Virtual Research Environments Proposal Cover Sheet

Cover Sheet for Proposals	***JISC Capital Programme***

Name of Capital Programme:	Virtual Research Environments
Name of Lead Institution:	University of Manchester
Name of Proposed Project:	Collaborative Research Events Pilot for National & Institutional VRE's

Names of Project Partners:
E-Science North West, University of Manchester
Institute for Learning and Research Technology, University of Bristol
Intute (multiple institutions)
Institute of Health Sciences, University of Manchester
SIGGRAPH UK Professional Chapter, Eurographics UK Chapter

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Length of Project: 24 months

Project Start Date: 1 March 2007 **Project End Date:** 27 February 2009

Total Funding Requested from JISC: [redacted]

Funding Broken Down over Financial Years (April – March):

Apr06 – Mar07	Apr07 – Mar08	Apr08 – Mar09
[redacted]		

Total Institutional Contributions: [redacted]

Percentage Contributions over the Life of the Project:	**JISC –** [redacted]	**PARTNERS –** [redacted]

Outline Project Description

A project that builds on the success of two Phase 1 VRE projects, Iugo and Memetic, by developing and integrating these technologies and embedding them in a variety of authentic research settings, including Intute, a national JISC service to provide access to web resources for research to UK universities, and the Institute of Health Sciences, which promotes health sciences research in Manchester. Integration of Iugo and Memetic technologies will enable the capture of the scholarly communication that occurs at research events (e.g. conferences and workshops) to create lasting research resources from material that is often ephemeral.

Iugo has developed a semantic web application that organises and allows access to the disparate content and information related to conferences and workshops. Memetic has developed a tool that records and annotates Access Grid sessions allowing flexible and navigable playback. The integration and development of these tools will enable presentations and other types of sessions to be recorded and automatically annotated to become discoverable in context, enabling powerful, single-point multimedia searches across distributed conference and related research data. Searches will yield results within written documents such as abstracts and papers and also in rich audio-visual content, such as clips from presentations.

We also propose to integrate complementary portlet applications – such as from Manchester's Campus Grid initative and those developed by the Subject Portals Project – within institutional portals at the Universities of Bristol and Manchester to provide users with added value access to additional research content and tools.

Mapping of Project Activities onto VRE Development Model

Proposed VRE development activities:

For each activity complete the funding requested and the number of pilot implementations.

Stage	Activities	Funding Requested
Management	Project & Technical Management	[redacted]
Stakeholder Participation	User Needs Analysis	
	Contextual Analysis	
	Change Analysis	
Pilots	Pilot Preparation	
	Pilot Implementation (3)	
	Pilot Evaluation	
VRE Construction	System analysis and design	
	Building and integration	
	Quality assurance and testing	
Total funding requested:		

I have looked at the example FOI form at Appendix A and included an FOI form in the attached bid (Tick Box)	**YES** √	**NO**

I have read the Circular and associated Terms and Conditions of Grant at Appendix B (Tick Box)	**YES** √	**NO**

FOI Withheld Information Form

We would like JISC to consider withholding the following sections or paragraphs from disclosure should the contents of this proposal be requested under the Freedom of Information Act.

We acknowledge that the FOI Withheld Information Form is of indicative value only and that JISC may nevertheless be obliged to disclose this information in accordance with the requirements of the Act. We acknowledge that the final decision on disclosure rests with JISC.

We hereby acknowledge this form and have no wish for any sections or paragraphs to be withheld from disclosure under the Freedom of Information Act.

Section / Paragraph No.	Relevant exemption from disclosure under FOI	Justification

Collaborative Research Events Pilot for National & Institutional VRE's

Principal Investigators: Michael Daw, Nikki Rogers, Rob Procter, Caroline Williams, Andy Hall

Project Target Audience: Intute national JISC service for event/resource discovery; Institute of Health Sciences, University of Manchester; SIGGRAPH UK Professional Chapter; Eurographics UK Chapter; existing Memetic users; researchers at the University of Bristol

A. Introduction

Length: 24 months; duration: March 2007 – February 2009; JISC contribution requested: £521,681

1. We propose to build on the success of two Phase 1 VRE projects, Iugo and Memetic, by developing and integrating these technologies and embedding them in a range of authentic research settings. Our project user partners are: Intute, a national JISC service to provide access to web resources for research to UK universities; the Institute of Health Sciences, which promotes health sciences research in Manchester; high-profile international research groups in visualization; existing Memetic users; and research groups at the University of Bristol.

2. Integration of Iugo and Memetic technologies will enable the capture of the scholarly collaboration that occurs at research events to create a lasting and rich research resource that is also valuable for training and awareness-raising in a variety of domains. 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 funds of money but their content is often ephemeral and is rarely made available in a linked, easily searchable online environment – informal blogs or more formal event documents such as research papers are rarely cross-linked in context in the way that Iugo makes possible. Similarly, Access Grid or other audio-visual content is rarely open to interrogation by advanced semantic search tools as enabled by Memetic. Our developments promise to make the entire range of event content persistent, accessible and searchable by researchers. We expect this to result in a greater return from the high level of investment in research events, and also to promote greater opportunities for distributed researchers to collaborate using these new research resources in a social software context.

3. 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. Their integration, development and deployment in a VRE (through a portal or on-line service) will enable presentations, such as lectures, conferences or seminars taking place over single or multiple sites, easily to be recorded and automatically annotated to become discoverable in context. This will enable powerful, single-point multimedia searches across distributed conference and related research data. Searches will yield results within written documents such as abstracts and papers and also in rich audio-visual content, such as clips from presentations and workshop discussions. To add further value to the VRE, we propose to integrate complementary portlet applications within institutional portals at the Universities of Bristol and Manchester to provide access to Manchester's Campus Grid initative and portlets developed by the Subject Portals Project (http://www.portal.ac.uk/spp/) in order to embed generic research support in both an institutional research portal context as well as in a national, subject-oriented service.

4. The development methodology to be used is based closely on the VRE Development Methodology combined with the concept of co-realisation in order to place the user and pilot technology at the heart of the project. The project team is well-connected to related initiatives such as the National Grid Service (NGS), the Open Middleware Infrastructure Institute (OMII-UK), the Access Grid Support Centre (AGSC) and the National Centre for e-Social Science (NCeSS), and we have solicited involvement from the Oxford e-Social Science node (OeSS) to help with consideration of important issues such as confidentiality, privacy and data protection.

B. Project Description

B.1 Key Project Building Block: Iugo

5. The Iugo Conference Integration project was undertaken as part of the JISC VRE phase 1 programme. The project's aim was to develop a proof-of-concept events data aggregation system and to consider its likely impacts and benefits to a range of users, not just in terms of utility and usability, but also in a wider ethical, legal and social context. An Iugo system 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 and symposiums. 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).

