

Enhancing the Value of Collaborative Research Events through Virtual Research Environments

Michael Daw*, Rob Procter*, Andy Hall*, Roger Slack§, Martin Turner*,
Mike Jones†, Meik Poschen*, Nikki Rogers†, Caroline Williams*

* University of Manchester
† University of Bristol
§ University of Wales, Bangor

Abstract

Iugo and Memetic were two projects within the first phase of the JISC VRE programme. Iugo is a Semantic Web application that organises and allows access to the disparate content and information related to conferences and workshops. Memetic is a tool that records and annotates Access Grid sessions allowing flexible and navigable playback. Iugo and Memetic are being integrated through a collaboration under the second phase of the VRE programme known as Collaborative Research Events on the Web (CREW). Collaborative research events facilitate scholarly collaboration; however, their content is rarely open to interrogation by advanced semantic search tools. This paper examines how Iugo, Memetic and CREW have and will help contribute to the definition of VRE's; it examines issues common to all three projects in the use of semantic techniques and in legal, social and ethical perspectives; and it shows how lessons learned concerning user engagement are now being applied within the design and development methodology used by CREW to ensure greater levels of usability and integration of the technology to genuine user scenarios.

1. Introduction

Collaborative research events such as conferences, workshops, seminars and meetings are a characteristic part of the research process in facilitating the formal and informal scholarly collaboration that is vital among vibrant research communities. These events are critical to enable the fruits of research to be shared and to provide opportunities for the seeding of new ideas; they entail the spending of significant amounts of money but their content, such as presentations, research papers or informal blogs, is often not exploited as much as it could be on conclusion of these events. This, we argue, is a familiar story of the under-use of materials which are, in principle, easily accessible but where people experience difficulties finding what they want. A powerful potential solution is the use of semantic search tools.

Iugo¹ and Memetic² were two projects within the first phase of the JISC Virtual Research Environments (VRE) programme. Iugo is a Semantic Web application that organises and allows access to the disparate content and information related to conferences and workshops. Memetic is a tool that records and annotates Access Grid (AG) sessions allowing flexible and navigable playback. Iugo and Memetic technologies will be integrated

through a collaboration under the second phase of the VRE programme in a project known as Collaborative Research Events on the Web (CREW).

This paper examines how Iugo, Memetic and CREW have helped contribute to the definition of VRE's in the support of events such as conferences and seminars that are a central feature in most research communities, but the content of which is either ephemeral (in the case of presentations) or difficult to search (in the case of papers). It will examine issues common to all three projects, for example, the use of semantic techniques to allow research event outputs to become discoverable in context and the legal, social and ethical perspectives that affect usage of, and dictate the need for, certain functionality within the applications. Finally, it will examine lessons learned during the first phase projects in terms of user engagement, the benefits of which are now being applied within the design and development methodology used by CREW to ensure greater levels of usability and match of the resulting technology to genuine user scenarios.

2. Initial Definitions of a VRE

The definition of a VRE as stated on the JISC VRE programme website³ is "...to help

researchers in all disciplines manage the increasingly complex range of tasks involved in carrying out research. A VRE will provide a framework of resources to support the underlying processes of research on both small and large scales, particularly for those disciplines which are not well catered for by the current infrastructure. ” Iugo and Memetic were conceived to meet the needs of different stages of the research lifecycle. Iugo's aim was to develop a proof-of-concept data aggregation system to support research events, in particular conferences, and to consider its likely impacts and benefits to a range of users in terms of utility and usability, and also in a wider ethical, legal and social context. The aim of Memetic was to support AG sessions, in particular meetings, as they comprise a pervasive feature of the everyday working life of researchers (and, indeed, of many workers both inside and outside of academia).

2.1 Iugo

Iugo is a Semantic Web application designed to allow researchers and users of research to use precise, single-point search-and-browse to find information relating to research events, such as conferences, workshops, symposia and the delegates and presenters who attended these events. Iugo integrates and cross-links existing web information for these events to the level of individual sessions or individual presentations; it links formal and informal event-related information, such as event papers and delegate blog entries. It also uses various 'Web 2.0' features to allow registered users to make comments – 'annotations' – about event resources listed in Iugo. These annotations can be entered directly as text or as links to some external resource (such as images of a presentation held on a photo sharing website). The prototype stores metadata created for Iugo from which it then links existing web-based content for research events.

