Managing Participative Diversity in Virtual Teams: 
Requirements for Collaborative Technology Support

Sajda Qureshi  
Information and Decision Sciences  
Faculty of Management  
Erasmus University Rotterdam  
3000 DR Rotterdam  
The Netherlands  
squareshi@fac.fbk.eur.nl

Irma Bogenrieder  
Organisational Behaviour  
Faculty of Management  
Erasmus University Rotterdam  
3000 DR Rotterdam  
The Netherlands  
ibogenrieder@fac.fbk.eur.nl

Kuldeep Kumar  
Information and Decision Sciences  
Faculty of Management  
Erasmus University Rotterdam  
3000 DR Rotterdam  
The Netherlands  
kkumar@fac.fbk.eur.nl

Abstract

Information systems development has grown to become an area in which organisational performance and satisfying information needs secures primary consideration. As a result participation has become commonplace in the form of teamwork; autonomous work groups and even globally distributed virtual teams. However the benefits of participation have been contradictory as vested stakeholders may jeopardize the group process and emotional, irrational behaviour may thwart progress. This suggests that there are multiple dimensions of participation that need to be recognised. Once recognised, participation can then be used to increase the efficiency and effectiveness virtual teams. This paper describes this participative diversity through episodes at which aspects of learning took place in a globally distributed virtual team. Following an analysis of interactions on a virtual space, conclusions are drawn with respect to the functionalities required for collaborative technologies.

1. Introduction

Checkland and Scholes [2] describe the development of an information system as an ongoing activity in which human relations have to be identified and information flows defined. An information system need not necessarily have a technical component, but when it does, the social system plays a crucial part in determining the way in which the technology is used. In this participation is seen to a vehicle towards achieving a fit between the resulting information system and the organisations' social system. Communication through the computer network can provide a powerful means of linking a group of widely separated people. This increases participative diversity. In this, the support of work processes in which people do not physically meet or see each other can be provided within virtual structures. As defined by Hiltz and Turoff [13], "these systems use computers and telecommunications networks to store, deliver, regulate and process communication among the group members and between the computer and the group".

In particular groupware technology [10] such as electronic communication systems, discussion databases, collaborative writing tools and workflow applications, has been viewed by both scholars and practitioners as having the potential to facilitate productive teamwork [5]. DeSanctis et al. [5] suggest that because groupware systems provide a platform on which teams can support their communication needs and shared work obligations, teams which use groupware should experience improved information exchange and fewer coordination problems than those that do not. Studies reported by McCarthy [19] on real time multimedia conferencing suggest that the technology introduces interesting asymmetries into the interaction between people bringing about hierarchical relationships. Perin [22], state that there are situations in which this technology, especially in its current state, may not help. For example, simple tasks requiring two or three people may be accomplished more effectively in a regular setting. On the other hand, simpler collaborative technologies, such as email have been active in facilitating the informal diffusion and dissemination of information throughout organisations and some argue that this brings about more egalitarian beliefs and aspirations [3, 24].

The seeds of this contradiction appear to lie in the type of participation that takes place. Kling [16] terms these as twin rationalities of system rationalism and segmented institutionalism. Systems rationalists focus on the “legitimate” use of computing. They assume that there is consensus on major social goals relevant to computing use, placing efficiency and efficacy, whether economic or organisational, as the predominant value [16, p.63]. Segmented institutionalists on the other hand, observe that
participants in organisations adopt computing to enhance their personal status or credibility, as well as to improve the technical quality of their own decisions or to increase the economic efficiency of their own specific segmented activities. They assume that inter-group conflict is as likely as co-operation. They typically identify settings of computer use as broad forums for political activity [16, p.63-65]. Traditionally participation has taken a systems rationalist view in which the goals and objectives of the organisation are seen to be the key to framing discussions. In this view arguments and counter arguments are justified with reference to the organisational objectives. While participation, by including the diverse stakeholder groups, is expected to include the diverse interests, in practice the traditional participative process usually continues to aspire towards a single composite “consensus” view. Thus it is likely that most arguments in the participative debate continue to be formulated and justified in terms of the “greater good” of the unit or the organisation. Consequently the participants formulate most of their arguments, objections, suggestions, and solutions within the context of the goals and objectives of the organisation - i.e., the goals and objectives usually assumed and stated even before the participative process begins.

