Networked Learning and Social Action: a Social Informatics perspective

Steve Walker and Linda Creanor
Leeds Metropolitan University, Glasgow Caledonian University
s.walker@leedsmet.ac.uk, l.creanor@gcal.ac.uk

ABSTRACT
This paper considers networked learning in the context of civil society organisations concerned centrally with some form of social action. We briefly outline some recurring characteristics of learning, and in particular networked learning, interventions in such social action settings. We introduce the concept of sociotechnical interaction network from the social informatics literature and apply it to identify and to analyse three aspects of networked learning, drawing on case material from transnational trade union education. Finally we identify issues for further research highlighted by this model.

Keywords
Networked learning, social informatics, social action

INTRODUCTION
This paper considers networked learning in the context of civil society organisations concerned centrally with some form of social action. We briefly outline some recurring characteristics of learning interventions in such settings. We use the concept of sociotechnical interaction network from the social informatics literature and apply it to identify and to analyse three aspects of networked learning, drawing on case material from transnational trade union education. Finally we identify issues for further research highlighted by this model.

Networked learning and social action
Networked learning in social action settings is frequently conducted outside formal further or higher education, though frequently in collaboration with them. Two broad, and frequently overlapping, themes can be identified: learning concerned with improving the access of socially excluded groups to economic and social opportunities; and learning with the goal of improving the ability of individuals, groups or organisations to carry out some form of social change. We are primarily concerned with the latter group of issues as seen for example in trade union, development, human rights education or community development. We refer to this as 'learning for social action'.

Learning for social action is characterised by the values informing the design and content of learning and the intent to encourage some form of collective social change. Pedagogies are varied, but in general tend to be learner-, rather than teacher- or expert-, centred, often using co-operative or collaborative methods. The collaborative dimension of the learning is a part of the process of social change, and in some cases is intended directly to encourage collaborative working beyond a particular learning intervention. The audience for many social action learning interventions is made up of people without histories of engagement with educational institutions, and in some cases active alienation from them. It can, in the examples discussed below, involve bringing together of people living and working in very diverse settings.

Framework: sociotechnical interaction networks
In the social informatics literature, the concept of sociotechnical interaction network (STIN) (Kling *et al*, 2003) has been used to examine the emergence of electronic journals in scholarly publishing. STINs offer rich models of the interactions between people, technologies, documents and practices, and can be used at multiple levels of analysis. A STIN is a metaphor for the complex social, political, economic and in the cases discussed here, pedagogic, interactions among networks of people, organisations, technologies, data, documents and other resources in technology use (Kling *et al*, 2003). A STIN portrays these as heterogeneous networks of nodes and the varied links between them. The scope of a STIN, and the appropriate level of detail are determined by the researcher, relative to the issue under analysis: different levels of resolution and magnification will be appropriate to different analyses. Another way of thinking of STINs is as recursively embedded within each

other - in principle it is always possible to break down individual elements of STINs further, to reveal the networks within them. In developing our analysis of the relationship between technology and learning we concentrate on a micro-level analysis of the specific arrangements of people, technologies and practices. The value of diagrams of sociotechnical interaction networks lies in the way they allow us to illustrate the important social and technical nodes and diverse links between them. Comparing the 'topologies' of these networks then allows us to illustrate commonalities and differences between heterogeneous configurations of actors. It is in this, metaphoric, mode that we use the concept of STINs in this paper. We use STINs here to describe and analyse three aspects of networked learning: the relationships between 'local' configurations; between 'local' and 'global' configurations'; and as a way of modelling the way configurations may change over time. Below we reconceptualise three issues in related literatures as sociotechnical interaction network terms before testing these models against case study materials.

Local configurations.

