

Technology and Social Action: sociotechnical networks and design

Abstract: This review paper examines accounts of design practices in social action settings. Drawing on the conceptual model of the ‘sociotechnical interaction network’ from the social informatics literature it identifies examples of novel roles evident in sustaining sociotechnical networks, arguing that understanding such roles is essential to understanding and designing effective social action technologies. It characterises and discusses four aspects of design in social action settings: participation, learning, critique and entrepreneurship.

Keywords: social action, social informatics, design, technology

Introduction

The conventional distinction between developers and users is no longer a helpful way to think about practices of implementing technologies. There are three sets of reasons for this. Theoretically, representations of users as rather passive consumers of technologies have been challenged by a ‘social actors’ view which recognises complex agencies in the way people interact with technology (Lamb & Kling, 2003). Technologically, increasingly powerful applications are available to non-professional user/(designers) who can absorb them into myriad practices, a trend perhaps most obvious in ‘web 2.0’ technologies. Politically, critical approaches to technology, and more specifically the participative design movement have challenged the binary divide. The latter point is of particular relevance to those concerned with technology design and use in emancipatory social action settings, where participation and empowerment are ends in themselves.

This review paper draws takes a networked perspective on technologies-in-use, viewing them as sociotechnical ensembles of people and things, linked by protocols, norms, practices and so on. While we recognise that the structure and trajectories of particular sociotechnical networks is situated in specific contexts, we hope to be able to identify general themes and patterns of organisation which will be of assistance in recognising the dynamics of particular networks, and formulating approaches for designing interventions.

This paper has been written to inform fieldwork being conducted as part of the Practical Design for Social Action project, supported under the UK Arts and Humanities Research Council/Engineering and Physical Sciences Research Council ‘Designing for the 21st Century’ programme.

What do we mean by technology and social action (TSA)?

Scope and rationale of the paper

The concern of this paper with social action in civil society has a broader focus than is typical in community informatics research. It is part of a wider project¹ examining and seeking to develop digital design practices in civil society settings. Technology design and use is situated in particular contexts: one of our research questions to examine whether there is sufficient commonality in context between diverse areas of civil society for there to be meaningful discussion and mutual learning and development of design practice. Among factors likely to be common across civil society and which distinguish it from the mainstream of design research are, we suggest, values of social justice and inclusiveness, reliance on the contributions of volunteers and their intrinsic motivations, diversity of volunteer skills (particularly in relation to ICT), diversity of available technologies, a strong commitment to work with people and organisations who themselves may have limited access to and knowledge of ICT (that is, across digital divides), restricted access to resources, reliance on bottom-up and individual initiatives, and in many cases engagement in some form of social conflict (Carroll & Rosson, 2007; McPhail *et al.*, 1998; Walker & Dearden, 2005; 2008).

This review encompasses at least three areas of research literature which appear to have limited linkages between them: community informatics (CI), social movements and ICT (SM&I), and labour movement and ICT (LM&I). Of these, CI is both the most clearly established and the best linked to the mainstream of information and computing research: while Schuler (2001) noted the weakness of links between the (HCI) research community and what he calls the 'Civic Sector', this situation has changed over recent years. The Community Informatics Research Network (CIRN) was established in 2003 (ciresearch.net) and the Journal of Community Informatics provides a forum for discussion and debate on community informatics (which approximates to Schuler's 'Civic Sector'). CI also has the clearest links to information systems/computing/information studies and related fields, for example, IFIP WG 8.1 Design and Evaluation of Information Systems has established a Task Group on Community IS Development.

By contrast, there are less clearly established foci for researchers concerned with design in the LM&I and SM&I literatures. In the SM&I literature, there is a widespread consideration of the implications of the internet by researchers approaching the field from a social movement studies perspective (e.g. Garret, 2006; Langman, 2005) addressing issues such as the consequences of ICTs for movement identity (Wall, 2007), repertoires of contention (Rolfe, 2005; Earl & Kimport, 2008) or movement organisation (Pickard, 2006a; Earl & Schussman, 2003). In the informational disciplines the journal 'Information, Communication & Society' has provided a particular forum for discussion of ICT in social movements (e.g. Diani, 2000; Rolfe, 2005; Garrett, 2006; Earl & Kimport, 2008). There is, though, little about

¹ Practical Design for Social Action (PRADSA) supported under the Design for the 21st Century joint programme of the UK's Arts and Humanities Research Council and Engineering and Physical Sciences Research Council.

the process of design. A distinct literature has also emerged in the study of ICT in trade unions. Several industrial relations and labour studies journals have recently had, or have planned, special issues devoted to aspects of the internet and trade unions: *Journal of Labor Research* (2002, 23/2), *Industrial Relations Journal* (2003, 34/4), *Critical Perspectives on International Management* (2005), *WorkingUSA* (2005, 8/4), *European Journal of Industrial Relations* (forthcoming in 2010). Again, the primary focus for these industrial relations/labour studies researchers has been on the consequences of ICT for trade union structure and practice. With some exceptions, (e.g. Earl & Schussman, 2003; Cockfield, 2005; Rolfe, 2005; Martinez Lucio & Walker, 2005) in both LM&I & SM&I literatures, accounts tend to take ICT as a given, and concentrate on the consequences of ICT rather than consider the forces shaping technology, and still less issues of design.

