



JISC VRE Programme: Impact Study

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Acknowledgements

In completing this work, I have drawn upon the experiences and perspectives of many people actively involved in thinking about, building and using Virtual Research Environments. This work would be much diminished without their input, and I hope that my analysis does them and their work justice.

This project is one of several commissioned to address different aspects of JISC's ongoing funding for Virtual Research Environments. I would like to thank the teams working on the other evaluation projects for their thoughts, comments and ideas over the past few months, with particular mentions reserved for Jim Farmer at im+m² and Torsten Reimer at King's College London's Centre for e-Research³.

JISC's VRE Programme Manager, Frederique Van Till, commissioned each of these studies and provided valuable input throughout. On so many levels, this work would have been impossible without her.

¹ http://www.jisc.ac.uk/fundingopportunities/funding_calls/2009/01/vreimpactstudy.aspx

² <http://www.immagic.com/>

³ <http://www.kcl.ac.uk/iss/cerch>

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Introduction

Building upon work undertaken in earlier e-Science projects and elsewhere, the Joint Information Systems Committee's (JISC⁴) Virtual Research Environment (VRE) Programme⁵ fuses technical prowess and domain knowledge to explore the evolving manner in which effective ICT supports the research process.

With three phases of work to date (2004-2007⁶, 2007-2009⁷, 2009-2011⁸, the VRE Programme has engaged a wide range of academic disciplines in developing tools, exploring issues, and assisting researchers in the tasks that they complete each and every day.

This study is one of three commissioned by JISC in order to assess progress within the Programme to date. Ten projects funded under Phase 3 of the Programme are at an early stage. As such, these are largely omitted from this work.

With an emphasis upon exploring the *impact* of JISC's VRE Programme upon the UK HE sector, this study combines desk research with stakeholder consultation.

Stakeholders are considered to include the project personnel themselves, project-hosting institutions, funders, institutions that might directly implement project outputs, and those that might be less explicitly influenced.

In defining 'impact' there is a recognition that a wide range of factors apply, and that many of them remain difficult to quantify in terms that are meaningful across all of the projects and disciplines concerned. A pragmatic approach is taken in assessing the extent to which the Programme and its constituent projects have impacted upon those around them. Broadly, impact might be sought in terms of continued activity by a project team, post-funding; continued use within the host institution, post-funding; successful acquisition of supplementary funding; direct adoption of project outputs by similar groups at other institutions; identifiable influence over activities elsewhere; citation.

⁴ <http://www.jisc.ac.uk/>

⁵ <http://www.jisc.ac.uk/whatwedo/programmes/vre.aspx>

⁶ <http://www.jisc.ac.uk/whatwedo/programmes/vre1.aspx>

⁷ <http://www.jisc.ac.uk/whatwedo/programmes/vre2.aspx>

⁸ <http://www.jisc.ac.uk/whatwedo/programmes/vre/projects.aspx>

The Virtual Research Environment

The notion of a Virtual Research Environment, or VRE, is an evolution from earlier developments across Higher Education in the UK and overseas. The name, clearly, owes much to the more established concept of the Virtual *Learning* Environment (VLE), although the understandable misconception that a VRE – like a VLE – will most commonly manifest as a ‘thing’ continues to cause confusion.

In the UK, early consideration of the role that a VRE might play emerged most clearly in the area of e-Science. It was closely linked with processing of large data sets, the Grid, and attempts to build portal-like tools. JISC’s VRE working group, for example, opened their 2004 *Roadmap for a UK Virtual Research Environment*⁹ by stating;

“e-Science is a new paradigm of research, often characterised by a ‘deluge’ of data analysed by massive distributed computing power. e-Science research collaborations are frequently large, distributed and multidisciplinary involving hundreds of institutions across the globe. Grid technology, emerging in response to these challenges, is enabling exciting possibilities for better research, even creating new disciplines like astro-informatics. In this context, a wide range of national and international initiatives are under way.

The concept of e-science is now broadening and evolving into e-research generally, to encompass the social sciences and the arts and humanities. At the same time it has to be recognised that different communities are at very different stages in their awareness of the new technologies: thus the current needs of a large international scientific collaboration are likely to be much more complex than those of the lone humanities researcher, wishing to collaborate more effectively with a handful of colleagues world-wide in the same field of interest. In our thinking we have tried to keep the whole range of requirements in view. At the high end, the new developments are making the process of carrying out research more complex and demanding. The aim of a Virtual Research Environment (VRE) is to help researchers manage this complexity by providing an infrastructure specifically designed to support the activities carried out within research teams, on both small and large scales. JISC has recently been allocated £3.2 million as part of the Comprehensive Spending Review to develop a VRE.”

(Roadmap for a UK Virtual Research Environment; p.2)

⁹ http://www.jisc.ac.uk/uploaded_documents/VRE%20roadmap%20v4.pdf

Michael Fraser from the University of Oxford continued in the same vein, writing¹⁰ in 2005 that;

“Virtual research environments (VREs), as one hopes the name suggests, comprise digital infrastructure and services which enable research to take place. The idea of a VRE, which in this context includes cyberinfrastructure and e-infrastructure, arises from and remains intrinsically linked with, the development of e-science. The VRE helps to broaden the popular definition of e-science from grid-based distributed computing for scientists with huge amounts of data to the development of online tools, content, and middleware within a coherent framework for all disciplines and all types of research”

(Virtual Research Environments: Overview and Activity, *Ariadne*)

The concept of the Virtual Research Environment has evolved in the past few years, largely driven by the experiences of those working on JISC-funded VRE projects. The JISC web site currently offers a rather terse definition¹¹;

“A VRE helps researchers from all disciplines to work collaboratively by managing the increasingly complex range of tasks involved in carrying out research.”

(JISC’s *Virtual Research Environment programme* web page)

Earlier suggestions that the VRE might be a single coherent product that should be specified and built have largely disappeared, replaced by the more pragmatic concept of VRE as shorthand for a wide range of tools and techniques intended to facilitate the processes behind funding, conducting and disseminating research. In his 2009 book, *Virtual Research Environments: from portals to science gateways*¹², Robert Allan identifies twelve characteristics of a modern VRE;

“In our view, therefore, a VRE should do the following:

- Support the processes of conducting research, including marshalling of resources, scholarly discourse and publication, and the creation and maintenance of collaborations across domains, institutions and countries, including support for meetings and organisational processes.
- Be designed to meet user requirements and address usability and accessibility, with appropriate evaluation mechanisms and benchmarks for new service and tool development.

¹⁰ <http://www.ariadne.ac.uk/issue44/fraser/>

¹¹ <http://www.jisc.ac.uk/whatwedo/programmes/vre.aspx>

¹² Allan, R. 2009, *Virtual Research Environments: from portals to science gateways*. Chandos Publishing.

- Include modes of access which (almost) any user can download and install on their laptop/ desktop/ PDA/ mobile phone/ home computer, with 'servers' that can be easily installed by system administrators without specialist knowledge and national-level servers as appropriate, so that tools work 'out of the box.'
- Be secure and trustworthy – the VRE components should interoperate with federated cross-institutional authentication and authorisation mechanisms.
- Be accountable, by providing adequate logging and probity including supporting queries about provenance.
- Be compatible with other widely used and deployed systems, including at least: web, e-mail, instant messaging, SMS, wikis and video-conferencing tools from lightweight desktop applications through to high-end video conferencing via Access Grid.
- Support the creation, sharing and curation of digital content, through ease of authoring, publishing, discovery and access. This implies adoption of appropriate metadata schemas and support for automatic generation of metadata. Resources to be described will include data, publications, computation, experimental or observational facilities and human researchers.
- Be based, as far as possible, on loosely coupled, distributed, interoperable services and tools, rather than monolithic applications.
- Be extensible with enhanced or new tools (possibly domain-specific) from any developer, through the use of published standards and software development kits, software libraries, etc. It should be as easy as possible to make existing software and services (e.g. e-print repositories, portals and proprietary software) interoperate with the VRE.
- Be open source and standards-compliant wherever possible. The licensing of the software should encourage and support improvements to the tools and development of new tools by the community. Intellectual property rights (IPR) issues need to be investigated and understood.
- Support tailoring of the environment by individuals or groups to reflect their domain interests and personal preferences.
- Support the delegation of routine tasks to intelligent personal agents where the means to realise these exists, e.g. by incorporation into workflow processes.

(Allan 2009; pp 11-12)

Whilst occasionally aspirational rather than widely available in today's VREs, the capabilities in Allan's list are useful in illustrating the current perspectives of someone who has been closely involved with VRE building for a number of years.

With increasingly explicit recognition of the role that the Web itself plays in binding data, applications, processes and people together, there is clear value in exploiting the architecture of the Web in addressing many of Allan's points.

