JISC Project Plan

Project Information			
Project Identifier	*To be completed by JISC*		
Project Title	Research Data Management for Mechanical Engineering Departments (REDm-MED)		
Project Hashtag			
Start Date	1 November 2011	**End Date**	31 May 2012
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Partner Institutions	n/a		
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Programme Manager	Simon Hodson		

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1.1	January 2012	1st Revision

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1 Project Overview

1.1 Project Summary

This project will scope, specify, design and implement a research data management plan suited especially to the needs of the Department of Mechanical Engineering at the University of Bath. This work will build upon the team's work investigating the research data management needs of the Innovative Design and Manufacturing Research Centre (I*d*MRC) at the University of Bath during the JISC-funded ERIM Project and other recent work by the Managing Research Data Community. Work completed in the ERIM Project in specifying a Research Activity Information Development Associational Tool (RAID) will be continued by the development of a prototype tool for integration within the specified research data management infrastructure.

Thus, the aim of the research will be to implement effective and practical research data management where there is little or none and that can be adopted easily elsewhere.

The work will take place in conjunction with the UKOLN and the DCC at Bath, and with the support of the Department of Mechanical Engineering and the Bath University Computer Service (BUCS).

The REDm-MED Project is complementary to the University of Bath's Research360 Project which is being funded similarly by JISC under the Managing Research Data Programme 2011-13.

1.2 Objectives

Objective 1 is to develop a user-driven requirements specification for a research data management plan (RDMPRS). Principally the CARDIO toolkit and semi-structured interview techniques will be used for requirements elicitation and analysis.

Objective 2 is to develop and deliver a data management plan (DMP) for the Department of Mechanical Engineering based on the specification derived from the above exercise.

Objective 3 Implement a technical system and infrastructure to support implementation of the data management plan. This broadly embraces underpinning systems, such as the BUCS-delivered data storage facilities and web service. Understand what existing tools and infrastructure support might be adopted (from MRD programme and other sources).

Objective 4 Provide documentation of the implemented DMP and the supporting infrastructure as a 'blueprint' so that the approach can be implemented by other groups, departments. Write-up specification/ description of the DMP and supporting system.

Objective 5 Implement a prototype of the RAID Associative Tool using, where possible, existing technologies, tools and methods to implement the functional requirements. Develop RAID Tool functionality with rapid prototyping using where possible existing components (e.g. Compendium and Waypoint) as a basis.

Objective 6 Guidance and user support documentation as appropriate. Write department procedural user documentation.

Objective 7. Provide input to the DCC, by the submission of any policies and guidance created by the project, for assessment and reuse by the community. Similarly, provide appropriate feedback to the DCC on assessment and use of DCC tools and methods within the project.

1.3 Anticipated Outputs and Outcomes

Output	Brief Description
DMP Requirements Specification	An analysis of the requirements of research data management of the Department of Mechanical Engineering (**D1; due end January 2012**).
Planning Document	A Research Data Management Plan for the Department of Mechanical Engineering (**D2; due end February 2012**)
Planning Document	A model research data management plan adapted from the departmental one, for use elsewhere (**D3; due end May 2012**).
Technical Infrastructure	This infrastructure will consist of the underlying computational support, tools and protocols supporting the day-to-day application of the data management plan within the Department – focusing on storage and contextualization.
Report	a report describing it for the purposes of assisting the deployment of similar infrastructures elsewhere (**D4; due end April 2012**).
Procedural and guidance documents	The support documentation and guidance needed by users of the system (**D5; due end May 2012**)
Prototype web application	A prototype RAID Associative Tool to demonstrate the visualization of research data record contextualization, together with developer documentation (**D6; due end May 2012**).
Summarizing Report	A summary of interactions with the DCC and the feedback given by the project about DCC tools and guidance (D7**; due end May 2012**)

Outcome	Brief Description
Transferable Knowledge	Understanding gained during this project will result in shareable knowledge on DM planning that will be readily generalizable to other mechanical engineering departments. It might be expected that such knowledge would be generalizable to other engineering disciplines.
Enhanced capacity	Uptake of the DM guidance provided by this project assist researchers in meeting the DM expectations of their funders and will, more widely, support the developing desire to make their data more shareable and re-usable.
Basis for wider understanding	Liaison with the department and with other entities within the university will help accelerate the delivery and understanding of the message that the value of research data may be substantially increased – to the benefit of many – through good governance.
Basis for wider adoption	The presumption is made that the research data management needs of the participating department will intersect closely with those of similar departments in other research institutions, not only of higher education but in the wider commercial world and therefore the work will be transferable.

