**Outline Project Description**

The Orbital project will build on recent JISC-funded work at the University of Lincoln to develop a university 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 intend to meet the requirements of this commercially sensitive research environment as well as to provide the facility to expose datasets through a discovery tool and public APIs made available on our existing http://data.lincoln.ac.uk service.

**1. Our proposal**

1.1 The Orbital project will develop, test and implement a state-of-the-art research data management system, which meets both internal and external partner organisation's requirements in terms of robustness and security. We will 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. A personalised web interface for specific researcher profiles and a public discovery interface will also be developed.

1.2 This technical infrastructure will be supported by the development of requisite institutional policy and training and any appropriate certification. The project Director will be Prof. Paul Stewart (PVC Research, Founding Head of the School of Engineering). The Snr. User will be Prof. Andrew Hunter, Head of the College of Sciences. 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.

## 2. Context

2.1 The University of Lincoln is a very successful 'new university', with a rapidly rising international research profile, having increased our QR funding by 628% following the 2008 RAE. Dynamic growth both in research income and the number of research outputs from academic staff has created a thriving, developing research culture at Lincoln. In the 2008 RAE, most of the 14 Units of Assessment entered across the University had elements of world leading expertise and all were recognised as of national/international stature.[1]

2.2 Since the 2008 RAE, working in partnership with Siemens, the University has established the first School of Engineering in the UK for over 20 years, with a £7m purpose-built School due to open in September 2011, accommodating a centre of excellence for Industrial Research and Development.[2] The expertise of the School is concentrated in the core disciplines of Mechanical Engineering, Combustion Engineering, Electrical and Electronic Engineering, Control and Systems

Engineering, and Aeronautical and Automotive Engineering. The School is home to three research groups[3] and the EPSRC Airport Energy Technologies Network (AETN).[4]

2.3 The School of Engineering has been chosen as the pilot user of this project because:

1. It is a research-intensive School where all academic staff are research active allowing the project team to reach users across the School, including post-graduate students.
2. The School of Engineering is the largest contributor to our Institutional Repository, showing a willingness to use services provided by the institution to disseminate their work.[5]
3. The School's research activity is often 'near market', offering us certain key challenges relating to security, confidentiality, IPR management, real-time ingest and sharing of data between both academic and commercial research partners.
4. Both the School of Engineering and Siemens have acknowledged a need to improve the management and preservation of their research data.
5. In meeting these challenges through the development of various policy, a programme of staff support, personalised web services and a robust technical infrastructure, many other disciplines will benefit, not least in the College of Sciences but also across the institution.
6. Project Director, Paul Stewart, is both PVC for Research at Lincoln, and Professor of Control Engineering, thus providing the project with high-level oversight and endorsement as well as having an active interest as a primary user of the proposed project outcomes.
7. Some analysis of the requirements for engineering research data has been completed as part of the JISC-funded ERIM project. The Orbital project will quickly leverage this work.

## 3. Building on recent innovation

3.1 This project will build directly on the following previous JISC-funded projects, where we have gained experience in developing and implementing university-wide data-driven services.

3.2 In 2007-8, we undertook the **LIROLEM** project, a 'start-up' project, which led to the creation of our EPrints Institutional Repository.[6] 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).[7] In September 2010, we formally mandated[8] 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.[9]

3.3 The **Total Recal** project[10] 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 September 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**.

3.4 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 resource collections into Nucleus, which provides data to Sphinx, a single searchable index for the Jerome discovery tool.[11] As well as developing a modern, scalable and very fast, personalised library discovery tool,[12] 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

3.5 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.[13] 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[14] 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.[15]
5. The development of http://data.lincoln.ac.uk, which provides **documented APIs** to our data, with inherent authentication and permissions management.[16] 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.

3.6 Having developed this infrastructure for previous projects, we propose extending our experience to the domain of research data management. 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.[17]

**4. Methodology**

4.1 We use an **agile** approach to developing our web services, relying on regular, active input from users, working iteratively on short 1-2 week code sprints. To support this methodology, we use a tool-set incorporating Codeigniter, a PHP development framework, Github[18], a distributed source-code repository and Pivotal Tracker[19], 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[20] and Zen Desk for long-term support.[21] 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.

4.2 We will use other collaborative software such as our project blog and Google Docs, which is in widespread use at the university for managing all of our BS25999 Business Continuity documentation, to produce the requisite requirements analysis report, implementation plans, policy documents, support materials and business plan. We will ensure that draft documents are carefully considered by our Steering Group.

