

Social Shaping Perspectives on e-Science and e-Social Science: the case for research support

A consultative study for the Economic and Social Research Council (ESRC)

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### **0. Executive Summary**

This paper reports the outcome of a consultative study commissioned by ESRC with the objective of identifying and evaluating research themes and issues under the general rubric of “social shaping of e-Science and of e-Social Science”. “Social shaping” is

defined very broadly to include all social scientific aspects of the genesis, use, implementation and effects of the new e technologies.

Despite the enormous unfolding investment in eg grid technologies, it seems we know almost nothing about how and why (and by whom) these new technologies will be taken up, nor what will be the likely effects on the nature and conduct of e-Science and e-Social Science research.

The need for attention to these questions is urgent because the initial current investments are establishing systems that will remain in place for some time to come.

The social shaping agenda provides a major opportunity for intervention by, for example, contributing social science expertise in the development of software and in the engineering of the interface.

This agenda also provides the opportunity to contribute to our basic understanding of the genesis, impacts and implications of new technologies – worked through in relation to a new generation of highly influential communication technologies.

Although the research capacities in this area are both extensive and multidisciplinary, these are only just beginning to be drawn upon in understanding the new phenomenon. With the right mode of funding ESRC could effect a major innovation in interdisciplinary collaborative research.

A set of core research themes and associated questions are outlined, which might be used as the basis for a call for research proposals.

It is recommended that ESRC develop a multi faceted programme style initiative, which includes collaboration with and input from other funding bodies including JISC, EPSRC and other research councils.

## **Social Shaping Perspectives on e-Science and e-Social Science: the case for research support 1**

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### **1. Background**

ESRC's current e-Science <sup>2</sup> strategy comprises two strands. The first concerns the application of grid technologies within Social Science (eg the potential of e-Science for qualitative social research). The second relates to the design, uptake and use of e-Science (eg user-centred design issues and the development of grid infrastructure). The proposed new ESRC national E-Social Science Centre is envisaged as key to the delivery of this strategy. To deepen this strategy we need to evaluate the potential of other social science perspectives which might both contribute to and cut across these strands. So the objective of this consultative study was to evaluate the potential of perspectives which follow a broadly "social shaping" (including sociology of technology, anthropology, linguistic, science and technology studies) perspective <sup>3</sup>.

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<sup>1</sup> Many thanks to Catelijne Coopmans for invaluable assistance in the preparation of this report. My thanks also to all the participants in this study, and especially to those who responded so creatively to the somewhat flatfooted "questionnaire".

<sup>2</sup> For definitions of e-Science, e-Social Science and the grid see Appendix 1.

<sup>3</sup> Definitions of social shaping are discussed below, see section 4.9.

## 2. Aim and Scope of this Study

The main questions addressed were:

What is the nature and extent of research already underway in, or of potential contribution to, this area?

What then are the key research themes and issues needing to be addressed?

These initial questions immediately suggest some core lines of inquiry.

There has in recent years been considerable research on general aspects of the genesis and impacts of information and communication technologies. This has generated a substantial body of results and research expertise. So an obvious question is the extent to which the key themes of this previous work is now applicable to the particular case of ICTs in science and social science? For example, what can we transpose from what we know about virtual communities to the particular case of the virtual communities (if that is an appropriate term) of scientists? Are there particular features of scientific organisation and practice which can benefit from the “application” of existing knowledge about communities in general? Conversely, are there features of science which may bear upon and enrich our understanding of the general character of community?

Attention to these questions is urgent because of the sheer speed and scale of investment in e-Science. Once such large resources are committed, their structure and organisation is likely to have lasting consequences: we shall have to live for some time with the effects of our decisions about the design and implementation of these new technologies.

These might be largely construed as questions about the context of uptake and implementation. But there is also a more crucial theory of knowledge issue at stake: what are the effects of new technologies on the nature and practice of research, and on the substance and direction of new academic knowledge? The history of science shows how the adoption of new technologies can have crucial effects in this respect. But how much do we know about the likely effects of the widespread adoption of grid technologies on (social) scientific knowledge?

There is a tendency to distinguish between research which uses the grid and research which is about the grid. This study set out to examine the extent to which these two strands are, or need be, distinct. Is it possible to specify research which integrates an understanding of the social and economic conditions of uptake and use, with the actual development and design practices? In other words, what are the prospects for an interactive social science approach which articulates the advantages of a social shaping perspective for practice and policy?

The aim of the consultative exercise was to document and evaluate existing research on these issues, and to specify the research themes and issues which need to be addressed. It aimed to identify the key work already underway. But it also attempted to extend the potential pool of research resources. For example, to what extent might attention to these questions profitably draw upon previous approaches to the social scientific understanding of new technologies? To what extent might existing theoretical perspectives and empirical frameworks in the social understanding of other technologies be of value in understanding these new (viz. grid) technologies?

### 3. Methods

Bibliographic and online searches were conducted of both existing publications<sup>4</sup> and of recent activities in the area<sup>5</sup>. These activities included recent and imminent conferences, meetings, emailings (eg recent email questionnaires such as that by Nigel Fielding on qualitative research methods), discussions on email lists, websites of research groups, centres, other organisations and funding initiatives.

This generated an initial database of 226 people for whom was obtained website, email addresses and other contact details.

A first round email questionnaire was sent to all 226, yielding responses to date 6 from 166 people. The questionnaire asked respondents to identify “key players” and “other potential researchers”. This process generated a further 179 names. A second round questionnaire was sent to those nominated as a “key player” or by two or more people as someone else working in the area, comprising 116 (of these 179) 2<sup>nd</sup> round names. Thus far, 68 responses have been received. A further 9 unsolicited responses were received from people who received the questionnaire passed on by colleagues or through email lists.

In sum, a total database of 413 was identified of whom 351 were contacted (see Appendix 2). The response rates are: 1<sup>st</sup> round:  $166/226 = 73\%$ ; 2<sup>nd</sup> round:  $77/125 = 62\%$ ; overall:  $243/351 = 69\%$ .