A common characteristic of participants in networked learning activities is that they come to the event from a diverse range of contexts. Each participant will be embedded in a particular 'local' context. Representing local situations as STINs allows us to identify important elements in a particular setting, and the relationships and interactions between them. In networked learning participants use the technical infrastructures of interacting hardware, software and telecommunications facilities. Access to these infrastructures may in turn be influenced by income, occupation and organisational position, while in some cases reciprocally influencing them. People are also embedded in a range of occupational, domestic or other sociotechnical networks and practices. These networks have important implications for the ways in which learners mobilise resources needed to participate in networked learning. In social action settings, largely outside formal educational institutions, informal elements of learning and access to resources play a significant role Sawchuk (2003) has demonstrated how resources are mobilised through social networks to enable learning about technology in working class communities in Canada. These informal 'working class computer learning networks' are central to the development of their members' knowledge about computers. Sawchuk's identification of these networks highlights how effective participation in networked learning events may rely on available social capital, understood as the ability to mobilise a variety of resources (including information) through social networks.

We can use sociotechnical interaction networks to illustrate these circumstances, using them in ways analogous to the 'ego' network of social network analysis (Wasserman & Faust, 1994:41) which traces the network links to and from an individual person. In a sociotechnical interaction network, these 'ego' networks will be heterogeneous, made up of the social and technical relations associated with a particular practice of technology use. We develop this further in the first case study below. Implications for the design of networked learning may include the need to identify the 'ego' network within which learners are operating, socially, technically and intellectually, and to ensure an adequate level of support to overcome any insufficiencies in a participant's local STIN. Pedagogically, this signals the need for a social-constructivist approach to learning which encourages the formation of supportive learning communities through involvement in collaborative group work and meaningful online discussion and debate (Fowler & Mayes, 2000)

Networked learning as the relationship of local and global configurations

Designing networked learning events which bring together participants from diverse local situations raises a number of issues If we conceive of participants' local contexts as sociotechnical interaction networks, then the design of networked learning events involves linking together these networks through networked technologies to enable learning. Such learning events are, we contend, themselves amenable to analysis as sociotechnical interaction networks – in effect they become networks of networks. Discontinuities between participants' local STINs can be thought of as boundaries, which given the heterogeneous nature of STINs can take multiple forms.

The design of networked learning events can then be thought of as an exercise in 'heterogeneous engineering', bringing together people and technologies organised through pedagogic practices and artefacts. Discussing the boundaries between communities of practice, for example, Wenger (2000) characterises a range of ways in which people and boundary objects can come together to interact across boundaries to enhance learning. We have argued in an earlier paper that networked learning interventions can be thought of as boundary encounters, and that depending on the nature of the intervention, boundaries may either be central opportunities for learning or obstacles to enabling learning (Walker & Creanor, 2005). In such settings, tutors play particular roles in the design of artefacts and actions to facilitate learning by identifying problematic issues such as linguistic differences and designing a course framework and learning activities which address them directly. We explore this further in the second case study below.

Changing configurations over time

The structures of many networks are likely to be time sensitive. For example, Barabasi (2002) has demonstrated that where new nodes are likely to join a network through linking to those nodes which are already most prominent (as is the case with the Web) the resulting structure will be 'scale free', with a small proportion of highly connected nodes and a large proportion of nodes with low connections. Similarly, we may find that the manner in which STINs emerge or are designed may influence their topologies in important ways. The sociotechnical configurations of networked learning change over time at three levels. Firstly, an individual's 'ego' STIN may be reconfigured as a result of their participation in a learning event. This may be because of the development of new social relations or the development of new knowledge or skills. New skills relating to the use of technology may result in the reconfiguration of elements of the technical elements in the 'ego' STIN. More widely, as people's needs change at different stages of their career, they mobilise information and learning in different ways (Penuel & Cohen, 2003), which may be amenable to analysis both as reconfiguration of 'ego' STINs and as part of a trajectory of an individual to more central participation in a community of practice. Secondly, within a learning event, different sociotechnical configurations may be appropriate to different stages of a learning process. The design of networked learning may incorporate changing activities, social relations and uses of technologies through the life of a learning intervention. Thirdly, particularly in social action settings, an explicit aim of a networked learning intervention is frequently to achieve some form of longer term social change and learning interventions may be aimed either at equipping individuals to participate more effectively in some wider processes or at supporting ongoing interactions among participants beyond the life of the learning activity itself. This involves moving from learning together to doing or working together. It also suggests exploring how networked learning interventions may contribute to the emerging understandings of how virtual communities change over time (Andriessen, 2005) and how learning, in these less formal guises, can be supported.