1.4 Overall Approach

The aim of the proposed work is to provide a usable and sustainable data management plan which responds to the needs of the researchers and research teams within the Department of Mechanical Engineering whilst conforming with the developing requirements for data management driven by funders and the wider society in the interests of better data re-use and of scientific validation.

To provide a DMP which is both usable and sustainable, and importantly which will be adopted most readily, it will be necessary to take a simplifying approach. To this end, the Project has adopted the following dictum or rubric:

We will aim to provide guidance and tools to aid practical RDM planning which are simple and engaging to use, easy to access and which require least effort on the part of the users.

To assist in this, a panel of researchers (as data originators/users) with the Department of Mechanical Engineering will be engaged as a 'sounding-board' for evolution of DM understanding, procedures, guidance and tools. The panel will include representatives from a wide spectrum of sub-disciplines within the department. In addition liaison will be maintained with current departmental service providers including the Bath University Computing Unit, the Library and, of course, UKOLN/DCC.

The approach to achieving the objectives is given below:
Objective 1. The research data management plan (DMP) requirements specification will be the result of a requirements analysis and elicitation activity carried in liaison with the panel members. The CARDIO tool will be, principally, used for data collection and analysis.

Objective 2. The data management plan will take in the operational requirements of the department and the requirements necessary for supporting post-project re-use of data. A data-lifecycle approach will be taken, thus supporting data management from project start to post-project archiving. It is intended that the DMP will consist of a description of desired practice and DM objectives, with guidance on how to achieve these aims with the tools selected. Thus, it will in effect be a 'specification' for the department, which will allow an individual project readily to develop a bespoke data management plan as suits their own needs and constraints. As mentioned above, the default approach will be to make data management planning and implementation by the user as simple as possible.

Objective 3. The technical system and infrastructure to support implementation of the data management plan will be based largely on tools and techniques developed during the ERIM Project and the wider JISC MRD Programme, and by such other data management organizations as the DCC, etc. To this end, an early task will be to review what tools are on offer, and how they might, as requirements become clear, contribute to data management at the level intended.

Given the short time frame in which to achieve the aim, it is intended that infrastructure elements of the work will be based on light-weight web-based services interfacing with existing file storage space, where possible using existing software and tools. However, Computational support and data storage will be based on that implemented already within the Department of Mechanical Engineering and supported by BUCS. We will make best use of tools available within the university, as appropriate, for example the Sakai virtual research environment platform which has already be developed and trialled within the university.

Objective 4. Documentation of the implemented DMP and the supporting infrastructure will be provided as a 'blueprint' to assist the adoption of similar DMP solutions by other entities engaged in engineering research. There are no special issues associated with this.

Objective 5. As part of the technical system and infrastructure it is intended to implement the RAID Associative Tool specified in the ERIM Project this tool will be known as RAIDmap. RAIDmap will be a web-based tool, developed using a rapid-prototyping approach managed by applying agile software development practice and appropriate versioning, testing and integration tools. The tool will be either stand-alone or, perhaps, integrated with a virtual research environment if this proves to be practicable within the time frame. A web-based tool has been chosen in order to limit dependence on specific platforms.

Reflecting our simplification approach, it is the intention to develop the tool in iterative stages working from a minimal functional first stage. It is intended that a test-driven approach to software development is applied.

For practical purposes, in light of the time-frame available, the implemented functionality of the RAID tool will be limited in the first instance to provision for each *research data record* to be associated using a minimal metadata set (informed by the ERIM Project work and arrived at from the user-base requirements analysis, and including some of the above data development processes) with precursors and successors together with versioning, and classification as one of the ERIM-defined research data

record types *(research data record, context data record, associative data record, research object data record* or *experimental apparatus data record)*.

