e-Research Community Engagement Findings

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C O N N E X I O N S

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Chapter 1

Training, Education and Outreach

1.1 Understanding Distributed Systems

1.1.1 Understanding of Distributed Computing Principles[1]

Researchers are often not aware of the potential of distributed systems or of the issues involved in developing and using them. This means that they find it difficult to make sense of the e-Infrastructure services or to related them to their own work and come up with possible ways of using them. While training material exists that provides instructions for the use of advanced ICT systems, there is a lack of material that teaches the underlying principles of e-Research and helps researchers to engage creatively and critically with these technologies.

> *"...grid computing ... is an under utilised resource. I think there probably are barriers to people understanding how they could use it, what they could do with it, and seeing it as a true alternative to maybe poorly managed desktop processing or using under resourced local computers but I'd imagine that there's a, there's a lack of understanding of the technical context" (information services professional)*

> *"They probably wouldn't understand the impact it would have the way access it and what they would do with it. But they'd probably believe that because they can do what they're doing now that it's okay. But it'd be similar to somebody who sits and writes out fifteen letters in Word to fifteen people that are all the same and types them all out. But the person next to them puts the names and addresses into an excel spreadsheet and merges a letter from word. You both get the same result but the one has done it in about a tenth of the time but the other person doesn't think there's anything wrong with what they've done. They've used their own skills they've done the job it works but if you're not aware of the alternatives." (information systems professional)*

> *"We provide training material but it's more based on the technical use of products rather then the researchers requirements for the product, and as many people know if you throw a data set at some package like SPSS it will give you an awful lot of information whether it's what you wanted and whether you know what you do with it is another matter. (information systems professional)*

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[1]This content is available online at <http://cnx.org/content/m20940/1.4/>.

1.1.1.1 Enablers

- Embedding of education and training on distributed systems would enable young researchers to start developing the knowledge and skills required to effectively utilise e-Infrastructures.
- A textbook introduction to distributed systems for researchers would enable the teaching of distributed computing principles and e-Research skills. Funded by the UK's JISC, an effort is currently underway to produce a core introductory text under the title Research in a Connected World[2].

1.1.2 Understanding of Distributed Systems by IT Services[3]

IT service staff often lack understanding of distributed systems that would be necessary to effectively facilitate the uptake of e-Infrastructure services by researchers.

Example 1.1

"maybe [there is] a lack of understanding from the technicians that there is actually a requirement and again the idea that you know I could run a piece of analysis that takes three days. If it was on the grid it would take ten minutes [...]. Who can [...] tell a researcher actually you can do it better and I don't think many University IT departments even would appreciate how we do that. Even dealing with the business computing systems when we write a piece of code it's difficult to predict how long you think it will take. So if you don't understand the nature of high performance and what it will give you then it's difficult for you to promote it or be aware of its benefits." (information service professional)

1.1.2.1 Enablers

- Education and training courses for IT service staff would enable them to better facilitate the uptake of e-Infrastructure services by researchers.

1.2 Understanding the Potential of e-Research

1.3 Domain-Specific Material and Events

1.3.1 Training Aimed at Domain Experts[4]

Training offered is rarely tailored to the needs of researchers working in particular areas but is rather generic and technology-centric. This has the effect that training courses become less attractive for researchers and of making the learning outcomes less relevant for their day-to-day work.

"perhaps there's a general need for more training that's aimed at the domain experts rather than e-Science experts." (researcher)

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[2]*Research in a Connected World* <http://cnx.org/content/col10677/latest/>
[3]This content is available online at <http://cnx.org/content/m20941/1.3/>.
[4]This content is available online at <http://cnx.org/content/m24628/1.1/>.

1.3.1.1 Enablers

- Discipline-specific training programmes with content tailored to the specific needs of researchers can help to ensure that training is of interest and the outcomes practically applicable.
- Hands-on support sessions can be used to add relevance to a generic training course that teaches the basics, while the subsequent support sessions add context and help researchers to apply what they have learned to their own research problems. The combination of these two styles can help overcome the problem that creating tailored training material for every conceivable research area would be too expensive and would cause problems with keeping material up to date.

