



Final Report for the e-Uptake Follow-on Project

Project Information			
Project Acronym	e-UptakeFO		
Project Title	e-Uptake Follow-on		
Start Date	1 st May 2010	End Date	31 st October 2010
Lead Institution	University of Manchester		
Project Director	Rob Procter		
Project Manager & contact details	Rob Procter Manchester e-Research Centre University of Manchester Arthur Lewis Building, Oxford Road Manchester M13 9PL rob.procter@manchester.ac.uk		
Partner Institutions	n/a		
Project Web URL	http://www.researchconnect.org/e-UptakeFO		
Programme Name (and number)			
Programme Manager	Judy Redfearn		

Document Name			
Document Title	<i>Project Report</i>		
Author(s) & project role	Rob Procter (project director) Alex Voss (consultant)		
Date	31 st October 2010	Filename	
URL	http://www.researchconnect.org/e-UptakeFO		
Access	<input type="checkbox"/> Project and JISC internal		<input checked="" type="checkbox"/> General dissemination

Document History		
Version	Date	Comments
0.1	21.07.2010	Version 1 written by Alex
0.2	21.09.2010	Update by Alex
0.2	19.10.2010	Update by Alex
0.3	28.10.2010	Update by Rob and Alex
0.4	31.10.2010	Update by Rob
0.5	04.11.2010	Update by Alex
Draft	05.11.2010	Version 2 written by Rob
Final	27.01.2011	Final edits by Rob and Alex

1. Executive Summary

The JISC-funded e-Uptake project, which ran from 2007-9, conducted a series of interviews to find out what inhibits or enables researchers' use of e-Infrastructure tools and services. The e-Uptake Follow-on project was funded to add value to the outputs of e-Uptake by continuing the exploitation of the corpus of data, by continuing the dissemination of findings and by engaging with stakeholders, such as service providers (both e-Infrastructure and HEI ICT services), concerning specific findings that give rise to concrete actions which could remove some of the barriers to e-Infrastructure use.

This report, which documents the findings from the follow-on project, draws on the e-Uptake interviews with researchers and HEI ICT service intermediaries, plus additional discussions with e-Infrastructure service providers to propose a series of concrete recommendations for actions that they, JISC and HEI ICT services might take to address key challenges. These actions focus on raising awareness of e-Infrastructure services, on improving service providers' engagement with their users and on addressing specific problems with infrastructure provision and support mentioned by our respondents.

The report also documents further work to make the e-Uptake corpus of interview data accessible to e-Infrastructure service stakeholders. This database is now available at <http://researchconnect.org/ci> and its contents can be accessed using a simple web-based interface that allows full text searches to be conducted on the whole corpus or on a subset defined by role or research discipline.

Finally, the report outlines steps we have taken to establish a community intelligence process that, by building on the database of findings, will serve to bring together data already collected and future data collections to inform the ongoing development of the e-Infrastructure services and support activities.

2. Background

The Enabling Wider Uptake of e-Infrastructure Services project (e-Uptake) has produced a wealth of empirical data by conducting interviews with researchers from a range of disciplines and members of research computing (i.e. advanced ICT) support services in a range of different institutions. The interviews were recorded and transcribed to facilitate analysis. The project has produced a number of reports¹ and academic papers² as outputs that provide an overview of the general lessons learned and a selection of the evidence in the form of quotes that illustrate specific issues.

As the material collected by the e-Uptake project is extensive and can be analysed from a number of different perspectives and with different aims in mind, the e-Uptake Follow-on project was funded to add value to the outputs of the e-Uptake project by continuing the exploitation of the corpus of data available, by continuing the dissemination of findings and by engaging with stakeholders such as service providers to discuss specific findings that give rise to concrete actions.

This work was also informed by the observations and recommendations of the recent international review of the UK e-Science Programme, which highlighted the need to better *embed* e-Science activities in institutions and research communities (RCUK, 2009) and the recommendations of the review commissioned by the Department for Business Innovation and Skills to identify the next steps for the development of UK research infrastructure (BIS, 2010).

¹ <http://www.engage.ac.uk/e-uptake/e-uptake-deliverables>

² <http://www.engage.ac.uk/e-uptake/e-uptake-publications>

3. Aims and Objectives

The aim of the e-Uptake Follow-on project was to identify concrete recommendations for actions to be taken by e-Infrastructure stakeholders such as service providers, funders (i.e., JISC, Research Councils) and higher education institutions (HEIs). In order to ensure that the recommendations are valid and relevant to the stakeholders and that they are accepted and taken up by them, a series of consultations with stakeholders was included in the work programme.

4. Methodology and Implementation

As the fieldwork material gathered in the e-Uptake project amounts to a corpus of data too large to be easily analysed through manual methods alone, we started by converting it to XML to be imported into an XML database. A simple front-end allows full text searches to be conducted on the full corpus of data or on selections of data by interviewee role (researcher or 'intermediary', i.e., support staff or e-Science Centre employee) or research discipline.

Extracts from the database were generated using keywords relevant to different stakeholders. For example, extracts relating to the National centre for Text Mining (NaCTeM) were produced by searching for variations of the spelling of the centre's name as well as searching for 'mining'. Where a review of the extracts prompted the inclusion of additional keywords, the search was repeated.

Based on the extracts generated, an analysis was conducted of the issues raised, often prompting additional searches as well as further investigations drawing on complementary material such as websites, manuals or reports. The results of the analysis were recorded in a tabular format listing recommended actions and extracts from the data backing them up as well as timeframes, the addressees to take action, resources needed, dependencies and any additional comments where appropriate.

The tables produced were reviewed by the project team in data sessions and discussed with JISC as well as the relevant stakeholders. Meetings with stakeholders were conducted face-to-face where possible or remote using Skype, telephone or Access Grid. By way of illustrating the process, excerpts from the tables, showing examples of issues and supporting evidence from interview transcripts, recommended actions and information about the outcome of discussions with stakeholders, are included in Appendix A of this document.³

5. Outputs and Results

The analysis has provided evidence of specific issues that researchers face in relation to their usage of existing services that service providers need to address, as well as evidence of wider issues that will need to be addressed at a higher level by funders and policy makers.. The number of issues uncovered varies significantly, reflecting differences such as the extent to which different services were discussed in the interviews, as well as the number of times interviewees mentioned issues they faced. The length of each table should therefore *not* be seen as an indication of the quality of a service.

³ Where these could be identified, timeframes for actions, resources needed and dependencies are also noted. Evidence sources are anonymised. Researchers are identified by a number preceded by a code representing the funding council associated with their discipline area. For example, EP05 is interviewee number 5 working in Engineering and Physical Sciences. Identifiers of the form ITnn are IT support intermediaries.

6. Outcomes

In this section we briefly discuss outcomes of the discussions with different stakeholders, one at a time, before we move on to draw out more general conclusions and make recommendations in section 9.

6.1. National Grid Service

Discussions with members of the NGS took place in a number of meetings by Skype/phone and Access Grid. The points raised in our recommendations were generally accepted as valid, but often our colleagues commented that various actions taken by the NGS since the interviews were conducted in 2007/2008 had already addressed them. It became clear that while there was an intuitive understanding by NGS staff of the impact these interventions had made and in some cases also anecdotal evidence, what was missing was a systematic analysis of the state of adoption of NGS resources and how it changes over time. A major outcome of the consultations is that the NGS are now reviewing their own data collection and analysis practices through monthly meetings. Alex Voss is taking part in these discussions and conducting follow up research.

6.2. Access Grid Support Centre

The table of recommendations produced for the Access Grid Support Centre was discussed in a teleconference with Fiona Cook, the AGSC service head and Katy Boyle, a service officer involved in outreach activities. The results of the discussion can be found in the table in Appendix A. One notable finding is that the Access Grid Support Centre has started to provide support for non-Access Grid technologies such as the Enabling Virtual Organisations (EVO) System⁴ and that there is a feeling that service provision should become less technology centric. The term "Access Grid" in particular is seen as being unhelpful, as it does not convey the uses of the technology and it gives rise to false associations with "the Grid". The presentation of Janet support services for remote collaboration as two technology-centric services neglects users' need to get advice on technology choice and interoperability. It would be better to provide a single, unified entry point with a task- rather than technology-focus.

An issue that came up during the discussion is the evolution of Access Grid technologies. The funding for the vic and rat tools has come to an end and the development of the Access Grid Toolkit seems to have come to a standstill. The only commercial supplier of Access Grid solutions is not advertising its products under this name. As a result, potential users may be uncertain about the risks involved in investing in the technology, so the uptake of Access Grid by new users will be limited. A clear message about the future of the Access Grid and a roadmap mentioning active projects that are continuing the development of the technology and associated services and tools would seem to be needed.