Objective 6. Provision of on-line or other guidance and user-support documentation will be developed for the application of the departmental data management plan and usage of the infrastructure. There are no special issues with this. However, adoption of the DMP and the tools for its implementation at a department level will require its approval. The time frame for doing this will almost certainly be outside that of the project and outside the control of the project itself; however, championing of the DMP and tools by individual Principal Investigators will be encouraged during the term of the project.

Objective 7. Effective feedback to the DCC of issues that arise and tools used will be facilitated because one of the project team members is also a DCC officer.

The project objectives will be mapped onto coincident work packages for the purposes of work flow management and target reaching.

1.5 Anticipated Impact

Impact Area	Anticipated Impact Description
Researcher- and project-level DM planning	Improved during-project data management, leading to better use. This will also enhance management for potential re-use and re-purposing, through increased accessibility and interpretability.
Post-project 'local' research re-use	Better during-project management will increase the potential for post-project re-use and re-purposing of research data
Institutional and Academic governance	Conformance with regulatory and governance requirements on data management are reliant on the necessary mechanism being available, this includes local data management support provided by REDm-MED outputs
'External' party data use	Improving the way in which research data is managed for the purposes of re-use and re-purposing, and archiving will, necessarily, enhance the potential of application of that data amongst a wider user group, this will include re-use, re-purposing and will assist in making research more easily validated and more transparent
Research cost	Re-use will reduce costs.
Response to Funder Requirements	The data management measures developed and submitted for use by the Dept. of Mechanical Engineering will provide a means by which the department may fulfil its data management obligations to its funders (principally the EPSRC). Likewise the model departmental DMP will help departments and institutions elsewhere who are preparing EPSRC RDM roadmaps for May 2012.

1.6 Stakeholder Analysis

Stakeholder	Interest / stake	Importance (H/M/L)
University policy makers*	University policy & strategy	High
University data management directors*	Management policy/planning	High
University data management implementers*	Archiving, curation, etc	High
Research project managers	Data management implementation	HIgh
Researchers	Data management support	High
Researchers/academics	Research finding support	High
University service providers (e.g. computer support, archivists, etc.)	Service provision compatibility	Medium

* These stakeholders are represented especially by the Research360 Project at the University of Bath

1.7 Related Projects

This project is related to the precursor ERIM Project, in which much of the foundational theoretical and empirical work was done on which the REDm-MED data management 'delivery' project is predicated. Also, this project is complementary to but largely independent from the University of Bath's Research360 Project, funded similarly under the MRD Progamme. It is possible that REDm-MED project will feed into other MRD Programme projects such as the University of Lincoln's Orbital Project.

1.8 Constraints

1. Availability of key personnel.
2. Concurrent development requirements of what are strictly serial processes (e.g. development and validation).
3. Interaction and contribution of individuals necessary to but external to the project.

1.9 Assumptions

1. The project objective can be separated logically into development of the RAIDmap application on the one hand, and all the other development and delivery work. They are not strictly interdependent. These two elements can be managed as separate entities.
2. The support found to be necessary to the project and to implementation of the recommended data management measures, and currently undefined, from external services (e.g. BUCS and the Department of Mechanical Engineering) will be available to the level and within the time frame required.
3. Full validation of the measure proposed for adoption by the target research body will be essentially post-project because of time constraints.

1.10 Risk Analysis

Risk Description	**Probability (P) (1 = low 5 = high)**	**Severity (S) (1 = low 5 = high)**	**Risk Score (PxS)**	**Detail of action to be taken** (mitigation / reduction / transfer / acceptance)
Lack of liaison/support from the Department of Mechanical Engineering	2	2	4	As home to the 'end-user' it is in the interests of the Department of Mechanical Engineering to provide material support to this project. However, because a light-weight web-based approach is intended the reliance on, for example, computation and systems support, is minimized.
Problems with developing the RAID tool	2	3	6	We will favour working prototypes, increasing functionality over time. In case of difficulty, we would either adjust the scope of the RAID tool or re-allocate resources to software development. In addition an 'agile' approach will be taken to managing the software element of the project.
Non-interoperability between and lack of	3	3	9	The need to use proprietary software in place of open-

maturity of proposed open-source software and other enabling tools				source software or tools which have emerged from MRD projects has been anticipated in the budget.