1.4 Quality of Training Material

1.5 Early Engagement and Outreach

1.5.1 Awareness of Services[5]

Researchers are often not aware of services available locally, regionally or nationally. In general, there seems to be a lack of systematic introduction to the services and the training available, which results in a lack of awareness as well as a lack of understanding of how services and methods can facilitate research and what different options exist. Some respondents from information services have suggested that there is an emphasis on basic desktop computing support caused by the wide uptake of desktop computing and that this may have led to a lack of emphasis on applications and advanced research tools.

> "maybe now [information services] need to get back and think about helping people with what it is they want to use computers for."

Researchers are often working with systems they know without becoming aware of the existence of other systems or recognising alternatives.

> What I tend to do is go straight to the web of science and you never really know what is going on to the rest of the site and I don't know what other things are available" (researcher)

Even when they take an interest in what services might be available, there are not necessarily easy ways for doing this as services are provided by different institutions, making it difficult to find out about their existence and their relevance.

> "I guess the big barrier is actually just finding out about what's available" (researcher)

> "I think the uptake of certain services like [...] the British library offer secure electronic delivery of documents which I think a number of researchers either haven't used, or weren't aware of, despite our best efforts to publicise this" (information systems professional)

> I mean in our organisation generally people don't know who JISC are and what they do [...] I know that some of the roadshows that have been happening have been addressing that" (researcher)

The fragmentation of researchers into small groups can add to the problem of awareness, especially when groups work in isolation. This is a problem that can be found quite regularly in some discipline areas.

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[5]This content is available online at <http://cnx.org/content/m20963/1.8/>.

> *"I'd imagine there might be an issue with awareness of what is available both locally and nationally and possibly regionally. I'd imagine that people because they work in small departments and in small groups which won't appear a particular [institution] trait would tend to work with what they know, and may not be aware of just communications or larger issues. You may find two research centres pretty close to each other with a completely different solution to the same problem and unaware of it." (information services professional)*

Support and outreach activities varied significantly between different kinds of institutions and between different disciplines. Awareness of services provided within an institution is systematically reported to be higher than that of equivalent services provided elsewhere even if those have a national remit.

Researchers appear to find out about e-Infrastructure services through events such as the UK e-Science All Hands Meeting, through colleagues or workshops. We might conclude that the network of social relations of people already involved in using e-Infrastructure services is a key enabler of uptake.

1.5.1.1 Enablers

Researchers become aware of the existence of e-Infrastructure services mainly through personal contacts and through the examples of others using them in their work. As a consequence, the following interventions can help to address the problem of awareness:

- Respondents have called for service providers to visit institutions, making use of staff development events. Roadshows such as the series of events funded by the UK's JISC[6] , booths at research conferences as well as other dissemination activities can help to raise awareness. However, they are relatively expensive interventions that do not scale well.
- Embedding of information about e-Infrastructure services in instituional resources such as information services websites and catalogues.
- Embedding of education on distributed systems and e-Infrastructure services in research education allows awareness to be raised amongst coming generations of researchers.

  > *"some of the OMII people have been helping us run the little short courses, so two three days courses on e Science or Life Sciences and these are actual workflows for Life Science and Medicine and that sort of stuff, and they're incredibly useful just to some people like PhD students and post-docs." (researcher)*

  Clearly, such routine arrangements would be of immense value in other areas but they rely on having a critical mass both on the demand and the supply side. Another opportunity that has perhaps not been exploited to a large enough extent is to link e-Research with existing ICT training programmes and with doctoral training centres.
- Case studies, roadmaps, examplars and success stories, e.g., in the form of briefing papers, short articles or video clips can help to raise awareness not only of the existence of services but also of the ways in which they can be combined and used.