At the same time, a round of more intensive face to face and phone interviews was undertaken. Interviewees were identified on the basis of their evident prowess in the community, as a result of their frequent nomination by respondents to the questionnaire and because of their institutional leadership (heading research centres and institutes or leading major bids for research funding). The study also took advantage of participation in two academic meetings where the author led round table discussions of these issues: international conference on Information, Communication and Society (Oxford iCS/OII, 17-20 September 2003); KNAW Experts Meeting on e-Science (Amsterdam, 25-26 May 2003).

A first draft of the report was sent out to some of the key informants for comments, which were then taken into account in the final report.

### 4. Results

4.1 The high response rates were surprising.

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<sup>4</sup> A small sample of indicative publications is given in Appendix 4.

<sup>5</sup> As discussed in section 4.9, since one purpose of the exercise was to discover variations in respondents’ definitions of “the area”, its precise definition could not be stipulated in advance.

<sup>6</sup> Although more responses continue to be received, these figures are based on the first round response database as “frozen” at 10 Oct 2003.

4.2 The careful and detailed attention to the questions in many returns was also surprising. It is notoriously difficult to excite meaningful returns by email questionnaire.

4.3 The level of interest and enthusiasm for the exercise and for the research area was very impressive. Indicative comments include: “It has been extremely helpful as the questions forced me to ask just what is it that I find most interesting and/or most worthy of research and commentary (respondent 041 7); “This is an interesting idea” (253); “Wow, interesting questions and a difficult area! My angle is to integrate quantitative assessment techniques into science communication investigations. I would love to be involved in any studies of this kind” (352); “Very interesting and an excellent direction for ESRC to be thinking about” (231). It is clear that the consultative exercise both revealed and further stimulated interest in the area.

4.4 With enthusiastic responses came good suggestions of further names to include and consult. Many respondents provided lengthy replies sometimes even attaching copies of full academic papers on the topic. Some also sent reading lists for relevant courses they had recently devised. Many sent urls for further follow up.

4.5 The iCS/OII meeting plus the questionnaire prompted further discussion on some of the major mailing lists eg AoIR (Association of Internet Researchers) with the result that 8 returns were sent in by people not initially targeted.

4.6 The responses were highly international with most of the contact population from UK (58%), followed by USA (18%), Netherlands (9%) and Germany (5%).

4.7 A comparison between questionnaire rounds revealed a decline in the proportion of respondents nominating new “key players” (1<sup>st</sup> round: 73/166 = 0.44; 2<sup>nd</sup> round: 22/77 = 0.28). But there was an increase in the overall rate of generation of new names (ie names of both “key players” and of “others who might be interested in collaborating” Appendix 3, question 6) (1<sup>st</sup> round: 179/166 = 1.07; 2<sup>nd</sup> round: 108/68 = 1.59). This suggests an interesting possible dual feature of the emerging research population. While the responses seem to be converging on a relatively small number of existing “key players”, they also indicate a diverging number of other researchers who might become involved in collaboration.

4.8 On closer inspection it is clear that very few of the “key players” were already using “social shaping ” approaches to look at e-Science and e-Social Science. Rather they seem to have been nominated as people known for work in social shaping more generally. As one respondent put it: “You’re describing an area that basically doesn’t exist yet. So I’m not sure anyone fits the description” (046).

4.9 Outside the UK, a handful of institutions and centres are in the process of setting up programmes of research (eg KNAW proposals for an E-Social Science Institute: IRISS; KNAW Nerd). In the USA some researchers are part of networked initiatives (eg 006, 035, 079, 184). However, with the possible exception of the proposed KNAW institute, there has as yet been little attempt systematically to integrate social shaping perspectives with on going initiatives in e-science or e-social science. So this presents an opportunity for the UK to take the lead in this respect.

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<sup>7</sup> An anonymised code applied to respondents’ quotations.

4.10 Spread of disciplinary expertise. It was anticipated that the key players would include researchers drawn from a very wide range of social sciences: sociology, economics, management, ethnomethodology, communications, anthropology, and science and technology studies. In the event the responses revealed an even wider array of disciplinary interests and expertise, including:

- Anthropology of internet use
- Business studies (eg of effects of disruptive technologies on value chain, and of ubiquitous computing)
- Communication studies and education studies
- Distributed cognition and communities of practice
- History and philosophy of science and technology
- Innovation studies
- Knowledge organisation (taxonomies and ontologies)
- Law and legal perspectives (especially on IPR) and socio-legal perspectives
- Library information science, computer-assisted content analysis, data mining
- Marketing
- Media studies and internet studies
- Organisational analysis, economics and business studies, innovation theory
- Policy studies and political theory
- Psychology of technology use
- Science and technology studies
- Science communication
- Social informatics, CSCW, ethnomethodology
- Social science methodology
- Sociology of consumption (science and academia as consumption of ICTs)
- Sociology of technology

Some respondents additionally pointed out that the entire premise of the exercise underestimated the importance and potential involvement of the humanities (eg 255, 352) and that research funding should be actively structured to include humanities disciplines.

## **5. Mapping the New Research Area: Research Questions and Research Organisation**

5.1 For the purposes of this exercise, “social shaping” was initially defined very broadly “to include all social scientific aspects of the genesis, use, implementation and effects of the new e-technologies.”

Most respondents accepted that when used broadly, “social shaping” was a good enough general label for the relevant interests and approaches. However some cautioned against the narrow interpretation - viz. that “social factors” are somehow causally prior to emerging technologies – since this has been superseded by more sophisticated theories for example, that the “social” and the “technical” are mutually elaborated. This means we need to consider bi directional “impacts” ie both how grid technologies will affect practice, and how the practices of social scientists will affect the development and use of these technologies (048, 176).