However, social constructivists such as Guba and Lincoln [11], suggest that it is both unrealistic and unnecessary to achieve complete consensus. Segmented institutionalism occurs through political behaviour where people try to implicitly manipulate the system requirements to bring these in consonance with their personal objectives. As private interests and goals are considered “non-rational” from a systems rationality perspective, they are usually not expressed explicitly but are used to tacitly manipulate the discussion. Moreover, as these multiple hidden agendas clash and conflict, a lot of time and energy is spent in manoeuvring for position or what is commonly referred to as “power play and politics”. Consequently, power and politics become the key concepts while the interplay of conflicting objectives and operation of supposedly “non-rational” choice processes determine the consequences [18]. Instead of consensus where all participants agree, we achieve a process of accommodation between the participants where people are willing to co-operate at the core while accepting to recognise, accept, and ultimately live with their remaining unmet expectations. Participation according to the segmented institutionalist model is seen in this paper to increase the effectiveness of virtual teams because it generates participative diversity and brings socio-cognitive conflict into motion. Socio-cognitive conflict creates the conditions for learning. This provides virtual teams with the ability to carry out more complex activities such as problem solving, policy making and strategy formulation.

In this paper we explore segmented institutionalism by investigating the creation of participative diversity through socio-cognitive conflict. Transcripts of a meeting between geographically dispersed members of an international agency network are analysed from a socio-cognitive perspective. The members of this network are involved in collaborative policy making and strategy formulation. The analysis reveals episodes of participative diversity, how it emerges and is hindered when systems rationalism comes into effect. Further episodes of participative diversity are used to arrive at implications for managing participative diversity through collaborative technologies. This paper concludes with requirements for collaborative technology if it is to create the conditions for more effective participation in virtual teams.

2. Socio-Cognitive Conflict

2.1 Definition of Socio-Cognitive Conflict

The concept of socio-cognitive conflict is used in this paper as a model of participative diversity. The interaction of multiple stakeholders with their own segmented institutional interests is seen to bring about socio-cognitive conflict. The concept of socio-cognitive conflict was first introduced by Doise and Mugny [6] whose aim was to further develop Piaget’s ideas about the cognitive development of children. According to Doise and Mugny [6], learning takes place via socio-cognitive conflict. It must be stressed that ‘conflict’ does not refer to an argument or even a quarrel between some actors. Instead ‘conflict’ is only to be understood as cognitive difference as it is recognised by actors. The essential idea of this concept is that a cognitive difference (actor A thinks x, actor B thinks y) only triggers learning when the cognitive difference (x, y) is also socially represented. This paper follows Doise and Mugny’s [6, p.161] view of socio-cognitive conflict, which is defined as follows: “... socio-cognitive conflict is not merely an opposition of responses; it is a conflict between social agents occupying social positions”.

Socio-cognitive conflict has two aspects: first a cognitive difference must occur and secondly this difference must be socially represented. A cognitive difference occurs when two or more actors have a discrepancy of opinions or different judgements. The second aspect for the emergence of socio-cognitive conflict is that the cognitive difference is socially represented in that a social disequilibrium must be felt by the actors. When someone asserts an opposing central idea to that of the child, the child is faced with a cognitive conflict not only of a cognitive but also of a social nature. Socio-cognitive conflict occurs because two opposing central ideas exist simultaneously for the child and cannot be as easily denied.
2.2 Socio-Cognitive Conflict, Diversity and Organisational Learning

Socio-cognitive conflict brings about participative diversity and creates the conditions for learning. Learning will only occur through participative diversity if and when the actors are involved in serious social relationships. In this cognitive differences are perceived as a relational problem. The social relation between participants is a strong trigger for solving cognitive differences and therefore to bring about learning. Learning is conceived as transcending the cognitive difference by 1) finding a ‘new’ solution which integrates the cognitive differences or 2) through the process of accommodation which also indicates that cognitive conflict is resolved. Accommodation refers to the solution of the cognitive conflict and implies that the participant’s views must adjust to each other for learning to occur. Learning is seen to take place when one party accommodates the viewpoint of the other. Seen in this way, accommodation takes a specific view of solving socio-cognitive conflict. Whether learning only happens when participants really solve the socio-cognitive conflict together or whether it is sufficient to be aware of a different viewpoint in order to trigger learning is the subject of discussion [23]. In the latter, learning is postponed after the interaction.