King's College London's *Virtual Research Environment: Collaborative Landscape Study*¹³ explores a number of relevant definitions from around the world. Although that study does not select a single, harmonised, definition for future use, it does extract some core attributes that are useful to bear in mind;

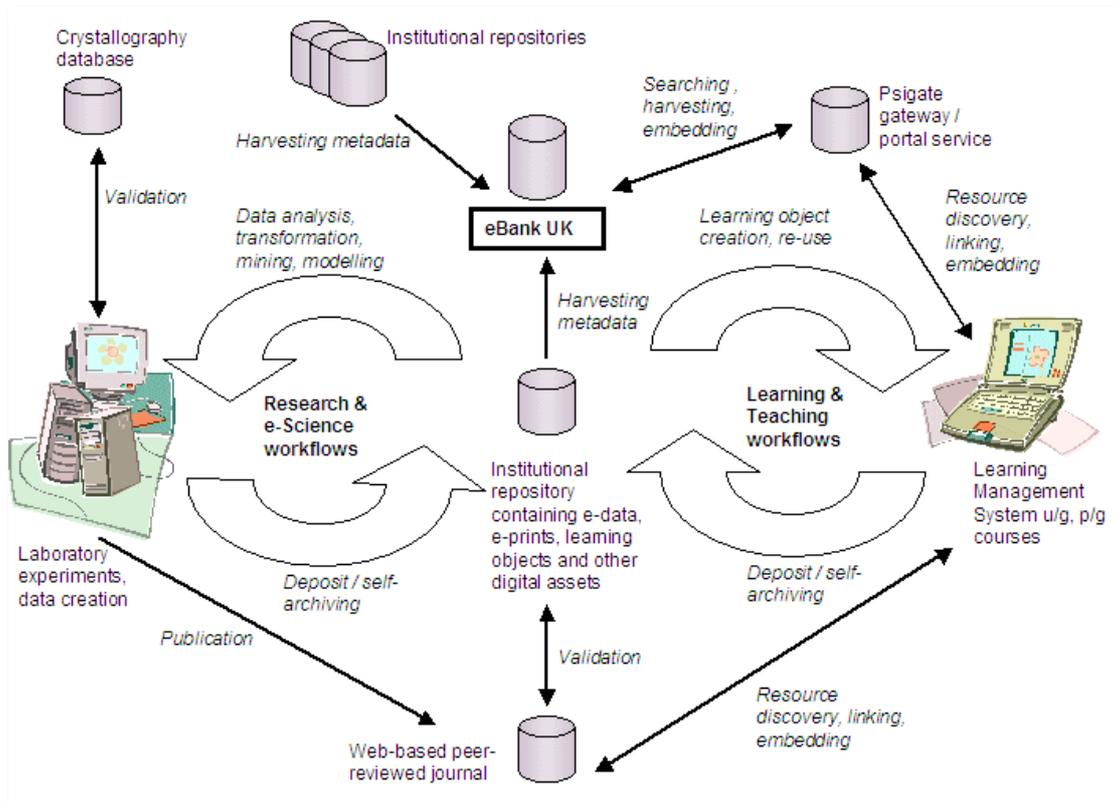
"To summarise, we found that the term used was not important, though the understandings associated with the terms 'VRE,' 'Collaboratory' and 'Gateway' are converging on a set of characteristic features: an electronic web-based environment for a) access to data, tools, resources; b) co-operation or collaboration with other researchers at the same or different institutions; c) co-operation at the intra- and inter-institutional levels; or d) preserving or taking care of data and other outputs. Not all of these environments serve all of these functions, but they generally serve two or more."

(Carusi & Reimer; p21)

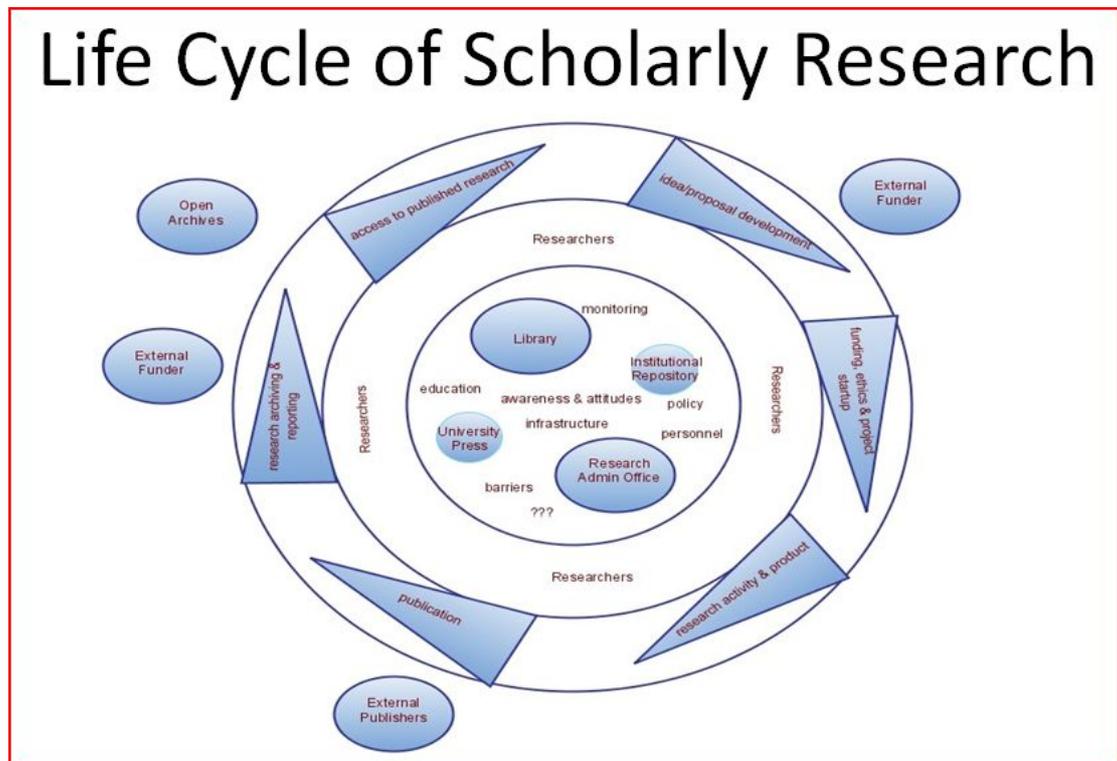
Alongside these, it is perhaps worth emphasising the role of the VRE in facilitating the research *process*, typically by means of synergy with typical *workflow* patterns.

VRE capabilities touch the behaviours of researchers and those supporting them at many points throughout the research cycle. Some of the details of those interactions may be generically applicable, many are domain specific, and a significant number of those most critical to successful adoption are all too often entirely personal. In this context, 'the VRE' may more usefully be recognised as an ongoing set of activities to respect, understand, respond to and (where necessary) shape individual behaviour and institutional practice in an environment within which ICT plays an ever-greater part, rather than one or more specific technological 'solutions.'

¹³ Carusi, A. & Reimer, T. unpublished, *Virtual Research Environment: Collaborative Landscape Study*. Unpublished draft report.



Liz Lyon's illustration of the 'scholarly knowledge cycle¹⁴,' one aspect of the research cycle



<http://blogs.ubc.ca/pkp2009/2009/07/13/open-access-supports-for-researchers-in-canadian-universities-the-session-blog/>

¹⁴ <http://www.ariadne.ac.uk/issue36/lyon/>

VRE Programme: Objectives

In the years since the VRE Programme's first phase commenced, technologies have changed and attitudes have evolved. It is nevertheless worth reflecting on the stated objectives at each phase of this programme, in order to understand the manner in which the Programme shaped – and responded to – those changing circumstances.

Phase 1

Phase 1 of the VRE Programme, which ran from 1 April 2004-31 March 2007¹⁵, placed emphasis upon the building of tools and frameworks. In certain contexts, at least, there was an implicit belief that 'a VRE' might be built and adopted reasonably widely. Portals such as Sakai¹⁶ featured in much of the discussion.

The Tavistock Institute's *Formative Evaluation of the JISC VRE Programme*¹⁷ describes the three aims of the programme at that time;

"The VRE1 Programme emerged during a period of heightened interest in high-performance computing for scientific research and a growing awareness of the relevance of Virtual Learning Environment (VLE) and digital libraries technology for the research community.¹ Against this background, the aim of the Programme was to learn more about the potential and application of VREs in higher education. Specifically, the programme had three aims:

- Engaging the research community in building and deploying Virtual Research Environments (VREs);
- a clear definition of what constitutes a VRE, its boundaries and how this function overlaps with other related technologies, e.g. Virtual Learning Environments, peer-to-peer applications and online collaboration software;
- Raising awareness and stimulating discussion on VREs within the UK research community."

And continues,

"In funding the 15 projects¹⁸, JISC expected to achieve the following objectives:

¹⁵ <http://www.jisc.ac.uk/whatwedo/programmes/vre1>

¹⁶ <http://sakaiproject.org/>

¹⁷ <http://www.jisc.ac.uk/media/documents/programmes/vre/vre1lessonslearntdeffull.pdf>

- Gain an increased understanding of the requirements of VREs to support decision making on future activities in this area;
- Produce tangible products and/or demonstrators of usable services & tools;
- Begin moving technologies into the wider community;
- Begin to change behaviours and cultures.”