  > *I think what would be useful particularly would be [...] information about developments in the sector or information on let's say case studies or exemplars where something has been identified as being a good practice possibly like the, the JISC intranet service where they have these sort of case studies and exemplars of how you go about introducing this to your institution. There's something where people can actually have an easy access point something that's quite readable but allows them to dig further.*

  > *Well I think the ideal would be to produce some kind of whether it's a roadmap or a guideline. But some kind of simple short document or resource on the web that just explains the context of the resources that are available. I do think the idea of you know exemplars, worked examples would be very helpful. But they'd have to be seen as being relevant for people to have an interest in them.*

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[6]http://roadshows.jiscinvolve.org/

Another important enabler is 'boundary spanning', where researchers move between their own discipline and another one, which may expose them to technologies and new ways of doing things:

> "before I was at [my current institution], I was at an engineering department at [other institution] and so I was kind of aware of a lot of these things that we are talking about − Access Grid, e-Science."

The respondent recounted how they kept in touch with the e-Science programme from its early days even when switching institution and discipline area, for example through attending conferences. They used their experiences to come up with ways of applying e-Infrastructures in new contexts:

> "[even] before the funding programme for e-Science had gone out I was aware of that, that it was happening and I thought 'oh, that is something we should look at for Arts and Humanities', so when the opportunity came for us to do something using e-Science technologies, I kind of hassled the research computing people [at my institution] to tell me about it."

1.5.2 Linking Initial Interest and Specific Training[7]

The initial interest generated through outreach activities needs to be converted into enrollment into specific training activities seamlessly, otherwise there is the danger that not only will the benefit of outreach be lost but also that people might be disenfranchised. An continuation of engagement is important even if researchers show initiative to acquire the necessary skills themselves.

> you don't say to somebody we've got this wonderful technology, would you like to learn how to use it and then they say, 'yeah, great' and then nothing really happens after that if you know what I mean because the first port of call is obviously the documentation try and work a few things yourselves. If it gets complicated people get put off very quickly." (researcher)

People can be resourceful in getting the support they need once they have made a decision to engage and are becoming more self-reliant over time.

> "I use Access Grid quite a lot, I have got training to my local node... I kind of hassled them until they taught me how to use it" (researcher)

Some may even actively contribute to the development of e-Infrastructure services and tools through reporting bugs and stating requirements. However, being able to engage in such a meaningful way depends on the availability of support mechanisms that are well advertised and dependable.

1.5.2.1 Enablers

- 'At elbow' support is an important enabler of uptake, especially in the early phases where there is a danger that researchers might give up on technologies as they see the costs of adoptions while the benefits might not yet be visible.

  > "Really, hand holding is the way to get people onto these things to a large extent because every problem's different [...] and that's what you need to do, you can't just write a web page or even a tutorial that would cover everything." (information systems professional)

- Continuation of engagement requires the routine availability of training arrangements in a way that is accessible for people.

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[7]This content is available online at <http://cnx.org/content/m24045/1.1/>.

Chapter 2

User-Designer Relations and Requirements

2.1 Understanding Research Practice

2.2 Understanding Available Options

2.2.1 Exploring Possible Uses of Technologies[1]

Potential users of e-Infrastructures often lack the time and resources to explore their possible uses. One respondent commented:

> "I can see that there are things there which we probably could be able to use in the future but first we'd have to work out how [...] if we had the time to actually be able to get far enough into the technology to be able to actually utilise it properly." (researcher)

2.2.1.1 Enablers

- Exemplars and use cases, developed not as demonstrations of technical feasibility but as ways to explore possible uses and socio-technical configurations can help to further uptake by communicating a vision or triggering competitiveness:

    > having stuff where you can show that people have done really new science using those tools [...] it seems to be working quite well in terms of getting engagement and we're seeing that other communities just like these things - like the systems biology communities are beginning to be very keen to play and join in." (researcher)

- Clearly, it is important for the community to formulate clearly where e-Infrastructure usage has made a significant difference to researchers and to disseminate these success stories widely to inspire more researchers to start engaging
- It is important that the early exploration of technological options is supported and conducted as a conversation between researchers, service providers and intermediaries

2.3 Hybrid Knowledge

2.4 Social Organisation

2.4.1 Managing User-Designer Relations[2]

Managing the relationship between users and designers or service providers can be a challenging task for a number of reasons. The current divisions of labour in ICT development and service provision mean that there is often a gap between the social context in which people work on developing technologies and providing services and the contexts in which these get appropriated and used. The work involved in bridging this gap is increasingly recognised as crucial and ways are being devised for practically tackling the issues involved.