6. The Iugo prototype portal is open source software, written mainly as a Java web application and based on open source Semantic Portal software that was originally output from the SWAD-Europe project in 2004 (http://www.swed.org.uk/). The prototype stores metadata created for Iugo from which it then links existing web-based content for research events. The web-based prototype (with example data) can be viewed at http://iugo.ilrt.bris.ac.uk/IugoPortal/. The software (and license information), including a 'personalisable' portlet for Iugo, is available for download from http://iugo.ilrt.bris.ac.uk/download/.

7. The project evaluation reported on how Iugo 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. The project concluded that the proof-of-concept system developed for Iugo was well-received and underpinned by sound theory and that a production-grade Iugo system would offer a new class of research resource to UK HE and FE. An investigation undertaken into the viability of Iugo documented questions such as “Is there a research need for event data after the event?”, “Would event organisers be willing and able to contribute data to an Iugo system?” and “Do differing requirements underpin how different subject disciplines work with research and technology?”. Recommendations included: extending the Iugo prototype to maximise the convergence of semantic web and social software technologies in this events-oriented context; introducing additional sources of information to the Iugo portal such as subject-specific content from subscription services; and the recommendation (part of the inspiration for this project) to integrate audio/visual content from events.

8. Given the level of data transparency and information integration that Iugo potentially offers – the linking of people to projects, events attended and presented at, papers, blogs, and so on, the project included significant work to examine the potential legal, ethical and social impact. New technologies, exemplified by the Iugo approach, can be seen to change social behaviours, to challenge ethics and to stretch the law, with significant potential impact. This also applies to Memetic approaches to the capture of conference presentations and the like at which ‘who said what’ may be preserved in searchable audio-visual recordings. The work of this project will build upon and incorporate these initial investigations to feed into the design of subsequent developments and for wider dissemination to assist other projects in the VRE programme and beyond.

B.2 Key Project Building Block: Memetic

9. Memetic was also developed as part of the VRE programme Phase 1. The software has a BSD-style open source license and can be accessed at http://www.memetic-vre.net/software/Memetic/. It comprises of robust software to record the normally ephemeral interactions conducted via the AG and make these navigable in linear and non-linear ways both within and across sessions. Recordings can be annotated both manually and automatically and these tags are stored as semantic web RDF. Concept maps allow annotations that are rich and detailed and can support a wide variety of applications, such as traditional meetings, ethnographic analysis, and evaluation of performance art (all trialled by users during Phase 1). The session metadata generates multiple event timelines that are presented to the user and allow an intuitive visual perspective of the recording, as well as providing more traditional navigation through dragging the 'now bar' across the timeline.

10. A popular application of Memetic for users in Phase 1 was to record AG seminars and lectures utilising ScreenStreamer, a tool developed as part of Memetic that broadcasts the user's computer screen to other clients. One example of its use is when a presenter uses ScreenStreamer to display slides to remote AG sites; this stream is recorded (along with the video and audio of the talk) and thumbnail images of each slide are used as automatic annotations to allow intuitive navigation of the recording. Such functionality provides significant savings in resource compared to the manual annotation of presentations for on-line dissemination, such as that used in the ReDReSS project (http://redress.lancs.ac.uk/).

11. It is important to highlight that presentations do not have to involve multiple AG sites to be recorded using Memetic software. We anticipate that users will take advantage of this functionality in both a traditional conference setting with a local presenter and local audience, as well as using AG to bring in remote speakers or to allow the participation of a remote audience. Although we anticipate that our users will use Memetic at a number of stages in the research lifecycle, it is this presentation mode that has most potential crossover with the functionality of Iugo.

12. Ideas for developments in this proposal are based in part on evidence of user needs taken from the user evaluation process currently underway in the Memetic project. These user needs may be viewed as an element of the Stakeholder Engagement Cycle taking place prior to commencement of this project. (Appendix 4 provides a number of quotes from users who feature in the pending Memetic user evaluation report.)

B.3 Integration of Iugo and Memetic

13. There is a clear added value to be gained in integrating Iugo and Memetic technologies. Currently, Iugo users are only able to see still photos of events; there would be significant gain in functionality were there also to be available annotated, audio-visual recordings of presentations. Similarly, the value of Memetic archives would be enhanced with suitable software that would enable recordings more easily to be discovered through an established search-and-browse user interface, such as that implemented for Iugo. This approach has been trialled in other contexts, such as the AHRC e-Science programme-funded Locating Grid performing arts workshops , where members of this proposal team worked together to build a proof-of-concept lightweight semantic web integration prototype that linked Memetic to PARIP Explorer software (http://parip.ilrt.org/) to enable straightforward discovery of Memetic recordings. A proposed architecture for the integrated technology may be found in Appendix 2; screenshots of Iugo, Memetic and a mock-up of a prototype integrated tool may be found in Appendix 3. Because both Memetic annotations of recordings and Iugo conference data are stored as RDF, this allows us more easily to integrate their data models and will allow users powerful search functionality to yield results that encompass audio-visual recordings and presentations as well as more traditional documents.

B.4 Target Audience & User Scenarios

14. Our pilots' target audience consists of researchers who use the Intute national service for event and resource discovery; the Institute of Health Sciences, University of Manchester; prestigious international visualization research groups; existing Memetic users; and groups of collaborating researchers at the University of Bristol.

Impact on National Research Practice via Intute Pilots

15. Intute (http://www.intute.ac.uk) aims to advance education and research in UK universities by promoting the best of the web. Following a user requirements survey conducted by Intute staff at the University of Oxford (Wilson, A.J. 2006, *internal report*), it is examining ways to enhance the internet information and training services offered to researchers. Intute's involvement presents a valuable opportunity to appraise the advantages of this technology, such as how different subject areas are enhanced by this research support as well as associated ethical, social and legal issues.

16. Intute will pilot a new conference information service for the UK research community based on the Research Events Application. Intute currently provides a database of scholarly events in the social sciences, from which skilled cataloguing staff at Intute create metadata records. This high-quality data is ideally suited for submission to the integrated software in order to provide a service that not only alerts researchers to forthcoming conferences, but also enables them to browse and access the formal and informal research-related outputs of past events. For selected events that occur during this project, researchers will use the system to add annotations such as comments, links to associated blog entries, or index points within presentations. Evaluation of the effectiveness of the technology will allow Intute to explore the potential for the pilot to be rolled out as a service across all four of its subject services.

17. Because Intute has a remit to deliver training in internet research skills, it will pilot the use of these technologies to provide on-line training to staff in UK universities. One method currently employed is face-to-face seminar events, but relatively few people attend and there are questions as to the cost effectiveness of this approach. Intute will pilot these technologies to reach a wider audience at low cost and to maximise the benefit from training events and associated materials by creating a persistent web-based resource. At an early stage in the project we will record a distributed Intute training event on the AG, and make this available to a national audience. The outcome of this pilot will be evaluated as to the potential for this technology to deliver subsequent Intute training.

