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Published in:

Information and Management

Published: 02/11/1998

Document Version:

Post-print, also known as Accepted Author Manuscript, Peer-reviewed or Author Final version

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Publication record in CityU Scholars:

[Go to record](#)

Published version (DOI):

[10.1016/S0378-7206\(98\)00056-1](https://doi.org/10.1016/S0378-7206(98)00056-1)

Publication details:

Kamel, N. N., & Davison, R. M. (1998). Applying CSCW technology to overcome traditional barriers in group interactions. *Information and Management*, 34(4), 209-219. [https://doi.org/10.1016/S0378-7206\(98\)00056-1](https://doi.org/10.1016/S0378-7206(98)00056-1)

Citing this paper

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**Applying CSCW Technology to Overcome Traditional Barriers
in Group Interactions**

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Original Submittal: May 8, 1997

Accepted: Wednesday, May 20, 1998

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Category of I&M submitted to: Research

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Abstract

CSCW systems are designed to improve group communication while alleviating negative interactions. However, their developers often focus on the technology, producing highly sophisticated software systems to address problems that may not exist in real life groups or may not effectively address problems encountered by them. As a result of an extensive review of the literature and a large-scale survey of meeting participants in a University setting, we believe that we have identified the most important problems in group interaction. These are matched with specific features of CSCW technology, as well as with their potential drawbacks. This problem-solution-drawback arrangement is posited as a point of departure for a common knowledge base for future CSCW development.

Keywords:

CSCW technology; group communication; group interaction problems; CSCW solutions; solution drawbacks; CSCW application contexts.

1. Introduction

The primary goals for applying Computer Supported Cooperative Work (CSCW) technology include cost reduction, space optimisation, and improved performance, effectiveness, and satisfaction. There are also more specific goals, such as improving group cohesiveness and diminishing the influence of dominant figures.

Since setting up a CSCW system involves purchasing production software, a major question facing users and developers must be: which CSCW features are needed and how should they be applied? Features needed or to be designed should solve real problems perceived and reported by real groups. Furthermore, applications of those features should be based on and supported by reported experience. In addition, knowledge of possible drawbacks reported in the literature can help to improve management of the development and application of CSCW systems.

When the application of new technology solves a problem, negative side effects may emerge. We must either accept these drawbacks, find new ways to overcome them, or try a different solution. Mandviwalla and Olfman [41] identified issues concerning which groupware systems users need, but they did not examine how problems could be linked to potential solutions. Thus, their work takes a technology-focused approach and the problem focus is lacking. In this paper, we deal with a necessary pre-requisite to any successful CSCW development methodology: the elicitation of problems, solutions, and possible drawbacks from the literature, thereby presenting a balanced problem- and technology-focused approach.

In addition, we support the literature survey by contrasting it with the responses to a survey [14] that gathered information about group interaction problems in a major university in Hong Kong, where CSCW systems were not deployed. In 1996, we administered a survey to the 1307 academic and administrative staff members of this university. Of the 357 who replied (a response rate of 27.3%), 77% were academic staff. These included teaching and research staff from four faculties: Science, Law, Business and Humanities. Administrative staff were drawn from a variety of offices including: the university library, the computer centre, and the personnel and finance offices.

2. Traditional Group Interaction Problems

There are four broad categories of problems that contribute to inefficiencies in traditional face-to-face group interactions: time, space/distance, cost, and behaviour.

2.1 Time-Related Problems

Scheduling meetings for groups can often be time consuming and frustrating, but a more serious problem is in limiting the meeting process time itself. Attempts to reduce this time can result in incomplete task analysis and poor decision making [53]. However, allocating too much time to meetings also produces problems: 18% of our survey respondents reported that they spent more than 20% of their working time in meetings. Furthermore, only 28% of the surveyees felt that more than 60% of that time had been used in serious discussion and only 33% felt that the time was used efficiently.