Framework: socio-technical interaction network (STIN) and design

Underlying this review is a conception of working technologies as fundamentally socio-technical arrangements which can be thought of as networks of people, material artefacts and the practices and relationships which link them. More specifically, it is informed by the concept of a 'socio-technical interaction network (STIN) (Kling *et al*, 2003). A STIN is a network which includes "people (including organizations), equipment data, diverse resources (money, skill, status), documents and messages, legal arrangements and enforcement mechanisms, and resource flows" (*ibid.*: 48). The STIN approach draws on other socio-technical views of technology such as socio-technical systems, social construction of technology, and most clearly actor network theory (ANT) which also views technologies as networks. While concepts generated in the ANT tradition, such as interpretive flexibility, translation, enrolment are consistent with the STIN approach (Meyer, 2006), there are two significant differences between the approaches. Firstly, Kling *et al* (2003) reject the 'strong symmetry' view of the agency of human and non-human agents which treats humans and artefacts as equivalent. Secondly, Kling *et al* de-emphasise of the process of 'enrolment' of actants into a network as a single, primary driving force in the stabilization of networks. There are a growing number of examples of the application of STINs to the study of what Kling (2000) has called 'highly entwined' technologies, including open source software production (Scacchi, 2005), online community (Barab *et al*, 2004), e-learning (Walker & Creanor, 2006), academic publishing (Kling *et al*, 2003) and digital libraries (Rosenbaum & Joung, 2005).

Here, we use the STIN concept to help us think about the process of socio-technical design interventions. The process of design can be thought of as an attempt to bring into being a target sociotechnical arrangement of people and institutions to use artefacts in particular ways. Often it is not a case of creating an entirely novel STIN but of reconfiguring all of, or parts of pre-existing STINs. The design process then becomes one of rearranging a STIN and, to draw on a concept from the ANT literature, the designer is a kind of 'heterogeneous engineer' (Law, 1992) bringing together a diversity of network elements. In practice, different people bring different types of expertise to the design process: a designer more concerned with roles, decision making and incentives might concentrate on using games to elicit

organisational dynamics that might influence technology design, and translate these findings into an outline specification to be used by a web designer more concerned with the construction of the artefact of a web site. A usability specialist might focus on elements of the interaction between network participants² and material artefacts. It may also be possible to view the design process itself as a STIN in transition, into which certain elements (such as people, design tools, methods) are recruited temporarily. Given the emphasis of many actor network studies on technological change, it is likely that ANT will prove a particularly helpful source of network concepts in this phase.

Kling *et al* (2003) offer an 8-step heuristic for analyzing STINs: identification of system interactors; identification of core interactor groups; identifying incentives; identifying excluded actors and undesired interactions; identification of existing communication fora; identification of architectural choice points; identification of resource flows; map architectural choice points to socio-technical characteristics. Here, we have the more restricted aim of conducting a preliminary review of literatures relating to technology and social action, initially to identify recurrent interactors and core interactor groups in the process of technology design. Beyond this, the STIN concept is used primarily as a sensitizing device.

Who does what in TSA: themes

This review section is organised in two sub-sections: the first identifies from the literature a set of ‘novel’ situated practices (roles) associated with technology use in social action settings. These practices support, sustain and/or shape others’ use of technologies and help to sustain the effective functioning of sociotechnical networks. Secondly, it characterises four aspects of design in social action settings. Conceiving of technologies as STINs is significant to design in three ways.

The human actors: considering roles and practices

Once we start to examine technologies as sociotechnical networks, our attention is drawn to the roles that people play in sustaining them. Rather than simply ‘using’ technologies, people involve technologies in a range of distinct practices, often mediating, influencing or supporting others’ use through technology-related practices. Some of these roles, such as web authors or ICT trainers, are widely recognised. Others, such as those discussed below, may be more specific to civil society. Understanding roles in stable sociotechnical interaction networks may help us to understand how such networks might be replicated, designed or modified successfully. In social action settings there are, though, rather few case studies of technology use that consider in detail the various roles and practices. Most of the case studies are concerned with assessing the consequences of technology or in analysing design interventions in which by definition, the attempt is to change a pre-existing sociotechnical network. There are though, some examples of novel roles which are emerging in social action

² Here we follow Kling *et al*’s (2003) terminology, preferring the term ‘participants’ to ‘users’, which better captures both the multiple different ways in which people may act in a STIN, and that one person will be a member of multiple STINS .

settings and which may help us to understand some of the distinctiveness of technology use in social action. The remainder of this section gives a brief overview of some of these modes of participation in sociotechnical networks.

One increasingly widely recognised set of actors in social action settings is that of the 'circuit rider' – someone who provides technology-related support to non-profit organisations, typically from outside the organisation and for limited periods of time. The circuit rider movement has mobilised and linked a wide range of people to support smaller nonprofit organisations (Crawford & Eliaz, 2005). The details of riders' practices vary substantially, both in content (as, for example, strategic planning, web design and training) and in organisation (working as teams or individuals). The detailed meaning and function of circuit riding is thus likely to be rather specific to particular cases, though there are also some wider issues arising. For example, with identification, recognition and naming of the practice of circuit riding has come discussion about the need to define the role and legitimate expectations of a rider more clearly, and in the eyes of some at least, a need for quality assurance or accreditation (ADP Consultancy, 2007). Since the diversity of skills and practices involved makes this rather difficult, initial steps have focused not on quality assurance of particular, well defined, practices but on establishing a wider set of principles to which circuit riders can be invited to sign up (LASA, 2008). These include recognising and respecting the characteristics of particular nonprofit organisations; using non-technical language; ensuring legal and best practice requirements are made explicit; engaging in continuous learning; sharing knowledge; helping organisations to understand the impact ICT can have on staff, volunteers and beneficiaries; equipping organisations with tools, knowledge and processes to enable them to make informed decisions and take full advantage of ICT. These general principles emphasise that circuit riding is concerned with the social and organisational settings of technology design-use, rather than the purely technical. For Crawford and Eliaz (2005), at least, the defining characteristics of circuit riders are not specific skills but the itinerant relationships between riders and their clients, and their motivation and values (that is, riders are 'mission-driven'). These principles, along with emerging institutions such as conferences, are also steps towards formalising expectations of what circuit riders are and do.