1.11 Technical Development

This chiefly relates to technical development of the RAIDmap application. As mentioned above, the development of RAIDmap will be informed by agile software development practice, implemented as appropriate to this specific task:

1.12 Standards

Name of standard or specification	Version	Notes
XML	1.0	A choice will be made between the sole use of XML and its use together with RDF for the representation and manipulation of RAIDmap-associated data
RDF	n/a	
SOAP	n/a	A choice will be made between SOAP and AJAX as the best means of providing client-server communications
AJAX	n/a	
SVG	n/a	Basis technology for RAIDmap visualisation

1.13 Intellectual Property Rights

The intellectual property generated by this research project will rest with the University of Bath. However, in line with common practice, the outcome of this project with respect to guidelines, procedures and tools will be shared with the community at large, in the first instance with JISC. It is intended that the prototype code for the RAIDmap application will be made available under an open-source licence.

2 Project Resources

2.1 Project Partners

None, other than the named research teams from University of Bath and UKOLN.

Project Roles

Team Member Name	Role	Contact Details	Time spent on project
Chris McMahon	Project Director	01225 384026, c.a.mcmahon@bath.ac.uk	2% FTE
Dr Liz Lyon,	University of Bath Research Data Management Steering Group and Research360 liaison point-of-contact	01225 386254, E.J.Lyon@bath.ac.uk	1% FTE
Mansur Darlington	Project Manager; and Requirements elicitation; developing, designing and documenting research data management procedures	01225 384551, M.J.Darlington@bath.ac.uk	83% FTE
Alex Ball	Scoping and development of the technical system and infrastructure, and software and user documentation; project	01225 383668, A.J.Ball@bath.ac.uk	50% FTE

	liaison with DCC.		
Uday Thangarajah	RAID Associative Tool development and development of user interfaces and software services	U.Thangarajah@bath.ac.uk	100% FTE

2.2 Programme Support

No especial support from JISC has been indentified at this time.

3 Detailed Project Planning

3.1 Evaluation Plan

The final measure of the success of the project will be the adoption of the data management plan and infrastructure by the Department of Mechanical Engineering, but as this will necessarily take place after the end of the project, a self-evaluation will be performed as part of the Final Report, using as criteria the satisfaction of the requirements derived from the analysis in D1 and the resolution of any issues highlighted by user testing, alongside consideration of long-term resource usage and benefits. In addition to this, the panel of CARDIO participants, who will primarily be used in a 'gap analysis' exercise, will also be available to critique the developing RDM plans as they develop during the project. Further, these participants will be asked to give an early evaluation of the RAIDmap tool once it has reached a illustrative level of functionality.

It is expected that adoption of REDm-MED Project outputs by the Department of Mechanical Engineering will provide the basis for further assessment and development. There will also be consideration of the extent to which the systems and tools put in place are compatible with the developing expectations and the data management procedures that are implemented at institutional level. In respect of this it is expected that deliverables from the REDm-MED Project (for example guidelines, templates and other tools, etc) may be taken up by Research 360 (the University of Bath's other MRD Programme project) for investigation and, subsequent to successful validation, adopted at department/faculty/university use. The R360 project will continue for about 11 months after REDm-MED project end, so there should be ample time for assessment.

Finally, all data management measures proposed as an output of REDm-MED will be available to and provide influence for departments and institutions elsewhere. As has been observed elsewhere (cf ERIM Project) engineering research data is of a very broad-spectrum nature and therefore it can be expected that measures for their management will be readily generalizable to other disciplines.

3.2 Quality Assurance

Output / Outcome Name	When will QA be carried out?	Who will carry out the QA work?	What QA methods / measures will be used?
RAIDmap prototype application	As part of the application development	The developer, the project director and the project manager	Agile Software Development best practice as tailored to single-person development
Documentation elements of RDMP	As part of the origination process	Members of the project team	The usual method of quality control using team-based peer-review.
Assessment of developing DMP measures	During the time span of the project	A panel made up of members of the Dept. of Mech. Eng.	n/a

3.3 Dissemination Plan

The progress of the project will be communicated through the project blog. Where the project finds an approach to be particularly successful, or uncovers a tough challenge, this will be posted to the blog to disseminate best practice to, and solicit it from, the community. Project staff will similarly monitor and when appropriate comment on the blogs of the other successful projects funded by the call. We

will contribute to programme level meetings, workshops and synthesis work, participate in the DCC's RDMF7 event and attend the International Digital Curation Conference. We will aim to raise awareness of project's outputs through at least one journal paper. Project documents will be made available through the University of Bath's Opus repository, while source code will be hosted by Sourceforge.