2.2 Distance and Space-Related Problems

The physical distance between participants acts to impede group interactions due to the time, cost, and effort involved in travelling to and from group meetings [43, 45]. If meeting space is limited, scheduling meetings becomes more difficult and can result in additional delays. Research on the ergonomics of space utilisation [38, 42] indicates that the traditional fixed-format designs of meeting rooms and tables can lead to problems involving "power" seats, line-of-sight interaction, and the need to set up sub-groups. Furthermore, smaller meeting space imposes additional constraints on how groups can interact. Our survey data reveals that 22% of meetings involve more than 20 participants. This kind of group size exerts considerable pressures on meeting space.

2.3 Cost-Related Problems

In attempting to alleviate time-related and distance/space-related problems, increased cost may arise [7]. Expenses are incurred in various ways, including: utilisation of space (whether for a meeting or storage of materials); time spent arranging meetings, and in travelling to and from meetings.

2.4 Behaviour-Related Problems

Behavioural barriers to effective group interactions arise mostly due to the distortion or loss of information, a lack of common conventions and standards [61], defects in the decision making process [35], and status variations [19, 26]. These problems all too often result in process losses, defined by Miner [46] as the "difference between potential and actual group performance".

2.4.1 Discussion domination and yielding to higher status

During face-to-face meetings, certain individuals may dominate the discussion [30]. Difficulties may arise in the appropriate distribution of time among opposing group members, especially in the presence of such dominating individuals. Our survey data shows that 19% of respondents agreed that some group members tried to intimidate others (through aggressive gestures, threats, talking loudly); furthermore, 17% agreed that they felt inhibited due to the behaviour of other members. Meanwhile, 25% of respondents indicated that they experienced pressure either to conform to a particular viewpoint [29] or to agree with others and 33% believed that some group members tried to use their status or power to force issues on others. Our data, which varies little by staff type, suggests that status-related discussion domination problems affect between 17% and 33% of the population.

The use of status to moderate communications is a natural regulatory mechanism that can be beneficial by giving greater influence to more experienced group members [58]. However, yielding to higher authority may not be out of conviction, but simply an expression of fear of the consequences of public opposition. Equally, yielding in *opinion* and yielding in *final decision* are different; a process that allows high status people to wield influence in the final judgement is acceptable in many situations, particularly in high power distance cultures [cf. 28].

2.4.2 Yielding to group pressure

Group pressures can result in the imposition of inferior majority views on superior minority views [49, 51]. Furthermore, undecided group members often vote for majority opinions. If a minority opinion is seen as obstructing the attainment of a goal, then the majority may express considerable dislike for the minority [47, 48].

This social pressure leads to what Janis [31] characterised as 'groupthink', exemplified by the statement: 'I think it is all right because everyone else thinks so'. In many cases, important ideas are glossed over and good opportunities are then missed.

2.4.3 Poor expression and miscomprehension

The quality of inter-group communication depends on the accuracy and completeness of idea transmission. Although verbal communication of unwritten material may misinform the recipient, a similar effect can occur in detailed, but poorly organised, written reports that deter effective group interactions by discouraging group members from reading them thoroughly. Additionally, the synchronous mode of decision making in face-to-face meetings often strains the process and causes a deterioration in decision making. Forced synchronous decision making does not allow for mismatches in comprehension speeds, particularly when interlocutors do not share a common mother tongue [1]. Notwithstanding the above, only 11% of our survey respondents indicated that they experienced problems expressing themselves in meetings, while 7% agreed that the language of the meeting prevented them from participating, and 6% admitted to experiencing difficulties in understanding others. Therefore about 90% of our population do not experience language problems.

2.4.4 Intercultural difficulties

Due to differing sociolinguistic and paralinguistic conventions and value systems, group process related problems may surface. For example, yielding in judgement to higher status members is acceptable in high power distance cultures, but relatively less acceptable in low power distance cultures. Collectivism and the free sharing of

information is stressed in certain cultures, whereas self-reliance and the structured exchange of information is stressed in others [8].