(Junge *et al* 2007; p.7)

Phase 2

For Phase 2, which ran from April 2007 until October 2009, funding focussed down on four ‘integrating projects,¹⁹’ and the JISC web site describes²⁰ the intention to

- “stimulate change in research practices through the development and deployment of VRE solutions
- continue involving and engaging the research community in building and deploying VRE solutions
- start exploiting and extending such solutions amongst the Higher Education community
- continue raising awareness of the benefits of VRE solutions in the research community”

The *Phase 2 Roadmap*²¹ provides additional detail, stating that

“The focus of phase 2 will be on **pilots with a wider range of users in real-life research settings** within UK HEIs and partner institutions. This would include large- and small-scale pilots addressing real target user group needs. The applicability and fitness for purpose of emerging VRE solutions to a wider range of research settings will also be established, where appropriate projects will be encouraged to conduct pilots in settings other than the ones for which they have been developed.

The target user groups for the pilots would be formal and informal teams and communities of research practitioners, as well as individual researchers of all disciplines, focusing on hybrid teams of various types of research practitioners working within single- or cross-discipline research settings.

The focus of the pilots should be on implementing real change in the practices of the chosen user groups by providing support for a broad range of research activities.

¹⁸ see Annex 1 for a list of projects, and links to those that are still available online

¹⁹ see Annex 2 for a list of projects, and links to their web sites

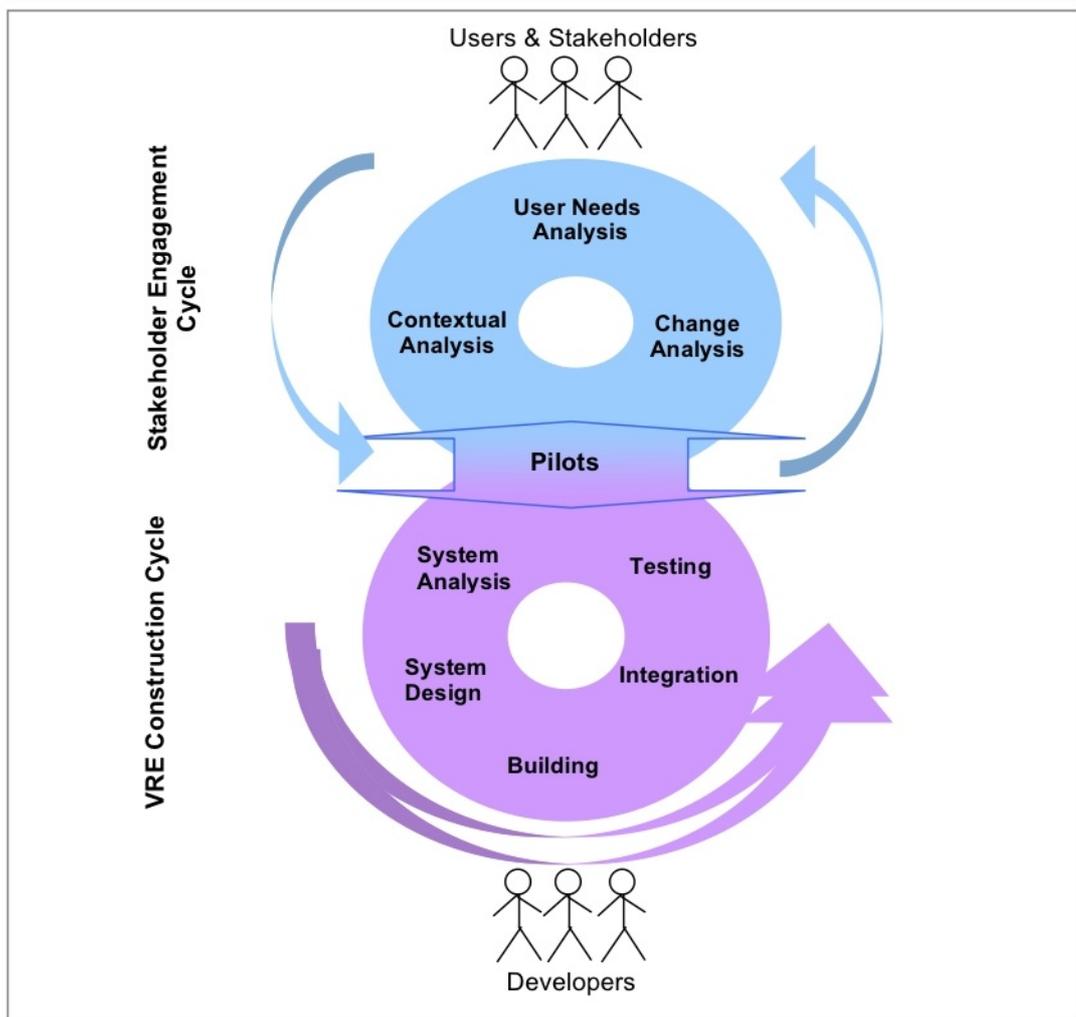
²⁰ <http://www.jisc.ac.uk/whatwedo/programmes/vre2.aspx>

²¹ http://www.jisc.ac.uk/publications/programmerelated/2006/pub_vreroadmap.aspx

The technical focus will be on creating and piloting interoperable and innovative VRE solutions that address the needs of the chosen target user groups, such as maturing current VRE solutions and integrating them with other existing solutions to provide breadth of functionality and ensure interoperability of tools and resources. Where gaps in the functionality are identified, existing tools should be assessed and new components developed to address these gaps. Projects will be asked to address as many of the key capabilities described here in the ‘Current Vision for Future VREs’ section during the development of their solutions.

Finally, projects under Phase 2 should evaluate the extent of change introduced into research practices as a result of implementing these technical solutions, as well as identify and address any barriers to their adoption, including social, behavioural, technical and institutional ones.”

(my emphasis)



The Figure of Eight Development Model, <http://www.oss-watch.ac.uk/resources/vre-report.xml>

Phase 2 placed a repeated emphasis upon stakeholder involvement, and an iterative development process. These became enshrined early on in the ‘figure of eight development model’ (illustrated here by OSS Watch) that was closely associated with many presentations at the time. As the OSS Watch paper²² describes,

“The VRE2 call prescribed a user-centred development approach, introducing a ‘figure of eight’ model based on *agile* and *participative* software development methods. As a result, all four VRE2 projects are strongly committed to user community engagement in the sense of understanding their users’ needs and working closely with them when developing the software. From an open development perspective, this is clearly a good thing: users will turn away if their needs are not satisfied and without users there is no project.

As a *software development* model as opposed to a *community* development model, the ‘figure of eight’ assumes the user community is already out there, waiting to be engaged with and does not place very much emphasis on drawing in *new* users. The VRE2 projects all had user communities written into them at their outset and genuine efforts had been made to keep them engaged and interested.”

(Mascord, M. 2008, *The JISC Virtual Research Environment Phase Two Programme: Attitudes to and Awareness of Open Development*)

In hindsight the ‘funnelled approach’ of moving so quickly from 15 experimental projects toward four essentially inward-facing development activities was, perhaps, premature, and detrimental to wider engagement with the programme and its objectives.

Phase 3

With Phase 2 projects still underway, Phase 3 was commissioned to

“build upon the existing phases to establish strong communities supporting the use of and development of VREs both within and without JISC. Particular emphasis will be on the embedding of VREs within both local and national infrastructures and the overlap and synergy between VREs and Virtual Learning Environments both in terms of content and technologies.”

(*VRE Phase 3: Draft Programme Definition*²³, p.1)

²² Mascord, M. 2008, *The JISC Virtual Research Environment Phase Two Programme: Attitudes to and Awareness of Open Development*. <http://www.oss-watch.ac.uk/resources/vre-report.xml>

²³ http://www.jisc.ac.uk/media/documents/committees/jsr/25/26a_jsr_future_programmes.pdf

The document, prepared as part of the process of securing funds for this third phase, continues;

“Phase 1 of the VRE Programme concentrating on examining the context and concept of ‘Virtual Research Environments’. This established a common understanding of the term, as well as some preliminary investigation into tools and technologies. In general, it did establish that VREs are not homogeneous and tend to vary, sometimes quite radically, between disciplines and communities.

Phase 2 of the VRE Programme set out to establish a small number of large scale demonstrators which could be used to demonstrate the opportunities opened up by building and adopting VREs and establish the research impact of VREs.

Phase 3 will concentrate on consolidating these two phases to build a community of support and development spanning both VRE developers and users.”

(p. 1)

In common with the earlier phases of the programme, a set of aims are defined;

- “stimulate change in research practices through the development and deployment of solutions
- continue involving and engaging the research community in building and deploying solutions
- continue raising awareness of the benefits of solutions in the research community
- start exploiting and extending such solutions amongst the Higher Education community
- sustain VRE development by building self-supporting communities of practice and expertise, and investigating institutional embedding of VREs.”