It appears that participative diversity creates the conditions for learning and if it is to be of value to the organisation, participation should enhance organisational learning. Fiol and Lyles [8, p. 804] suggests that learning occurs because “Organisations, unlike individuals, develop and maintain learning systems that not only influence their immediate members, but are then transmitted to others by ways of organisation histories and norms.” According to Duncan and Weiss [7] organisational learning consists of producing communicable, consensual and integrated knowledge. Although “the individual is the only entity in the organisation who can learn, this must be viewed as part of a system of learning with exchanges of what is learned among individuals. This knowledge produced by individuals is organised only when it becomes exchanged and accepted by others” [7, p. 89]. They argue that the process of knowledge exchange is of a social nature, or in their terms, an extra-individual process, which takes place in social interaction. Acceptance of newly acquired knowledge depends on whether the new knowledge fits into a common organisational framework. In addition, acceptance of this newly acquired knowledge must fit into the power structure of the organisation and this new knowledge must be communicated.

2.3 Pre-requisites for Socio-Cognitive Conflict

For socio-cognitive conflict to take place three conditions need to exist. These are: the existence of a diversity of knowledge, its social representation, and confrontation between socially represented cognitive differences. Firstly meeting places should exist that provide for cognitive diversity, where people with differing opinions can come together. Secondly people with various opinions must effectively communicate with each other to bring about a diversity of knowledge which can only take place in so far as there is exchange between the various views [14]. These two conditions form the basis of the third condition which is to ensure social interaction in order to create accommodation. Accommodation is seen to be embedded in the creation of social structures. Social structure is recognisable in dependencies of power, cultural considerations and various contextual constraints [20].

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It appears that participative diversity from socio-cognitive conflict requires support if it is to effectively create the conditions for organisational learning. In supporting socio-cognitive conflict, collaborative technologies provide meeting places particularly in virtual spaces or shared work facilities. These are seen to provide sufficient participative diversity to stimulate socio-cognitive conflict. Collaborative technologies also support communication in various ways from simple email communication to communication over full video motion picture protocols. Collaborative technologies also enable communication to be structured through particular tools such as those for brainstorming, voting and organising ideas. However, research has shown that electronic meetings suffer from the failure of communicating contextual information and the salience of information [4]. Furthermore, the flow of interaction is often hampered by the difficulty of interpreting the meaning of behaviour [4, 15] and due to the lack of turn yielding cues [13]. This has repercussions for the way in which socio-cognitive conflict emerges, the way in which accommodation occurs, the form that learning may eventually take place and hence the success of the virtual team.

Although collaborative technology may offer effective support in order to create socio-cognitive conflict, the effective use of this support must be imbedded in organisational practice. If the technology does not fit with the existing practices, the support, which is offered by technology, will not be accepted [1]. In the following sections socio-cognitive conflict is explored on a virtual space. This provides an insight into how socio-cognitive
conflict emerges and the type of participative diversity that can occur on the virtual space. Armed with this insight, which is specific to the organisational practice described in the following case study, this paper is able to arrive at implications for managing participative diversity on a virtual space.

3. The Study

3.1 Research Approach

The approach of this research is that of interpretivist hermeneutics and is seen to be valuable in two ways: 1) it captures the meaning in documents which information richness theory considers the leanest of all communication media and 2) it considers not only the conception of text but also individual actions, group behaviours and even social institutions [17]. This approach entails an in depth analysis of a real world situation where relevance is more important than rigor. An in-depth analysis of socio-cognitive conflict is carried out in transcripts of an electronic meeting between geographically dispersed members of an international agency network. The technology on which participative diversity on the virtual space occurs is investigated very basic. This provides the research with empirical data on the very basic influence of the technology on socio-cognitive conflict. This is because the more complex and sophisticated the technology is, the greater the level of its influence on participation. On the simple virtual space, participation among these members is analysed to reveal episodes of participative diversity. These episodes inform the type of support required to bring about effective communication and in the creation of media spaces. The following section describes interaction on a virtual meeting place where participative diversity resulting from socio-cognitive conflict occurred.