Circuit riders, then, carry out a rather broad set of activities, and are loosely organised as a movement, though with attempts being made to formalise at least some elements of the position. Other examples of roles have been explicitly designed in particular types of sociotechnical networks. In establishing transnational networks of trade unionists in Europe, the Dialog On project created a position of 'network animateur' to facilitate and lead the establishment of mixed online/offline networks (Walker & Creanor, 2005). People, primarily trade union officers rather than technologists, were trained to conduct a range of activities to support the creation and development of distributed networks. The original conception of the animateurs drew heavily on experiences in the e-learning literature, reflecting the educational perspective of the project management, as well as the then-emerging literature on online community (especially Preece, 2000). The design of these roles envisaged that activities would include giving front line technical support to network participants; configuring and establishing conferences and folders in an online environment; and facilitating online discussions. In practice, the project evaluation found the animateur role to be considerably more complex than originally envisaged. Animateurs' work included practices identified as: ambassador (primarily a 'backstage' function resolving issues between the online network and other organisational structures, for example around legitimacy and accountability); archivist (developing and implementing policies for dealing with online information 'past its sell-by date'); chair (leading/facilitating discussions on specific topics and managing the network agenda); host (maintaining a socially supportive environment); librarian (managing online information within the online structures set up for the network); support (first-line/expert user-level technical) and weaver (concerned with pulling together substantive threads of discussion and synthesising contributions, as distinct from task-oriented chairing). The animateurs' role, then, was a combination of designed and emergent practices intended to establish a vision of a particular way of organising networks.

Other practices and roles have emerged, rather than been designed, and may prove to be more disruptive to previous ways of conducting social action. Earl and Schussman (2003) in a study of 'strategic voting' web sites during the US presidential election campaign of 2000, identify what they term 'movement entrepreneurs' (ME) who play an increasingly prominent role in online campaigning. These movement entrepreneurs bring together the technical skills needed to build and run a web site, with a 'grievance' or cause. Earl and Schussman's small-scale study may only be suggestive but, they found that a majority of their movement entrepreneur respondents had computer science qualifications, were professional programmers or had significant prior amateur experience of web design. Significantly, most ME reported having had no previous online political experience. This suggests that they bring 'computer-based models of action instead of more political and activist models' to campaigning. Earl and Schussman also note that most of the web sites they examined emphasised 'private activism' (e.g. through keeping personal details confidential), in contrast to the public campaigning and position taking of conventional social movements. Here, then, we see novel technology-related practices which allow some people with technical skills to avoid having to get involved in more traditional forms of mobilisation, and which may have consequences for more traditional forms of organisation.

Referring to 'stable' sociotechnical networks suggests that roles and activities may be well defined and agreed. This is not always the case. Indymedia, the global network of local Independent Media Centres (IMCs), is perhaps the most widely documented example of social movement use of the Internet (e.g. Atton, 2004; Morris, 2004; Pickard, 2006; Pickerill, 2007) and illustrates the emergence of tensions between actors in sustaining sociotechnical networks. From its origins in the Seattle IMC's reporting on anti-WTO campaigns and protests in 1999, Indymedia has emerged as a global network of IMCs using the web to sustain open news publishing. It presents itself as alternative or counter-media to the mainstream and commercial media, broadly from the perspective of activists in the global justice movement. From accounts of the organisation and activities of Indymedia, we can start to identify two of the role components of the wider network. The infrastructure is maintained and developed by 'techs' (Morris, 2004) or 'tech geeks' (Pickard, 2006) – people with the technical expertise to carry out these tasks. The other major group is comprised of the correspondents who contribute news stories to their IMC and the wider network. Atton (2004) identifies tensions between two broad groups of Indymedia correspondent: the 'amateur' or 'activist' correspondents reporting largely first-person accounts of campaigns or issues, and 'elite' correspondents who, while maintaining a radical perspective, take an approach to writing more compatible with the mainstream media. Similarly, Pickerill (2007) notes hierarchies forming around editorial and technical skills and activities, despite some practices such as training sessions, aimed at overcoming some of these boundaries. Indymedia and IMCs tend to take these issues more seriously than most and many activists are deeply sceptical of individuals becoming too closely identified with functional specialisms. Even here, though, people play differing roles in the wider Indymedia sociotechnical network.

Several features stand out from these, and other, examples. Firstly, they combine, in differing ways, elements of technical skills and knowledge with elements of what we might term 'domain' skills and knowledge. By domain knowledge and skills, we mean those relating to the particular area of concern – a particular community, issue, voluntary sector organisations, alternative media or international trade union organising. The ability to link technological knowledge to the particular social action context appears central. Secondly, the level of technological expertise need not be high, in absolute terms, for a position to be important to a functioning sociotechnical network. In the case of the network animateurs, for example, the level of technological expertise may actually be quite modest – the technical expertise is relative to the network members, and quite specific to the operation of a particular conferencing system. Thirdly, as in the case of the Indymedia 'tech geeks' or some circuit riders, the technological expertise is frequently deployed in supporting or mediating other's use of technology, in ways similar to Orlikowski *et al's* (1994) 'metastructuring of technology in use'.

Design approaches

The previous section has considered roles and practices in some example social action STINs, highlighting some of the roles emerging around technology and social action. In this section, we consider approaches to design. Here, design is conceived of as the intentional creation or reconfiguration of a STIN. This is a rather broader view of design than one which considers design simply as the creation of artefacts; it includes consideration and arrangement of practices and relationships that enable particular hardware or software to be useful. The difference between design STINs and stable STINs is a matter of degree, scale and perhaps most significantly, level of analysis, rather than an absolute distinction. In the examples in the preceding sections ‘tech geeks’, amateurs and circuit riders may all be involved in reconfiguring STINs at a ‘micro’ level: for example, reorganising particular online conferences (amateurs) or tools for maintaining open publishing web sites (tech geeks) are examples of micro design (the extent to which these may have relatively local effects in a STIN or, under certain circumstances widespread ones is a significant issue, but one outside the scope of this paper).

