Contact: Karen Walshe karen.walshe@bl.uk

Defining a new role: the embedded Research Information Manager

Final Report January 2011

JISC Final Report

Project Document Cover Sheet

Project Information			
Project Acronym			
Project Title	1.1. Defining a new role: the embedded Research Information Manager		
Start Date	1st March 2010	**End Date**	31st August 2010
Lead Institution	University College London, Crucible Centre		
Project Director	Professor Nick Tyler		
Project Manager & contact details			
Partner Institutions	The Science Technology and Medicine Team, the British Library (Primary Contact: Dr Karen Walshe)		
Project Web URL			
Programme Name (and number)			
Programme Manager			

Document Name			
Document Title	*Final Report*		
Reporting Period			
Author(s) & project role	Karen Walshe, Kamal Achuthan, Rachael Kotarski		
Date		**Filename**	
URL	*if document is posted on project web site*		
Access	☐ Project and JISC internal	☐ General dissemination	

Document History		
Version	**Date**	**Comments**
V1.0	01/08/2010	

1. Table of Contents

2. Acknowledgments

The project team would like to thank the various people within UCL and beyond, who contributed to the study by participating in interviews, completing the online survey, suggesting contacts, attending the workshop or through input into project direction and outputs. We were met with support, interest and cooperative spirit by all who were contacted throughout the study. We thank them all for giving so generously of their time, experiences and views.
This work was funded by the JISC as part of the Research Information Management Programme.
ARG researchers are funded through a range of grants from the Research Councils EPSRC, ESRC and MRC.

3. Executive Summary

This report is a key deliverable of the 'Defining a new role: The Research Information Manager' project, which seeks to define the need, explore the benefits and risks, and evaluate the approaches for establishing an embedded research information specialist –the **Research Information Manager (RIM)** *within* a highly multidisciplinary research environment as represented by the Accessibility Research Group (ARG); established by Prof Nick Tyler at University College London (UCL).

For the purposes of this project "Research Information" is defined to include scholarly publications, grey literature, electronic resources, datasets, databases, images, information systems, software tools, workflows, methods and standard operating procedures and information interrogation methods, as well as funding information and research outputs and metrics. This term therefore encompasses all information used in, produced by, and descriptive of, researchers and research activity.

This pathfinder project arose in response to the real-life challenges faced by those involved in Science, Technology, Engineering and Medicine research areas including:

- Researchers faced with a daunting volume of research information with issues about its quality assurance, navigation, management and sustained accessibility

- Institutional research support services under increasing pressure to evolve information services and develop new infrastructure to support changing researcher needs, compliance with mandates and provide metrics of research outputs

The dynamic nature of scientific research and the ever-accelerating rate of change of information management associated with it, have demonstrated a need to look beyond purely technological solutions. A purely systems-based approach will struggle to keep pace with advances and to respond with appropriate consideration for the research culture. Effective information support for multidisciplinary research is fundamentally about people. It's about supporting networks of people who rely on one another to access, filter, understand, re-use and share information in an increasingly complex and hard-to-navigate research information landscape. These observations argue the case for a role to augment, facilitate and join up systems-based approaches to research information management.

This project captures a holistic view of the way that ARG researchers currently undertake and manage their research projects; giving an insight into their attitudes, motivations, behaviours, habits and the problems they encounter during this process. It maps their requirements for support to the existing services and infrastructure in UCL to define the RIM role skill set required to enhance the management of research information and data within the research group. Finally, it utilises consultation and models of national and international best practice to inform implementation of the RIM role in different research settings in the future.

We believe that many of the information challenges that face multidisciplinary research groups such as ARG are common. Thus, this report sets out a methodology for others to adapt and use to define a Research Information Manager role to fit with their own specific needs through a combination of people, systems and services. We hope this will also be useful in encouraging a wider dialogue on the best approaches to research information management across the Higher Education sector.

Our findings indicate that:

- There is a recognised gap in support and guidance for researchers in managing data across the entire research lifecycle, which urgently needs to be addressed.
- There is significant support available to researchers working within UCL, but there is a disconnect between researchers and centralised services, which means that researchers are often unaware of existing support and unsure who to approach in order to find out what is available.
- There is much goodwill on the side of the support service staff to help find solutions to the problems facing researchers, but this is somewhat constrained by often limited and thinly spread resource. The increase in student numbers, and a greater focus on teaching and learning in university strategies across the UK has led libraries to emphasise more the need to support taught students. Given the finite resource that is available, this may well mean that libraries currently spend less time on research support than they used to. The challenge for institutions in the future is how to redress that imbalance.
- Support services find it difficult to engage with less senior researchers, because of issues with identifying them, having the resource to interact directly and the high turn-over of junior researchers. Department Heads are therefore currently the 'default' communication channel, and as non-research demands on their time grow, this will become an ever-weakening route to engaging with the broad range of research group needs.
- Much of the way researchers learn their craft is through a process of self study and informal mentorship, partly because they feel training offered centrally is not relevant to them. There is a need therefore, for tailored, context specific and embedded support and training for researchers.

Summary of Recommendations

1. **There is a HE sector-wide need to perform a comprehensive review of infrastructure, systems and services relating to research information management and support across Institutions.**

2. **Data management skills need to be further developed and supported across the UK HE sector. There needs to be a better understanding of the division of data management duties between central and embedded support services and researchers.**

3. **Institutional Support Services need to engage continually with all levels of researchers, in order to understand and capture their complex needs and align services accordingly. The balance of effort for teaching and research support should also be examined.**

4. **Funding should be secured to pilot the RIM role, as defined in this report. Evidence of the realised costs/ benefits of such a role could then be gathered to evaluate the practicalities, added-value, and long term impact of a wider implementation.**

5. **Funding bodies should work together with universities, to support emergent roles such as the RIM.**

6. **Education and training of both researchers and information professionals needs to be addressed at an institutional and possibly national level, due to changing requirements.**

4. Background: The Research Landscape

4.1. Financial landscape

This report is published against a backdrop of considerable economic instability. The global financial crisis, which began in 2007 and continues to date, has had profound economic consequences for the UK.

One of our most valuable assets in addressing economic and other societal issues, is the breadth and vibrancy of our research base. Our universities have a strong international reputation for excellence in research and the UK is second only to the United States across a number of key output indicators, with each pound spent on research yielding more publications and citations than any other G8 country. Their economic contribution is also immense, with a recent report suggesting that public investment in research of some £3.5 billion results in an economic footprint in the UK of an additional £45 billion in jobs, exports, innovation and added value[1].

In the lead-up to Autumn's spending review, research leaders, university Vice-Chancellors and learned societies made the case for sustained investment in the research base, in order for the UK to retain its competitive advantage, ability to drive innovation and respond flexibly to society's future demands. Maintaining a broad research base, ready to meet unidentified future opportunities is central to this. This is particularly salient when considering broad societal issues such as climate change and our ageing population. There is a need to ensure that any constriction of the research budget does not restrict our future ability to deal with these cross-cutting issues.

Government indicated its general agreement that having a strong research base is crucial in helping to rebalance and support long term growth of the economy, as Chancellor George Osborne announced that the UK's science budget will be frozen in cash terms. This amounts to a cut of less than 10% over four years. Although the cuts were far less severe than initially feared the practical implications of these reductions will take some time to become fully apparent. It is worth noting that in response to the worldwide recession a number of countries e.g. the U.S., Canada, France, Germany, Australia and Ireland meanwhile have injected significant resource into their research budgets as part of their respective economic stimulus strategies[2].

These proposed research budget cuts are likely to impact the HE sector in the following ways:

- Overheads and infrastructural spend will be reduced
- QR is likely to be cut
- There may be a reduction in the reach of research funding
- Competition for research grants is therefore likely to be greater and success rates may reduce
- Competition for non-Research Council funding will intensify putting pressure on other funders' investments and cash budgets which yield their resources to support research and which are also subject to the more general pressure on the economy
- There will be more pressure to demonstrate the social and economic impacts of public spending
- There will be a greater focus on value for money and efficient use of public funds

[1] **Haskel, Jonathan & Wallis, Gavin, 2010. "**Public Support for Innovation, Intangible Investment and Productivity Growth in the UK Market Sector**," CEPR Discussion Papers 7725, C.E.P.R. Discussion Papers. http://www.universitiesuk.ac.uk/Publications/Documents/recession_to_recovery.pdf**

[2] **http://change.gov/agenda/economy_agenda/, http://www.taoiseach.gov.ie/eng/Government_Press_Office/Taoiseach's_Press_Releases_2010/Leaflet_-_Capital_Expenditure_Review.pdf**
http://www.universitiesuk.ac.uk/Publications/Documents/TheGlobalPicture20100907.pdf

With the suggestion by George Osborne that the majority of the 10% cut will be managed through efficiency savings, HE institutions will be required to demonstrate how research funds were used and whether the outputs represent value for money. To accomplish this, integrated systems and services that facilitate the management of the complex flows of information, both into and out of the research process, will be essential for researchers and central services alike. In a forthcoming time of austerity for research, it may seem counterintuitive to be considering new roles and services. However, we argue that this is exactly the right time for auditing current practices in order to consider novel approaches, restructuring for best effect and maximising efficiencies. Any approaches considered will clearly need to maximise the benefit extracted from current research spend.

The question that will need to be addressed is where the money to fund any proposed new projects will initially come from and how spending will be cut elsewhere to enable this. In arguing for spending to be directed into any novel approach, a strong case will need to be made indicating the potential benefits of the proposed system or service. Through this document, we seek to assess the potential benefit of a RIM support role in filling the gaps identified in research support, improving researcher efficiency and make the case for focusing funding on this.

4.2. Information landscape

A concurrent driver for change in the UK HE research environment is the rapidly changing information landscape. Recent years have seen unprecedented advances in technologies, an explosion in the availability of digital content and intensification of data driven science, all of which provide new opportunities for research avenues but also present many new challenges.

Researchers are faced with a daunting volume and range of research information: scholarly publications, large and complex datasets, images, software tools, workflows and a myriad of other information resources and outputs. The information is often redundant, overlapping, dispersed throughout the internet and growing in complexity. Discovery and access may be an issue, but more often now the primary concern is ensuring relevant, high-quality, context-specific information is directed to the researcher. Meanwhile changes in the external environment such as the rise of digital publishing options, open access mandates and data management requirements have resulted in confusion amongst researchers about ownership, control of and responsibilities for research information outputs and IP issues.

This pathfinder project arose from the requirement for information management solutions, necessitated by this increasingly rich and difficult to navigate research information landscape.

A report by the Science, Technology and Medicine team at the British Library and the Research Information Network examined how information was used by researchers in the life sciences[3]. Research groups tend to manage and share research information in an informal way, without accessing professional support from institutional library and information services. They also don't always feel able to locate, identify and develop expertise in the resources they require[4]. Researchers' information literacy skills therefore need some attention, as there is currently a weight of expectation that they will somehow keep up to date with developing technologies. They require user-friendly formats and interfaces and more integrated systems and services that will enable simpler information discovery, as researchers want to spend less time locating and mastering databases and more time on research. They also express a strong desire for professional advice, training and support, with a particular demand for support to be closely integrated within research teams and laboratories.

The majority of systems developed across HE to address research support needs have focused on technologies and infrastructural development rather than emerging cultural practices and how best to effect behavioural changes that will increase adoption of systems and novel technologies. Anything that is developed in the future should help solve issues and

[3] **http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/disciplinary-case-studies-lifesciences**
[4] **http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/researchers-and-discovery-services-behaviour-perc**

fit in with the way researchers work, to enable researchers to focus on research by freeing up their time and releasing them from bureaucratic processes. New systems and services will also need to be continuously evolving in approach in order to meet changing demands. With the dynamic nature of research and the rate of change ever accelerating, it will be difficult for systems alone to keep pace with technological advances. This argues the case for a role as opposed to a purely systems-based approach.

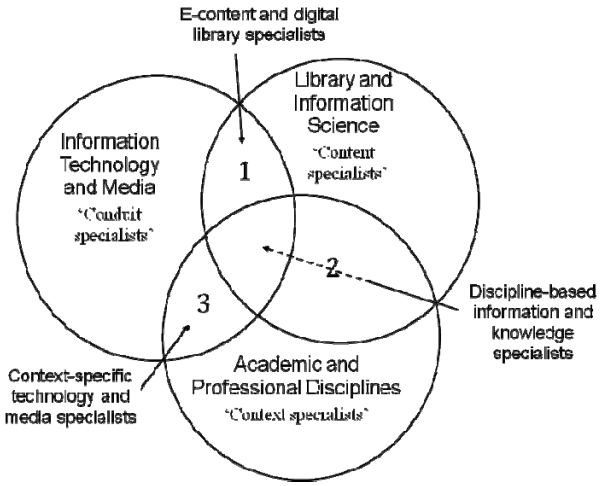
4.3. Information Professionals

Traditional relationships between researchers and academic libraries have changed significantly in recent years. While STEM researchers in the past relied on physical library facilities and print versions of papers, now most of their activity occurs online and most of their library usage is via remote-access[5]. Immediacy and efficiency of access to information is extremely important to researchers whose principal goal is to develop and answer their research questions by performing experiments and producing data. With the significant reduction in library visits by STEM researchers, there has been a corresponding disintermediation between libraries and the research community they support[6].

Libraries have responded to the digital revolution in a number of ways. They have transformed operations and are now heavily involved in the provision and management of digital content, particularly research-level material. Librarian roles and skill sets are changing too with a trend towards the blurring of professional boundaries and skill sets with a move toward outreach, liaison and embedded roles the most notable.

As suggested in recent reviews of the changing roles of librarians, there has been an extension of traditional skills to include, among others, IT and teaching skills. This fusion of boundaries for information professionals has led to the creation of a new term 'blended professional' which is increasingly being recognised[7]. Key features of this type of post are broad skill sets and overlapping roles.

The Blended Professional



Reproduced with permission from Sheila Corall

In the academic setting there has been a move away from departmental library services to a centralised and increasingly converged model of service provision. Co-location of disparate resources has many benefits in streamlining management and avoiding duplication. However, the move from department-based to central services and subject-based repositories has created issues for libraries in relation to communication and engagement with researchers. Recent years have therefore seen a move in a complementary direction – towards liaison or

[5] **http://www.jisc.ac.uk/publications/reports/2010/digitalinformationseekers.aspx**
[6] ***http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/researchers-use-academic-libraries-and-their-serv***
[7] **Educating the academic librarian as a blended professional: a review and case study. Sheila Corall. ALSR 2010: Conference towards Future Possibilities**

outreach roles, more proactivity in engaging with researchers and ultimately toward embedding information support within research teams.

The United States has seen the greatest proliferation of these new library roles, with Liaison Librarians existing in nearly every research library[8]. The 'Liaison Librarian' role continues to have the responsibility of traditional 'subject librarians' - providing expert support to the students and staff in their discipline area. There is, however, an increasing push towards a more proactive approach, with liaison roles leaving library buildings and engaging more with researchers. A recent article, describing liaison roles, indicated that the increased interaction with researchers has further expanded activities resulting in librarians needing to acquire new skills, including IT and data related skills and adapt and leverage compatible expertise from colleagues, where their own skills are lacking[9].

The Welch Medical Library at Johns Hopkins, which had a longstanding Liaison Librarian programme, has recently evolved this into an embedded Informationist programme. The concept for the role of 'Informationist' (Information Specialist in Context) arose in a clinical context. This grew out of a responsibility to provide specialised information services within a clinical research team to support and encourage evidence-based practice[10]. It has since been developed in different bioscience settings[11]. The role continues to be refined for a range of research disciplines and service provision requirements. The Informationist service model denotes a customized approach to information support, embedded in the research environment, delivered to researchers where they work and integrated with their working practices. An Informationist's activities broadly encompass research information and knowledge management, which they bring together with a strong understanding of the clinical/research culture and processes. Key to the successful integration of the informationist within a research team, is a proactive approach to relationship building, requirements gathering and delivery of support.

It is ultimately the environment in which the embedded information professional works that defines their precise role, but irrespective of context, they inform, enable and support information usage, as and when required. As such, there is no universal definition of an Informationist and responsibilities tend to vary depending on the needs of the researchers and clinicians they support. Anecdotally, the personalized approach of embedding information expertise within research teams increases the perceived value and relevance of information literacy skills.

"Digital or not, it always comes back to people and relationships" Informationist at Welch Medical Library

Evidence of the real benefit and impact of a number of such programmes in the US is beginning to mount. A recent formal evaluation of the National Institutes for Health (NIH) Informationist programme reported that embedded information support in clinical teams was regarded positively and had resulted in a greater feeling of satisfaction in their ability to find answers to their clinical questions[12].

While these kinds of initiatives have primarily been in the medical and life sciences to date, they are beginning to transfer to other disciplines and this is also likely to be instructive to future strategies for the information support provided to researchers in the UK university setting. The continuous evolution of top-level information support services is critical in underpinning successful world-class research[13].