High-level Workplan

| **Work Package/Month** | **O** | **N** | **D** | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** | **J** | **F** | **M** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1: Project Initiation | X | | | | | | | | | | | | | | | | | |
| 2: Community Engagement | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 3: Recruitment | X | X | X | X | X | X | | | | | | | | | | | | |
| 4: Literature review | | X | X | X | X | | | | | | | | | | | | | |
| 5: Gather user requirements | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 6: Policy development | | | | | X | X | X | X | X | X | X | X | X | X | X | X | | |
| 7: Technical development | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 8: Assess data sources | | | X | X | X | X | X | X | | | | | | | | | | |
| 9: Evaluation of standards and technologies | | X | X | X | X | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10: Develop training materials and workshops | | | | | | | | | | | | | X | X | X | X | X |
| 11: Documentation and Use Cases | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 12: Develop Business Plan | | | | | | | | | | | | | X | X | X | X | X |
| 13: Project Evaluation | | | | | | X | | | | | | X | | | | | | X |
| 14: Dissemination | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 15: Project Close | | | | | | | | | | | | | | | | | | X |

4.3 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 is 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.

4.4 We will recruit two developers and anticipate that the Lead Developer post will be filled internally within the first month of the project. A further developer will join them in month seven.

4.5 Dissemination will be both informal and formal. Community engagement will be ongoing through the project through our project blog and Twitter accounts. We have demonstrated in past projects that we maintain active project websites and use social media effectively. More formal dissemination will take place through the use of Press Releases, workshops, case studies, conference and journal papers.

4.6 Formal evaluation of the project will take place at six-month intervals and we have contacted Dr. Mansur Darlington of the ERIM project[22] and Martin Donnelly at the Digital Curation Centre, who have agreed to help us undertake this.

4.7 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.

**5. Anticipated Technical Approach**

5.1 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 fast[23] and allows us to develop simple, attractive APIs upon which we can expose to the Jerome 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.[24] Overall, our approach will be to develop a set of flexible, data-driven web services rather than a single application.

5.2 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 Recal project.[25] 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://lncn.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.

5.3 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.

5.4 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

**6. Benefits**

6.1 We believe this is a distinctive bid that clearly re-uses and builds on previous JISC-funded projects. It offers a number of benefits to project stakeholders:

6.2 **To students and academic staff**: Researchers will benefit from a state-of-the-art research data management infrastructure with supporting training, documentation and policy. Through the re-use and integration with other services such as the Institutional Repository, My Calendar and the Jerome discovery tool, researchers will enjoy a richer, more integrated research environment that helps foster cross-disciplinary collaboration internal and external to the university. Researchers and their partners will be assured that their data is stored and transported securely, conforming to third-party certification where appropriate. A web-based service will provide tools for accessing, querying and downloading the data where appropriate.

6.3 **To technical staff**: An opportunity to further learn, develop and embed recently adopted technologies (MongoDB, OAuth, HTML5, etc.) and provide appropriate training to staff outside the immediate project team resulting in broader staff development opportunities. The prestige of receiving funding for the project would provide us with further leverage to introduce new ideas, technologies and practices in our day-to-day work. We recognise the need for continued innovation in our online services and welcome the opportunity for peer-review that the community engagement and dissemination requirements of externally funded projects bring to our work.

6.4 **To the University of Lincoln***:* As with our Institutional Repository project, the Orbital project will provide the opportunity to both develop the requisite policy and technical infrastructure for managing research data at the university as well as lead to institutional change in terms of researcher practices and broadening the skills and experience of our ICT staff. Whereas some of our previous JISC-funded projects have focused on ‘rapid innovation’, the remit of the Orbital project is much broader and with high-level endorsement will lead to the long-term adoption of new practices, policy and technologies. The Orbital project will also provide the university with a clearer framework for managing research data, making it more straightforward to provide assurances to funders of our research, such as the Research Councils.

6.5 **To the university sector**: We aim to demonstrate efficiency through the re-use of previous JISC-funded projects at the University and offer an assurance that the project will lead to a service that is used. We will also re-use other funded work such as the ERIM, IDMB[26] and DPM-ESRC[27] projects, as well as adapting the training materials produced under the MRD programme.