3. Applying CSCW Systems in Group Interactions

We first examine the physical impacts of CSCW on the workplace, before looking at the psychology and culture of group dynamics. A number of the drawbacks are those associated with the introduction of new technologies, viz.: its implementation cost, the cost of learning the technology, the possible loss of reliability, potential incompatibilities, and the need to adapt interaction style to fit the technology.

3.1 Physical Impacts

CSCW can help groups to overcome the time-, distance/space-, and cost-related problems and thereby improve their interactions.

3.1.1 Time-related problems

Time scheduling helps improve the efficiency of scheduling meeting activities. Also, the time spent in communicating and collaborating with others can be reduced through the use of communication tools, such as email, teleconferencing, and multi-media channels [55]. Mail filtering tools permit us to focus information acquisition on those topics that interest us the most, and thereby reduce the time spent looking for materials [36].

Where asynchronous communications are enabled, participants can be involved in their group sessions at a time that is convenient to them. This can make the whole process of communication more efficient by optimising participants' time. However, it is also true that in asynchronous environments, there is very little

peer pressure to participate. Thus, participation often occurs at the last moment, if at all. Table 1 summarises such issues.

Insert Table 1 About Here

3.1.2 Distance- and space-related problems

An intelligent space scheduler can help improve utilisation of space. Although one might expect electronic teleconferencing systems to reduce the need for travel to distant places [45], there is little evidence that it occurs. Likewise, asynchronous meeting systems can also address the space problems by allowing users to participate from their desks. This, however constitutes a major change in meeting style and is less similar to human face-to-face meeting. A drawback of this meeting style, where participants are evidently not in a face-to-face mode, is the reduced intimacy in, or depersonalised form of, interaction. All communications are conducted through the technology - whether it be textual, audio or visual - and none through true 'face-to-face' modes. Table 2 summarises CSCW impacts on the distance/space problem domain.

Insert Table 2 About Here

3.1.3 Cost-related problems

In theory, the use of CSCW can be expected to reduce travel costs as well as accessory costs such as food, hotels and insurance, and emotional (e.g. family-related) ones. In practice, this may not translate into actual cost reduction, but rather to better interactions leading to better decisions for the same cost. Still, we

can ascribe an equivalent cost reduction for the same performance to the use of CSCW technology. CSCW systems have also been demonstrated to reduce human and space costs. The cost of implementing and/or acquiring the CSCW systems themselves, however, must also be taken into account. Not all parties to a CSCW technology supported conference will necessarily have the requisite software and hardware available. Even if they do, the networks that connect them may not be sufficiently resilient, reliable, or secure from outside interference or surveillance, and so teleconferencing may not be feasible, especially when at least one of the participants is located in a less developed networking environment. Additional problems may be caused by system incompatibilities, resulting in prohibitive additional costs. The cost is therefore not only related to the financial costs of the CSCW technology. Table 3 summarises the possible impact of CSCW technology on costs.

Insert Table 3 About Here

3.2 Behavioural Impacts

Apart from the physical impacts, CSCW influences groups in terms of their cohesiveness, dynamics, and interpersonal relations:

- Active participation in a group can be increased when electronic communication tools (e.g., idea generation/categorisation tools) are available [22].
- In some situations, the human moderator or facilitator can influence the outcome of a decision making process procedurally. Automating the

decision making protocol gives the participants a sense of fairness and procedural neutrality. For synchronous settings, getting the group together to learn the CSCW technology has been shown to improve group cohesion.

- Automatic translation, although still imperfect, promises to bridge the linguistic gap [52, 59]. A key difficulty in automatic translation occurs when slang, euphemisms, in-jokes and other sociolinguistic features are present [2].
- Anonymity sometimes helps reduce personal and cultural tensions. On the other hand, it can have dysfunctional effects if it is managed poorly with participants becoming disinhibited and deindividuated [27]. Watson et al. [68] found that when anonymity was provided to groups in Singapore, some group members criticised others - a culturally inappropriate behaviour facilitated by the technology.