[8] **MIT, Welch Medical Library (Johns Hopkins), Vanderbilt, UCSD, Countway Library (Harvard Medical School), Sloan Kettering, Purdue University**

[9] **Karla Hahn "Introduction: Postioning Liaison Librarians for the 21st Century" A Bimonthly report from ARL, CNI and SPARC, no 265 (Aug 2009)**

[10] ***The Informationist: A New Health Profession?*** **Davidoff & Florance (2000) Ann. Intern. Med. 132 (12):996-8.**

[11] ***The Emerging Informationist Specialty: A Systematic Review of the Literature.*** **Rankin et al. (2008) J. Med. Libr. Assoc. 96(3): 194–206**

[12] **Grefsheim, S *et al* The Informationist: building evidence for an emerging health profession J Med Libr Assoc 98(2) April 2010**

[13] **http://www.rin.ac.uk/news/press/challenges-academic-libraries-difficult-economic-times**

In common with the rest of the sector, UK academic libraries are facing many challenges due to the current economic climate. A report detailing these, published in March 2010 by RIN[14] presented the following core findings:

- It is likely that academic libraries will face a period of cuts, which will necessitate a balance of spend on information resources and staffing, while maintaining services and developing new ones
- This provides an opportunity for Library Directors, supported by senior management, to assess new strategic directions for the future

In addition to these considerations libraries need to examine and reflect on their roles both in developing institutional infrastructure and support services for researchers in relation to their data. This includes enabling the archiving of research data within institutional archives, providing data management training components in any general information management training and supporting researchers in finding routes to publish or reuse data. One way to offer this support is to implement dedicated roles within the library team.

The role of Data Librarian has developed in some libraries in the UK as a result of an existing high demand for data, particularly in social sciences. Their role in data support ranges from the preparation of user guides for data resources, troubleshooting data management issues, signposting places where data can be deposited and even acting as institutional representatives for national data centres[15], but the exact responsibilities of data librarians differ at various institutions. In the United States there is an increasing diversity of subjects supported by data librarians[16]. There is a need for a broader national discussion to take place about developing professional education programmes that encompass the lessons learnt from the US and how to adapt these in our own context to meet changing needs.

4.4. Data Landscape

Data encompasses a wide gamut of research content, but for the purposes of this report we have defined it as:

Any scientific information - generated by various scientific means including observation, computation or experiment - that forms an evidence base for the work of researchers. That information may be stored in any digital form, including text, numbers, images, video or movies, audio, software, algorithms, equations, animations, models, simulations etc'.[17]

Data management is a growing issue for researchers. While the impetus for researchers to produce papers is as high as ever, there are growing demands on them to make the data behind these papers more readily available. Already funders are beginning to mandate that data from research they fund is made available for re-use[18,19], enabling a greater return on their investment.

Meeting this expectation is not always easy. Researchers are not always aware that their funder expects them to make their data available or what the implications of this are and there is wariness about including data management costs within grant applications, derived from the fear that a proposal will be seen as less competitive[20], especially when the value of reuse

[14] **http://www.rin.ac.uk/news/press/challenges-academic-libraries-difficult-economic-times**
[15] **http://hdl.handle.net/1842/2499**
[16] **Of relevance to ARG, the University of New Mexico is in the process of recruiting an engineering data librarian in support of data management.**
[17] ***This definition is based on Cyberinfrastructure Vision for 21st Century Discovery*. Chapter III. National Science Foundation Cyberinfrastructure Council (2007).**
http://www.bl.uk/reshelp/experthelp/science/sciencetechnologymedicinecollections/researchdatasets/nsf0728_4.pdf
[18] **http://www.dcc.ac.uk/sites/default/files/documents/reports/DCC_Curation_Policies_Report.pdf**
[19] **http://www.rin.ac.uk/our-work/research-funding-policy-and-guidance/research-funders-policies-management-information-outpu**
[20] **http://www.lib.cam.ac.uk/preservation/incremental/IncrementalProjectReportJune2010.pdf**

is still not easily measured. There are many other issues that hinder research data sharing, documented elsewhere[21,22], but where data management and sharing requirements and processes are considered from the outset, many of these barriers can be overcome.

Sharing data is not the only area of concern. Researchers must also find suitable data for re-use. The Economic and Social Research Council (one of ARGs funders) asks that:

> *Any applicant whose research proposal involves funds for primary data collection, or for access to existing datasets, must establish in their application that the required data are not already publicly available.*[8]

The UK Data Archive (UKDA) is funded by the ESRC to hold data from its funded projects, where appropriate and although it provides advice on data management, researchers, especially those not originally from a social science discipline, are not always aware that this help exists. Most data repositories tend to be discipline-based[23] in this way, which compounds the problem for cross-disciplinary researchers. Other advice and support for data management is provided by bodies such as the Digital Curation Centre, which provides documentation, briefing papers and reports online, but awareness of this support is again lacking[24].

This increase in the priority of research data means that support services need to ensure that their researchers are made aware of data management requirements, and offer the training and advice that will enable them to cope with these changes.

PhD students and early stage researchers are often given the role of information management within a lab, but they don't necessarily have the skills to perform the required role. While training students and early career researchers could help fill the niche, proper career development and progression is needed[11].

'*Sometimes it's not a data manager, sometimes it's a researcher who does the data management, but now I think there are more and more data managers employed as such*' Data manager, UCL

There are isolated pockets of support roles across the UK either in post or soon to be implemented. A summary of these is given in Appendix I. Some have been implemented as part of the UK Research Data Service (UKRDS) feasibility study[25], which identified a distributed service approach to implement a national data service. One of the key elements for data management was identified as '*Well defined responsibilities and skills supported by training, tools and repositories and suitably skilled staff in libraries, IT and research support*' and the advantage of the UKRDS approach was '*the opportunity to embed the skills of data management at the heart of research within HEIs*'. . As part of the pathfinder for the UKRDS[26], roles are being put in place in Bristol and Leicester (the third pathfinder institution is Oxford) that will work with specific multi-disciplinary research projects to pilot the approach. They will provide support from research support services, IT and the library, but the key will be to provide an interface between all these.

"*In different institutes these kinds of roles can be housed in library services, IT and research support offices and the missing link typically is joining all of this up.*" Leicester University Research Liaison Manager.

---

[21] **http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/patterns-information-use-and-exchange-case-studie**
[22] To Share or not to Share: Publication and Quality Assurance of Research Data Outputs: RIN
[23] **E.g. Economic and Social Data Service, Archaeology Data Service, British Atmospheric Data Centre, Biological Records Centre.**
[24] **Support available is elaborated in Appendix I**
[25] **http://www.ukrds.ac.uk/resources/download/id/16**
[26] **http://www.ukrds.ac.uk/resources/download/id/47**

The UK approach is seemingly in contrast to the approaches taken by the U.S. and Australia. Their focus is on creating the ICT-based infrastructure for data management. Core to Australian National Data Service's responsibility for 'building the Australian Research Data Commons' is the provision of a central research infrastructure with the tools to manage, store and access research data created by government-funded researchers. The U.S. National Science Foundation, Office of Cyberinfrastructure has funded a small number of projects under its DataNet programme to develop "exemplar national and global data research infrastructure organizations". It should be noted that these are not exclusive of building capacity with support roles, but this is not a focus.

"*A lot of money is being poured into infrastructure development, but if you don't have people encouraging uptake of those tools, your return on investment is not going to be as great*"
Data Manager, Australia

Europe-wide, the European Commission is leveraging the European Strategy Forum on Research Infrastructures (ESFRI) to ensure coordinated use and support of the data infrastructure already available across Europe to minimise duplication of effort across its members[27].

4.5. Accessibility Research Group

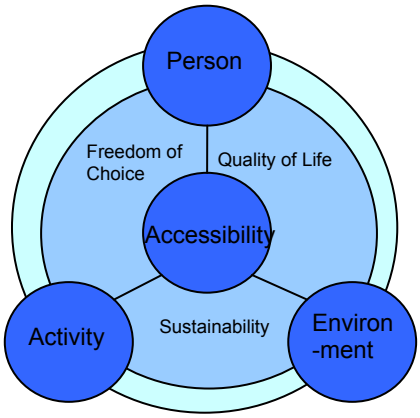
Research increasingly involves adopting a multidisciplinary approach to tackle contemporary cross-cutting issues effectively. University College London (UCL) aims to foster cross-disciplinary working via their Grand Challenges[28] and through a number of interdisciplinary centres and institutes. Professor David Price, Vice Provost in Research recognises the importance of creating cross-discipline links in driving successful funding bids.

'UCL has a moral obligation to contribute to improved human wellbeing and flourishing. We also have a rare opportunity, as a multi-disciplinary research-intensive university to develop the culture of wisdom (defined as the judicious application of knowledge for the good of humanity) that is necessary to address global challenges of wellbeing.
These are complex, systemic and multi-faceted problems and require knowledge drawn from not just one discipline, but across disciplines, to enable the different approaches and multiple perspectives that will lead to new insights and solutions.' Professor David Price

An exemplar of this approach is the Accessibility Research Group (ARG) [29] within the Department of Civil, Environmental & Geomatic Engineering (CEGE). The Accessibility Research Group (ARG) has a wide-ranging brief to understand what accessibility is, why it is important; what barriers to access exist, who they affect and how they could be eliminated or reduced. Their research seeks to understand how people are disabled by the interaction between their capabilities and those required by the design of the built environment, informing the provision of accessible systems that enable people to achieve their potential (represented in the diagram below).

The ARG was chosen for this study as the research group is small but highly multidisciplinary in nature, operating within a large dynamic cutting-edge university. The ARG's research interests span sustainable and adaptive accessibility, ease of movement for pedestrian & wheelchair users, infrastructure & public transport design and co-ordination, information systems for people with learning difficulties, development of video mapping devices, ethics, social inclusion and access to justice in planning processes.

[27] **UK-based data infrastructures already feed into the ESFRI roadmap, see** http://ec.europa.eu/research/infrastructures/pdf/esfri/other_ri_roadmaps/united_kingdom_en.pdf#view=fit&pagemode=none
[28] **http://www.ucl.ac.uk/research/gc/**
[29] http://www2.cege.ucl.ac.uk/cts/arg/



In recognition of the group's enormous contribution to the field, the ARG was included on the UK Government's Disabled Persons' Transport Advisory Committee (1998 – 2001). The ARG currently has a research portfolio of approximately €16 million with access to other skills and expertise within CEGE including ergonomists, specialists in transport safety, and fuel cell and power systems technologies, as well as through Professor Nick Tyler's appointment as Director of the CRUCIBLE[30] Centre to all other Faculties and Departments in UCL. The ARG has just been appointed to provide advice to the Chinese Government on the design of Low Carbon City Development in their £1.2 billion project in four cities in China.

The ARG provides a rich information management challenge with research activities fusing elements of engineering, architecture, design, bioscience, public health and environmental sciences and drawing together expertise from the Departments of Engineering, Psychology, Art, Architecture, Philosophy and Economics, and a wide spectrum of medical research areas at UCL.

The group also works with a broad range of external collaborators, such as the University of Westminster, the London School of Hygiene and Tropical Medicine, the Royal National Orthopaedic Hospital, Moorfields Eye Hospital, the UCL Institutes of Neurology, Cognitive Neuroscience, Ophthalmology, the UCL Ear Institute and universities in Japan, China, Canada, Italy, Germany, the USA, Latin America and Spain.

Working across traditional disciplines, subject areas and international boundaries is not without its challenges. Striving to navigate unfamiliar domains requires barriers to be broken down – such as differing vocabularies, conceptual viewpoints and methods of working. Thus ARG provides a rich test bed for scoping the role of a RIM.

The ARG comprises 15 researchers, a number which enables this pathfinder project to be comprehensive in determining the entire group's research information needs and behaviours. We were mindful in our conclusions to explore the scalability of our findings to other research groups. Thus, we also consider the balance between a range of RIM-supported services and the number and type of researchers who could be making use of them to allow some estimation of scale of implementation of the role in different settings

The ARG is responsible for the Pedestrian Accessibility and Movement Environment Laboratory (PAMELA), which is a facility established to study the way people interact with their immediate environment. The facility is used to measure pedestrian reactions to changes in the built environment under variable light and noise conditions in a controlled laboratory setting. This facility is also used to carry out contract projects and experiments for public and private organisations. We explore the information challenges associated with PAMELA later on in this report.

[30] **http://crucible.cege.ucl.ac.uk/**


5. Aims & Objectives

By gaining an enhanced understanding of current ARG information practices and UCL support services, the project aimed to scope the need for, and requirements of, an embedded role to support multidisciplinary information needs. The specific study aims as set out and agreed at the beginning of the project were as follows:

- Identify key stakeholders relevant to the project: including research managers, research administrators, ICT support, institutional repositories and libraries
- Assess and capture the information needs and practices across the ARG research team and key stakeholder perspectives, to identify context specific requirements, gaps and opportunities
- Identify examples of best practice in the UK and overseas that map to the gaps and opportunities identified, to inform the role requirements for a RIM in the context of the ARG
- Establish the skill set and training requirements for the RIM role and distinguish those specific to ARG and generically applicable for the wider HE research environment
- Identify mechanisms to integrate the RIM role with existing institutional processes and infrastructure to enhance the research lifecycle and the wider applicability of such approaches
- Synthesise qualitative and quantitative findings to produce a report to JISC that includes:

  − an evaluation of the approaches taken to define the RIM role;
  − recommendations on the requirements for successful implementation of a follow-on pilot of the RIM role;
  − key findings and lessons learnt of relevance to the broader HE research community

- Ensure project outputs are shared widely, through liaison with JISC InfoNet

6. Methodology

This six month scoping project (March – August 2010) was divided into three phases. The initial phase (March – April) involved planning and preparation of materials for data capture, phase II (April – June) involved stakeholder research, concept testing and establishing researcher needs and requirements. The third and final phase (July – August) involved synthesis and analysis of results and findings.

The study employed a range of qualitative and quantitative research methodologies designed to capture current ARG researcher practices, culture and needs; map existing institutional support service offerings at UCL to identify gaps; and consider selected examples of best practice, both nationally and internationally. The following sections set out in more detail the work undertaken over the six month period.

6.1. Stakeholder Mapping

It was acknowledged at the outset that the scope of the RIM role needed to be driven and defined by researcher requirements. In order to ensure a reliable and representative understanding of the variety of perspectives and diverse needs within the ARG research group, the entire complement of researchers was utilised as the primary stakeholder group for consultation. The 11 active researchers, previous team members, lab manager, departmental finance manager and two technical staff that make up the research group all participated in the study. This group comprised a mix of researchers at different career stages: PhD students; mid-career post-doctoral researchers; lecturers; and a Professor who is also the founder and head of the group.

A key challenge for this project was to identify all potential people in addition to the research group, e.g. support staff and other stakeholders beyond UCL - that would influence the successful scoping of the RIM role. Given the project's time and resource constraints, it was not feasible to consult all those identified, but the project did prioritise key people for follow-up interviews.

In the case of UCL support services, interview candidates were identified through a combination of approaches, as there was no simple way to identify and clarify all potential support departments, staff and their responsibilities. A number of library service representatives were recommended by Dr Paul Ayris (Director of UCL Library Services, and Project Board member). A list of additional support staff from a variety of areas mapping to the requirements for services obtained from ARG researchers, was gathered from the UCL website. Each interviewee was also asked to propose suitable candidates. A shortlist was then generated to ensure the various research support services offered at UCL were covered during the consultation process. This Research Support Infrastructure in UCL includes Administration, Library Services, Research Finance, Human Resources, Repository staff based in the Library, Research Office, Data Managers, IT Services, Commercialisation and IP support.

At a late stage in the project we became aware of *Stakesource*[31]; a web-based tool that automates stakeholder mapping, which had been developed at the computer science department at UCL. Although we had already interviewed a number of support service staff, it was decided that the mapping tool should be used to help evaluate whether we had succeeded in identifying all the relevant areas of support of the research process within UCL. There is currently no known single source of this information within UCL and mapping the distributed network of support would serve as a useful resource for ARG and for the RIM.

Initial definition of the broader research information landscape leveraged the breadth of Project Board expertise and domain knowledge to create a master list of all institutions, organisations and professional bodies that could potentially serve as examples of best practice, policy, strategy, key influencers, opinion leaders and key targets for outputs of the project. We supplemented this list with desk research and a 'crowd sourcing' approach, by eliciting information via an online survey (described below) and by asking interviewees for examples of best practice and relevant stakeholder groups. The final list chosen for interview was selected under the guidance of the Project Board.

[31] http://www.stakesource.co.uk/; S. L. Lim, D. Quercia, and A. Finkelstein. StakeSource: Harnessing the power of crowdsourcing and social networks in stakeholder analysis. Proceedings of the 32nd International Conference on Software Engineering, ICSE (2) 2010, pages 239-242.

6.2. Survey

We used an on-line survey to assess the extent to which existing roles in other institutions and organisations mapped to the skill set and responsibilities envisaged for the RIM, as defined through the consultation process with ARG researchers and UCL support services. The survey helped to establish contacts within other institutions for follow-up interviews in order to examine in more detail how these roles functioned, to extract elements of good practice and to review lessons learnt in other contexts.

The survey was produced using the Survey Monkey software tool[32], and was circulated to target groups through pertinent channels. These were selected in a targeted way, in order to capture informed and diverse perspectives that would be of value in assessing the current research information support landscape. A number of professional bodies agreed to distribute the survey to their membership by email. These included; ARMA (the professional association for research managers and administrators in the UK), RLUK (Research Libraries UK) and the JISC research data management mailing list.