Impact on Institutional Research Practice – the Institute of Health Sciences

18. The research needs of the Institute of Health Sciences (IHS) at the University of Manchester, and its co-located organisational member, the School of Nursing, Midwifery and Social Work (SNMSW), provide a valuable and authentic institutional research setting. The IHS is a network of leading groups from across the University and local NHS organisations spread over a wide geographical area, with a significant number of national and international partners, together comprising 19 research organisations with more than 500 research staff.

19. The IHS has active networks focussing on child health, diabetes/obesity, patient safety and psychological therapy. Each network runs 3-4 workshops a year to enable attendees to develop new ideas for research and interventions, and to bring research into NHS practice. The workshops are attended by 50-80 people and aim to have a collaborative and informal style. Network members include academics, consultants, nurses, and consultant policy makers. Many members work in NHS settings and frequently need to provide staff cover, which results in high non-attendance rates at workshops. Therefore, there is a pressing need to record and make available after the event presentations and other activities so that non-attending members can review, contribute and share expertise with colleagues. The IHS will pilot this

technology in these workshops to support the usage of recorded material beyond the workshop's duration. A project evaluation will determine the technology's effectiveness in enhancing workshop outcomes to add value to involvement in networks and to improve the technology and support for future events.

20. A further pilot implementation will focus on a planned Health Economics seminar series to raise the profile of this subject and to examine its impact on research and research designs. This topic underpins much of the work in health sciences research, such as the cost effectiveness of drugs and treatments. These seminars will be held three times a year, to include pre-eminent academic contributions from across the UK. Seminar material will be captured and recorded using the integrated technology to enable attendees and others to review the seminar at their leisure.

21. In addition to these events, as part of a longitudinal evaluation, this project will also be used to support the work of the SNMSW Educational Research group, which includes long-term regional, national and international collaborations. SNMSW currently broadcasts fortnightly research seminars and uses a range of desktop videoconferencing technologies to support a dispersed post-graduate research community including students undertaking an on-line PhD programme. Deployment of the enhanced integrated software will support the IHS and SNMSW in accessing, reusing and repurposing research data.

Impact on International Scientific Research Groups

22. The first UK Professional Chapter of ACM's Special Interest Group on Graphics and Interactive Techniques (SIGGRAPH, see http://www.siggraph.org/), which is based in Manchester, has for the past six months been using the Memetic recording and annotation system to build up an archive of presentations of individual talks and tutorials. The approach of running distributed, repeatable, events has significantly widened the audience for this group, given its limited financial resources. This group will capture and upload the six main meetings a year, which includes international keynote quality presentations within a discursive environment.

23. The Eurographics UK Chapter (http://www.eguk.org.uk/) runs a small annual international conference, the aim of which is to promote networking between various UK visualization research establishments. The conference includes tutorial sessions. Archives of these and other conference sessions would be greatly enhanced by the recording and annotation of presentations and audience contributions to allow for advanced search/browse functionality for replay and reuse by researchers.

Impact on Institutional Research Practice – Memetic Users, University of Bristol Researchers

24. Memetic currently has several groups using its project outputs for events capture, such as the phase 1 VRE project on the History of Political Discourse at the Universities of Hull and East Anglia (http://www.earlymoderntexts.org/). Researchers at the University of Bristol in close working relationships with ILRT regularly use the AG to host and take part in seminar series. Although not formal partners, we anticipate that groups such as these will help to provide valuable additional feedback on our integrated software to improve quality, as well as reap the benefit from enhancements to the technology.

B.5 Project Outputs

25. The exact form of software produced by the project will be subject to user requirements and usability focus groups carried out in the Stakeholder Engagement Cycle and Pilot Evaluation activities. However, it is possible to outline the scope of project outputs, which are: a Research Events Application; an Events Recording Web-based Application; an Institutional Virtual Research Environment; and various non-software outputs.

Research Events Application

26. Iugo will be extended to include fine-grained search and retrieval functionality of Memetic recordings of research events, such as presentations and workshops, integrated seamlessly with current functionality that allows search and retrieval of other types of event information. Users will be able to view results of searches that include clips of presentations, e.g. a particular slide or question from the audience, alongside results that include extracts from papers, abstracts, blogs, etc. This application will be made available as a VRE portlet (via JSR168/286 and/or WSRP) and will include development of a standards-based, integrated Iugo/Memetic metadata model to represent data associated with research events. The Research Events Application will include enhanced support for the events data acquisition process leading to simple and quick linkable data upload to support funding body and RAE issues relating to research outputs, enhanced search-and-browse interfaces supporting large amounts of data, and improved support for the hierarchical subject schemes that support multi- and cross-disciplinary search-and-browse (including further integration of informal vocabularies such as 'folksonomies' from other 'Web 2.0' systems).

Events Recording Web-based Application

27. Memetic will be developed to offer enhanced tools and a highly usable interface focussed on recording and annotating research events, in single or AG multi-site settings. Each event has associated metadata (information about the event, such as date and location) and annotations (index points within the

event, such as presentation slide or question from the audience). Mechanisms will be developed via a simple interface to allow users to 'upload' event metadata and annotations so that they are automatically accessible to the Research Events Application. The Events Recording Application will encompass security and related enhancements, including those arising from our investigations into legal, social and ethical issues, e.g. *automated provenance tracking* ('who said what' in terms of data added to the Research Events Application) and *resource removal* functionality to support cases when speakers retract permission for recording.

Institutional Virtual Research Environment

28. Institutional portals based on the uPortal framework are at an early stage of rollout at the Universities of Bristol and Manchester, concentrating in the first instance on support for student applications and staff administration systems. There is currently no plan to offer research applications through the portals. We will work closely with our respective Information Services divisions, e.g. by sharing development and testing environments, and to enable access through the portals to the Research Events Application. We will also work to include complementary portlet applications such as an interface to the Campus Grid initiative (under development at ESNW) and modular portlets produced by the Subject Portals Project (for which ILRT are the Technical Lead).

Non-Software Outputs

29. Other outputs for the project include: a Technical Architecture Report to document an exemplar architecture for the distributed, modular events retrieval and recording components; an Institutional/Service Embedding Report to document the project's findings from trials embedding the technology in authentic settings and on issues of VRE deployment, intra- & inter-institutional use that arise from deployment of pilots, with advice for sustainable options for institutional/service adoption; a report detailing the legal, social and ethical issues surrounding data capture and use of such technologies (in cooperation with OeSS); and a final evaluation report summarising major findings, lessons learnt and the impact of this project's approach to facilitating effective researcher collaboration in a range of authentic research settings.

