Virtual Research Environments – The Next Steps
Report on the Knowledge Exchange Workshop
Rotterdam, 23-24 June 2010

On 23-24 June 2010 an international workshop on Virtual Research Environments – the next steps was held in Rotterdam, organised by the Knowledge Exchange working group on Virtual Research Environments. The main aim of the workshop was to extend international dialogue and to promote the development of VREs led by researchers’ needs.

1. Management summary

Overview of workshop

The workshop was introduced by Paul Wouters’ keynote presentation on the nature of online collaboration and its impact on knowledge generation. In the next session, presentations from fifteen European VRE projects gave an insight in the current state of development regarding technical innovation, disciplinary specific solutions and impact on the research community. Presentations were followed by a poster session which provided opportunity for interaction and networking.

The second day focussed on the next steps to improve and advance the development of VREs. The results of two landscape studies funded by the JISC and SURF were presented as keynotes and offered an impulse for the following discussions in breakout groups.

Among the fifty workshop participants were project managers, researchers, information management specialists, developers and representatives of the Knowledge Exchange and its partners. Delegates came from the Germany, the Netherlands, the UK and the USA and represented universities, libraries, museums and funding bodies.

Important topics

Technological issues:
- Interoperability: discovery of tools and services, standards for sharing
- Fields and topics seen as promising: visualisation, metadata, workflows, linked data, ontologies, social networks

Organisation and concepts
- Different types of VREs: institutional or project focussed; different sizes
- VREs as community (building) projects
- Provision of support and advice for users

Researchers’ needs:
- VRE development driven by researchers’ requirements
- Awareness raising and promotion: critical roles of academic champions and trusted specialists (librarians, curators etc.)
- Identification of generic as well as discipline specific components of VREs
- VREs and their role in the research process: integrated or disruptive
- Strategic issues:
- Sustainability and business models: sustaining VREs beyond initial development grants
- International: infrastructure needs to reflect the international nature of research collaboration
- New models for evaluating and rewarding research in collaborative online environments

Relevance of VREs

The workshop clearly demonstrated the potential of VREs to facilitate scholarly communication and to enable new forms of research collaboration, thus leading to new research findings that would otherwise not have been possible. As VREs are still at an early stage of development, it also became clear that there will be significant impact on the way research is going to be conducted; an impact that needs to

1 On the working group see http://www.knowledge-exchange.info/Default.aspx?ID=288
3 For the list of participants see http://www.knowledge-exchange.info/Default.aspx?ID=392
be better understood and evaluated. Because of the increasingly international nature of research collaboration, VREs need to be understood, developed and supported in an international context.

Recommendations for partners and KE

- As there is no other initiative that could better take forward the VRE agenda on an international level, KE should continue and perhaps expand its VRE activities in order to bring together the international community.
- Areas that should be taken forward at an international level could be interoperability (of data and infrastructure) and discovery (of services and data).
- KE should also consider taking an interest in agenda setting, for instance by working with the European Commission with regards to the place of VREs in the next Framework Programme.
- KE should help develop an international VRE forum and knowledge base to facilitate knowledge exchange as well as share access to resources and support an international VRE community.
- Strategic issues relating to VREs might best be addressed by a KE funding programme for workshops and perhaps even projects.

2. Detailed overview of the workshop

Theoretical context – the keynote

Paul Wouters’ main argument was that as historically the introduction of new media had always had an impact on form and content of “the message”, it has to be assumed that VREs and new ways of scholarly communication will also have an impact on knowledge creation. Based on this assumption, he made the point that it was crucial to see VREs not just as technological enterprises, but to think of them in terms of the nature of collaboration in research and how the assumptions built into VREs would impact on the work of the next generation of researchers. Because of the collaborative and international nature of VREs, it would not only be technical but also aspects of national, social and disciplinary boundaries that would have to be broken down, perhaps even including some of the boundaries currently separating professional researchers and amateurs.