In total, 96 people completed the survey over a two week period. Survey results were cross-tabulated and analysed for trends (see Results) and six candidates were chosen for follow-up interview. The survey and a summary of results are available in Appendix II.

6.3. Interviews

A pilot interview was conducted to refine the structure and approach and obtain feedback from an ARG researcher on the process and length. The basic interview structure was then adapted for different interviewee groups, as detailed below. Interviewees were then emailed a brief of the project and asked to participate in the study. The semi-structured interviews, conducted by two project team members, ranged from 1 – 1.5 hours in length. They were audio recorded with the permission of the participants and summarised. The findings were then cross-tabulated and analysed for commonalities and trends.

The concept of the research lifecycle (see diagram below) was utilised in interviews to prompt interviewees to think about end-to-end scenarios and the activities and services that occur throughout the research process. It is an artificial construct, used to depict the research process as four distinct quadrants of activity (below). While the concept was a useful tool to ensure all areas of research were covered, we recognize that it is an over-simplified representation of the research process.

Interviewees were also asked for suggestions on how to improve the existing services and anticipated future services. The proposed RIM role was described and reactions, expectations, and postulated challenges were gauged. The interview templates are available in Appendix III.

Research Lifecycle

1) Idea inception – generating a research question or hypothesis;
2) Securing funding – from identifying sources to putting together a bid;
3) Experimentation – collecting data and analysing it;
4) Dissemination – sharing and publishing findings

[32] http://www.surveymonkey.com/

ARG Interviews

The initial phase of the project focused on gaining a holistic understanding of ARG researcher processes and practices throughout a research lifecycle, to distil and document the common problems they encounter and their requirements for support.

The focus was primarily on the research information used and produced in the different phases of research. A workshop session was organised following completion of all the ARG interviews to validate empirical findings, reflect upon current practice, suggest immediate solutions and prioritise their requirements of support services.

Research Support Services Interviews

Consultation with UCL support services set out to determine the support available to researchers and identify perceived and actual gaps. This strategy ensured that the final list of ARG support needs did not focus on duplication of existing services, but on the augmentation of and complementary approach to, these services. It was not our aim to cover all of the UCL research support services by interview, and so interviewees were selected based on the key service requirements of ARG researchers. A total of 12 semi-structured interviews of support service staff within UCL were completed. In the analysis stages of these interviews, we focused on how a new role would integrate into and add value to existing UCL infrastructure.

Best Practice Interviews

Desk-based research into national and international approaches to 'best of breed' information management within a research setting was complemented by interviews with organisations offering best practice examples in the UK and worldwide. Interviewees included: representatives of advisory bodies and other institutional libraries; data managers; information professionals and liaison and embedded roles. A total of 10 semi-structured interviews of this type were completed.

UHMLG Ideas Carousel

As an additional element of external stakeholder consultation, a workshop (ideas carousel) was presented at the University Health and Medical Librarians Group summer conference. The themes of the meeting related to the roles and future of HE libraries and librarians in medicine/healthcare and the audience was mainly librarians from across the UK managing services in support of HE and NHS researchers, students and practitioners. The carousel consisted of 3 sessions of round table discussions with conference attendees, facilitated by a project team member, for 20 minutes each. The conference attendees were split into 3 groups. These group sessions allowed us to assess a range of library professionals' views and perspectives on the following:

- The extent to which current services are centralised versus embedded
- Problems facing current services and/or embedded information specialists
- How would a RIM role overlap with existing roles? Would this be an issue?
- What skills and training would required for an information specialist within a research team
- What is required for a truly embedded liaison role to be implemented and what potential challenges are there?

7. Outputs and Results

7.1. General Findings

As one of the world's leading multidisciplinary universities, UCL, is consistently ranked highly and recognised internationally for the excellence of its teaching and research activities. It aims to provide innovative support services to its academic and research staff and is constantly striving to evolve this support to better meet their changing needs and maintain its world-class standing. It is important to note that all of the UCL support staff contacted during

this project welcomed the opportunity to input into, and were keenly interested in, the findings of the project feeding into these services.

Amongst those interviewed there was a general consensus that HEI research support services could be improved for the future; with scope for improving visibility, increasing communication, streamlining processes and by reducing the siloed or duplicated nature of some activities. There was also a general concern that there was a lack of national join-up of research support activities, initiatives and infrastructure across the Higher Education sector.

'A range of people and systems are handling various processes reasonably well, but …we could look towards highlighting and unifying some of the more specific 'research information' aspects of those to develop a more sophisticated and up to date research information service.' Research support services representative UK HEI

At the time of writing this report, there are a number of projects underway or in planning stages within UCL that aim to address some of these research information issues. The existing support services provided in UCL are described in more detail in Appendix IV.

Those interviewed were from the following areas within UCL services:
- Library services: Academic support, digital curation, IT services development
- Research Planning and Strategy
- IT services: Faculty support officers, Research Management systems manager and developers
- Research Facilitators (provide support in relation to identifying funding)
- Academic Planning (RAE/REF support)
- Finance/Department Manager
- Data Manager

There is significant good will from the support service staff to help find solutions to the problems facing researchers. **However, UCL central services face their own challenges, namely:**

- **The constraints of limited and thinly spread resource**
- **Difficulty engaging with less senior researchers (department heads are the 'default' communication channel) to deliver existing support**
- **Maintaining a balance in supporting both teaching and research information and data needs**
- **Staying current, being relevant and adapting to changing researcher needs and technology advances**

This was also reflected more widely than UCL, with similar concerns and issues identified across the HE sector through the online survey (detailed results provided in Appendix II) and external consultation processes. Two studies recently published, in the UK (Research Information Network (RIN) funded) and the US (Commissioned by the Online Computer Library Center) assessed the extent to which information-related support services meet the needs of researchers. Interestingly, both studies reinforced many of the findings reported here and indicated that tensions, issues and concerns appear to be both sector-wide and not unique to the UK HEI environment[33].

The UK study investigating information-based research support services at four UK universities (UCL, Leicester, Warwick and York) reported the following core findings:
- Information support tends to focus on early and late stages of the research process
- There is a gap in supporting researcher's data management, curation and preservation
- There is a demand for simple tools to facilitate collaborative working
- There is scope for developing shared services across UK HEIs

[33] **http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/research-support-services-what-services-do-resear**

The JISC funded Institutional Data Management Blueprint (IDMB) project at the University of Southampton, which aims to create a practical institutional framework for managing research data throughout its lifecycle recently reported the following issues relating to research data[34]:

- There is a need from researchers to share data, both locally and globally;
- Data management is carried out on an ad-hoc basis in many cases;
- Researcher demand for storage is significant, and outstripping supply;
- Researchers resort to their own best efforts in many cases, to overcome lack of central support;
- Backup practices are not consistent, with users wanting better support for this;
- Researchers want to keep their data for a long time;
- Data curation and preservation is poorly supported;

This argues for the wider applicability of any interventions that would seek to solve these issues, such as the RIM role.

'The existing support roles within our research unit are rather traditional and maybe outdated now. Information management has changed so rapidly in the last 15 years or so that I feel a fresh look at the way researchers are supported is needed. A lot of our tasks are distributed among different members of our team. Procedures and workflows could be streamlined so that we avoid duplication…. If the role of a Research Information Manager was established within research organisations then these changes might take place. Also more cooperation and sharing of practices across research organisations would become possible.' Information Officer UK HEI

The online survey highlighted the need to perform a more comprehensive review of infrastructure, systems and services relating to research information management and support across HEIs in order to understand the best strategies for reducing duplication of effort and enabling national coordination to take place. It also reinforced the findings that identifying relevant support within institutions is difficult, as there is little consistency of nomenclature of support roles in the sector.

This study focused on the interactions between the ARG research group and the institutional support services available to support it. The RIM role would seek to enhance the flow of information into and out of research teams, this could have knock-on effects in improving the flow between the individual support services, but it would not be the primary expected function of the role. As such, we did not investigate how different support services departments work and interact with each other. This could however be usefully investigated as an element of a comprehensive review of HE systems and services.

7.2. ARG Requirements

The focus of the project dictates that we detail the requirements and unmet research information needs of ARG researchers. ARG has been highly successful in:

- Cultivating a multidisciplinary approach to bring together a broad range of skills and expertise to tackle complex research questions
- Delivering major advances in the field of accessibility research
- Attracting significant national and international research funding and collaborations

During the process of consultation ARG researchers were very open and honest about the areas where they felt their own practices and the support they receive could be improved upon and this is reflected in the requirements detailed below. An in-depth, detailed description of ARG practices and needs throughout the research lifecycle is provided in Appendix V.

[34] **http://www.southamptondata.org/uploads/7/3/0/0/730051/idmbinitialfindingsreportv4.pdf**

In working across traditional disciplinary boundaries, ARG faces a unique set of challenges relating to this approach, as well as those challenges inherent to the current research process and culture. We do believe however, that many of the information challenges that face multidisciplinary research groups such as ARG are common and as such any solutions to these will have wider applicability. This is not to say that requirements will be identical across all research groups, in all disciplines or that the solution will be a 'one size fits all' RIM role. It is likely that there will be some measure of institutional and discipline context and research activity specificity alongside the more generic issues that face the majority of research groups.

Activities and practices across the team vary, reflecting personal preferences for specific ways of working, as well as experience and level of seniority. The heterogeneous nature of the team means that there are also sometimes marked differences in the needs of the group members.

Early stage PhD researchers tend to be focused on acquiring the technical and subject matter knowledge and skills in order to undertake a research project successfully. They procure these skills primarily through informal mentorship, supported principally by the ARG's Head (Principal Investigator; PI) and to some extent by senior researchers.

Mentorship and encouragement from colleagues should not be underestimated as a major route to learning in the research context – new techniques, methods, tools and services are usually adopted only when introduced and promoted by a trusted team member. This transfer of tacit knowledge is not formalised and therefore is reliant upon researchers taking the time and effort to share their expertise with colleagues. Local support is crucial when researchers are in the early learning stages, as otherwise the time costs of adopting the new practice are seen to outweigh the benefit. This argues for formalising this embedded approach to training, recognising peers as the most trusted source of guidance and advice.

The PI currently acts as the main information channel for the group, tying together the objectives, activities, researchers and network of collaborators. Junior researchers tend to be extremely reliant on the advice and guidance of the PI on all research related matters, and rarely approach others, including the support services, unless encouraged by the PI.

Senior ARG members have many responsibilities which place major constraints on their time including, research mentoring, formal teaching, administrative and reporting duties, as well as membership of numerous committees and professional bodies. There is willingness across the senior team members to engage with the information management issues that face ARG but in reality, time given to this means other areas of effort lose out.

There is currently no role within the team that is responsible for managing ARG's research information and data portfolio. To ease demands on senior group members, a RIM, providing dedicated, quality, context specific support for all members of the group, would free up senior researchers' time to focus on their own research goals would therefore be likely to improve the efficiency and productivity of the group as a whole.

The ARG also provides a rich information management challenge with a need for tailored advice and guidance in a number of areas across the research lifecycle. While some training is available at UCL, ARG researchers feel that existing provision in this area was neither tailored to their needs nor relevant to their research areas.

ARG require training, guidance and advice:

- **On identifying relevant sources of information within and outside UCL encompassing, literature, data, best practice, technologies, expertise, potential collaborators and support services**

- **With appropriate and context-specific search methodologies and strategies, from someone with considerable subject knowledge as well as appropriate information skills**

- **On relevant funding opportunities from funding organisations other than Research Councils and for activities such as public engagement**

- **Including a more formal approach to the training of PhD students, perhaps arranging 'buddies' (more senior researchers in related fields); to include training on project management, specific software tools, grant writing and experimental design**

- **On all aspects of data management, to include help in using metadata standards and practical advice on costing in the early stages, creating, documenting, storing, accessing and sharing data.**

It was the topic of data that was the single greatest cause for concern for ARG researchers, and it was this area they felt was most lacking in the advice, training and support and guidance they needed – this is a vital role for a RIM to fulfil. Although ARG members are clear that they need support in this area, they were unclear at the outset of this study as to the basic principles of data management, lacked an understanding of the terminology and were uncertain how to frame their requirements. Within UCL they were unsure who to approach and what to ask of UCL central services.

The support ARG requires in relation to data is rudimentary, and yet extends beyond that of a 'traditional' data manager post. As such, the RIM would not take responsibility for hands-on data management, but would support researchers in doing so themselves. As UCL currently has no formal institutional data management policy or infrastructure in place to store research datasets, the RIM role would need to combine data management expertise and liaison/outreach to work with institutional support services to help input into future developments and would therefore usefully have a more strategic overview of the entire research and data lifecycle.

Some of the issues ARG raised relate to enhancing existing mechanisms, channels and strategies for communication; both internally across the team and with close collaborators and externally to help promote and publicise the ARG's activities and expertise. Team members agreed that the flow of information across the group could be improved, perhaps by finding alternative methods of communication, especially given that ARG team members are geographically dispersed. By virtue of the fact that ARG works with such a broad range of external collaborators, across disciplinary and international boundaries, the management of ARG communications is a complex process. **ARG would benefit from a RIM role to streamline, enhance and coordinate the flow of information, for communication purposes.**

ARG communication could be enhanced through:

- **An improved website and other online strategies to raise ARG's profile externally and to enhance access to its research outputs, expertise and facilities**

- **Development and maintenance of online collaborative working spaces, technology and tools to enhance communication and the flow of research information and sharing of data across the group**

- **Opportunities and organized events for networking and collaborative working that bring the team together with collaborators in one physical space to exchange tacit knowledge and share best practice**

The above could be achieved through the delivery of an ARG dissemination strategy that would include appropriate formal publication routes, conferences, website and social media routes to increase the visibility to potential students, staff and collaborators.

ARG also identified the need for systems and tools to enable efficient use and reuse of ARG's research outputs and data. Effective liaison with existing information, IT and other services at UCL could be facilitated by the RIM role. This would allow external expertise to be leveraged to benefit ARG. Equally this could enhance information flow from research groups to central support services such as for the production of metrics to feed into REF, data repository requirements, service development etc.

ARG needs systems and tools to:

- **Manage research information and data collected and produced by the team as a whole, including reference materials, and networks of researchers and research organisations**
- **Manage deadlines for funding calls, relevant conferences and general project deadlines (possibly a shared calendar)**
- **Allow for the simple and secure deposit, storage and retrieval of complete project records that include (and link) project proposal, ethics applications, summary of the design of experiment, data layers (raw, processed and final) and metadata (a data repository either within ARG/Department or through UCL central facilities)**

A RIM Role for ARG

Throughout the consultation process ARG researchers were very enthusiastic about the prospect of a RIM role, to support their information/data needs across the research lifecycle.

'I think having somebody like that would be very useful, especially within ARG to teach me new tools and maybe keep me updated with new ways of managing data as well' ARG researcher

'I would be unlikely to approach someone I didn't already know to help with the problems I was having, so having someone who is part of the team and dedicated to answer our questions and help us find solutions would be great' ARG researcher

The ARG researchers felt very strongly that discipline specific knowledge and an understanding of the research culture and working practices, would be central to the success of the role. It was to the lack of this kind of subject knowledge, that they felt made communication with central services difficult at times. The issue of how and where to recruit a RIM, was raised by a number of stakeholders and a number of options were suggested. From an ARG standpoint, the preferred candidate for the role would be a researcher with an interest in the informatics/data areas. Alternatively, ARG researchers proposed that if an information/data professional were to fill the role, they would need good subject knowledge and a strong understanding of researcher practices and motivations to function effectively.

It was suggested that for the role to succeed the RIM would need to feel like an integral and valued member of the research department. **Regardless of the RIM's background, ARG researchers felt it was crucial that the role 'sit' within the research team, probably at a departmental level, in order to build an understanding of practices and foster close working relationships with the research teams that they support.** They also felt it was important for the sustainability of the role that the RIM be acknowledged as a valuable asset

to the institution. This balance will require institutional 'Champions' at a variety of levels, from department heads to senior management.

The broad range of ARG research information management needs raises the question of how they might all be met effectively. Not all of the issues facing ARG would be solved by the RIM role and it is important to clearly delineate the scope of the role to make it manageable and deliverable. The focus should remain on information management throughout the research lifecycle. The other functions may be delivered through a combination of the RIM role facilitating enhanced understanding and dialogue between existing services and research groups and interfacing with relevant expertise. The role could also provide clearer evidence based input into future service provision strategies within UCL.

In the context of ARG, during a pilot phase the RIM could support the research group by (in order of priority);

1) **Increasing efficiency and productivity**; by auditing current information and data practices across the group to reduce duplication of effort across the team and streamlining processes, thus reducing the burden on PIs and freeing up researchers' time to focus on their research.

2) **Adapting research information strategies and solutions**; working with departmental IT support and FISOs (Faculty Information Services Officer) as required, to capture researcher requirements and issues in relation to systems and infrastructure. This will ensure systems are fit for purpose and consider changes in the information landscape and technology and infrastructure advances in UCL and beyond.