6.3. Mimas, Edina and UKDA

We have not been able in the time available to schedule a discussion of our findings with EDINA or UKDA; however, the Data Services table was discussed with Keith Cole, director of Mimas. This confirmed that Mimas has been taking action to address a number of the issues raised. For example, Mimas is hosting a series of workshops for librarians and e-resource curators aimed at building a network of 'site reps' for e.g. their Landmap services, and is creating a series of 'use cases' focused on a number of its key data services in order to raise awareness of the value of Mimas services.

Improving the search experience is something that Mimas is alert to. However, search issues will vary from service to service depending on the nature of the content. Mimas does

⁴ See <http://evo.caltech.edu/>

get feedback from users via the help desk and other events and does endeavour to respond to feedback by enhancing service interfaces where it can – or providing on-line 'guide on the side' documents to help users get started.

Many services, especially those of relevance to library staff (e.g. copac and zetoc), are well embedded in institutional lists of resources but other services (e.g. Landmap, ESDS, etc) are less well integrated. However, libraries & librarians are only one group of intermediaries who need to be made aware of the full range of resources available via JISC/JSC Collections/ESRC etc. Mimas acknowledges that more marketing work is required to promote the various collections available, but this is time/resource consuming.

The evidence from ESDS users indicates that registration is still a barrier. The trouble is that funders and data providers often like to know who the users are. If Mimas does not collect user information (e.g. status, discipline, etc) at registration point then it has to gather it in some other way (e.g. survey), which can be time consuming.

6.4. National Centre for Text Mining

The table of recommendations was discussed with Bill Black, the NaCTeM project manager. This led to the identification of a number of actions that NaCTeM has been taking within the past 12 months to address a number of the issues documented. For example, NaCTeM has an active outreach programme targeted at user communities such as biology, medicine, education and involving evaluation workshops, tutorials and hands-on sessions.

Within the UK PubMed Central (UKPMC) project, NaCTeM also participates in organising and running regular engagement workshops with UKPMC users in collaboration with the BL and the EBI.

NaCTeM is now planning to extend this engagement programme to other discipline areas by running a series of one-day 'hands on' courses and to put resources into running pilot projects with potential users of text mining in social research.

6.5. OMII / Software Sustainability Institute

Our table of recommendations was discussed with Neil Chue Hong, director of the Software Sustainability Institute (SSI). While the SSI is not a direct successor to OMII, there are important issues uncovered in relation to OMII or the development of research software products that suggest actions for the Software Sustainability Institute. The SSI is providing an increasing amount of information through its website and newsletters. The portfolio of case studies described on the website give an indication of what issues researchers are facing in relation to the sustainability of their codes and the kinds of help that SSI can offer. Through the information provided, SSI is addressing some of the issues raised by the e-Uptake findings, such as advice on sustainability approaches. Additional advice is going to be provided by the Software Preservation Study⁵ but some issues will require further investigations, e.g., on the role of modularity in helping to sustain software products.

6.6. HEI Research Computing Support

Our investigation of the provision of research computing support within HEIs in the UK has found a very heterogeneous picture. While in some (mainly large and research intensive) institutions, research computing support services or e-Science centres exist that provide a point of contact for researchers, other institutions provide fewer services and often do not have a dedicated group focusing specifically on support for research. Where services exist, awareness amongst research-active staff is often an issue and contact with support services is often made too late, i.e. after a grant has been awarded, rather than at the proposal submission stage.

⁵ <http://www.software.ac.uk/resources/preserving-software-resources>

The number and diversity of HEI research computing support issues (see associated table) documented suggested that we should attempt to identify recommendations that could be applied strategically, rather than trying to deal with these issues piecemeal at an operational level. We present these recommendations in section 9.2. Some preliminary feedback on these has been gathered through the discussions at the *Future of Research* conference organised by JISC (cf. section 7.3).

6.7. JISC and Research Councils

For reasons similar to those in the previous section, we will discuss recommendations for dealing with the issues documented in the JISC and Research Councils table in section 9.3.

7. Dissemination Activities

In addition to these consultations with specific service providers, we undertook a series of additional dissemination activities.

7.1. Workshops

Two workshops were organised by the e-Uptake partners at Kings College during the period of the follow-on project:

1. Workshop on Uptake of e-Infrastructure Services in the Arts and Humanities at King's College London, 6th July 2010.
2. Workshop on Uptake of e-Infrastructure Services in the Arts and Humanities at the Digital Arts & Humanities Conference (DRHA) at Brunel University, 5th September 2010.

Rob Procter gave a presentation at each workshop on the e-Uptake findings and led a discussion with participants about how barriers to the wider adoption of e-Infrastructure might be addressed. Some of the points raised by these discussions have been incorporated into this report.

Lorna Hughes of the Centre for e-Research in the Humanities (CeRch), Kings College, is preparing a fuller report on the outcomes of the two workshops.

7.2. Enhancing Community Intelligence for e-Science

We convened a workshop at the UK e-Science All Hands Meeting in Cardiff on the topic of community intelligence. The presentations provided an overview of how different providers of e-Infrastructure services deal with user engagement and the collection and analysis of data about service usage.

Mike Baker from the Edinburgh Compute and Data Facility (ECDF) reported on how the service is collecting data through interviews and visits to research groups as well as regular stakeholder meetings. These close relationships with researchers in the institution allow the ECDF to establish an overview of resource usage and unmet needs as well as to bring research groups together around specific topics such as particular subject areas or tools.

Andy Richards presented user engagement activities in the NGS and the collection of usage data, which starts when users sign up to the NGS services. He discussed the issues the NGS has faced regarding data quality and how these have been addressed. Through the application forms, the NGS can establish an overview of the overall number of users, their affiliation, discipline area and funding source. This data is now made routinely available on the NGS website. A second source of data are the user surveys, which have been conducted in 2008 and 2009 and provide more detailed information about the usage of the services by existing NGS users. Finally, the NGS is analysing data from its helpdesk ticketing system to obtain data about its responsiveness to user requests.

The Software Sustainability Institute (SSI) uses the Trac wiki and issue tracking system to manage information about communities within the SSI and within the communities themselves. The facilities provided by Trac and the relative simplicity of the tool make it a suitable candidate to replace more elaborate candidate solutions such as Customer Relationship Management systems (CRMs). The fact that Trac was already used within the SSI for project management lowered the barrier to entry and effort had to be invested only in configuring it to serve the purpose of collecting community intelligence. Initially, a structured approach was taken to embed metadata in wiki pages but issues with consistency and the time required to make entries meant this was eventually abandoned and a simpler strategy adopted. The Trac system is being used for SSI-internal purposes, but SSI staff see potential in making some of the information contained available to the wider community.

The session also featured a presentation by Rob Procter on a survey on the use of digital research tools by social scientists. This presentation complemented the other presentations by providing a perspective not from the point of view of a service provider, but from researchers studying adoption in a specific community.

Alex Voss presented the e-Uptake follow-on work described in this report, including a demonstration of the database of findings and its integration into a Trac instance. The discussion that followed confirmed that there is interest in having a common approach to gathering and managing community intelligence. It was agreed that it would be a good idea to create a Trac instance that can be used to experiment with possible configurations and to explore the federation between different Trac instances to provide a common view or at least loose integration via InterTrac links.

7.3. JISC Future of Research Conference

Rob Procter presented findings from the e-Uptake follow-on work at a session of the JISC Future of Research Conference dedicated to HEI IT services strategy.⁶

The presentation argued that the e-Uptake project findings show researchers feel that HEI ICT services are too remote and that the remedy is for HEI ICT services to develop closer relationships with researchers, i.e. to make ICT support *more* localised. While there is a plausible case that centralisation of ICT services will result in cost savings, the evidence from e-Uptake and from other studies (e.g. Fincham et al., 1994; Fichman, 2000; Gallivan, 2001) is that over-centralisation of ICT services stifles innovation because it leads to the expertise needed to make it successful being too remote from the potential users. Centralisation inhibits 'agile' decision-making and makes it more difficult for institutions to take advantage of 'bottom-up innovation' processes. The discussion that ensued focused on how HEI ICT services might respond to the challenges of engaging more closely with researchers. Points made included the need for HEIs to devise practices, rewards and career structures to encourage development of 'hybrids', i.e. people who are knowledgeable about ICTs and the needs of researchers within a given domain of application.

The discussion briefly touched on the cost implications of HEI ICT services achieving stronger engagement with their user communities. Concerns were expressed that, with HEI ICT service budgets already under pressure from the demand for new facilities and the squeeze on HEI income, stronger engagement would be unaffordable unless costs could be cut elsewhere from ICT service provision. It was suggested that one way forward would be for HEI ICT services to review whether outsourcing via the rapidly developing ICT service marketplace offers more cost-effective solutions for their more mature, 'commodity' service commitments. Indeed, the discussion confirmed that some HEIs are already adopting

⁶<http://jiscred10.jiscinvolve.org/wp/reputation-attract-the-best-and-save-costs-centralise-your-it-support-for-research-jiscred10/>

Query Interface

Fulltext

Query: Only responses

Selection

All
 Only researchers
 Only intermediaries

Researcher Selection

Submit

Probably... Certainly when I started there was no introduction to 'these are the current services offered by JISC', I haven't seen that anywhere, I've only found it out in retrospect. Now maybe that I have come from outside the UK so I am not aware of it. I suppose for example in the introduction when you come to an Institution you are generally told what is available in the institution and some sort of a walk through: 'here are the things that are available and might be of use to you' and in a sense...I don't

Figure 1: Database of findings query interface

outsourcing solutions for commodity services such as student email and data storage⁷, and there was a measure of agreement that savings gained through opting for these and emerging 'cloud-based' compute and data hosting solutions might enable HEI ICT services to re-focus scarce ICT expertise closer to their users, and so improve their capacity to support the adoption of more innovative and strategically important new services.