The deliberate attempt to change a STIN, then, constitutes a design intervention, and the designer(s) are key actors in that STIN. The range of actors and the complexity of their interactions in design interventions is evident in the literature. For example, Luke *et al* (2004), identify seven stakeholder groups (not including the design group itself) in a participative design project in a Canadian community organisation: project leader/interlocutor; senior programme staff/managers; staff (the eventual immediate users of the case study system); volunteers; community constituents; advisory board (itself made up of volunteers); and a group of technically competent volunteers known as the ‘Community of Practice Understudy’ who were to take over responsibility for the network from the development company. The company itself comprised 2 programmers and 2 process/interface designers. Similarly, van Belle and Trussler (2005), drawing explicitly on actor-network theory to analyse their case as a sociotechnical network, identify twenty-five human, organisational and material actants in the establishment of a community tele-service centre in South Africa.

We have identified four perspectives on technology and social action design: design as learning, design as participation, design as social critique and design as entrepreneurship. The learning and participation perspectives on design are particularly closely related. We consider them as distinct elements since they clarify different aspects of the practices of design. Before discussing these perspectives, though, one important point needs to be made. Most of the TSA design literature consists of accounts of interventions by self-identified academic designer-researchers. The papers give detailed accounts of design processes, methods and outcomes. None of the papers claim that their methods are representative of widely-used practices; indeed, many document new methods and techniques; or the use of techniques in novel contexts. Consequently, we do not claim that this review is in any way representative of how TSA design is actually done ‘in the wild’.

Design as participation

Issues of participation in design are central to many discussions of technology in social action settings (e.g. Day, 2002; de Cindio, 2004; Merkel *et al*, 2004; Byrne & Sahay, 2007; Carroll & Rosson, 2007; Day & Farenden, 2007; Wessells *et al*, 2008). Indeed the early development of participative design (PD) in Scandinavia was itself a form of social action concerned to increase worker and trade union influence in the workplace (Clement & van den Besselaar, 1993). Participation in design by those affected was seen as a right in the context of developing the ‘good work’. In wider social action settings, participation in design is similarly often seen as a form of emancipation or empowerment, and thus as a goal in itself. Although PD has its roots in social action, it is also widely used pragmatically, as a way of improving the quality (or saleability) of applications. These differences of emphasis are frequently presented as Scandinavian (emancipatory) and N. American (pragmatic) traditions of PD. These two aspects of PD are both radical in the sense that they challenge what it means to be

a designer (Carroll & Rosson, 2007), though in social action setting more weight is likely to be given to the emancipatory dimension.

There are several recurrent issues in PD in social action settings. A common concern is with identifying who should participate in a design process; essentially the problem of determining the boundaries of the sociotechnical network involved in design. PD's workplace origins focused on giving a design voice to workers affected by systems. In social action settings we have a broader range of actors (or actor roles) including those beyond an artefact's immediate users but who might also legitimately have a stake in the design process (Byrne & Sahay, 2007; Wessels *et al*, 2008). Byrne & Sahay (2007), for example, include those who may not be direct 'users' of an information system but who might be affected by its users. Consequently, determining appropriate boundaries of participation in community and social action settings might be more difficult than in workplace settings. Closely related to the question of who participates is the nature of power relationships. Despite Carroll & Rosson's (2007) argument that the absence of a 'boss' in community settings reduces the significance of us/them divisions, community informatics development can be the location of struggle between groups in a community (Van Belle & Trussler, 2005). The nature of these power can place limits of the nature of participation and hence needs to be recognised in the organisation of participation (Byrne & Sahay, 2007). Barab *et al* (2004) pay particular attention to the relationship between designer and community participants. While space does not permit a detailed review of PD methods which have been applied in social action settings here, there a variety of approaches are documented which address issues of power both within communities and between designer and user communities. These include critical design ethnography (Barab *et al*, 2004; Barab *et al*, 2007), 'facilitative conversation' spaces (Wessels *et al*, 2008); and 'appreciative enquiry' (West & Thomas, 2005), along with specific techniques such as future workshops (Pilemalm *et al*, 1998; McPhail *et al*, 1998).

Design as learning

Learning about technologies is important to many discussions of PD and other user-oriented design approaches. PD frequently requires that people who are not primarily concerned with technologies learn about them in order to participate meaningfully in a design process. The need for learning may be exacerbated by characteristics of social action settings, perhaps most starkly where initiatives aim explicitly to address aspects of the 'digital divide' but also where for example, volunteers or other participants simply have very diverse levels of ICT expertise. Consequently, techniques such as 'participatory learning workshops' (Day & Farenden, 2007) and scenarios (Blythe & Monk, 2005; Carroll & Rosson, 2007; Lee *et al*, 2007) have been used in PD to help learning and participation.

Learning is not just restricted to the design process, but may also be part of an intended design output. Here, for example Carroll and Farooq (2007) have proposed 'scaffolded documentation' and 'informal developmental learning' to address some of the problems of asserting community control over ICT. This control may be important in addressing the issue of sustainability in community technologies (Merkel *et al*, 2004; Day, 2002) (though, as Lievrouw (2006) points out, some social action technologies are intrinsically ephemeral, so while sustainability may be a widespread design objective, it is not universal). 'Pragmatic' (Bishop *et al*, 2004) and 'minimal' (Rosson & Carroll, 2005) approaches to design take user participation beyond learning about using technology to include ongoing design-in-use. Mason and Rennie (2007) argue that web 2.0 technologies provide a particularly flexible and accessible infrastructure for communities to implement applications with a minimum of specialised technical knowledge. The emphasis on learning and technology is also linked to the incorporation of technology in to TSA initiatives which promote wider community (e.g. Barab *et al*, 2004; Bishop *et al* 2004) or organisational (Creanor & Walker, 2005) learning.