B.6 Value to JISC Community

30. The project outputs offer significant potential value to the JISC community. They offer: a route to sustainability for previous investments in successful VRE projects through an enhancement of Iugo and Memetic and the development of powerful integrated tools; VRE content that can be repurposed via the portalised versions of the enhanced integrated tool; exemplars of institutional VRE implementation resulting in a wider user base; an exemplar of a national VRE implementation (via trials with the Intute online service); an exemplar of application integration in the semantic web to construct interoperable VRE components customisable for different subject disciplines and inter-disciplinary working; further integration of VRE and other e-Science technologies; and a deep evaluation of tools with a significant potential impact in social, ethical and legal contexts in co-operation with OeSS, and corresponding dissemination.

B.7 Project Activities

Overview

31. In phase 1 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 – these projects are now ready for more comprehensive and integral user engagement, where user needs are the driver and focus for development and underpin the whole methodological approach. The project activities described below are structured in such a way that users take the lead in the development process, rather than operate responsively. Our project activities are based on a modified version of the VRE Development Model, outlined in Appendix F of JISC Circular 04/06, combined with the concept of co-realisation advanced by Hartswood et al (2003) which moves the locus of design into workplace settings. In line with the VRE "figure-of-eight" model, our project activities form two cycles – the Stakeholder Analysis & Impact Cycle and the VRE Construction Cycle. These cycles are bridged by the implementation, use and evaluation of pilots in authentic research settings, which form the core of the project. There are three full iterations of activities throughout this project, including three major software releases. The project timetable is summarised in a Gantt chart in Appendix 1.

Co-realisation & Co-attended Sessions

32. The methodology to be adopted closely follows the concept of *co-realisation* which stresses work-affording technologies. Co-realisation 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 development and is particularly appropriate for the VRE development model adopted for this project. We will use ethnographic observation to explicate practical work undertaken within the VRE. The aim is to assess how far the project technology affords work in authentic research settings as well as how this changes over the lifetime of various iterations of the Stakeholder Engagement and VRE Construction cycles. Evaluation will proceed from an analysis of stakeholder needs and requirements and will assess the ways in which developments meet these in research settings throughout the lifetime of the project. It will explicate how the technologies are used in and across research contexts as well as providing an opportunity for sharing best practice between both end-users and developers.

33. The core of our project activities to ensure maximum user engagement and understanding of user needs are the scheduled *co-attended sessions*, held as part of the pilot activities. These 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. These sessions offer a natural conduit between the two user-focused and development cycles and aim to facilitate a high degree of understanding between users and developers. This approach to the pilots has the important side-effect of ensuring close collaboration among the team.

Activity Sequence & Iterations

34. Activities have been scheduled to occur in a sequence designed naturally to build upon each other and to take best advantage of lessons learned from those preceding. We begin our project with User Needs and Contextual Analyses (which utilise focus groups, among other methodological approaches) to enable a greater understanding of researchers' needs and the context in which they work; results from these activities feed into System Analysis and Design. In parallel to these activities, we also begin the project with installation of an initial pilot system, formed from the final output of Memetic, Iugo and associated portal development work currently underway at the University of Manchester as preparation for this project. After induction sessions based in the users' research environment, the VRE will be used early on in the project as part of normal working practice by researchers from our target audience.

35. Whilst the VRE is in use by our research user groups, further development is underway in the VRE Building activity. (Requirements for the first phase of construction stem in part from the results of final evaluations of Memetic and Iugo.) Usability focus groups are also conducted during this phase. The Pilot Implementation is concluded by the Change Analysis and Pilot Evaluation activities, in which are assessed measures of the VRE's impact and any lessons that arise. In addition to this formal feedback, during the Pilot Implementation there are synchronous activities of continuous feedback, bug fixing and support, which will enable us continuously to build on requirements as they arise throughout the project. These evaluation activities mark the completion of one full cycle of activities and feed into the second cycle of activities.

Legal, Ethical & Social Issues

36. The Oxford e-Social Science Node: Ethical, Legal and Institutional Dynamics of Grid-Enabled e-Sciences (OeSS) has a remit to gain an understanding in distributed collaborations related to issues such as confidentiality, privacy and data protection. Because we are proposing to develop 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 is substantial crossover between the remit of OeSS and this project. We have negotiated to become a case study for OeSS, led by Annamaria Carusi. Researchers with the OeSS project will conduct observations and attend our user events, hold interviews with research team members and users, and analyse data gathered from events and usage of our technology. This arrangement provides reciprocal benefits for both projects: the OeSS will gain close experience of innovative technology that highlights social, ethical, legal and institutional issues of e-Research; and we will use findings produced by the OeSS to highlight social and institutional issues and their relation to its design. This activity will take place within the Contextual Analysis activity of the project plan and consists of four one-day meetings at four, ten, sixteen and twenty months between key project stakeholders (users, developers, evaluation experts) and will involve demonstrations of the technology, discussion of usage and context, and potential relevant issues that arise from OeSS analysis.

Evaluation

37. There are several key points within the project for evaluation. Firstly, the User Needs and Contextual Analysis activities to elicit requirements and inform development, i.e. which research activities are to be supported, how those activities are currently undertaken and how might they be undertaken. Secondly, the evaluation of pilots in context and an examination of how these afford work in various contexts over several iterations of pilot implementation. Thirdly, the Change Analysis activities, which look

at the impacts of the VRE on research – what does it allow to be done that could not previously be done; what ethical and socio-collaborative issues are raised by the VRE and how are these resolved in the user setting; and is there need for further exploration around technical or social/ethical aspects. Finally, an end of project evaluation to determine the extent to which the VRE constructed by the project was successful in enhancing the processes of research practitioners within and across disciplinary and institutional boundaries. This final evaluation is the key to determining the extent of this project's success in facilitating effective collaboration for researchers in authentic research settings.

B.8 Project Management

38. The project will be managed and administered by the **Project Manager** (PM), Michael Daw, based at the University of Manchester. The role of the PM is to provide strategic direction for the project; to monitor progress of project activities; to initiate remedial action because of slippage or in the event of risks occurring; to provide a single point of contact for the project; to chair the Pilot & User Management Group; to ensure the full engagement of all stakeholders (users, developers, evaluation experts, OeSS, and the wider JISC community) through effective implementation of the dissemination strategy and internal procedures (i.e. co-attended sessions, meetings, collaboration tools, etc.); and to lead the production of JISC progress and final reports.

39. Technical aspects of the project will be managed by the **Technical Manager** (TM), Nikki Rogers, based at the University of Bristol, who reports to the PM. The role of the TM is to provide technical leadership; to oversee the VRE construction cycle and monitor progress of technical activities; to ensure focussed and effective integration of the project building blocks (Iugo, Memetic and the portal environment); to enable productive collaboration among a distributed technical team; and to chair monthly Technical Team meetings.