CASE STUDIES

In the following section, these three aspects will be illustrated, drawing on case material from Dialog On, a European project led by the European Trade Union College, in which networked learning interventions were used to build the capacity of trade unions to organise in the current rapidly changing economy. The project was organised in two 'strands': a computer-mediated distance learning (CMDL) strand in which trade unionists from pairs of countries participated in blended mode courses; and a 'networking' strand in which trade unionists working in particular industrial sectors (such as the graphical industries, or higher education) participated in networks organised by European level sectoral trade union federations to exchange information and generate knowledge about developments in the sector. CMDL strand tutors and network 'animateurs' were trained in online learning and network facilitation methods before embarking on their own 'mini-projects' of particular courses or networks. The data used below were derived primarily from the project evaluation activities. These activities included: pre- and post-activity participant and tutor questionnaires, interviews with course tutors and network animateurs and analysis of online conference archives (see Walker (2004) for a fuller account of the evaluation design and activities). The examples below have been chosen to demonstrate how a sociotechnical interaction approach can represent in practice the elements of the framework proposed above.

Local sociotechnical interaction networks

Dialog On was concerned with enabling participation by people living and working in very different situations. Some elements of these situations will be common across groups or sub-groups of people but some may be unique to an individual. Certainly, particular combinations of circumstance may be unique. To understand the detailed circumstances of individual participants would require more detailed ethnographic research, in this case beyond the scope of the project evaluation. However, data from pre- and post- course questionnaires, tutor interviews and review of course archives allow us to key aspects of local STINs. Identification of the significance of elements of local context is based on reports of problems which affected individuals' participation. While, of course, this way of assessing significance does not identify essential aspects of local networks which are universal, pragmatically it does identify issues which are significant to the design of networked learning events. Below, we use STINs to discuss access to the project conferencing server, which emerged as a recurrent issue across a range of both CMDL and networking mini-projects.

Participation in networked learning events requires access to the relevant infrastructure, typically through a computer and internet connection. Access, however, is embedded in a range of organisational and domestic circumstances. Some of these relationships come to the fore clearly in the case of trade union education, where participants may, for example, be full-time union employees participating as part of the their paid employment, workplace representatives with an office and technology access provided by agreement with (or legal requirement on) the employer, or an activist with no access in the workplace but access from the home.

Domestic and office settings have differing enabling and constraining implications for access. Below, we present these differing situations as micro-level sociotechnical interaction networks, exploring the relationship between the social, organisational and physical settings and the enabling and constraining features of particular technologies.

The project conference system could be accessed both via a web interface or using dedicated client which communicated with the server using a proprietary protocol. Training in the use of the infrastructure was provided to most participants in project workshops. The training emphasised the use of the dedicated client, partly since some functionality was only available via the client and partly because, once learned, the client interface was thought to be easier to use than the rather clumsy web interface. However, a widely reported problem across the project was that of using the client to access the server through organisational firewalls. The client uses seldom-used Internet connection settings. For security reasons, many network managers set firewalls to block all connection settings except those explicitly permitted, for example for applications such as the web or email. A frequently reported experience, following the training, was of participants returning to their organisations and finding that they were unable to connect to the server. When this problem was encountered, participants were advised to discuss their problem with whoever was responsible for network security in their organisation. While many network managers were responsive to the problem and 'opened' the firewall to client traffic, others were not. In such cases, despite the training, participants were forced to use the web interface. However, the problem recurred on several occasions even where the firewall had been opened: where network managers opened the port informally, the new settings might be lost when a firewall was upgraded. From a user perspective the firewall appeared arbitrarily to deny access again. For these participants achieving and maintaining access to the server was an organisational accomplishment as much as a technological one (see Fig 1).

