

Multidisciplinary research into new technologies: Collaboration and Breakdown.

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The Internet has had and continues to have deep and long-standing social implications, and as it continues to be designed and developed for applications spanning everyday life, commerce, government, education, creativity, science and research, there is a recognition of a need for a stronger, better informed, social shaping agenda. This was the incentive for a joint MIT-OII workshop held in April 2005, to address the question of how to do research into the social implications of new technologies, with a view to this research contributing to the design process. The workshop brought together participants from a broad range of disciplinary and methodological perspectives in the social sciences, political sciences, computer science, futures studies, law, economics, new media, cultural studies, philosophy and other areas (Dutton, Carusi & Peltu, in press). The workshop was a good example of multidisciplinary dialogue in action in the socio-technological domain, as much for the areas in which there was consensus as for those where there was not. Disagreement, misunderstanding and lack of a common language are not unusual for multi-disciplinary discussions and collaborations. The lack of a common language at this workshop, however, seemed often to revolve around the *values* of participants; that is, social, political as well as research values. This seemed to be of significance in a discussion concerning the social shaping of technologies. In many respects, it is to be expected that a social shaping agenda of technologies should bring into play divergent and often competing sets of values, and this workshop was not an exception.

We undertook an analysis of the workshop in order to study the interplay of values as underlying motivators for consensus, dissent or breakdowns in engagement among participants. Our aim in the analysis was:

- to understand the role of values in multidisciplinary discussion on new technologies, by distinguishing, as far as possible, which values were at play and what was the relation between them;
- to make suggestions for the facilitation of multidisciplinary events and projects for the social design of new technologies.

While Dutton, Carusi & Peltu (in press) gives a full report on the workshop and supporting papers, this paper presents some of the detailed findings regarding the range of values and their inter-relationships. The workshop was a particular event, and as such, the

generalisability of our findings is tentative at this stage. However, we believe that the group was representative of multi-disciplinary dialogue in the area of new technologies, and that the patterns we have identified in our analysis of its participants' discourse raise important issues about multidisciplinary communication that have wider resonances.

Methodology

Recordings of the workshop were transcribed and analysed, looking at, in particular, the degree to which there was engagement among participants, where breakdowns occurred and what had elicited them. The analysis was done qualitatively, using methods of holistic or situation interpretation founded in hermeneutics and ethnomethodology (for example, Stahl 2006 (chapter 4), Gadamer 1960/1988, Habermas, 1985). It was supported by a mapping of the discourse, using MindManager, in order to try to capture the rich detail of the discussion. We made no attempt to do a quantitative analysis of the frequency of the topics discussed, but rather tried to ensure that topics that emerged during the discussion were represented in the map. We tracked whether topics were taken up by other participants, and how they were taken up, in particular, how much continuity and agreement with respect to meaning of terms used there was in the uptake of topics.

Establishing whether or not there is agreement is difficult. Agreement and disagreement can pertain to the meanings of words, and the values associated with words. The definitions of words often appear to be purely descriptive, but often carry with them research and social values. An example is the word 'user' which appears to be neutral from one research field (for example, Human Computer Interaction Studies) but not in another: some of the social scientists at the event felt that it indicated a pre-selection of the target audience of design as being those who are already positioned within a computing world.

During interpretation, particular attention was paid to uptake, engagement and breakdown.

Uptake was taken to occur when:

- the same term was used by participants in response to each other;
- the same term was not used but some anaphoric reference ('this', 'that', 'it', etc.) related utterances to one another;
- either of these, together with non-verbal cues linking utterances (gaze, tone, gesture, etc).

Engagement was taken to occur when there was uptake in any of the senses above, as well as discussion of the point, either to elaborate upon it, or to disagree with it.

Breakdown occurred when there was uptake but not engagement, sometimes even when interlocutors seemed to believe there was.

Breakdowns were judged to have occurred by contrast and comparison to other parts of the discussion, where, for example, there was uptake of terms by respondents to an initial position or statement, and where participants engaged in an incremental re-statement of the topic or problem. The discourse as a whole was analysed for indications of implicit value-systems of the participants, with respect to political, social and research values. For example, we paid special attention to what participants thought counted as 'good' research, and what they seemed to believe were the aims and justifications of research into technologies, both in terms of benefits to the research itself, to the technologies, and to broader social and political concerns.