5.2 Many respondents expressed concern about what they regard as the restrictive connotations of the terms e-Science and e-Social Science, and were unwilling to adopt uncritically the definitions provided by promoters of these ideas (see Appendix 1). “I tend to think of e-Scholarship rather than of e-Science” (076). Some US respondents refer to the field as i-Science (“i” denoting interactive). Others suggested e-Academia would be much better than e-Science. It was noted that in languages other than English terms like e-Wissenschaft help overcome the sometimes artificial distinctions between e-Science and e-Social Science. In a similar vein, several respondents stressed that to focus solely on research would be to overlook the likely widespread effects on more routine aspects of academic life, teaching, administration, journal operation, refereeing and so on (eg 238). Similarly, respondents pointed to the need to research the use of grid technologies in areas outside science and engineering per se, such as in digital libraries, CSCW, education and crisis management.

5.3 There was a widespread difference in views about the nature and extent of take up and use. Some envisaged positive benefits – for example that systems of peer review might significantly improve with the uptake of new technologies and collaborations (096) – others were sceptical: “Grid technologies will not affect the vast majority of social science research .....a few dozen at best scientists and social scientists can be persuaded to make use of the new technologies” (180). This range of views underscores the point that we badly need to know how actually, on the ground, in everyday usage these technologies are perceived and used. Indeed, a recurrent theme was the need for research on the actual usage of communication technologies. For example, much more knowledge is needed about how to do ICT mediated collaboration (184).

5.4 Many respondents pointed out that there is a widespread lack of knowledge about the existence and purpose of grid technologies and their applications. It is suggested that current usage is fragmentary and ill informed (eg 125). We need to know much more about the distribution and currency of views on grid technologies; which kinds of factors lead potential users to be favourably disposed or otherwise?

5.5 Much emphasis was placed on the need to investigate variations in actual usage by different constituencies. While this is often discussed in general terms, about (e)-*Science* as a whole, it was thought highly likely that different areas of science will respond to and use grid technologies in quite different ways (184). And, again, it is possible that social scientists will have quite different needs from natural scientists, perhaps more related to peer to peer communication than to data sharing (349).

5.6 The responses largely affirm the value of transposing questions and themes about “virtual community” and “virtual society” to the prospective domain of “virtual science”. In this vein, some of the obvious substantive research issues which come to mind include: What social circumstances encourage or inhibit data sharing and collaborative working? How will the implementation of new grid technologies affect this situation? Are patterns of communication between scientists likely to be significantly affected by the adoption and use of grid technologies? Are users likely to be more or less sensitive to IPR concerns? Will the enhanced technical capacity for communication lead to different attitudes to risk, liability and responsibility? Are changing structures of accountability concomitant with changing communication practices? Are we likely to witness the emergence of new concerns about ethics, privacy and trust? What different social and economic factors affect the uptake and use of grid technologies in different

organisational settings? Are changing reward and recognition practices affecting communication practices, and vice versa?

5.7 In particular, the growing body of work on the idea of virtual communities offers themes to be explored in assessing prospects for significant changes in the organisation and conduct of scientific research. We need to extend what is just now beginning to be learnt about knowledge-sharing, intimacy, trust, reciprocity and disclosure (099, 176). This kind of knowledge is essential if we want to develop a “collection of enormous data sharing options within e-Science and e-Social Science, and should be a major contributory factor in their design, development and management” (184).

5.8 In addressing these questions it is important to develop approaches which avoid “fetishising” the technology. Respondents noted that although discussion at the policy level often tends to invoke summary descriptions of “the grid” and its “impacts”, and to adopt rather simple interpretations of core concepts such as “trust” and “sharing”, a lot is to be gained by investigating the nature of these activities in detail, especially given the likelihood that they will change in association with attempts at implementation and adoption. For example, what actually counts as “grid technology” may vary widely, just as what comes to count as trust and sharing as new practices evolve. In these circumstances, it is argued, it is inappropriate to adopt the language of barriers and encouragement as if the effects of the new technologies are already straightforwardly known. Instead, “we need ways of describing datasets that go beyond conventional metadata in order to represent organisational uncertainty around data” (079). The suggestion is that we need to explore ways of conceptualising the phenomenon as, say, networked communication or as distributed practice, with emphasis first and foremost on off-line relations rather than just on the technologies themselves (196).

5.9 Historical comparisons are needed. Respondents remarked that many of these analytic themes were reminiscent of previous experiences with eg ARPANet. What can be learned from this and similar past experiences (048, 054)?

5.10 We also know very little about international comparisons, about for example to what extent different national science policies are pursuing different kinds of “solution”, funding structures and organisation (096). Do these differences lead to variations in take up and use? To what extent does this have a bearing on possibilities for international collaboration?

5.11 With these possible differences in mind we need to look at what in practice the use of Grid technologies will achieve: to what extent, and for whom, will grid computing allow computing to become much more intuitive. For example, will grid technologies actually facilitate many more working calculations (John Law’s notion of “qualculation”) rather than leading to an increase in rigour per se? (003). And will this in turn lead to new scenarios of use, and to what counts as adequate knowledge?

5.12 Answers to these questions can offer a new perspective on old debates about supposedly fundamental differences between science and social science. What sorts of data are or are not amenable to data sharing? Will the deployment of grid technologies make a difference? Given the longstanding disputes between traditions which favour codification versus interpretation, will these technologies favour the view that social science data can be meaningfully interpreted outside of its context of production? What

is the role of the commercialisation of knowledge and of universities in the genesis and use of the new technologies?

5.13 The total population of experts identified in this study can be very roughly divided into 3 main categories:

- i) those researching the social dimensions of the uptake and use of new communications technologies
- ii) those predominantly concerned with developing, implementing and using these technologies. This includes social scientists declaring themselves as having a predominantly methodological interest (eg 228)<sup>8</sup>.
- iii) those researching the social and communication characteristics of social and scientific communities

Although, as yet, little research attempts to span these categories, it is likely that the most profitable outcomes will derive from attempts to operate across the boundaries. It is therefore recommended that in supporting these areas, special attention is given to means of encouraging collaboration and cooperation across existing interests. In particular, it is important that we modify the current tendency to research the “technical” aspects of e-Science (human factors, interface design and requirements engineering) in isolation from the social shaping dimensions.

