Voting before discussing: Computer voting as social communication

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Abstract

This paper presents a case study on the use of an alternative method of computer support to that normally used, one that uses voting as a tool for social rather than rational choice. This voting before discussion (VBD) method is indicated in cases where agreement is an important group output, or where interpersonal conflict is creating problems in meetings. Given that participants are warned to avoid "groupthink", the VBD method seems to increase group unity, reduce inter-personal conflict and speed decision making, while still allowing argument and analysis. The method is based on a three-process integrative theory of group interaction, which proposes that group cohesion arises primarily from normative influence rather than rational information exchange. If this model is correct, the VBD method may be just one of many new possible ways that computer support can be tailored to support group processes according to the nature of the group and the situation.

Introduction

This paper examines an alternative to both traditional face-to-face (FTF) discussion and current group support system (GSS) methods of interaction [26]. Face-to-face discussion is a complex interaction which computer software has tried to emulate or even improve upon [27]. One theoretical base for these computer tools is the steps of decision making, namely [35]:

1) *Intelligence*. A period of idea generation when the problem is defined and relevant ideas and information are brought out in the open,

2) *Design*. A period of analysis, where alternatives are identified and arguments presented, and,

3) *Choice*. The final stage where one or more decisions are made, with the intention to implement them.

Other steps have been added before these three steps (problem awareness and problem definition) and after them (implementation and feedback, however the central steps have not changed in over 40 years) [5]. This linear decision method, shown in Figure 1, implies that discussion, such as occurs in face-to-face groups, involves an initial "brainstorming" period of information exchange (intelligence), followed by presentation of arguments and development of alternatives (design), and finally a decision making phase, which occurs towards the end of the discussion, perhaps involving an explicit formal vote. Where groups deviate from this rational procedure, for example by immediately searching for alternative solutions or by calling a final vote too soon, the result is poorer quality decisions [12, 14]. The surfacing and resolution of conflict seems a natural part of the design and choice stages of this procedure [31].

These ideas seem to have strongly influenced GSS design, beginning with DeSanctis and Gallupe's foundation paper on group decision support systems, which defined a decision making group as two or more people who are jointly responsible for detecting a problem, elaborating it, generating possible solutions, and evaluating them [8]. The Software Aided Meeting Management (SAMM) agenda implies a similar rational process (define problem and criteria, discussion, define alternatives, rate/rank/vote on alternatives, and define decision) [41]. Group Systems software has equivalent stages of idea generation, idea organisation and prioritising (voting) [27, 39]. In summary, current GSS methods appear to be computer implementations of the model shown in Figure 1, which assumes that groups resolve problems the same

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Figure 1. Traditional rational group decision making model
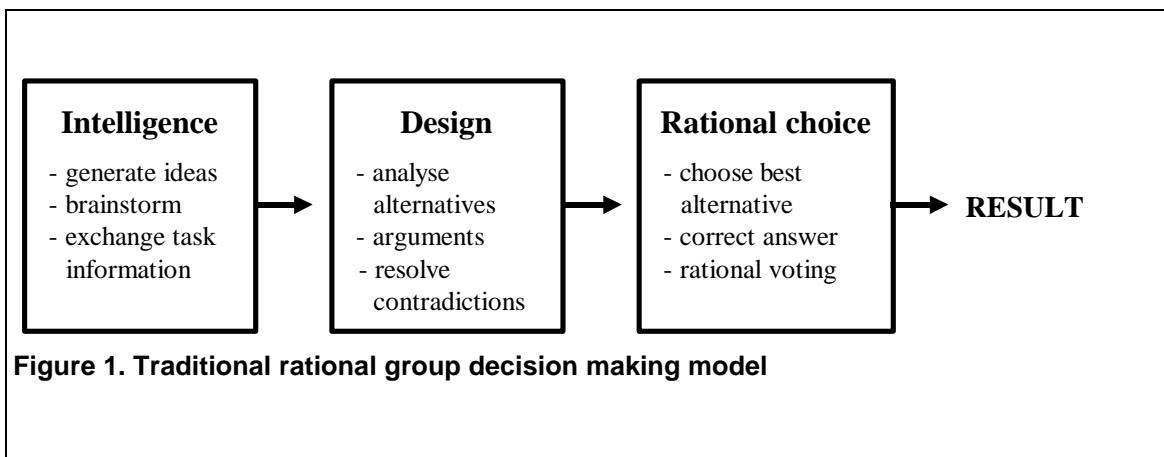
way as a rational individual might, or if they don' t, it is highly desirable that they should do so.