The interpretation attempted to grasp the intentions of participants in the discussion in making their utterances. However, because the way in which people use terms is not always transparent to them (Polanyi (1966), Gadamer (1960/1988), Garfinkel (1967)), especially with respect to values, and because we were looking specifically at factors which were often, though not always, below the level of conscious, deliberate intentions, we did not always settle interpretations by reference to these, but tried to reconstruct implicit structures of value. In other words, values are not always stated explicitly, so the analysis had to tease out implicit views and values. (see for example Carusi, 2006)

In this paper, we discuss the most important themes to have emerged from the workshop and the analysis, in an attempt to show how values and value-systems inform the social dynamics of multi-disciplinary collaboration in the domain of social studies of technology. This is of particular relevance to a social-shaping of technology agenda. Technologies have social values embedded in them anyway; informed social shaping needs to be aware of the values it is bringing to technology.

The paper is divided into the following sections:

- 1) Background on the social-shaping agenda in relation to the design of the Internet and the need for multi-disciplinary research and design teams
- 2) A report on some of the most important value differences discovered at this event
- 3) Suggestions regarding generalisable hypotheses
- 4) Suggestions regarding the conduct of multidisciplinary research.

Background

The Internet exemplifies an emergent social technology that has co-evolved through the contributions of many individuals, groups and institutions, as was indicated at the workshop by one of the designers of the Internet, David Clark, Senior Research Scientist at MIT and a convener of the event. He recalled:

I have been working on the Internet since about 1975, when there were twelve of us and we could do anything we wanted. Sometime in the 1990s, I had this revelation that we had in fact designed the Internet to try and deal with the unknown application, to try and optimize for change. But when I have tried to understand what direction we were going in, what was pushing back on us and what was happening, I realize the forces that were shaping the Internet were not the forces of technical innovation. The techies were not in charge. We had to look at issues of investment and industrial structure which we had created inadvertently. It had not been obvious to us in 1975, as much as it is now, that the modularity of its interfaces defines an industry structure.'

Because it is not always been obvious what might be the social implications of the Internet, Clark and others involved in Internet development realised that there was a “need to engage people who have skills other than the technical engineering skills that the sector need”. This was the main impetus for holding the workshop, to see what kind of multi-disciplinary research could be effective in a social shaping agenda in Internet design and development.

Examples of engagement

An example of engagement – that is, where participants are explicitly taking each other up, using the same terms, and seem to be aware of themselves as referring to the same thing – occurred in a series of progressive re-statements of the problems regarding how to distinguish which technologies to focus on, and how to predict what new technologies would emerge and what their social implications would be.

From 'order of magnitude' to 'technology spiral' to 'synergistic technology'

One of the ways in which the unexpected occurs when there is a great leap in orders of magnitude between the intended use of a technology as it is being developed, and its uptake.

'Anytime you get an order of magnitude in some technology, strange things are going to happen to the way it is used.' [quoting prior speaker]. So I would say that one way of looking at or for emerging technologies is to look to see where those 'order of magnitude' changes are likely to be taking place over the next five or ten years or what ever range you have in mind. [...]

The linearity of orders of magnitude gave way to technology spirals at a later point of the discussion:

In response to that point, it seems to me is what you do seem to get, with your sniffer devices, is technology spirals. Some kind of innovation like that and you'd immediately have someone who is in the business of bomb-making, innovating with something that couldn't be detected by sniffer technology or some kind mask for bad smells, that is technological innovation in itself. Just as when the police first had radar guns in this country then you could buy a device that would detect the radar gun. You get a spiral which is actually sometimes not entirely productive or entirely counter-productive. It's a bit like your thing about the order of magnitude improvement, especially the storage thing. [...]