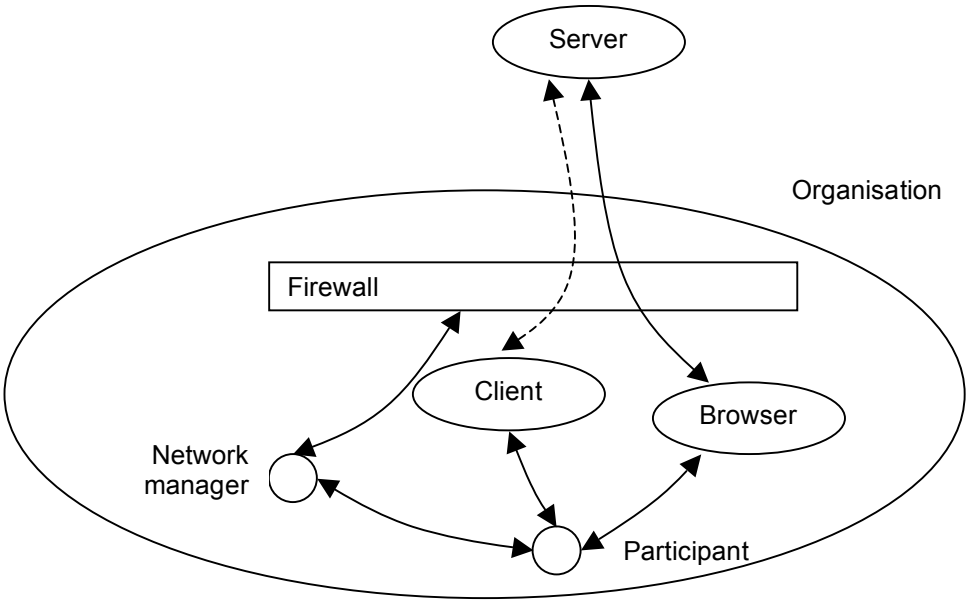

Fig 1: Accessing external conference server from within an organisation: stylised example of an 'ego STIN'

For those participants who accessed the project server from the home, a rather simpler 'ego STIN' (Fig 2) illustrates the organisationally simpler environment. It may be that these issues are of particular importance in social action settings: in this case participants accessed from particularly diverse settings, as volunteers and as paid employees.

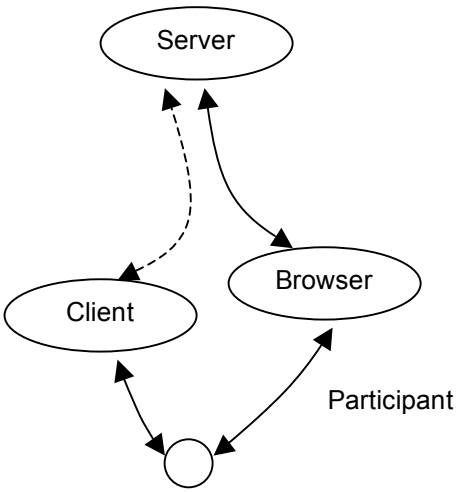

Fig 2: Accessing external conference server from home: stylised example

Given the difficulties in accessing the course infrastructure, there was an immediate danger of an ongoing impact on the motivation and subsequent levels of participation in the course. It is recognised that learner motivation can be affected by many factors (Warren, 2000), but for networked learning in particular, ease of access is fundamental. In this context pedagogically effective course design and tutor support play a major role in ensuring sufficient incentive for each participant to overcome barriers, especially, as in this case, where the motivation for learners is not a recognised qualification. By capturing aspects of social arrangements, the STINs help us to think of what is frequently conceived of as a simple issue of technical access as rather more complex.