An evaluation report⁴ produced as one of the Iugo project's outputs suggested that the technology might fill a perceived gap in the exploitation of pools of rich research-related data that manifest around highly-funded research events by developing a viable mechanism for preserving links to event outputs. Initial trial use of the software suggests it has been well-received by users and that a production-grade Iugo system would offer a rich research resource to both Higher and Further Education.

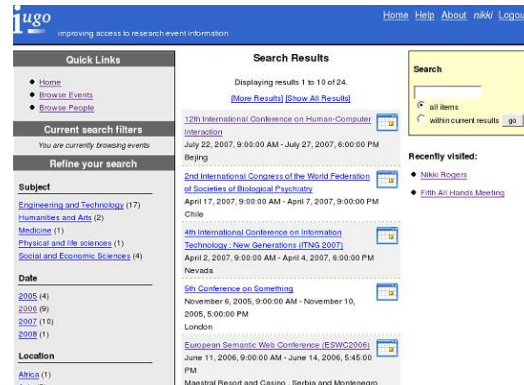


Figure 1 - Image of the Iugo prototype interface for events searching

2.2 Memetic

The original aim of Memetic was to provide support for meetings: to offer a sense of what has been achieved in the meeting, how decisions have been made and by whom. Memetic can provide a 'natural history' of the meeting and the decisions made therein and make these visible to participants in a manner that is hard to achieve with linear written minutes (which usually provide the viewpoint of just one person and is only available some time after the meeting takes place)⁵. A main aim for Memetic was to use the technology to realise a shared understanding of the work of meetings and to map dimensions of issues discussed.

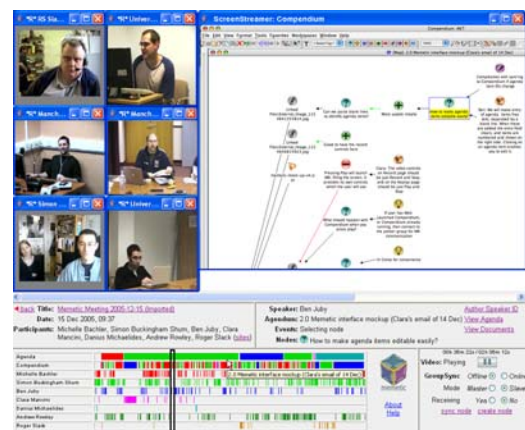


Figure 2 - Screenshot of Memetic in playback mode for a typical meeting

Many teams now use videoconferencing as an indispensable part of daily work. Videoconferencing as a meeting setting provides the opportunity to create and offer flexible, navigable records of meetings with no additional equipment to what is standard in these facilities (i.e. cameras, microphones, etc.). Whilst not considered useful or even desirable in some contexts (e.g. for reasons of privacy,

litigation, intrusiveness), in the many situations where it would be useful, there is a need for functionality that goes beyond simply replaying/skimming a digital movie.

Memetic is a toolkit that transforms the normally ephemeral character of interactions within a videoconferencing setting (even though these interactions need not necessarily involve remote locations) into persistent records which can be navigated in linear and non-linear ways, and which, as interactions spanning multiple meetings, can be traced, manipulated and (re)searched.

3. The VRE Definition Evolves

Although Memetic was originally conceived as a tool to support meetings, because the tool records video and audio streams generated by the AG, users began to experiment with using the tool in disruptive scenarios, sometimes far removed from its original conception. Examples of this include using Memetic for the evaluation of performance art, as a tool for virtual ethnography and (most popularly) for recording seminars and other types of presentations. This offered a number of avenues for evolution of the Memetic VRE and near the end of the Memetic project development began to concentrate on further support for its use in seminar-type scenarios. The most significant element of this was in the automated annotation of slide changes in ScreenStreamer (a tool that allows the sharing of a user's desktop with other participants in an AG session) and the consequent functionality for users to navigate recordings by presentation slide.

Independently of these developments, Iugo's project evaluation report⁶ included a recommendation to integrate audio-visual content from events into the application. This offered the potential for synergistic advantage to accrue from a collaboration between Memetic and Iugo to create an integrated VRE that would enable the capture of the scholarly collaboration that occurs at research events to create a lasting and rich research resource that has the potential to be of value in a variety of domains. This collaboration resulted in a proposal to the second phase of the VRE programme and became the project now known as CREW.