5. 14. In further pursuit of this question, respondents were asked in particular about the relationship between research which uses the grid and research which is about the grid.

A distinction is often made between research which *uses* the new (grid) technologies and research which is *about* the use of these technologies. Does your work fit most easily into:  
research which uses the new technologies  
research which is about the new technologies  
both

A small minority said their work fell under a 9; a larger minority opted for b; a surprisingly large majority said “both”. A typical comment was “One cannot do b well without doing a, though of course there are many who get away with doing b alone” (255). Or, a more pointed criticism of the implication that a and b *could ever* be separate: “how could you do ethnographies of distributed practice without making them distributed ethnographies” (079).

There was considerable enthusiasm for the idea of conjoining “social shaping” approaches with attempts to develop innovative applications in social science. For example, it was suggested that the technologies could be developed to provide powerful

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<sup>8</sup> Some of the people in this category viewed grid technologies as enabling cross disciplinarity rather than inter disciplinarity: “grid services will facilitate cross discipline analyses of shared data without requiring collaborators to involve practising a completely different discipline” (239)

<sup>9</sup> One extreme response: “I have no interest or expertise in these questions. My interest is in the use of grid technology to actually do social science. I realise other people are interested in other aspects, but I would have thought ESRC should be mainly concerned with funding people to actually do social science.” (225)

tools for mapping scientific controversies; that exciting research and teaching tools could result from efforts to link scientometrics, ideas about web democracy, history of science archives, and intelligent purpose-built web crawlers (224).

5.15 While there are significant opportunities for cooperation and collaboration across disciplines, both within and beyond the social sciences, several respondents commented on the structural problems they perceived to be associated with the UK funding of such an inter and cross disciplinary area. Others contrasted the UK situation with what they saw as the favourable conditions for interdisciplinary support in the Netherlands (eg 319) 10. For example, the KNAW (2003) proposals envisage a new research institute which fully integrates humanities, computation and “science studies” – the Dutch equivalent of a broadly construed social shaping perspective. This kind of integration also provides the opportunity to explore new forms of collaboration and new ideas about the possible “utility” of social shaping approaches.

5.16 In the UK, a current danger is that social shaping falls between two funding stools: it is perceived as either insufficiently technical, and so inappropriate to the (natural) science funding rubric, or as insufficiently addressing the traditionally defined social scientific agenda of researching “social impacts”. It is recommended that we aim to develop a funding structure which encourages the active participation of social shaping research in scientific and social scientific research, and vice versa. This highlights the need to explore innovative models of cooperation and collaboration. An example is suggested by one of the short listed bidders for the ESRC e-Social Science Centre competition. He inquired about the possibility of incorporating a social shaping perspective into his final bid, specifically by flagging the intention of applying for second round funds to follow the “social shaping of our programme as it unfolds. The aim would be track the effects of grid technologies on social science - and of course vice versa” (174).

## **6. Conclusions and Recommendations**

6.1 There is considerable interest in the development and application of the social shaping agenda in relation to e-Science and e-Social Science. The research community recognises the urgency of understanding how these new technologies are being developed, how they will be used and what are their impacts and implications.

6.2 There is also considerable capacity for developing this new area both in virtue of expertise in social shaping which can be applied to grid technologies, and through the potential collaboration between interface designers and experts in science and social science methodology and social shaping researchers.

6.3 In broad summary, the various research questions identified in section 5 might be grouped into 4 main themes:

The Genesis of new Grid Technologies. Historical comparisons with the development of other communications technologies and ICTs. The broader institutional and political

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<sup>10</sup> This reflects in part the Dutch use of the organising concept “*wissenschaft*” rather than “science and social science” (see section 5.2).

contexts. How do these efforts relate to the wider pressures on accountability, value for money and the commercialisation of research?

Social Organisational Features of Design, Uptake and Use. How in practice are the new technologies being used/will they be used? How do the many concerns about the operation of virtual communities and organisation – sharing, privacy, trust, collaboration, IPR – map onto the particular case of “virtual science”? To what extent do new grid technologies challenge existing social scientific knowledge about the social shaping of new technologies?

The Changing Nature of Science and Social Science. What are the implications for the nature and practice of science and social science and for the nature and direction of new knowledge? To what extent can these questions about e-Science and e-Social Science research be usefully related to other areas of scholarship, such as the humanities, and to more routine aspects of academic practice such as teaching and publishing?

International Comparisons. To what extent do different national science policies signal other kinds of attempts to fund and organise these developments?

### **Appendix 1: Some e-Definitions**

**e-Science** "means science increasingly done through distributed global collaborations enabled by the Internet, using very large data collections, terascale computing resources and high performance visualisation"

“In the future, **e-Science** will refer to the large scale science that will increasingly be carried out through distributed global collaborations enabled by the Internet. Typically, a feature of such collaborative scientific enterprises is that they will require access to very large data collections, very large scale computing resources and high performance visualisation back to the individual user scientists.”

“The World Wide Web gave us access to information on Web pages written in html anywhere on the Internet. A much more powerful infrastructure is needed to support e-Science. Besides information stored in Web pages, scientists will need easy access to expensive remote facilities, to computing resources - either as dedicated Teraflop computers or cheap collections of PCs - and to information stored in dedicated databases.”

“The **Grid** is an architecture proposed to bring all these issues together and make a reality of such a vision for e-Science. Ian Foster and Carl Kesselman, inventors of the Globus approach to the Grid define the Grid as an enabler for Virtual Organisations: ‘An infrastructure that enables flexible, secure, coordinated resource sharing among dynamic collections of individuals, institutions and resources.’ It is important to recognize that resource in this context includes computational systems and data storage and specialized experimental facilities.”

"The word **Grid** is chosen by analogy with the electric power grid, which provides pervasive access to power and, like the computer and a small number of other advances, has had a dramatic impact on human capabilities and society. We believe that by providing pervasive, dependable, consistent and inexpensive access to advanced computational capabilities, databases, sensors and people, computational grids will have a similar transforming effect, allowing new classes of applications to emerge."