Theoretical foundations

Normative influence

The limitations of this traditional "systems rationalist" paradigm, which currently pervades both theory and design of electronic group support systems, have been pointed out elsewhere [21]. The criticism is less that the approach is incorrect, than that it is insufficient, because it does not recognise the non-rational or non-task activities of individuals and groups:

Most efforts have focused on the relatively narrow, rational view of the decision process . .   [17]

The voting-before-discussing (VBD) method arises from a theoretical model [42, 44] which proposes that group interaction usually involves not one, but three, distinct and parallel processes, namely:

1. ***Resolving the task****:* Using and contributing to *informational influence,* which provides task-relevant information

2. ***Relating to others****:* Using and contributing to *personal influence,* which supports interactive personal relationships

3. ***Representing the group****:* Using and contributing to *normative influence,* which supports group unity.

In this model, normative influence is seen as the main force generating group unity and agreement, an

area where electronic groups are commonly seen as lacking [25]. More than one group interaction process means there can be more than one way for groups to reach a decision. The VBD method uses *social decision making* [2, 19] to generate agreement. Agreement is seen as an important group output in its own right [23, 43], independent of any task output, increasing group unity and member commitment to group decisions [4].

Normative influence requires the exchange not of task information or argument, but of the group position. In democratic groups this is represented by *the sum of the behavioural positions of each member*, where position is a concept similar to Lewin' s idea of "valence" as the acceptability of a solution option [22]. Traditional group voting is the formal exchange of such positions, and group voting has been described as a *highly condensed form of human communication* [13], a many-to-many communicative act from all group members to all group members. The integrative model distinguishes the effect of group position, or group influence, from the personal influence of individuals, which explains why group influence can operate even when interaction is anonymous [28, 42].

In a face-to-face discussion, member position information can be conveyed not only by direct comment, but also by paralinguistic signals, such as sounds, facial expressions or body language. Participants in such interactions may be informally "voting" throughout the "discussion". The distinction between informational and normative influence is similar to that between p*ersuasive arguments theory*

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[40] and *social comparison theory* [32], and computer-mediated studies have shown that the exchange of positions without arguments can be just as effective in generating agreement as the exchange of positions with arguments [28, 34, 42], as the integrative theory would predict. A normative interpretation fits well with what natural groups tend to actually do, which is to immediately generate solutions without considering all the alternatives [14]. There is also evidence that once the group "valence' for a given option is seen to reach a commonly understood threshold level, members perceive the group to have made its decision and adjust their positions accordingly [15]. The model for this *social decision* method is shown in Figure 2. In this procedure the surfacing and resolution of nascent conflict is neither a required nor desired pre-requisite for generating agreement.

For cohesive groups, who tend to think the same way, group influence offers a far quicker and safer decision method than rational discussion. The worst outcome of group interaction is not making a bad decision. We make mistakes every day. The worst outcome is that internal conflict could paralyse or even destroy the group. Discussion increases the group's

be a risky business, one which is perhaps only really necessary where normative influence has failed, and the group is split. Even then, only one or two people may need convincing before normative influence brings the whole group around to the majority position.

In summary, for groups, the normative process may be more fundamental than the individual orientated task resolution process, as groups must first agree before they can be right or wrong. Most real life problems cannot be solved by reason alone [7]. Voting can be used in two ways, as tool for rational choice or as a tool for social influence [45].

Voting-before-discussing

In group support systems with a systems rationalist task focus, voting is used as a rational choice tool, so is usually highly formal, and tends to be used once at, or towards, the end of the sequence of activities, if at all. Although voting tools are considered a critical design feature of GSS, empirical investigation shows only 7% of organisations with a GSS actually use this function, and even for those that do, its contribution is only marginal [3].