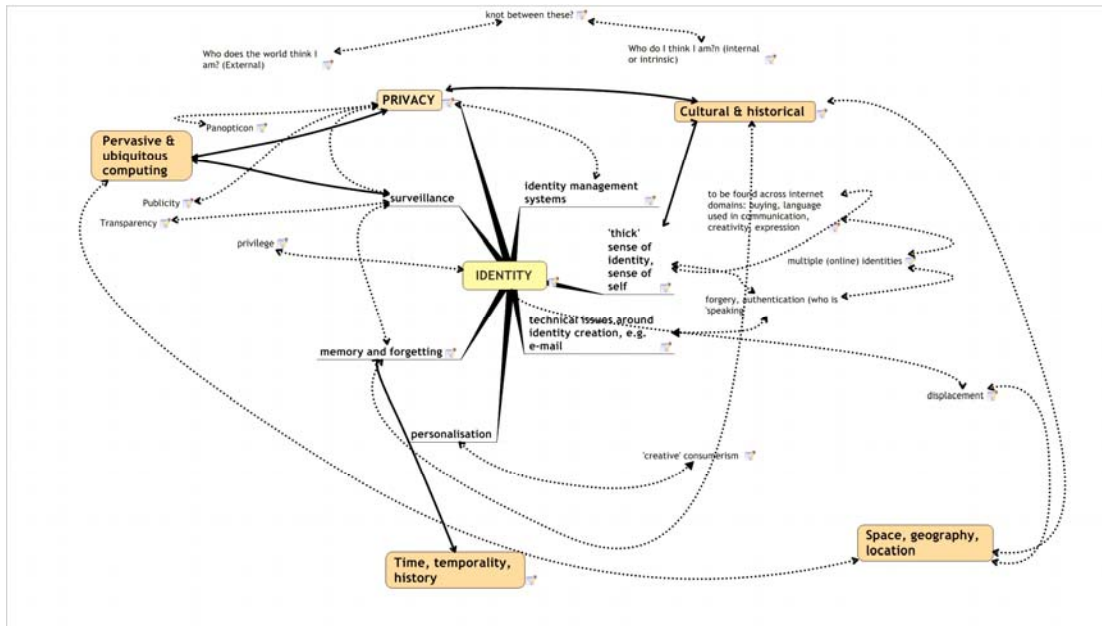
This was subsequently taken up and re-stated by another participant, with clear references back to both previous statements:

My main comment was really about orders of magnitude change and where we might be seeing them. A little bit on [the previous speaker's] point about spiralling technology, I think we are seeing lots of synergistic technology as well. In the work that I'm doing with [others], looking at identity management systems, looking at the way that CCTV is working with RFID, is working with smart cards. Or in a different application area, is working with big databases and all of this being pulled together. Not only that but the way a lot of masking is going on, so a lot of these synergistic technologies are being put into place for very good customer service reasons, high quality service provision. [...]

This shift from order of magnitude, to technology spirals, to synergistic technology was one of the examples of real engagement at the workshop. It is against the background of this sort of example, that other exchanges were seen to be cases of breakdown. In these exchanges it was less clear whether contributors were using terms in the same ways or with the same meanings. Some of these are the following:

Privacy and identity

This was particularly clear in the case of two central terms, *privacy* and *identity*, and the way in which these were hooked up to a constellation of other terms.



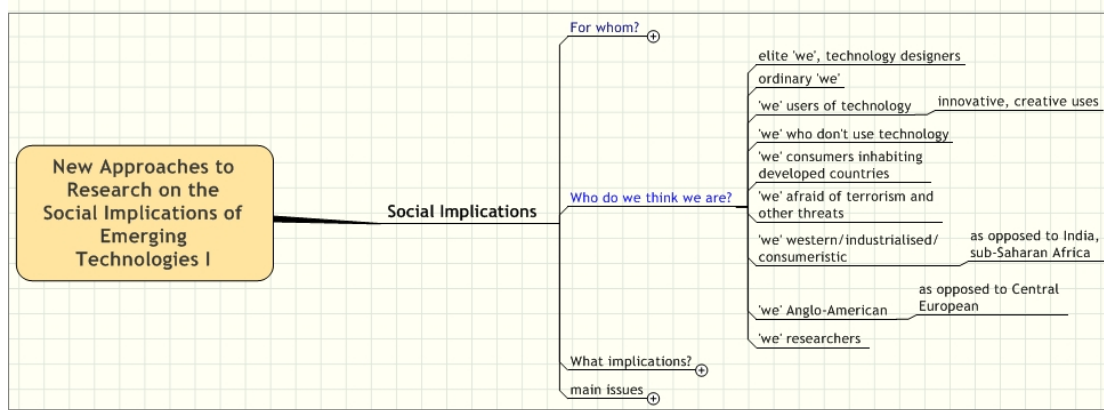
Map 1: Privacy, identity and related terms (for a larger version of this map, click on <http://web.comlab.ox.ac.uk/oucl/work/annamaria.carusi/multidisciplinarity/>)