We have generated a more specific list of problems we feel are typical of group interactions. These are the basis for Table 4.

Insert Table 4 About Here

3.3 Increased Depth of Interactions

CSCW technology can both support a variety of styles of group interaction and be used to conduct detailed surveys of participant attitudes. A combination of interactive styles leads to more meaningful intercommunication, while the efficiency of the group interaction process improves. Since this efficiency results in

increased information exchange, we describe these impacts as increasing the depth of group interactions. One such major class of CSCW systems includes tools commonly termed Group (Decision) Support Systems, i.e. the generation, categorisation and evaluation of ideas.

In electronic brainstorming programs, participants are able to use a relatively unstructured format for the free generation of ideas. These may then be linked to one another. More structured idea generation tools allow participants to generate ideas, but then help in their categorisation. Irrelevant or unnecessary ideas can then be discarded and a short-list of key ideas, suggestions, or solutions reached. Use of an evaluation tool will reveal the degree of consensus achieved by participants and so feed back for further discussion. This process, from initial brainstorming through evaluation and then back to detailed discussion contributes immeasurably to the depth and quality of the interactions between the members of the group.

Electronic idea generation and evaluation is often conducted anonymously to reduce undue influence from dominant figures. On the other hand, by permitting weighted voting, the amount of influence exerted by more experienced persons can be adjusted to ensure that their experience is given due consideration in the voting process. Alternatively, voting scores can be normalised to equalise the effect of a particular sub-group that has more members, but no more authority, than another.

Such voting mechanisms also provide a faster method of polling the views of a group and returning them to all participants (who may not necessarily be geographically proximate). Thus, ideas or potential solutions can be evaluated on the basis of numerical criteria - ranked weights, point allocation, Likert scales - and

participants can compare their perception of each idea or issue with that of the group as a whole. This can be valuable in stimulating further discussion.

A key purpose of CSCW systems that support idea generation and evaluation is to increase group productivity and participation. Consensus can often be achieved in this way, through acceptance of the rule of the majority, a common phenomenon in pluralist societies and cultures and where power distance is low. Where, however, power distance is greater and consensus implies acting for the good of the group and forging a group ideal, some features of CSCW technology may not be appropriate. For example, anonymity has often been hailed as a means to encourage lower status participants to get involved [17]. This may be valuable, but anonymity can be misused.

Meaningful interactions are clearly important, but when certain individuals have vested interests at stake, they may be less interested in meaning and more interested in their own interests. Indeed, there are various ways of conducting social transactions: seeking truth is one way; seeking meaningful interaction is another. Upholding moral worth and displaying respect for elders/seniors are more important in Confucian cultures [10]. A CSCW system that focuses exclusively on the values of a single culture may be inappropriate in cultures where radically different approaches to social transactions are found. Indeed, Gray and Olfman [24], discussing interface design of GDSS, go further and contend that "it is arrogant for the designer to assume that all users of a GDSS have the same [style] and that they come from the same cultural and language background".

Indeed, it is likely that if users are unable or unwilling to adapt their interaction style to fit a technology [18], failure to adopt the technology is highly probably. This is especially true in cross-cultural situations and it is noteworthy

that CSCW systems have been developed and are used primarily in countries with strong 'Western' elements in their social cultures. In this respect, we note that in Singapore a GSS with distinctively *Chinese* characteristics was developed [69] so as to facilitate local adoption of the technology.

4. CSCW Application Contexts

The context where a CSCW technology is applied often requires a very specific set of requirements and special features that shape its design.

4.1 Co-operative Scientific Discovery

Substantial science projects, such as the Human Genome Mapping Project, involve thousands of scientists around the world, all working for essentially a common goal [63]. There is a strong need to support collaboration among the members of such a community of widely distributed researchers. One such system, designed and implemented to support the researchers mapping a model organism (the *C. elegans* nematode), is called the Community Worm System [60].

