CSCL The next ten years – a view from Europe

Abstract: This paper reviews some foundational issues that affect the progress of CSCL after ten years. In particular we examine the terms technology, affordance and infrastructure and propose a relational approach to their use in CSCL. Following a consideration of networks, space and trust as conditions of productive learning we propose an indirect approach to design in CSCL. The work supporting this theoretical paper is based on the outcomes of two European networks, E-QUEL a network investigating e-quality in e-learning and Kaleidoscope, a European Union Framework 6 Network of Excellence. In particular this paper is an outcome of the 'Conditions of productive learning in networked learning environments' project. This paper does not aim to be comprehensive or summative in its review of the state of the art in CSCL rather the paper provides a view of current issues and perspectives for CSCL from a European point of view.

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CSCL

Computer Supported Collaborative Learning as an emerging field of research and interest still struggles to find a provisional stability even arguing over its very name (Koschmann, 1996, 2001, Strijbos, Kirschner and Martens 2004). However, seen from a sociology of knowledge perspective CSCL *is* already a scientific field and a scientific community complete with its own conferences, journals and educational programs. Due to the very nature of the object of its research: Computer Supported Collaborative Learning, the field is interdisciplinary drawing on a variety of feeder disciplines such as learning, anthropology, psychology, communication, sociology, cognitive science, media- and informatics.

Studies in CSCL are diverse in their contributions dealing with analysis, theorization, modelling, construction, and design – and the methods applied stretch from controlled laboratory experiments on group collaboration, to action oriented, situated, social experiments designing for various forms of collaborative learning in a global digital networked setting. What knits the field together and what makes it so special is the *integration* of the four fundamental concepts: computer, supported, collaborative, and learning.

However, in some of the recent work reflecting on CSCL, including Koshmann (2001) – one of the founding fathers of CSCL – there is a questioning of the necessity for integrating technology into CSCL:

> "CSCL research has the advantage of studying learning in settings in which learning is observably and accountably embedded in collaborative activity. Our concern, therefore, is with the unfolding process of meaning-making within these settings, not so-called "learning outcomes". It is in this way that CSCL research represents a distinctive paradigm within IT. By this standard, a study that attempted to explicate how learners jointly accomplished some form of new learning would be a case of CSCL research, even if they were working in a setting that did not involve technological augmentation. On the other hand, a study that measured the effects of introducing some sort of CSCL application on learning (defined in traditional ways) would not". (ibid. p 19).

Strijbos, Kirschner and Martens (2004 p1, p 246) make a somewhat different point, but one that also implies a non-technological emphasis. For these authors the emphasis in CSCL is on learning and the weakness in CSCL is in learning and educational design. Unlike Koschmann we think it is both necessary and challenging to keep technology within our focus. Unlike Strijbos *et al* we see the technological aspect as deeply integrated in a socio-cultural theoretical approach to the understanding of collaborative learning. The technology has to be taken seriously as properties, either symbolic or material, as a set of tools which can afford meaning making, because this is precisely what makes this research area special. In our opinion this is where CSCL has something profound to contribute to the field of learning.

Much of the research that has taken place within CSCL has focused on the micro level of collaborative learning, on the collaborative learning taking place in single groups (see e.g. Dillenburg 1999). Supplementing these approaches, we would like to argue for more focus on what we would call the meso-level of collaborative learning:

- On how to design for collaborative learning at the institutional level, in organisations, school settings, and in networked learning environments
- On what the basic conditions are that allow for collaborative learning in these settings
- On how the technology and infrastructure affords, and mediates the learning taking place

In this way we would like to throw light on the field of CSCL making use of the theoretical lenses of educational research, human centered informatics and the social sciences more generally. In doing so:

> "One needs, first of all, the right vocabulary for thinking about the phenomena that occur on levels of analysis that we are not familiar with discussing. We need appropriate conceptual resources and analytic perspectives. This is what is meant here by a ´theory´" (Stahl, forthcoming p. 5).

In the following, we are not providing a theory, but in line with Stahl, we would like to contribute to the collaborative process of establishing a meaningful conceptual framework for the understanding of conditions for productive learning in networked learning environments. In order to understand the new emerging practices in this area and to be able to contribute to the productive development of them, we must develop conceptual tools. This is even more necessary because of the interdisciplinary nature of the field. Integrating concepts from different disciplines involves a cost in terms of the intellectual work necessary to ensure that the historically embedded meaning travels with the concepts, and that the concepts are rethought and integrated in the perspective of the new practices and the insights from neighbouring disciplines.

