approval by PVC for Research.	Documented open source code, available via our public source code repository. Maintenance of the project website for 3+ years, documenting the process of implementation.
An institutional data management policy	Development of policy by key institutional staff, including research staff and IP and Academic Enterprise Manager. Oversight and approval by Research and Enterprise Committee (including Faculty Research Directors). Oversight and approval by PVC for Research.	CC-BY licensed policy document. Available from our Institutional Repository via project website and Orbital web service.
Support/guidance/training	Development of materials and programme by Research and Enterprise Office, working with Staff Development colleagues and Project Team. Working with key staff across the university, including Faculty Research Directors.	CC-BY licensed supporting materials, user documentation, workshop plan and resources. Available from our Institutional Repository via project website and Orbital web service.

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### 3.5 Sustainability Plans

We recognise the set of Principles developed by the Research Councils UK<sup>24</sup> and are committed to developing an institutional response to this important aspect of university governance. Similarly, we understand that “with the increase in ‘Big Science’, the proliferation of multi-disciplinary research projects and rapid changes in technology”, there is a greater-than-ever need for a robust approach to managing research data.<sup>25</sup>

The proposed project receives the full support of the University’s PVC for Research, and concords with the University’s strategic aim for all academic staff to engage in research and “to develop clearer and more powerful ways of communicating our research.”<sup>26</sup> We also understand there is a Business Case for making our research data available in a managed and accessible way and will produce a number of indicative use-cases to inform this document.

Project Outputs	Why Sustainable	Scenarios for Taking Forward	Issues to Address
Development and implementation of an integrated pilot OAIS technical infrastructure for research data	This is the principle output of our pilot project and intended to be rolled out across the university following the completion of the project. Throughout the project we will take measures to ensure that we develop a set of services that reflect our user requirements and are supported by institutional policy, user documentation and training.	Develop Business Case for roll out of Orbital across the institution.	Ensure that the local developer skills to maintain and develop Orbital are retained. Ensure that the benefits of using Orbital are clear to research staff. Measure impact of using and maintaining Orbital wherever possible.

## Appendices

### Appendix A. Project Budget

### Appendix B. Workpackages

<sup>24</sup> <http://www.rcuk.ac.uk/research/Pages/DataPolicy.aspx>

<sup>25</sup> Alexogiannopoulos, E., McKenney, S. and Pickton, M. (2010) *Research data management project: a DAF investigation of research data management practices*. Northampton: University of Northampton. <http://nectar.northampton.ac.uk/2736/>

<sup>26</sup> University of Lincoln Draft Strategic Plan 2011-2016 (Internal access only).