Figure 2. Normative group decision making model
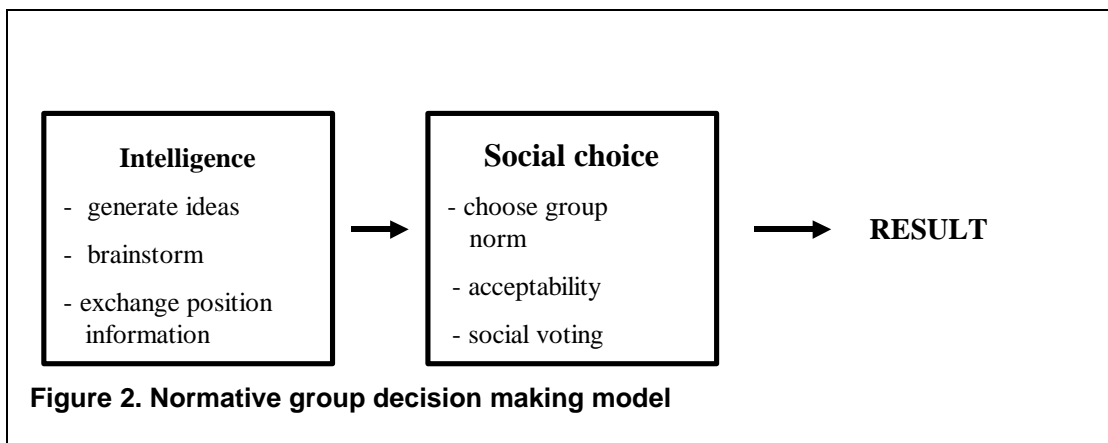
domain of information, which is known to reduce group agreement and member confidence [37]. Discussion also raises the risk of personality clashes between individuals. From a group perspective, the exchange of task and inter-personal information can

The VBD method uses voting as a social tool. It has a central rather than marginal role in group interaction, and in this study subjects voted hundreds

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of times. This was possible because the computer made voting very easy - subjects could quickly vote on items leaving the computer to calculate and distribute the results. Just as E-mail lowers the psychological cost (or "messaging threshold") to the user of sending a message compared to ordinary mail [30], so "E-voting" appears to reduce the cost of a group vote. For E-mail, this cost reduction means it is seen by users as a relatively spontaneous medium, quite distinct from letter writing [20]. Likewise informal computer voting seems a quite different form of interaction from traditional voting, which is a one-off, formal and time-consuming procedure, done only when necessary.

2. Time wasted arguing proposals which have little possibility of group acceptance
3. A group member unaware of the opposition of others to their position, may initially fail to present their position in an effective manner
4. Early disagreement may sour personal relations to such a degree that the entire meeting gets bogged down.

The method aims to use computer support to increase agreement, and therefore is indicated when generating agreement is creating a problem. The VBD method aims to reduce initial inter-personal