3.4 Exit and Embedding Plans

The RDMP and associated documents and tools will be made available to the members of the Department of Mechanical Engineering at the University of Bath. Where such assets are appropriately delivered using web pages, the URLs will be made available to university access. Similarly, such assets will be passed, as appropriate, to the Research360 project.

The code for the RAIDmap application will be made available as unsupported open-source code using Sourceforge (or other similar means).

The outputs of the project will be made available, too, through the communications channels of the MRD Programme.

3.5 Sustainability Plans

The work proposed in this project is supported both at institution and at department level. On completion of a successful project it will be in the interests of the Department of Mechanical Engineering that the data management service that is being proposed is perpetuated after project end. The intended approach is to implement a light-weight web-based user service, interacting with existing University of Bath file storage space (which will be supported indefinitely). This light-weight approach will minimize the resource requirement in the future, making its preservation amenable to the department's computer support unit. There is some expectation that the DM service that is implemented might be adopted by other engineering departments within the Faculty of Engineering and Design. In addition to this, the University of Bath's Research Data Management Steering Group is engaged in developing research data management at an institutional level, targeting this Faculty for first implementation, thus proving the basis for long-term perpetuation of the department-level data support emerging from this project.

Project Outputs	Why Sustainable	Scenarios for Taking Forward	Issues to Address
RDM Plan components (guidelines, tools, etc)	Will be made available to the Department of Mechanical Engineering for adoption, and also to Research 360 for consideration for adoption. In addition, 'Blueprint' documentation of tools and infrastructure will be made available to the community through the institutional repository.	Parts or all of the components of data management planning will be taken up by the Department of Mechanical Engineering for local use. More distributed use may come from their recommendation for faculty/university use by Research360	Funding contingent on continuing enthusiasm by the research councils for RDM; in turn this will be contingent on validation of the business model in light of emerging understanding of costs/benefits.
Model RDM Plan	This plan will be made available for general use external to the University of Bath	Parts or all of the components of data management planning will be taken up by other institutions as part of their preparation of RDM roadmaps for EPSRC (by May 2012) and others.	Fit with institution and discipline RD demands.
RDM Infrastructure	The infrastructure components necessary for department-level	Integration of supporting infrastructure components in department- and	Integrability with existing/developing university-level RDM

	implementation of the RDM plan may be integrated with the university-level infrastructure found necessary for RDM	institution-level infrastructure	strategies and infrastructure components.
RAIDmap	The prototype will be made available for evaluation and uptake. In addition the source code will be made available under an open-source licence	Given the availability of the source code for unrestricted development, the prototype RAIDmap application will be developed further, possible as a commercial undertaking or through further funding sought through the funding agencies.	Seeking and finding development resources which are commensurate with the level of development established as desirable.

Appendices

Appendix A. Project Budget

Directly Incurred Staff	**Apr11– Mar 12**	**TOTAL £**
Applications Developer, 06, 100%	£20384	£20384
Researcher, 07, 50%	£11468	£11468
Project Manager/researcher, 07, 83.33%	£19203	£19203
Total Directly Incurred Staff (A)	£**51055**	**£51055**
Non-Staff	**Apr11 – Mar 12**	**TOTAL £**
Travel and expenses	£1000	£1000
Hardware/software	£5000	£5000
Total Directly Incurred Non-Staff (B)	**£6000**	**£6000**
Directly Incurred Total (C) (A+B=C)	**£57055**	**£57055**
Directly Allocated	**Apr 11– Mar 12**	**TOTAL £**
Chris McMahon, 2%	£928	£928
Liz Lyon, 1%	£464	£464
Estates	£6860	£6860
Directly Allocated Total (D)	**£8252**	**£8252**
Indirect Costs (E)	**£21716**	**£21716**
Total Project Cost (C+D+E)	**£87023**	**£87023**
Amount Requested from JISC	**£69618**	**£69618**
Institutional Contributions	**£17405**	**£17405**
Percentage Contributions over the life of the project	**JISC 80%**	**Total 80%**
No. FTEs used to calculate indirect and estates charges, and staff included	**No FTEs** 0.68	