With respect to these terms, discussion led to a layering of the topics. While there was acknowledgement from the outset that privacy and identity were central issues, they were initially mentioned as more-or-less standard technical terms (identity management, data collection, security). The terms emerged clearly as hinge-points around which the technological and the social revolve, as the terms ranged over ‘thinner’ senses (a mode of re-identifying an individual) and ‘thicker’ senses: personality, psychology, cultural and historical identity, and so on. In addition, the terms were connected with a constellation of other terms. For example, the way in which identity and privacy are manifested on the Internet is affected by its spatial characteristics. Pervasive and ubiquitous computing certainly does not go hand in hand with a unitary sense of self across geographical boundaries, and the tensions between the different senses of identity that were needed to hold in view both of these were evident in the discussion.

Who are ‘we’

The underlying reasons for this were the ways in which the participants at the workshop thought about ‘who’ questions, that is, ‘who are we?’ as researchers / designers of technology and who are the people for whom these technologies have implications? Some participants took issue with the idea that there is a clear and homogenous sense of ‘we’ as designers and researchers.

The divergence of views on this is clearly seen in the relevant section of Map 2:



Map 2: Who are we? (for a larger version of this map, click on <http://web.comlab.ox.ac.uk/oucl/work/annamaria.carusi/multidisciplinarity/>)

Here there were clearly different value systems brought into play, manifested mainly as a contrasting set of concerns between social scientists aware of social and cultural heterogeneity within societies (not everyone within a society has the same access to technologies) and across societies and cultures (global issues). Even while there was probably quite a high degree of social and political concern among participants, this was expressed in very different ways. Here a basic differentiation was between those who take the Western industrialised and developed society as the basis for social and political action, taking its values for granted, and those who adopted a more critical stance, and operated from an awareness of global inequality and different, and problems associated with consumerism and cultural imperialism. These issues often clustered or flared around notions of individuals and individualism, as will be clarified in the section on methodology.

Prediction and its relation to research and socio-political values

There were differences here relating to which are the disciplines to draw upon and how. Because the workshop was addressing a temporal future-oriented question, one of the main issues was how to predict or forecast that future, which technologies it may bring, or which social implications. There was disagreement on how to do this. Maps 3 and 4 set out the main exchanges around which disagreement clustered. While several different examples and 'visions' and possibilities were put forward, two of these stand out as attracting the most engagement from other participants. These are the examples of possible 'blue skies technologies' or ways of thinking about them put forward by a proponent of 'rigorous imagining' and a proponent of starting with specific technologies: The discussion around these illustrated some of the deepest rifts with respect to research methodology and political or ethical values which characterised the session as a whole.

The subject of the first of these exchanges was the viability of adopting a method of futures studies described as rigorous imagining. This is a scenario-based method which tries to explore what are the possibilities of social change which would follow on the development of technologies 'in entirely unexpected ways' rather than in a linear fashion. This is a method which starts off with central social concepts (such as creativity), and attempts to project how they may change in the future, giving as much concrete detail as possible. The examples given at the workshop focused on everyday production and consumption, and how that would change lives of people. The proponent acknowledged that one outcome would be banal creativity, as consumers could be actively involved in the design of their goods, and the self-construction of identity. These are activities in which 'consumers' become actively involved in production, and so the central dichotomy between production and consumption is broken

down. Similarly the self-construction of identity implies a breakdown of the central dichotomy between individualism and collectivism. (It was unclear in the discussion whether the overcoming of dichotomies was something to be achieved in research or in social reality).