8. Community Intelligence

The e-Uptake Follow-on project has also further developed the concept of a database of findings by improving accessibility to the data through curation of the database and the addition of enhanced browsing and searching facilities.

The e-Uptake interview data is now available as a database in an XML-based format (see below). The simple web-based interface (see Figure 1) supports full text searches using the Lucene search engine and the sections of the data to be searched can be restricted to different groups identified by their role (researcher vs. intermediary) and discipline in the case of the researchers. These selections are based on the questionnaires filled in by researchers before the interviews were conducted. We used this functionality in conducting the analysis presented above.

As the existing research data is subject to consent conditions that do not allow the sharing of the full transcripts with researchers outside the three projects in the JISC Community Engagement programme, we have taken steps to integrate the database of findings into a Trac instance, where extracts from the full data would be available to third parties (see Figure 2).

⁷ See RIN 2010b) and

<http://www.jisc.ac.uk/publications/reports/2008/outsourcingemailcasestudies.aspx>

At the same time, some researchers are themselves opting for third-party service offerings rather than in-house solutions. See RIN (2010a).

Query Interface

NGS

Fulltext

Query: Only responses

Selection

All
 Only researchers
 Only intermediaries

Researcher Selection

We use NGS resources and WhiteRose grid resources to do the population initialisation which is creating the start population for 2001 and that again was a computationally intensive and data intensive task and yet we've got some, we've worked with Shiv Kaushal who used to be in Manchester and he's written some staging stuff that allow us to use MPJ Express on these resources. ([Transcript ES03](#))

Well, I only run it for poor portions of it, (Q. [I] OK), and so, we, I am trying to write, I mean

Figure 2: Database of findings query interface integrated into Trac

The idea is to make this data searchable in the same way as the full database of findings and to use the functionality in Trac to allow users to annotate the data and manage a set of derived actions using the issue tracking functionality that Trac provides. This functionality will then be used to manage the outcomes of the e-Uptake follow-on project and to establish a wider community intelligence process, adding data from similar studies and continuing discussions about furthering the uptake of e-Research and of e-Infrastructure services.

The database is now available at <http://researchconnect.org/ci> and its contents can be accessed using a simple web-based interface that allows full text searches to be conducted on the whole corpus or on a subset defined by role or research discipline.

8.1. Presentation at the JISC Innovation Team Meeting

Following on from the work to integrate our database into Trac, we demonstrated the system to the JISC Innovation Team. We set up an instance of Trac to create a hypothetical community intelligence system for JISC that would allow information relating to different projects to be managed. For this we mapped concepts of the Trac system to functionality we believe would be required. The main value would lie in an appropriate configuration of the ticketing subsystem to allow the tracking of issues over time, their provenance and their assignment to groups or people. Through links, keywords and queries, relationships between different issues can be established so that larger tasks can be broken down into subtasks and related issues be highlighted. Another feature we believe might be useful is the subversion integration that would allow browsing archived data such as project reports through the system.

A lively discussion ensued and it became clear that our presentation raised some concerns amongst programme managers about possible pressures and changes in working practices. Concerns were also raised about the effort involved in managing information in the system. Our presentation was not intended to suggest that existing systems such as PIMS or data entry should be duplicated, or that working practices should be significantly altered but rather we intended to point to the advantage of being able to track issues within and across programmes and to link these to existing information collected and existing systems. For example, information about programmes and funded projects would be included by federating the system with PIMS and used to fill the navigation structure of the Trac system.

The test installation we used to demonstrate Trac has been archived as an Amazon EC2 instance image and can be made available to JISC on request.

9. Recommendations

In e-Uptake deliverable D1.4 (Procter and Voss, 2009) we noted that “It is increasingly recognised that the technical infrastructure needs to be embedded within a ‘human infrastructure’ consisting of social and organisational arrangements that enable the technologies to be effectively utilised.” and argued that the e-Uptake project findings demonstrated that “compared to the investments in the development of underlying technologies and the development of technical services, the investment into this ‘human infrastructure’ has been almost negligible.”

Twelve months on, our follow-up discussions with e-Infrastructure and HEI ICT service providers provide some grounds for believing that these human infrastructure issues are now receiving more attention, but there is much that remains to be done.

In earlier sections of this report, we have focused primarily on operational issues specific to particular service providers and on recommendations to address these. In this section, we draw on the e-Uptake Follow-on project findings and those of other recent studies to focus on more strategic recommendations that we believe will help e-Infrastructure service stakeholders to address these human infrastructure issues.

9.1. e-Infrastructure Service Providers

One of the most significant findings from the e-Uptake study’s interviews with researchers was the lack of awareness of e-Infrastructure services. While the sample cannot be taken as representative of the research community as a whole, this finding nevertheless gives cause for service providers to review the effectiveness of their awareness-raising efforts and to improve the ways in which they engage with both existing and potential user communities, a point which has also been stressed by the BIS review panel’s report (BIS, 2010). It is therefore encouraging that our follow-up discussions with service providers show that user engagement is an area on which they have been focusing. These discussions highlighted that what is needed to inform the shaping of service and support provision is a continuous dialogue that increases the level of awareness among researchers, and provides evidence of actual and potential usage, as well as uncovering the nature of barriers and helping to devise measures to tackle them.

The following recommendations summarise where our findings suggest that effort by e-Infrastructure service providers to address these issues might be most productively directed:

- e-Infrastructure service providers should continue to develop their dissemination, outreach and training activities, seeking collaborations with HEI ICT services and other service providers where possible to provide information about wider e-Infrastructure service provision rather than a single service in isolation.
- e-Infrastructure service providers should share their experiences of what forms of dissemination activities are most effective, and work continuously to establish and evolve

‘best practice’, including how to establish more effective relationships with HEI ICT services.

- e-Infrastructure service providers should develop mechanisms to collect ‘community intelligence’ on a routine basis to improve the evidence base available to inform their support provision. Many service providers have routine ways of engaging with their user communities and can collect data from operational systems and existing management reports, but these often need to be (re-)analysed to provide input into ongoing service development. Examples of such activities are the NGS statistics meetings and actions emerging from them, as well as the plan to re-introduce more regular QA testing for Access Grid nodes.

The need for stronger user engagement has been a dominant theme throughout the e-Uptake study. Efforts to improve engagement with users must not be limited to e-Infrastructure service providers, however. They should also extend to the ICT services within the HEIs in which users are based.

9.2. HEI Research Computing Support

Approaches to achieving stronger user engagement have variously been framed as, e.g. ‘co-realisation’ (Hartwood et al., 2008; Voss et al., 2009) and ‘embedding’. What both terms refer to is the strategy of locating ICT expertise so that it is within easy and timely reach of users, i.e. where users do their work. Proponents of embedding argue that this is the best way to create an effective dialogue between ICT experts and users and thus ensure the development of useful and usable ICT-based innovations: a dialogue which enables ICT experts to gain an in-depth understanding of user needs and enables users to understand the potential of new technologies,

The problem of user engagement features strongly in the BIS review of e-Infrastructure. Focusing on the challenge of ‘crossing the chasm’ (i.e. achieving wider adoption of e-Infrastructure innovations), the review observes:

“One way of achieving this objective [crossing the chasm] is to encourage the use of mixed teams in e-infrastructure related projects. This would bring together researchers, research technologists and IT specialists who collectively can share their experience of best practice, reuse and re-purpose existing e-infrastructure and deliver products that meet the needs of the research community.” (BIS, 2010, p18)

The recent JISC-funded review of ICT support models (Hawtin et al., 2010) questions whether moving ICT support closer to users actually does deliver better results. However, the findings of the e-Uptake study (and, as we noted earlier, the evidence of the IT services research literature more generally) suggests strongly that it does. In our view, these apparently contradictory conclusions serve to emphasise the importance of not falsely dichotomising ICT service options. The question for HEI ICT service providers is not whether centralised or localised support is best, but how to maintain an appropriate balance between them: realistically, cost-effective provision across a range of services will involve a mix of approaches appropriate to which phase of the adoption lifecycle each service is in. Fostering the adoption of innovations is a process whose support needs to change over time. At its inception, a new service demands close engagement between technical experts and users, but as it matures and becomes more widely adopted, then the benefits of this close engagement become harder to justify, while the costs of providing it increase with the growth in the number of users. As a consequence, which of the localised or centralised support options is most appropriate for a given service will change over the adoption lifecycle.