CREW has several distinct advantages over its predecessor projects Iugo and Memetic. Iugo users were only able to see still photos of events and CREW offers a significant gain in functionality through the availability of annotated, audio-visual recordings of presentations. Similarly, the value of Memetic

archives are enhanced when recordings can more easily be discovered through an established search-and-browse user interface, such as that implemented for Iugo.

The VRE provided by CREW in the second phase of the programme offers an evolution of the definition of a VRE through the integration of what began as two distinct projects supporting different stages of the research lifecycle to a VRE that adds significant value to currently ephemeral events by providing the means to offer a persistent rich resource that currently has only limited availability and utility to researchers.

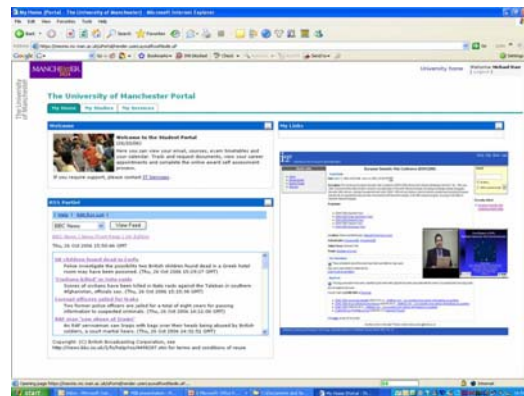


Figure 3 - Mock-up of proposed CREW portal interface

4. Common Issues

4.1 Semantic Techniques

A common approach underlying Iugo, Memetic and CREW is in their use of semantic techniques to allow research event outputs to become discoverable in context.

Both Iugo and Memetic make use of Resource Description Framework (RDF) to store data within the applications. For Iugo, this data concerns events and people; specific examples of this data are Uniform Resource Indicators (URIs) for papers, the physical location and dates of the conference, its delegates, and so on. For Memetic, this data concerns AG sessions; specific examples include meeting participants, session start and end times, decisions made during the session, and so on.

The requirements for the CREW data model are an extension and integration of the data models of Iugo and Memetic and will allow users to perform powerful searches, the results of which encompass audio-visual recordings and presentations from the conference or

research event as well as linear documents or information about that event.

This approach was trialled in the AHRC e-Science programme-funded Locating Grid performing arts workshops⁷, where members of the CREW team worked together to build a proof-of-concept lightweight Semantic Web integration prototype that linked Memetic to the PARIP Explorer⁸ software to enable straightforward discovery of Memetic recordings.

RDF is particularly appropriate to the needs of CREW and VRE's in general because of its flexibility and the potential it offers for the reuse of data, which enables users to make queries in ways that may not have been originally envisaged by those creating the data.

Several RDF schemas are being developed for use in CREW. They are being effectively federated to link the class of an Iugo event to a Memetic recording. Thus Memetic AG recording annotations data may be aggregated with Iugo events/sessions metadata via the conceptual linking of the RDF schemas by which they are encoded. We use this Semantic Web, RDF-based approach because it allows precisely this extensible integration of metadata schemas. Once the schemas are logically 'linked', the RDF applications we use (underpinned by the Jena Semantic Web Framework⁹) automatically process the data, allowing the user interface developed for the Iugo events application to 'seamlessly' access data stored across Iugo and Memetic servers. Users are able to annotate sessions they attend at conference events. When a user submits an annotation, the application semantically links it to the event in question, thereby adding more data to the overall 'RDF graph'. Here a social software aspect to the application is combined with the Semantic Web approach.

The RDF schemas in use build upon other initiatives taking place in the Semantic Web community at large. For example, the Iugo project reused and extended the RDF schema used to define events, related people data and other data categories for the 3rd European Semantic Web Conference in 2006. The SKOS standard¹⁰ is also used to semantically relate subjects on a broader/narrower/related basis. This is directly supportive of the faceted browser interface developed previously in the Iugo project which provides the user with hierarchical navigation through the data available.

The CREW project also looks at integrating user defined tags with the formal classifications used in the CREW Events software. Currently,

SKOS is the primary candidate for specifying how such integrations may be interpreted by the RDF-based software; however it should be noted that these standards themselves are under development and that CREW development work is still at an early stage with regards to this aspect.

4.2 Legal, Social and Ethical Issues

Another major issue shared by Iugo, Memetic and CREW is in the context of confidentiality, privacy and data protection, which apply to the storage of data related to research events (in the case of Iugo and CREW) and to audio-visual recordings of collaborative sessions in general (in the case of Memetic).