Presentation of European VRE projects

Staff from fifteen VRE projects from Germany, the Netherlands and the UK presented their projects in five minute presentations.4 Even though the main focus of this session was to facilitate knowledge exchange and networking among the projects, general themes emerged that were important in setting the context for the following discussions. Among them were:

- It is now generally seen as crucial to involve researchers (“the users”) in the development process from a very early stage.
- Implementation, generation and use of metadata and workflows are of importance to many projects.
- Visualization of data and findings has great potential for VREs.
- Connecting VREs and mobile clients (such as smartphones) can revolutionise the process of data collection and sharing and speed up the publication process.
- VREs are seen as ideal platforms to access thematically linked data that is widely distributed.
- Sharing of data, in a secure environment, is one of the most important features of VREs.
- There is only a fine line, if any, between sharing of data and collaboration.
- Despite VREs and new communication technologies, the importance of physical meetings as part of a running project should not be underestimated.
- Integrating social networking into VREs has great potential to enable collaboration and sharing of knowledge on a scale that up until recently was almost unthinkable.

Two VRE Landscape studies

In this session, two recent landscape studies were introduced to participants, the JISC funded VRE Collaborative Landscape Study and Collaboratories: Connecting Researchers, commissioned by the SURF Foundation. It was noted that there was much overlap and agreement between the two studies and participants even suggested combining the findings into a general “how to”-guide or wiki and to consider follow-up work on addressing open issues.

As both studies are available online, only some key points are mentioned here:

- Sustainability may be the most important challenge VRE projects are facing.
- Despite the importance of technology, VREs are community building projects first and foremost.
- Dedicated support is critical for the uptake of VRE, ideally available on-site and with a good understanding of both the technology and the research processes.
- Bottom up introduction of VREs appears to work better than top down approaches. It is critical to involve researchers in the development process and to, ideally, let their needs drive the process.
- Academic champions increase the acceptance of VREs among researchers.
- There does not appear to be much interest in the VRE community to develop a common definition or terminology for VREs.
- Creating trust is one of the key success factors for online collaboration.

Group discussions

The groups were organised around the following topics: 1. technological challenges; 2. organisation & concepts; 3. researcher needs; 4. strategic issues. The results of the group discussions were presented and discussed in a plenary that concluded the workshop. Despite the different focus of the groups there was noticeable overlap in terms of the recommendations and issues discussed. This emphasises the importance of thinking about VREs in a holistic way instead of conceptualising them as ‘just’ technological projects.

3. Issues and challenges

Technological issues

The technology sub-group in particular identified two general issues: discovery (of data, tools, services etc.) and interoperability. Intelligent concepts to support discovery would enable VRE developers to make better use of existing infrastructure and enhance VREs by providing more functionality and access to the increasing amount of data available online. In order to realise this promise, at least a certain degree of interoperability is needed to connect resources.

In order to facilitate discovery, linking up with existing registries for data/tools and relevant initiatives was identified as a first step. Digital Research Tools (DiRT) was mentioned as an example for tools, and DataCite and DVN were mentioned in relation to data. It was suggested that (building on the work of existing initiatives) a shared registry could be developed for developers.

Interoperability was understood both in terms of data and infrastructure components. It was suggested that in order to facilitate interoperability with regards to data, KE partners could support research communities in developing ontologies and identifying suitable data formats or data containers. Furthermore, KE partners could take an active role in disseminating this information and promote awareness of the importance of suitable data exchange formats. With regards to software, the development of interoperable components was seen as crucial; this could also be embedded in focussing on VRE frameworks that addressed generic aspects of VREs and could be expanded with specialised modules. It was, however, noted that there is a persistent contradiction between the need for flexibility and standardization in VRE development.

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8 DataCite: [http://www.datacite.org/](http://www.datacite.org/)
9 DVN: [http://dvn.iq.harvard.edu/dvn/](http://dvn.iq.harvard.edu/dvn/)
Apart from these two major issues, several other points were raised during the discussions. For instance, there seemed to be a consensus that it may not be worth competing with larger software companies, but instead to look for collaboration and to focus on those aspects of development most closely linked to research. It was also noted that the relationship between the "everyday software infrastructure" and VREs needs to be thought out better.