E-Science is thus envisaged as a major agent of change: “e-Science is about global collaboration in key areas of science, and the next generation of infrastructure that will

enable it.....e-Science will change the dynamic of the way science is undertaken.” (John Taylor, Director General of Research Councils, UK Office of Science and Technology)

A **National e-Science Centre** is based in Edinburgh (and is a collaboration between Edinburgh and Glasgow Universities). This Centre supervised the setting up of a “National Grid” of computing and data resources including eight Regional Centres based at the Universities of Newcastle, Belfast, Manchester, Cardiff, Cambridge, Oxford, Southampton and Imperial College, London.

See for example: <http://www.escience-grid.org.uk/>, <http://www.rcuk.ac.uk/escience/> and <http://www.nesc.ac.uk/>

By analogy **e-Social Science** is “the conduct of social science through global collaborations.... drawing on the computational power of grid technologies.”

In late 2002 ESRC invited calls for proposals for small scale **pilot projects in e-Social Science**, with the aim of exploring the potential application of Grid technologies within the social sciences. “Proposals should address substantively focussed research questions, based upon the novel use of either quantitative or qualitative or mixed data sources. Proposals are encouraged from all areas of social science. Proposals are invited on the following topic areas, although this is by no means an exclusive list: Data Management, Disclosure and control, Data Fusion, Data Mining, Data Visualisation, Simulation, and Collaborative Analysis tools”.

In April 2003 ESRC announced calls for proposals for a **National Centre for E-Social Science**, which will have the overall aim of “stimulating the uptake and use by social scientists of new and emerging Grid-enabled computing and data infrastructure both in quantitative and qualitative research.” See <http://www.esrc/esrccontent/DownloadDocs/escicentrespec.doc>

There is also, however, some scepticism about the significance of the (claimed) difference between the effects arising from grid technology and from its predecessors. For example, Elijah Wright provided the following characterisation:

“Doesn't grid sound like I2 (Internet 2) all over again? .... “grid” computing is being pushed as mostly cell-based - while I2-style research was characterized by its focus on massive bandwidth consumption without much regard for the computation happening at the peripheries. So,  
paradigm 0: *gosh this network is slow.*  
paradigm 1 (I2): *we need more bandwidth, we'll figure out what to do with it later...*  
paradigm 2 (grid): *golly, now that we have a lot more bandwidth, it sure would help to be able to generate computationally intensive problems that take advantage of that... whether they require massive data transfer or just massive amounts of intercommunication...*”

## Appendix 2: List of people contacted

\* denotes face to face or phone interview

Abbate	Janet	University of Maryland, USA
Agar	Jon	Cambridge University
Agre	Philip	University of California, Los Angeles USA
Aguillo	Isidro	CINDOC-CSIC Madrid, Spain
Ahmad	Khurshid	University of Surrey
Alter	Steven	University of San Francisco, USA
Anderson	Anne	University of Glasgow
Anderson	Stuart	Edinburgh eScience Centre
Anderson*	Ben	University of Essex
Atkinson	Malcolm	National e-Science Centre
Bakardjieva*	Maria	University of Calgary, Canada
Banks	Marcus	University of Oxford
Bannon	Liam	University of Limerick
Barjak	Franz	University of Applied Sciences Solothurn Northwestern Switzerland
Barry	Andrew	Goldsmiths College
Beaudouin-Lafon	Michel	University Paris-Sud, France
Beaulieu	Anne	Netherlands Institute for Scientific Information Services (NIWI)
Beaulieu	Micheline	University of Sheffield
Beckett	Elizabeth	University of Oxford
Beek*, van	Krijn	Dutch Council for Social Development
Benford	Steve	University of Nottingham
Bennis	Hans	Meertens Institute, Netherlands
Bergman	Max	University of Neuchatel, Switzerland
Bernard	Russell	University of Florida, Gainesville USA
Besselaar*, van den	Peter	Netherlands Institute for Scientific Information Services (NIWI)
Bijker*	Wiebe	University of Maastricht, Netherlands
Billig	Michael	Loughborough University
Bingham	Nick	Open University
Birkin	Mark	University of Leeds
Birnbaum	Michael	California State University, Fullerton USA
Bisby	Frank	University of Reading
Bohlin	Ingemar	Göteborg University, Sweden
Boot	Peter	Constantijn Huygens Institute, Netherlands
Bosnjak	Michael	University of Freiburg, Germany
Bowers	John	University of California, Santa Barbara USA
Bowker	Geoff	University of California, San Diego USA
Brady	Mike	University of Oxford
Brannen	Julia	University of London
Brent	Edward	IdeaWorks USA
Breuer	Franz	University of Münster, Germany
Brey	Philip	University of Twente, Netherlands
Brown	Nik	University of York
Bryman	Alan	Loughborough University
Brynjolfsson	Eric	Massachusetts Institute of Technology (MIT) USA
Buchanan	Tom	University of Westminster
Buckingham	David	University of London
Buitelaar*	Paul	Saarbrücken University, Germany
Burk	Dan	University of Minnesota Law School