Figure 3. Proposed voting-before-discussing group decision method
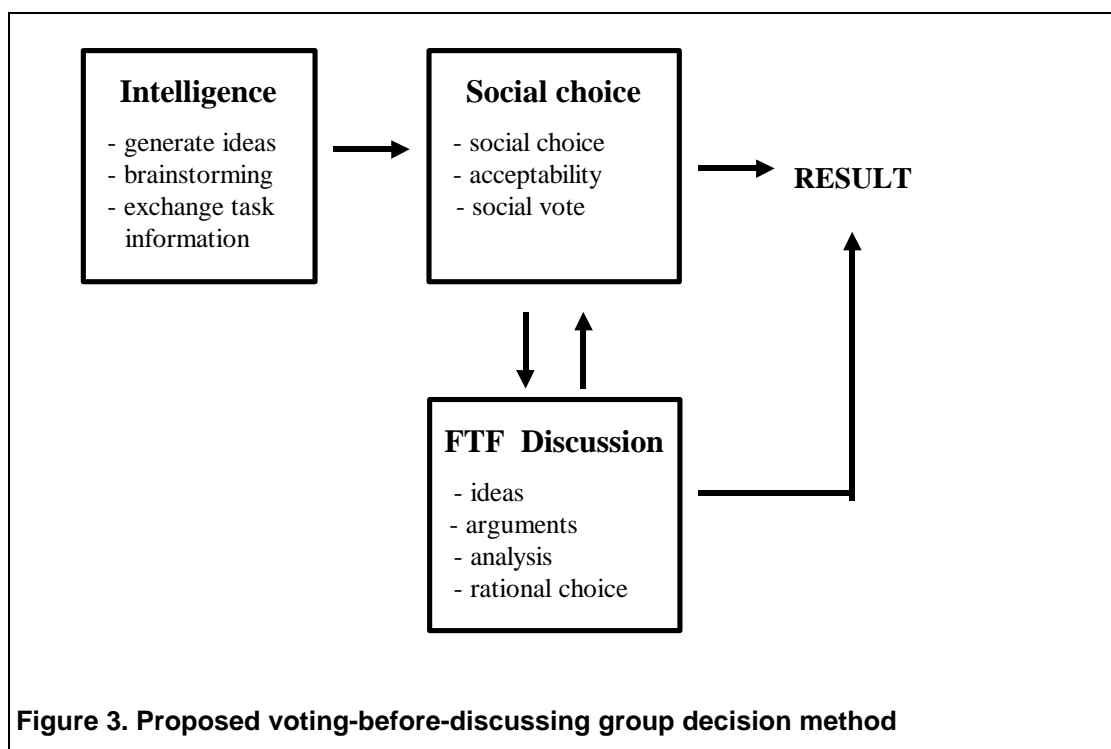
The way computer support was used by the group is shown in Figure 3. Where the group already has consensus it allows for an alternative, shorter, path to a group decision, one that bypasses face-to-face discussion. While this involves the danger of "groupthink" [16] it avoids the following problems:

1. Time wasted discussing proposals everyone already agrees with

interaction to allow a sense of group identity to first be established, and so is also appropriate where personal relations can side-track the meeting. A feature of this method is that the computer-mediated interaction proceeds asynchronously, and thus could occur on a distributed network. Only the face-to-face discussion of disputed items requires same-place synchrony.

Method

The environment

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The study took place at Manukau Institute of Technology (Manukau), an educational institution located in Auckland, New Zealand. Manukau provides post-secondary trade and degree programmes to a student population of approximately 10,000 full time equivalents. Manukau, and other similar institutions, were facing a period of government initiated change designed to make them more market responsive. The case study reports meetings held to formulate a strategic marketing plan for the institute. Meetings were conducted over three sessions (of 6.5, 4 and 4 hours), with a separation of 13 working days between sessions 1 and 2, and three working days between 2 and 3. The first author acted as both software guide, and also to a limited extent as discussion facilitator. After the final meeting, the second author conducted semi-structured interviews with each of the participants of approximately 30 minutes duration on that same afternoon, and the recordings of those interviews were transcribed for subsequent analysis.

Subjects

The six professional staff members of the Manukau Marketing Section were all strong minded, expressive people, each with very different backgrounds, whose individual opinions often differed on any given issue. Face-to-face discussions of "the way ahead" in the past had typically involved conflict between conservative and radical styles. These meetings often involved long, heated discussions, which frequently moved off the subject to wider issues and generally resulted little consensus being achieved. This group therefore seemed to offer an ideal opportunity to test whether computer support, using social voting, could enhance group agreement.

The task

This group faced a complex, unstructured problem – to develop a marketing plan for the institute. This *project* [24] was structured into sub-tasks based on marketing theory, as shown in Table 1, and this structure was visible to all from the beginning. The *Items* column shows how many items were brainstormed under that heading.

Tasks	Sub-tasks	Items
Task Window 1:	Market Analysis	49
(Analyse the current environment)	Customer Analysis	101
	Competitor Analysis	13
	Environment	26
Task Window 2:	Strengths	9
(SWOT analysis of the organisation)	Weaknesses	14
	Opportunities	10
	Threats	6
Task Window 3:	Target groups	23
(Marketing objectives)	Job seekers, overseas students, . . .	
Task Window 4:	Tasks were taken from task window 3	37
(Develop strategies)	One prime aim and seven sub-aims were produced	

Table 1. Task structure

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Interaction method

While the *task structure* was aimed at producing a plan, the *group interaction procedure* was aimed at obtaining group agreement. Within each task window, the facilitator encouraged the following steps:

1) *Electronic brainstorming:*

    a) Anonymous entry of ideas

    b) Read other people's ideas - if you disagree, suggest a better alternative

2) *Electronic voting.* Everyone votes on all items, to uncover the group position

3) *Face-to-face discussion.* Face to face discussion of unresolved items, involving:

    a) Clarification of ambiguous items

    b) Removal of duplicates

    c) Advocacy: Anyone could speak to any item

    d) Discussion of disagreement, and re-vote.