**Organisation and concepts**

There was a general consensus among all sub-groups that different categories of VREs would have to be regarded in the different contexts in which they operated. For instance, there are larger, often more general institutional VREs as opposed to smaller VREs used by projects and teams; inter-institutional VREs could fall in either of those two categories. VREs with a more specific use can be temporary, for instance for the duration of a project, while institutional ones were usually developed for a more permanent existence. Depending on the role of a VRE, it can relate to just one, several or all aspects of the research lifecycle.

In order to better understand the resources needed to run VREs it would be useful to analyse organizational experiences and models and advise the community based on these lessons. This could provide valuable insights into which aspects of VRE development profit from a bottom up and which ones from a top down approach. While it is often assumed (and generally supported by workshop participants) that VREs are best developed through participatory collaboration, research on collaboration has shown that more bureaucratic, institutionally driven approaches can also have value, particularly in scenarios when personal trust has not yet been established between participants.

As was noted in the landscape studies, institutions should not underestimate the need to provide dedicated support for VREs. This includes management and technical support, but also specialists that can work as translators between users and developers. These specialists need a good understanding of both the technology and the research process.

**Researchers’ needs**

Understanding user needs is critical to VRE development and uptake. It is now generally seen as best practice to involve researchers (“the users”) in the development of VREs from an early stage onwards. Ideally, the whole process should be driven by researchers’ requirements.

Raising awareness among researchers in order to help them to articulate their needs was seen as important. In this context, the role of “academic champions” was mentioned: senior academics with an interest in VREs who help projects gain acceptance among researchers and ensure that their needs are listened to. Specialists such as librarians and curators do also have an important role in this context.

In order to help VRE projects to collect requirements, they need best practice guides and an understanding of relevant methodologies. This should include lessons learned from VRE projects, particularly from “failures”, but also research on user needs and the nature of collaboration.

Even though collaboration varies across disciplines, there are generic elements in collaboration. Because of this VREs do not have to be restricted to be discipline specific as long as they take the social organization and the epistemic style of the field into account (both are independent of subject matter). It is important to understand how generic functions and discipline-specific functions in VREs relate to each other.

It was also noted that we need to understand the impact of VREs on the research process better. On the one hand participants stressed that VREs should integrate as much as possible with existing research workflows and that the methods used for learning about researchers’ needs should not be too disruptive to their work practice. On the other hand there also seemed to be a consensus that VREs will have an impact, perhaps even a disruptive one, on research practice, knowledge generation and scholarly communication, possibly on a much larger scale than many would assume right now. This area would warrant further research, as would the general area of user needs, perhaps through a KE study or a follow-up workshop that looks at VREs from a sociological perspective.

**Strategic issues**

Among the issues relating to VREs, both landscape studies identified sustainability as one of the most critical. There is a lack of suitable business models to sustain VREs beyond the initial development phase covered by development and research grants. It was noted that VREs are different from research outputs in the sense that: a) as infrastructure they need continuous management and support and, b) as
software projects they require ongoing development to fix issues and ensure that they can still be used when data formats, requirements and technologies are changing.

To address these issues, VRE projects need to develop viable business models. It was suggested that funding bodies should see themselves as venture capitalists that take an active interest not only in identifying promising projects, but also in supporting them to develop suitable business models and sustain them during this process. Because of the existence of different types of VREs, there will most certainly be several business models. In order to identify and develop those models, funding bodies should work with both the VRE community and researchers in relevant fields (such as business studies) and then disseminate the findings to the community.

Some participants suggested that the more general, institutional VREs may have to be seen as part of the general investment of a particular institution (be it a library, a higher education institution or a museum), while project VREs could be sustained through writing the cost into research bids of those academics who use the VRE. The latter approach would also help to identify “successful” VREs (“successful” in the sense that researchers are prepared to invest money from grants in them).

However, there are concerns as to whether this approach could really work as the gap between the initial development funding and later support through such grants would be too big. Another suggestion was that funding bodies could make additional funds available for VRE projects that support others in re-using components that they have developed.

It was suggested that KE should take an active interest in supporting the development of suitable business plans and to ensure that these models would not unduly hinder free access to data and research outputs. KE could also have a role in the sharing of evaluation material to help funding bodies to identify successful projects that would warrant continuous investment.