The theoretical framework adopted in this work can be described as socio-cultural in a broad sense and it draws on the works amongst others of Vygotsky (1978), Leontjew (1977), Engestrøm (1987), Lave & Wenger (1991), Wenger (1998), Giddens (1984), Castells (1996/2000), Dewey (1916) and Negt (1975). Because these traditions are in some ways contradictory, with regards to epistemology and methodology (e.g. the relation between subject and object, the level of analysis, the understanding of technology.), there has to be profound work and discussion in order to solve or clarify these contradictions and elaborate the practical consequences of them.

In the following sections we will be dealing with some of the key theoretical concepts which have emerged from the work in two European projects and networks, E – QUEL, (http://www.equel.net/), and Kaleidoscope, a European Union Network of Excellence concerned with technology enhanced learning. In particular this paper relates to the outcome of the project 'Conditions of productive learning in networked learning environments' (http://www-kaleidoscope.imag.fr). We will focus on two sets of issues: firstly, technology, affordances and infrastructure and secondly on networks, space and ethics. These have emerged in our work as being crucial to an understanding of the conditions for productive learning in networked learning environments.

Technology, affordances and institutions

We argue that the concept of technology and the relationship between the design of technology and the use of technology is a crucial issue within the CSCL community. Vygotsky's socio-cultural approach, suggesting that tools fundamentally mediate higher mental functioning and human action, is a deeply accepted stance and at times it is even taken for granted in the CSCL community (Vygotsky 1978, Cole 1996, Kaptelinin, Danielsson and Hedestig 2004). Both the material and symbolic properties of tools are seen as having important implications for understanding how internal processes come into existence and operate (Fjuk, and Berge 2004). Fjuk and Berge argue that in order to understand these processes, analysis and design must consider the individual learner in her/his concrete situation and the mediational means that are employed. The focus on social practice links this work to a similar position elaborated by Orlikowski (2000). Orlikowski suggests making an analytical distinction between the use of technology, what people actually do with technology, and its artifactual character, the bundle of material and symbolic properties packaged in some socially recognizable form, e.g. hardware, software, techniques (ibid. p. 408). Through a theoretical and empirical analysis she demonstrates, that the same artifact used in different institutional contexts and by different social actors can evoke very different actions.

Theoretically, these different processes are explained by Orlikowski using structuration theory (Giddens, 1984), and she makes a distinction between two discrete approaches (op.cit pp. 405):

    a)   which posits technology as embodying structures (built in by designers during technological development), which are then *appropriated* by users during their use of the technology

    b)   a practice-oriented understanding where structures are emergent. Structures grow out of recursive interactions between people technologies and social action in which it's not the properties of the technology per se which structure the practice. Rather it is through a recurrent and situated practice over time, a process of *enactment*, that people constitute and reconstitute a structure of technology use. (Orlikowski op. cit. p. 410).

The practice-oriented structurational approach to technology (b) suggests that although the technology embodies particular symbolic and material properties, the technology in itself is not a structure, which determines the use and the users. Rather the opposite, the structure – understood as resources and rules - is instantiated and emerges through the users' responses and enactment in relation to the technological artifact. However we would go on to argue that Orlikowski may present too strong a contrast between the two approaches summarized above in a) and b). Seen from the practice of design, technologies do indeed embody features and properties and they also carry meaning having been designed with certain purposes in mind, embedding certain understandings of communication, interaction and collaboration. However, as Stahl (2005, forthcoming) formulates the question, though the designs carry meaning, and the tools have been designed with certain purposes in mind, how the users respond to or enact the technology cannot be predicted and it is in and through practice that the structural features will emerge. Therefore, it becomes an interesting research question for CSCL to ask how technologies are both taken into use and related to what may be thought of as technological affordances (see below) and reconfigured by users in varying situations and institutional contexts, including how users find creative ways to deal with inappropriate design.