Burnhill	Peter	University of Edinburgh
Burrows*	Roger	University of York
Burt*	Eleanor	University of St Andrews
Button	Graham	Grenoble Xerox Laboratory
Caldas*	Alexandre	University of Sussex
Camp	Jean	Harvard University, USA
Campbell*	Heidi	University of Edinburgh
Carter*	Denise	University of Hull
Chadwick	Andy	Oxford Internet Institute
Chalmers	Matthew	University of Glasgow
Chambers*	Stephan	University of Oxford
Chan	Yolande	Queen's University, Kingston (Ontario), Canada
Chattoe	Edmund	University of Oxford
Christensen	Clay	Harvard University, USA
Ciborra	Claudio	London School of Economics
Clark	Nigel	Open University
Clement	Andrew	University of Toronto, Canada
Coffey	Amanda	Cardiff University
Cole	Keith	University of Manchester
Coleman	Stephen	University of Oxford
Conole	Grainne	University of Southampton
Corbett	Greville	University of Surrey
Corti	Louise	University of Essex
Cothey	Viv	University of Wolverhampton
Crabtree	Andrew	University of Nottingham
Craglia	Max	University of Sheffield
Crouchley	Robert	Lancaster University
Dale	Angela	University of Manchester
David	Matthew	University of Plymouth
David*	Paul	University of Oxford
De Roure	David	University of Southampton
Deacon	David	Loughborough University
Dew	Peter	University of Leeds
Diatlov*	Vladimir	University of Southampton
Dicks	Bella	Cardiff University
Doornik	Jurgen	University of Oxford
Dorling	Danny	University of Leeds
Dourish	Paul	University of California, Irvine USA
Dovey	Matthew	University of Oxford
Downey	Gary	Virginia Polytechnic Institute, Blacksburg USA
Draper	Steve	University of Glasgow
Dutton*	Bill	University of Oxford
Earl	Michael	University of Oxford
Eberle	Thomas	University of St Gallen, Germany
Edwards	Pete	University of Aberdeen
Elliot	Mark	University of Manchester
Elvebakk	Beate	University of Oslo, Norway
Evans	Rob	Cardiff University
Facer	Keri	University of Bristol
Faulbaum	Frank	University of Duisburg-Essen, Germany
Featherstone	Mike	University of Nottingham

Fielding	Nigel	University of Surrey
Finholt	Thomas	University of Michigan, USA
Firth	David	University of Oxford
Fischer	Michael	University of Kent
Fitzpatrick	Geraldine	University of Sussex
Foot	Kirsten	University of Washington, USA
Foster	Ian	University of Chicago, USA
Fox	Geoffrey	Indiana University, USA
France	Alan	University of Sheffield
Frankland	Linda	University of Oxford
Franklin	Sarah	Lancaster University
Fraser	Mike	University of Nottingham
Friday	Adrian	Lancaster University
Fry	Jenny	Netherlands Institute for Scientific Information Services (NIWI)
Fujimura	Joan	University of Wisconsin, Madison USA
Gardner	Michael	University of Essex
Garson	David	North Carolina State University, USA
Gavaghan	David	University of Oxford
Gaver	Bill	Royal College of Art
Gellersen	Hans	Lancaster University
Geser	Hans	University of Zürich, Switzerland
Gibbs	Graham	University of Huddersfield
Gilbert	Nigel	University of Surrey
Gillespie	Tarleton	Cornell University
Goble	Carole	University of Manchester
Golding	Peter	Loughborough University
Grabosky	Peter	Australia's National University, Canberra
Graham	Andrew	University of Oxford
Gresham	John	Kenrick Glennon Seminary, St Louis USA
Grint	Keith	University of Oxford
Hagendijk	Rob	University of Amsterdam, Netherlands
Halfpenny*	Peter	University of Manchester
Hall	Wendy	University of Southampton
Hardey*	Mike	University of Newcastle upon Tyne
Harley	John	Ernst & Young
Harmelen, van	Frank	Vrije Universiteit Amsterdam, Netherlands
Harnad	Stevan	University of Southampton
Harper	Richard	University of Surrey
Harris	Martin	University of Essex
Harrison	Tina	University of Edinburgh
Hay	Donald	University of Oxford
Haythornthwaite*	Caroline	University of Illinois, Urbana-Champaign USA
Heath	Christian	King's College London
Heath	Anthony	University of Oxford
Heimeriks	Gaston	University of Amsterdam, Netherlands
Hellsten	Iina	Netherlands Institute for Scientific Information Services (NIWI)
Hendry	David	University of Oxford
Hess	David	Rensselaer Polytechnic Institute, USA
Hetherington	Kevin	Lancaster University
Hewson	Claire	Bolton Institute
Hey	Tony	EPSRC

Hilgartner	Steve	Cornell University
Hindmarsh	Jon	King's College London
Hine*	Christine	University of Surrey
Hodgson	Susan	University of Sheffield
Holdaway	Simon	University of Sheffield
Hølge-Hazelton	Bibi	Roskilde University, Denmark
Hovy	Eduard	University of Southern California, Marina del Rey USA
Hughes	John	Lancaster University
Hunter	Jane	University of Queensland, Australia
Ingwersen	Peter	Royal School of Library and Information Science, Copenhagen Denmark
Introna	Lucas	Lancaster University
James	Allison	University of Sheffield
Jankowski*	Nicholas	University of Nijmegen, Netherlands
Jasanoff	Sheila	Harvard University, USA
Jeffery	Keith	Rutherford Appleton Labs
Jeffreys*	Paul	University of Oxford
Jirotko*	Marina	University of Oxford
Jones	Kip	De Montfort University
Jong*, de	Gaspard	Netherlands Institute for Scientific Information Services (NIWI)
Karasti	Helena	University of Oulu, Finland
Keeble	Leigh	University of Teesside
Kelle	Udo	University of Vechta, Germany
King	John	University of Michigan, USA
Knorr-Cetina*	Karin	University of Bielefeld, Germany
Koenig	Thomas	University of Göttingen, Germany
Krantz	John	Hanover College, USA
Kretschmer	Martin	Bournemouth University
Kretschmer	Hildrun	Netherlands Institute for Scientific Information Services (NIWI)
Kuutti	Kari	University of Oulu, Finland
Lash	Scott	Goldsmiths College
Latour	Bruno	Ecole de Mines de Paris, France
Laurillard	Diana	Open University
Lee	Nick	Keele University
Lee	Stuart	University of Oxford
Lee	Raymond	Royal Holloway, University of London
Lenoir	Tim	Stanford University, USA
Lessig	Larry	Stanford University, USA
Lievrouw	Leah	University of California, Los Angeles USA
Light	Ann	University of Sussex
Livingstone	Sonia	London School of Economics
Lloyd	Ian	University of Strathclyde
Lloyd	Ashley	University of Edinburgh
Loader	Brian	University of Teesside
Luff	Paul	King's College London
Lynch	Michael	Cornell University
Lyon	Stephen	University of Durham
Lyon	David	Queen's University, Kingston (Ontario), Canada
MacKenzie	Donald	University of Edinburgh
Mackenzie Owen	John	University of Amsterdam, Netherlands
MacMillan	Katie	Loughborough University