Steps two and three of the traditional paradigm have been interchanged, and discussion is the optional final step, rather than voting. After brainstorming subjects could vote and re-vote as often as they wished. Votes were anonymous and visible to all. Voting was on the scale:

1. Strongly disagree
2. Disagree
3. Slightly disagree
4. In the middle
5. Slightly agree
6. Agree
7. Strongly agree
- Abstain
? Don't understand

After all votes on a question were in, all members could see a display of the member votes and the group position in a single line format. Each digit in the position display string below, indicates the vote position of a group member according to the scale above. Member votes in the string are not linked to member identity - the display presents the votes in numerical order, left to right.

155556	**SLIGHTLY AGREE**

In this example, one person voted *Strongly disagree*, four voted *Slightly agree*, and one voted *Agree*. The majority position was *Slightly agree*, as indicated in words on the right. Such an item, where one or more people disagreed with the rest, was automatically raised for discussion in step 3. Items with a *Don't understand* vote were also automatically raised for discussion, allowing anyone to easily call a discussion on any item.

This method was expected to produce agreement on most of the items initially, leaving the contentious items for later discussion. It was predicted that this early focus on areas of group agreement would set a tone of group unity that would carry over into the face-to-face discussion, since manipulation of communication valence sequence has been found to significantly affect behaviour and attitudes in this manner [33]. Person-to-person conflict was bypassed, at least at the beginning, because the computer interaction was anonymous. It was not possible to argue, even anonymously, because the commenting facility was turned off for the first two steps. If a participant disagreed with an idea presented, the only way to "argue" with it was to suggest a better alternative, and let the group vote decide between the two.

In summary, the aim was to reduce initial interpersonal conflict as much as possible, and use computer voting to beneficially enhance the group normative process. It was considered unlikely that, for this group, normative influence would be so powerful as to override individual judgement.

The software

The groupware used, FORUM DGSS, was developed by the first author as a research tool. It has been used by over a thousand people during three years at Manukau. It aims to provide a *computer-mediated environment* within which participants have freedom of action, subject only to the properties of the environment. It differs from "tool kit" type systems (e.g. Group Systems) where software "tools" are initiated by a central facilitator, and all subjects use the same tool at once. In a computer-mediated *environment* all actions (such as voting, commenting, mail and brainstorming) are under end-user control, and potentially available at any time during the session. For example in this study, the group was supposed to first brainstorm and then vote on the ideas

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brainstormed, as two separate phases. However often subjects in the middle of voting would suddenly think of another idea. In FORUM DGSS they could stop voting, add their new idea to the list, and then carry on voting. The software then automatically informed the group that a new item had been added for voting. Experimenter control was exerted not by direct central control but indirectly, by control over the rules of the environment, which were defined in over 150 parameters which the experimenter could adapt or "tailor" prior to the situation [38]. Table 2 gives some of the key properties used for this case study.

Results

General

In each session only a few items needed discussion, typically 5-8 from a set of 30-40. After discussion, the item was re-voted and usually agreement was reached. Occasionally the group simply agreed to differ and moved on. However

agreement meant agreement *under that heading,* and if you disagreed with the item placement you had to vote against the item. In a distributed environment such querying of system itself could have more serious results, perhaps with subjects losing faith in the system.

The most serious problem was caused when group members questioned the nature of the task given. There was considerable discussion about whether we were looking at marketing objectives or organisation objectives (that related to marketing), and whether production should drive marketing or the other way around, an idea which simmered in every session. Disagreement about this temporarily derailed the whole process for a while and caused a great deal of concern. In the end, it was agreed that a key marketing aim should be to raise the profile of marketing in the organisation. Computer-mediated groups, using either a rational information exchange process or a normative group cohesive process, seemed

Action	Properties
Add	Only the Chairperson could add/edit subject headings.
Edit/Delete	Except for the chair, only the item owner could edit or delete.
Order	Some lists were automatically ordered by vote agreement, while others were prioritised by the chairperson.
Vote	Votes were anonymous. The group position was visible to all.
Comment	Commenting was turned off for steps 1 and 2. Headings could not be commented on.