6.6 **To the public**: Where appropriate, data will be publicly accessible from our http://data.lincoln.ac.uk service, possibly pre-empting the need for FOI requests and ensuring the upmost transparency with regards to our research processes.

Consumers of open data will benefit from attractive, well-documented APIs.

| 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 http://data.lincoln.ac.uk | Low |

**7. Deliverables**

1. A **requirements analysis** for a pilot research data management infrastructure. This will build on previous work undertaken in the MRD programme, such as ERIM, IDMB and DPM-ESRC projects, paying particular attention to the requirements of 'near-market' research undertaken by our School of Engineering.
2. **Implementation plans** for a pilot research data management infrastructure including a technical plan and a clear indication of the involvement of stakeholders including commercial partner users, Library administration staff and university researchers.
3. **Development and implementation** of a set of services, which re-use and develop our previous JISC-funded work as well as other initiatives (e.g. SWORD and DataCite DOIs).
4. **Documented open source licensed code** will be made available by the end of the project.
5. Development and implementation of **mechanisms for managing and transferring data**, including the use of MongoDB, OAuth, read/write RESTful APIs, SWORD2 interoperability, and integration with the administrative functions of EPrints.
6. **Policies and guidance** aimed at researchers, commercial partners, administrators and the Institution, covering the use and administration of an OAIS-style data archive. Where appropriate, we will re-use the work of previous MRD programme

outputs.

7. **Support**: User documentation, monthly and adhoc training workshops. Where appropriate, we will re-use the work of previous MRD programme outputs.
8. An **institutional data management policy**. This will be developed by the Project team, overseen by the Steering Group and proposed to the University's Research Committee.
9. A **Business Plan** to sustain the infrastructure, presented to the Executive Board.
10. We have made **contact with the DCC** about working with them as a consumer of new APIs for the DPM Online tool. Reciprocally, we have asked them to help evaluate our project at an appropriate time. (c. month 12).
11. Contribution to **JISC events** and at least one **conference/journal paper.**

**8. Risks**

8.1 Clearly there is a risk by *not* developing a technical infrastructure to manage our research data, supported by institutional policy, documentation and training opportunities (e.g. researcher dissatisfaction; the inability to further innovate because of the 'chilling' effect of out-of-date technology; the burden and exposure of poorly managed data e.g. 'climategate', loss of opportunity for the institution to demonstrate impact of its research). We feel these outweigh any risks internal to the project. Through work done so far, we are confident that we have sufficient skills and experience among team members to undertake each of the deliverables. The project has support from the most senior level of university management.

8.2 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 partners, so that mechanisms are put in place during the development of our framework that ensure we meet their requirements with regard to the security and long-term management of such data.

8.3 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.

8.4 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 Recal/My Calendar and Jerome.

**9. Sustainability**

9.1 We recognise the set of Principles developed by the Research Councils UK[28] 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.[29]

9.2 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.”[30] 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.

9.3 Our proposal is borne out of lessons learned from the JISC-funded Total ReCal, Jerome and Linking You[31] projects. We are clearly committed to developing and improving our research, teaching and learning environments and see our work on this project as integral to this commitment. The University can demonstrate that past JISC-funded projects have led to sustained services that continue to benefit our staff, students and the wider community.

9.4 We will engage in a number of ways to communicate with stakeholders throughout the project (blog, Twitter, conferences, case studies) so as to ensure that our work is widely known, understood and supported. All documentation and source code will be made available under appropriate open licenses, thus allowing for further scrutiny, re-use and improvement.

**10. IPR**

10.1 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.

**11. Engagement with the community**

11.1 Much of the Orbital project will take place in public channels with RSS feeds (Blog/Twitter/Github/Pivotal Tracker/Get Satisfaction). Stakeholders will be actively encouraged to offer feedback and participate in formal beta-testing.

11.2 General feedback will be solicited throughout the project via the blog and Twitter. User stories and feedback will be gathered in workpackage five and then iteratively throughout the project in workpackages two and 14. Public scrutiny of the code will be possible at any time via the public repository. Part of workpackage eleven will document the outcomes of the project on the blog. In previous JISC-funded projects, we have demonstrated very active engagement by working in this way. In addition, we will arrange for a press release to be issued at the start and end of the project, highlighting the objectives and achievements of the project respectively.

11.3 Early in the project, we will contact other institutions inside and outside the MRD Programme, which might be willing to offer 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.