Another way to deal with this question is to examine how we conceptualize technology. In her paper, Orlikowski counter poses technology thought of as:

    a)   "an identifiable, relatively durable entity, a physically, economically, politically, and socially organized phenomenon in space-time" – technological artifact

    b)   " a repeatedly experienced, personally ordered and edited version of the technological artifact" – technology in use (op. cit p408)

She makes it clear that this distinction is analytic rather than ontological in character but our work leads us to question the usefulness of this distinction in relation to certain kinds of technology. In particular we wonder whether the Web or Internet can usefully be thought of as technological artifacts in relation to CSCL. We would support the general position that Orlikowski seeks to maintain but we are concerned that conceptions that apply the metaphor of artifact to large, complex and composite forms such as the Web and Internet are in danger of reifying a deeply reflexive phenomenon. In important ways the Web and Internet do not fully conform to Orlikowski's criteria. Though relatively durable they are constantly in flux, though organized they show an uncommon self-organizational capacity, a network form, rather than stable economic, political and social forms. We suggest that the idea of technology and in particular technological artifact is an area ripe for further CSCL research, especially in relation to large scale and composite technological forms such as the Web and Internet.

Affordance

The concept of affordance has been central to thinking about technology within the CSCL tradition and beyond. The idea of affordance has been applied to technology in the sense that:

> "technologies possess different affordances, and these affordances *constrain the ways that they can possibly be' written' or' read'."* (Hutchby 2001 p447)

Affordance used in this way allows for the possibility of technologies having effects and the idea that particular technologies can constrain users in definite ways. The idea has its origins in the work of Gibson (1977) who was interested in the psychology of perception. Affordances in Gibson's view might vary *in relation* to the nature of the user but they were not freely variable, the affordances of a rock differed from those of a stream, even though different animals might see the affordances of each differently. The Gibsonain view is strongly relational and differs in significant ways from the later application of the idea of affordance by Norman (1990, 1999) and Gaver (1996). These authors have an essentialist and dualist approach in which technologies possess affordances and users perceive them. All three authors have recently been reviewed by Kirschner, Strijbos and Martens (2004) who emphasize the distinction added by Norman between an affordance as a property possessed by an entity and an affordance as it is perceived. Kirschner, Strijbos *et al* (2004) suggest that educational researchers and designers are

not dealing with the affordances of technologies themselves; rather they are dealing with the perceptible (Gaver 1996) or the perceived (Norman 1990, 1999). In both Norman's and Gaver's view the link between an affordance and action is one that relies upon the perception-action coupling.

Kirschner, Strijbos *et al* (2004) propose a six-stage model for a design framework based on affordances. This sophisticated and detailed model categorizes affordances as educational, social and technological. Educational affordances are defined as "those characteristics of an artifact that determine if and how a particular learning behavior could be enacted within a given context." (Kirschner, Strijbos *et al* 2004 p14). Social affordance is defined as "properties of a CSCL environment that act as social-contextual facilitators relevant for the learner's social interaction." (op.cit p15). For technological affordances the definition relies on Norman and technological affordances are "perceived and actual properties of a thing, primarily those fundamental properties that determine how the thing could possibly be used." (op.cit p16). It can be seen that all three definitions rely upon an essential reading of affordance, on the *properties* and *characteristics* of CSCL environments, artifacts and things. In all types of affordance considered by Kirschner *et al* the property of having an affordance lies within the thing, environment or artifact, even if the affordance relies on these features being perceived.

The view of affordance that we have begun to consider and would propose to the CSCL community is one that returns to a Gibsonian view and treats affordance as a *relational* property. In this way of thinking about affordances properties exist in relationships between artifacts and active agents, which would include animate actors and following Callon and Latour inanimate actants. This view is non-essentialist, non-dualist and does not rely on a strong notion of perception. Affordances in this view could be discerned in a relationship between different elements in a setting whether or not the potential user of an affordance perceives the affordance.

In educational settings we are likely to be concerned with reflexive social relationships. For example in a CSCL setting a task set for formative or summative assessment can provide the affordance of focusing group activity around which collaboration can occur. A relational view of affordance would suggest that we could analytically discern features of the setting apart from the perceptions of particular groups of users. Any actual group of users would have varied understandings and draw out different meanings from the setting but designers can only have direct influence over those abstract elements, that may become affordances in the relationship between the task and the participants. An example of such relational thinking can be found in Kreijens and Kirschner (2004). They point to the affordance of proximity in encouraging face-to-face interaction such as that associated with coffee machines/water coolers. They point to the need for teleproximity in computer networks, a simulacrum of actual proximity using designed features in digital environments. The affordances of both proximity and teleproximity rely on the relationship between participants rather than being a feature of any particular participant or a feature of the digital or physical environment.