(pp. 1-2)

Finally, a set of Outcomes and Benefits are identified;

- “Agile and flexible VRE support and development
- Spreading the VRE brand virally, building an inclusive community of both old and new VRE developers and users
- Co-ordinating knowledge and demonstrators to advise community and for continuity
- Building sustained communities of practice
- Supporting sustainability and business cases for VRE solutions
- Encourage commercial engagement”

(p. 2)

Ten projects²⁴ were funded across three strands of activity in Phase 3, along with the four studies of which this is one. The projects are due to finish by 31 March 2011, and mark the beginning of a refocusing of VRE activity towards institutional engagement and embedding. In addition, a further 14 'Rapid Innovation' projects²⁵ have been funded during 2010, reaching out to the wider community in order to align existing institutional efforts with JISC's programme of work. A wiki site²⁶ set up to support these Rapid Innovation projects is already having some success as a focus for VRE-related activity, within the funded programme and beyond.

This table, based on text presented recently by Programme Manager Frederique Van Till, provides a useful insight into JISC's perspectives on the changing nature of the programme.

VRE1	VRE2	VRE3	VRE-RI
2004-2007	2007-2009	2009-2011	2010
15 projects	4 pilots	10 projects	14 projects
Technology focused	User- and research practice focused	Broadening use, across institutions and disciplines	Rapid Innovation throughout research lifecycle
Experiment	Development	Development	Rapid Innovation
Diverse design & development approaches	Unified design and development approach	Diverse designs; driven by community need	'Scratching itches,' solution driven
Stand-alone solutions	Integrated Pilots	Focused on technical interoperability, nationally and institutionally	Focused on technical solutions and Business Community Engagement

It is also interesting to note continued community interest in engaging with JISC calls in this area, with 58 proposals against the fixed budget that funded 15 Phase 1 projects, 18 proposals resulting in 4 Phase 2 pilots, 22 proposals resulting in 10 Phase 3 projects, and 45 proposals in response to the most recent call, resulting in 14 projects.

²⁴ see Annex 3 for a list of projects, and links to their web sites

²⁵ see Annex 4 for a list of projects, and links to their web sites

²⁶ <http://code.google.com/p/vreri/>

vreri - Project Hosting on Google Code
<http://code.google.com/p/vreri/> My favorites | Sign in

JISC vreri
 Virtual Research Environment Rapid Innovation (VRERI) Programme by JISC

Project Home Downloads Wiki
 Summary | Updates | People

Welcome to the VRERI Wiki

What is going on here?

This wiki is the Programme Managers notebook on the VRERI programme. Because it is a notebook it has errors and mistakes, however this online notebook is attempting to demonstrate good practice in transparency and FoI. We hope you will view this additional information as helpful and informative in that way.

Please see the JISC website for details on what [JISC](#) is about and how to get involved. Also see the links on the right side of this page. Or please feel free to contact [Frederique van Till](#) with any questions.

Who is this wiki for?

This wiki supports the projects of the new phase of VRE funding for VRE Rapid Innovation (VRERI) projects. These projects are part of the [JISC VRE programme](#).

There are three expected audiences for this website (in order of significance):

1. **"You the Project Manager"** so you can find out what you should be doing at various stages in the project (and what/how other projects are doing).
2. **"The Powers That Be"** aka the money holders and auditors so they can have an overall view of how the money is being spent.
3. **"Other Developers"** interested in the work that is being done here

How does this work?

On this wiki projects will report their progress in the form of blogs. These posts can be read by the larger audience as the projects are running. (Instead of the 'old fashioned' reporting after doing...) This way the community of projects can learn **while** doing!

Here, you are on the "Project Home" page/tab (which is really the "Programme Home" by JISC terminology but nevermind) this page describes the overall Programme status, the other tabs/pages have the following information:

- **Downloads:** any downloads that the programme manager wants to pass to projects or any items that the project want to pass one another.
- **Wiki:** This will primarily be a place where the programme manager will keep notes on the various processes projects should carry out as well as general notes on what is going on with each project. Otherwise, it is a sandbox where anyone can come and create a page, the programme manager will highlight pages via a table of contents ([ToC](#)) page below.

As Project manager **your best starting point** is to have a look at the project documentation requirements page and take it from there: [ProjectDocumentation](#) on the wiki.

The following are lists of the VRERI projects in various groupings:

- [VRERI Project that are currently active](#)
- [VRERI Project that have completed their funded work](#)

What is going on with these projects right now (aggregated feed from all the project progress blogs):
<http://pipes.yahoo.com/jisc/rapidinnovationprojectnews> To be completed...

What is rapid Innovation anyway?

In 2008 JISC started with the first round of funding Rapid Innovation projects in the [JISCRi programme](#).

This way of funding allows a larger number of smaller/cheaper projects. This in turn allows academics to trial solutions and try out more innovative things and approaches. You will find an entertaining yet informative introduction to Rapid innovation on the JISCRi site above.

DISCLAIMER

This wiki is an experiment and so feedback is greatly appreciated. I have a monitor set on all the comments areas, so feel free to send opinions that way (if you want a response make sure to make me aware of the handle you are using).

Code license: [Apache License 2.0](#)
Content license: [Creative Commons 3.0 BY-SA](#)
Labels: [vreri](#), [jisc](#), [jiscri](#), [programme](#), [notebook](#), [home](#), [vre](#), [rapidinnovation](#), [disclaimer](#)
Links: [VRERI Funding Call From October 2009](#)
[Archive of Tweets on VRERI](#)
[Definition of "Rapid Innovation" \(methodology for the programme\)](#)
Blogs: [FreeVRE](#)
[Archive of Tweets on "VRERI"](#)
Feeds: [Project feeds](#)
Project owners: [People details](#)
[dff.jisc](#),
[Frederique.vanTill.jisc](#),
[TanteTill](#),
[andrew.mcgregor77](#)
Project committers:
[AndrewGDRowley](#),
[jim.downing](#),
[jon.blower](#),
[remarkability.jandyks](#),
[jwcl.london](#),
[aidan.slingsby](#),
[mark.c.hedges](#),
[ts23gm](#), [serpent.ucl](#),
[lesscar](#),
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[athomas.ucl](#),
[l...@skfscotland.co.uk](#),
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[peter.murray.rust](#),
[LBJames](#), [msusavi](#)

JISC's experimental wiki for the VRE Programme's Rapid Innovation Projects

VRE Programme: Approach

From the outset, projects funded under the VRE Programme were encouraged to adopt a range of approaches in addressing their goals. The Tavistock evaluation, for example, identified nine broad approaches to software development²⁷ across the Phase 1 projects, and the table on p.16, above, suggests that this permissive outlook continued through most Programme phases.

Phase 1 projects, reflecting the attitudes of that period, placed great emphasis upon the core role of portal products such as uPortal²⁸ and Sakai²⁹. However, as Jim Farmer's survey of these projects shows (Farmer, *pers comm.*), only 37.5% of those responding to his question continued to use their portal one year after project funding concluded. 75% of those portals had been compliant with the JSR168 specification³⁰, and were therefore designed to consume and produce reusable 'portlets' capable of sharing functionality between portal sites.

Phase 2 projects such as Oxford University's Virtual Research Environment for the Study of Documents and Manuscripts³¹ (VRE-SDM) continued with Phase 1's interest in portals, with the first aim of the project stated on their web site as;

"View, manipulate and enhance digitized images of documents and manuscripts *within a portal framework*"

(my emphasis)

Additional 'embedding funding' was allocated to each Phase 2 project for the six months to October 2009, enabling VRE-SDM³² to explore a more lightweight approach to embedding of their tools on third party sites, leveraging the OpenSocial³³ API to

²⁷ *Formative Evaluation of the JISC VRE Programme*, Table 2-1.

<http://www.jisc.ac.uk/media/documents/programmes/vre/vre1lessonslearntdeffull.pdf>

²⁸ <http://www.jasig.org/uportal>

²⁹ <http://sakaiproject.org/>

³⁰ <http://jcp.org/en/jsr/detail?id=168>

³¹ <http://bvreh.humanities.ox.ac.uk/VRE-SDM>

³² <http://bvreh.humanities.ox.ac.uk/files/VREExtension.pdf>

³³ <http://en.wikipedia.org/wiki/OpenSocial>

develop portlets (more commonly known as widgets or gadgets in this context) suitable for embedding within services such as Google's personalised home page, *iGoogle*³⁴.

Work package 2 of this extension project;

“will work on porting the tools developed by the VRE-SDM project to work within a Google gadget/OpenSocial environment. Currently, the VRE-SDM image viewer, annotation and search tools are implemented as JSR-168 portlets which have been embedded within uPortal. The Google gadgets/OpenSocial API is a newer mechanism which combines multiple components in a web environment. This approach has increasing take up, and is being implemented or considered for implementation by upcoming versions of Sakai and the Bamboo project infrastructure. During this workpackage the team will convert the VRE-SDM tools to operate as OpenSocial components, allowing us to make use of the better interactivity and JavaScript support as compared with the JSR-168 standard. This will both improve the user experience of the tools, and help ensure their sustainability by making them easier to embed within a wider number of frameworks, including systems such the Oxford VLE (based on Sakai) and future Bamboo Project infrastructure.”