The heterogeneity of the HE sector precludes the making of general recommendations for how stronger and more effective user engagement might be best achieved. However, we would recommend that individual HEI ICT services conduct an examination of the following issues as part of a review of their own service provision:

- The structure of ICT services and their effectiveness with respect to specific service instances (for a review of service support models, see Hawtin et al., 2010). This should involve examination of actual and potential barriers operating between: researchers and providers of external services; researchers and central research computing services; central research computing services and local (or departmental) ICT services; local (or departmental ICT services) and central ICT services; researchers and central ICT services (where local services or research computing services do not exist).
- HEIs are in prime position to stimulate researcher-led experimentation and exploitation of advanced ICTs. For example, the Research Information Network (RIN) report on the adoption of Web 2.0 services in scholarly communication (RIN, 2010a) concludes “The adoption of Web 2.0 services has often by-passed central HEI computing and information services – reflecting the importance of local support and innovation by research groups to make Web 2.0 available and relevant to scholarly activities. These observations suggest the need to reconsider institutional support structures and approaches.” (RIN, 2010a, p. 52). HEIs should examine how to adapt their policies in order to ensure that they maximise the benefits of these bottom-up processes of innovation, while minimising the risks.
- The range of measures that might be taken to leverage enablers and minimise/overcome barriers, and planning for ICT service development, including business models for sustaining and further enhancing services. An important issue for consideration here is the relationship of the ICT department with the institution of which it is part and its representation within strategic decision-making bodies. In their report on the integration of technology into HEI strategy, Duke et al. (2008) observe that this representation is generally not in evidence, with potentially damaging consequences:

“We found that very few institutions saw ICT as a *transformational enabler*, showing an awareness of the possibilities for doing business in a completely different way. Those that did, without exception, had Type 42 [having significant expertise or understanding of technology] senior managers or a senior ICT expert as CEO or on the SMT [Senior Management Team]. It is difficult to believe that transformational approaches can succeed without such a senior post on SMT.” (Duke et al., 2008, p. 16).
- How the service engages with its users, including how engagement is coordinated and managed, how service requirements are initially established and subsequently tracked, how well users perceive engagement works and how disciplinary cultures, institutional frameworks, policies and career structures influence the development of hybrid roles spanning ICT services and domain expertise (see Procter and Voss, 2009; BIS, 2010, p19).
- The recent RIN report on e-Infrastructure observes “There is widespread concern about the low numbers of people available with specialist expertise to support researchers, to run the infrastructures, to manage data or computing services; and the lack of career paths for such people.” (RIN, 2010b, p. 20) and that “The key problem that such people face is that there is no obvious and scalable career structure for them in the research and HE sectors.” (Op cit., p 21) This brings into focus the need for HEIs to examine the measures they might adopt to increase incentives and provide enhanced career structures for people to take on hybrid roles. Hawtin et al. (2010) argue that career paths are best pursued through the central IT service route. However, domain-specific knowledge can open up career opportunities, especially where staff still have academic roles and a shift into an IT department or group might be seen as a negative step by staff with academic ambitions.
- The cost-benefits and risks of different models of ICT service provision, for example, shared (federated) services or outsourcing options, by service type and maturity. The range of outsourcing options available to HEIs are likely to continue to expand as third-party providers develop their service offerings for, e.g. compute, data hosting and

scholarly communications. However, the way forward is hindered by a lack of clear evidence of the potential cost-savings. As Hammond et al. (2010, pp. i-ii) note: “Unless an organisation has fully identified the costs of local provision, and understood how those costs would be changed by adoption of cloud systems, it is not possible to judge which approach is less expensive overall.”

- How to share experiences of service provision and how to work cooperatively so as to establish and evolve ‘best practice’ across the sector. This is particularly important for smaller HEIs, who do not have the necessary breadth of knowledge in-house, and may lack dedicated research computing support and therefore structures to develop their own research computing strategy. In the future, inter-HEI cooperation might extend to the adoption of federated service models. The BIS (2010, p. 9) report makes the case that “A federated infrastructure will be essential to exploit existing and future investments effectively.” This underlines the need for HEIs (both large and small) to develop competencies in managing services that span administrative and funding boundaries.
- Finally, with the possibility that HEIs may increasingly look to regional collaborations to meet the demand for some ICT services, establishing effective inter-institutional service models will take on increasing importance. The opportunities, costs and benefits of such collaborations need to be carefully examined.

9.3. JISC and The Research Councils

The recent RIN report (RIN, 2010b) on taking forward e-Infrastructure strategy observes that there is a perception among researchers of a lack of coordination in strategic planning for UK e-Infrastructure provision. Many of the respondents (researchers, policy makers and service providers) interviewed for the RIN report agreed that JISC has, by virtue of its acknowledged capacity to bring together stakeholders from HEIs, e-Infrastructure service providers and the Research Councils, an important role to play in tackling this problem. For example, one possible action for JISC would be to promote the development of a roadmap of e-Infrastructure provision that spans HEI and disciplinary boundaries. Within the HEI sector, another action would be for JISC to provide the evidence that would help HEIs to make informed decisions over strategy, for example (as we expand on below), on the cost-benefits of outsourcing services.

The formulation of a top-down vision for e-Infrastructure needs to be informed by mechanisms for factoring evidence from within research communities into strategic planning of service provision. JISC is perhaps best placed to ensure that vital intelligence about e-Infrastructure usage continues to be gathered and analysed, the findings disseminated and acted on, and the outcomes tracked and evaluated – and to encourage the individual e-Infrastructure service providers to do the same. This top-down vision and planning needs to be complemented by continuing encouragement of bottom-up innovation and here it is to be hoped that JISC will have the resources to continue to fund the piloting and development of new services.

A comprehensive in-depth understanding of the opportunities, benefits and costs of outsourcing ICT services is essential if HEI sector members are to make properly informed decisions. JISC-funded reports on outsourcing commodity services such as student email data storage and managed learning environments⁸ provide a useful starting point, but outsourcing of research IT services raises more complex questions, as the recent report by Hammond et al. (2010) on cloud computing services and the RIN report on e-Infrastructure (RIN, 2010b) make clear. With the exception of this report, we are unaware of any other relevant studies of this issue and this can only hinder attempts by HEIs to make informed

⁸ See http://www.jiscinfonet.ac.uk/InfoKits/creating-an-mle/index_html

decisions on the way forward for ICT services provision. JISC should be encouraged to extend its investigations into this strategically important area.

To be sustainable, e-Infrastructure services will need to become demand- rather than supply-driven. The evidence from the research community is that there is potential for this demand to be realised, but funds are necessary to help researchers 'cross the chasm' (BIS, 2010), and to build effective relationships between service users and providers. Activities such as the JISC-funded ENGAGE programme have been successful in encouraging researchers to explore new ways of doing research and more initiatives of this kind are essential. The Research Councils have a vital role to play in ensuring that training in the use of new research methods and tools is integrated into curricula at both graduate and undergraduate levels (RIN, 2010b).

Finally, Research Councils have a role to play in fostering good practice throughout the HE sector. As with initiatives to drive the adoption of Open Access, Research Councils should make strategic decisions to support the adoption of e-Infrastructure services, e.g. by making it easier for applicants to request budgets for their usage. As Hammond et al. (2010) observe in their recent report on cloud computing in research, unless this is done, adoption may be negatively affected:

"Cloud Computing may well provide some significant benefits for certain kinds of research [...], but in the case of economic benefits, these accrue at an institutional or national level rather than to the researchers themselves. There may indeed be a disbenefit to the users in adopting cloud services. Without a fundamental shift in institutional (or Research Council) approaches to costing, this misalignment of benefits and costs is likely to preclude extensive natural adoption of cloud technologies for tasks which are currently well met by local provision." (Hammond et al., 2010, p. ii)

10. References

- BIS (2010). Delivering the UK's e-Infrastructure for Research. Available at <http://www.rcuk.ac.uk/research/xrcprogrammes/eInfrastructure/Pages/home.aspx>
- Duke, J., Jordan, A. and Powell, B. (2008). A Study for the JISC into the integration of technology into institutional strategies. Available at http://www.jisc.ac.uk/whatwedo/programmes/programme_jos/project_lfhe.aspx
- Fichman, R. (2000). The Diffusion and Assimilation of Information Technology Innovations. in R.W. Zmud (Ed.), Framing The Domains of IT Management: Projecting the Future Through the Past, Cincinnati, OH: Pinnaflex Press, pp. 105-128.
- Fincham, R., Fleck, J., Procter, R., Scarbrough, H., Tierney, M. and Williams, R. (1994). Innovation and the Management of Expertise: Case Studies from the Financial Services Sector. Oxford University Press.
- Gallivan, M. (2001). Organizational Adoption and Assimilation of Complex Technological Innovations: Development and Application of a New Framework. ACM SIGMIS Database - Special issue on adoption, diffusion, and infusion of IT Homepage archive, Volume 32 Issue 3.
- Hammond, M., Hawtin, R., Gillam, L. and Oppenheim, C. (2010). Cloud Computing for Research. Report for JISC. Curtis+Cartwright Consulting Ltd. Available at <http://www.jisc.ac.uk/whatwedo/programmes/researchinfrastructure/usingcloudcomp.aspx>
- Hartwood, M., Procter, R., Rouncefield, M., Slack, R. and Voss, A. (2008). Co-realisation: Evolving IT Artefacts by Design. In: M. Ackerman, C. Halverson, T. Erickson and W. Kellogg (eds.) *Resources, Co-Evolution and Artifacts*, Springer.