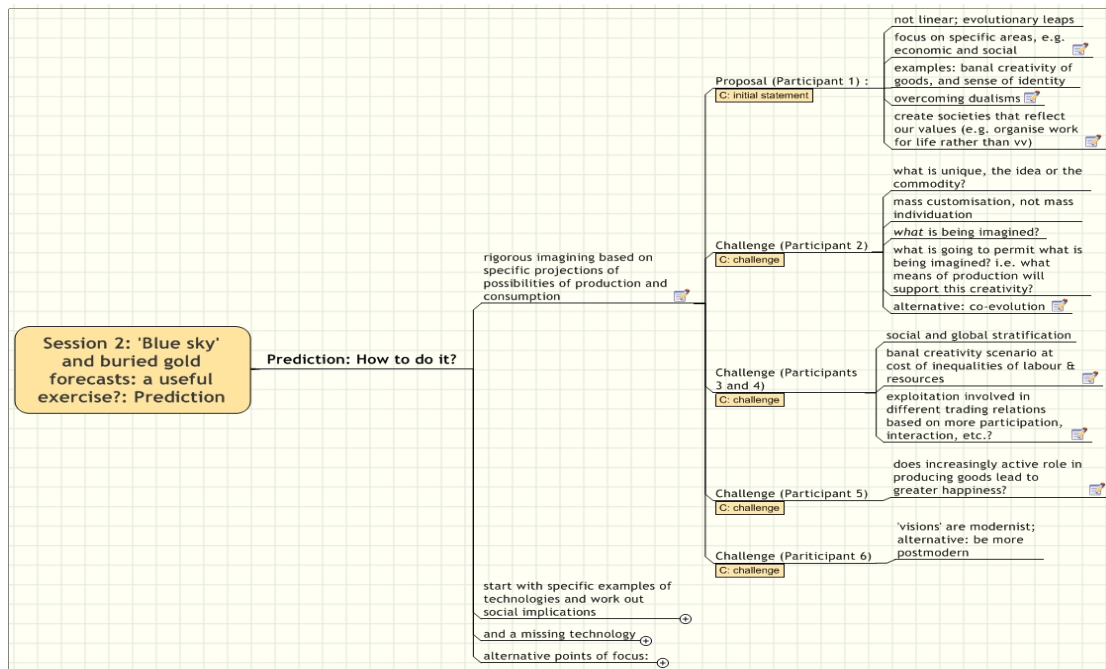
These mini-scenarios kicked off a series of exchanges, most of which were challenges (see map3).

Methodology issues: there was a great deal of disagreement on how to go about predicting, forecasting or foreseeing blue skies / buried gold technologies and this disagreement was (probably) indicative of deeper differences regarding preferred research methodology. In this particular exchange there was a division between starting with social concepts or starting with the technologies and trying to work out the implications on that basis (a view which was not without its opponents during the session). A further difference was with respect to the theories of social change, with some proposing to focus on discontinuity and disruption, and others backing the alternative of co-evolution.