(Embedding the VRE-SDM tools, p. 3)

Working Across Disciplines

Key to the success of the VRE Programme in its various phases was the pairing of technical and domain expertise. For example, the VRE-SDM³⁵ project at Oxford University aligned the technical interests of the Oxford e-Research Centre³⁶ with the epigraphic requirements of researchers in the Faculty of Classics³⁷. Similarly, Reading's Virtual Environments for Research in Archaeology (VERA³⁸) leveraged computing capabilities within the University's School of Systems Engineering³⁹ alongside the particular requirements of archaeologists engaged in the multi-year analysis of an important Roman city. In each case, researchers from both groups were unequivocal in stressing how much they had benefitted from close collaboration with experts from beyond their usual networks.

³⁴ <http://en.wikipedia.org/wiki/Igoogle>

³⁵ <http://bvreh.humanities.ox.ac.uk/VRE-SDM>

³⁶ <http://www.oerc.ox.ac.uk/>

³⁷ <http://www.classics.ox.ac.uk/>

³⁸ <http://vera.rdg.ac.uk/>

³⁹ <http://www.sse.rdg.ac.uk/>

The emphasis of the remaining Phase 2 projects, myExperiment⁴⁰ and CREW⁴¹, was less explicitly upon partnership between technologists and domain experts, and rather more upon the continued development of tools begun in Phase 1 and elsewhere. Whilst end users of various types were sufficiently involved in the project (CREW, for example, collaborated with the Institute of Health Sciences⁴² in developing a pilot and subsequently delivered a solution to enable sharing of maths lectures between a range of institutions,⁴³) the collaborative emphasis was far more upon groups of technologists working on the software from different institutions.



CREW partners collaborating via the Access Grid, <http://www.crew-vre.net/?p=155>

For Phase 3 projects, there is once again a far more explicit requirement to engage substantively with stakeholders from across the institution, and this requirement is clearly expressed from the outset. Especially for those projects in the Interoperability strand (see Annex 3), all of the complex issues associated with institutional embedding and stakeholder buy-in are key to their success. For VRE adoption to move beyond the current enthusiastic early adopters and recipients of JISC funding, these institutional questions are at least as significant as the technical task of making software *work*.

⁴⁰ <http://www.myexperiment.org/>

⁴¹ <http://www.crew-vre.net/>

⁴² <http://www.ncess.ac.uk/events/conference/programme/fri/3aposchen.pdf>

⁴³ <http://www.crew-vre.net/?p=185>

VRE Programme: Achievements

Although it is perhaps too early to enumerate achievements from a Programme that is both still underway and capable of widespread ongoing impact, there remains value in celebrating some early examples and looking for areas in which further achievements may be forthcoming.

These achievements occur both at the level of the Programme itself and within individual projects, with the nature of each being quite different.

Programme Level

Building upon achievements identified by the Tavistock Institute back in 2007⁴⁴, VRE projects across all phases of the Programme have continued to work productively with one another. Clear management from JISC and an effective calendar of Programme Meetings and related events have consistently assisted in establishing and maintaining connections.

The Tavistock report noted that;

“The experiences of Programme meetings and other interactions between projects indicate that the Programme and its stakeholders succeeded in contributing to the construction of an emergent ‘community of practice’ around virtual research environments. We would argue that the development of this emergent, and in some ways hidden, community of practice had powerful impacts for the programme and the actors involved.”

(Junge *et al* 2007, pp12-13)

This assertion appears as true today, some three years on; although it is disappointing that the ‘emergent community of practice’ has failed to grow significantly beyond the pool of practitioners in direct receipt of JISC project funds. If Programme outcomes are to be valued, adopted and sustained, there is a clear need to *actively involve* a far broader range of stakeholders.

⁴⁴ <http://www.jisc.ac.uk/media/documents/programmes/vre/vre1lessonslearntdefull.pdf>, pp. 11-33

The wiki⁴⁵ recently created to support participants in the Rapid Innovation round of VRE3 projects is open, and JISC's Programme Manager professes the belief that both it and the extremely inclusive projects that it was initially established to support will go a long way toward addressing this shortcoming.

The Tavistock also identified (pp. 13-15) commendable efforts to disseminate Programme findings via published papers and presentations at events. This trend continues, with myExperiment proving particularly active in the production of papers⁴⁶.



Video introductions to some of the VRE Programme's Rapid Innovation projects

At a Programme level, the production of two short DVDs⁴⁷ in 2007 and 2009 captured the essence of projects from Phases 1 and 2. In talking with potential beneficiaries of

⁴⁵ <http://code.google.com/p/vreri/>

⁴⁶ <http://www.semanticgrid.org/myexperiment/>

⁴⁷ DVD content is also available online at <http://www.jisc.ac.uk/whatwedo/programmes/vre/outputs.aspx>

VREs across higher education, almost all of those who claimed awareness of the concept or Programme cited one or other of the DVDs as ‘memorable.’ A less polished but more immediate approach has been adopted for the current Rapid Innovation projects, with short video summaries of each project available online only a few days after their first meeting⁴⁸. There is probably still scope for a more polished piece of synthetic work to draw out the key issues for a general audience.

Finally, the Tavistock noted the importance of web presence, commenting that;

“A brief review of VRE 1 project sites in September 2007 indicated that the majority were easily accessible and usable across a range of browser platforms. However, accessibility is also about communicative clarity to a wide range of target audiences who may be interested in utilising findings, data and tools in their own work. A number of project websites were not available, from either the main JISC VRE website or at the project specific URL. There was also evidence that key internal projects links were down within one or two project sites (e.g. presentations). On occasion, it can also be challenging for the user to discern precisely what type of outputs have actually been produced by projects. And in the case of projects where demonstrators, tools or prototypes are deliverables these are sometimes not available or remain in development. Project websites are a primary vehicle for marketing, communications and dissemination, not only for existing user communities but for engaging potential new users as well. It would seem that the websites of VRE projects have an untapped potential to be used for these purposes.

For instance:

- Project websites could offer a brief and easy to read introductory account of the project and the added value that the project provides to researchers and academics or other specific target user groups.
- In the case of downloadable prototypes, software and demonstrators there could be also be an emphasis on straightforwardly written user manuals and instructions. Use of video walkthroughs or other visual media could also augment usability and take up.
- The design and content of websites should also be considered with respect to the overarching social marketing and communications strategy for the project and its objectives.”

(Junge *et al* 2007, pp14-15)

⁴⁸ <http://vimeo.com/groups/36018/videos>

These ‘observations’ remain true today, with too many of the project sites still failing to deliver compelling descriptions of project, aims or outcomes. In almost all cases the sites lacked dynamism or any compelling reason to revisit, and little current content was easily available. With so much valuable work being undertaken across all of these projects, there is clearly a missed opportunity with respect to dissemination, adoption and sustainability if the project websites fail to adequately engage with potential beneficiaries or reflect developments. Although rapid and *ad hoc* cooperation via tools such as the new wiki is to be welcomed in enabling the projects to iterate rapidly toward their goals, this essentially *internal* communication should not be considered a replacement for outward-facing explanations of the projects and their purpose. Public access to the wiki may foster engagement by the wider community, but someone needs to tell them what they’re participating in, what it’s for, and why it’s important.

With growing *institutional* interest in that subset of the original VRE concept now loosely termed the Research Information System⁴⁹, and continued academic requirements for ICT to support the conduct and dissemination of their research, it is perhaps more important than ever that JISC’s existing investment in this space is packaged in a form suitable for reaching those far beyond the circle of funded JISC projects.

Project Level

Within individual projects, achievements included both pursuit of the Programme’s objectives and advancements with respect to the disciplines directly involved. For example, VERA advanced understanding with respect to the collection and processing of data in the field whilst simultaneously enabling archaeologists to accelerate the process of analysis and publication. Oxford’s VRE-SDM developed tools to enable remote collaboration on the analysis of images, whilst facilitating a significant reinterpretation of important ancient texts.

Within each of the VRE2 projects, direct beneficiaries speak favourably with respect to the impact of the VRE upon the conduct of their research.

CREW and VRE-SDM, especially, highlighted the value of collaboration with remote researchers. For VRE-SDM, this synchronous examination of ancient texts significantly reduced the costs and time involved in arranging a process that previously required

⁴⁹ http://en.wikipedia.org/wiki/Current_Research_Information_System

researchers to travel in order to work side by side on a single physical object. Within CREW, effort was expended upon developing mechanisms to effectively capture, search and replay video interactions, bringing significant aspects of a previously synchronous experience to those who wished to participate (or review) asynchronously after the fact.