Networked learning events as 'global' networks

The CMDL courses in Dialog On were designed to bring together trade unionists from pairs of countries to study some aspect of industrial change, to encourage the development of a wider European perspective. Conceived of as sociotechnical interaction networks, they are form a network of 'local' STINs for the duration of the course. One of the aims of the courses was to enable learning from the process of collaborating with trade unionists from other countries. This is a particular challenge for trade unionists in Europe, where industrial relations systems, trade union organisation and ways of working vary radically from country to country. As some aspects of workplace regulation are now agreed at the level of the European Union and with increasingly transnationally integrated work methods, trade unionists need increasingly to work with others in very different situations.

The course here brought together 16 experienced French and Spanish trade unionists in a blended mode course of two residential workshops and an intervening period of 18 weeks of online small-group collaborative learning activities. Four working groups (two of Spanish participants, two of French participants) prepared presentations on topics identified by participants at the first workshop for discussion at the second. As with the other project activities, the course used the First Class conferencing system which is a particularly flexible tool for configuring conferences, sub-conferences and folders, enabling the configuration of environments to support the planned working patterns for the learning tasks. The course can be thought of as an attempt to create a sociotechnical interaction network which brings together participants operating in diverse 'local' STINs.

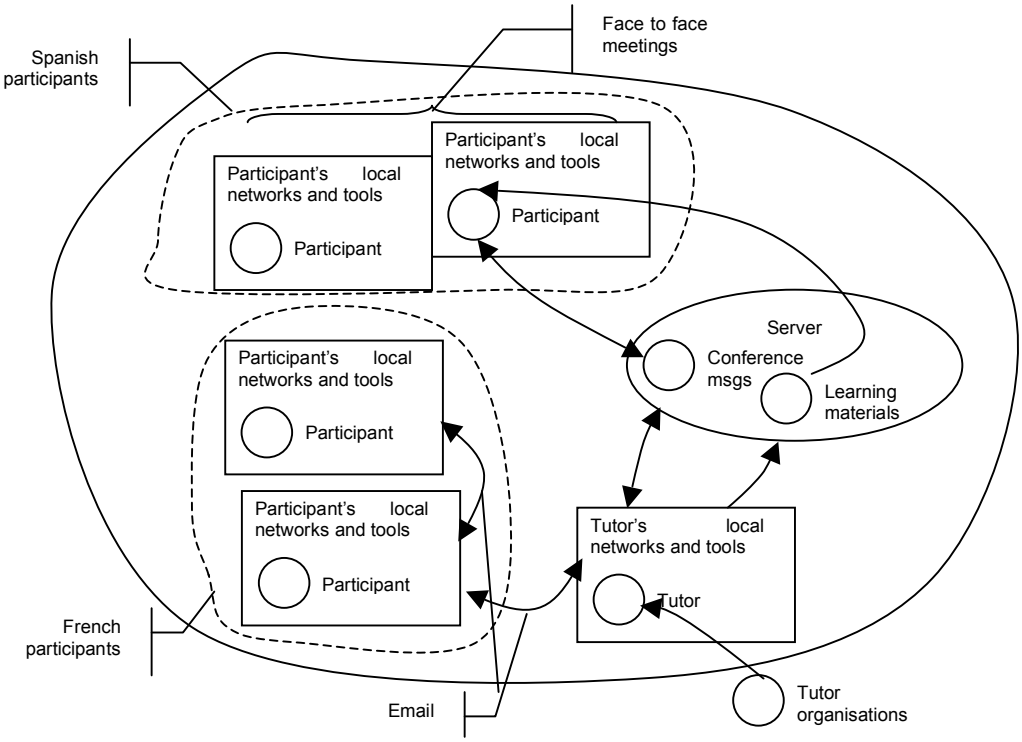

Figure 3 Sociotechnical interaction network diagram of case study distance learning