3.2 The Context: a Network of International Agencies

The network form described in this paper is composed of a group of people and institutions that have developed rules to govern a set of varied activities performed by networking between these people and organisations. This network of international agencies comprised of reciprocal relationships formed on the basis of collaboration on joint projects and funding arrangements. The ICGITD was proposed at a collaborative meeting called “Information Technology for Development: Informal Consultation for Mobilising Resources” co-hosted by the Commonwealth Secretariat and the International Development Research Centre (IDRC) in London January 1993. The meeting comprised representatives from some of the major and key agencies active in the field of IT for development. At the time, the ICGITD included the following international and donor agencies: the Canadian International Development Agency (CIDA), Commission of the European Communities (CEC DGXII), Danish International Development Agency (DANIDA), International Development Research Centre (IDRC), International Conference for Computer Communication (ICCC), United Nations University (UNU), United Nations Development Programme (UNDP), United Nations Educational, Social and Cultural Organisation (UNESCO), USAID Centre for Development, World Bank, and the African (ADB) and Caribbean Development (CDB) Banks. The ICGITD consisted of people representing these donor agencies who wanted to be able to exchange ideas and experiences on information technology projects in developing countries in order to learn from each other. Because of the competition for self-sustainable projects with high yields, most international development agencies considered funding of their Information Technology projects in developing countries to be classified information. At the same time it was clear that the various agencies could learn much from each others’ experiences and could develop a common approach in order to fund more projects cost effectively. They also differed with respect to available resources, particularly financial but also in terms of contacts and experts. The agencies also differed in their image and status. The purpose was to “allow informal dialogue to be extended in order to facilitate collaboration”. The collaboration could be fruitful if common solutions - hence learning could take place. It was agreed that “identified officials” from a diverse range of agencies, including many of those represented at the meeting, could share concerns, opportunities, and outline project proposals on a strictly “off-the-record” basis. Project information, ideas and experiences, joint funding initiatives, and publications were the main areas requiring consultation among members of the group.

3.3 The Technology

The intention was to encourage brainstorming and an active exchange of ideas to ensure informed and thus effective collaboration in projects. The technology used was a simple chat like facility that enabled the meetings to take place in virtual rooms. This provided the participants with a forum for discussion, consultation and collaboration. Communication on the chat facility was not anonymous, and comments typed by each participant were displayed next to their name on the virtual space. It was useful in enabling greater focus on the more general topics posted on the discussion board, while different ideas were generated. Communicating on the talker enabled meetings to be held without having to move the participants away from their offices or their countries. The second type of communication was the asynchronous
notice board which enabled people to communicate at different times from their respective geographical locations.

4. Results: Episodes of Participative Diversity

Preparation well in advance of the meetings was required to ensure that the time people spent in the electronic meetings was fruitful. The purpose of the meetings had to be clear in the minds of the participants and often an appeal was made to the vested interests of certain participants. The experience of the authors was that it took a few weeks for people to co-ordinate their agendas and sort out any technical or connectivity problems that arose. Then, items to be discussed had to be defined. This was carried out through an agenda sent electronically to all the participants for feedback and further modification where necessary. The role of the chairperson in the distributed electronic meetings was important to ensure effective discussion and participation, but also ensured that there was focus on key issues. This form of synchronous computer conferencing was seen by the consultative group to be useful as long as there were some clearly defined objectives. As stated by a participant of a meeting: “Our experience with computer conferencing...is that the more clearly defined the objectives of the exercise and the topic problem being discussed, the more likely something concrete can come out of it.”

The way in which new ideas were generated indicates that there was participative diversity. New ideas create cognitive differences. These are illustrated in the following transcript 1. If these cognitive differences are socially represented and communicated within relationships, they become valuable for bringing about learning. This would mean that the group process should then have products such as decisions, or as in the case discussed here, action points to be taken up at a later stage.

**Transcript 1: Opinions and Open Discussion**

| L  | We have found in our INDIX meetings with other donor organisations at the bilateral level that government policy still severely limits information sharing and access between countries |
| O  | I am sure governments are able to isolate information that can be put into the public domain as opposed to sensitive information. Transparency in the age of open governance should facilitate this. |

While the talker facilitated and enabled a mechanism for consultation and collaboration, it also functioned as a forum within which the cognitive differences of people of the different institutions could be communicated to each other. As illustrated in transcript 2, the concept of "good government" varied among the participants to a very large extent. This was due to the different interests vested in the term "government" and the different meanings associated with the word "good".