4.2 Electronic Support for Public Self-Government

During the 1992 US presidential election campaign, the issue of using electronic systems (with implicit reference to CSCW technology) to hold electronic town hall meetings was raised as a campaign vision. Such methods can establish an efficient two-way communication between the public and elected officials on matters of public interest [4].

4.3 Intra-Organizational Support

The design objective for systems aiming to occupy this niche is to support the day-to-day activities within an organisation; e.g., a large multinational corporation. This

application setting requires support for a collection of mainly asynchronous activities. CSCW systems provide this support through facilities that include: database support, a sophisticated email facility, etc., mail filtering, a meeting scheduler, elaborate security mechanisms to protect sensitive information, and support for wide-area networking. A good representative system in this category is LOTUS NOTES.

4.4 Software Requirements Analysis and Development

Davison [12] discusses how GSS can facilitate the collection of systems' requirements from end-users, while Mashayekhi et al. [43] describe how a GSS can enable distributed, collaborative software inspection to take place when the various developers or designers are distributed around the world. Issues of consistency and concurrency must be addressed, as also must questions of version control and document management.

4.5 Supporting Conference Papers/Presentations

Recent work [15] has addressed the suitability of using groupware technology to support conference presentations. In essence, all members of an audience could be equipped with a notebook computer and networked software running a CSCW system. This would enable them to communicate with each other and with the chair of the conference session, to ask questions of the presenter, to make general comments about the topic being presented, etc.. This extra level of communication should elicit valuable comments about the topic of presentation. No longer will the audience have to wait patiently to the end of a session before being able to comment or ask questions. Furthermore, audience members who arrive late will be

able to catch up on earlier comments: the group's memory is stored for retrieval at any later date and may even be archived for public access on the WWW.

4.6 Other Applications

CSCW technology has also been used to support collaborative: learning [67], distance education [20], criminal investigation [66], computer aided design [62], group authoring [33], distributed project management [25], and business activity modelling [16].

5. Conclusion

In this paper, we have argued that CSCW systems must be relevant to their users; the systems must address real problems that are faced by the users. We can match identified and reported problems with CSCW solutions, but we must also be aware of possible drawbacks to those solutions. Indeed, such problems tend to be multifarious and hence require a multifaceted solution. Furthermore, the application of one solution may necessitate or preclude the simultaneous application of other features. It is this form of problem-solution relationship that is instrumental to the development of a knowledge base that can be used to develop future CSCW applications. Complete expert knowledge for this approach has never been collected in a single knowledge base, but it does exist in an incomplete and fragmentary in the literature and in the experiences of users. Furthermore, whilst it is probably impossible to collect *all* knowledge about group interaction problems and their potential solutions, it is possible to collect a sufficiently large sample to make a persuasive case for the development and continuous updating of a knowledge base that can usefully be employed by CSCW designers. At the present time, CSCW systems are still largely production software, but that does not

preclude future user-specific CSCW systems. Such a system will be much easier to design with the benefit of previous experience.

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Table 1. The impacts and drawbacks of CSCW features on time-related problems in traditional group interactions

PROBLEM	CSCW SOLUTION	DRAWBACKS & REFERENCES
Too much time spent in arranging meetings	Group Calendar	<ul style="list-style-type: none"> • co-operation of all members of group essential • senior people may need to retain control over system if it is to work well [3]
Insufficient time spent in analysing issues during meetings	Asynchronous distributed meeting systems	• restricted media richness [11, 37, 65]
	Synchronous teleconferencing systems	• transborder data flow problems
	Advanced multi-media email	• no apparent drawbacks
Too much time in travelling to distant meetings	Asynchronous distributed meeting systems	• transborder data flow problems [56, 64]
	Synchronous distributed meeting systems	• transnational environments may introduce time zone problems in synchronous settings [23]
	Synchronous teleconferencing systems	• restricted media richness [11, 37, 65]
	Communication tools (e.g. email)	• restricted media richness [11, 37, 65]