Another, important dimension of learning and design is that of ongoing learning about design (as 'professional' development), primarily by those who see themselves as designers. Design patterns and associated pattern languages are currently influential approaches to capturing and disseminating learning about technologies. Indeed, some of the accounts

mentioned above (e.g. Carroll & Farooq, 2007) present findings as patterns. The 'Design for Living Communications' (Schuler, 2008) represents the most far-reaching attempt to systematise social action design patterns. Many of these patterns address issues beyond the immediate technology concerns of this review, but patterns such as 'Online Community Service Engine' (De Cindio & Sonnante, 2008) and 'Mutual Help Medical Websites' (Dearden & Radin, 2008) address specific classes of ICT applications.

Design as critique

All use of technology in those social action settings concerned with empowerment and social justice is to some extent a social critique. Technology and design, with their potential to disrupt and reconfigure existing social relations, may offer particular opportunities for social critique. This does not necessarily mean that all design in social action settings can be thought of as explicitly embodying social critique; voluntary sector agencies frequently import the 'economic-technical rationalism' for ICT use that is dominant in business information systems (Cecez-Kecmanovic *et al*, 2008). Elements of social critique can be found in both the design process and designed (socio-)technologies.

In the design process the approach taken can itself be viewed as social critique. Where approaches to design, as in emancipatory PD, give voice to those otherwise marginalised in design process, they effectively form a social critique by highlighting and challenging existing power relations. Barab *et al* (2004) and Barab *et al* (2007) highlight this view of design as social critique in their critical design ethnography. For Barab and colleagues a particular concern is the tension between a critical design process and its creation of artefacts which carry embodied values into other contexts.

In some social action cases, designed artefacts aim specifically to embody or afford a particular social critique. Floodnet, for example, is a Java application to generate traffic to a target web site by periodically reloading a web page, to slow server performance (see Stalbaum, n.d.). The Floodnet applet only makes sense when used simultaneously by large numbers of protesters; it encodes a collective view of protest and social change (as opposed, for example, to a terrorist view). It is also presented by its designers as a form of 'performance art'. Perhaps the most significant development of design-as-critique is the free software movement whose very existence can be seen as a critique of centralised software production and intellectual property law and which uses licenses to propagate particular social arrangements for the production of software. Lieverouw (2006) draws out implications of similar technologies for design, highlighting the centrality of access, understood as the variety of resources available to users, the connectivity of such resources and the utility in helping people to 'do what matters to them'. Participation relies on the reconfiguration of technologies, and the repurposing ('remediation') of content.

Design as social entrepreneurship

The term 'social entrepreneurship' is a complex term with multiple meanings. It is used here to capture two related sets of ideas.

Firstly, entrepreneurship is associated with mobilising or organising resources in innovative ways. In business, this is for commercial gain, but the term is also used to refer to innovation and social change. Alvord *et al* (2004), use the term social entrepreneurship to refer primarily to the use of innovation to achieve social change in a wide range of settings, including social movements. Earl & Schussman's (2003) use of the term 'movement entrepreneur' discussed above refers to the identification of a particular type of technology-related social movement practice. Similarly, Ward & Lusoli (2003) note the importance of 'organisational policy entrepreneurs' in technology-related activities in trade unions, particularly in the early stages of adoption. While neither of these accounts are concerned directly with the design of technologies, the innovation-diffusion understanding of technologies suggests an approach to design in which those responsible for building technological artefacts are rather more distant from the users of those artefacts than is the case in participatory approaches. This also appears to be the case in Rolfe's (2005) account of the

diffusion of 'electronic repertoires of contention' and identifies examples of small groups of 'online activists' who have developed online campaigning tools such as Floodnet and reamweaver.com. These small groups are characterised by a "high level of critical awareness, technical expertise in various fields, small organisational structures, an innovative and collaborative mindset, and a flexible 'rolling agenda' rather than alignment to a specific ideological cause" (p.70). Such 'hothouses' of innovation are partially detached from the mainstream of particular movement causes, frequently innovating from the margins. In a similar vein, Earl & Kimport (2008) identify 'warehouse' web sites, which specialize in supporting particular genres of online protest (e.g. online petitions) for use in support of a wide range of causes.

The second meaning of 'social entrepreneurship' is the use of business methods, or at least business relationships, in social action settings. This can be through social enterprises set up with explicitly social goals (Spear, 2006) in effect as a form of social action or. Alternatively, it can mean the philanthropic activities of conventional businesses. Social action organisations will frequently buy in expertise to design ICT artefacts and applications, often from individuals or organisations who share similar social values and goals. However well intentioned the relationships, difficulties can occur including 'ownership' of learning (Farooq et al, 2005) and the constraints of delivering applications on time and budget (Luke et al, 2004).

Social enterprise models have been particularly prominent in technology infrastructure initiatives where issues of accountability, commitment and sustainability of sociotechnical networks come to the fore. In a fascinating account of the WorkNet email and bulletin-board system in South Africa, established at a time of great political change in the late 1980s and early 1990s, Adler (1992) discusses the tensions and issues between democratic accountability, technological innovation and users' simultaneous desire for a good service with lack of time or interest in becoming involved in the management (since the target users were already heavily committed to other, pressing, areas of the anti-apartheid struggle). WorkNet's view of accountability moved from the strongly held commitments to political mandate of the anti-apartheid movement to a more market-oriented conception of accountability – essentially, if it retained and recruited users WorkNet was fulfilling a user need. Combining market relations and social action in infrastructure provision has, though, created tensions (Lovink & Riemens, 2004; Finkelievich, 2004). While the financial relationships may not ordinarily be considered elements of design, in considering technologies as sociotechnical networks, this also illustrates the significance in the ways in which people and organisations relate to a technology.

Discussion

Before discussing some of the issues emerging, it is worth noting two connected limitations in the literature covered by this review.

Firstly, the literature which discusses the actual practice of design originates from academic researchers discussing approaches to design and design communication, largely from human-computer interaction or information systems backgrounds. There is a difficulty in reading this literature (for the purpose intended here, at least) since the focus is on describing and theorising their own interventions, rather than identify methods used 'in the wild'.