3) **Developing an ARG data management plan**; utilising an understanding of current practices, and leveraging the network of expertise (best practice, data management and training e.g. data manager networks and DCC) established through this study to provide pragmatic advice to enable better management, storage and reuse of ARG's valuable datasets and providing support and guidance to ensure implementation.

4) **Interfacing with UCL support services**; signposting expertise within UCL. Opening up much-needed channels of communication between researchers and central services to facilitate understanding and cooperation. This will make it easier for researchers to know where to go for help (across a variety of UCL's research support services) throughout the entire research lifecycle.

5) **Developing an ARG training plan**; working with researchers to establish and prioritise departmental training needs and feeding requirements to UCL's central services (e.g. Library Services for Information Literacy skills and IT services) and working with external partners as appropriate to provide tailored and specific training for researchers.

6) **Exploring alternative mechanisms of internal and external communication**; evaluating Web 2.0 tools and institutional infrastructure and technology developments to decrease reliance on email and establishing tools to manage information on networks of collaborators.

Additionally the RIM could help support the case for wider applicability of the role across other departments at UCL, by;

1) **Evaluating the realised benefits of the role**; defining the metrics and measuring the added value of this type of support.

2) **Disseminating the benefits of the role**; working across departments and communicating with different groups within UCL to establish scalability of the RIM role as a solution to broader requirements and gaps.

3) **Ensuring appropriate engagement with senior stakeholders in UCL**; Senior Academics and Senior Managers as 'Champions' of the RIM role would ensure sufficient buy in from both communities. This would also allow the RIM and those they represent to have input into future strategic decision making and planning of roll out across UCL.

7.3. RIM role: Practicalities

Through a combination of structured interviews with UCL services, external stakeholders and library professionals we sought to capture a variety of perspectives on the practicalities of implementing such a role in the HE context.

Of the 60 UK respondents to the online survey (demographics of respondents are detailed in Appendix III), 80% indicated that they felt there was a need for a RIM-like role in UK HEIs. Many identified a number of positive outcomes and felt it would be really beneficial to have an embedded post that could:

- Combine information/librarian skills with administrative and technical skills
- Provide a 'way in' for support services to research groups and departments other than Departmental Heads
- Coordinate research information management across the entire research lifecycle through liaison with the fragmented and dispersed support across institutions
- Connect to other institutions, learning from examples of best practice nationally and internationally

There were however a number of key issues raised, namely:

- How to define an appropriate and manageable skill set
- Level of granularity of the role
- Scalability of the role
- Funding and sustainability
- How to demonstrate added value

Best Practice UK and beyond

Through a combination of leveraging project board expertise, desk research and the online survey, examples of best practice external to UCL were identified and a number were chosen for structured interviews. The stakeholder list considered potentially relevant at the outset of the project was extensive (see Appendix VI) and included institutions, organisations and professional bodies that could serve as examples of best practice, policy, strategy, key influencers and opinion leaders. The priority list for interview was refined on the basis of aligning to the specific needs of the ARG and therefore focused on advisory bodies (particularly relating to research data), institutional libraries, Information professionals (including liaison and embedded roles) and data mangers.

We would propose that the RIM role follows the model set out by the U.S. 'Informationist' roles[35]; where more specialist discipline specific knowledge in combination with information skills are provided direct to the clinical team, where they work. We would propose that the embedded and proactive nature of these and other information and data support/manager roles is a service provision model that works particularly well in supporting research teams in relation to information and data needs. While these roles as an integrated member of the team they support, in most cases they support multiple teams. We would suggest that

35 *The Emerging Informationist Specialty: A Systematic Review of the Literature.* **Rankin et al. (2008) J. Med. Libr. Assoc. 96(3): 194–206**

working at the departmental level, a RIM role should be able to provide sufficient support while balancing with cost.

As the 'Informationist' programmes evolve in the U.S. we see the potential for expanding this role to additional disciplines but also to meet other related needs of a research team. Alongside information literacy skills, the supplementary activities that we have identified as gaps in the context of ARG (such as data and technologies), were highlighted through discussions as areas that current informationist roles may well accommodate in the future, as roles continually mature and evolve in response to changing needs. In considering the development of new role types and ways of working it is essential to recognise that both the information landscape and research environment are evolving rapidly and so all information and related professionals (including the RIM) will need to adapt to remain relevant and useful.

Through the course of this project a number of established Informationist, liaison and data support roles were identified as examples of 'best in breed' for consultation. It is important to note that most of those interviewed indicated that these programmes, initiatives and support (particularly in the area of data) are in very early stages world wide and are typically still experimenting with best approaches.

Many in data support roles suggested that they feel isolated and lacking in the guidance and support that they themselves require and identified a lack of opportunities for continued professional development as an issue. It was suggested that opportunities for dialogue and sharing experiences and learning would be very welcome. Data support roles from the US, Australia and Europe also indicated that they often looked to the UK; for example to JISC programmes and UKOLN for examples of best practice themselves.

We would propose that in implementing a RIM role it would be crucial to set up networks of support, to ensure two-way transfer of knowledge and learning from peers. A hub for RIM activities in the UK that could bring together expertise, skills, useful resources and guidance for the community that would help with continued evolution and sustainability of roles. This could also involve existing programmes of relevance, thereby supporting information and data services across UK HEIs to ensure national join up, and to avoid duplication of effort.

RIM Skills and Scalability

The notion of credibility and the requirement for a balance between requisite subject and domain knowledge versus information or technical skills was also a recurring theme. Those in liaison roles or more actively engaging with researchers valued subject or research culture knowledge more highly than their counterparts in centralised roles. Given the embedded and liaison aspects of the role, it was suggested that the 'soft' or people skills would be crucial in the successful integration of the RIM within a research team or department.

A number of those interviewed indicated that they felt their research background was useful in gaining respect and credibility from the academic community and being able to communicate with them in an authentic and authoritative way.

'There is a strong need for people with the relevant expertise in Library services, research grant costing and IT services, but when those people go and meet researchers they don't always know the right kind of questions to ask, because they're not involved in the research lifecycle and it's that background that makes a difference.' Research Liaison Manager

'You don't have to come from a research background… but it open doors for me that wouldn't otherwise open so easily' Liaison Librarian

'If they [Informationists] have had any kind of experience in a laboratory or some kind of health science arena or environment, that's extraordinarily helpful' Informationist

This was particularly highlighted as crucial for the embedded Informationist roles in U.S. institutions. In contrast, some of the UK librarians felt that not being PhD scientists would be advantageous as there *'wouldn't be competition'* and they wouldn't *'tread on the academics toes'*. Clinical Librarians in the UK felt that lack of scientific background wasn't hindering them in a clinical context and that they were respected members of the team, valued for their particular skills and areas of expertise. It was also suggested that it would be important for the RIM to be able to communicate with and relate to a broad range of people in addition to researchers.

It may be difficult to find one person with the range of skills needed for the role, and so up-skilling and continuous professional development would be critical. The portfolio of skills required by Research Information Managers needs to be addressed in terms of what is required now, and what will be needed in the future. It was proposed that this would need careful coordination and management, to support individual development of roles embedded in departments, who could become isolated from a coordinated centre.

'I think professional development and networking to retain knowledge and understanding of library and information management and developments in the area is very important, and I think you would lose that if you were full-time in the faculty.'

Sustainability, career progression and who pays?

The cost and affordability of a highly skilled role such as the RIM was raised as a possible concern. How would the 'right' kind of person be attracted to the role? Libraries and information support currently find it difficult to recruit individuals with a science, technology or engineering background. The reasons for this may stem from the fact that positions within the library are perceived as remote from research process, so perhaps where new roles are closer to the *'coalface'* of research they may appear more attractive?

Given the current economic climate it is unsurprising that the issue of financing a RIM role was a persistent motif in all discussions. **It was suggested that acquiring funding for new initiatives and pilot studies was likely to be extremely difficult and this seemed to be the biggest perceived barrier to piloting the role.**
A number of options on how funding might be achieved were put forward, namely:

- Attach the RIM role to a particular research grant
- Cost the time of a departmental RIM into all research grants
- Centrally fund from block grant

The issues of job security, career structure and progression are particularly relevant in the early stages of developing new strands of professional practice, when roles are likely to be isolated 'singleton' posts. Parallels can be drawn here with the emergent role of biocurators, who enable *'translation and integration of… the scientific literature as well as large data sets'*, specifically in bioinformatics research. This role is now becoming a recognised career path for researchers, gaining speed since the creation of the international Society for Biocuration[36,37], and with increasing opportunities for development and training within the role. It was mentioned by some of those interviewed, that were it to be created, the RIM would greatly benefit from being part of a network of similar roles for mutual support and to push for greater recognition, with those we interviewed in comparative roles keen to be put in touch with anyone who may take part in a pilot as a RIM.

'*Networking is very important, I have now started a data managers group… we meet every three months or so, we can talk informally [about our issues and problems] 'such as: 'How do you deal with gaps?' 'How do you implement security?' Data manager UCL*

[36] **http://www.biocurator.org/home.shtml**
[37] **Bateman, A. Curators of the world unite: the International Society for Biocuration. Bioinformatics (2010) v26, 8. pp 991.**

Some argued that the lack of career structures and clear routes for progression at this early stage should not be allowed to be a barrier to exploring the possible benefits of a RIM through a pilot. This will need to be resolved for a number of emergent roles in the future including those in data and information support.

"There's not really a well defined skill set for us, and there's not really a well defined training and career paths… That would be across the sector as a whole" Data Manager Australia

There was some discussion (but no conclusion) on the optimum number of people a role could support i.e. how many people or teams. It was felt that this would depend on the size, activity and needs of the team. There was concern that it would be very resource intensive for an institution and, for it to be an affordable solution, it was proposed that the role should provide support at a departmental level. The departmental level of support would seem to be the appropriate level to trial the role during a pilot phase, when feasibility of a role working across a number of research teams (In CEGE – ARG's department, there are ~150 research staff and PhD students) could be assessed in more detail.

Measuring Success

Consultation with examples of best practice in information and data support sought to address how to demonstrate realised benefits of such a role. Some of those involved in liaison and embedded support activities acknowledged the importance of this, but none had undertaken a formal evaluation of their services. They suggested a number of ways this could be approached and recognised that it was something they would need to do in the near future.

A systematic evaluation of the costs and benefits of the role should be encouraged, but the appropriate timing, as well as methodology employed, should be carefully considered. This will require a baseline to be set to describe current practice. For implementation in other contexts a scoping and information/data audit approach would therefore usefully be considered at the outset to serve as a baseline measure.

Many reported that since recognition in an academic setting is primarily measured through publication record, if RIMs were recognised in this way, it could be seen as a good indication that the research teams they support valued their input.
Some of the possible measures of success could be:

- Time and Cost saving; improving efficiency
- Changes in researcher behaviours
- Changes in researcher perceptions
- Increased communication and understanding between researchers and services
- Inclusion within grant costing
- Publications including the RIM as an author

Evaluation would need to be built into the later stages of a pilot, as those involved in implementation of novel support roles suggested it takes a significant amount of time to get a new role off the ground.

8. Outcomes

8.1. RIM role profile

The findings of this report have underscored the need for new approaches to research information support to improve the ability of researchers to do their work in a more efficient way, leading to acceleration of the research process, enhanced collaborative opportunities, and new research outcomes.

Through evidence gathered in this study, we believe embedded, context-specific expertise in the form of RIM is key to enhancing this research information and data management and flow within the HE environment, at a departmental level.

As this is an enabling role, all the tasks performed by a RIM in post would be in close liaison with the research team and would be tailored to their needs. Irrespective of context, the role should inform, enable and support information and data usage, as and when required. Key to providing this type of support is an ability to engage with research team colleagues, identify very specific needs and skills-set gaps, and initiate provision or bespoke training to transfer knowledge and improve research efficiency. Close liaison of the RIM role with central services would be key in enhancing two-way communication and opening up dialogue. This would allow the researchers to make better use of existing services and enable central services to gain a more holistic understanding of researcher needs.

There was unanimous agreement, across all those interviewed that the generic skill set of the RIM is therefore likely to be focused on the interpersonal and relationship building aspects of the role.

Some of the more specific and technical tasks will be determined by the needs of the department the RIM supports and may also change over time. In the context of ARG and UCL, the greatest need currently relates to data management expertise, advice and training, but this may not be the case elsewhere.

RIM Role Tasks and Skill Set

Although it is impossible to define a single narrow skill set for the RIM, that would work in all contexts, the following gives a list of potential tasks which could be selectively applied as relevant.

- **Undertake an information/data audit of the department they support, throughout the research life-cycle to develop an in-depth understanding of practices and needs, in order to:**
    - Gain a holistic understanding of departmental research culture
    - Map research support provision within the institution
    - Track relevant research information trends and communicate developments to colleagues to improve research efficiency and support future planning

- **Build effective relationships and networks to become embedded in research groups as an expert member of their team while liaising closely with central services to:**
    - Respond proactively to researcher information and data management enquiries and develop solutions whenever possible
    - Transfer tacit knowledge across teams
    - Raising awareness of useful information resources and demonstrate tools, including training colleagues in the use of information systems and databases, as required
    - Ensure that the research groups' working practices co-ordinate with host Institute's resources and services (library, information technology, data and research administration)
    - Facilitate collaboration through the implementation and support of appropriate tools and technologies

- **Review practice and procedures and work with the research groups and appropriate stakeholders to implement pragmatic solutions to support information/data management across the department. Examples may include:**
    - Developing and managing electronic resources for accessing information and data

  - Developing effective systems to select and curate information and data for re-use
  - Designing workflows to execute required computational or data manipulation steps
  - Identifying gaps in provision of resources or skills and developing appropriate solutions e.g. developing training and support

- **Promote best practice in information and data management for the benefit of the research groups and the HEI, as a whole by:**
  - Enhancing awareness of and access to information and data resources
  - Facilitating sharing of expertise across research teams
  - Ensuring researchers are familiar with institutional and funders guidelines and mandates relating to research information and data

Minimum skills requirements (essential)

- Research domain knowledge e.g. postgraduate qualification (or equivalent) in a relevant discipline
- Practical experience of working in a research environment, including knowledge of the types of resources and tools researchers need and use
- Formal training or experience in at least one of the following: informatics, information science or data management
- A self-starter with a track record in building effective working relationships and proven experience of working in collaboration across different working environments and cultures
- Takes responsibility for their own work, shows flexibility and a positive attitude and is able to work in an agile and proactive way
- Strong interpersonal and communication skills, including the ability to influence across different levels within an organisation
- Evidence of a desire for continuous learning, retraining and the ability to adapt quickly to a changing environment
- Experience in information searching, retrieval and critical appraisal skills
- Good analytical and problem solving skills including the ability to synthesise complex requirements into practical solutions

Additional skills requirements (desirable)

- Knowledge of research funders mandates in regard to open access and data sharing
- Knowledge of open access publishing and archiving
- Experience in submitting papers for publication
- Familiarity with the research funding process and preparing grant applications
- Experience in project management
- Experience of delivering tailored training to individuals and groups
- Technical knowledge of data curation and metadata

8.2. Evaluation of Scoping Study

The scoping process has been in essence an audit of current research information practices in ARG along with mapping relevant services within UCL. By considering these over the entire research lifecycle and end-to-end view of research information and data management requirements and gaps has been obtained.

Benefits delivered by this study for ARG:

- ARG are now aware of issues, gaps and needs both in terms of research support and their own skills and practices and the underlying reasons for these issues have been defined, so they can be addressed effectively
- ARG are now working towards implementing some of the solutions proposed in this report to improve information flow across the group

- The participation of an ARG member in the project team, mapping stakeholders and meeting with UCL support services, arms the group as a whole with a new understanding and knowledge of existing services available to them
- A list of contacts within UCL services has been generated and a set of relationships built. These relationships could be developed and maintained by a RIM to ensure ARG keep up-to-date on new services and tools offered by UCL as well as a route to communicate ARG researcher needs and feedback

Benefits delivered by this study for UCL as a whole:

- Providing UCL central services with an holistic view of the research process across ARG will enhance their understanding of researcher needs, motivations and working practices
- The gaps identified in research information support have opened up internal discussion. Potential solutions to the problems and issues identified are being fed to central support services in UCL for consideration in future research support strategies
- Researcher needs in relation to data management, storage and sharing have been highlighted as a major gap to be addressed in research support at UCL
- Identifying examples of best practice elsewhere provides the opportunity to join up and coordinate initiatives and create networks of expertise
- Provides evidence to UCL of the potential research efficiency gains should the RIM role be piloted

Lessons learnt from the approaches taken during this scoping study:

Lesson 1: ***Don't underestimate importance of an active and relevant Project Board/Steering Committee.*** Ensure representation of variety of useful perspectives and levels, to guide the project and provide an understanding of institutional and wider landscape and stakeholders. Internal to Institution: Senior Academic and Postdoctoral Researcher from department to pilot RIM, Senior Management from Library Services and IT services. External Expertise: Data Manager and Information Services.

Lesson 2: ***The RIM should be involved in scoping the role.*** A potential RIM candidate involved in scoping would gain understanding of researcher practices, stakeholder mapping and begin to build relationships. Failing this, a researcher from the department that would be trialling the RIM should be included to allow the research department to access to the benefits outlined above from an early stage.