The screenshot shows a web browser window displaying the myExperiment website. The page title is "Workflow Entry: Identification of differential genes using the LIMMA Bioconductor package within R". The page includes a navigation menu with "Home", "Users", "Groups", "Workflows", "Files", and "Packs". A search bar is located below the navigation menu. The main content area displays the workflow details, including the title, type (Taverna 1), and a preview of the workflow diagram. The diagram shows a sequence of steps: getMasson microarrays, getNamesUsingXPath, selectControlData, queryMaxd, mergeOutput1, selectTestData, queryMaxd2, mergeOutput2, performT_testUsingLIMMA, drawCSV, filter, getAffyids, getTranscriptid, getGeneName, getTargetDescription, createFinalCSV, createGeneList, GOtermFinder_privat, and analyseGenesPK_Output. The right sidebar contains a "New/Upload" section, a "Log in / Register" section with a login form, and a "Popular Tags" section with 25 tags including bioinformatics, BLAST, and microarray.

myExperiment enables researchers to share experimental workflows, and to share comments with their peers

Supporting the Process of Research

“Universities need to manage information about the research they host, in order to inform strategic decisions about that research, to ease reporting to external stakeholders such as funding councils and research funders, and to offer useful services to those within and beyond the institution’s boundaries.”

(JISC’s Research Information Management page⁵⁰)

One of the clearest areas for widespread benefit across a wide range of academic disciplines is in terms of support for the administrative process of research; applying for funding, managing reporting, tracking project staff, managing the process of publication, and clarifying the flow of information between researchers, their institutions and the funders.

Although identified by the Tavistock as one of three ‘emerging socio-technical systems⁵¹’ and squarely addressed by Phase 1 projects such as Leeds University’s EVIE project⁵² and Nottingham’s ELVI⁵³, subsequent projects have paid less attention to this area. Tangential references in Phase 3 perhaps point to resurgence in interest;

“We wish to accelerate the development of the next generation VRE incorporating full scholarly networking and strong connections to critical research infrastructure, **including** repositories and **research management systems.**”

(<http://www.jisc.ac.uk/whatwedo/programmes/vre/insscol.aspx>, my emphasis)

“For example, ELVI’s research ‘digital dashboard’ is one web page which provides access to a range of personalised channels, e.g. research activity channel, Project Monitoring, Financial Management channel, Targeted Funding Opportunities channel, Research News-Feeds, Collaboration tools, Virtual Library facilities etc. Alternatively, EVIE’s RSS channel presents at-a-glance funding alerts to researchers.

Such comprehensive institution-wide systems can be instrumental in collecting and managing information for both academic and administrative purposes. For example, the ELVI’s research activity channel provides access to research activity data for academics,

⁵⁰ <http://www.jisc.ac.uk/whatwedo/themes/informationenvironment/ResearchInfoMgt.aspx>

⁵¹ <http://www.jisc.ac.uk/media/documents/programmes/vre/vre1lessonslearntdeffull.pdf>, pp. 19-20

⁵² <http://www.jisc.ac.uk/whatwedo/programmes/vre1/evie.aspx>

⁵³ <http://www.jisc.ac.uk/whatwedo/programmes/vre1/elvi.aspx>

school managers and administrators, faculty heads, and senior management. The channel presents tables of data regarding research outputs (Publications, Research Funding, Student Supervision and Esteem Indicators) by the University's academics, and enables the user to drill down into the details of those outputs by clicking on the numbers within the table. In terms of its main benefits the research activity channel enables access to a wealth of data about the University's research. So far, it is mainly used for preparation of the University's RAE submission, but it is hoped that it could also become a powerful tool for encouraging collaboration by enabling academics to explore the research interests of colleagues throughout the University.

Moreover, the project finances channel is the other important channel on the ELVI's research dashboard, since academics, School Management and Central Support need easy access to financial data for their projects. Some of its main benefits include easier access to project finances which assists academics in managing their finances. At the same time, however, problems and deficits are highlighted earlier."

(Junge *et al*, p. 19)

The screenshot shows a web-based dashboard with a blue header and a yellow vertical separator. The left sidebar contains navigation links for Help And Support, eStaff Profile, Expertise Search, Business Search, Funding Opportunities, and Electronic Submissions. The main content area is divided into Project Tasks, Project Finances, and My Research Profile. The Project Finances section features a table with the following data:

ID	Title	Contract End	Latest Statement
AB0001	My example project title	1/12/04	Apr
AB0235	Another truncated project tk...	31/6/06	Apr
RFS67	Perhaps we need to truncate titles?	1/12/04	Apr
AB0235	through a top-down, proactive approach ...	31/6/06	Apr
GH7644	innovate and be an inside-out organization	1/12/04	Apr
AA098	business supply-chains that expedite ...	31/6/06	Apr
JJ76437	B2B2C deliverables that leverage ...	1/12/04	Apr
KJ8398	grow e-business supply-chains that ...	31/6/06	Apr
FD4567	evolve dot-com initiatives delivering ...	1/12/04	Apr
HG4930	inside-out organization which faci...	31/6/06	Apr
AB0098	we take that action item off-line	1/12/04	Apr
JF9994	B2B e-tailers and re-envisioneer inno...	31/6/06	Apr
KK0384	turnkey channels implementing vir...	1/12/04	Apr

The My Research Profile section shows a dropdown menu for 'Prof Nicholas Miles' and a summary table with columns for Income, PGR, RA, Publications, and Esteem.

The ELVI project's 2006 vision of a research administration dashboard, <http://www.nottingham.ac.uk/~bbzijw/elvi/Dashboard.php>

JISC continues to engage with this area of activity in other contexts, for example via the Research Information Management strand of activity;

“In the UK, JISC, HEFCE, the Research Councils and others are funding a range of work to help the sector better manage information about research, covering institutional infrastructure (joining up institutional systems), national infrastructure (building services and interoperability to share research information), as well as providing guidance, support and opportunities to share experiences and work together. JISC is funding a significant strand of work during 2009-2011 that aims to do exactly this.”

(JISC’s Research Information Management page⁵⁴)

At the institutional level, JISC-funded projects such as Glasgow’s Enrich⁵⁵, Oxford’s BRII⁵⁶ and Bristol’s CIP⁵⁷ and ResearchRevealed⁵⁸ are exploring aspects of this problem space. Alongside these projects, a number of institutions such as (jointly) St. Andrews and Aberdeen⁵⁹ and York are procuring commercial solutions to meet their needs;

“The system will take information from existing internal sources, on grants and post-graduate students, for example, and also from external databases that house publications, conference proceedings and citation data. More data will be added manually, such as impact statements, details of collaborators and research expertise, to build a complete picture of the University’s research capability. Links will be provided to repositories (eg White Rose Repository Online), so that full text can be added without re-entry of details like the authors and article title.

RIIS will have multiple purposes across the University, both for individual researchers and those responsible for managing research and its marketing. The content will be available for display on staff websites, could be extracted to form part of grant applications, and is likely to play a role in Performance Reviews.

A particularly important function of RIIS is that its data will be used for external reporting and form the basis of the University’s submission to the successor of RAE, the Research Excellence Framework, which is due in 2012.”

(*The University of York Magazine*, September/October 2009⁶⁰. p. 12)

It will be important to ensure sufficient cross-fertilisation between these activities and those conducted directly within the VRE Programme, and JISC’s recent move to place both activities under the same Programme Manager suggests wider recognition of this.

⁵⁴ <http://www.jisc.ac.uk/whatwedo/themes/informationenvironment/ResearchInfoMgt.aspx>

⁵⁵ <http://www.jisc.ac.uk/whatwedo/programmes/inf11/enrich.aspx>

⁵⁶ <http://brii.ouls.ox.ac.uk/>

⁵⁷ <http://cip-blog.ilrt.bris.ac.uk/>

⁵⁸ <http://researchrevealed.ilrt.bris.ac.uk/>

⁵⁹ <http://www.st-andrews.ac.uk/itsnew/newsletter/2009/04/resinfosys.html>

⁶⁰ http://www.york.ac.uk/media/communications/magazine/33220_Sept_Oct09.pdf

Supporting Collaboration

A consistently important aspect of the VRE discussion has been around support for collaboration, both within a single institution and amongst researchers collaborating across institutional boundaries.

Collaboration takes many forms, including asynchronous and synchronous exchanges, and encompassing text, audio, and video communication. In some domains, collaborative works are rich and data intensive, whilst in others the integration of a few simple processes can significantly boost effectiveness.

As with other aspects of VRE capability, there remains no clear answer as to whether specific VRE tools should power acts of collaboration themselves or not. In the years since the VRE Programme commenced, widely available external tools have greatly improved, to the extent that free desktop video conferencing software such as Skype or Tokbox is often (although certainly not always) sufficient for interactions that earlier VRE projects might have required Access Grid capabilities to complete.

Whilst there may be less of a need than previously to construct and deploy collaboration tools within a VRE, there is clearly value in offering easy access to a range of tools, and in managing the outputs of any collaboration (as CREW seeks to do) in ways that preserve outcomes. Rather than consigning the logs of instant messaging conversations to – at best – languish unseen on the hard drives of participants, for example, there may be a role in ensuring that these logs are preserved and made available for later use.