Infrastructure and institutions
Implementation of CSCL in higher education is a complex task involving management, administration and ICT support as well as teachers and learners. Research in CSCL recognises that influences on practice arise from an organizational as well as a pedagogical perspective (Collis and Moonen 2001; Dirckinck-Holmfeld and Fibiger 2002). Despite these contributions the implications beyond the practice of the individual teacher or small group of teachers are still relatively vague. Change nevertheless involves processes well beyond the individual or small group. Nyvang and Bygholm (2004) draw on the works of Star and Ruhleder (1994, 1996). They suggest that we interpret ICT in use as infrastructures that both shape and are shaped by practice and go on to propose that we understand infrastructure as a relational concept.
> *Thus we ask, when – not what – is an infrastructure* (Star & Ruhleder 1996, p. 113).
This understanding of infrastructure has strong resonance with the earlier accounts of technology and affordance and we would suggest that the infrastructure for CSCL is a location in which these general issues find focus for research.

In a recent case study of a Masters level programme Jones (2004a) argues that obtaining a single login to enable all students on a distance taught programme access to library like digital resources is a multi-level problem. Jones (op.cit) argues that the technology does not present itself as a simple technological artifact; rather the technology is immediately a socially mediated form. The required digital resources are enmeshed in a legal framework of ownership concerned with property rights. Access to the materials and resources available for teaching and learning is not a simple matter as some of the materials that appear freely on the web are ephemeral with links moving or disappearing on a regular basis. Secure resources have to be embedded in an institutional and organizational

infrastructure that takes on some of the roles, such as preservation, that libraries have hitherto fulfilled. This institutional support may be external to the university and even the educational sector, as with government, NGO and corporate supplied materials. When resources become organizationally supported they often disappear from the Web's open access behind password protection. The creation of a single log-on authentication for staff and students and a public 'commons' for educational materials is a political, legal and social process well beyond the control of single educational programmes.

We have argued that technology, affordance and infrastructure are terms that the CSCL community may need to revisit. We have suggested that all three may be better understood using a relational perspective. We have also set out a number of ways in which we think this approach may lead to new research directions. The idea of technology and in particular the idea of technological artifact is an area ripe for further CSCL research as we argue technology and the affordances that may emerge in its use are factors that require investigation at a more macro level than has been usual in CSCL.

Conditions for productive learning: Networks, places and ethics

Castells (1996, 2000) writes about inclusion/exclusion in networks, and the architecture of relationships between networks, enacted by information technologies, which configure the dominant processes and functions in our societies. Castells has described the form of sociality in network society as one of 'networked individualism' (Castells 2001p129 ff). On the one hand the new economy is organized around global networks of capital, management, and information, whose access to technological know-how is at the roots of productivity and competitiveness:

> "Business firms and, increasingly, organizations and institutions are organized in
> networks of variable geometry whose intertwining supersedes the traditional distinction
> between corporations and small business, cutting across sectors, and spreading along
> different geographical clusters of economic units" (Castells 1996, 2000 p. 502).

On the other hand he claims that the work process is increasingly individualized:

> "Labour is disaggregated in its performance, and reintegrated in its outcome through a
> multiplicity of interconnected tasks in different sites, ushering in a new division of
> labour based on the attributes/capacities of each worker rather than the organization of
> the task" (ibid. 502).

This overall trend in societal development raises fundamental questions about the relationships between the networked society and the organization of learning environments within formal education. We believe it is a significant question for CSCL whether the designs of networked learning environments have to, or perhaps should, reflect the trend towards 'networked individualism' or on the other hand whether CSCL could serve as a counter practice offering opportunities for developing collaborative dependencies in networked learning environments.

The idea of networked learning has developed some force within European research, expressed in a number of publications and a series of international conferences. One definition of network learning from this tradition is that:

> Networked learning is learning in which information and communication technology
> (C&IT) is used to promote connections: between one learner and other learners,
> between learners and tutors; between a learning community and its learning resources
> (Jones 2004 a p. 1).

