The research cycle and research data management (RDM): innovating approaches at the University of Westminster

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This article presents a case study based on experience of delivering a more joined-up approach to supporting institutional research activity and processes, research data management (RDM) and open access (OA). The result of this small study, undertaken at the University of Westminster in 2013, indicates that a more holistic approach should be adopted, embedding RDM more fully into the wider research management landscape and taking researchers' priorities into consideration. Rapid development of an innovative pilot system followed closely on from a positive engagement with researchers, and today a purpose-built, integrated and fully working set of tools are functioning within the virtual research environment (VRE). This provides a coherent 'thread' to support researchers, doctoral students and professional support staff throughout the research cycle. The article describes the work entailed in more detail, together with the impact achieved so far and what future work is planned.

Background

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The University of Westminster's Information Strategy has three strategic priorities: to 1) maximize potential for staff and student collaborative and integrated working; 2) exploit information flow, management and use; and 3) integrate corporate systems and services to enhance/exploit their usage. Within this framework there is a strategic objective to improve support for research.

In March 2012, the Pro Vice-Chancellor (PVC) for Research and Enterprise and the Research Committee received a paper from Suzanne Enright, Director of Information Services, reviewing progress of the information framework and IT systems to support research and to better integrate research data into a wider institutional framework.[1]

As a result of this review, Suzanne, with support from the Research Committee, PVC and Chair of the Graduate School Board, took the lead in setting out to meet researcher needs in terms of research data management (RDM) and to devise and deliver a 'research pathway' based on a new research management system. Following earlier work by Jisc[2] and Microsoft[3], the envisioned system was badged as a virtual research environment (VRE) with portal capabilities comparable to the virtual learning environment (VLE), Blackboard, and which would have interfaces to, and interoperability with, key university systems. Aggregated functionality would make the VRE the 'go to' place for all of the research community. This, in turn, would contribute to improved research success for the university.

In parallel, the university's Corporate Services were being given a strong steer that, given an anticipated increase in activity, support for research and academic enterprise needed to be enhanced, with appropriate resources assigned. This created an opportunity to produce a

more integrated framework of research and academic enterprise support which has its focus clearly on ensuring delivery of support and service for the virtual Graduate School and PVC. This focus is reducing duplication of effort based on process efficiencies and co-locating different activities to improve relationships and/or referral activities. The VRE was also expected to underpin this.

Getting under way

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As a direct result of this strategic focus on the research pathway, Ken Chad Consulting (KCC)[4] was invited to the University in September 2012 to discuss potential overall approaches to research information and, specifically, RDM. KCC had been researching approaches to RDM for some time and was working with a small technology company (ONEIS)[5] to explore how their information management platform could solve RDM problems. At that time, Westminster, like most other universities, was using several poorly connected systems to manage research information. Although Jisc[6] and the Digital Curation Centre[7] have, for some time, highlighted the opportunities and outstanding need for solutions, and many in the sector have grappled with this complex area, the whole RDM marketplace remains emergent, with no mature 'off-the-shelf' product.

Scope

The focus was on direct engagement with researchers to help inform the University as to their needs in terms of RDM, to identify how best those needs could be addressed and also to explore how such data and workflows could be integrated into the posited VRE as part of the institutional infrastructure. A pragmatic 'hands-on' approach using interviews was agreed in order to deliver results quickly and efficiently. The approach to these interviews was informed by existing surveys from other institutions[8], allowing KCC and ONEIS to focus on in-depth structured interviews with researchers and to have them review the usefulness of a prototype application. We decided to work nimbly. As the ONEIS platform enables very rapid development, it meant we could involve researchers straight away on the basis of discussing a prototype RDM tool at the earliest design stage.

We also set some limits. For example, we did not set out to deliver a 'big data' project about storing, mining or analysing large research data sets.

Consultation

To maximize engagement from the sample group of researchers, the following key attributes were identified:

> "… we could involve researchers straight away …"

- participating in collaborative projects, part of a dispersed team with challenges of sharing data, and where the funding body has specified RDM requirements
- being open to new ideas, bringing enthusiasm towards the project, recognizing the importance of trying to solve these problems
- facing a pressing RDM problem at any scale, as of equal concern was the need for handling of sensitive and confidential data.

The emphasis on partnership with researchers and their ownership of solutions was validated early on during the interview process when it became apparent that a solution imposed from above was not likely to gain wide acceptance.

A number of key themes emerged from the interviews undertaken with researchers. There were barriers to sharing information about research. Systems were not joined up to enable a comprehensive or coherent approach to provide visibility of local needs and activity across the university. There were significant issues about workload and a lack of trust in university

systems. This contributed to the sensibility of mistrust around any provision of 'top down' solutions that would add to the workload. Changes to RDM practices were not high on the list of 'problems' as researchers reported they 'just get on with it', and so were not inclined to change. Given this, it was unsurprising that none of the researchers interviewed was aware of the work of Jisc or the DCC.