Lesson 3: **Give sufficient time to stakeholder mapping.** Identifying individuals within the host institution research information support services that the RIM role would need to be aware of and build relationships with is important to inform and enable implementation of the role.

Lesson 4: **Find Institutional Champions at an early stage of the project.** Crucial to future success is early and widespread acknowledgement of benefits and value to the institution as a whole. By involving champions at all levels both top down and bottom up promotion of efficiency gains.

To ensure the findings of this study are disseminated appropriately;

- the report will be shared with interested groups within the University, including research support services staff, staff from the CEGE Department and Senior Management
- the JISC Report will be made available in the UCL Eprints repository and the project website
- Papers will be placed at conferences as appropriate

9. Conclusions & Implications

JISC activities and funded research and development help to drive innovative use of technology to support the UK HE sector and raise its competitiveness on a global stage. Through the consultation with best practice beyond the UK, we were reminded that many now look to the UK for leadership and guidance in the arena of technology and data. Many cited JISC funded reports and projects, as well as UKOLN activities, as 'go to' resources in helping support and inform their own activities. It is important to remind ourselves of the importance of having a centrally coordinated body such as JISC.

There is however, still some way to go in connecting the dispersed activities relating to research information and data across the UK HE sector. At a time of impending budget cuts, it is crucial for institutions to make their core administrative as well as research processes as efficient as possible, in order to avoid duplication of effort, free up resources and maximise cost effectiveness. While information and communication technology (ICT) has a vital role to play in this, research information systems will need to fit with researcher needs and workflows. Particularly at early implementation stages, this requires people; to help integrate researcher requirements into developments and support researcher adoption of new services and technologies.

This study has scoped the requirements for a RIM role, and we feel that embedded support of this type, will be key in effecting successful integration of research information and data management practices and infrastructure into researcher workflows.

Intervention in the form of a RIM role is justified, we feel, because the potential risks for UCL as highlighted throughout this report are serious. The effective management of research information and data is critical to sustained institutional competitive advantage and reputation, as well as to overall efficiency. UCL currently lacks an institutional data management strategy and repository and support for researchers in relation to research information and data is a major issue. As such, UCL is significantly exposed to the risk that vital research information and data might be irretrievably lost or corrupted. With the appropriate intervention there is a huge opportunity to enhance the effective flow of research information including sharing of and improved access to data across its multiple disciplines and between institutions.

We propose the next steps for UCL should therefore be an implementation phase - a small but informative pilot of the RIM role, in order to examine practicalities and added value in more detail. In the first instance we suggest this should focus on the CEGE department (where the ARG is housed). This would allow the pilot to build on the findings of this scoping project, utilising the understanding of researcher practices and requirements to inform the day to day activities of the role. We propose a two year pilot approach to include two phases, allowing review and decision points at each stage:

1. agree recruitment process and funding commitment for pilot
2. pilot implementation, review challenges and benefits; decide on continuation

Phase 1 – 0-8 months

- **Present a funding case within UCL and seek external funding sources for piloting** including service provision requirements, recruitment or training strategies and level of support costs
- Prepare a detailed job specification for the RIM Role
- Agree arrangements for governance and reporting lines
- Recruit RIM

Phase 2 – 6-24 months

- Liaise with CEGE research teams to support embedded working and agree day-to-day tasks
- Establish mentoring for RIM (e.g. regular meetings to provide guidance and advice) to include an internal research support services and external best practice mentor
- Ascertain training requirements for the role to include input from UCL Information and Library services, IT support and the British Library and working with professional bodies e.g. CILIP and DCC as appropriate

- Progress report at 6 months: initial benefits, issues, solutions and other findings
- Evaluate and report on recommendations for going forward at 12 months

At 18 months, **agree with UCL senior management if and how the role will continue**, be developed further or rolled out to other pilots. Should this pilot be successful in demonstrating compelling outcomes and benefit to those involved, scalability and sustainability would need to be examined. This would include determining funding models and appropriate partners for a sector-wide pilot. We feel that there is a great potential for benefits of a RIM role to be realised in a variety of other contexts, particularly in multi- and inter- disciplinary research.

10. Recommendations

We aimed to generate a set of recommendations which would include practical solutions that could be implemented by ARG, in addition to overarching recommendations that could have wider implications for the HE sector as a whole.
Wider Recommendations include:

1. **There is a HE sector-wide need to perform a comprehensive review of infrastructure, systems and services relating to research information management and support across Institutions.**
   - A unified nomenclature in relation to support services roles should be considered
   - This will help to define the best strategies for increasing efficiencies and reducing duplication of effort
   - A strategy is required to enable national coordination of support services and infrastructure to take place.
2. **Institutional Support Services need to engage continually with all levels of researchers, in order to understand and capture complex needs and align services accordingly. The balance of effort for teaching and research support should also be examined.**
   - Services need to be mapped and more effectively marketed so that researchers are aware of the relevance to their work/needs
   - Communications about systems and services should be tailored to particular groups and not pan-UCL. This requires up-to-date email lists or a tailored portal which could feed this information
   - Systems should be streamlined, efficient and user friendly to minimise the time and effort required by the researcher
   - Central Support Services should provide enhanced, discipline tailored training; to include new tools, technologies, data management and curation skills
   - Central Support Services should develop strategy and policy frameworks to address institution-wide data needs, including repository, metadata schema and standards development and case study examples of good practice in information and data management, curation and sharing
   - Information professionals will need to broaden their expertise or new roles need to be established to support changing needs**.**
   - Support services should take into account the importance of mentorship and encouragement by colleagues as a major route to learning in the research context, and look to embed support where appropriate.

3. **Funding should be secured to pilot the RIM role. Evidence of the benefits and impact of such a role could then be gathered and the practicalities of its wider roll out could be examined further.**
   - Evaluation and continued review should be inherent to the pilot and measures of success agreed for different perspectives including researchers, funders and host institute
   - In order for researchers to make use of support, and to welcome it into their everyday practice, they will need to see clear evidence of benefits, which can only be evidenced through piloting and evaluation exercises

- In order to earn central and senior management support for such a role, the benefits to central services in enhancing their reach and facilitating communication with the research community should be emphasised

4. **Funding bodies should work together with Universities, to support emergent roles.**
   - JISC and research funders should consider the support roles that are required to ensure researcher uptake of novel infrastructure
   - Funders should ensure that embedded support is costed into both research and infrastructural projects in the planning stages
   - New roles should be recognised and professional development and career progression structures formalised
   - To ensure sustainability, funding for the role should not be tied to the funding of any one project
   - Appropriate training and thereafter accreditation needs to be put in place for new roles

5. **Education and training of both researchers and information professionals needs to be addressed at an institutional and possibly national level, due to changing requirements.**
   - Employability skills such as interpersonal and relationship building skills should be considered in relation to STEM curricula
   - Researcher information skills are lacking and the reasons for this failure need to be examined
   - Curricula for Information Science and Continuous Professional Development need to take cognisance of new demands for 'blended professional' roles (there may be a role for the British Library, CILIP and institutional Libraries to input into this in partnership)

6. **Data management skills need to be further developed and supported across the UK HE sector. There needs to be a better understanding of the division of data management duties between central and embedded support services and researchers.**
   - Basic data management training should be introduced into undergraduate programmes, to cover the fundamentals of data management throughout the research lifecycle
   - Initiatives such as DCC and UKRDS along with academic libraries should play a continued and perhaps greater role in supporting improved researcher data management skills across the HE sector

11. References

[1]Haskel, Jonathan & Wallis, Gavin, 2010. "Public Support for Innovation, Intangible Investment and Productivity Growth in the UK Market Sector," CEPR Discussion Papers 7725, C.E.P.R. Discussion Papers.
http://www.universitiesuk.ac.uk/Publications/Documents/recession_to_recovery.pdf
[2] http://change.gov/agenda/economy_agenda/,
http://www.taoiseach.gov.ie/eng/Government_Press_Office/Taoiseach's_Press_Releases_2010/Leaflet_-_Capital_Expenditure_Review.pdf
http://www.universitiesuk.ac.uk/Publications/Documents/TheGlobalPicture20100907.pdf
[3] + [20] *Patterns of information use and exchange: case studies of researchers in the life sciences. A report by the Research Information Network and the British Library*. 2009.
http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/patterns-information-use-and-exchange-case-studie
[4] *Researchers and discovery services Behaviour, perceptions and needs. A study commissioned by the Research Information Network*. 2006 http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/researchers-and-discovery-services-behaviour-perc
[5] *The Digital Information Seeker Report of findings from selected OCLC, RIN and JISC user behaviour projects*. L.S. Connaway and T.J. Dickey (2010).
http://www.jisc.ac.uk/publications/reports/2010/digitalinformationseekers.aspx

[6] *Researchers' Use of Academic Libraries and their Services A report commissioned by the Research Information Network and the Consortium of Research Libraries*. 2007. http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/researchers-use-academic-libraries-and-their-serv
[7] *Educating the academic librarian as a blended professional: a review and case study*. Sheila Corall. ALSR 2010: Conference towards Future Possibilities
[9] Karla Hahn "Introduction: Postioning Liaison Librarians for the 21st Century" A Bimonthly report from ARL, CNI and SPARC, no 265 (Aug 2009)
[10] *The Informationist: A New Health Profession?* Davidoff & Florance (2000) Ann. Intern. Med. 132 (12):996-8.
[11] *The Emerging Informationist Specialty: A Systematic Review of the Literature.* Rankin et al. (2008) J. Med. Libr. Assoc. 96(3): 194–206
[12] Grefsheim, S *et al* The Informationist: building evidence for an emerging health profession J Med Libr Assoc 98(2) April 2010
[13 + 14] *Challenges for academic libraries in difficult economic times: A guide for senior institutional managers and policy makers*. Research Information Network (2010) http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/challenges-academic-libraries-difficult-economic -
[15] *Data librarianship: a gap in the market*. E. Hyams, L. Martinez-Uribe, S. Macdonald (2008). http://hdl.handle.net/1842/2499
[17] *This definition is based on Cyberinfrastructure Vision for 21st Century Discovery*. Chapter III. National Science Foundation Cyberinfrastructure Council (2007). http://www.bl.uk/reshelp/experthelp/science/sciencetechnologymedicinecollections/researchdatasets/nsf0728_4.pdf
[18] *A report on the range of policies required for and related to digital curation*. S. Jones, DCC (2009) http://www.dcc.ac.uk/sites/default/files/documents/reports/DCC_Curation_Policies_Report.pdf
[19] *Research Funders' Policies for the management of information outputs A report commissioned by the Research Information Network* (2007). http://www.rin.ac.uk/our-work/research-funding-policy-and-guidance/research-funders-policies-management-information-outpu
[21] To Share or not to Share: Publication and Quality Assurance of Research Data Outputs: RIN (2008). http://www.rin.ac.uk/our-work/data-management-and-curation/share-or-not-share-research-data-outputs
[22] *Incremental: Scoping study and implementation plan*. L. Freiman, C. Ward, S. Jones, L. Molloy, K. Snow (2010). http://www.lib.cam.ac.uk/preservation/incremental/documents/Incremental_Scoping_Report_170910.pdf
[25] *The UK research data service feasibility study. Report and recommendations to HEFCE*. (2008). http://www.ukrds.ac.uk/resources/download/id/16
[26] *UK Research Data Service: Proposal and Business Plan for the Initial Pathfinder Development Phase.* (2010). http://www.ukrds.ac.uk/resources/download/id/47
[27]http://ec.europa.eu/research/infrastructures/pdf/esfri/other_ri_roadmaps/united_kingdom_en.pdf#view=fit&pagemode=none
[28] http://www.ucl.ac.uk/research/gc/
[29] http://www2.cege.ucl.ac.uk/cts/arg/
[30] http://crucible.cege.ucl.ac.uk/
[31] http://www.stakesource.co.uk/; S. L. Lim, D. Quercia, and A. Finkelstein. StakeSource: Harnessing the power of crowdsourcing and social networks in stakeholder analysis. Proceedings of the 32nd International Conference on Software Engineering, ICSE (2) 2010, pages 239-242.
[32] http://www.surveymonkey.com/
[33] http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/research-support-services-what-services-do-resear
[34]http://www.southamptondata.org/uploads/7/3/0/0/730051/idmbinitialfindingsreportv4.pdf
[35] *The Emerging Informationist Specialty: A Systematic Review of the Literature.* Rankin et al. (2008) J. Med. Libr. Assoc. 96(3): 194–206
[34] http://www.biocurator.org/home.shtml

[34] Bateman, A. Curators of the world unite: the International Society for Biocuration. Bioinformatics (2010) v26, 8. pp 991.

12. Appendices

Appendix I: Current Data Support Roles

Appendix II: Online Survey

Appendix III: Interview Structures

Appendix IV: List of Support Services in UCL

Appendix V: ARG Research Lifecycle Case Study

Appendix VI: External Stakeholder master list

Appendix I: Current Data Support Roles

Role	Institution	Responsibilities	Notes
Resource Development Officers	University of Glasgow	▪ ICT based support to research projects ▪ Advise on the technical appendix (as part of core time)	They are also written on to funding for their time in developing e.g. databases or providing technical expertise. If it's not costed some projects can flounder without this support, those that receive it progress well
Senior Data Manager	University College London	▪ Management of research data and associated documentation from research study ▪ Coordination of data management policies, security, data protection, storage, backups and data sharing ▪ Development and maintenance of the study SAS database and XML metadata	- Affiliated specifically with the MRC longitudinal study Whitehall II
Associate Data Librarian	University of Edinburgh	▪ Role is multi-faceted - supports researchers in finding, accessing, use, sharing, and management of research data	
Data Scientists	NERC Data Centres	▪ Provides data management services to large multidisciplinary research projects	The NERC funds 6 discipline-specific data centres. These largely provide some form of data support, though not necessarily via a Data Scientist role. The Responsibility given is an example from a British Oceanographic Data Centre Data Scientist
Data Asset Manager	University of Bristol	▪ Identify what data assets the University has and how these can be exploited ▪ Manage a Data Management Plan registry ▪ Advise researchers on funders' data management requirements	Part of the pathfinder for the UK Research Data Service
Data Librarian	University of Bristol	▪ Coordinate library and IT staff for the join up of the institutional repository with a repository for research data ▪ Provide advice for researchers on how best to store, manage and preserve their data	Part of the pathfinder for the UK Research Data Service
System Developer	University of Bristol	▪ Develop the data management plan registry and links between the article and data repository	Part of the pathfinder for the UK Research Data Service

		▪ Develop the web interfaces for these	
Exabyte Informatics Tool Developer	University of Bristol	▪ 'develop functionality for metadata creation, data modelling and support of experimental design and planning'	Part of the pathfinder for the UK Research Data Service
Research Liaison Manager Lead (RLML)	University of Leicester	▪ Champion the case for sustainable best practice in research data management within the University ▪ Coordinate input from national bodies of expertise, including DCC and JISC ▪ Initiating requirements gathering for projects ▪ Design training of researchers in best research data management practice	Part of the pathfinder for the UK Research Data Service
Research Liaison Manager	University of Leicester	▪ Support the RLML in support of the three identified pathfinder projects liaising with the relevant University Colleges and offices as required ▪ Lead requirements gathering, data mapping and data management planning activities in two projects ▪ Advise on experimental design, data curation and build on best practice established during Year 1 ▪ Implement training in research data management practice for key researchers and contribute to existing postgraduate skills training programmes	Part of the pathfinder for the UK Research Data Service. This role at Leicester has been in place for less than a year, but the value of having signposting to appropriate services is starting to be seen by those departments that he has approached and worked with so far. Interest in the support he can offer is growing.
Research Computing Support	University of Leicester	▪ Provide technical support and implementation of the above activities within IT Services	Part of the pathfinder for the UK Research Data Service, this is comprised of: ▪ Storage Architect – design and implement tiered storage and secure backup solutions ▪ Database Administrator – adapt Access Databases in arts and humanities to support biomedical and engineering datasets ▪ System Administrator – support daily requirements of researchers to access and utilise the databases ▪ Web Developer – design an interface to satisfy the requirements of clinical and nursing staff as well as more advanced research querying for bioinformatics ▪ Java Programmer – design discipline specific query tools for each of the projects with growing complexity

Appendix II: Online Survey

Survey Questions

1. Please give your name, email and affiliation (optional)

2. What type of organisation do you work for? (Tick as many as relevant)

University
Business/industry
Research Institute
Library
Government
Archive/Respository
Public Sector Organisation
Other

3. Please describe your role in 20 words or less.

4. In your organisation, are there role(s) similar to the Research Information Manager, as described at the top of the page? (If No, go to question 8)

5. If you answered yes to the previous question, could you please specify relevant job titles.

My Role/Role 1

Role 2

Role 3

Role 4

Role 5

6. Which of the following operational tasks do these roles perform to support researcher's information and data management needs? Please indicate if support for each of these tasks is not needed, or if support is needed but not available.