Secondly, the literature on design is primarily concerned with variants of PD; communication of design knowledge is discussed in terms of design patterns and pattern languages. Important though these issues are, this review cannot be read in anyway as an account of how design happens 'in the wild' where there is not a significant input from academic researchers. We don't know how extensively PD approaches are used. Anecdotally, it seems plausible that user-centred methods have spread following its popularisation in web design. Similarly, the widespread use of participative methods in international development is likely to have implications for the conduct of technology design. Beyond this, though, we know little

Thirdly, this review doesn't attempt to differentiate between and analyse the many important levels of context beyond CI, LM&I & SM&I. There is a strong representation of North American CI examples, many based on the work of a rather limited number of research groups. No attempt is made here to distinguish systematically between N. American, and European examples, or between the global North and South. Similarly, we might also expect different patterns of design in different social movements: for example designers in the women's and environmental movements may emphasise different values in their approach to design. One question this raises, for example, is whether the methods documented in the CI literature, which by definition are place-based, can meaningfully or practically be extended to delocalised contexts where both practical and cultural obstacles to effective communication are likely to be more significant.

Bearing these limitations in mind several we can identify several discussion points. Taking a STIN perspective on design practices has drawn attention to the activities of individuals and the roles they enact. We have identified some examples of both emergent and designed novel roles within some STINs; we note that some of these roles can be disruptive to previous practices.

A STIN approach also highlights the significance of relationships between people and technologies and the mediating practices. As noted above, accounts of the detail of practices that mediate important relationships in the design process are more detailed in some design contexts (e.g. place-based community informatics) and are discussed largely in the context of a particular family of methods (PD). Nevertheless we can try to infer something of design practices from higher-level discussions of relationships. Perhaps most significantly, accounts of ICT use in social movements appear more concerned with issues of disruptive innovation and the diffusion of innovation from the peripheries to the mainstream of social movements. This suggests that PD design methods are less prevalent; here, some significant technological innovations seem to be developed by small groups of technology-activists. They may be taken up more widely, but their use may be quite ephemeral.

The four aspects design (participation, learning, critique and entrepreneurial) noted above, while related and overlapping, suggest that different bundles of perspectives, practices and skills are significant to design. 'Entrepreneurial' design may prioritise software development skills, and in some cases business skills. Participative design suggests the prioritisation of social facilitation skills and knowledge of a set of PD techniques. Learning suggests certain kinds of educational skills, in practice probably similar to some of the skills required in PD (not least because many with an interest in emancipatory education are likely to value social learning and social constructivist approaches to organising learning). 'Critical' approaches to design may include PD approaches but equally may rely on the world-view of designers; the most widespread 'critical' design of technology may be the free software movement which has a complex relationship among designers and between designers and users. Also some approaches to the design of critical outputs (for example, design and performance art) may emphasise the distance between the designer and the user (or audience) as an element of social critique. Importantly, given the context of this study, it may be that these approaches map onto distinct social movement and community contexts, for example for ideological or structural reasons.

The STIN approach highlights the situated practices (roles) which are identifiable in the literature. These practices mediate relationships between people and between people and technologies, and sustain the functioning of many STINs. Identifying and analysing these roles is central to understanding how digital technologies function and the social arrangements which sustain them. Socially recognised roles are similar to communicative genres (e.g. Brown & Duguid; Yates & Orlikowski;) and it may be useful to analyse them in similar terms, for example distinguishing between the designed and the emergent. The relationship of emergent roles both to technology-related roles in other contexts, and to other social action roles may also be fruitful. For example, Belanger's (2001) proposal of a set of skills suitable for 'technology organisers' builds on the North American idea of a community organiser, bringing together political organising and technology skills (including, for example, technology evaluation).

Boundaries, understood as a 'discontinuity of some form of practice' (Walker & Creanor 2005), and methods for working across them are significant in a number of ways. As noted above, identifying legitimate participants in a PD process can be thought of defining a boundary around a design STIN. An important function of specialist designers is crossing boundaries between contexts, as a source of new perspectives, ideas and methods (Carroll & Rosson, 2006). Wenger (1998) notes several types of boundary encounter and boundary practices; explicit consideration of these may help to enrich this aspect of design.

Conclusions

This review presents a social informatics approach to thinking about design in social action settings. It has described examples of some novel roles and practices associated with technology use in social action settings and characterised four aspects of technology design in social action settings. It very much represents 'work in progress', informing a set of empirical case studies of design practices 'in the wild' currently being carried out as part of the Practical Design for Social Action project (see <http://www.technologyandsocialaction.org/>).

References

- Adler, T. (1992) Democratic Electronic Networks: The Worknet Experience In South Africa, paper presented at Information Technology, Electronic Communications And The Labour Movement, Manchester, UK
- ADP Consultancy (2007) Circuit Rider Project: Evaluation
- Alvoord, S.H., Brown, L.D. & Letts, C.W. (2004) Social entrepreneurship and societal transformation, *Journal of Applied Behavioural Science* 40(3) 260-282
- Atton, C. (2003). "Reshaping Social Movement Media for a New Millenium." *Social Movement Studies* 2(1): 3-15.
- Barab, S., Dodge, T. Thomas, M.K. Jackson, C. & Tuzun, H. (2007). "Our Designs and the Social Agendas They Carry." *Journal of the Learning Sciences* 16(2): 263-305.
- Barab, S., S. Schatz, and Scheckler, R.. (2004). "Using Activity Theory to Conceptualize Online Community and Using Online Community to Conceptualize Activity Theory." *Mind, Culture, and Activity* 11(1): 25-47
- Barab, S., Thomas, M.K., Dodge, T., Squire, K., & Newell, M. (2004). "Critical Design Ethnography: Designing for Change." *Anthropology and Education Quarterly* 35(2): 254-268.
- Bélanger, M. (2001). Technology organizing and unions. In M. Moll & L. Shade (Eds.), *E-commerce vs. e-commons* (pp. 129-151). Ottawa, Ontario, Canada: Canadian Centre for Policy Alternatives
- Bishop, A. P., B. C. Bruce, Lunsford, K.J., Jones, M.C., Nazarova, M., Lindermand, D., Won, M., Heidorn, P.B., Ramprakesh, R. & Brock, A (2004). "Supporting Community Inquiry with Digital Resources." *Journal of Digital Information* 5(3).
- Blythe, M. and A. Monk (2005). "Net neighbours: adapting HCI methods to cross the digital divide." *Interacting With Computers* 17(1): 35-56
- Borch, O. J., Førde, A., Rønning, L., Vestrum, I. K. Alsos, G. A. (2008). "Resource configuration and creative practices of community entrepreneurs." *Journal of Enterprising Communities* 2(2): 100-123
- Byrne, E. and S. Sahay (2007). "Participatory Design for Social Development: A South African Case Study on Community-Based Health Information Systems." *Information Technology for Development* 13(1): 71-94.