To help examine these issues, CREW has enlisted the assistance of the Oxford e-Social Science Node: Ethical, Legal and Institutional Dynamics of Grid-Enabled e-Sciences (OeSS)¹¹, which has a remit to gain an understanding in these areas as they relate to distributed collaborations. Because CREW is developing technology to store and allow access to participant data resulting from distributed and co-located research events, as well as other stages of the research lifecycle, there are particular concerns that arise and must be met and these aspects of CREW mean the project is ideally suited to become a case study for OeSS.

Researchers with the OeSS project conduct observations and attend user events, hold interviews with research team members and users, and analyse data gathered from events and usage of the technology. This allows the OeSS to gain close experience of innovative technology that highlights social, ethical, legal and institutional issues of e-Research, but it also allows the CREW project team to highlight social and institutional issues and their relation to application design.

Results from this case study will yield certain functional requirements of CREW technology in order for it to become compliant with ethical and legal concerns. One example of such a requirement may be to allow the retraction of permission on the part of a presenter for the recording of all or some of a session during a conference, perhaps due to the inclusion of content by the speaker that was not anticipated. In this case, there must be functionality to allow for the straightforward removal of the recording from being publicly viewable or to allow the editing of the recording to remove offending sections.

5. Lessons Learned

The focus for phase two of the VRE programme is on pilots and on the maximum involvement of users in driving VRE solutions.

In phase one of the VRE programme, both Memetic and Iugo attempted to engage users wherever possible. Users participated in a number of induction sessions, workshops and in continuous feedback via mechanisms such as bug reporting tools and support e-mail lists. Whilst this was successful in engaging a number of users in occasional and informal use of the tools – which was appropriate to the development of this level of technology – phase two of the VRE programme concerns more comprehensive and integral user engagement, where user needs are the driver and focus for requirements gathering, development and evaluation, and underpin the whole methodological approach.

One of the most important lessons from the Memetic project¹² is that there are three main strategies necessary to ensure maximum user engagement, without which involvement may be relegated to best intentions. These are: *enfranchisement*, where empowered and disparate groups of users provide a dynamism through otherwise unlikely interactions, together with explicit benefits from the use of innovative software and being involved in development projects that help users to remain enthusiastic; *hypothecation*, where some project funds are set aside to remunerate users for time spent in assisting the development process, for example, in activities such as usability focus groups; and *synergy*, where users realise the benefit of the newly-developed technology and begin to apply it to work on other projects.

The aim for the CREW project is to learn these lessons from phase one of the VRE programme and to structure its activities in such a way that users take the lead in the development process, rather than respond reactively to what the development team produces. As well as taking into account the strategies outlined above, project activities are based on a modified version of the JISC VRE Development Model,¹³ combined with the concept of co-realisation¹⁴ which moves or ‘embeds’ the locus of design and development activities into workplace settings because user requirements can only be identified in and through the context of use.

Co-realisation builds on accepted practice within software development to achieve maximum user engagement and is in contrast to the situation where users and developers operate

in distinct worlds and where there is little engagement with users and the context of use.

The aim within CREW is for design to become a co-operative and situated practice involving both end-users and the designers of technology throughout the project lifecycle and to ground the work in the experience of end-users as they use the technology.

It brings together insights from ethnomethodological¹⁵ workplace studies and participatory design.¹⁶ The method of co-realisation means establishing a shared and situated practice involving users and ‘co-realiser’s’. Co-realiser’s are facilitators not only through their technical abilities (‘IT facilitators’) but as members of a team whose aim is to develop work-affording systems in partnership with users. This involves appreciating the benefit of active user participation and fostering it through adequate communication, the explicit connection of studies of work and system design, attending to the evaluation of technologies, adapting to a particular organisational setting, and commitment to a ‘long-term engagement’ when viable.

The CREW methodology aims to enable users to *grow into* technology: it is minimally invasive, preserving the advantages of technology for work life while refraining from engaging in gratuitous technological interventions or dubiously-predicated work redesign efforts. Through creating shared practice, co-realisation seeks to capitalise on user-led processes of ‘design-in-use’ and emphasises tightly coupled, lightweight design, development and evaluation techniques that can be easily and rapidly customised to create new systems and artefacts for evaluation in use. It has synergies with agile software development¹⁷ and is particularly appropriate for the VRE development model adopted for this project.