Hawtin, R., Davies, C. and Hammond, M. (2010). Advanced ICT support for researchers Review of models. Report for JISC. Curtis+Cartwright Consulting Ltd. Available at <http://www.jisc.ac.uk/whatwedo/programmes/researchcommunities/modelsofsupport.aspx>

Procter, R. and Voss, A. (2009), Deliverable 1.4 Community Engagement Recommendations. Available at <http://www.engage.ac.uk/e-uptake/e-uptake-deliverables>

Research Information Network (2010a). If you build it, will they come? How researchers perceive and use web 2.0. Available at <http://www.rin.ac.uk/our-work/communicating-and-disseminating-research/use-and-relevance-web-20-researchers>

Research Information Network (2010b). E-infrastructure – taking forward the strategy. Available at <http://www.rin.ac.uk/our-work/data-management-and-curation/e-infrastructure-taking-forward-strategy>

RCUK (2009). RCUK International Review of e-Science. Available at <http://www.epsrc.ac.uk/research/intrevs/escience/Pages/default.aspx>

Voss, A., Hartswood, M., Procter, R., Slack, R., Rouncefield, M. and Büscher, M. (2009). Configuring user-designer relations: Interdisciplinary perspectives. Springer.

11. Acknowledgements

The e-Uptake Follow-On project was funded through the JISC Community Engagement programme. We would like to thank our colleagues who have provided input for this document.

12. Appendix A: Stakeholder Tables

National Grid Service

The tables below list recommendations for each of the four NGS themes – management, operations, outreach and training as well as research and development – plus those to be considered in collaboration with GridPP regarding issues such the certification authority and associated tools.

General Comments

It is important to note that the central funding available is limited and that the current funding round is set to finish in March 2011. Also, recommendations should take into account the potential role the NGS may play in the establishment of a National Grid Initiative in the UK that is linked to the EGI in Europe and other regional grid initiatives throughout the rest of the world.

The NGS3 proposal sets out a vision of the NGS as enabling collaborative research that crosses institutional boundaries. We believe this concept is of crucial importance as the provision merely of raw compute and data storage capacity can increasingly be realised at an institutional level or sourced from cloud service providers. If the NGS did focus on the raw capacity it would degrade to become the poor person's supercomputer rather than an important piece of the national e-Infrastructure that enables the UK to maintain its position in research and integrate with the rest of the world.

Management

#	Timeframe	Recommended Action	Resources Needed	Dependencies	Example Database Extracts	Additional Comments
1	2 months	Provide advice to staff about how to engage with (potential) users to give them an honest appraisal of what they can expect. This may involve a change in the way the NGS is presented or a form of consultancy that will establish the costs and benefits of adoption for specific use(r)s			IT04: "NGS were not as helpful as they could be because they spent a lot of their time trying to downplay the problems"	
2		Provide a roadmap that outlines the establishment of an NGI in the UK and highlights the benefits this may bring for researchers – more likely to be related to collaboration with international partners than with increase in resources available.	½ FTE for ½ year to produce roadmap	Development of EGI and NGIs in other countries	IT23: "I think the NGS is extremely technically competent... I've used TeraGrid quite a lot ... over the years and [the] NGS [is] extremely well polished" IT09: "our collaborators are international because we need to use instruments which are all over the world but most infrastructure projects are national"	The NGS provides an example of a service that is probably close to what an NGI should be. The benefits of integration with European counterparts should be presented clearly.
3		Provide a model of support and engagement that spans local provision, nationally provided (shared) resources	Consideration of the model of	Needs to align with the	IT04: "it' not clear what people should be doing..."	Relationship with institutions needs to reflect their diversity.

		and specialist (HPC) resources. NGS should move from being identified through the resources provided to being identified through the expertise and good practice sustained in the community.	operation of the NGS in a changing context. NGS as an NGI serving communities of resource providers and users will require core resources directed at developing and maintaining expertise and common standards.	development of the EGI in Europe.	what is good practice... what sorts of things are worth investing in... we would expect there to be some kind of national lead on this and as far as we see there isn't. " IT15: "our researchers can use the NGS Oracle databases because they have several dedicated administrators and they have all the licensing there, so that saves us quite a lot of work..."	Many of the current resource providers have stable organisational arrangements and their members will not benefit so much from additional resources but from the collaboration they can enable. Others will benefit from resource provision that could not afford themselves.
4		Operationalise the vision of the NGS as more than a provider of compute facilities, concentrating on support for collaboration and reflecting this ambition in public documentation.			IT02: "In terms of access to physical machines the NGS doesn't do anything that we need."	

Operations

#	Timeframe	Recommended Action	Resources Needed	Dependencies	Example Database Extracts	Additional Comments
1	6 months	Review the (local) implementation of the process of issuing certificates			IT04: "as an institution we aren't very happy with the philosophy ... the way that they want to do things makes life much more difficult for the user than it needs to be and a consequence of that is that it has negative security implications ... we've come across users sharing certificates..."	It seems that the pains of having to acquire an NGS certificate differ between different institutions. Will the SARoNGS service make it unnecessary for researchers to obtain UK e-Science certificates?
2		Provide instructions not just for the case where all goes well but ensure pointers are provided for dealing with common problems.	?	None		
3		Develop triage mechanisms that bring together researchers with people who can provide expert advice on specific issues. Where such interactions result in solutions being developed, document these to facilitate	?	None	ES03: talks about how they needed help to get MPJ Express running, which involved accessing a node	This should be done in collaboration with the institutions and other partners such as the SSI.

		spreading this knowledge in the community.			list. IT08: "the end of Moore's Law... going down the multi-core route... if you look at the code base they don't scale so the numerical tools for example that we have today need a thorough overhaul and that's an enormous task."	
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Outreach and Training

#	Timeframe	Recommended Action	Resources Needed	Dependencies	Example Database Extracts	Additional Comments
1	2 months	Provide a schematic description of NGS services and how they relate to each other.	Some technical staff time - ½ PM?			This should answer questions like: what happens to a submitted job or where does data get stored?

Research and Development

#	Timeframe	Recommended Action	Resources Needed	Dependencies	Example Database Extracts	Additional Comments
1	12 months	Provide better support for job monitoring and debugging.	Probably in the order of 1FTE for a year if new tools are to be developed	None	EP05: "monitor a 100,000 jobs, that's practically impossible using Globus because Globus just doesn't want to work like that." ES08: "it's difficult to find out what's going wrong"	This might involve the deployment of existing tools in the standard set of tools available or the creation of new tools.

Some of the points above were discussed with Gillian Sinclair, NGS Liaison Officer and Jason Lander, NGS System support officer at University of Leeds in June 2010. The main outcome of this meeting was that the NGS has initiated an activity to review its own data collection and analysis. Since September 2010 a series of monthly meetings have taken place with the aim of improving the evidence base that the NGS is using to make decisions. A number of sources of data have been identified, e.g., usage data or helpdesk statistics, and efforts have been undertaken to produce outputs feeding into NGS board meetings.