- supporting grant application
- supporting researcher requirements
- dealing with researcher queries
- identifying and managing new resources and tools
- managing data curation and storage

7. Which of the following interpersonal tasks do these roles perform to support researcher's information and data management needs? Please indicate if support for each of these tasks is not needed, or if support is needed but not available.

- promoting best practice
- training colleagues on information systems and databases
- transferring tacit knowledge on resources and tools across research teams
- facilitating dissemination of research outputs
- facilitating networking (inc social networking software)

8. Do you have a research information management system in place?

9. Are you aware of other organisations with research information management roles/systems?

10. Do you see a need for a dedicated Research Information Manager role in your organisation?

11. What additional tasks/responsibilities do you think the role should perform?

12. If we were to come to your organisation and meet the people involved in these information management processes, who would they be? (Please list names, roles and contact details if possible)

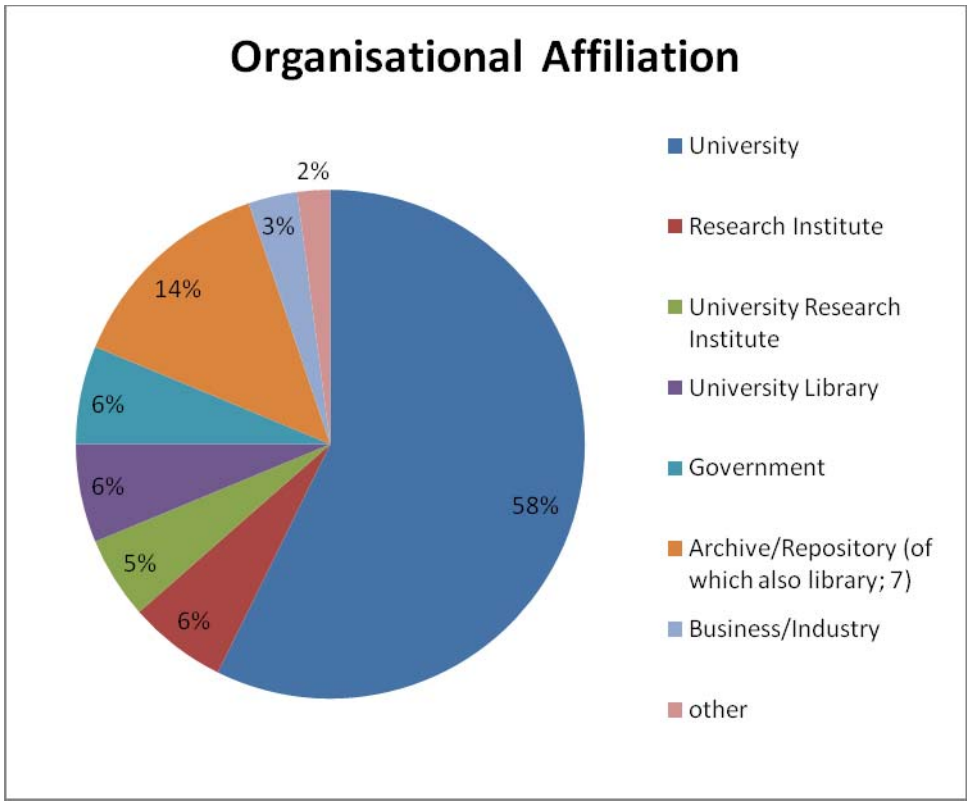
Survey Results

The online survey was designed to:
- Capture a snapshot of existing services across the UK HE environment
- Identify where any existing roles or systems mapped to ARG needs and gaps
- |dentify examples of best practice in the UK and beyond
- Establish contacts for follow-up consultation

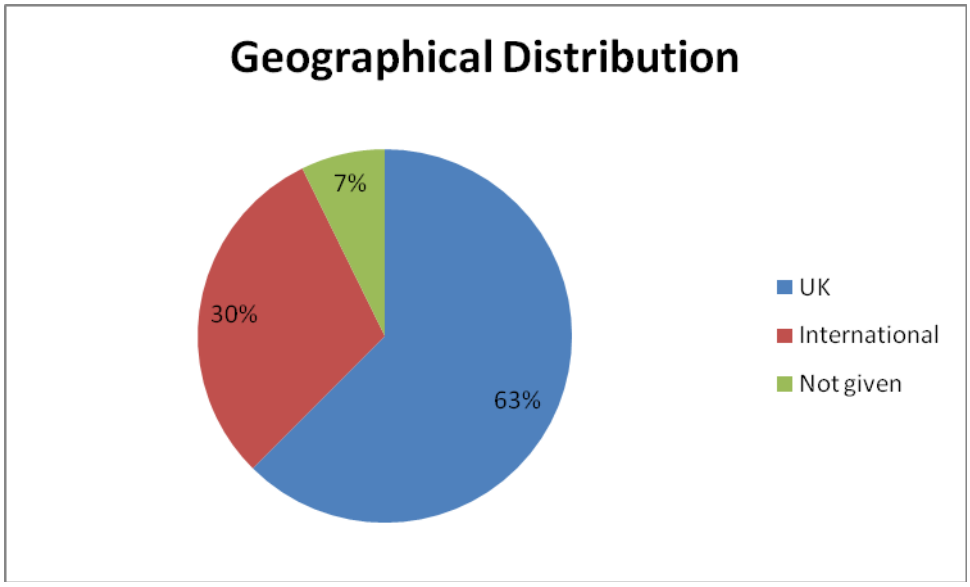
The Survey was distributed through a number of professional bodies including; ARMA (the professional Association for Research Managers and Administrators in the UK), RLUK (Research Libraries UK) and via the JISC research data management mailing list. This ensured a variety of perspectives and geographical locations would be captured.

There were 96 responses to the on-line survey, which covered a range of roles and organisational affiliations both within and beyond the UK. A number of respondents were chosen for follow up interviews, to investigate their responses in detail.

Demographic of Respondents



Of those who responded to the survey 63% identified themselves as working in the UK, the vast majority of these were HEI affiliated (90%). This subgroup of survey respondents also had a very broad range of job titles, from data managers to researchers, sitting within a variety of central and other services including; libraries, repositories, IT, finance, administration, senior management, knowledge and technology transfer and IP and research offices. The largest groups of respondents, who were not located in the UK, were from the U.S. (43%), Australia (14%) and Ireland (11%).



Many roles in HEI services have evolved over time, taking on extra responsibilities as needs arise or internal structures change. This means that the nomenclature is inconsistent, making it difficult for researchers to identify the appropriate support services and individuals to approach within an institution.

Although there was little co-ordination of terminology across different institutions and organisations, when asked what kind of responsibilities these roles covered it became apparent that there is significant overlap between the activities of the different roles. Over half of UK respondents indicated that they performed at least one of the suggested operational or interpersonal tasks to support researchers' information and data management needs (as detailed above). This apparent duplication of effort was further reinforced by a number of the respondents' comments on why they felt a RIM role might be needed in UK HEIs;

'A range of people and systems are handling various processes reasonably well, but it could be argued that tasks like facilitating networking (including social networking software), promoting best practice, transferring tacit knowledge, etc. are to some extent spread out between different people across the central university and Schools: we could look towards highlighting and unifying some of the more specific 'research information' aspects of those to develop a more sophisticated and up to date research information service.'

'Support needs to be co-ordinated and managed throughout so researchers aren't duplicating information that needs to be shared and are contacted about relevant support and services at pertinent times.'

'The existing support roles within our research unit are rather traditional and maybe outdated now. Information management has changed so rapidly in the last 15 years or so that I feel a fresh look at the way researchers are supported is needed. A lot of our tasks are distributed among different members of our team. Procedures and workflows could be streamlined so that we avoid duplication…. If the role of a Research Information Manager

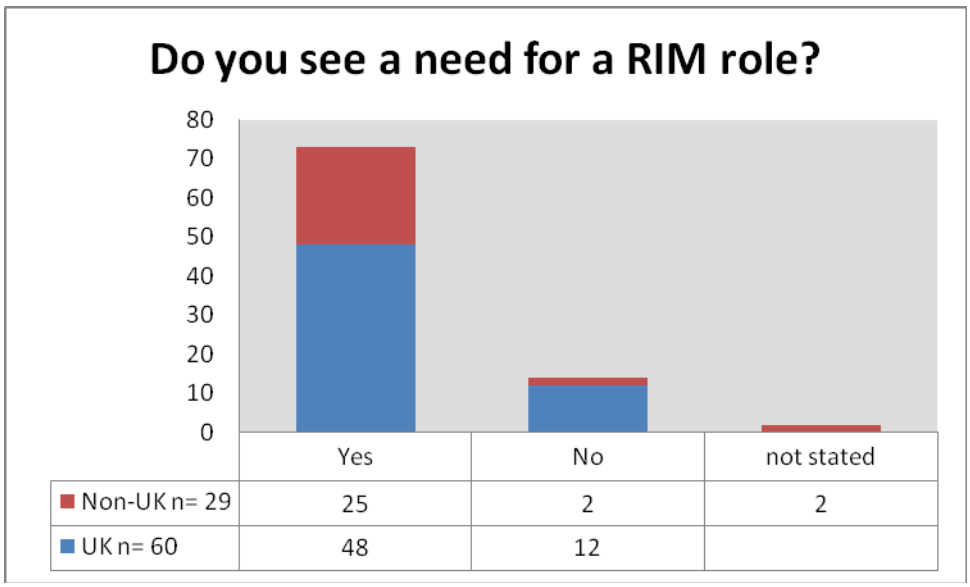
was established within research organisations then these changes might take place. Also more cooperation and sharing of practices across research organisations would become possible.'

With new requirements such as data management gaining national attention, best approaches for providing support need to be carefully considered. Burdening existing roles with additional responsibilities may not be the best solution, as current resource is already stretched and will be unable to cope with new demands. Strategic repositioning of areas such as Library and Information services may now be appropriate. The idea of coordinating resources locally to improve efficiency and join-up at a national level is also seen as an appealing one given the likelihood of cuts across the sector and the need for a coordinated approach to the upcoming Research Excellence Framework (REF).

'Increasingly more research information is being required by funders, REF and also for internal intelligence. A joined up system is needed for research information management and an information/system manager would be needed for this.'

Response to RIM role

In general the response to the concept was positive, as evidenced by 80% of UK respondents and 86% of non-UK respondents indicating that they see a need for a Research Information Manager role. The perceived benefits mainly related to coordination and improving efficiencies through reduction of duplication, as displayed through the selected comments above.



Of those who did not agree a need for a RIM, a range of concerns were raised, including issues of funding, how the range of skills required could map to an individual, the level of granularity at which the role would work and also the tension between information and data management skills and subject specific knowledge.

'No one individual will have the skills and expertise required across all of the areas covered by this term; rather, a team approach is required..'

'This is a varied role covering a wide range of activities, it is not a single role.'

'There's a need to promote coherent and joined-up approach to research support; we have already engaged in discussion of the strategic requirement for and benefits of this approach; difficulty is the balance between generic and discipline-specific knowledge requirement.'

Appendix III: Interview Structures

Interview Structure for Researchers

- **Introduction – Interview will take roughly one hour**
- **Summary of the project**
  - Background and brief summary (just overall idea and approach - nothing on specific tasks – avoid influencing responses)
  - Definition of data/information – ensure they realise we mean the full range of types books, scientific papers, white literature, conference proceedings, product information, databases, datasets etc
  - Provide some prompts/diagrams listing sources of data, information, systems, services, and ways of dissemination etc
- **Confidentiality and quotation**
- **Notes and permission to record**
- **Area of research/Roles and responsibilities in the group (Warm up questions)**
  - What is your role in the research group (Research/Administrative)?
  - Explain the area of research/responsibilities?
  - How did you first get involved in ARG?
  - How do you keep yourself updated in your core area of research and other areas of research (outside your expertise/multidisciplinary)?
    - What practices,
    - How and Where do you look for ,
    - Technology and tools
  - How would you begin? Who would you approach? What support or services are there to help you when entering a new/unknown area?
- **Information used**
  - Think of the most recent project that you worked on and answer the following questions:
    - How did you find out what information would be relevant to the project?
    - How & where did you discover what you needed to collect and where to obtain it?
    - What did you collect? (the source and type ie both information and data)
    - How do you find information on sources of funding and processes for application? Are there services at your institution to help support you? If so what are they?
    - How did you use, store, manage and share the information and data you collected. How much of what you had collected did you actually use? How did you decide what kind of information and data to use? (any filtering, preliminary analysis, tools used)
    - Do you think you may have missed some data/information that could have been useful?
    - Do you think there are any issues or problems in accessing what you need? If so what do you think they are?

      Prompts
      - Understanding what information would be required
      - Knowing where to look to find information (Online/library/databases)
      - too much information to filter – time
      - Accessing information and data sources (cost, technical difficulties etc)
      - Using the information and data in their available formats (needing specific software, tools etc)
    - Are there any services/personnel technology/tools that help you with your information/data needs? What/who are they?
    - Would you find it useful to have advice and help with this part of your research? Would you trust someone else to find the information for you?

- Discuss their responses to the above questions if they were to do a research project in a different area (outside their area of research/multidisciplinary research) eg any specific barriers that they feel are different when embarking on research in a new field.

- **Information produced**
  - Think of the most recent project that you worked on and answer the following questions (was this project the one you described previously, if not what was it?)
    - During or at the end of the project what kind of data/information did you produce?
    - How do you document and store your own/other members of the team's data produced during in the project?
    - How do you share or disseminate your data/information within your team (ARG), with other collaborators, across your department, and with the wider scientific community? (If its made available public or within the department) How did these approaches differ?
    - Discuss their response to the above questions; Are there any difficulties/inefficiencies/barriers to the above tasks?

      Prompts
      - Technical expertise
      - Knowledge of best practice
      - Time or interest to learn the skills needed
  - Are research outputs produced in a format/standard that other researchers (in their or multidisciplinary research) will be able to make use of the output now and in the future? Have they heard of metadata (prompt with definition) and standards? If not, why not?
  - Are there any services/personnel/technology/tools within (or outside of) UCL that help you with your needs in relation to your research outputs? What/who are they?
  - How do you decide where and how to publish your research findings, particularly for multidisciplinary research? Are there any resources to help with this publication process?
  - Would they find it useful to have advice and help with the management etc of their data? What
    - Also if data produced should be made available public and if Yes when (what stage of the project or how long after)? What is current practice and ideas on better mechanisms for this?
- **Suggestions on how to improve the existing sources or services**
- **Type of sources and services would you anticipate needing in the future**
- **Here we could describe the possible tasks a RIM could undertake and skills that they could bring to a research team in detail. Ask for views/comments on Research Information Manager and related systems for information management**
  - If some of the barriers/anticipated services could be performed by a specific role or a system within their department or university would they welcome/make use of it, pros and cons etc?
- **Any Questions they would like to add on or comments**
- **Thanks**

Interview Structure for Research Support Stakeholders

- **Introduction – interview should take roughly 1 hour**
- **Summary of the project**
  - Background and brief summary (just overall idea and approach - nothing on specific tasks – avoid influencing responses)
  - Definition of data/information – ensure they realise we mean the full range of types books, scientific papers, white literature, conference proceedings, product information, databases, datasets etc

- Depending on Stakeholder may provide some prompts/diagrams listing sources of data, information, systems, services, and ways of dissemination etc

- **Confidentiality and quotation**
- **Notes and permission to record**
- **What Organisation, department(s) they work in and how their role fits into organisational structure. (Warm up questions)**
  - What does your role specifically entail? - explain the areas of responsibility
  - How closely do you work with research departments/groups? What would be your point of contact with researchers – is it direct contact or through someone else? Do researchers come to you or do you actively seek to engage with them?
  - How do you keep yourself updated on researcher activities and needs and broad trends in your organisation? and wider?
    - What are your current practices (are there any plans to change these?)
    - How and where do you look?
    - What technology and tools do you utilise?
  - How do you think the service you provide/your activities are perceived by the research community?
  - Do you have any skills/knowledge/practices/tools that could be used directly by researchers that currently aren't? If yes, then how could this be highlighted to researchers? How much of these skills did you already have and how did you acquire additional skills in post?
  - Introduce the idea of the research Lifecycle (from idea inception right through to dissemination) and ask them where their activities would fit into this lifecycle? Specific to each quadrant?

    Depending on response might cover one/more of sections below:
- **Information use**
  - In your role (or describe a role that you aware of), do you do any of the following?
    - Help signpost information and resources or tools that would be relevant to a research project. How do you do this?
    - What have you helped researchers connect with? (the source and type ie both information and data)
    - Do you provide any advice to researchers on how to store, manage and share the information and data they collect?
    - Provide advice on funding opportunities and/or help with funding applications?
    - Do you think there are any issues or problems in researchers accessing what they need? If so what do you think they are?

      Prompts
      - Understanding what information would be required
      - Knowing where to look to find information (Online/library/databases)
      - too much information to filter – time
      - Accessing information and data sources (cost, technical difficulties etc)
      - Using the information and data in their available formats (needing specific software, tools etc)
    - Are there any other services/personnel technology/tools that help researchers at your organisation with their information/data needs? What/who are they?
- **Information produced**
  - In your role, do you do any of the following?
    - Help researchers with advice on how to document and store their data produced during their projects?
    - Consider or advise on how research outputs could be produced in formats/standards that other researchers will be able to make use of the output now and in the future? Do researchers consider metadata and standards? If not, why not?
    -
    - Help researchers in the dissemination of the research findings. Describe how.