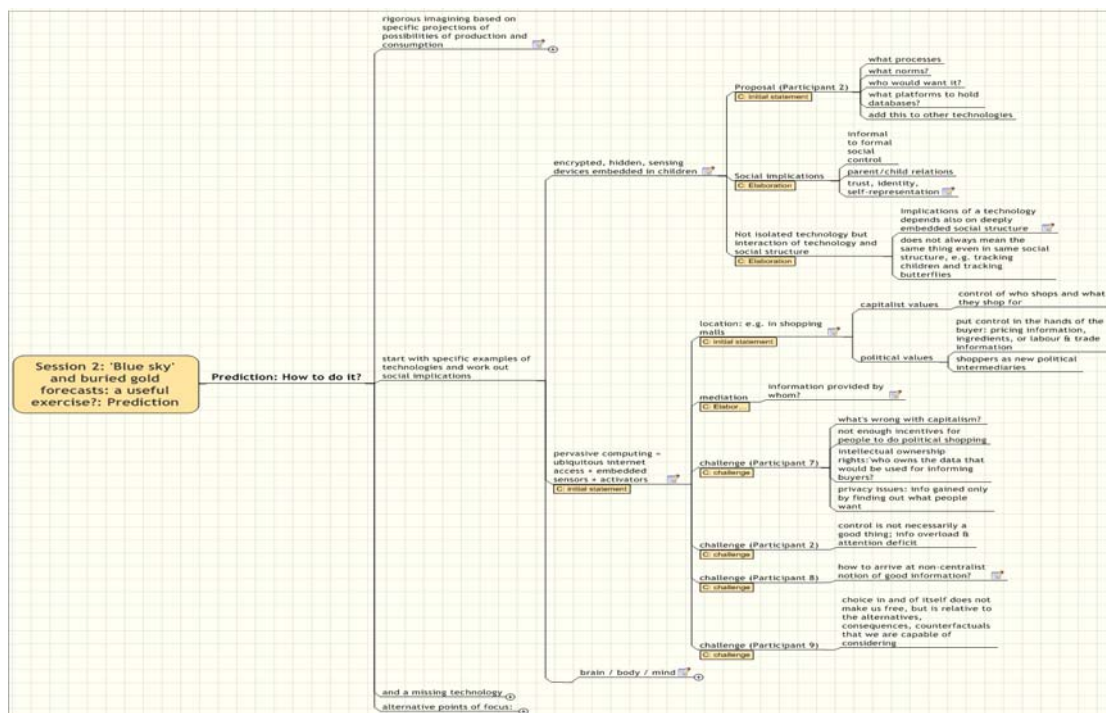
Ethical / political value issues: On this front, there were several objections to the mini-scenarios. While it was not clear from the discussion whether the mini-scenarios were being advocated or merely described, many of the participants did take them up as being advocated. There was a persistent ‘how’ question, which had a practical version (how would all these unique goods be produced, by what actual means of production?), and a political version (who would be exploited in this new dispensation of consumption and production – who would the workers be, what global and local distributions of labour would ensue, who would have the resources for creativity, banal or not?). Another ethical objection was whether active co-designing or co-production of goods was a good thing, whether it made people happier, or did not simply lead to more work and frustration for people in their everyday lives.

The positive value associated with terms like ‘activity’, ‘creativity’, ‘productivity’ were obviously not shared by all participants at the workshop. In the next example, positive associations of ‘choice’ proved to be similarly problematic.

The second exchange that we examine occurred around another participant’s example of a specific ‘near-future’ technology, together with a proposal of possible applications, both ‘dystopian’ and ‘utopian’ (see Map 4). The near-future technology in question is pervasive computing, a combination of ubiquitous internet access, embedded sensors and activators. The proposer described a scenario in which this is applied in a familiar location, a shopping mall. The consequence could be either dystopic, as access to shopping malls is restricted and consumer preferences are tracked and manipulated, or it could be utopic, real blue skies technology, as shoppers are enabled to exercise greater choice over what they buy, including the possibility of shopping ethically and politically.



Map 3: Rigorous imagining (for a larger version of this map, click on <http://web.comlab.ox.ac.uk/oucl/work/annamaria.carusi/multidisciplinarity/>)



Map 4: Specific technologies (for a larger version of this map, click on <http://web.comlab.ox.ac.uk/oucl/work/annamaria.carusi/multidisciplinarity/>)

This was an example of starting with a specific technology, and predicting from that basis what might be possible applications and the possible social implications for consumer behaviour, control, and choice. It elicited a great deal of discussion at the workshop, with responses ranging from elaborations on the basic idea to objections. The most important responses either concerned the detail of how the blue skies version of this technology would work (for example, there was scepticism about the way in which the information given to

consumers be mediated, and scepticism about whether consumers would actually want this extent of choice, or whether choice is always a good thing) or questioned the dystopic version of this vision, in particular with whether it was, after all, so bad to sell people what they want, and whether it would be possible to gain the sort of information about people which the pessimist feared without ownership of data or privacy rights.