40. A **Pilot & User Management Group** (PUMG) will oversee strategic progress of the project with a particular focus on issues relating to pilot implementation and use. The PUMG will consist of the PM (chair), the TM, the evaluation expert (Roger Slack), and one representative from each of the major user groups (i.e. Intute and IHS), to oversee strategic progress of the project with a particular focus on issues relating to pilot implementation and use. It will meet every two months. Three **'Project Sandpits'** will provide an informal setting in which to reflect upon and review all aspects of the project, as well as to develop and consolidate collaborative working relationships between a diverse, distributed team. The Project Sandpits will be attended in person by all members of the team, i.e. managers, user representatives, software developers and user engagement experts.

Risk	**Probability (1-5)**	**Severity (1-5)**	**Score (PxS)**	**Action to Prevent/Manage Risk**
Staffing	2	4	8	Expertise is spread across a number of individuals at each institution
Organisational	4	1	4	There are difficulties involved in collaborating between more than one institution. However, project teams have experience in working this way (e.g. the original Memetic project involved a collaboration between four institutions and all personnel are used to remote collaboration using AG)
Technical	3	3	9	The technologies involved are challenging. However, the sites involved are experts and well known to appropriate user groups if external assistance is required
External suppliers	1	1	1	No external suppliers involved
Legal	3	3	9	Legal issues are a key topic in software that stores copyrighted data. These issues are being explicitly addressed in project activities
User stakeholders	2	4	8	Users are so highly integrated in this project that significant problems would occur were they not to be fully engaged. We have mitigated this risk through the payment of consultancy fees for time spent in evaluation activities and for project management, which provides a higher obligation on the users' part. Additionally, both phase 1 VRE projects are in contact with many user groups that would make good replacements were any major user groups to opt out during the project due to unforeseen circumstances

B.9 Sustainability

41. This project regards sustainability as a priority if full value is to be achieved from software development. We will address this issue in the following ways. Working closely to embed our VRE into normal Intute and IHS working practice, as well as existing users of Memetic and researchers at the University of Bristol, will increase the likelihood of continued use and development, as well as acting as an exemplar for similar groups of researchers. By engaging with portal development teams at both Manchester and Bristol, and also the technical team at the Intute service, we complement the project's technical outputs with a comparative exploration of the issues around embedding and sustaining VRE's within a range of technical architectures. This is of value to other VRE adopters on the route to sustained institutional support for VRE's. Related to this there is value to be derived from this project's conclusions on how best to understand and manage the ethical, legal and social issues that impact on research practice following the adoption of VRE technologies.

42. We will submit robust software releases to the OMII-UK project repository so that the source code becomes managed and available beyond the project's lifetime. By working to make our VRE into a standards-conforming portlet, combined with availability through OMII-UK, it can be plugged into any institutional portal, so promoting reuse and broadening the potential user base. Our strategy of working closely with the computer services divisions will mean that tools produced by the project, alongside complementary portlet applications, will be available to users as part of institutional portal deployments, so extending lifespan. Finally, our close working relationship with NCeSS opens up possibilities of the tools being available as an additional element of its forthcoming e-Infrastructure project for the social sciences, so making them available as services to a still wider community.

B.10 Dissemination

43. We will develop a plan for dissemination in order to reach the widest possible audience among potential users, service providers and other stakeholders. This plan will help us provide most value to the JISC community in terms of ensuring sustainability, a wide user base, and the most productive use of technology leading to more effective research practices. Use of a coherent plan rather than a more piecemeal strategy will build on best practice in the community and lead to more effective dissemination in the pursuit of project aims. This plan will be based upon a strategy such as the ESRC's Communications Toolkit (http://www.esrc.ac.uk/ESRCInfoCentre/Support/Communications%5FToolkit/) in order to achieve maximum impact for our work and will include conventional routes such as reports, publications, workshops and conferences, but also the potential for embedding demonstrators in initiatives such as the NCeSS e-Infrastructure project (managed by one of the co-Investigators of this project), NGS and the AGSC, which offer the potential for technology developed in this project to be offered to a wide community of researchers across disciplines and for these groups to disseminate reports and findings based on actual usage. Our dissemination will be strengthened by this enhancement to effective practice in authentic research settings.

44. We will take advantage of our close links with OMII-UK, NGS, NCeSS, the AGSC and Intute (all of which are based, at least in part, at ESNW at Manchester). We will disseminate project outcomes, including work produced with the OeSS on the legal, ethical and social impacts of such technology, to the wider research community through conferences and journals such as Computer Supported Cooperative Work, International Conference on Systems Science, All Hands e-Science Meetings, International Conference on e-Social Science, Conference on the Design of Cooperative Systems, Conference on Human Factors in Computing Systems, Semantic Technologies in Collaborative Applications, Design Computing & Cognition and AG-related conferences, such as AG Retreats, SC Global, and the Workshop for Advanced Collaborative Environments. Many of these events have accepted previous papers from our projects and/or reviewers have expressed the hope that further work is presented.

B.11 Intellectual Property Rights (IPR) Issues

45. All tools and software developed in this project will be available on an open source basis, licensed for free non-commercial use and development and will be available to the UK HE and FE community in perpetuity.

C. Budget

Directly Incurred Staff	March 07	Apr 07-Mar 08	Apr 08-Feb 09	TOTAL £
Project Management (Mcr) 0.1 FTE		[redacted]		
Evaluation Expert (Mcr), 0.5 FTE				
Developer (Mcr), 1.0 FTE				
Developer (Mcr), 0.5 FTE				
Technical Management (Bris), 0.5 FTE				
Developer (Brist), 0.5 FTE				
Developer (Bris), 0.5 FTE				

Total Directly Incurred Staff (A)	**£13,396**	**£163,642**	**£150,001**	**£327,039**
Non-Staff	**March 07**	**Apr 07-Mar 08**	**Apr 08- Feb 09**	**TOTAL £**
Travel and expenses		[redacted]		
Hardware/software				
Dissemination				
Evaluation				
User consultancy				
AG hire & general office costs				
Total Directly Incurred Non-Staff (B)				
Directly Incurred Total (A+B=C) (C)				
Directly Allocated	**March 07**	**Apr 07-Mar 08**	**Apr 08- Feb 09**	**TOTAL £**
Staff		[redacted]		
Estates				
Other				
Directly Allocated Total (D)				
Indirect Costs (E)				
Total Project Cost (C+D+E)				
Amount Requested from JISC				
Institutional Contributions				
Percentage Contributions		**JISC –** [redacted]	**Partners -** [redacted]	**Total – 100%**

C.1 Institutional Benefits

46. Both the Universities of Bristol and Manchester are keen to benefit from the prestige that will naturally accrue from hosting this development and deployment project which will help improve the future efficacy of research processes across academia. The integration of research applications within the institutional portal at the University of Manchester will increase its value to the wider Manchester academic community and yield mutually beneficial synergies with the IT Services division responsible for core portal development. The position at the University of Bristol is similar: its portal currently provides access to personalised information for staff, with student-centric data being added as part of a project due to complete in 2007. As the project progresses, there will be an opportunity to explore the integration of research-related components as part of Bristol's portal developments, which are currently focused on teaching, learning and administration. Some of these components are already in place via applications such as ROSE, IRIS, IR8, MetaLib and BOFINS, but an exploration of how they may be integrated with each other and with other components such as this project's outputs will be viewed as supportive of Bristol's research practice in a VRE context.