Through interviews with researchers, it was concluded that a solution dedicated solely to RDM would be unlikely to gain a sufficient level of engagement as researchers did not see it as a priority when other issues around the management of research were more pressing. Far from being 'Luddites', they identified clear benefits, including improved access, from better managed research data. However, it was clear that issues with RDM had to be seen in the context of, and embedded in, the overall process of managing research. Of course, this may seem self-evident, but it is clear from much of the work and projects around RDM that it has not yet been fully or widely taken into account.

"… the need for a more comprehensive, holistic approach to managing the processes around research …"

While the project had been initiated with a focus on managing research data, in the light of these interviews, the need for a more comprehensive, holistic approach to managing the processes around research (not just research *data*) was recognized. User engagement remained paramount. Clearly, researchers are under time pressure, so any new solution would need to be very easy to use and preferably integrated into their existing workflow to have a greater chance of being used.

Many of the problems facing researchers were concerned with the management of information around research projects. By devising an improved information management solution around research activity, some of the problems that researchers themselves regarded as most pressing could be solved. Working in this way built their trust and engagement with the system. At the same time, creating better records of researchers and research projects would be critical building blocks for a successful research data management system.

Using the ONEIS platform to deliver a comprehensive and accessible directory of researchers and research projects meant we could deliver more effective information sharing across the university. On top of these records, workflows designed to improve and automate processes could be implemented, reducing or eliminating pain points in administrative and academic processes around research. Concise management information 'dashboards' would improve visibility to all stakeholders.

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Building on an existing, stable and sustainable platform made innovation easier, and enabled managed risks to be taken. Using this approach also meant that project time did not need to be spent in building generic system functionality; there was instant access to the platform's support for sophisticated permissions, search, user management, and a polished user interface. This meant the focus could be on cutting-edge user-facing functions developed to specific requirements, essentially 'having our cake and eating it'. And rapid deliver functionality could be delivered, helping to build engagement and momentum for the project as researchers involved in designing the functionality would see it in use within a few weeks. This flexibility enabled the solution to have a high degree of future-proofing, as it can easily be tweaked or new functionality built to meet changed or totally new requirements as they emerge. It also helped staff to understand the kinds and degree of institutional and vendor support required.

Delivering improvements

Early on, KCC and ONEIS were asked to extend their interviews to a wider variety of university staff engaged in the wider research process. This reinforced the key finding that before there could be a successful solution to RDM, it was necessary to reduce or eliminate

specific pain points in administrative and academic processes around research procedures by improving and automating workflow, and to provide greater visibility to all stakeholders through concise management information dashboards.

An extension of the work was agreed, and it was decided the best approach to dealing with these issues was to do so in manageable bite-sized chunks. Two key technology-related issues were important: firstly, that the ONEIS platform lent itself to rapid development, and, secondly, that ONEIS had a highly skilled business analyst who could get a clear understanding of business needs and have them translated into an elegant, easy-to-use solution. In June 2013, a pilot was launched, based on the ONEIS platform, and this was deployed operationally from September 2013. Following successful evaluation of the initial functionality, the University has continued, since November 2013, to develop this VRE.

The VRE focuses on three specific areas:

1. 'Research Manager' guides the research lifecycle. It includes finding researchers and research projects across the University and will offer a streamlined workflow for grant applications, project costings, ethics approval, project approval and data management plans. It will also help to analyse progress at all stages of the research lifecycle. The pilot delivered key changes to two identified pain points: firstly, it raised visibility of supervisory capacity amongst academic staff, ensuring fair utilization of supervisory capacity and reducing the administrative inefficiencies by identifying suitable staff to supervise research students' projects. Secondly, the process for applying for research ethics approval (locally and centrally) has been streamlined with online applications, automatic routing of applications and support for ethics committee administration. This provides greater visibility on ethics applications to both applicants and those with responsibility for research ethics at the university. A key deliverable going forward will be to review and improve workflow and processes related to grant awards and financial data integration. This will be a development of interest not just to researchers and research development officers, but also to those academic staff engaged in academic enterprise and business development.

2. 'PhD Manager' focuses on supporting doctoral researchers, improving visibility of the progress of PhD candidates and supporting successful completions. This led to streamlining of the administration relating to registration, changes to mode and suspensions, transfers, examinations, and to making more visible the way supervision meetings and progress reviews were tracked. With direct access by research students, supervisors, and the Graduate School Registry, it supports efficient information sharing across all parties and transparency of processes. In 2014, the University will consider integration of Doctoral Researcher Development Programme (DRDP) activity planning and recording and will explore how the VRE can dovetail with similar workflows in the HR Development team.