Access Grid Support Centre

#	Timeframe	Who to take action	Recommended Action	Resources Needed	Dependencies	Example Database Extracts	Additional Comments
1	2 months	AGSC	Provide overview of application sharing functionality currently available and document best practice.	10 person days	None	IT33: "it's still quite difficult to share applications and that seems to be quite a strong feature of an Access Grid session"	There may be a longer-term action in this to provide a working real-time screen-sharing facility. Might this use something like VNC?
2	2 months	JISC/UKERNA with AGSC and JVCS	Provide a clear guidance for the use of similar services, e.g., AGSC and JVCS (the UKERNA Janet videoconferencing service). Update main video-conf website to reflect this.	5 person days	None	IT11: "it seems to be a shame that they are... they're both offering videoconferencing... it's information services we don't support Access Grid but we do support videoconference studios"	
3	2 months	JISC/UKERNA with AGSC and JVCS	Provide a one-stop-shop and triage service that provides advice on video conferencing and collaboration independent of the technology but with a strong focus on users' needs.	?	Willingness by existing services to work together in this way.	s.a.	This should ideally also provide better support for sessions involving different technologies.
4	2 months	AGSC	Clarify the relationship between booking access grid nodes, local room bookings and virtual venues. Promote usage of the booking system amongst long-term users who know the Access Grid from days when it did not exist.	2 person days for improving documentation, ongoing effort to promote booking system		MR09: "I think this whole thing about booking rooms... I mean you can book rooms to join our Access Grid, too, can't you? ... I am never quite sure whether the virtual space I'm going to, anybody else has got it or..."	
5	2 months	AGSC	Provide advice on practical measures to make sessions scale better to larger numbers of sites	5 person days	None	NE01: "that's a large number of sites, more than 10, probably about 15 sites joining ...that's the real problem".	
6	2 months	AGSC and JVCS	Make it easier to book a single node session	2-3 person days?	None	Personal experience	Currently, booking a single node session involves booking an "other public event"
7	6 months	AGSC	Raise awareness about videoconferencing and remote collaboration tools, many researchers have not heard of AGSC or if they had,	?	None	IT03: "I don't know what Access Grid and EVO are."	This needs to be done at the right time, no use raising awareness when

			they thought it was something to do with grid computing.				interest is then frustrated.
8	6 months	AGSC	Develop guidelines and practical advice for running secure sessions on the Access Grid. Most Access Grid meetings are run without encryption but some user groups require security because they deal with sensitive data.	?	None	ES02: "we find that some of the things that worked before don't work now... for example moving to the latest version of Access Grid some of the security hasn't been carried over"	
9	6 months	AGSC	Provide advice on how to arrange Access Grid sessions from within secure environments such as the NHS.	?	Discussions with NHS ICT	MR09: "we had to use the personal Access Grids for our clinical partners so we had various problems with set-up, particularly when you're working with a medical school which is they tend to basically block everything ... we have one centre in XYZ that has never ever managed to achieve an Access Grid session in 3 years"	There is an NHS-HE group concerned with issues like this, need to dig out...
10	6 months	JISC, RCs	Fund studies of how people actually make use of remote collaboration technologies to inform further development of technologies and services. This seems particularly important in relation to Access Grid. Do we really know how people use it and its (commercial) competitors?				It seems the JANET videoconferencing strategic review did not include consideration of Access Grid?
11	12 months	ASGC with technology providers	Provide a roadmap for Access Grid that spells out how the technology is going to be positioned against increasing competition from commercial offerings.			IT23: "Access Grid's a kind of a bit of a misnomer"	Also consider a name change unless the current one is matched to the vision.
12	12 months	ASGC with technology providers	Provide better functionality to adapt to network characteristics.			BB03: "there are bandwidth issues for our institution as well so I think that, I mean the major control of how our internet connection is used is through our computing service and when we we're not on the sort of the SuperJanet backbone, you know, there are issues to do with how much of that bandwidth which we use for conferencing."	Adaptation to different network conditions will also be important as people adopt Access Grid as a tool on their desktops or if commodity products are used as roaming stations.
13	12 months	ASGC with technology providers	Turn Access Grid into a commodity in order to make using and deploying it			Transcripts BB03, IT19, IT41 & MR07 interest in desktop video	Need to look at current IOCOM

			simpler to lower the barriers so that no dedicated operator is needed.			conferencing, repeated indication that ease of access is a problem.	offerings, are they more commoditised versions of Access Grid?
14	12 months	JISC and ASGC	Persuade institutions to provide support through their IT- or research computing service or media services.		This may require a good presentation of where Access Grid actually provides the value that justifies the cost.	Repeated observation that Access Grid is not well supported in many institutions.	
15	Beyond 12 months	JISC, AGSC, JVCS	Move towards providing technology-agnostic services and gateways between different solutions to mitigate effects of growing heterogeneity.			Technologies mentioned in interviews: Skype, H323, Office Communication Server, EVO, ...	

The above points were discussed in a teleconference with Fiona Cook and Katy Boyle on 22nd July 2010:

1. Presentation sharing is provided by the IGPix tool in IOCOM sites, and AGTk nodes registered with the AGSC are given access to the standalone version of IGPix. Documentation for all AGSC supported products and tools is available on the AGSC website at <http://www.ja.net/services/video/agsc/AGSCHome/documentation.html>. Instructions as to how to use unsupported AGSC products should be sourced elsewhere.
2. The decision to provide a single entry point for video conferencing is currently being looked at by JANET(UK).
3. s.a.
4. A quick start user guide as well as a more in depth guide on how to use the AG Booking Service are available on the User Guides page on the AGSC website. Navigation to this page perhaps needs to be clearer.
5. There is no actual limit to the number of sites that can participate in an Access Grid session. Problems arise when participants are not aware how to properly enter / operate an AG session at their node. It is crucial to have well-trained operators available at all sites; User guides on how to arrange and operate successful meetings are provided on the AGSC website. Having sites that are regularly QA tested is also important. The site QA is no longer compulsory but is offered once a year. Efforts are currently being made at the AGSC to bring all Nodes up to QA standard. Twice yearly training workshops are also held by the AGSC to help operators and node administrators keep up to date on all AG news and developments.
6. This was raised as an issue and has now been changed in the booking system.
7. A problem is that the name "Access Grid" does not describe the service very well. However, recent outreach activities by AGSC have helped address this issue and a series of roadshows is currently being prepared. Awareness also needs to be raised by JANET(UK).
8. Known issues exist encrypting meetings. People joining an encrypted session without entering the encryption code will cause the session to end. A different method for entering encryption into AGTk nodes also causes interoperability issues with AGTk and IOCOM.
9. Steps and testing are currently underway to open a gateway between the N3 network and the JANET(UK) network.

10. There are a number of case studies that have been published that demonstrate how Access Grid is being implemented (JANET News, OMII UK, The Times). These case studies show that the use of Access Grid in teaching is picking up, e.g., in the MAGIC group - <http://www.maths.lancs.ac.uk/departement/training/magic> and SEPnet <http://www.sepnet.ac.uk/>
11. 'Access Grid' has come to refer to a specific set of technologies. The funding for the ongoing development and maintenance of vic and rat has come to an end as the AVATS project has concluded. There is little evidence of ongoing development of the Access Grid Toolkit although the latest release was in September 2010 (AGTk 3.2). Technological developments and the increasing use of mobile technologies are likely to lead to more heterogeneity in the short and medium term with little direct interoperability between different competing offerings. The provision of gateways may therefore be an important service going forward.
12. The latest IOCOM and EVO products provide better adaptability to network characteristics.
13. IOCOM also offer commodified products.
14. The main issue here is the maintenance of the equipment and embedding into organizational processes. Often equipment is bought on project funding but not maintained, so there is a high failure rate. The problem of a lack of trained node operators is a secondary problem.

Data Services: Mimas, Edina, UKDA

#	Timeframe	Who to take action	Recommended Action	Resources Needed	Dependencies	Example Database Extracts	Additional Comments
1	2 months	Edina	Provide link to latest community report from main web page.	Almost none	none	EP03: "if there was some way of getting an overview ... some account of what Edina does..."	trivial
2		All	Provide descriptions of datasets linked to using the 'title' attribute - long lists of links are more easily navigated this way.			EP07: "I've clicked on learning and teaching resources and there is a list of say 20 links that I'm going [to] plough through ... to see what each of them does."	
3		Edina	Provide an overview of the web services and grid services offered, e.g., those that allow partial downloads of datasets			ES03: "I was downloading all the important ... data because I wanted to get hold of the roads throughout the whole of the UK... but you could only download the data for a small part of the UK [at a time]. I am aware of a new service that they are trying to develop... looking forward to being able to use that"	Researchers may need to download complete datasets for the whole country to then extract a particular feature they are interested in.
4	6 months		Survey library websites to identify which ones do not link to data resources. It should be possible to do this semi-automatically.	2PMs		AH03: "get librarians more involved with kind of listing this stuff so that it's there where people go"	
5		UKDA	Review the ways in which instructors can sign up their classes to the end user license or, more generally, consider ways in which groups of people can license data as easily as individuals.		?	ES07: "using datasets in teaching examples... the process of instructing people how to access the same files individually... the instructions that you need to pass on to people regularly change over time"	
6		All, JISC	Survey intermediaries to establish if those providing support are sufficiently aware of services provided.			IT11: "JISC just maybe overestimates the awareness that they hope there is throughout information services"	
7	12 months and beyond	JISC	Consider if underlying services provided by data services should not perhaps be presented in a uniform way			ES01: "there is a slight confusion between Edina and Mimas when it comes to map data... the issue has been resolved now to some extent by the one stop shop registration which is now done through archive"	'archive' in the quote is UKDA?

The above points were discussed with Keith Cole, Director of MIMAS, who has taken action to address a number of the issues raised, see section 6.3 of this report.