**Transcript 2: Cognitive Differences 1**

| R  | something like good government is very relevant and well defined and finds an audience easily. |
| V  | OK. If one is to discuss IT in government, how about a specific issue like “Access to Government Information”? |
| Chairperson | Could you please suggest a more focused topic V, as you already have a DSS workshop. |
| R  | we can get a few different groups in different cities of the world listen to a panel discussion and send in their own comments in real time |
| O  | or government information systems (gis). |
| R  | access to govt information sounds very attractive we have lots of govt information, but not the access! |
| V  | slightly different group than “government officials” although the government folk are the ultimate beneficiaries of all this technical work (plus of course the people THEY in turn service). |
| Chairperson | How is this different from a video conference for example. I want to make this more information intensive - with both database access and discussions |

The diversity created as a result of the above discussion later on in the same conversation increased the cognitive differences as the participants continued to communicate their varied perceptions on the same issue. As illustrated in transcript 3, these differences are compounded as the participants attempted to find common ground in specific aspects while their interests still diverged on their respective vested interests and meanings of the initial topic.

As this mechanism involved a politically sensitive form of communication among a group of donor agencies who had until recently been unaccustomed to this use of the technology, there were some very strong reciprocal interdependencies which caused the content of collaboration to remain unstructured and thus amenable to conflict. The types of conflict that arose related to what Cramton [4] refers to as influence from expertise required to see successful projects through, verses conflict related to status, territoriority with respect to projects and sensitiveness of the information exchanged. In their study of
was the members with projects that made clear progress that
Although all members did get a chance to air their views, it
Consensus is an outcome of the systems rationalist view of
towards arriving at consensus and not accommodation.
the chairperson’s influence meant that there was pressure
and time given for debate of the items on the agenda. The
question about his command over the discussion, selection
and carefully managed will perform more effectively than
groups that are forced to arrive at consensus without
allowing their diverse views to interact. In summary we
suggest that order to enhance virtual team work
collaborative technologies must stimulate socio-cognitive
conflict. In the following sections different types of
participative diversity are identified and their implications
for managing virtual teams discussed.
5.1 Technological Complexity
The interaction on the collaborative technology supported
virtual space is more focused and structured than in
comparable face to face meetings. At the same time the
virtual space itself introduced a new level of complexity
into the social interactions. This complexity was related to
the technology itself, and the new, somewhat alien
environment that it supported. Complexity was also brought
about in the new and different ways that relations emerged
and different opinions communicated on the virtual meeting
place. All this contributed to the creation of new social
structures – additional complexity. This additional
complexity affects socio-cognitive conflict in that it can
enhance or hinder learning. This depends upon whether
participation follows the traditional systems rationalist
model which strives towards consensus regardless of the
stakeholders involved, or the segmented institutionalist
model which aims to bring together the diverse views and
arrive at accommodation. In this paper we contend that the
segmented institutionalist model of participation is more
effective that the systems rationalist model. This is because
the segmented institutionalist model enables participative
diversity to be fostered the processes of socio-cognitive
conflict to be socially represented and come into operation
and thus bring about accommodation and learning. This
means that groups in which cognitve conflict is fostered
and carefully managed will perform more effectively than
groups that with differing views may come together when it
represents a socially accepted forum. Once the technology
conferring. Hiltz and Turoff [12] observe that there are
always one or two individuals that dominate distributed
synchronous meetings. The experience of the international
agency network confirms this and suggests that the role of
an effective chairperson in such an environment was not
democratic but drew upon the more traditional functions of
maintaining structure and focus through authority based
upon position. This is illustrated in transcript 4.

5. Implications for Supporting Participative Diversity with Collaborative Technologies

The role of the chairperson was very explicit. There was no
question about his command over the discussion, selection
and time given for debate of the items on the agenda. The
chairperson’s influence meant that there was pressure
towards arriving at consensus and not accommodation.
Consensus is an outcome of the systems rationalist view of
participation, it inhibits diversity and thus learning. Although all members did get a chance to air their views, it
was the members with projects that made clear progress that
had the most to say. In addition, those members who just
wanted to air their ideas without making any significant
contribution to the discussion found themselves at the
fringes of the discussion while the influential members got
on with their own agenda. Influence in an electronic group
meeting was not only associated with the activities that the
participants were involved in but also the status of members
in their own organisation; this bore considerable weight on
their influence in the group discussions. In addition, the
information that members had access to gave them an
element of credibility in the general discussion.