A range of competing values were either explicit or implicit in the discussion around this example, beginning from the question which possible consequences were dystopic, and which utopic. An important underlying factor was the relative value attached to individuals and individualism, and this was expressed both as a research methodology issue (when we think about social implications, should we start out by considering individuals in their interactions and relations with technology, or should we consider social wholes or groups from the outset), and as a political and ethical values issue (ought we to accept or encourage the ideological, political and economic values associated with individualism?).

A similar set of competing values, both methodological and political / ethical was also evident in the discussion around another specific technology put forward as an example, that is, the embedded sensors used to track children. Implicit in that discussion was the methodological question what should be represented in the initial condition of a phenomenon to be explained: should this include social concepts, such as trust and family, or consequences of the technologies, only of a description of the technology?

Engineers and social scientists

Although the need for collaboration between different disciplines and sectors (government, industry and academia) to address the complex social and technological issues at stake was another common point of reference, the contested ground here was over the precise nature of such collaboration and the expectations of what each party could or should contribute. For example, Clark would like to promote the role of social researchers as designers and engineers of technology-based solutions. However, Angela Sasse, Professor of Human-Centred Technology, University College London, suggested his was an untypical view, as she once heard a networking quality-of-service specialist exclaim in an off-guarded moment: 'Stuff the users - the whole thing is already too complicated without considering them!' This reflects a concern among many social scientists that some 'user-centred' design studies are driven by 'business cases' that aim primarily to find and test new markets, products, services and styles of living, rather than a broader research concern for understanding the range of user needs. There is also caution about engaging in hands-on design among those social researchers who see a basic contradiction between social science research and that required in some industry-based engineering programmes. This difference was perceived to arise essentially from industry's prime interest in using social research to help define user needs and develop business cases for new products and services, whereas social scientists often employ critical tools to analyse powerful institutions, such as business.

Some typical perceptions among social scientists of their priorities in studying the implications of growing ICT diffusion are summarized below:

- Aggregated view of interaction between different technologies, rather than studies of particular technologies.
- Foregrounding social concepts rather than studies of individuals.
- Longitudinal rather than short-term studies.
- Start with what people are doing rather than 'user requirements'.
- Multiple method approach to 'construct' the world of those who will be using the technology.

- Taking account of historical analysis of current technologies.
- Highlighting how people are integrating different forms of technology.
- Comparing old and new technologies.
- Identifying different processes of ongoing social change tied to the use of technologies.

Social scientists were in the majority at the meeting and many participants from computer science and other more technical ICT backgrounds said relatively little in the open sessions. This in itself was an interesting finding, but means that it is beyond the scope of this case study to identify representative engineering-oriented views of research in this field equivalent to those we obtained from social scientists.

For instance, more investigation is needed into how engineers perceive their own research aims and what they expect from social scientists. However, our analysis clearly shows that there was a strong perception that what engineering, industry and government expect from social scientists is at odds with what the researchers themselves think is most valuable.

Social scientists often believe that too many designers, engineers and technologists, particularly in industry, see the main purpose of research as being to enhance specific technologies, in contrast to their own research aims as summarized above. This leads to their concern that engineers might expect them to be interested primarily in offering ‘proof of concept’, for example by assisting to develop a user requirement specification for ICT-based products, services and business applications. Expectations that social scientists may be able to smooth away negative social implications to facilitate innovation is another potential source of misunderstanding and/or conflict in multidisciplinary collaboration.

The crux of many misunderstandings between engineers and social scientists, as well as the opportunities for greater engagements, was illustrated by a comment at the workshop by Clark:

We are more and more, as technologists, being pushed to say, ‘Look, it is no longer acceptable to invent something that is technologically cool.’ You actually have to ask why are you building it, what the purpose is and, in many cases, we are being pushed very hard to think about design for values and being told that it is a really important part of your job to be able to explain the values of what you do. On the other hand, I have never seen a paper in computer science which was publishable because it was explained by some artefact of higher value than some other artefact. It is outside the space of what we know how to publish. What is cool in our discipline is to say ‘Here is the goal, here is how I got that’... I came here listening to whether there were disciplines that were going to help us make value decisions... [but] when I came up with a social values question I was told [by people in other disciplines] that it is a values question not research.