With regards to general models for activities of funding bodies there seemed to be a preference for combining bottom up and top down approaches. While there was no interest in suggesting the development of a “monolithic European VRE”, there was a consensus that aspects of a more general infrastructure development require a strategic approach towards funding (the UK’s activities around Shibboleth were mentioned here).

In terms of funding the issue of access to information resources and licensing was also discussed. One model that was suggested was to think about European licenses for content, an approach that would simplify the work of libraries, would reduce the cost as publishers would not have to implement many systems for access control and would give researchers access to a wide range of materials for their work. This proposition was countered by two arguments: 1) a standardised pay-on-demand system would be cheaper overall as not everyone needs access to all knowledge; 2) while related to the VRE agenda, this was not a VRE specific issue.

A general aspect that everyone saw as critical to the uptake of VREs was the question of how research is evaluated and rewarded. The current focus on high impact publications has a conservative influence as it makes researchers less likely to engage in research that is process focused or risky in the sense that it may never lead to high ranked publications. It was felt that the new ways of creating knowledge and scholarly communication in online collaborative environments are currently not rewarded well enough. Encouraging the development of suitable reward-models was seen as another field that would profit from a more coordinated international approach.

4. The next steps

The role of Knowledge Exchange

Especially during the second day the discussion often came back to the question of the role of Knowledge Exchange with regards to VREs. There was a clear consensus that VREs need to be considered in an international context. Such an approach cannot be imagined without an active involvement of international organisations, and it appears there is no organisation better placed to do this than KE.

Because of this, participants expressed their hope that the KE would continue to act as an international forum on VREs. The effective facilitation of knowledge exchange regarding VREs on an international level was seen as the most important issue to address as further action is dependant on this. There was a consensus that KE should actively be involved in this field, through coordinating partner programmes, but ideally also by developing its own activities.
Activities could include specific KE calls for funding (in areas where the national calls issued by KE partner organisations would not be suitable), particularly relating to joint workshops. Workshops could partly be organised by the community (through an open call for funding\(^\text{10}\)) and partly by the KE (for more strategic issues and follow-ons from the discussions in Rotterdam). In order to facilitate knowledge exchange and networking across the community of VRE developers, the organisation of “developer days”\(^\text{11}\) was also suggested.

It was generally seen as very important that lessons learned through such activities should be collected and made available for the VRE community, for instance in the form of an online forum/knowledge base on VREs (see below). Because of the international nature of such an undertaking, KE was seen as in the best position to facilitate this.

It was also suggested that the KE should take an active interest in agenda setting and engaging with other funding bodies with regards to VREs. The European Commission’s Framework Programme was mentioned in particular.

**VRE forum / knowledge base**

During both days of the workshops, participants regularly mentioned an interest in collecting and synthesizing lessons learned through past and existing VRE projects and studies. There was a clear consensus that building a VRE knowledge base would be extremely helpful to support those working in the field, expand outreach and awareness raising and to generate a focal point for developing an international VRE forum. Such a platform could also be used to showcase existing research and demonstrate the value of VREs.

Even though different terminology was used to refer to this undertaking (“registry”, “wiki”, “how-to guide”, “VRE starter kit”, “web platform for knowledge exchange”, “storage of web parts”, “tools wiki”), participants agreed that it should provide VRE developers with the tools and knowledge needed to do their work. The following components could be part of this platform:

- a directory of people and projects
- information on relevant standards
- a registry on tools and data
- a VRE development guide
- case studies and briefing papers, including information on organisational models
- a synthesis of the knowledge already collected (for instance through landscape studies), possibly in the form of a wiki
- information on collecting user needs

\(^\text{10}\) Compare the approach of the AHRC ICT Methods Network:  
[http://www.methodsnetwork.ac.uk/activities/distributed.html](http://www.methodsnetwork.ac.uk/activities/distributed.html)  
\(^\text{11}\) [http://www.terena.org/](http://www.terena.org/) was mentioned as an example and an organisation it might be worth working with.