Transcript 3: Cognitive Differences 2
R ‘one can use a listserv, like the Governet listserv we just set up’
Chairperson ‘1. We could have a workshop on IT in development.’
R ‘The unfortunate part will be that a lot of people interested would be outside electronic networks’
Chairperson ‘2. Decision support systems – we could run a training programme for a week or so through networks without students having to go from one country to another.’
I ‘It is again for me too broad, something more specific’
Chairperson ‘applications in the use of computers in Government for example’
V ‘I guess a real question is what is the objective of the exercise. Is it to experiment with training via networking?’

Transcript 4: Chairing
Chairperson ‘We were planning begin with a pilot database at the Commonwealth Secretariat and then transfer it to an institution in a user country such as Malta as its is a small country and it provides a window to developing and developed countries. But do you have other suggestions ?’
I ‘If you have developed the database it is absolutely essential to use it , to connect to it otherwise it is dead, useless and soon becomes inefficient’
N ‘with the database, it seems to me that we need to think about 1 willingness to use it; 2 ability to use it; and 3 need to use it’
O ‘a most practical mechanism would be to incorporate such information in a database that is widely or easily globally accessible by interested parties such as on the WWW’
is considered a socially accepted forum for the exchange of different views, it has to be appropriated with a sufficient set of tools from which users may choose to support their own ways of interacting. The experience of this study suggests that the technology also has to be simple, and easy to use. Extensive windowing facilities intended to yield user-friendliness tend to hinder rather than facilitate use. Learning how to use the technology and how to get around the numerous difficulties that it presented was an important outcome of complexity imposed by the technology. The participants had to get accustomed to the environment of the software; in particular, how to use the basic commands, entertain themselves with the more amusing commands and then communicate with each other using these commands. An examination of the meeting transcripts suggests that this particular group of participants were relatively familiar with the technology and were comfortable enough with it to be able to discuss important and somewhat sensitive issues on their virtual meeting place. However this was not the same for the majority of the participants as is illustrated in the following transcript 5:

**Transcript 5: Technological Complexity**

| L | I have been knocked off of your system 3 times - my connection must be bad - I apologise for being in and out and not contributing to the discussion |
| R | R here. I finally figured out how to get in into this cyberspace! |
| R | I am sorry what I typed in seems to have got garbled by the software |

The technology used in this study was represented in poor media in that the full context of participants’ behaviour could not be fully comprehended due to the technical difficulties. Although the meeting was planned, some participants were late. This delay was due to technical connectivity problems for two of the participants and due to a usual busy agenda for just one participant. It appears that in order to ensure that technological complexity stimulates socio-cognitive conflict to enhance organisational learning, support for technical connectivity and participant connectivity status reporting for the whole group would be very useful. This because some participants log on through slower lines than others which affects their ability to participate on the virtual meeting place. In addition, use of the technology was limited as the participants did not use the additional 'rooms' available on the talker. However, the technology did influence the meetings as contributions were very much dependent upon the typing skills of the participants. This suggests that customised help facilities would support more directed learning.

### 5.2 Communication Complexity

The virtual meeting place presented the members with a work environment that was different from what they were accustomed to. These participants brought into the meeting place ways of communicating that were familiar to them in their own organisations (as would be the case in face to face meetings). When these varying perceptions and norms of behaviour came together on the virtual meeting place, new ways of communication emerged. The lack of visual cues and subtle intonations on the virtual meeting place meant that the political meandering, common in the face to face meetings among these civil servants, was impeded. Thus the participants adapted to this new work environment by having more formal and, compared to the face to face meetings, more focused interaction. A few instances of this focussed conversation pattern is illustrated in the following transcript 6:

**Transcript 6: Communication Complexity**

| R | 'C you will have to say more about what you have in mind is it something that can be done over e-mail or does it require something more sophisticated' |
| O | 'an end users workshop for GOVERNET could be in order.' |
| Chairperson | 'There are a number of choices :' |
| O | 'one can use a listserv, like the Governet listserv we just set up' |
| Chairperson | '1. We could have a workshop on IT in development.' |
| R | 'the unfortunate part will be that a lot of people interested would be outside electronic networks' |
| Chairperson | '2. Decision support systems - we could run a training programme for a week or so through networks without students having to go from one country to another.' |
| Chairperson | 'Could you please suggest a more focussed topic V., as you already have a DSS workshop' |
| Chairperson | 'Shall we carry this further or shall we go on to the next item?' |
| V | 'Can the chair recap where we are in the discussion pls?' |
| V | 'Let me see if I have this clearly. We are discussing holding an online meeting over government officials to discuss a topic related to IT in order to test this medium?' |

The statements were also shorter compared to face-to-face interaction. Examples, broad elaborations and redundancy are avoided. This is probably the reason why the interaction is often interrupted with clarification statements such as 'Did I get it right etc.?' Because the flow of interaction was easily lost, the chairperson had to summarise and revitalise the discussion. Support for this more focused form of communication would require that the collaborative
technology provide functionalities for the on-line visualisation of 1) the patterns of communication and 2) the flow of the conversation. An overview of patterns of communication would provide the chairperson with valuable information about which participants have the most communication linkages as compared to those who have communicated less and have established few or no communication linkages with other meeting participants. In addition to this, dynamic reporting of the conversation flows would provide an overview of how the topics related to each other, which topics had been communicated on the most and the least and most importantly the participants’ views (for an against) on the topics being discussed.

5.3 Accommodation

Accommodation took place when the social and cognitive conflicts were communicated, socially represented and a degree of shared meaning emerged. This was recognisable in the behaviours of the participants and their communication relations. Collaborative technologies that provide automatic chronological accounts of the meeting would be helpful in identifying the process of accommodation. A social representation of the creation of social structure, and thus accommodation through socio-cognitive conflict, is that the participants hardly reacted to personal or more interactive statements. Only one participant made an attempt to be more interactive, but as she was not reciprocated by the others she left the meeting early. This interaction is illustrated in the following transcript 7:

Transcript 7: Social Interaction

| 'l am ignorant. Who is mtsd?' |
| 'I am ignorant. Who is mtsd?' |
| 'bravo' |

The social process is perhaps the most important and least understood of the factors that influence interaction on the virtual meeting space. Values, norms and perceptions created over time in the minds of human actors are manifest in the way in which human actors behave on the virtual space. It is thus necessary to consider the rules and regulations, responsibilities of the users, their positions with respect to their colleagues and the importance (immediacy) of the tasks. Interaction among human actors also contributes to changing these values, norms and perceptions and thus behaviour.

In view of this, supporting accommodation itself is not quite as straightforward as one might expect, especially as people learn more about their environment, they are able to shape the social space to suit their own habits. In the study reported here, the technology tempered the ability of the participants to express their perceptions, norms and values, and the very subtle cultural nuances were brought to bear in different ways. Communication etiquette developed gradually and benefited from the participants who were more familiar with communicating electronically. Jarvenpaa et al. [15] suggest that high-trust teams do not really need ‘high trust’. ‘Swift trust’ takes place, which is very much task-oriented and yet empathic enough in order to achieve good performance. Teams with ‘swift trust’ comment seriously and in a constructive way on the work with other participants. This suggests that the intensity and quality of interaction was focused on the task. Collaborative technology functionality which may help improve the quality of the interaction could take the form of an automatic indicator that pops up every time the discussion is not focused to the task any more. This functionality would also require semantic understanding of the discussion.

The participants were not explicit about the acceptance of the newly developed knowledge and insights but were keen to further develop upon the results of this meeting. Due to lack of time, the chairperson decided to postpone the decision till the next meeting. A part of this encounter is illustrated in the following transcript 8:

Transcript 8: Accommodation

| Chairperson 'It is not only testing the medium but hopefully to take it forward for them to interact on a more regular basis.' |
| 'Yes, Chairperson, I can see that as an important objective too.' |
| 'When would you want to reconvene?' |

The above interaction suggests that the social context of this encounter for the group in general and participants in particular has yet to take an identifiable form. The extent to which accommodation has taken place in this meeting can be examined using Nonaka and Takeuchi’s [21] theory of knowledge creation. This theory enables us to identify two types of knowledge: tacit knowledge which needs to be mobilised and converted to explicit knowledge. According to Nonaka and Takeuchi [21], organisational learning takes place when knowledge is converted in the following ways: 1) from tacit knowledge to tacit knowledge which they refer to as socialisation, 2) from tacit knowledge to explicit knowledge, or externalisation, 3) from explicit knowledge

| Table 1: Requirements for Collaborative Technology Support |
|-----------------|------------------------------------------------------------------|
| Elements of Socio-cognitive conflict | Pre-Requisite for Socio-cognitive conflict | Collaborative Technology Functionality |