MacQueen	Hector	University of Edinburgh
Maiden	Neil	City University London
Mangabeira	Wilma	Middlesex University
Mann	Chris	University of Cambridge
Marres	Noortje	University of Amsterdam, Netherlands
Mason	Jennifer	University of Leeds
Mason	Bruce	Cardiff University
Masser	Ian	(visiting) University College London
Matzat	Uwe	University of Düsseldorf, Germany
May	Tim	University of Salford
Mayer-Schoenberg	Viktor	Harvard University, USA
McCarty*	Willard	King's College London
McEnergy	Tony	Lancaster University
Merz	Martina	Swiss Federal Institute of Technology, Zurich
Michael	Mike	Goldsmiths College
Miller	Danny	University College London
Mruck	Katja	Freie Universität Berlin, Germany
Muhr	Thomas	ATLAS.ti
Muller	Henk	University of Bristol
Musson	David	University of Oxford
Nash	Victoria	University of Oxford
Nentwich*	Michael	Austrian Academy of Science
Nerbonne	John	University of Groningen, Netherlands
Neyland	Daniel	University of Oxford
Nissenbaum	Helen	New York University, USA
Norris	Pippa	Harvard University, USA
Norris	Clive	University of Sheffield
Olsen	Gary	University of Michigan, USA
Olson	Judy	University of Michigan, USA
Orlikowski	Wanda	Massachusetts Institute of Technology (MIT) USA
Palfrey	John	Harvard University, USA
Palmer	Carole	University of Illinois, Urbana-Champaign USA
Pawson	Ray	University of Leeds
Peters	Simon	University of Manchester
Pilsbury	David	World Universities Network
Pitt	Lisa	University of Edinburgh
Pleace	Nicholas	University of York
Procter	Rob	University of Edinburgh
Psathas	George	Boston University, USA
Purdam	Kingsley	University of Manchester
Rall*	Denise	Southern Cross University, Lismore NSW, Australia
Randall	Dave	Manchester Metropolitan University
Rappert	Brian	University of Nottingham
Ratto	Matt	Netherlands Institute for Scientific Information Services (NIWI)
Rayner	Steve	University of Oxford
Rayson	Paul	Lancaster University
Read	Rupert	University of East Anglia
Reddy	Colin	Netherlands Institute for Scientific Information Services (NIWI)
Reichertz	Jo	University of Duisburg-Essen, Germany
Reips	Ulf-Dietrich	University of Zürich, Switzerland
Renn	Jürgen	Max Planck Institute for the History of Science, Germany

Renold	Emma	Cardiff University
Richards	Lyn	QSR International Pty Ltd, Australia
Robb	Margaret	University of Oxford
Robinson	Peter	De Montfort University
Robinson	John	University of Maryland, USA
Rodden	Tom	University of Nottingham
Rodriguez Medina	Leandro	State University of New York, Stony Brook USA
Rogers	Richard	University of Amsterdam, Netherlands
Rogers	Yvonne	University of Sussex
Rose	Richard	University of Oxford
Rosen	Paul	University of York
Ross	Seamus	University of Glasgow
Rouncefield	Mark	Lancaster University
Rousseau	Ronald	Polytechnic University Brugge Oostende, Belgium
Ryan	Nick	University of Kent
Sandvig	Christian	University of Oxford
Sassen	Saskia	University of Chicago, USA
Scharnhorst	Andrea	Netherlands Institute for Scientific Information Services (NIWI)
Schauder	Don	Monash University, Australia
Schmidt	William	Michigan State University
Schmidt	Kjeld	IT University of Copenhagen, Denmark
Schneider	Steve	State University of New York Institute of Technology, USA
Scholl	Wolfgang	Humboldt University Berlin, Germany
Schroeder	Ralph	Chalmers University of Technology, Sweden
Schürer*	Kevin	University of Essex
Seale	Clive	Goldsmiths College
Selwyn	Neil	Cardiff University
Shadbolt	Nigel	University of Southampton
Shapiro	Dan	Lancaster University
Sharrock	Wes	University of Manchester
Shephard	Neil	University of Oxford
Shepherd	Adrian	Birkbeck College
Shove	Elizabeth	Lancaster University
Sillitoe	Paul	University of Durham
Silverstone	Roger	London School of Economics
Simon	Bart	Concordia University, Montreal Canada
Slack	Roger	University of Edinburgh
Slater	Don	London School of Economics
Smart	Carol	University of Leeds
Snellen*	Ignace	Erasmus University Rotterdam, Netherlands
Soothill	Keith	Lancaster University
Sörensen*	Knut	University of Trondheim, Norway
Spence	Michael	University of Oxford
Star	Leigh	University of California, San Diego USA
Stark	Thom	Stark Realities, USA
Steed	Anthony	University College London
Stewart	Iain	Durham eScience Institute
Steyaert	Jan	Fontys Hogescholen, Eindhoven, Netherlands
Stronks	Els	Utrecht University, Netherlands
Suber	Peter	Earlham College, Richmond USA
Suchman	Lucy	Lancaster University