The central term in this definition is *connections*. This definition takes a relational stance in which learning takes place in relation to others and also in relation to learning resources. Networked learning differs in this way from CSCL and Communities of Practice in that it does not privilege strong relationships such as cooperation and collaboration or the close relations of community and unity of purpose. Unlike CSCL and Communities of Practice this definition of networked learning draws particular attention to the place of learning resources and peer learners in relational terms (For further elaboration of this view see Jones 2004, Jones 2004 b and Jones and Esnault 2004).

European research and practice has been heavily influenced by Communities of Practice thinking and other learning environments for professionals have built more explicitly on ideas of communities of practice and the pedagogical principles of collaborative learning. For instance in the form of problem and project based learning, encouraging and expecting students to work together (See for example Dirckinck-Holmfeld, 2002, Fjuk and Dirckinck-Holmfeld, 1997). The concept of communities of practice has developed from the apprenticeship model proposed by Brown, Collins and Duguid (1989), and is most commonly associated with Etienne Wenger (1998).

For Wenger, networks are not necessarily in opposition to the ideas of communities of practice. Wenger suggests that a network with strong ties resembles a community.

> "Communities of practice could in fact be viewed as nodes of "strong ties" in interpersonal networks" (1998 p. 283)

However, he also stresses the difference in purpose:

> "…but again the emphasis is different. What is of interest for me is not so much the nature of interpersonal relationships through which information flows as the nature of what is shared and learned and becomes a source of cohesion – that is, the structure and content of practice" (ibid p. 283).

In other words, Wenger is not only concerned with the flow of information between nodes, he also emphasizes the differences in what flows across the network. Communities of practice are characterized by three related structural properties, that of a shared enterprise, mutual engagement, and a shared repertoire (Wenger 1998 p. 72 ff), while networks are characterized as interconnected nodes (Castells 1996/2000) or the *connections* between learners, learners and tutors, and between a learning community and its resources (Jones, 2004 a p.1) As such networked learning is concerned with establishing connections, and relationships whereas a learning environment based on communities of practice is concerned with the establishment of a shared practice.

In some learning environments this is dealt with as a combination of the networked perspective and community of practice, in the sense that the individual learner is supported in relating learning to his / her work practices, which are seen as the primary community of practice (Jones 2004 a). However in other learning environments, different means are used such as team based project work in order to design for, and facilitate – not only connections between students – students and facilitators – and their learning resources but to establish true interdependencies and mutual engagement between participants – peer students as well as teachers and facilitators (Dirckinck-Holmfeld, L., E. K. Sorensen, et al. 2004)

The notion of networked learning and the practical application of the design of networked learning environments raises several questions:

- Should researchers in CSCL and education more generally serve as critical opponents to the overall trends in the networked society as expressed by Castells and stand up against "networked individualism", or should the design of CSCL and education reflect these trends?
- Which models, networked models or community of practice models, are more productive with respect to the learning of the individual participant and under what conditions? Is it, for example, more productive for busy professionals to be organized through a pedagogical model based on relatively weak ties among the participants, or is it more productive to be organized in accordance with a pedagogical model facilitating the development of the strong ties in a community of practice?

The theoretical approach based on the metaphor of networks is one that has a strong resonance with the relational approach suggested earlier.

Space and place in networked environments

Several authors have in recent years pointed to the need to distinguish between space and place in computer networked environments (see for example Goodyear, Jones *et al* 2001, Jamieson *et al* 2000, Ryberg and Ponti 2004). Goodyear, Jones *et al* (2001 Part 8) claim that that we should not try to design the elements that are most closely involved in learning itself. They emphasize the need for learners themselves to have some possibility to adapt and reconfigure what teachers and designers create for them. They argue that it is appropriate to try to design learning spaces (the physical learning environment, including all the artifacts which embody 'content') but they point out that we should expect students to customize these designed learning spaces and make their own 'local habitations' or 'nests' (Nardi & O'Day, 1999; Crook, 2001). More generally they argue for a distinction to be made between space, understood as a relatively stable and potentially designed environment and place, understood as contingent and locally inhabited.

The distinction between space and place is connected in significant ways to the earlier discussions of technology, affordance and networks. Participants in a computer network are simultaneously situated at a real point in time and space and displaced from that in a space configured through the network. Ryberg and Ponti (2004) are interested in the development of social context in networked environments. They comment on Lash (2001) who argues that networks are non-places.