Unfortunately, much work in e-Science is driven by technological visions and is not sufficiently grounded in the real-world, day-to-day requirements of researchers, as illustrated by this quote:

> My sense is that [the] e-science project in general has been a little bit too focused on building infrastructure and middleware [...] I fear it's been designed and implemented in a vacuum, so the problem I have with a quite bit of e-science projects is that they are built for general problems and maybe they can solve a class of problems but when we really want to use them you end up finding that they are not good enough" (researcher)

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[1] This content is available online at <http://cnx.org/content/m24636/1.1/>.
[2] This content is available online at <http://cnx.org/content/m20971/1.4/>.

The same respondent pointed to a general problem in software engineering that is particularly vexing in e-Science, the problem of deciding what specific functions to support and how generic to make a piece of software:

"what I fear is that the e-science software so far has been too focused on building general infrastructure and maybe they [would be] better off solving, fewer, smaller [...] problems but at least solving them properly. I think they should at least be a lot more proactive with the specific, with a couple of groups, instead of trying to make all scientists happy maybe try and make the hardcore users happy, and maybe work much closer with them, so instead of trying to be a facility for everyone, try and solve some of the more difficult problems first and that will provide them with some very interesting solutions, rather than try to write something so general that everybody should be able to use it but in the end no one will use it." (researcher)

The choice, of course, who to work closely with and how to scale up to developing software that finds wider application is difficult to make in the abstract and can only be made in the light of experiences gained with specific users and their day-to-day work.

There are, as yet, no guidelines for the development of e-Science software that are based on sound software engineering practice but take into consideration the specific nature of e-Science. While many projects contain elements of closer user-designer relations, the practice followed can very widely.A range of methods get used at, are employed different times in the design lifecycle and with varying degrees of participation by researchers. Very often, participation is limited to distinct phases of the overall project lifecycle or takes the form of formal participation in project review boards etc. where the impact is likely to be limited.

2.4.1.1 Enablers

- A number of programmes such as the JISC VRE programme or the ENGAGE initiative recognise the importance of real end-user involvement and mandate it as a condition for awards.
- A number of mechanisms can be used to provide an environment in which an ongoing dialogue between technology providers, service providers and users can be fostered. These can involve technical elements but often the organisational arrangements and human effort are most crucial.

  "I mean you know we have a sort of common set of ways of interacting with them you know there's obviously their wikis and things that they can post questions on we have a help desk that they can phone up or email questions to or visit if they happen to be here and that's quite responsive but on top of that we have regular user group meetings to, where we'll take the temperature of what people want, we'll put proposals out for debate, we have weekly mailing lists where we'll send round a newsletter to say this is what's happening you know, what are your views and lastly we will because of this consortium based approach that the groups are in we have a regular programme of going out and visiting the leaders of each of the consortia sort of on an annual basis so someone will go and visit the various PI's discuss the problems that they're having, spend a day, two days with them." (service provider)

- It is important to recognise that the relationship between service providers and researchers is not necessarily a one-way road. It would be wrong to think that researchers are passive recipients and users of technological innovations and expertise provided to them. Rather, they can actively take part in shaping service provision. As one social scientist put it:

  "there is sometimes the case that I have downloaded a file and then found out perhaps an error within the data file or lack of priority on a particular variable or a variable missing within the data file that's referred to in the documentation and occasionally I have reported that sort of example to the help desk, and they've usually been, well in fact pretty much every time they've been able to get back and come up with the solution quite rapidly so I find them a very helpful service in that respect."

Actively encouraging input from service users and dealing with requests and suggestions in a professional manner can help to engage researchers as contributors to the service, giving them responsiveness

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