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to explicit knowledge or combination and 4) from explicit
knowledge to tacit knowledge, or internalisation. In the
meetings analysed here organisational learning took place in
the first two of the four ways of Nonaka and Takeuchi’s [21]
theory of knowledge creation. In the first, socialisation
occurred when experiences were shared and tacit
knowledge was created in the form of shared understanding
of the meeting objectives. Collaborative technologies that
support processes such as brainstorming, idea organisation
and the generation of creative dialogue also support
socialisation. Externalisation took place when tacit
knowledge was articulated into explicit topics of discussion.
This took place in the form of concepts for joint projects -
all expressions of images or tacit knowledge. Due to the
poverty of the electronic medium, discrepancies did occur
between articulated expressions and the images representing
tacit knowledge. Support for collective reflection and
dialogue between individuals would enable these
discrepancies to be overcome.

6. Requirements for Collaborative Technology
Support

This paper has illustrated the development of socio-
cognitive conflict and explored how a very simple
collaborative technology was used to support participation.
The additional complexity was seen to enhance the
participative process as it enabled diverse views to be
expressed on a socially accepted space and accommodation
or a common ground to be found upon which the
participants could proceed further. Collaborative technology
has been identified as an instrument for socio-cognitive
conflict. Collaborative technology may offer meeting places
for diverse knowledge to emerge and it allows for direct
interaction. The diversity of communication and knowledge
creation does take place on the electronic medium and the
emergence of accommodation and organisational learning
may also be supported by it. The analysis of the case studied
in this paper reveals that the form of communication and the
social relationships change within the virtual meeting place.
People adjust their ways of communication and interaction
to the technology. Light was thrown on how a media poor
technology led to more focused communication in a
traditionally messy, politically laden decision making
environment on the one hand, but at the cost contextual
information on the other hand. These insights point to a
more defined role for collaborative technologies in
supporting participative diversity. These requirements are
summarised in table 1.

7. Conclusions and Future Directions

This paper suggests that participative diversity in virtual
teams brings more effective participation. It developed
Kling’s [16] concept of segmented institutionalism using
theories of socio-cognitive conflict to examine participative
diversity. Episodes of participative diversity were
uncovered in meeting transcripts between geographically
dispersed members of a network of international agencies.
An analysis of these episodes suggested that participative
diversity occurred in at least two ways, namely through
technological and communication complexity. While the
technology provided a forum for communication, it
introduced additional complexity. Communication was also
a major factor in creating participative diversity as it was
not only tempered by the technology but also driven by
varied perceptions, norms and cultural considerations. This
influenced the social interaction that brought about
accommodation. This has clear implications for the
requirements for collaborative technology for virtual
teamwork. Virtual teamwork should be actively managed
and guided with the help of collaborative technology and is
not to be seen as an enigmatic black box phenomenon.
Further research into the effect of the different collaborative
technology functionalities described above within a
longitudinal study would shed further light into the
particular ways in which collaborative technology may
support organisational learning.

| Technology as a virtual meeting place | Meeting places should exist that provide for cognitive diversity, where people with differing opinions can come together. | Support for technical connectivity, status reporting of connections and customised help. Flexibility and reliability of collaborative work tools i.e. shared work spaces. |
| Communication to bring about diversity of knowledge | People with various opinions must effectively communicate with each other to bring about a diversity of knowledge which can only take place in so far as there is exchange between the various views | Dynamic visualisation tools for patterns of communication and flow of conversation. Additional support for communication flows involve tools for dynamic reporting of communication, information access and exchange facilities. |
| Accommodation or common ground upon which to proceed | Social interaction should take place in order to create accommodation of cognitive conflict which is socially represented | Meeting reports containing chronological account of behaviours. Automatic signalling system. Particular tools support for brainstorming, idea organisation and the generation of creative dialogue. Support for collective reflection and dialogue. |

Table 1: Requirements for Collaborative Technology Support
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