D. Key Personnel & Partner Profiles

47. The University of Manchester is the UK's largest university, a member of the Russell Group of universities and member of the Worldwide Universities Network (WUN). **E-Science North West** (ESNW) is a collaboration between Manchester Computing and the School of Computer Science and is a virtual e-Science centre based around collaborative technology, including more than seven AG nodes across campus. ESNW is host to the Manchester centre for OMII-UK; it leads two projects in Phase 1 of the VRE programme (Memetic & CSAGE); it runs the AGSC; it provides leadership for the NGS; and it has close links with NCeSS. ESNW undertakes collaborative research and consultancy in the areas of e-Science, visualization/virtual reality, databases and datasets, digital preservation, learning and teaching, digital libraries and electronic publishing; and it has a close working relationship with IT Services and experience of providing local services. The School of Computer Science was rated 5* in the last UK RAE assessment, and is a world leader in technologies for the Semantic Web, being one of the prime designers of the W3C Web Ontology Language OWL and its precursors OIL and DAML+OIL.

48. The University of Bristol is a world leader in research, a member of the Russell Group of universities and member of the WUN. It is host to the Centre for e-Science Research, Bristol. The **Institute for Learning and Research Technology** (ILRT) is located within the University's Information Services division and is an interdisciplinary team that works to develop, promote and support technologies for learning and research. ILRT's activities have a particular focus on the Web, on emergent technologies and innovative application of existing technologies. It is host to one of the earliest Semantic Web research groups (now known as 'Web Futures'), with a strong track record in producing Open Source software (for example the Redland Semantic Web toolkit), a history of contribution to standards development (for example Semantic Web standards via the W3C) and a range of innovative projects. Examples of recent

project work include: prototype development and related research for the JISC-funded Iugo project; a workshop series with the University's departments of Drama and Computer Science funded under the AHRC's e-Science programme; Mixed Media Grid (MiMEG) – an e-Social Science 'node' funded by the ESRC via NCeSS; the JISC-funded Shibboleth-aware Portals and Information Environments Project (SPIE); the JISC IE Metadata Scheme Registry project (IEMSR) with UKOLN and the JISC-funded Subject Portals Project (SPP).

49. **Michael Daw** is a co-investigator for this project. He is team leader of the Collaborative Working Developments team within Manchester Computing, Manager of the Access Grid Support Centre, Project Manager of the Phase 1 VRE project Memetic, and has recently been appointed Manager of the project to build an e-Infrastructure for the social sciences. He has an international reputation in the AG community, was Technical Director of the international SC Global 2003 conference (and nominated as Chair of the 2005 SC Global conference), has managed several small projects, and has contributed widely to collaborative technologies in terms of documentation, development and research.

50. **Nikki Rogers** is a co-investigator for this project. She is co-coordinator of the Web Futures team, based at the ILRT, University of Bristol, in which she has over six years experience in developing web applications. This team is renowned for its contributions to standards developments in the semantic web arena (such as W3C-related standardisation work on RDF/RDFS, SKOS and RDF Data Access). Nikki was Project Manager of the Phase 1 VRE project Iugo; co-Technical Coordinator of the multi-partner JISC Subject Portals Project (SPP); and Technical Researcher for the JISC IE Metadata Schema Registry project (IEMSR), the JISC Shibboleth-aware Portals and Information Environments (SPIE) Project, and the EU-funded SWAD-E (Semantic Web Advanced Development Europe) project.

51. **Rob Procter** is a co-investigator for this project and is Research Director of the ESRC-funded NCeSS. Professor Procter's role at NCeSS focuses on developing Centre research strategy, coordinating development of applications of e-infrastructure and services in social sciences, and investigating socio-technical issues influencing wider adoption. Among other prominent roles, he is a member of the EPSRC e-Science Strategic Advisory Team, the JISC VRE Programme and e-Infrastructure Programme Advisory Boards, the e-Science Usability Task Force, OMII-UK User Group and the AHRC ICT Programme Steering Committee.

52. **Caroline Williams** is a co-investigator for this project and is based at MIMAS, University of Manchester. She is Intute Executive Director and manages relationships between Intute partner institutions. In partnership with UKOLN and SHERPA, Intute has been commissioned by JISC to develop a repository search infrastructure that builds on the ePrints UK project and facilitates material discovery, access and retrieval. Intute also delivers metadata creation services to the JORUM service and has a long history of working with the Higher Education Academy in standardisation of metadata and interoperability.

53. **Andy Hall** is a co-investigator for this project and is a Senior Lecturer in the School of Nursing, Midwifery and Social Work at the University of Manchester and Chair of the Faculty of Medical and Human Sciences Pedagogical Research & Development Committee. His expertise lies in the development, implementation and evaluation of technologies for teaching, learning and research. He is currently working with the Institute of Health Sciences to enhance health research and its dissemination though the use of technology. He has led a range of national and international technology projects in the field of medical education and specialises in the development of practice though the use of communication technologies.