- Carroll, J. M. and U. Farooq (2005). Community-based learning: Design patterns and frameworks. ECSCW 2005: Ninth European Conference on Computer-Supported Cooperative Working, Paris, Springer.
- Carroll, J. M. and U. Farooq (2007). "Patterns as a paradigm for theory in community-based learning." *International Journal of Computer-Supported Collaborative Learning* 2(1): 41-59.
- Carroll, J. M. and M. B. Rosson (2007). "Participatory design in community informatics." *Design Studies* 28(3): 243-261
- Cecez-Kecmanovic, D., H. K. Klein, & Brooke, C. (2008). "Exploring the critical agenda in IS research." *Information Systems Journal* 18: 132-135.
- Cockfield, S. (2005). "Union renewal, union strategy and technology." *Critical Perspectives on International Management* 1(2/3): 93-108
- Crawford, T. & Elias, T. (2005) eRiding: A Solution to the ICT Capacity Crisis at: http://www.ungana-afrika.org/resources/from_ungana_files/eriding_article.pdf
- Creanor, L. and S. Walker (2005). "Learning architectures and the negotiation of meaning in European trade unions." *Association for Learning Technology Journal: ALT-J* 13(2): 109-124
- Day, P. (2002). "Designing Democratic Community Networks: Involving Communities through Civil Participation."
- Day, P. and C. Farenden (2007). CNA - Communications and Community; Neighbourhoods and Networks; Action and Analysis: Concepts and Methods for Community Technology Research. Online Communities and Social Computing, HCII 2007. D. Schuler. Berlin, Springer-Verlag,. LNCS 4564: 301-314.
- de Cindio, F. (2004). Role of Community networks in Shaping the Network Society: Enabling people to Develop their own projects. *Shaping the Network Society: The New Role of Civil Society in Cyberspace*. D. Schuler and P. Day. London, MIT Press: 199-225.
- De Cindio, F. & Sonnante, L. (2008) Online Community Service Engine, in Schuler, D. (Ed) *Liberating Voices: A Pattern Language for Communication Revolution*, MIT Press: London available at: <http://www.publicsphereproject.org/patterns/pattern-table-of-contents.php>
- Dearden, A. & Radin, P. (2008) Mutual Help Medical Web Sites, in Schuler, D. (Ed) *Liberating Voices: A Pattern Language for Communication Revolution*, MIT Press: London available at: <http://www.publicsphereproject.org/patterns/pattern-table-of-contents.php>
- Diani, M. (2000). "Social Movement Networks Virtual and Real." *Information, Communication & Society* 3(3): 121-147
- Earl, J. and K. Kimport (2008). "The Targets of Online Protest: State and private targets of four online protest tactics." *Information, Communication & Society* 11(4): 449-472.
- Earl, J. and A. Schussman (2003). "The new site of activism: on-line organizations, movement entrepreneurs, and the changing location of social movement decision-making." *Research in Social Movements, Conflict and Change* 24: 155-187
- Garret, R. K. (2006). "Protest in an information society: A review of literature on social movements and new ICTs." *Information, Communication & Society* 9(2): 202-224.
- Lamb, R. and R. Kling (2003). "Reconceptualising Users as Social Actors in Information Systems Research." *MIS Quarterly* 27(2): 197-235.
- Langman, L. (2005). "From Virtual Public Spheres to Global Justice: A Critical Theory of Internetworked Social Movements." *Sociological Theory* 23(1): 42-74
- Lee, R., C. H. Gano, et al. (2007). "Making use of Scenarios for Achieving Effective Use in Community Computing Contexts." *Journal of Community Informatics* 3(1)