The communication practices during the reveals the importance of the local networks within which individual participants operate. In this case, the difficulties in building bridges between these local networks during the distance phase of the course demonstrate the difficulties encountered in establishing an effective 'network of networks'. Participants from each country shared linguistic, organisational and, to some extent, geographic, commonalities with each other which differed from participants from the other country. Linguistic commonalities were reflected in the design of the tasks: the four working groups were monolingual – two working in Spanish and two in French. In practice, however, the working patterns of the two language groups diverged significantly, with almost no interaction between them. The French participants did not use the conference server as their primary communications medium. Partly because the training planned for the first residential workshop did not happen, the French participants reverted to more familiar email systems for their group work, effectively rendering the work invisible to tutors and other participants. The Spanish participants, already familiar with the conferencing system from its use in their own confederations, used it in a way closer to the tutors' original expectations. Many of the Spanish participants were based in Madrid and organised their own informal meetings. Consequently, levels of electronic communications as seen in usage of the conference server were modest, even among the Spanish language group. Because of the language and technological differences, communications between the two groups during this phase of the course were very limited, mediated by one of the tutors. The Spanish group augmented their online working with face to face meetings, while the French group used a different (and to the Spanish, invisible) communications medium. Figure 3 represents the observed interactions qualitatively as a STIN to highlight the discontinuities in communications between national groups, and the alternative communications channels which emerged

Changing configurations of sociotechnical interactions over time

We expect many sociotechnical configurations to change over time. In Dialog On, participation in networked learning was aimed either directly or indirectly at improving the collective capacity of trade unions to respond to and contribute to shaping social change. In the CMDL strand this was largely indirect through the individual trade unionists' developing knowledge and skills that would be of use to their trade union work. In the networking strand, interventions aimed to establish durable computer-mediated networks from the initial training interventions that are stable over time. As this case, this was not always achieved.