NaCTeM

#	Timeframe	Who to take action	Recommended Action	Resources & Dependencies	Example Database Extract	Additional Comments
1	Ongoing	NaCTeM A&H research community Finding bodies/ Research charities?	<p>Offer advice to people who are interested, have begun to 'tinker' with technologies and might be in a position to bid for a grant that allows the development of methodological innovations in their disciplines.</p> <p>Maintain contacts over time and 'ping' occasionally as priorities can change over time.</p> <p>Survey existing practices that are using off-the-shelf tools and ad-hoc methods that could benefit from an injection of expertise and usage of NaCTeM's services.</p> <p>Provide a model for engagement that allows early exploratory work and transition to a project proposal where necessary.</p>		<p>AH05: "I have started to do work in terminology, across domains across visualisation in the A&H and the sciences and Engineering. So it may happen that if this work continues I use text mining at some level but I haven't had to do it yet and again all of these things are not really what I am funded, paid to do, in my job it is additional work that I am doing myself."</p> <p>BB06: "So it was just the wrong timing for using the NaCTeM services."</p> <p>BB03: "Well we've done simple text mining on abstracts and what we're looking, on text abstracts, so we're looking to evaluate the improvements in the quality and the quantity of information we get when we get sort of the deep, the sort of the more advanced text mining in full text in full abstract in full articles... You know, sometimes we've either missed the opportunities there ... having pilot [projects?] you know, relatively easy to come by short term funding to explore relationships can be ... useful to evaluate a new technology, for example text mining"</p> <p>BB05: ... and then the other aspect is it's just people we can go and talk to ... because we've got a challenging problem around hypothesis generation and we need to just bounce ideas off and just see whether what we're doing is actually sensible or actually there are other tools out there we could or should be using."</p>	
2		NaCTeM	<p>Develop applications like TerMine, which are applicable to texts from any domain.</p> <p>Continue to promote the results of earlier projects that address A&H use cases.</p> <p>Provide workflows with customizable tools that</p>		<p>BB05: "text mining for us is absolutely central and crucial. Most phonologies out there in the literature and there is a huge need to actually pull that in effectively, our biggest challenge is hypothesis formulation of a large and complex datasets where most of the knowledge is just in the literature, and so we're using loads of</p>	

			enable communities to develop discipline-specific text analytics.		different text mining strategies, we're using loads of workflows ... some of it is, there's some bog standard stuff that we need to be able to run in a workflow environment, even if we have to crunch through vast amounts of it, and it's good to have somebody else looking after that, so the stuff's just there to plug in to a decent API, decent web services interfaces, stuff like that, AH06: "What they do is very specialised and they are involved in projects to do text mining in biomedical fields so I don't think you will find very many people that say they have used their services."	
3		NaCTeM	Emphasise long-term availability and ongoing evolution of the service as an advantage over other options.		BB05: "If we're building stuff that links loads of different things together, most academic software seems to have the lifespan of about a year before it disappears or doesn't get updated or something, and we just can't work like that so the reason why we would always want to work with people like OMII and the Text Mining rather than some of the academic groups within the space is that we know that there's longer term support available, so the stability matters to us."	
4		NaCTeM	Consider how communities can contribute to the services offered by NaCTeM and how the potentially growing number of specializations may be managed. For example, consider hosting third part services, and providing ways in which third parties can more easily create plug-ins for NaCTeM analysis frameworks.		BB06: "I'd really just like to develop some more services - we've got particular ideas in mind for processing text and doing some text mining initiatives using these workflows so we really need enough services to be put up there by the text mining centre which is obviously where we're going to be in touch with fairly soon. We just need new services really but we want to be up with our work, being maintained by the text mining centre if they feel that it's, it's, it's you know, suitable for them to maintain."	

This table was modified and commented on by Bill Black, the NaCTeM project manager, who provided the following comments:

1. Some of this agenda can be developed under an umbrella of workshops and training services. As part of NaCTeM's sustainability agenda, we are negotiating to provide some commercial entities with services, including feasibility studies and customized tools, that cost less than engaging full-time staff for the duration of a project. Similar service packages could be devised that are aimed at academic users.
2. We already have a sentiment analysis tool, but it needs to be better wrapped to make it usable by A&H researchers. U-Compare is NaCTeM's strategic framework for addressing the creation of custom text analytic workflows. We are planning to make it more accessible.
3. We have secured institutional support to make the centre sustainable through 2015, and are developing income streams to make it self-sustainable beyond that.

4. Our current workplan includes promoting U-Compare and making it suitable for addressing the whole cycle of development and deployment of text analytics. U-Compare has a library of third-party components, and we should make it easy for others to contribute to it.

OMII / SSI

The actions for the SSI may need to be reviewed at a later point once the SSI is more fully established and mode of its service provision visible and tangible. Most of the issues we are discussing below relate to issues that are familiar in other contexts but are most pronounced in academic software development. Some are taxing current software engineering practice and may require further research.

#	Timeframe	Who to take action	Recommended Action	Resources Needed	Dependencies	Example Database Extracts	Additional Comments
1	6 months	SSI with OSS-Watch	Provide an overview of different models for incorporating community contributions that will help developers developed a more well-defined process for accepting these and increase the responsiveness of development efforts to needs and solutions emerging from the community.		This may require or could be supported by a short, focused empirical investigation.	IT10: "Of course some of these things are open so you can try to fix them, but then you're fixing other people's stuff in a sense so then you have to have dialogue for that and that only works if it's very well organized. , you know things like OMII UK you have a model for maintaining more stable distribution and incorporating fixes from other people and trying to create a better product we can all depend on, but if you sort of drag components from here and there to build a solution then whether it's going to work is always a matter of how long the sticky tape can hold it together"	
2	12 months	SSI	Provide examples of successful transition from the research to the development phase and models for longer-term sustainability considering different models and sources of funding.			IT24: "Quite a lot of research projects are done and then once they are not quite leading edge and bleeding edge anymore they are left in a state."	This seems to be covered by the 'case studies'
3	ongoing	SSI	Promote modular designs and the development of reusable, loosely coupled components. This will facilitate reuse-based innovation, lower the barriers to adoption and facilitate maintenance of configurations as researchers can ignore parts they do not require.			EP06: "it's still not immediately clear how we might use, I'm going to download the latest OMII bundle but I can see how components of it are useful for me ... which is why I go up to higher levels within the service and say well look, I can see how I might be able to use that bit ad that bit, can we de-couple them and munch them in with what I do" (also see IT10 below)	
4	ongoing	SSI	Related to the above, provide advice on best practice in relation to managing the ongoing evolution of technologies. This will involve recommendations for technology developers,			ES02: "the underlying technology is changing very quickly, there are many people who work in this area and you know, some of them having to spend	

			<p>service providers as well as users and will need to take into account issues such as version management, maintaining engagement between users and developers and the management of dependencies between individually developed components.</p>			<p>time maintaining new generations of software, hardware, middleware... a need to try and use the software as it's been developed and be part of that development process"</p> <p>IT10: "Well we try to refrain to use too many components, trying to keep it as simple as possible, because that's the only way you can keep things under control, and often we use the things we build ourselves rather than depend on many, many other components because then we don't have the control."</p>	
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The above points were discussed with Neil Chue Hong on the 28th of July 2010:

1. SSI will publish a series of case studies on their website [Update: these case studies are now available at www.software.ac.uk]
2. This issue is being addressed through the Software Preservation Study that SSI conduct in collaboration with Curtis & Cartwright, see <http://software.ac.uk/what%20do%20we%20do/sustaining-software>
3. It is unlikely that there is a single approach that could be promoted by SSI. With the kinds of projects the SSI supportes this is unlikely to be a major issue.
4. The SSI will provide advice on aspects of this.

HEI Research Computing Support

#	Timeframe	Who to take action	Recommended Action	Resources Needed	Dependencies	Example Database Extract	Additional Comments
1			Ensure that research staff are aware of national services, focusing in particular on new members of staff			AH05: "Certainly when I started there was no introduction to 'these are the current services offered by JISC', I haven't seen that anywhere, I've only found it out in retrospect."	A JISC roadshow can be a suitable mechanism.
2			Ensure that local support is available that is easy for researchers to access and provides the bulk of support so researchers do not have to refer to more time-consuming mechanisms for simple cases.			EP05: "I mean most of the time our first port of all is with the local e-science centre [...] if they don't [know] then we'll, you know, sort of escalate that to a [...] proper support request."	
3			Provide a model for support that allows researchers to focus on their core activities rather than being concerned with the technology. This can be centrally provided support or technical staff embedded in research teams.			ES04: "all the teaching and other responsibilities. But at the moment I am happy with the group that I am working with, we have people who get on with the technical side of the research and I get on with other stuff [...] We have worked out where our skills are and we're kind of focusing on that."	
4			Develop a strategy for research support that includes training in areas of ICT use but also in related areas such as statistical methods. The provision of training ultimately needs to be driven by demand but may need to be kick-started with offerings in areas likely to be of interest either to specific, large groups of researchers or to a wider audience.			IT02: "I mean we do our best but it's, we're not really funded sufficiently to have permanent trainers on site [...] universities they will invest for example in trainers for corporate systems but they don't invest in trainers for you know software or things like that. [...] Well we offer training as requested, so if people ask us for example to do a Python course, we'll do a Python course. If we do Fortran or C++, we'll have regular courses on these, we do parallel programming courses because there's always a demand for that, so we're user driven we	