Research collaborations increasingly cross the boundaries of institution and subject, both in terms of large funded partnership programmes from bodies such as the European Commission, and in the smaller bipartisan relationships that individual researchers form from time to time.

As Caroline Wagner notes in her recent book,

“Self-organizing networks that span the globe are the most notable feature of science today. These networks constitute a new invisible college of researchers who collaborate not because they are told to but because they want to, who work together not because

they share a laboratory or even a discipline but because they can offer each other complementary insight, knowledge or skills.”

(Wagner 2007)

King’s College’s *Collaborative Landscape Study* notes that 81.5% of those consulted in their survey were involved in a VRE with at least one other institution;

“This was also reflected in some of the interviews and case studies as even VRE projects that aim only to support a single institution often provide access to research partners in other countries. Not only may this indicate that VREs are indeed supporting the more international research of the future, the collaborative nature of many ventures does also become quite clear when looking at the high percentage of projects that involve more than one institution.”

(Carusi *et al*, p. 35)

As institutions increasingly seek to provide rich and comprehensive solutions tied to their own administrative infrastructure there is real potential to hamper further growth in inter-institutional collaborations, especially those that are more *ad hoc* in nature. If an institutional VRE becomes good enough to truly form the researcher’s everyday dashboard, they are likely to demand similar capabilities for interactions outside the institution. Any requirement for complex administrative procedures to secure ‘guest’ accounts – or the need to use different tools in order to collaborate at all – is likely to reduce the incentive to collaborate in the first place.

This tension between creating comprehensive ‘solutions’ and providing modular capabilities that may be recombined to meet different purposes is unlikely to disappear in the near future, although the rise of lightweight web tools based upon AJAX⁶¹ and related principles does illustrate some of the possibilities. Growing adoption of equally lightweight authentication mechanisms such as OAuth⁶² also create opportunities for exploitation.

⁶¹ [http://en.wikipedia.org/wiki/Ajax_\(programming\)](http://en.wikipedia.org/wiki/Ajax_(programming))

⁶² <http://en.wikipedia.org/wiki/OAuth>

Assessing 'Impact'

The Tavistock's evaluation of Phase 1 concluded by noting;

“The VRE1 Programme has clearly demonstrated the potential to have a major impact on changing research practices in the academic community. It has clarified viable routes for conceptualising and implementing VREs. Moreover, the Programme has also helped to clarify what is important and what is less important in the development and deployment of these new technologies: building technologies that are ‘fit for purpose’ of their user communities, rather than follow an abstract idea or concept of what a VRE might or should be. As a result, there is evidence that research practices are already being influenced. At the same time, in HEIs there is considerably more awareness of VREs, with a number beginning to show a real interest in their potential value. Furthermore, across the Programme, a community of practice has begun to emerge – the evolution of which could help to drive VRE2 and any subsequent incarnations of the programme forward. However, challenges do remain, and despite the scale of the opportunity that is currently presented by VREs, **institutional buy-in and embedding remains an enormous challenge**. Significantly, key and critical players in institutions have not tended to have been involved in, or engaged with, these projects consistently and this has been to the detriment of the projects’ institutional success and sustainability. A number of projects have been left in a state of ambivalence and insularity, within the HEI (though in the rare exceptions where institutions have been involved, this has made a huge contribution). At the same time, many projects have simply not had the resources, especially in terms of staff time and money, to engage with the wider environment of their HEIs effectively. **VREs are not only technical innovations per se, they are also practice-led innovations which are designed to function in context**. In order to encourage the take-up and institutional adoption of VREs the innovation will need to offer clear strategic or research added value to the institution and discipline and will necessarily require an effective communications and social marketing strategy.”

(Junge *et al*, p. 41, my emphasis)

Although the focus turned toward more targeted demonstrations of capability with Phase 2, this concern with respect to securing tangible – and ongoing – institutional commitment remains real, and forms a key plank of current activity in Phase 3.

Throughout the Programme, individual projects have successfully demonstrated their meeting (or exceeding) of requirements within their respective stakeholder communities. For the Programme at large, and the increased adoption of VRE concepts, principles

and techniques, there is a requirement to more aggressively address a far broader audience, especially as institutions are actively seeking solutions to increase the efficiency and effectiveness of their research activities.

Whilst tools developed in the early phases of the Programme remain used, the most significant growth has historically been driven by further injections of JISC funding.

A question of terminology?

The screenshot shows a Google Scholar search results page for the query "virtual research environment". The search results are dominated by articles from JISC-funded projects, with many from the University of Southampton (soton.ac.uk) and the University of Manchester (manchester.ac.uk). The results include titles such as "realisation of the Experiment my Virtual Research Environment for social sharing of...", "myExperiment—a web 2.0 virtual research environment", "Designing the myexperiment virtual research environment for the social sharing of...", "A Web/grid services approach for a virtual research environment...", "Virtual research environments: overview and activity", "myExperiment: defining the social virtual research environment", "From collaborative virtual research environment to teaching and learning", "User Requirement Study for a Virtual Research Environment", and "Towards grid services for a virtual research environment". Each result includes the title, authors, publication details, and a PDF link.

JISC VRE projects dominate the set of articles on the topic

Examination of resources such as Google Scholar illustrates that publications from JISC's VRE Programme dominate for 'virtual research environment,' which is certainly to be welcomed. However, the relative lack of comparable papers from the wider community might suggest that they are involved in a rather different conversation. As KCL's *Collaborative Landscape Survey* notes,

"Any review of the international VRE landscape has to start with the term 'Virtual Research Environment'. While it is widely used in the UK, mostly due to the impact of the JISC VRE programme, other terms are also used here to describe identical or very similar environments. Even considering only other English speaking countries, one realises that a variety of terms are used to refer to collaborative online environments for research and it is not always clear what the differences are. Apart from the term 'VRE', these are some of the related English terms used:

- Collaborative e-Research Communities
- Collaborative Virtual Environment
- Collaboratory
- Gateway
- Virtual Organisation
- Virtual Research Community"

(Carusi *et al*, p. 18)

Whilst many of these are too generic to easily isolate in web searches, terms such as 'research collaboratory' occur far more frequently (5,870 hits in Google Scholar, compared to 561 for 'virtual research environment').

Even in the United Kingdom, where awareness of the Programme might be expected to be higher, use of the VRE term for third party solutions remains relatively infrequent. Projects such as the University of Aberdeen's ourSpaces are the exception rather than the rule, describing itself⁶³ with;

"The ourSpaces virtual research environment is designed to allow researchers to manage their digital resources through a series of dynamic and collaborative workspaces."

Increased Understanding

Alongside technical achievements in all three Phases of the Programme, and the delivery of viable solutions to meet the needs of their user communities, projects

⁶³ <http://www.ourspaces.net/>

continue to play an important role in increasing the community's familiarity with the issues around use of electronic tools in support of research. From public 'Web 2.0' offerings such as blogs, wikis and Facebook to the rich interactions with bespoke Grid systems, researchers in all disciplines are increasingly embracing online tools to augment their existing behaviours. Alongside the benefits of near-instant recall, globe-spanning communication, and an ability to process vast bodies of data come challenges that individual researchers perhaps fail to contemplate until it is too late. Through demonstrations, pilots and consultation, VRE projects have gathered information on these issues and played their part in beginning a process of education. With a focus upon institutional embedding and broadening the community of VRE beneficiaries, Phase 3 of the programme will be crucial in pushing existing knowledge out toward the mainstream and identifying the major unanswered questions for future phases. The current round of Rapid Innovation projects, in particular, play a key role in establishing and then accelerating a sustainable feedback loop between potential beneficiaries and those concerned with building systems to support VRE requirements. That we still distinguish the 'virtual' from everything else would suggest that this process is only just beginning; perhaps one measure of success will be when the researcher of tomorrow moves seamlessly between analogue, digital and real-time modes without considering the virtual aspect to be either noteworthy or deserving of a separate label.

Integration

Projects such as myExperiment have proved successful in taking on a life of their own, and extending beyond the funded institutions. Elsewhere, projects were more concerned with providing functioning solutions for defined sets of stakeholders, typically within the funded institution. If these projects are to continue delivering real value once the incentive of JISC funding has been removed, there is a growing need to integrate the most useful features with other institutional systems and – more importantly – with the regular workflow of potential beneficiaries. In this context, the stated aim of Phase 3 projects to

“build upon the existing phases to establish strong communities supporting the use of and development of VREs both within and without JISC. Particular emphasis will be on the embedding of VREs within both local and national infrastructures and the overlap and

synergy between VREs and Virtual Learning Environments both in terms of content and technologies”

(*VRE Phase 3: Draft Programme Definition*⁶⁴, p.1)

is clearly important.