Increasingly there seemed to be a need for ‘normative computer science’, to investigate the norms that sub-tend computer science, and which may be both moral norms and norms of rationality.

Generalisable hypotheses

Although this was a single event, with a very particular ‘cast’ of participants, we believe that there are some generalisable conclusions, which may be of value in facilitating multi-disciplinary research and design of new technologies.

Breakdowns in engagement often (though not only) occur around implicit meaning (or significance) and value systems. The most important areas where we found breakdowns in dialogue occurred were:

- 1) the meanings of terms, in particular 'identity' and 'privacy', but also 'information', 'communication', 'mediation', 'individuals', 'users';
- 2) the answers to the question 'who are we?' as researchers into new technologies;
- 3) understandings of what constituted a research problem, and of the way to tackle research problems: for example, what are the starting points for research or intervention: the technology or the society in which it is embedded?
- 4) divergence between engineers' and social scientists' expectations of one another, and mutual misperceptions of these expectations;
- 5) the type of research or type of knowledge to draw upon: for example, how important is historical knowledge and understanding to making predictions concerning new technologies, and what kind of history to favour;
- 6) appropriate research approaches: for example, between individualism and holism as a methodological approach;
- 7) political and economic outlook, and what counts as a utopic or dystopic future development;
- 8) attitudes towards cross-sector partnerships, for example, between academia and business, industry and government

The underlying set of competing values can be synthesised as clustering around the following terms: 'self' and 'others' (eg: privacy, identity, 'we', 'them' and variants (eg: we= 'techies', them = 'users')); the involvement of the researcher/designer in the socio-technical systems they are dealing with; research values; social values; political and economic values; relations among all of these.

Suggestions regarding the conduct of multidisciplinary research for a social-shaping agenda

Multi-disciplinary talk does not need to seek consensus but common reference points. It is more important that people are talking about the same thing than that they agree. The following are suggestions to facilitate this:

- Seek to build on real engagements around mutually understood points of reference, even in the absence of perfect agreement and without necessarily seeking consensus.
- Attempt to be aware of the kinds of points and issues around which there may be value or meaning differences.
- Attempt to make explicit the values of members of the collaboration and their perceptions of the aims the research. For example, encourage interlocutors to make explicit what they mean by the terms they use, by:
 - Giving a definition
 - Listing examples of the items to which the term (as used by him/her) applies
 - Listing examples of items to which it definitely does not apply
 - Using concept maps or other kinds of mediating artefacts as ways of negotiating the meanings of terms.
- Attempt to establish realistic expectations for the kinds of input each partner is best able to bring to the partnership. Try to understand enough about other disciplines to grasp where there are overlaps, and where their main contributions may lie.
- In the long term: Enhance communication between disciplines and sectors through relevant training programmes and the provision of necessary ongoing resources and time allocated to improving communication skills.

- Establish appropriate assessment and reward frameworks and processes that give similar weight to multidisciplinary and within-discipline research, including joint authorship across disciplines.
- Encourage the migration of scholars to spend time in other disciplines.
- Explore ways of integrating the many academic staff now on short-term contracts into the collegiate experience that can breathe life into effective multidisciplinary.
- Consider the inclusion of policy makers, business and industry practitioners, users and other stakeholders in collaborations with multidisciplinary academic experts.

Conclusion

A social shaping agenda is always carried out from particular sets of values and worldviews. Such an agenda needs constantly to reflect on its own values in order to be capable of entering into a dialogue about values with other interested parties. The initial design and development of the Internet reflected the late capitalist libertarian values of professionals in a post-industrial society (Dave Clarke, in conversation). These will no doubt be increasingly contested in future developments of the Internet, which will bring into play different nations, societies and cultures. A better outcome than can be achieved in an unreflective process may be achievable if at least in part these developments will be informed by discussions similar to those which took place at the workshop described here. This paper hopes to make a small contribution to an understanding of how values inform such discussions, and where some of the fault-lines may lie.

Acknowledgments

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