						don't decide the courses ourselves, we ask our user community what courses they would like and then try and find someone either within the university or outside that can provide that training."	
5			Ensure that managers of research computing services have the necessary skills to make a case for funding services within the institutions as well as to acquire external funding.			IT02: "one of the things that we do is prepare business cases [...] to get any funding for Advanced Computing or high performance computing or storage we have to go through the same sort of process as you would do to get a new chair or a new building."	
6			Provide a strategy for research data curation in the institution and resources that allow researchers to archive their data.			IT04: "I think that a lot of money and time has been spent worrying about computational resource inside my own institution and not enough about data so we don't have a proper data repository strategy in the university."	
7			Ensure that core services are funded so that they are free at the point of use to enable their wide uptake throughout the institution and lay the foundation for uptake of costed services.			IT02: "We fought long and hard to make sure that it was seen as basic infrastructure so that any member of the university has access to it. It's free at the point of use, we top-slice the funds that are required from the usual sources." IT03: "Everybody grabs whatever money they can is our funding model. We have multiple different sources of funding. So the computing services itself receives a lump sum from the University each year, which mostly covers staff posts that are University posts [...] the University is trying to push us towards more and more user trading income"	
8			Ensure that a minimum service is available across different parts of the institution or provide central support. Spreading resources too thinly will			IT03: "Each institution in a University typically has its own computing support internally, but that can vary. Engineering has got	

			jeopardize results.			nearly a dozen people, some departments or some institutions get you know pay for a quarter of an FTE. It varies both quantitatively and qualitatively.”	
9			Ensure that support does not get balkanised as there are likely to be synergies between different departments.			IT02: “So for example if during her conversations with one particular research group she find that they, a lot they have can be satisfied by introducing them to another research group she does that.”	
10			Consider the whole research lifecycle rather than focusing on compute resources.			IT14: “I think that a lot of money and time has been spent worrying about computational resource inside my own institution and not enough about data so we don’t have a proper data repository strategy in the university. I can get small amounts of space, you know, fifteen, twenty gigabytes easily. Lots of that but I can’t got to anybody without spending quite a lot of money and get say ten terabytes and it just strikes me as, you know, that should be as easy as turning on a tap and it isn’t.” IT32: “the institutional level support for the management of research data generally I think is an under-supported and under-resourced area.”	
11			Ensure that the provision of research computing services is informed by researchers, their experience with using services and their requirements.			IT02: “we employ a Research Facilitator to make sure that we’re always in touch with the research community within the university and we’re fulfilling their needs [...] it was politically very, very important right at the start that we’ve made sure that the academics knew that this was their facility”	
12			Provide a clear management structure that ensures that requirements are			IT02: “we’ve got the internal management of it [...] so we can	

			communicated to senior management and acted on quickly.			react very quickly to requirements coming up from the user base by taking it into the university senior management and getting a decision on whether it can be funded or not.”	
13			Develop a strategy for research computing in the institution			IT11: “We also have a research computing strategy which was published during this year [...] we went to the appropriate committees and each of the [...] Colleges to discuss the research computing strategy”	
14			Ensure that senior management are involved in strategic planning for the provision of research computing services.			IT02: “The Executive reports to our university HPC board which is chaired by the Pro Vice-Chancellor for research and includes a significant number of the Senior Management Team or Senior Management Executive of the university on this board.”	

JISC and Research Councils

#	Timeframe	Who to take action	Recommended Action	Resources Needed	Dependencies	Example Database Extracts	Additional Comments
1	6 months	JISC - eduserv	Review software licensing in the UK HE sector			IT26: "Some of the MatLab software is potentially of great interest... but the way it's currently licensed we can't really afford it."	
2		JISC	Initiate the creation of subject-specific data services across different research areas and links with the evolving e-Infrastructure				
3		JISC	Create a triage or liaison service that will bring people in touch with those in the community who can provide expertise in particular areas and act as partners in projects.			BB03: "I think the problem is that our interest has slightly, our needs are somewhat outside the area that the Digital Curation Centre commonly work in... we still have an unresolved problem really... we have a number of very long-term datasets... all the metadata surrounding those datasets are in raw text and in the heads of senior scientists"	
4		JISC	Not sure that the recommendation following from this is but thought this quote should be of interest. Looking at the list of services that BIT provides to the BBSRC communities, it seems there are a number of different areas of overlap with services that JISC provides for the wider HE community. This suggests there may be scope for collaboration or for focusing resources where they are most effective.			BB03: "It's complicated because as a senior scientist I have within the department and within the institute other people who provide a lot of that technical support directly and in particular the organisation called BIT, the bio-sciences IT services that the BBSRC funds deals directly with JISC and it maybe that problems I have that I raise locally have implications for JISC and I don't know about it, so it's not that I necessarily we don't necessarily use the technical support that JISC provides, it's just that I might not know about it."	
5	12 months and beyond	JISC	Provide seed-corn funding that allows researchers to spend enough time with a service provider to develop the understanding necessary to define how a			EP06: "DCC, NaCTeM, NGS, OMII are all services that I interact with at the sort of research level almost rather than a service, but what's	"Making use of a service" can mean a number of different things but often

			collaboration might be taken forward, be it as a straightforward adoption of particular services or as a research project developing new methods. The ENGAGE initiative has demonstrated how a relatively modest investment with low barriers to entry to generate significant activities, some of which will produce immediate results while others lead to a longer-term follow-up.			dropping out is service provision”	involves longer-term interactions
6		JISC	Fund national training team that creates and maintains quality (online) training material that can be utilised at the institutional level and serves as a fallback training facility for researchers at institutions that do not have local support.	2 FTE posts, travel and some infrastructure and resources to enable use of clouds.		Many smaller institutions do not have research computing support groups and do not offer training in the use of grids. Our informants have generally found the training offered useful although sometimes were in need of courses tailored to their needs. [Check with NeSC training survey]	Our concern is that the interest generated through the roadshows is not met by training offered. Only few institutions (can) provide local training, so usage may get concentrated
7		JISC and RCs	Provide funding to encourage researchers with experience in using e-Science tools to act as evangelists carrying the message into their communities.	Small project grants given to application researchers only. Cf. the OMII PALs programme .	Needs to be combined with match-making mechanisms (see below)	EP06, who was talking about their experiences as an ‘advocate’.	Some people may be particularly useful, especially those who provide a service to their communities themselves. Cf. EPSRC “Crossing the Chasm” call
8		JISC and RCs	Fund specific pilot projects involving collaborations between research groups and at least on service provider.			BB03: “I mean the only other thing is more funding, you know, I mean we can always say it would be good to have more resources, it would be good to have a, you know, some pilot funding to really spend some time with the Digital Curation Centre to run a pilot experiment to see when there are problems could be addressed by some of the method data tools.”	
9		JISC	Provide information to researchers as end users of services through collaboration with local IT support services to tie together information about national service provision and local support.			BB03: “I mean in a sense there’s always a need to sort of have the organisation’s sort of computing and IT providers as part of that community and I would have	

						thought, I mean I said we had a one day workshop held at XYZ for just such purposes run by our computing services [...] it depends whether JISC want to, if you like, market to the end users or to it's, you know, bulk providers in the university or institute computing services because I think there's a different community there."	
10		JISC	Review how services interact with communities that see themselves as being self-sufficient. Does this view reflect actual circumstances and if so are there lessons to be learned for other communities? Are synergies to be realised where communities (partially) duplicate what services provide?			EP03: "well I think one of them is issues of for example DCC or OMII or ...(inaudible)... and the Access Grid, we don't need them, so [our community] is fairly technologically sophisticated, a lot of services that these provide we provide for ourselves anyway and have done through, for a long time and do so internationally."	
11		JISC and RCs	Promote the use of national standards to enable collaboration between institutions and mobility of researchers.			BB03: "I think, you know, there's a bit of cost benefit for being accessing them and I think the fact that they're supported on a national basis means that when we talk to other universities, you know, they're familiar with the same resources and there are tools [...] I think having a standard framework for those [...] whether those are collaboration tools or they're networking standards all these things make a huge difference."	
12		JISC and RCs	Spell out the vision for e-Research and set out a roadmap – this may involve making a clear commitment to support a core set of services (e.g. NGS as the NGI for the UK). May also require the creation of a central coordinating body (as also suggested in the Atkins report) but, crucially, this needs to be tied in with ongoing community engagement to avoid charges of dictatorship.	Significant, this is a strategic decision.	This will depend on the budget available to JISC and may need to wait until after the spending review conducted by the new government.	IT04: "the nature of ... e-Science and of grid computing it's very amorphous and there is no clear direction from anyone ... what is good practice, what is bad practice, what sorts of things are worth investing in ... we would expect there to be some kind of national lead on this..."	Need to look at the JISC strategy and distil out the part on research computing.