The core of CREW’s project activities to ensure maximum user engagement and understanding of user needs are held as part of the pilot activities and consist of user environment-based induction sessions, usability focus groups, and user feedback sessions. Each of these sessions is held within the research environment and provides an opportunity for users and developers to work together to exchange knowledge about the researchers’ work practices, learn how to use the pilot system, and offer constructive criticism and feedback concerning the technology, as well as other issues important to VRE usage (such as ethical, social and legal implications, discussed above). These sessions aim to facilitate a high

degree of understanding between users and developers and have the important additional effect of ensuring close collaboration among the team. Furthermore, research events (i.e. seminars, workshops, lectures) of user groups are supported in using and analysing the developed tools together with the users in the reality of research work practices.

Every attempt is being made to integrate end users in project working practices, including participation in the management of the project itself. The Pilot and User Management Group meets regularly to oversee project activities and comprises representatives from all user groups and development teams. Additionally, a mailing list and Wiki are used for fruitful discussion, organisation and concrete collaboration.

6. Conclusions

Iugo, Memetic and CREW occupy a distinctive place in the definition of a VRE in their support of collaborative aspects of the research lifecycle, in particular research events and meetings. They share common issues both in the use of semantic techniques and technologies to allow for flexible data storage and reuse, and in the relevance of a legal, ethical and social dimension to the storage and exposure of data related to collaborative events.

CREW will provide users with a significant gain in functionality through the integration of Iugo's established search-and-browse interface with the audio-visual recording and annotation capabilities of Memetic. In its evolution from two phase 1 VRE projects, CREW has the potential to apply lessons learned in order to achieve a high degree of user engagement in the design and development process in order to achieve more robust software that is appropriate to a wide range of end-user scenarios.

¹ The Iugo project website is at <http://iugo.ilrt.bris.ac.uk/>

² The Memetic project website is at <http://www.memetic-vre.net/>

³ The JISC VRE programme website is at http://www.jisc.ac.uk/whatwedo/programmes/programme_vre.aspx

⁴ The Conference Information Integration Project: Review of Non-Technical Barriers, Mary Jane Steer, December 2005, <http://iugo.ilrt.bris.ac.uk/iugo/docs/WP5-final.doc>

⁵ Buckingham Shum, S., Slack, R., Daw, M., Juby, B., Rowley, A., Bachler, M., Mancini, C.,

Michaelides, D., Procter, R., De Roue, D., Chown, T and Hewitt, T. (2006). Memetic: An Infrastructure for Meeting Memory. Proc. 7th International Conference on the Design of Cooperative Systems, Carry-le-Rouet, France, 9-12 May. http://www.memetic-vre.net/publications/COOP2006_Memetic.pdf

⁶ Final Project Report for Iugo, Nikki Rogers, Mike Jones, Paul Shabajee, Jasper Tredgold, September 2006, http://iugo.ilrt.bris.ac.uk/iugo/docs/iugo_final_report.pdf

⁷ For more information, see <http://www.acrc.bris.ac.uk/projects.htm>

⁸ The PARIP Explorer website is at <http://parip.ilrt.org/about.html>

⁹ For more information, see <http://jena.sourceforge.net/>

¹⁰ For more information, see <http://www.w3.org/2004/02/skos/>

¹¹ The OeSS website is at <http://www.ncess.ac.uk/research/nodes/OeSS/>

¹² "End User Requirements and End User Engagement in Memetic," the Memetic Project, December 2006, <http://www.memetic-vre.net/users/EndUserEval.pdf>

¹³ JISC Circular 04/06, http://www.jisc.ac.uk/fundingopportunities/funding_calls/2006/09/funding_circular04_06.aspx

¹⁴ Hartswood, M., Procter, R., Rouncefield, M., Slack, R. and Voss, A. (2007). Co-realisation: Evolving IT Artefacts by Design. In Ackerman, M., Erickson, T. and Halverson, C. (Eds.) *Evolving Information Artefacts*, Springer

¹⁵ For more information on ethnomethodologically-informed ethnographic studies of work practices, see e.g. Heath C., Luff P. (2000). *Technology in action*. Cambridge University Press

¹⁶ For more information on participatory design, see e.g. Greenbaum J., Kyng M. (eds.) (1991). *Design at work: Cooperative design of computer systems*. Lawrence Erlbaum Associates, Hillsdale, NJ

¹⁷ For references, see http://en.wikipedia.org/wiki/Agile_software_development