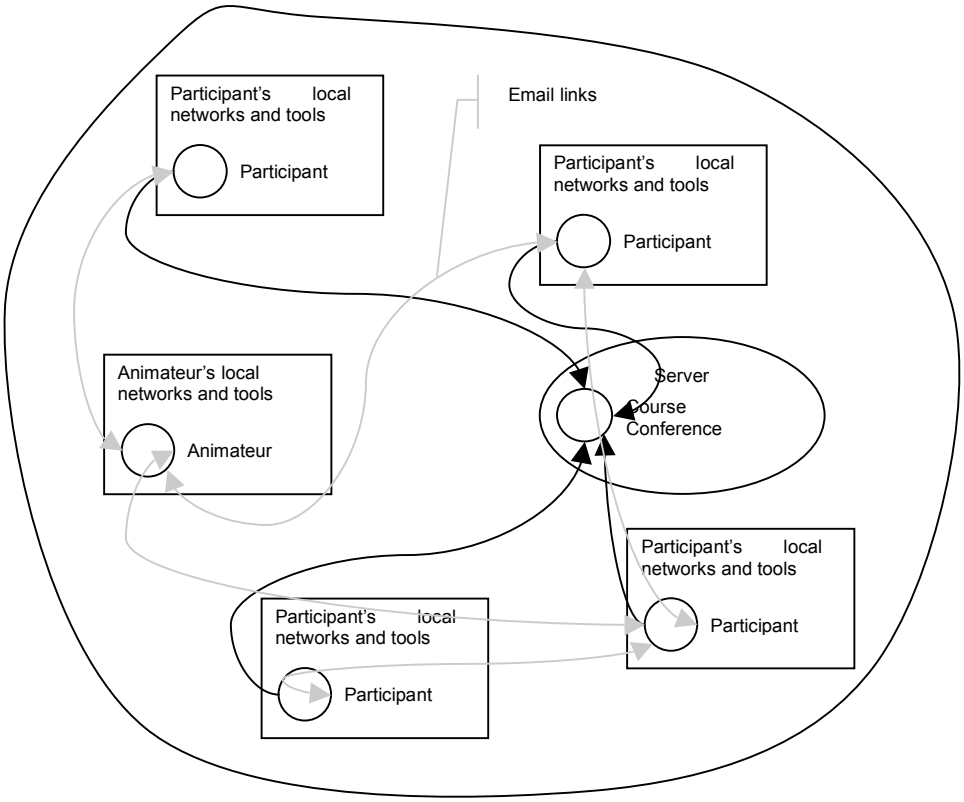

Fig 4: Collective bargaining information network initial configuration

The network aimed initially to improve the information collection on the state of collective bargaining in European countries in a traditionally well unionised industrial sector. It was established by the relevant European sectoral Federation, and its affiliated national trade unions. Previously, this information had been gathered via an annual paper-based survey which, while effective, had required a great deal of administration. It also only gathered information 'after the event' of the various national and company level negotiations. By creating an online forum, it was expected that information could be shared more dynamically during the process, and that as a result the network members would become 'closer together' and 'more linked', emerging as a durable learning and organisational network monitoring trends and developing the capacity to intervene. If successful, the network might also provide a model for other parts of the Federation. The network was prepared and launched at a residential workshop. Representatives from affiliated unions in each country were to provide bargaining information using online questionnaires through a single central forum. Ten of the thirteen initial network members were employees of national unions, the remainder being workplace representatives. The network conferences were implemented against a background of informal, ad hoc email links among some of the participants some of whom also met from time to time at meetings of the Federation. The network was co-ordinated by an animateur as part of their responsibility working for the European Federation. The initial task of collating collective bargaining information was handled by an academic with close links to the Federation. In the week immediately after the workshop, 27 messages were posted online. Subsequently, this fell before growing modestly. The animateur reorganised the network conference in week 18, creating a collection of six conferences with additional sub-conferences. In the five weeks before the reorganisation, a modest but consistent average of 7.5 messages were posted each week. Afterwards the average use (summed across all conferences) fell to less than two messages/week. Encouraged by early signs of growth the animateurs had tried to extend the range of the network, in part to encourage new participants to join. It appears, however, that contributions were fragmented across locations and usage rapidly fell away, and the network 'died'. The reorganisation, at best, appears to have been premature. The 'before' and 'after' states of the network are illustrated in Figs 4 and 5.