- Kling, R. (2000). "Learning about information technologies and social change: The contribution of social informatics." *Information Society* 16(3): 217-232.
- Kling, R., McKim, G. & King A. (2003). "A bit more to it: Scholarly communication forums as socio- technical interaction networks." *Journal of the American Society for Information Science and Technology* 54(1): 47-67
- LASA (2008) Circuit Rider Principles at: <http://www.lasa.org.uk/circuitriders/principles.shtml>
- Law, J. (1992) 'Notes on the Theory of the Actor Network: Ordering, Strategy and Heterogeneity', published by the Centre for Science Studies, Lancaster University, Lancaster LA1 4YN, at <http://www.comp.lancs.ac.uk/sociology/papers/Law-Notes-on-ANT.pdf>
- Lievrouw, L. A. (2006). *Oppositional and Activist New Media: Remediation, Reconfiguration, Participation*. PDC 2006 - Proceedings of the ninth Participatory Design Conference, Trento, Italy, ACM.
- Luke, R., Clement, A., Terada, R., Bortolussi, D., Booth, C., Brooks, D., & Christ, D. (2004) The promise and perils of a participatory approach to developing an open source community learning network. Proceedings of the Participatory Design Conference, Toronto:Canada
- Martinez Lucio, M. and S. Walker (2005). "The Networked Union? The Internet as a Challenge to Trade Union Identity and Roles." *Critical Perspectives on International Management* 1 (2/3): 137-154.
- Mason, R. and F. Rennie (2007). "Using Web 2.0 for learning in the community." *Internet and Higher Education* 10: 196-203
- McPhail, B., Constantino T., Bruckman, D., Barclay, R., & Clement, A. (1998). "CAVEAT Exemplar: Participatory Design in a Non-Profit Volunteer Organisation." *Computer Supported Cooperative Work* 7: 223-241.
- Merkel, C., B., L. Xiao, Farooq, U., Ganoë, C.H., Lee. R., Carroll, J.M., and Rosson, M.B. (2004). *Participatory Design in Community Computing Contexts: Tales from the Field*. Proceedings Participatory Design Conference, Toronto, Canada, AcM.
- Meyer, E. T. (2006). *Socio-technical Interaction Networks: A Discussion of the Strengths, Weaknesses and Future of Kling's STIN Model*. *Social Informatics: An Information Society for All?* In remembrance of Rob Kling. J. Berleur, M. I. Numinen and J. Impagliazzo. Boston, IFIP International Federation for Information Processing, Springer. 223: 37-48.
- Morris, D. (2004). *Globalization and Media Democract: The Case of Indymedia. Shaping the Network Society: The New Role of Civil Society in Cyberspace*. D. Schuler and P. Day. London, MIT Press: 325-352.
- Orlikowski, W., J. Yates, Okamura, K. & Fujimoto, M. (1994). "Shaping Electronic Communication: The Metastructuring of Technology in Use,." *Organization Science* 6(4): 423-444.
- Plisken, N. and C. Romm (1997). "The impact of e-mail on the evolution of a virtual community during a strike." *Information & Management* 32: 245-254.
- Pickard, V. W. (2006a). "Assessing the radical democracy of Indymedia: Discursive, technical and institutional constructions." *Critical Studies in Media Communication* 23(1): 19-38
- Pickerill, J. (2007). "'Autonomy online': Indymedia and practices of alter-globalisation." *Environment & Planning A* 39: 2668-2684.
- Pilemalm, S., N. Hallberg, & Timka, T. (1998). "From 'the good work' to 'the good life: a Perspective on Labor Union Visions Regarding Information Technology, Linköping University, Sweden.
- Plisken, N., C. Romm, et al. (1997). "E-mail as a weapon in an industrial dispute." *New Technology, Work and Employment* 12(1): 3-12

- Preece, J. (2000). *Online Communities: Designing Usability, Supporting Sociability*. Chichester, John Wiley.
- Ranerup, A. (2001). Online forums as a tool for people-centred governance: experiences from local government in Sweden. *Community informatics: shaping computer-mediated social relations*. B. Loader and L. Keeble. London, Routledge: 205-219.
- Rolfe, B. (2005). "Building an Electronic Repertoire of Contention." *Social Movement Studies* 4(1): 65-74.
- Rosenbaum, H. and K. Joung (2005). "Socio-Technical Interaction Networks as a Tool for Understanding Digital Libraries." *Proceedings of the American Society for Information Science & Technology* 41(1): 206-212.
- Rossen, M. B. and J. M. Carroll (2005). *Minimalist Design for Informal Learning in Community Computing*. *Communities & Technologies 2005*. P. van den Besselar, G. De Michelis, J. Preece and C. Simone. Dordrecht, NL, Springer: 75-94
- Scacchi, W. (2005). *Socio-Technical Interaction Networks in Free/Open Source Software Development Processes*. *Software Process Modelling*. S. T. Acuna and N. Juristo. New York, Springer Science: 1-27.
- Schuler, D. (2001). *HCI Meets the 'Real World': Designing Technologies for Civic Sector Use*. *Human-Computer Interaction in the New Millennium*. J. M. Carroll. New York, Addison-Wesley: 647-672
- Schuler, D. (2008) *Patterns for Living Communication*, MIT Press:London
- Spear, R. (2006). "Social entrepreneurship: a different model?" *International Journal of Social Economics* 33(5/6): 399-410.
- Stalbaum, B. (n.d.) *The Zapatista Tactical Floodnet*, available at: <http://www.thing.net/~rdm/ecd/ZapTact.html> viewed 18 Sep 2008
- van Belle, J.-P. and J. Trusler (2005). "An Interpretivist Case Study of a South African Rural Multi-Purpose Community Centre." *Journal of Community Informatics* 1(2): 140-157.
- Walker, S. (2002). "Internet training in trade unions: a comparison of four European confederations." *Internet Research: Electronic Networking Applications and Policy* 12(4): 294-304
- Walker, S. & Creanor, L. (2006) *Networked learning and social action: a social informatics perspective*, *Networked Learning 2006*, Lancaster, 10-12th April 2006
- Walker, S. and Dearden A. (2005). "Designing for Civil Society." *Interacting With Computers* 17(1): 1-8.
- Walker S. & Dearden A. (2008) *Technology and Social Action* in Innes, T. (Ed) *Designing for the 21st Century*, Ashgate:London 103-113
- Wall, M. (2007). "Social movements and email: expressions of online identity in the globalization protests." *New Media & Society* 9(2): 258-277
- Ward, S. and W. Lusoli (2003). "Dinosaurs in cyberspace? British trade unions and the Internet." *European Journal of Communications* 18(2): 147-179
- Wenger, E. (1998). *Communities of Practice: Learning, Meaning & Identity*. Cambridge, Cambridge University Press.
- Wessels, B., S. Walsh, & Adam, E. (2008). "Mediating Voices: Community Participation in the Design of E-Enabled Community Care Services." *Information Society* 24(1): 30-39
- West, D. and L. Thomas (2005). "Looking for the 'bigger picture': An application of the appreciative inquiry method in Renfrewshire Council for Voluntary Services." *International Journal of Information Management* 25: 429-441.