Table 1 (cont'd). The impacts and drawbacks of CSCW features on time-related problems in traditional group interactions

PROBLEM	CSCW SOLUTION	DRAWBACKS & REFERENCES
Too much time wasted in the collection and tabulation of anonymous votes during meetings	Electronic Voting Systems	<ul style="list-style-type: none"> • no apparent drawbacks
Difficulty in collecting and analysing multi-scaled data from meeting members	Electronic Survey Tools	<ul style="list-style-type: none"> • no apparent drawbacks
Poor use of time in meetings due to poor task focus	Structured idea generation /categorisation systems	<ul style="list-style-type: none"> • restricted to well-structured or structurable tasks [57]
	Electronic meeting agenda	<ul style="list-style-type: none"> • no apparent drawbacks
Too much time spent on filling in forms and searching for documents	Workflow automation	<ul style="list-style-type: none"> • no apparent drawbacks

**Table 2. The impacts and drawbacks of CSCW features on distance- and space-related problems
in traditional group interactions**

PROBLEM	CSCW SOLUTION	DRAWBACKS & REFERENCES
Shortage of meeting space	Room schedulers	<ul style="list-style-type: none"> • effective only if the amount of allocatable space is sufficient
	Asynchronous distributed meeting systems	<ul style="list-style-type: none"> • restricted media richness [11, 37, 65]
	Synchronous distributed meeting systems	<ul style="list-style-type: none"> • transborder data flow problems [55, 64]
	Synchronous teleconferencing systems	<ul style="list-style-type: none"> • transnational environments may introduce time zone problems in synchronous settings [23]
Rigid/Inflexible table design (only one table format is possible)	Modular tables with infra-red LANs	<ul style="list-style-type: none"> • widely distributed system impossible with infrared technology [54]
	Distributed system with wireless modem-based LANs	<ul style="list-style-type: none"> • widely distributed system impossible with wireless modem technology [54]
	Modular tables with wired communications	<ul style="list-style-type: none"> • wires may tangle when table modules are rearranged [40]

**Table 2 (ct'd). The impacts and drawbacks of CSCW features on distance- and space-related problems
in traditional group interactions**

PROBLEM	CSCW SOLUTION	DRAWBACKS & REFERENCES
Long distances between meeting participants require long distance travel	Asynchronous distributed meeting systems	<ul style="list-style-type: none"> • restricted media richness [11, 37, 65]
	Synchronous distributed meeting systems Synchronous teleconferencing systems	<ul style="list-style-type: none"> • transborder data flow problems [55, 64] • transnational environments may introduce time zone problems in synchronous settings [23]
Paper documents occupy too much space	Workflow automation with document imaging	<ul style="list-style-type: none"> • need to scan all paper documents • some documents need to be kept on paper for legal purposes (e.g. signatures and stamps) [5]

Table 3. The impacts and drawbacks of CSCW features on cost-related problems in traditional group interactions.

PROBLEM	CSCW SOLUTION	DRAWBACKS & REFERENCES
Expensive meeting space	Asynchronous distributed meeting systems	<ul style="list-style-type: none"> • restricted media richness [11, 37, 65]
	Synchronous teleconferencing systems	<ul style="list-style-type: none"> • transborder data flow problems [56, 64]
High travel costs	Synchronous distributed meeting systems	<ul style="list-style-type: none"> • transnational environments may introduce time zone problems [23]
High storage and human costs in archiving and maintaining paper documents	Workflow automation with document imaging	<ul style="list-style-type: none"> • need to scan all paper documents. • cost of transferring data to new physical media • volatility of magnetic media as opposed to high quality paper • some documents need to be kept on paper for legal purposes (e.g. signatures and stamps) [5]

Table 4. The impacts and drawbacks of CSCW features on behaviour-related problems in traditional group interactions