Appendix B. Workpackages

	OBJECTIVE	TASK	DEVELOPMENT OF/BUILDING ON
WORKPACKAGE 1	**Objective 1** Develop a user-driven requirements specification for a research data management plan (RDMPRS)	Elicit and synthesize the Department's data management needs in the context of the understanding gained during the ERIM Project of research data management. Extend and broaden as necessary. CARDIO toolkit and semi-structured interviews will be used for requirements analysis	Principles of Engineering RD Management (for the research data). Principles of Engineering Information Management (for research-related data). (parts of) IDMB data management policies. DMPOnline.
	Objective 2 Develop and deliver a DMP for the Department of Mechanical Engineering based on the above.	Interpret the user-derived RDMPRS with reference to the more narrowly defined ERDMPRS (ex-ERIM). Write a RDMP based upon the above, broadened to embrace the needs of the department as a whole and the extended lifecycle of research data	*The Engineering Research Data Management Plan Requirements Specification (ERDMPRS)* *The Draft IdMRC Projects Data Management Plan* JISC MRD I2S2 Project *Scientific Research Data Lifecycle Model,* if appropriate
WORKPACKAGE 2	**Objective 3** Implement a technical system and infrastructure to support implementation of the data management plan	Understand what existing tools and infrastructure support might be adopted (from MRD programme and other sources).	MRD tools and methods, e.g. HALOGEN's handling of diverse data, DMP-ESRC's handling of sensitive data. The 'cascade of best-practice documents' from the ERIM Project.
		Scope, develop and implement a technical system and infrastructure.	MRD Programme outputs, the RAID method, existing infrastructure, proprietary software as necessary. A means will be explored which will

	OBJECTIVE	TASK	DEVELOPMENT OF/BUILDING ON
			support the interface between the management of the research data records and the storage available. Such means include, e.g content-management systems such as the open-source and extensible JOOMLA; research management virtual platforms such as Sakai, and relational and NoRel database use (e.g. MongoDB).
WP 3	**Objective 4** Provide documentation of the implemented DMP and the supporting infrastructure as a 'blueprint' so that the approach can be implemented by other groups, departments.	Write-up specification/ description of the DMP and supporting system.	n/a
WP4	**Objective 5** Implement a prototype of the RAID Associative Tool using, where possible, existing technologies, tools and methods to implement the functional requirements.	Develop RAID Tool functionality using an agile software development approach with rapid prototyping; using where possible existing components as a basis.	*RAID Associative Tool Use Cases* *RAID Associative Tool Specification*
WP5	**Objective 6** Guidance and user support documentation as appropriate.	Write department procedural user documentation.	Practices and procedures from KIM Grand Challenge Project and ERIM Project.
WORKPACKAGE 6	**Show evidence of co-operation with the DCC**, in particular the submission of any policies and guidance created by the project, for assessment and reuse by the community.	Continuous activity. In addition, submit departmental guidance to DCC for assessment.	DMP Online
	Deliver appropriate feedback on the DCC's DMP Online or other tools, guidelines, used to help data management planning.	Write assessment of implementation/use of DCC tools and methods used within the infrastructure	n/a

	OBJECTIVE	TASK	DEVELOPMENT OF/BUILDING ON
WORKPACKAGE 7	Project Management:	1 Draw up a project plan. 2. Convene, regular project meetings to monitor and respond to progress against the project plan. 4. Evaluate the project by liaison with key stakeholders (represented by a local assessment 'panel'). 5. Liaise with and report to the JISC programme manager, including delivery of mandated reports	n/a

REDm-MED Work Package and Deliverables*

	2011		2012				
	Nov	Dec	Jan	Feb	March	April	May
WP1							
WP2							
WP3							
WP4							
WP5							
WP6							
			D1	**D2**		**D4**	**D3,5,6&7**

*Note: all deliverables will be delivered at the end of the month in which they are placed.