Table 2. FORUM DGSS environment properties

approximately once or twice per session an issue arose that challenged either the interaction environment or the nature of the given task, and demanded face-to-face discussion which taxed both the group and the facilitator. For example confusion arose over what to do when you agreed with an item, but disagreed with the heading it was under (e.g. under the heading "Weaknesses" you agreed with the statement "Staff are practically rather than theoretically orientated", but felt it was a strength not a weakness). The facilitator had to resolve this immediately, stressing that

to have problems dealing with such contextual issues, perhaps because they suggest group movement "outside the field". Such movement seemed to require what can best be described as "insightful leadership". However such difficulties, caused by the problem as a moving target, are not restricted to computer-mediated interaction [29].

In summary, computer-mediated interaction operates within a contextual framework, and one of

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the prime roles of the facilitator seemed to be to provide and maintain that context.

Use of top down task structure

The task structure, taken from a current marketing text, involved a top down approach, first defining the marketing objectives and then the strategies to bring those objectives about. Participants seemed to have difficulty working in this top down way. Most of the objectives initially brainstormed were seen on reflection to be strategies (or means to an end). People seemed to prefer to begin with the concrete actions and then consider why they wanted to do that, rather than work from end to means. For example, to establish a career counselling service was initially put forward as an objective and then seen to be a strategy.

The end product

The end product was unpolished and uneven in quality. As one subject said: "..I believe that the deliberations that come out of one of these sessions are really raw material, [and] they're not for distribution, and they look half baked, naïve, ill conceived incoherent …... and I believe it would be quite dangerous to use that output of a session like this and spread it around". In other words the product lacked consistency and focus, perhaps reflecting its multiple authorship. It had to be reworked by the director to

improve this and include dates and responsibilities. It seems that a coherent document is something best done by an individual, not a group. However the end product had the quality that everyone had contributed and therefore felt they partly owned the outcome.

Questionnaire feedback

Participants completed a questionnaire electronically at the end of the sessions. They could not see each other's responses. The results, shown in Table 3, showed that subjects felt the sessions generated more agreement than equivalent face-to-face sessions, and that the overall contribution of computer support was beneficial.

Interview themes

The interview questions were designed to reveal perceptions about the process and outcomes of the sessions, the effect of voting before discussing, and the computer software in general. The following themes emerged:

Comparison to face-to-face

The interviews confirmed that previous face-to-face discussions tended to easily go off track and involve personality clashes. One subject commented on an experience with a face to face brainstorming session that "…was disastrous, because they wouldn't

Question	Majority decision	Mean	SD
1. I disagreed with a lot of what the group decided	Disagree	2.5	1.3
2. I agreed with most of the group decisions	Agree	5.5	1.3
3. Using the computer gave more agreement than normal meetings would	Slightly agree	5.2	1.7
4. This group task would be better done in a face to face meeting	Disagree	2.2	1.1
5. This is a good way to develop a business plan	Slightly agree	5.0	1.0
6. This is a bad way to develop a plan for anything	Disagree	1.8	0.4
7. I think our group did quite well on this exercise	Slightly agree	5.6	0.8
8. I was not aware of the rest of the group through the computer	Disagree	2.7	1.3
9. I felt we were working as a group	In the middle	4.8	1.7

Table 3. Questionnaire responses

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obey the rules…[of not making value judgements on others' ideas]", and another reported that an attempt at face-to-face brainstorming was "an unmitigated disaster".