11.4 At six and twelve months during the project, we will report on the evaluation exercises and seek wider feedback from the JISC community. Mid-way during the project, an article will be written for the Staff Magazine, to inform all staff at the university of Lincoln about the project and seek their feedback. At the end of the project, a workshop will be arranged for university staff in Lincoln and elsewhere, who wish to learn more about the project outputs and how they might help in rolling out the system to other research disciplines. We will also make a short video will be made where the project team discuss their work and the relevance of it to the wider HE community.

11.5 The project team present regularly on their work at different workshops and conferences and will continue to do so for the Orbital project. We will aim to present at least one paper at appropriate conferences (e.g. OR12, ICDE13, IDCC12), which will be submitted to an appropriate peer-reviewed journal. At least one member of the project team will attend the funding programme's meetings and conferences and share the work of the project.

**12. Project Team**

12.1 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 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.[32]

12.2 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.

12.3 **Lead developer.** This post will be recruited internally from our existing Online Services Team, which has worked on a number of university-wide services, including My Calendar, Jerome, Posters,[33] Get Satisfaction and Zen Desk. This person will act as Systems architect and lead programmer on the Orbital project. A further 1.0FTE **Developer** will join the Lead Developer after six months to assist on the technical development of the implementation plan. Again, this post may be filled internally from among current fixed term staff.

12.4 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).[34] He will also assist with the preparation of supporting documentation, training materials and policy development.

12.5 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.

12.6 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.

12.7 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.

12.8 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.

12.9 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.

12.10 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.

**13. Steering Group**

13.1 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.

**14. External Consultancy**

14.1 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.

14.2 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.

14.3 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.

---

[1] For more information, see http://lincoln.ac.uk/home/research/
[2] http://www.siemens.co.uk/en/news_press/index/news_archive/unioflincoln.htm
[3] IPEG http://lncn.eu/ux68 AICG http://lncn.eu/ap2 LEG http://lncn.eu/sv7
[4] AETN http://lncn.eu/gsx6
[5] http://eprints.lincoln.ac.uk/view/divisions/sch=5Feng/
[6] http://eprints.lincoln.ac.uk
[7] http://roar.eprints.org/1392/
[8] http://research.blogs.lincoln.ac.uk/2010/03/30/use-of-repository-to-become-universal-practice-at-lincoln/
[9] http://commons.lincoln.ac.uk/
[10] http://totalrecal.blogs.lincoln.ac.uk
[11] http://sphinxsearch.com/about/sphinx/
[12] http://jerome.library.lincoln.ac.uk/
[13] http://blog.totalrecal.org/2010/07/28/why-nosql/
[14] http://alexbilbie.blogs.lincoln.ac.uk/2010/04/06/auth-lincoln-ac-uk/
[15] http://alexbilbie.blogs.lincoln.ac.uk/2011/03/23/introducing-common-web-design-v3-0/
[16] http://blog.totalrecal.org/2010/11/26/this-isnt-your-grandmothers-api-permissions-control-layer/
[17] http://public.ccsds.org/sites/cwe/rids/Lists/CCSDS%206500P11/CCSDSAgency.aspx
[18] We maintain both private and public repositories on Github https://github.com/lncd
[19] e.g. see our public tracker for the Jerome project https://www.pivotaltracker.com/projects/250373
[20] http://wwh.lincoln.ac.uk/universityoflincoln
[21] https://support.lincoln.ac.uk/home
[22] http://www.jisc.ac.uk/whatwedo/programmes/mrd/rdmp/erim
[23] http://jerome.blogs.lincoln.ac.uk/2010/07/23/engage-ludicrous-speed/
[24] http://blog.mongodb.org/post/1200539426/archiving-a-good-mongodb-use-case
[25] https://github.com/alexbilbie/CodeIgniter-OAuth-2.0-Server
[26] http://www.southamptondata.org/
[27] http://www.data-archive.ac.uk/create-manage/projects/JISC-DMP?index=0
[28] http://www.rcuk.ac.uk/research/Pages/DataPolicy.aspx
[29] 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/
[30] University of Lincoln Draft Strategic Plan 2011-2016 (Internal access only).
[31] http://lncn.eu/toolkit
[32] Joss blogged about his experience here: http://digitalpreservation.wordpress.com/
[33] http://posters.lincoln.ac.uk/all
[34] http://www.rsp.ac.uk/events/repositories-and-cris-systems-working-smartly-together/