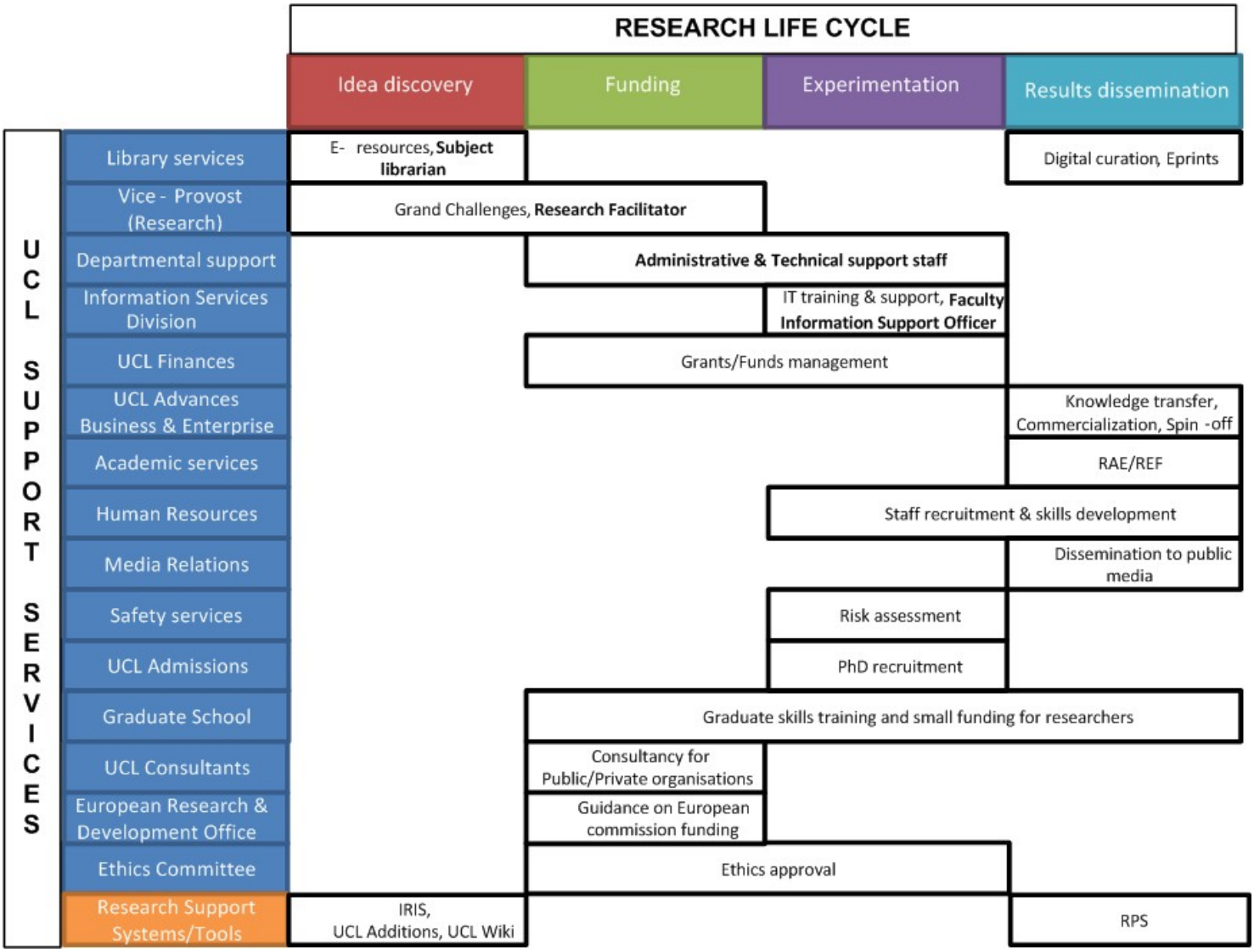
        - Discuss their response to the above questions; Are there any difficulties/inefficiencies/barriers to the above tasks?

            Prompts

            - Technical expertise
            - Knowledge of best practice
            - Time or interest to learn the skills needed

    - Are there any services/personnel/technology/tools to support researcher needs in relation to their research outputs? What/who are they?
    - Are there any gaps in the support of researchers in this area?
    - What would be the best way to provide researchers with advice and help with the management etc of their data?
    - Do you think there are any barriers to researchers managing their outputs and interfacing with institutional infrastructure/support? If so what do you think they are?
    - Are researchers making use of institutional repositories? Are they aware of mandates?
- **Suggestions on how to improve the existing sources or services**
- **Type of sources and services would you anticipate researchers needing in the future**
- **Here we could describe the possible tasks a RIM could undertake and skills that they could bring to a research team in detail. Ask for views/comments on Research Information Manager and related systems for information management**
    - If some of the barriers/anticipated services could be performed by a specific role or a system within the department or university do you think researchers would welcome/make use of it, pros and cons etc?
    - How would you see this kind of role integrating with existing services/infrastructure/practices across your organisation? Where do you think this person might originate from (ie research team or services) and sit (both physically and line management)?
- **Any Questions they would like to add on or comments**
- **Thanks**

Appendix IV: List of Support Services in UCL



- **Figure title**: Existing UCL support services serving the different quadrants of research life cycle
- Bars with a brief explanation of the service offered by each UCL support service is mapped to the quadrants of research life cycle supported
- Text that are presented in **Bold** fonts inside the bars indicate the dedicated Faculty/Departmental level role providing research support

Appendix V: ARG Research Lifecycle Case Study

Interviews with the ARG researchers and UCL support services were structured using the research lifecycle construct (Section 6.3), with interviewees responding on those areas relevant to their roles and activities.

1) Idea Inception

The idea for a research project may be generated in a wide variety of ways. It can be inspired by reading or hearing about the work of others, the findings of a previous project in the group, in response to a call for funding, at the suggestion of a collaborator or as a result of a conversation with a colleague. This broadly encompasses two main aspects:

- Information discovery - understanding the current knowledge in the field
- Identifying potential collaborators and expertise

Information discovery: keeping updated

There is a continuing need throughout the research process for researchers to keep up to date in their area of research. This requires them to identify, retrieve and manage large amounts of information of many types, typical examples being:

- Quality peer reviewed publications as reference material
- Information on protocols, techniques and technologies
- Reference datasets
- Curated databases

Most of the desk-based information discovery is currently performed online using web searches and other online resources for discovery and access. ARG researchers generally depend upon Google and Wikipedia for a broad overview of a topic which is then refined using Google Scholar, library databases and key journal publishers' websites. Some researchers have set up email alerts using subject specific keywords and subscribe to email lists and a couple subscribe to RSS feeds. There is however, no uniform strategy for information discovery across the group.

UCL Library Services offers a range of services, which vary greatly across disciplines, but includes access to collections (physical and electronic) and advice and training on literature searching and reference management. Most of the ARG researchers have not received any formal training in information search techniques and tools, and were not aware of training courses offered by the Library or the subject specific expertise and support available from subject librarians within UCL. Some of the researchers did not associate the availability of online resources and digital content directly with the Library, and thought instead that the physical Library building and services were targeted at undergraduate levels.

While researchers were interested in learning more about offerings specifically aimed at them, they were somewhat sceptical as to whether library staff would really understand or be able to provide what they needed. Meanwhile those who had made use of the library services regarded them positively. However, they did suggest that they would ideally like advice from someone with considerable subject knowledge as well as information skills, so that explaining their needs would be easier.

Many did express concern over the effectiveness of their information discovery skills and knowledge of information technologies and tools, as they tend to spend significant amounts of time finding the relevant sources and filtering the pertinent information. Carrying out research involving multiple fields also means that researchers are not always sure of the key journals and resources, terminologies and keywords to use.

"It is hard to know whether you have missed something and almost impossible to know if you have covered everything"

"I am less familiar with journals and search engines and the language used in other areas…different disciplines use different words to mean the same thing. This makes [the literature] *hard to accurately navigate"*

They also experience difficulty identifying non-academic organisations involved in research and finding their publications (such as government reports, policy documents and reports by private research organisations), as it requires regular trawling through numerous individual websites.

In addition to issues in identifying resources in new areas, more experienced researchers also indicated that they often feel overwhelmed by the sheer quantity of information now available. This creates problems in storing, managing and sharing this information. While UCL provides reference management software and training to use it, many reported that these tools did not offer sufficient benefit to warrant actively seeking out training and instead preferred to continue to get by with their own personal naming and filing systems, often involving a personal store of individual paper and digital copies. Within the team this information was usually shared by email or hard copy format, and there was little use of social bookmarking tools. When the interviewer (himself a researcher within the ARG) suggested he could teach interviewees to use the software they responded enthusiastically. This would seem to suggest that when training is made available locally through a colleague, researchers are more likely to assume relevance and consider the potential benefit. It was also noted that tools that would not just store the references (as most reference manager software does) but could relate, link and map the literature collected from different fields would be extremely useful.

"One of my biggest concerns is how I document and maintain the links of what I find…for instance if I find an article vaguely relevant to my work it would be great if I could see it in relation to whatever else I have found… particularly if there were a way to quickly create some kind of map of articles, websites, books, journals found"

Finding potential collaborators

Collaboration is a natural part of research, and in an increasingly globalised and multidisciplinary research environment the ability to build partnerships becomes all the more important. This involves searching outside of the immediate research group for expertise which is appropriate to a particular research question and also making expertise within the group more visible to others.

ARG has a strong track record of building partnerships to bring together complementary expertise and skill sets and open up new opportunities for funding.

The Head of the group is confident in his ability to identify collaborators, having a good knowledge of the expertise housed within UCL and having established networks of friends, colleagues and collaborators over his career. He suggested that sharing these contacts and other information across the team would be beneficial to more junior researchers and proposed that the use of networking tools and collaborative spaces such as Blogs, Twitter and the Crucible website could be a way of achieving this in the future. It was also suggested that a system to map the connections across networks of expertise would be extremely useful. Identifying someone within the ARG who would have the time and expertise to take on the responsibility for developing and managing the information and new tools, was difficult.

Junior researchers meanwhile were less certain of how to find potential collaborators, bring in new expertise or source advice to help them develop their research ideas. This dilemma is due partly to a lack of confidence when approaching busy senior academics outside their own department and in some measure due to the difficulty in finding information on other researchers across UCL that defines their relevant expertise in an easily accessible way.

The Institutional Research Information Service (IRIS) system (currently a pilot project) aims to address this issue of visibility. It is a web-based application wherein both researchers and administrators can view and update information related to researchers and their research activities, such as affiliation, publications, grants held, expertise and other esteem research activities that will supply the necessary information for assessment exercises (RAE and REF). Initially this application will be visible only to UCL staff, but eventually it is intended to be publicly accessible, to raise the profile of UCL research and foster new collaboration.

A key issue highlighted during the focus group, was the importance of raising the profile of ARG and the PAMELA facility externally. This could attract potential collaborators and possibly generate revenue streams, through use of PAMELA. The group is currently planning a re-design of their website to present their expertise, breadth of research interests and facilities in a more attractive and easy to navigate format.

"There are a number of projects around the UK working in a similar field but there's currently no way of connecting the people and projects together. Even at a basic level of awareness raising we could really increase the scope of the research we did if we knew where the crossovers between our projects were, let alone the opportunities for collaboration, sharing of resources, information and creating and exploiting new opportunities"

2) Securing Funding

In order to be able to undertake a new research project researchers must first find a way to finance it. This broadly involves:

- Identifying organisations that are relevant sources of funding
- Keeping up to date on specific funding calls from these sources
- Understanding trends in funding
- Formalising and submitting a funding proposal

Early stage PhD researchers tend not to be involved in or exposed to this phase of the research life cycle as much as senior researchers.

Information about funding opportunities

The majority of ARG research projects are funded by the UK Research Councils (EPSRC, ESRC and MRC) and because they are familiar researchers tend to focus on these sources for funding.

They receive automatic email alerts and updates on funding opportunities from a range of sources. While researchers were confident that they were well informed about major funding sources that are clearly directed at multidisciplinary research. They did indicate that finding the appropriate funding body can sometimes be problematic, when projects don't neatly fit into one of these targeted calls.

Ideally, they would like to be informed about funding opportunities from sources other than the research councils, such as charities and other European funding sources. It would also be beneficial to identify sources of funding for activities outside but aligned to their research, such as public engagement. Some suggested that alternative sources of funding tend to be known only to a few experts in a particular research area and information is passed on only by word-of-mouth or through personal contacts.

"I tried to approach a couple of funding bodies other than EPSRC…understanding their processes and policies was very complicated so I didn't go any further."

They reported that attempting to identify and monitor such a wide array of potential funding sources can be burdensome and is duplicated across the team, with each individual performing their own regular scans for opportunities. They would ideally like to set up and maintain a shared calendar, with dates and deadlines for funding calls relevant to ARG, which would enable better coordination, targeted planning and enhance collaborative working.

There is support available to researchers in this area from Research Facilitators (RFs within the UCL Vice Provost's Research Office). Each of UCL's three Schools has a dedicated RF to provide advice and guidance to researchers on securing funding. They can help identify

streams of funding, advise researchers on overall funding trends and help put together a funding proposal. In ARG, the few researchers that have made use of their assistance reported that it was an invaluable resource. Researchers mostly became aware of RFs by word-of-mouth and noted that they are not visible to the broader research community because communication is limited to Heads of the Departments/Groups and a handful of key researchers.

Writing research proposals

Most researchers write up and submit their funding proposals in consultation with the Head of the group, but have not received any formal training on how to put together a proposal. It was suggested that more inexperienced researchers (and to some extent all group members) would benefit from having 'templates' of funded grant proposals to learn what makes a grant application successful and how to best format and structure the information. Currently best practice is shared amongst colleagues informally but this could be improved. Some researchers indicated that an internal peer review process, prior to submission to funding bodies, might be useful to improve proposal quality, while others felt that this would simply add another layer of bureaucracy to the process.

Young researchers feel the training courses currently offered on grant writing and submitting research proposals are too general (spanning Arts and Humanities as well as the Sciences) to be useful. They articulated a need for more targeted and specific training. Also, most junior researchers had not received any support and were not aware of the support services available from the Research Office.

The department of Civil, Environmental & Geomatic Engineering (CEGE) has a dedicated departmental finance manager to assist researchers in costing research activities and also in managing the funds throughout the project. The departmental support liaises with the central Finance office (Research Services Division) on behalf of individual researchers. However, this function is not available uniformly across departments in UCL.

ARG currently does not have any strategy to include data management planning and costing when they are compiling a funding proposal. Funding body requirements and the possibility of open data mandates mean data management and storage costs will need to be considered in the future. There is currently no service within UCL to advise researchers on best practice for research information and data management, designing data management plans and calculating potential costs for required data management personnel, expertise and the infrastructure related to data management they might need throughout the course of the research project.

3) Experimentation

The experimental phase of research, with data collection and analysis at its heart, can be variable across disciplines and may involve researchers working alone or in large teams. Broadly it involves:

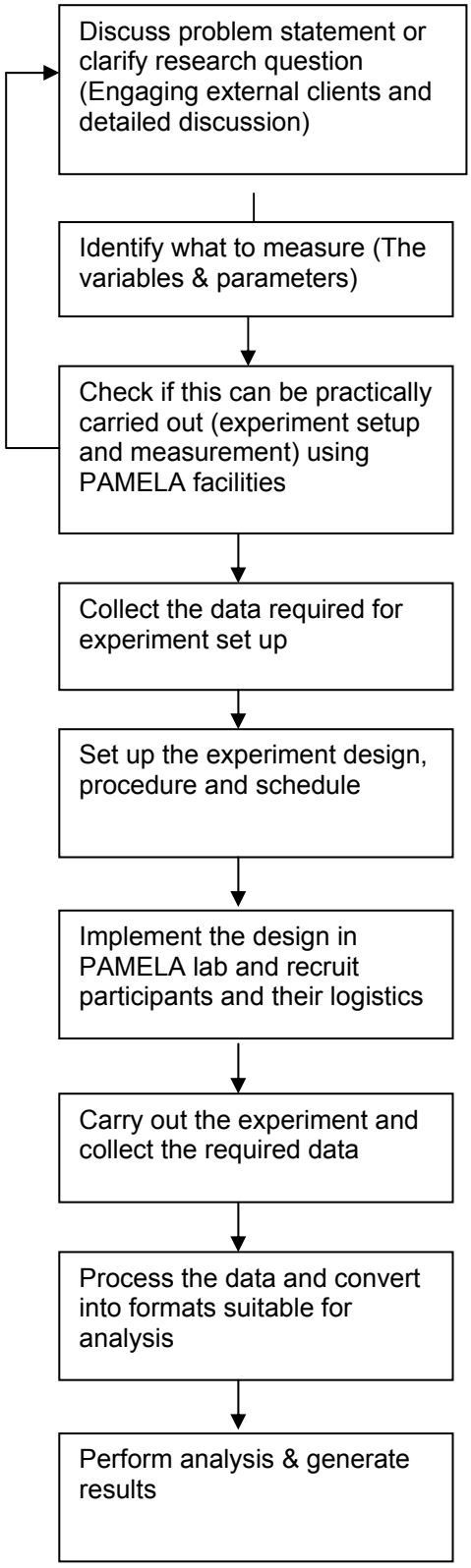
- Experimental design
- Procuring required equipment, tools and software
- Sharing knowledge and skills
- Generating, collecting, storing, managing and analysing data
- Documenting and recording the procedures followed

Experimental design and methods

ARG researchers carry out research in different disciplines and as such adopt a wide variety of experimental methods. These can include qualitative methods such as surveys, interviews and theory development, in addition to the capture of quantitative field data or measurements from experiments conducted in the PAMELA lab facility and elsewhere. The primary data can then be further utilised for modelling and simulation.