Personality clashes

The method used seems to have reduced or avoided personality conflicts. When asked what would have happened if a normal face-to-face process had been used, one subject catalogued the personality conflicts in detail: "I can tell you almost exactly what would have happened. Member A would probably have arrived late, and member B would be getting totally hacked off with that, and they then would have a fight over something …Member C would probably get all magisterial and annoy the rest of us, and then sort of sit and get sulky, and another one would probably whine gently, and we'd all be at each other's throats in a wonderful way." Computer interaction avoided such outcomes. It provided "..an opportunity for people to contribute ideas to a group situation without those ideas being coloured by their personality..". Another felt that "..ideas were judged on their merit, not by, or influenced by, the person who [was] advocating them.". Another felt " able …to give opinions without being identified or being criticised." While some liked being able to brainstorm without " . . . worrying about the dynamics of the group [or] being dominated by any personalities or agendas..". others missed the "bouncing" type of interaction experienced in face-to-face interaction.

Voting before discussing

Without voting before discussing, one participant said that "..I think we would have had much more tension in our meetings, [and] we certainly would have gone down a whole number of different blind alleys, ..., so I think overall the meetings would not have been so efficient or effective and we would have ended up with a lot of people feeling pretty angry about each other..". Another said"..I certainly think it helped our group in terms of our cohesiveness, and I think we all enjoyed each others' company in doing the process and things were pretty relaxed." and another "I found we were more aligned and more thinking on the same wave track than …if I'd been asked prior to the event would have said."

Interestingly, subjects generally did not mind voting on all items. When asked if they would have preferred a leader to pre-select items for the group to vote on, a typical response was "No I was quite happy

to give my opinion on all of them ..". Subjects seemed very interested to discover the group position by exchanging votes through the computer: "I found it very interesting each time to see what the their [the group's] final priority order was ..". This supports the idea that voting can be natural form of group communication.

Role of face-to-face discussion

Many pointed out the need for discussion to prevent a "groupthink" type of effect: "I believe this process where you vote before you discuss is an excellent way of saving time on things where there is no disagreement … so long as people have the opportunity to discuss. …for example there was one issue on which I voted strongly disagree …when they came to ask me why I persuaded the whole lot of them that they were on the wrong track because they hadn't seen the implications of it ..". The final discussion phase seemed sufficient to retain the desirable properties of face-to-face discussion: "When we had a contentious issue the author of the statement had to stand up and be counted, so we then got into the usual group dynamics and dominant personalities etc"

Opinion on computer interaction

Participants all agreed that after these sessions, their opinion on the use of groupware systems remained good, had moved from neutral to recommend, or had risen from previous experiences: "I think this system was better", and "…so yeh I guess I've moved from a position of total neutrality to one of approval", and " ..I think [computers] are a useful tool, I see them as a tool, and I would use them, yes.". However, one subject provided the caveat: …I don't believe it [computer interaction] is a total substitute for face to face discussion..".

Conclusions

Although there are limitations to the VBD method, such as the probable reduction of individual creativity, voting before discussing certainly seemed to increase the sense of group identity, reduce personality conflicts, and reduce needless discussion. Subjects may need to be warned not to mindlessly go along with the group, and encouraged to raise issues for discussion when they felt the group had got it wrong.

The group agreement achieved through voting was generated without prior surfacing and resolution of conflict. However such social agreement could be

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fragile in the face of well-reasoned opposition. Occasionally a point of disagreement which initially involved only one person, led to discussion where the person raised new information that caused the entire group to alter its position. In other words normative influence without rational discussion may generate high confidence, but this can be short lived if group members are not "inoculated" by considering alternative ideas and arguments [36]. A combination of both processes, as in the VBD method, seems the best way.

These findings are unusual, because more often than not, other studies of computer interaction have reported reduced agreement and increased conflict, both in the field [11] and in the laboratory [1, 6, 9, 10, 18, 24, 25]. However some experimental studies have shown that computer-mediated groups can more easily generate agreement [21, 42].

Since this study was not controlled, the effect cannot be unequivocally attributed to the method used. It was also limited to a particular group of individuals. However the VBD method certainly seems to be worth further study, and although purpose designed software is required, it is hoped that other researchers will try it out.

The results of this case study support the integrative theory upon which the VBD method is based. The existence of three distinguishable processes in group interaction opens up a variety of possible forms of computer support. It expands the possibilities for computer-mediated interaction beyond those implied by the traditional single-process, rational task-information exchange model. The VBD method may be just one of many new ways that computer support can be tailored to the nature of the group and the task situation.

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