> "Technological forms of life are disembedded, they are somehow 'lifted out'. As lifted out, they take on increasingly less and less the characteristic of any particular place, and can be anyplace or indeed no place. This lifted-out space of placelessness is a generic space…It is not any particular space, but a generic space. Its context is no context at all. Its difference is indifference… The Internet is a generic space. It is no particular space. Indeed, networks are themselves by definition lifted-out spaces." Lash 2001 p113

The question Ryberg and Ponti ask is:

> "If networks are non-places, with no context at all, how can we create a social context to support interaction and sociability?" Ryberg and Ponti (2004 p2)

Drawing a distinction between space and place Ryberg and Ponti quote Harrison and Dourish (1996) "space is the opportunity, place is the understood reality".

The distinction between space and place is fundamentally rooted in the shift toward networked environments and is one example of a set of problems in which designers only have an indirect control over the intended outcomes of their design. Indeed we argue later that this fundamental design problem could be useful in specifying a more general case for the ways in which design can be thought of in CSCL. It is also related to the notion of space as produced through interactions between individuals and institutions, rather than thinking of space as simply given. This point would be true of *all* spaces, not simply applying to the virtual. (See for example Lefebre 1991 and Urry 2000). Overall we argue that the notion of space and place is a problem area that could have a major significance for CSCL and practical implications in terms of design.

Ethical Dimensions of CSCL
Collaboration is not simply a technical, pedagogic or pragmatic concern. Collaboration includes an ethical dimension both in terms of the rationale for its use and in terms of the conditions for its success. The question, 'why collaborate?' cannot simply be answered by measures of success such as learning outcomes or considerations of alignment with economic goals. Collaboration has an ethical dimension that speaks to the ways in which we choose to structure our social lives. Too often collaboration is reduced to narrow concerns that ignore this ethical choice. This can lead to those involved in a CSCL environment not appreciating the rationale behind activity and comparing it unfavorably with individualized and transmissive methods that flow from different ethical positions.

In terms of the considerations for the successful use of CSCL the question of trust is perhaps central. Trust has been identified as an ethical question at the heart of communication:

> "Regardless of how varied the communication between persons may be, it always involves the risk of one person daring to lay him or herself open to the other in the hope of a response. This is the essence of communication and it is the fundamental phenomenon of ethical life."
> (Løgstrup, 1997, p. 17).

Rasmussen (2004) has argued from this position that this:

> " is not a question of a concept of trust which stands or falls on whether or not it is honoured. It is a matter of the simple form of trust expressed by the fact that we cannot avoid surrendering to each other."
> (Rasmussen 2004 p4)

Furthermore Rasmussen argues that this ethical demand can only be honored spontaneously. As soon as we begin to think about whether we are really acting as we ought, the focus moves away from acting exclusively in relation to the other person and towards ourselves. This ethical requirement for spontaneity can come into conflict with the modern demand for self-reflection. In educational terms we often require our students to be critically reflective in relation to their own work and the work of others. The question then arises as to how this might affect trust in CSCL environments. In so far as we require actions which are engaged in as a duty these actions may loose an element that is central to trust and as a consequence to collaboration. Also if free communication relies upon spontaneous action and the ability to lay oneself open to others how far does the planful nature of many CSCL environments and the pedagogic requirement for reflection affect collaboration and communication, and how might we design CSCL environments to reflect this ethical concern?

A second area of ethical issues affecting the conditions for productive learning arises around surveillance and control. Writers from a Foucauldian tradition point to CSCL environments as environments in which participants are aware that their actions are under surveillance (see for example Land and Bayne 2002, Rasmussen 2004). Surveillance comes from other participants in an equal power situation and often from others who are in a position of actual or potential control. Land and Bayne point out that for the tutor as constituted in the discourse and practices

of computer mediated environments they are both 'seers' of their students and 'seen' by their managers in an increasing process of accountability in education. This would suggest that participants would generally conduct themselves in accordance with the perceived norms of the environment and attempt to conceal actions that step outside of the accepted norms.

An example of how issues of trust impact on learning in networked environments can be found in the work done by the moderator in networked learning environments. Salmon argues that successful learning is the result of networking, but it is crucial that networking occur within a safe space:

> "[s] uccess in using CMC seems to come where most networking occurs and where there is openness and freedom to explore with little risk attached" (Salmon 2000).