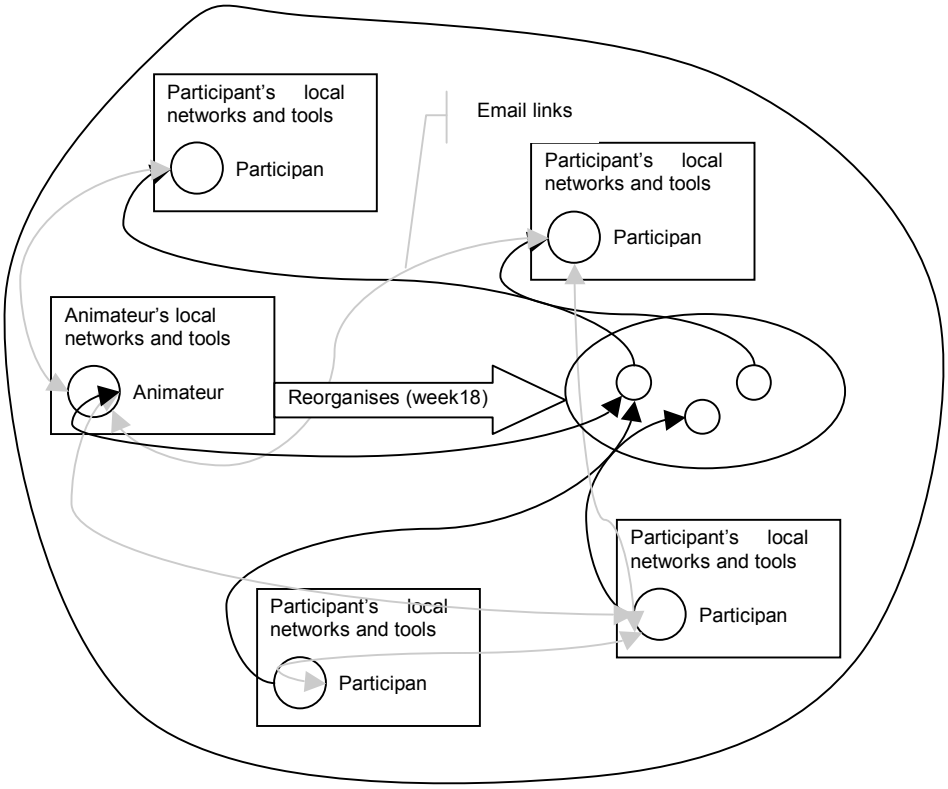

Fig 5: Collective bargaining information network – after re-organisation

DISCUSSION

We have argued that sociotechnical interaction networks are a fruitful way to conceive of networked learning interventions. We have used STINs illustratively in the context of learning for social action. We have explored three elements of the organisation of networked learning in social action settings. These cases studies are suggestive of issues for further research both in the conduct of networked learning for social action, and in the use of as sociotechnical interaction networks as an analytic tool.

Networked learning for social action

Sawchuk's (2003) work on working class computer learning networks demonstrates that gaining access to ICT and associated skills is a social process. Our case study here suggests that conceiving of such local networks as sociotechnical networks allows us also to consider the technological as well as social aspects of local networks. A better understanding of these relationships may help to support the design networked learning interventions that take account of participants' differing social and technological contexts. It may be possible to design learning interventions that can both mobilise and reinforce the enabling aspects of local sociotechnical interaction networks while minimising constraints. Thinking of courses as 'networks of sociotechnical interaction networks' helps us to consider both the detail of the interface between local and 'global' interaction networks and ways in which we can design the social and technological elements of the learning intervention to involve participants from widely divergent situations: the case of Dialog On suggests that these situation may be rather more diverse than among groups of students in more traditional networked learning contexts.

An important aspect of at least some learning for social change is the generation of new forms of networked organisation stemming from learning interventions. This implies that the sociotechnical interaction networks need to be designed to change over time from learning to organising modes. This may prove to be a complex process as the technological infrastructures appropriate for planned learning events may differ significantly from those designed for work or other activities. Also, as the case here illustrates, the timing of interventions can be critical. While conceiving of such changes as reconfigurations of sociotechnical interaction networks may be fruitful, current tools for thinking of temporal changes in STINs remain inadequate.

Sociotechnical interaction networks

Sociotechnical interactions have, we argue, been useful tools for thinking about several aspects of networked learning, here in the context of learning for social action. We may find that they are also useful tools in addressing networked learning in other settings. However, we have identified some weaknesses in the current 'state of the art'. Firstly, the diagrams here are rather metaphoric, derived largely from the observations of difficulties, rather than successes. Presenting other case studies in this way may allow us to recognize patterns associated with successful and unsuccessful interventions. There, may, though be value in considering such sociotechnical networks more formally with network analysis tools, identifying more precisely the nature and relationships of nodes and the interactions between them. Secondly, and more particularly, we have found that network diagrams of the type we have used here do not adequately capture key elements of the temporal dimension of networked learning interventions. Building on more formal representations of STINs it may be possible to capture the temporal dimension more usefully.

CONCLUSIONS

Our first foray into the use of sociotechnical interaction networks to help us to think about networked learning in social action settings has, we argue, been a useful way of conceiving of difficulties, and may help in designing alternative approaches to the organisation of such learning. However, we have also identified significant weaknesses in their practical use. It is, for us, an open question whether given the heterogeneous collection of nodes and links they represent, STINs may usefully be open to more formal analysis using methods developed in the analysis of other types of network (e.g. Barabas, 2002; Wasserman & Faust, 1994).

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