⁶⁴ http://www.jisc.ac.uk/media/documents/committees/jsr/25/26a_jsr_future_programmes.pdf

Conclusions

Commoditising the research environment

Towards the end of his book on Virtual Research Environments, Robert Allan writes;

“It is easy to dismiss e-research as just another flash in the pan. However, the technology that we are using for VREs is now available in everyone’s homes via broadband and will soon become as commonplace as the telephone. E-research does not require researchers to buy and learn to use special-purpose and complex pieces of equipment. The challenge of an easy to use, universally available technology platform for VREs has essentially been met and e-research will benefit from it.”

(Allan 2009, p.209)

Whilst it would be disingenuous to suggest that the research opportunities from the Large Hadron Collider – or its massive data stream – are going to be ‘as commonplace as the telephone’ anytime soon, Allan’s broader point with respect to the growing commoditisation of the tools with which research is conducted is certainly valid.

Specialisation...

A multitude of niches remain, in which particular tools and processes will be required to ease the conduct of research. The VRE Programme has already played its part in supporting some of these, and there is value in continuing to explore these areas both in their own right and as exemplars that may provide more generically applicable lessons.

...and Generalisation

Separately, the funding, conduct, dissemination and evaluation of research are continuing to evolve, driven by financial pressure, technological and philosophical advances. Individual researchers are increasingly independent in many areas, embracing lightweight and cost-effective tools that often originate far beyond their subject. The recent rise – and growing popularity – of Web 2.0 tools such as Mendeley is just one example of this; and far beyond the control of traditional gatekeepers such as Universities and academic publishers.

The Institutional and the Individual

As earlier notions of ‘the VRE’ fade, there remains a clear and immediate need to assist individual researchers and the community at large in grappling with the increasingly complex interactions between core institutional systems and the myriad tools with which researchers find themselves working.

As already explored on p.29 there is growing scope for tension between the institution’s desire to manage and track, and the individual researcher’s tendency to form more informal relationships with peers *and* tools far beyond the walls of their employer. More work is perhaps required to develop solutions that meet the reasonable – but quite different – requirements of both parties.

Nurturing a Community

The DVDs released to showcase Phase 1 and 2 projects proved reasonably successful in raising awareness of the Programme. Future efforts might more usefully use project experiences to address *generic* issues of broad relevance to the community, rather than continuing to showcase every project. The details of archaeology or classics may only be relevant to a small constituency, but the realities of the way in which online tools have changed their work (for better *and* worse) are far more widely applicable.

Early attempts to nurture a community around the Programme’s funded projects have proved extremely successful. As part of disseminating the Programme’s outcomes more broadly, attention should now be paid to ways in which that community might open and grow to encompass a far broader set of funded *and* unfunded stakeholders.

A space to learn

Finally, the VRE Programme has played an important role in creating a space in which the community can begin to grapple with an increasingly important set of issues. Project staff – and their institutions – have benefitted from experiences gained during the project and, as with other JISC funding programmes, the benefit to the community in terms of an increased skills base should not be underestimated. Further, there is real value locked up inside the personal experiences and formal reports of the past six years, and sound foundations have been laid to support the sector’s growing reliance upon a wide range of tools and approaches. Moving forward, the lessons learned here have the potential to ensure that researchers are empowered by their research

environments of choice, rather than held back by either inadequate tools or their ill-advised application.

References

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Annex 1: VRE Phase 1 Projects

“The [Phase 1] programme contains 4 strands:

- Larger scale projects to deploy VRE demonstrators based on existing frameworks, such as Sakai or OGCE
- Projects to identify functionality (in the form of tools and services developed in other projects) which has not hitherto been integrated into the existing framework architectures and to add such functionality to address clear user requirements
- Projects to develop and deploy lightweight, proof-of-concept VRE demonstrators appropriate to the needs and skills of specific communities
- A formative evaluation project to assess, as the programme proceeds, how effectively the selected projects are meeting the aims of the programme; to gather and disseminate best practice; to identify gaps; to raise awareness of the programme and stimulate discussion on VREs in the community; and to form an advisory group representative of all sectors of the research community to make recommendations for further work”

(VRE1 Projects, <http://www.jisc.ac.uk/whatwedo/programmes/vre1/projects.aspx>)

Strand 1

Sakai VRE for Educational Research

(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/sakaieduresearch.aspx>)

Sakai VRE Portal Demonstrator

(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/sakaiportal.aspx>)

A VRE to Support the Integrative Biology Research Consortium

(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/ibvre.aspx>)

EVIE (<http://www.jisc.ac.uk/whatwedo/programmes/vre1/evie.aspx>)

ELVI (<http://www.jisc.ac.uk/whatwedo/programmes/vre1/elvi.aspx>)

Meeting Memory Technology Informing Collaboration

(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/accessgrid.aspx>)

Strand 2

Implementing the Kepler Workflow Interface into the Cheshire Digital Library Framework
(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/cheshire3.aspx>)

CSAGE: Collaborative Stereoscopic Access Grid Environment for Experimentation
within the Arts & Humanities
(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/sage.aspx>)

Strand 3

CORE: Collaborative Orthopaedic Research Environment
(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/core.aspx>)

Silchester Roman Town: A Virtual Research Community
(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/silchester.aspx>)

GROWL: VRE Programming Toolkit & Applications
(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/growl.aspx>)

ISME: Integration & Steering of Multi-Site Experiments to Assemble Engineering Body
Scans (<http://www.jisc.ac.uk/whatwedo/programmes/vre1/isme.aspx>)

Cross-strand

VRE for the History of Political Discourse 1500-1800
(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/politicaldiscourse.aspx>)

BVREH: Building A VRE for the Humanities
(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/bvreh.aspx>)

IUGO: Conference Information Integration Project
(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/iugo.aspx>)

Strand 4

The programme formative evaluation from the Tavistock Institute

Strand 5

VRE Tools and Resources Interoperability Project
(<http://www.jisc.ac.uk/whatwedo/programmes/vre1/interoperability.aspx>)

Annex 2: VRE Phase 2 Projects

Collaborative Research Events on the Web (CREW):

<http://www.jisc.ac.uk/whatwedo/programmes/vre2/crew.aspx>

Documents & Manuscripts (VRE-SDM):

<http://www.jisc.ac.uk/whatwedo/programmes/vre2/sdm.aspx>

myExperiment: <http://www.jisc.ac.uk/whatwedo/programmes/vre2/myexperiment.aspx>

VRE for Research in Archaeology (VERA):

<http://www.jisc.ac.uk/whatwedo/programmes/vre2/vera.aspx>

Annex 3: VRE Phase 3 Projects

Tools Projects

Video Conversion on PAG

(<http://www.jisc.ac.uk/whatwedo/programmes/vre/vicovre.aspx>)

Frameworks Projects

IBBRE (<http://www.jisc.ac.uk/whatwedo/programmes/vre/ibbre.aspx>)

Collaborative Research in Business

(<http://www.jisc.ac.uk/whatwedo/programmes/vre/crib.aspx>)

Cancer Imaging VRE (<http://www.jisc.ac.uk/whatwedo/programmes/vre/civre.aspx>)

ONE VRE (<http://www.jisc.ac.uk/whatwedo/programmes/vre/onevre.aspx>)

Building Research and Innovation Networks

(<http://www.jisc.ac.uk/whatwedo/programmes/vre/brain.aspx>)

Interoperability Projects

LinkSphere (<http://www.jisc.ac.uk/whatwedo/programmes/vre/linksphere.aspx>)

Text VRE (<http://www.jisc.ac.uk/whatwedo/programmes/vre/textvre.aspx>)

Virtual Research Integration Collaboration

(<http://www.jisc.ac.uk/whatwedo/programmes/vre/vric.aspx>)

Institutional Scholarly Communications with Integrated Publication Sharing

(<http://www.jisc.ac.uk/whatwedo/programmes/vre/insscol.aspx>)

Annex 4: VRE Rapid Innovation

AMI (<http://code.google.com/p/vreri/wiki/AMI>)

BlogMyData (<http://code.google.com/p/vreri/wiki/BlogMyData>)

CritterVRE (<http://code.google.com/p/vreri/wiki/CritterVRE>)

EMBRaCE (<http://code.google.com/p/vreri/wiki/EMBRaCE>)

gMan (<http://code.google.com/p/vreri/wiki/gMan>)

MEGStream (<http://code.google.com/p/vreri/wiki/MEGStream>)

MILARQ (<http://code.google.com/p/vreri/wiki/MILARQ>)

OpenImpact (<http://code.google.com/p/vreri/wiki/OpenImpact>)

OpenPSIPearl (<http://code.google.com/p/vreri/wiki/OpenPSIPearl>)

PPCC (<http://code.google.com/p/vreri/wiki/PPCC>)

RDSPress (<http://code.google.com/p/vreri/wiki/RDSPress>)

SERPent (<http://code.google.com/p/vreri/wiki/SERPent>)

vizTweets (<http://code.google.com/p/vreri/wiki/vizTweets>)

WattNames (<http://code.google.com/p/vreri/wiki/WattNames>)