PROBLEM	CSCW SOLUTION	DRAWBACKS & REFERENCES
Lack of active participation in group interaction	Anonymous idea generation, categorisation and evaluation tools	<ul style="list-style-type: none"> • can lead to conflict and division if used to criticise others [68] • danger of social loafing [34] and freeriding [32]
Lack of group cohesion	Anonymous idea generation, categorisation and evaluation tools	• does not permit a natural leader to be identified [44]
	Introduction of CSCW technology in general	• technology must be robust to survive changing group membership [35, 44]
	Automatic translation of words and ideas	• cohesion may not be helped by imperfect translations [24, 35]
	Asynchronous distributed meeting systems	• reduced media richness [11, 37, 65] may lead to misunderstanding

Table 4 (ct'd). The impacts and drawbacks of CSCW features on behaviour-related problems in traditional group interactions

PROBLEM	CSCW SOLUTION	DRAWBACKS & REFERENCES
Multiple native languages	Automatic translation of words and ideas	<ul style="list-style-type: none"> • technology still underdeveloped [52, 59] • imperfect translations may cause confusion [1]
High personal and cultural tensions	Anonymous idea generation, categorisation and evaluation tools	<ul style="list-style-type: none"> • disinhibition and deindividuation of group members [21, 27, 70]
	Introduction of CSCW technology in general	<ul style="list-style-type: none"> • some cultures may not appreciate the structure and diffusion of information that CSCW enables [13]
	Automated meeting or protocol facilitation	<ul style="list-style-type: none"> • different cultures may have different approaches to meeting management [cf. 68]
	Idea generation and categorisation tools	<ul style="list-style-type: none"> • some cultures' preferred communication style may not be compatible with media-poor idea generation/categorisation tools [cf. 1]
	Automatic translation of words and ideas	<ul style="list-style-type: none"> • technology still underdeveloped [52, 59]

Table 4 (ct'd). The impacts and drawbacks of CSCW features on behaviour-related problems in traditional group interactions

PROBLEM	CSCW SOLUTION	DRAWBACKS & REFERENCES
High moderator influence through control of procedural matters	Automated meeting or protocol facilitation	<ul style="list-style-type: none"> • may only be a perceived, rather than a real effect [9, 35]
	Asynchronous distributed meeting systems	<ul style="list-style-type: none"> • remote participants cannot 'see' the moderator and hence trust may be reduced
Discussion domination	Anonymous idea generation, categorisation and evaluation tools	<ul style="list-style-type: none"> • disinhibition and deindividuation of group members [21, 27, 70] • can lead to conflict and division if used to criticise others [68]
	Parallel keyboard input	<ul style="list-style-type: none"> • fast typists can dominate; nontypists must request secretarial support [38, 39]
	Idea generation and categorisation tools	<ul style="list-style-type: none"> • restricted media richness [11, 37, 65]

Table 4 (ct'd). The impacts and drawbacks of CSCW features on behaviour-related problems in traditional group interactions

PROBLEM	CSCW SOLUTION	DRAWBACKS & REFERENCES
Yielding to higher normative status	Anonymous idea generation, categorisation and evaluation tools	<ul style="list-style-type: none"> • disinhibition and deindividuation of group members [21, 27, 70] • can lead to conflict and division if used to criticise others [68]
Yielding to group pressure	Anonymous idea generation, categorisation and evaluation tools	<ul style="list-style-type: none"> • persistently deviant minorities may disrupt the interaction process [50]
Poor expression and miscomprehension	Anonymous idea generation, categorisation and evaluation tools	<ul style="list-style-type: none"> • reduced self-editing of ideas if you know your mistakes cannot be identified [15] • expression may suffer with surfeit of disinhibited comments [27]
	Electronic, typed or taped communication	<ul style="list-style-type: none"> • may lead to miscomprehension or unintended insult [6]
	Automatic translation of words and ideas	<ul style="list-style-type: none"> • poorly worded original text will translate to incomprehensible 2nd language text [cf. 1]