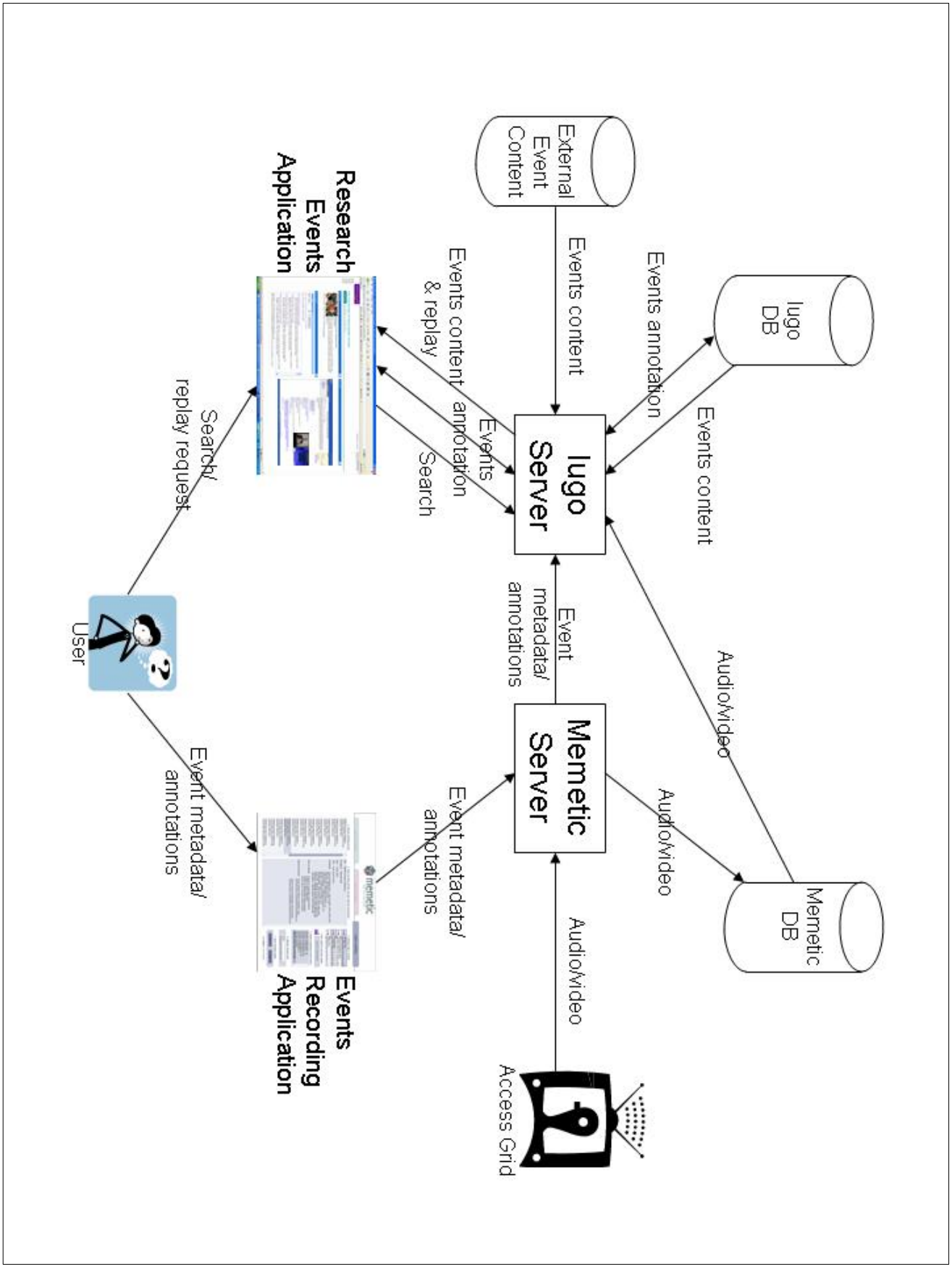
54. **Rebecca Jones** is an advisor for this project. She is coordinator of the Institute of Health Sciences, University of Manchester, a networked organisation of health science research groups in the University and local NHS trusts. Rebecca oversees the strategic and operational activities of the Institute in coordination with its management board and chair, including the organisation of workshops and conferences, website development, managing research networks on various aspects of interdisciplinary health science research and promotion of the activities of the IHS.

55. **Roger Slack** is the evaluation expert for this project and is trained in sociology, philosophy, communications and economics. He has interests in work-affording technologies and ethnographic research around work practice and technology in settings including collaborative technologies and medicine. He has published in a variety of sociological, technical and work practice journals and books. **Andrew Rowley**, **Anja Le Blanc** (University of Manchester) and **Michael Jones** (University of Bristol) are software developers for the project. Andrew is responsible for key developments in Memetic, including the backend server for recording /playback, the web-based client, and the desktop streaming tool using Java Media Framework. He has significant experience in contributions to core AG software in both open source and proprietary toolkits. Anja has worked on the VRE project CSAGE. She is currently working on portal development in conjunction with the University's web development team. Michael is a Senior Technical Researcher in ILRT. He acted as the technical lead on the development phase on the Iugo project, has over six years experience as a developer and, for the last four years, has developed web applications using Java technologies. Mike was previously a Senior Developer in the Web & Portal Team at Cardiff University where he worked on portals and web content management systems.

Appendix 1: Project Activity Gantt Chart

		Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09
Stakeholder Analysis & Impact Cycle																									
User Needs Analysis	Develop use case scenarios, user needs & req.s																								
Contextual Analysis	Analyse VRE deployment & adoption																								
	Issues for intra & inter-institutional use																								
	Assess legal issues surrounding data capture																								
	Define requirements resulting from legal issues																								
Change Analysis	Qualitative & quantitive measures of VRE impact																								
	Lessons learned																								
Pilots																									
Pilot Preparation	Install system for use																								
	User environment-based induction sessions (Intute)																								
	User environment-based induction sessions (IHS)																								
Pilot Implementation	Use of VRE in research practice																								
Pilot Evaluation	Usability focus groups																								
	User feedback sessions																								
	Continuous feedback (bug reporting, feature requests)																								
VRE Construction Cycle																									
System Analysis	Specify VRE solutions																								
System Design	Construct VRE design & architecture																								
VRE Building	Development of portal user interface																								
	Development of IUGO-Memetic common user i/f																								
	Integration of social software																								
	Development of security model																								
	Extend IUGO portlet																								
	Portalise Memetic																								
	Development of CampusGrid user i/f																								
	Integration of IUGO-Memetic data models																								
	Developments to ensure security & legality																								
	Develop relevant federated ontology for research																								
	Memetic security enhancements																								
	Development of Memetic conference user i/f																								
	User initiated developments																								
	Bug fixing & support																								
Quality Assurance	Code reviews																								
	Functional tests																								
	Regression tests																								