Part of the moderator's role, according to Salmon, is the creation of this safe space, and addressing any concerns or fears that the learners may have. Trust is a central element in the provision of both a safe environment for learners and the conditions for communication and collaboration. An interesting research question for CSCL might be how the condition of trust affects different types of relationship. It is by no means obvious that the weak links identified in network analysis are any less dependant upon trust, indeed the maintenance of weak links may require a high degree of trust just as much as the strong links of community and collaboration require high degrees of trust.

Future Perspectives for CSCL

Throughout this paper we have tried to indicate where we believe our reflections point us in terms of future topics and issues for CSCL research. Overall we have argued for a relational approach to our understanding of technology, affordances and infrastructure and we wonder if a network metaphor and an ethical dimension to our approach may be necessary. We indicated that the question of how technologies simultaneously embed constraining features, and express relatively fixed properties, including design intentions and are also brought into use contingently in ways related to and reconfigured by users with differing intentions in a variety of settings, draws us towards what we describe as a relational approach to technology and its affordances and an indirect notion of design. Technology within the CSCL tradition has had a relatively narrow focus that places in the background issues concerning the politics, policies, institutions and infrastructures in which the processes of CSCL take place. We would argue for a greater focus on what we call the meso-level of collaborative learning. We would include in this the way in which many of the aspects of the settings in which CSCL is enacted are beyond the direct control of the individuals and groups involved. Such areas might include the way institutions select and implement infrastructures, including the use of open source software, within which CSCL will take place (Nyvang and Bygholm 2004, Svendson, Ryberg *et al* 2004). We suggest that the concept of technology itself and in particular the use of the term technological artifact is an area that requires further attention in CSCL research and we point in particular to the Web and Internet as large scale and composite technological forms through and in relation to which CSCL now takes place. The past ten years have seen CSCL move on from an environment in which the Internet was a minority concern and the Web only an emerging form to a time when the Internet is becoming ubiquitous and the Web a basic platform.

Our research points us to a number of ethical questions related to our approach to technology. We point to how the condition of trust affects different types of relationship, including the weak links identified in network analysis and the strong links of community and collaboration. We argue that it is a significant question for CSCL whether the designs of networked learning environments have to reflect the trend towards 'networked individualism' or whether CSCL researchers might choose to act as a counter practice by offering opportunities for the development of collaborative practices. We ask whether CSCL, and education more generally perhaps, can or should act as a critical opponent to some of the trends identified in the networked society and stand up against "networked individualism". We ask whether CSCL should privilege certain models of learning, for example networked learning or communities of practice, and whether such models are more productive with respect to learning and under what conditions that might occur. We point to the example of continuing professional development for busy professionals and wonder if organization through a pedagogical model based on relatively weak ties or one based on the strong ties in a community of practice is more appropriate. We argue that these are choices that need to be made on the basis of CSCL research, which can provide good criteria for selection.

The approach to technology outlined above points to the need for what we label *indirect* design so that we can design *for* learning. The relational view we have of technology and its affordances suggests that designers have limited direct control over how their designs are enacted. How learners respond to, understand and enact in relation to any design is a complex, structuration process which has to be studied in practice. Examples of such studies have been given throughout this paper and also include Fjuk and Berge (2004); Pilkington and Guldberg (2004);

Johnsson, Vigmo et. al (2004); Hedestig and Kaptelinin (2004) and Bernsteiner and Lehner-Wieternik (2004). In our review of the case studies and theoretical work we had undertaken it became clear that there was an underlying common theme in relation to design. In order to plan and design for learning in CSCL environments some degree of predictability of response to the design is required. Our research showed how contingent factors necessarily reduced design capacity in this critical regard. We focused on exactly what we understood to be available in terms of design as predictable aspects for planning. We suggest that designers within CSCL need to concentrate less on the material aspects of the designed artifact and more on the relationships that surround the enactment of the design and the mobilization of technologies and artifacts in that enactment. This approach might also suggest a flexible approach to design in which designed artifacts are thought of as shells, plastic forms that incline users to some uses in particular but are available to be taken up in a variety of ways and for which the enactment of preferred forms depends upon the relationships developed in relation to the design.

Acknowledgements

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