Swiss	Thomas	University of Iowa, USA
Tacchi	Jo	University of Oxford
Tagg	Clare	Partnership Tagg Oram UK
Taylor*	John	Glasgow Caledonian University
Teasley	Stephanie	University of Michigan, USA
Thaller	Manfred	University of Cologne, Germany
Thelwall	Mike	University of Wolverhampton
Thomas	Graham	University of East London
Thomas	Martyn	University of Oxford
Thrift*	Nigel	University of Bristol
Treloar	Andrew	Monash University, Australia
Turkle	Sherry	Massachusetts Institute of Technology (MIT) USA
Uszkoreit*	Hans	Saarbrücken University, Germany
Valentine	Gill	University of Sheffield
Van House	Nancy	University of California, Berkeley USA
Vanhoutte	Edward	Centrum voor Teksteditie en Bronnenstudie, Gent, Belgium
Vann	Katie	Netherlands Institute for Scientific Information Services (NIWI)
Varian	Hal	University of California, Berkeley USA
Vaver	David	University of Oxford
Vogel	Carl	Trinity College Dublin
Voorbij	Hans	Utrecht University, Netherlands
Wagner	Caroline	University of Amsterdam, Netherlands
Wagner*	Caroline	University of Amsterdam/Rand Organisation
Wajcman	Judy	Australia's National University, Canberra
Wakeford	Nina	University of Surrey
Wall	David	University of Leeds
Walsh	John	University of Illinois, Chicago USA
Watson	Rod	University of Manchester
Waverman	Len	London Business School
Webster	Andrew	University of York
Webster	Juliet	Trinity College Dublin
Wernick	Paul	University of Hertfordshire
Wessels	Bridgette	University of Sheffield
Whalen	Jack	Xerox PARC, USA
Whittaker	Steve	University of Sheffield
Williams	Matthew	Cardiff University
Williams*	Robin	University of Edinburgh
Wilson	Andrew	Lancaster University
Winner	Langdon	Rensselaer Polytechnic Institute, USA
Wittenburg*	Peter	Max Planck Institute for Psycholinguistics, Netherlands
Woolgar	Steve	University of Oxford
Wouters*	Paul	Netherlands Institute for Scientific Information Services (NIWI)
Wright	Patricia	Cardiff University
Wyatt	Tristram	University of Oxford
Wyatt*	Sally	University of Amsterdam, Netherlands
Yearley	Steve	University of York
Zeitlyn*	David	University of Kent
Zinberg	Dorothy	Harvard University, USA
Zittrain	Jonathan	Harvard University, USA

### Appendix 3: Sample questionnaire

Dear

ESRC have asked me to do a scoping report to identify issues and problems they should be funding around "the social shaping of e-Science and e-Social Science".

Despite the enormous unfolding investment in eg grid technologies, it seems we know almost nothing about how and why (and by whom) these new technologies will be taken up, nor what will be the likely effects on the nature and conduct of e-(Social)Science research. "Social shaping" is defined very broadly to include all social scientific aspects of the genesis, use, implementation and effects of the new e technologies.

On the basis of initial searches we have selected a number of people with interests or potential interests in this area. So we are keen know where and how you see your work fit in (if at all), and if you have any views on what issues and questions ESRC should be funding in this area. Would you be so kind as to help us please by taking a few moments to respond to the brief questions below?

Many thanks for your help

Steve

1. We have thus far identified a number of questions and issues that fall within the remit of social shaping of e-Science and e-Social Science. Examples are:

What social circumstances encourage or inhibit data sharing and collaborative working? - How will the implementation of new grid technologies affect this situation? - How will the new grid technologies affect the methodologies employed by scientists and social scientists? - How will patterns of communication between scientists be affected? - To what extent will IPR be an issue? - Can we anticipate different attitudes to risk, liability and responsibility? - Are changing structures of accountability concomitant with changing communication practices? - What are the issues around ethics, privacy and trust? - What different social and economic factors affect the uptake and use of grid technologies in different organisational settings? - How can scientists and social scientists be persuaded to make use of the new technologies?

Which of these questions best describe your own work? Which others should we add?

2. We have also identified a number of disciplinary perspectives that come under the very broad rubric of "social shaping of e-Science and e-Social Science". Examples are:

Sociology of technology, science and technology studies  
Social informatics, CSCW, ethnomethodology  
Library information science, computer-assisted content analysis, data mining  
Organisational analysis, economics and business studies, innovation theory  
Science communication

History and philosophy of science and technology  
Communication studies and education studies  
Psychology and anthropology of technology use  
Media studies and internet studies  
Social science methodology

Which of these disciplinary perspectives best fits with your own work? Or, if none of these apply, how would you characterise your work?

3. Could your work be reasonably described as:

social shaping of e-(Social)Science  
social shaping of other technologies  
neither (please specify why not)

4. Frequently, a distinction is made between research which *uses* the new (grid) technologies and research that is *about* the use of these technologies. Does your research fit most easily into:

research which uses new technologies  
research which is about the use of new technologies  
both

5. Please nominate 3 (or more) people who you regard as the key players in this area:

6. Can you think of others who, although not working within a “social shaping” remit, may be interested in collaborating in “social shaping of e-Science and e-Social Science” projects or initiatives?

Thanks again!

#### **Appendix 4: A small sample of indicative readings relating to the social shaping of e-Science and e-Social Science**

(NB This is absolutely not a representative, let alone a comprehensive bibliography.)

Beaulieu, Anne, (2003) ‘Mediating ethnography: the Internet, situated knowledge and objectivity in anthropology’, paper for the Workshop ‘Objects of Objectivity’, September, NERDI.

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operation and Development (OECD), Directorate for Science, Technology and Industry (DSTI), Committee for Scientific and Technological Policy (CSTP)

Roberts, Kathryn A. & Richard W. Wilson, (2002) 'ICT and the Research Process: Issues Around the Compatibility of Technology with Qualitative Data Analysis', *Forum Qualitative Social Research*, Volume 3, No. 2 – May.

<http://www.qualitative-research.net/fqs-texte/2-02/2-02robertswilson-e.htm>

Steering Committee on Research Opportunities Relating to Economic and Social Impacts of Computing and Communications, National Research Council, *Fostering Research on the Economic and Social Impacts of Information Technology*

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Walsh, John P. & T. Bayma, (1996) 'Computer networks and scientific work,' *Social Studies of Science* 26, 661-703.

Wouters, Paul, (2000) 'The impact of the Internet on the sciences'. Paper presented at 4S/EASST conference Worlds in Transition: Technoscience, Citizenship and Culture in the 21<sup>st</sup> Century. September 27-30, University of Vienna, Austria.

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