Appendix 2: Proposed Architecture of Integrated System



Appendix 3: Screenshots of Iugo, Memetic & Mock-up of Proposed System

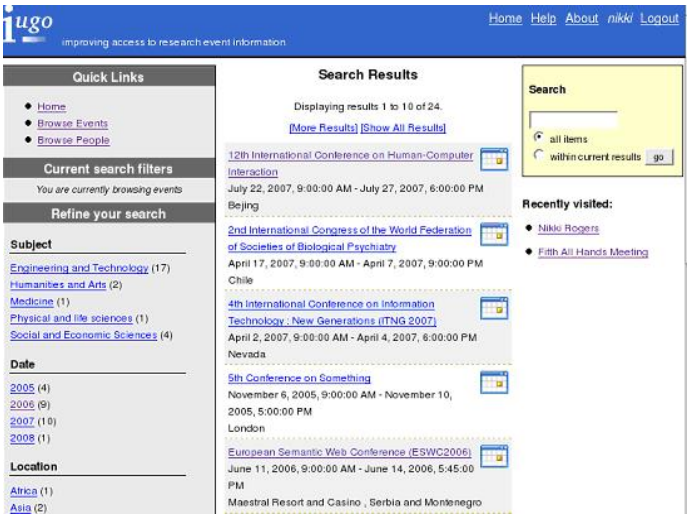


Figure 1 Image of the Iugo prototype interface for events searching

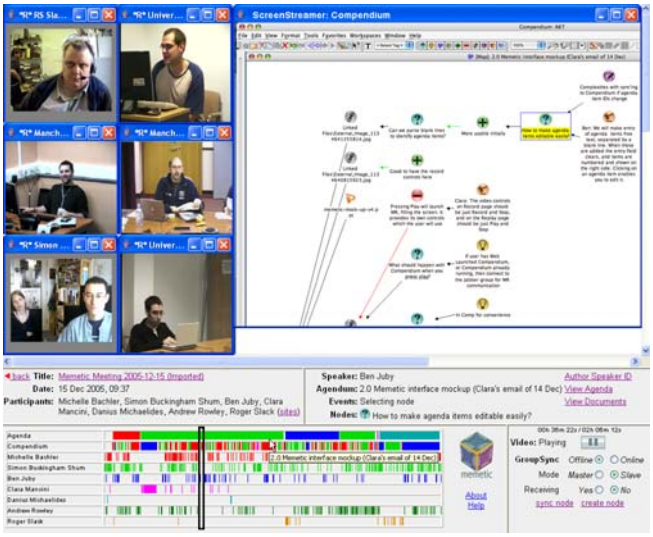


Figure 2 Screenshot of Memetic in playback mode for a typical meeting

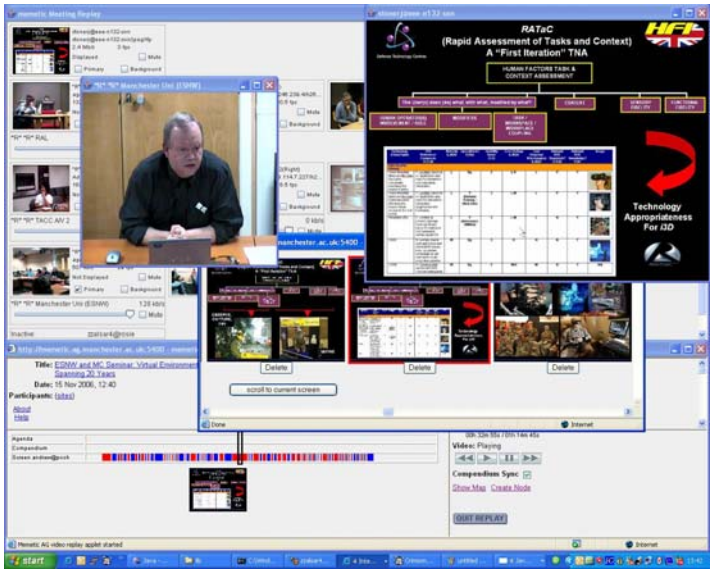


Figure 3 Screenshot of Memetic showing automated slide annotation

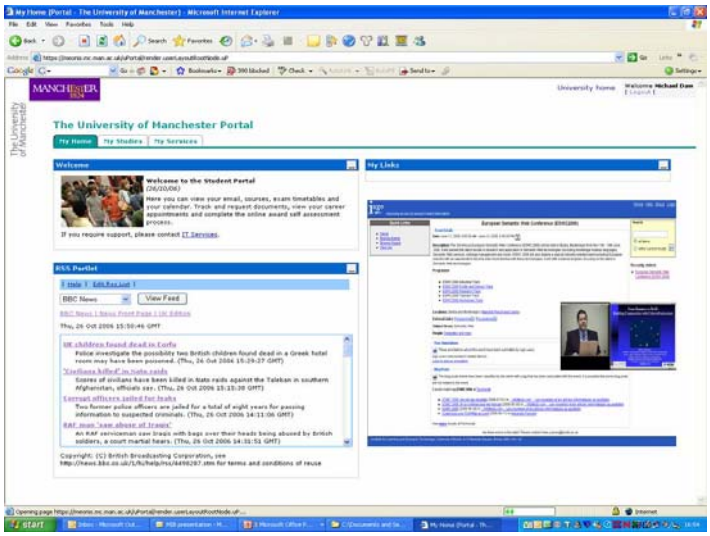


Figure 4 Mock-up of proposed Research Events Application

Appendix 4: Selected Quotes from Memetic End User Evaluation Report

"It's a fantastic pedagogic tool, you can look at the highlights of a seminar – it's a pity that it's not available in a format like MPEG that would be very useful for [name of site] to open a [media player] and watch it through that"

"Selecting streams to record and play back would be good – especially if you're watching clips"

"Make it a learning resource, a way to access institutional memory in an arts and humanities course – VREs have this benefit – select things we want to preserve in formats we want to use them in"

"Making things work in a classroom context is the problem – it tends to get squeezed out by other issues"

"One of the things that excited us early on about AG was its apparent flexibility for bringing in a number of applications"

"It's about bringing together the right people who know how to use the technologies and how to use them together"

"Memetic provides an interesting way of recording [performance] and mapping it…[its value is] simply in distributing audiences so you get a wider dissemination while at the same time preserving the liveness which is a key element in any practice-based research."

"I have no complaints about the user aspects in Memetic…Meeting Replay is straightforward"

"Things seem to hang together intuitively and it's easy to use…my ability to use it is because I have had a number of different encounters with it"

"It's good for meetings, it's good for classrooms, it's good for rehearsals"

"[Compendium is] an area which, when you're familiar with it, you realise it's as flexible as you want to make it"

"The division of labour: that might be an issue that would have a bearing on the way in which Memetic itself is structured that's important"

"A one day training workshop would be great to sell it to the arts and humanities world"

"Different pathways into (Memetic) so that it would be immediately recognisable to a variety of user groups

"I think while it is obviously integrated there are issues around running the recording and mapping functions, and how you use this on the machine you're running the AG meeting on – that's about (…) screen space to do those things"

"I don't think anything needs to be removed from it – it's great as it is!"

"[Any improvements are] really about the interfacing with materials that are held in a Memetic SRB that are able to be queried, its about the proper tagging of what's there … integrating Memetic into the broader open source, semantic web, e-science agenda"

Appendix 5: CV's of Key Personnel

Please see attached PDF files for CV's of key personnel, namely:

- Andrew Hall
- Andrew Rowley
- Anja Le Blanc
- Caroline Williams
- Michael Daw
- Michael Jones
- Nikki Rogers
- Rebecca Jones
- Rob Procter
- Roger Slack

Appendix 6: Letters of Support

Please see attached PDF files for letters of support from:

- The University of Bristol, for work conducted by ILRT, Intute and other Bristol-based researchers
- The University of Manchester, for work conducted by ESNW/Manchester Computing, Intute and the Institute of Health Sciences.