3. 'Data Curator' focuses on the provision of long-term secure storage of research data with support for data discovery, licensing and access, helping ensure compliance with funder requirements for the availability of research data and supporting the OA agenda. This is where it all began, when KCC was invited into the University in late 2012 … and in 2014, the circle is being closed by returning to the question of how to manage the research output lifecycle. It is not just research data that will be looked at, but also outputs more widely, research data publishing, and RDM. At time of writing, the best way forward is still under consideration, but it is believed this should include a single interface for researchers to submit their draft and final papers, presentations and data. Each of these outputs would be handled differently by the system, but the researcher would just need to deal with one, familiar interface. Various use can then be made of the records of outputs, for example: faculty could review researchers' output and performance (to help with assigning research support and research time); papers could be fed to the institutional repository (we use EPrints); data sets could be made available under selected access and licensing conditions (tying in with enabling funder compliance to be monitored);

better marketing and promotion of researcher/research group/University research; library service alerted earlier to new book publications. Essentially, instead of having separate ways of gathering and analysing the same information for each different purpose, we would provide a central directory of good quality records which could be filtered and selected in different ways, so that anyone who needed the information could access it to suit their needs. This would make it easy for the researchers to get comprehensive information and then for them to manage that information well.
Interestingly, this is the area where it is anticipated the library expertise will (finally) come into play. The expectation is that all this will result in more efficient compilation and review of research activity for the next REF.

"…we would provide a central directory of good quality records …"

Other issues

For ease of deployment and to increase user engagement, it was important to integrate the solution into existing workflows and systems as much as possible. Existing authentication systems are used to simplify access and to increase reliability and resilience. Initially, OAuth authentication was used, which relied on the credentials provided by the Google Apps infrastructure. A move was then made to mixed authentication, providing both OAuth to Google and direct authentication to the University's internal directory, using the secure LDAP protocol). The flexibility needed to support the permissions was found to be really challenging.

The VRE requires good quality data and there is a significant issue related to the required information architecture, as well as records management and data management, when thinking through how to take a range of disparate entities and make them work as a coherent whole. Work continues on integrating other systems. As noted above, planned work in 2014 will be around processes and workflows related to grant awards and financial data integration (Agresso) and business reporting (Qlikview)[9]. These developments related to financials and reporting are business critical; they will be of interest to researchers and research development officers, as well as to those academic staff also engaged in academic enterprise and business development.

There is definitely a shared service issue in respect of RDM – not least as past work in the sector on institutional repositories was piecemeal. While research-intensive institutions may be ahead of the curve here, there is a case to be made for Jisc, SCONUL, UCISA and ARMA to determine exactly what this might look like for the rest of the sector in respect of data storage, curation, metadata, archiving, preservation and access.[10]

It was recently announced that Jisc has begun to scope and explore how a Jisc-managed shared service might support institutions in meeting the HEFCE Open Access Policy requirements post REF 2014. Jisc Monitor is a one-year project and will be developed by Mimas. It will consist of a series of prototypes and test beds that aim to address three key use cases: monitoring all publication activity so that institutions have a clear picture of what has been published; monitoring compliance with funders' mandates, and monitoring spend on publication charges, i.e. how much an institution has spent on their OA publications and subscriptions. This has the potential to link workflows across institutional repositories, current research information systems (CRIS), 'gold' publishers, etc.

Conclusion

Working towards a more joined-up approach to supporting research activity and processes, RDM and OA requires co-operation and co-ordination across an institution. The organic and business-centric approach adopted at Westminster necessitated a flexible strategy with a focus on expert requirements gathering, understanding user concerns and motivations, and an agile development process. It has resulted in the delivery of a robust solution which closely supports the stated and specific needs of its research community on a proven and sustainable platform with rich functionality, good design and ease of use. Most importantly, it means the University is taking a holistic approach and is embedding RDM fully into the

wider research management landscape. The focus on quality participation from researchers was a critical success factor, and caused a change of direction in delivering what it is felt is a better solution today.

The groundwork of the last year has resulted in a much stronger starting position for work going forward, with better records of researchers, research interests and activities, and doctoral students' research projects. Researchers are already engaging, and building trust with the system, as they use it for ethics approval applications and administration around the research student programme. The VRE is building a reputation for being an effective solution to problems. It is gratifying to report that due to positive delivery of outcomes, securing funding for further development work, not least further integration with the wider information environment, has wide support. Moreover, building our solution on a flexible platform with a single interface means we can easily integrate any new initiatives developed nationally and respond to any new requirements.

"Researchers are already engaging, and building trust with the system …"

'ONEIS for Research' provides three connected modules (Research Manager, PhD Manager, and Data Curator) to support the entire university research lifecycle in one streamlined solution[11]. Based on the experience at the University of Westminster in partnering the development of this approach, we would recommend that any university would benefit most from using all three elements, and even if they start with just one element, we hope they would eventually use the full system.

This recent VRE development is set against the previous deliverables at the University, such as an e-thesis policy requiring doctoral students to submit to its institutional repository, WestminsterResearch[12] (as well as in print) and the introduction of an OA policy in 2013. More recent activity includes contract negotiations to establish a new University Press as a way to engage and support the research community in OA publishing.

"The VRE is building a reputation for being an effective solution …"

Slides from the original case study presentation on the project may be viewed at **http://www.slideshare.net/UKSG/research-process-rdmwestminsteruniversityuksgapril2014-33846000**

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