The choice of methods and techniques used by researchers in attempting to answer their research questions is decided at the outset, through a combination of advice from other team members and technical staff and scanning the literature. The lab manager (along with the technicians) supports researchers in experiments using PAMELA lab facilities. This includes discussing the requirements and scoping of the project, training on equipment, advice on schedules and the necessary logistics involved in the experiments such as arranging participants, preparing the space and model used etc. Researchers document the processes taken to collect their data; whether in a field or lab setting, in their own personal lab books. These are in paper format, with some protocols entered in digital format and then stored on personal hard drives. There is no central store of this documentation.

Typical ARG experiment



Train experiment

Client: Department for Transport (DfT)

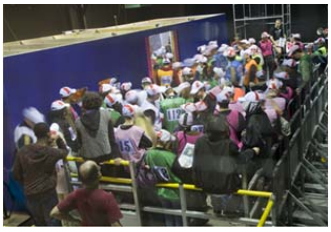
Question: Can 50 passengers alight / board train in 27 seconds?

Aim: To determine the optimum train design – doorway width, step height etc and investigate crowd management measures

Data collected: Train dimensions, platform measurements, CAD model of train, recordings of movement and sound on train platforms

Design & arrangements: Train (half-carriage) mock-up with modifiable seating arrangements, platform design, camera positioning. 120 participants, support staff, food & toilet facilities

Experiment: 224 runs of experiment for different combinations of alighting/boarding, train design & crowd management measures



Experiment outputs: Manual count of people and video recording on platforms and inside carriage

Data processing: Process the video files using ' Observer' software and manually code& match them using timeframes

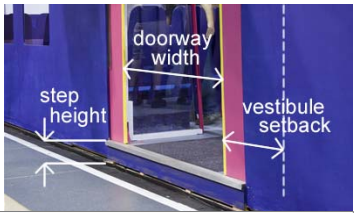
Data analysis: Obtain count data of people at different time frames inside carriage and in platforms in MS Excel

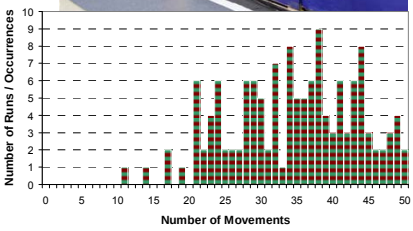
Results & analysis:

- Optimum train design
- Analysis of crowd management measures

Further research:

People's behaviour while alighting & boarding





Sharing of knowledge and skills

Skills required for carrying out their experiments within ARG, such as knowledge of specialised software tools and technical expertise in using equipment, tend to be acquired by individual researchers through a combination of self study and advice and mentorship from close colleagues. This transfer of tacit knowledge could be further improved, they felt, if relevant and very specific expertise (not just subject area, but particular techniques etc.) across the group and in UCL could be identified easily.

The group would like to set up their own system to capture and store experimental best practice, particularly in relation to conducting experiments at PAMELA. The issue of who within the team would have the time to develop and manage this function has hampered implementation to date.

While there are some research skills courses offered by UCL, these were reported to be too general and aimed at the administrative side of carrying out research. It was also articulated that training is not targeted to particular disciplines, which have very different experimental methodologies and rely on pedagogy as outline above..

Data Capture, Management & Storage

Many of the experiments at PAMELA are on a very large scale, sometimes with many participants and are thus expensive to run and difficult to repeat which means that data produced are very valuable. While researchers are aware of the necessity to ensure that experiments are carefully planned, designed and documented they are less clear how best to share and extract maximum benefit from their datasets.

It was the topic of data that was the single greatest cause for concern for ARG researchers, and it was this area they felt was most lacking in the support and guidance they needed.

The array of methodologies employed mean that a diversity of data types in a range of formats are collected and produced. The formats include text (MS word), numerical (MS Excel, Access, SQL and common statistical software formats), image, audio and video files. Much of the data collected from experiments is in proprietary formats which are then processed to yield text, MATLAB or MS Excel files. Some of the data collected are sensitive in nature which means that researchers are sometimes required to anonymise their datasets. Researchers indicated that they would really welcome advice on how to better manage, store and preserve their data so that it could be easily accessed and used in the future, both by themselves and others.

Data, once collected, are generally stored by individual researchers on personal hard drives with back ups also kept on personal storage devices. Only the raw data collected from PAMELA experiments is stored in the lab on DVDs, but in proprietary formats with a minimum of descriptive information or annotation. Once processed or analysed, secondary or derived datasets are again retained by the individual researcher. Researchers recognise that this is not the optimal situation and are worried that their individual naming, filing and storing conventions can make it difficult for others (and even themselves) to access and re-use data. In general the data collected are not shared across ARG at this stage (while carrying out research); and are usually only shared in the form of publication-ready final results or graphs either by email or using portable storage devices. In many experiments in the PAMELA facility, a range of variables are measured which are not necessarily included in the final published results; researchers noted this is a unique and valuable data resource that many researchers could benefit from if its visibility was enhanced and support for informed research access was in place.

Existing repositories at UCL focus on publications (reports, pre-publication copies of articles and theses) and there is currently no centralised managed facility for storing research data. It is widely acknowledged by support services that this is a major gap at UCL. There is an intention to work towards a centrally managed shared data repository, through proof of

concept, small-scale pilot studies, such as the Petascale project (a project which is in scoping stages).

The success of initiatives to address the gaps in data management support, will rely on uptake by researchers, which is to a large extent dependant on them understanding the benefits, and being provided with the training and support to annotate and devise metadata schema and submit datasets to the institutional repository. This will require targeted communication with researchers which will clarify benefits of utilising repositories. It is unclear how central services will support this on a larger scale as they currently lack the resources to reach out to individual researchers.

Researchers would like to make more use of secondary datasets available through national data repositories such as the UK Data Archive to carry out preliminary analysis in advance of experimentation. This could help inform experimental design and would allow them to test analysis tools in advance of collecting their own data. Some researchers who have made use of them revealed that using the data required significant processing before it could be used.

ARG researchers are well aware of the potential benefits of storing, managing and sharing data in standard formats, but currently lack knowledge on standards, curation and preservation skills. Also, researchers have not made use of any data sharing or collaborative data analysis facilities as they are not aware of facilities provided by UCL. They feel a strong need for advice, support and tools for data storage and management.

"We just don't have the skills in relation to data across the group...we know it's an issue we need to deal with and we talk about it forever but haven't come up with a solution as yet"

4) Results dissemination

Peer reviewed scholarly publications are still the main currency for recognition and career progression in scientific research and researchers are acutely aware of the primary imperative, which is often reduced to the mantra "Publish or Perish". The process of communicating research requires researchers to:

- Identify journals in which to publish and conferences at which to present findings
- Identify data repositories for submission of datasets for sharing and dissemination
- Format their outputs (papers, datasets, materials) for sharing
- Consider IP and patents where appropriate
- Raise awareness of their outputs across UCL and to the national and international research community

Communicating findings

ARG members present their findings internally through team and departmental seminars. They publish their findings externally in the form of reports, conference papers and journal publications, but they have identified several barriers to the dissemination of ARG research findings through these traditional routes of scholarly communication.

The majority of research is published in subject specific journals. It is not so easy to determine the most appropriate journals in which to publish multidisciplinary research. While ARG researchers are able to identify some key journals in their research areas, it is not always clear to them what the 'right' journal is. The time taken in preparing an article for a specific publication is significant and so submitting to a journal which may reject the paper based on scope or which fails to reach a relevant audience represents the potential waste of a great deal of time and effort and could reduce the perceived impact of the research.

"There isn't anywhere that actually naturally fits everything that we do at PAMELA, there is not one journal...it is difficult to know where to go …we are just on the edge of many things"

This is equally true in relation to conferences. The primary routes that ARG researchers use to identify appropriate conferences to attend and present their work are by personal searches or by word-of-mouth.

They would appreciate support in finding journals and conferences related to their research, and this need is especially true for members of the group at an earlier stage in their career, who have not yet built up a clear picture of their domain and how it integrates with other areas. The researchers also feel that ARG lacks a system for dissemination of outputs as a group and should make its findings more visible to the public. A broader dissemination strategy would also aid in raising their external profile.

There are also demands on the ARG group from their funders in terms of the access to published outputs arising from research grants. ARG's principal funders have requirements to make publications freely available:
ESRC: requires authors to deposit copies of articles and conference papers in Open Access archives, but within publishers rights and permissions[38].
EPSRC: requires authors to publish using paid-for Open Access journals or archive in open access repositories[39].
MRC: require authors to deposit peer-reviewed papers in an open access repository, and encourages publishing using open access journals[40].

UCL Library Services offers support in meeting these requirements through UCL Eprints[41]. Eprints is an open access digital repository that holds UCL research publications (reports, pre-publication copies, post-publication copy/publisher pdfs and e-theses) and other forms of selected digital information. Under UCL's Open Access mandate, where rights and permissions allow, a copy of the research outputs must be deposited into the UCL Eprints repository. The mandate does not however currently cover research data, which as mentioned previously is an obvious gap, which needs to be addressed. Improvements to the service are ongoing, including the development of the Research Publication System (RPS).

RPS provides a web-based interface for researchers to input their research publications either manually or by providing bibliographic information in standard referencing formats. RPS pulls information from various online publication sources, sending email alerts to researchers for verification, thus significantly reducing the data entry required to keep the publication list up to date. The link with Eprints will enable researchers to store related items centrally such as pre-publication versions of papers, reports etc. This system would help researchers to maintain their publication profile and generate the data required for purposes such as appraisal, biography, etc.

Researchers are not always aware of how and where research outputs could be disseminated beyond the routes of formal publication such as journal articles and conference proceedings. This may be partly due to the lack of accreditation and incentives for less traditional modes of dissemination or a lack of knowledge on what other forms of dissemination exist. These alternative routes could include social media, blogs and wikis.

Sharing and publishing data

As with publications, there are demands on the ARG group for data management and sharing from their funders:
ESRC: Annex C of the ESRC Research Funding Guide[42] sets out that funded projects must offer created and derived datasets to the UK Data Archive within 3 months from the end of a project and this data set must be 'to a standard which would enable the data to be used by a third party, including the provision of adequate documentation'. ESRC will withhold the final

[38] http://www.sherpa.ac.uk/juliet/index.php?fPersistentID=7
[39] http://www.sherpa.ac.uk/juliet/index.php?fPersistentID=6
[40] http://www.sherpa.ac.uk/juliet/index.php?fPersistentID=8
[41] http://eprints.ucl.ac.uk/
[42] http://www.esrcsocietytoday.ac.uk/ESRCInfoCentre/Images/ESRC%20Research%20Funding%20Guide%20July%202010_tcm6-9734.pdf

grant payment if this condition is not met, although it is unclear how often this has been enforced. They encourage applicants to contact the UKDA before applying for grants so that they can obtain the information necessary to outline how data will be handled in the grant application.
EPSRC: Does not have any specific policy on data sharing and re-use, although is covered by the RCUK statement on access to 'research outputs'[43].
MRC: The MRC policy[44] requires researchers to detail how data will be preserved and shared or justify why they cannot do this (e.g. privacy reasons). However it does not mention the consequences of not including this information. Data management is also a core theme in their Good Research Practice Guide[45]. MRC has also detailed guidelines on the management of data involving people and health data[46].

There is a disconnect in these requirements filtering down to the researchers, as none of those interviewed mentioned these in relation to data sharing. These requirements would also not apply to data produced as part of experiments commissioned by other departments such as the case study above.

The researchers are, however, in support of the idea that data produced using public funds should be made public. They appreciate that other researchers could then make use of their data more easily and in return they could access other researchers' datasets. None of the ARG researchers has ever published or archived their data in repositories, as the dissemination of datasets is perceived as difficult for many reasons:

- There are no facilities within the group to enable sharing of datasets and researchers are unsure where the data would belong externally
- They feel that they lack the time and skills to produce data in open standards and formats

"I wouldn't know what to do with the dataset to put it out to be publicly available"

"The raw data is in principle available for further research – in fact it is a pretty unique dataset – although whether it is in a readily usable format is a good question!"

- They are not aware of any guidance or advice offered on what data storage, management, formats and metadata standards should be adopted
- Some of the data is confidential and they require specific advice on when and how to share this kind of data
- They receive no credit for publishing datasets and so have no incentive to spend time on improving the above points

"They perceive there's no benefit in it [making data reusable]. There is, in that it will reflect well on them, but that isn't seen as a big enough reward compared to the effort they have to spend to make it useable" Data Liaison Manager

Balancing research data confidentiality with open sharing of data is a challenge for many disciplines. Data associated with human subjects, whether it is social or clinical information, should be held according to stringent security standards. One data manager we interviewed (outside ARG) had trouble defining what security was necessary or what standards existed for their own project. This also applies to derived data and data that the ARG researchers obtain from other sources – security standards set by the source of the data need to be adhered to. They have a responsibility to ensure the security of their copies of datasets, from the Economic and Social Data Service (ESDS) for example. The location of responsibility for the security of data may also be an issue - back-ups of sensitive data should have equal levels of

[43] **http://www.rcuk.ac.uk/research/outputs/default.htm**
[44] **http://www.mrc.ac.uk/Ourresearch/Ethicsresearchguidance/Datasharinginitiative/Policy/index.htm**
[45] **http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC002415 (chapter 5).**
[46] **http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC002452**

security, but if these are under the responsibility of central services, (e.g. for back-ups of shared drives) it may be difficult to maintain the same kind of security standards.

Their ideal solution to many of these issues would be having someone with the appropriate expertise and training to help them to manage their data for sharing, both internally between group members and collaborators and with appropriate repositories.

"There is no archiving of everything produced at PAMELA and because there are no standard approaches and formats data is kept in different places …without somebody taking ownership of and overseeing data management we will stick with this ad hoc system" ARG researcher

"It's just a waste of my time to produce datasets in the appropriate standards because it is not a skill I have" ARG researcher

All the researchers expressed the need to have a data repository within ARG or through UCL central facilities where they can store and easily retrieve complete records for projects, including the project proposal, ethics applications, summary of the design of experiment, data layers (raw, processed and final) and metadata. Eprints cannot currently serve as a data repository due to the structure and capacity needed to store large volumes of data, but the above-mentioned pilot Petascale Project has the potential to provide a public repository for sharing datasets. Again, the success of these systems requires the researchers to be informed, and understand the benefits of, such systems through training and support from the central services. The necessity for such services has been recognised and is covered as part of future Library strategy but a major hurdle for provision of this training are the resources required for central services to reach out to individual researchers, especially in the subject-tailored form is required by researchers.

Appendix VI: External Stakeholder master list

Description	Organisations
HE/Institutional libraries and Liaison/Informationist programmes and Library Coalitions	University of Sheffield Library Edinburgh University Digital Library (EUDL) Countway Library of Medicine Welch Medical Library MIT Broad Institute Stanford University Library Harvard University Library CEH Informatics Support Officers NLM fellowship scheme/MLA UKCHIP CISTI OCLC RLUK CILIP NTIS
Data: Preservation actors eg data archives/centres	Archaeological Data Service (ADS) Biological Records Centre (BRC), Chemical Database Service, European Bioinformatics Institute (EBI)NB Training for informatics, Economic and Social Data Service (ESDS), GEO Data Portal, National Biodiversity Network Gateway (NBN),

	National Digital Archive of Datasets (NDAD), NERC data centres, The National Archives (TNA), UK Data Archive (UKDA), UK Solar System Data Centre (UKSSDC), United Nations Environment Programme (UNEP) PLANETS
Data; best practice support, advice and advocacy for curation/creation/reuse issues	Digital Curation Centre (DCC) CODATA, Digital Preservation Coalition (DPC), Environmental Research Funders' Forum (ERFF), Research Information Network (RIN), Alliance for Permanent Access (APA)/PARSE. Insight, National Cancer Research Institute (NCRI), UK Data Forum (UKDF), Data Information Specialists Committee - United Kingdom (DISC-UK), Museum, Libraries and Archives Council, Science Commons, Datacite UK Data Archive Keeping Research Data Safe Monash University DISC-UK
Developers of software and hardware for data creation/curation/reuse, or those generally planning data infrastructures	Australian National Data Service (ANDS) and Versi (a level down - project level) European Strategy Forum on Research Infrastructures (ESFRI) UK Research Data Service (UKRDS)
Influencers	JISC Research Councils UKOLN SURF ARMA