

Supporting Discussions for Decision Meetings

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Abstract Decision meetings may be considered as composed of a divergent part and a convergent one. The divergent part has a discussion of the agenda items. This stage can be computer-supported and it can be done asynchronously during a short period of time. Aspects of the design of a software system intended for this purpose are presented. The discussion of the agenda items is organized in a structured manner, letting users make contributions for any item of the discussion structure. Using our developed tool, people can discuss in a distributed way. The system was tested with actual executives and professionals of a large organization. Results from their evaluation are discussed. These results are encouraging, since according to participants, the system use lets them improve the outcomes of the succeeding meetings.

Keywords Decision meetings · Structured discussions · GSS · Decisions support systems

1 Introduction

Group Support Systems (GSS) are a special type of groupware aiming to make group meetings productive (Nunamaker et al. 1991). GSS are designed to improve the efficiency and effectiveness of meetings by offering a set of tools to assist the group in structuring the activities, generating ideas and improving their communications (DeSanctis and Galleupe 1987). Although some organizations have already obtained benefits from GSS (Nunamaker et al. 1989), their use is not trivial; in particular, organizations may critically need proficient facilitators (de Vreede et al. 2001). Facilitators typically help users to prepare a GSS supported meeting and then, they moderate the actual meeting (Niederman et al. 1996). The activity of the facilitation role has been defined as a dynamic process that involves managing

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relationships between people, tasks, and technology, as well as structuring tasks and contributing to the effective accomplishment of the meeting outcome (Clawson et al. 1993). The facilitation subject has been extensively studied in many articles (e.g., the special issue of *Group Decision and Negotiation* 1996).

Bostrom et al. (1993) have characterized decision meetings as belonging to a lifecycle. This cycle begins with the preparation of the meeting (pre-meeting), then the meeting itself and then several activities after the meeting, such as dissemination of the decisions, follow-up, clarification of doubts, etc. (post-meeting). One of the outcomes of post-meeting activities may be material for the next cycle of pre-meeting, meeting, post-meeting. Thus, meetings rarely die.

The pre-meetings activities are done by the facilitator and the client. These activities concern the issues to be developed in the meeting, the approach to be taken, group membership, venue and time scales (Ackermann 1996). Bad preparation, a poorly structured agenda and careless time keeping can greatly reduce the efficiency and effectiveness of meetings (McFadzean and Nelson 1998).

The meeting itself involves the facilitator, the client and the participants. The meeting stage may be further divided into three sub-stages. These are an introductory sub-stage; the exploration and development sub-stage, and a concluding sub-stage (Ackermann 1996).

In the introductory sub-stage, Ackermann (1996) also claims these activities should be done:

1. Provide an explanation to the process.
2. Provide a clear set of objectives and a corresponding agenda.
3. Create and display an overview of the issue/problem.
4. Manage the group's direction and progress.
5. Ensure that participants perceive themselves to be equal for the event.

The meeting may also be considered as having two main parts: a divergent phase and a convergent one. The divergent part concerns participants discussing the issues of the agenda and the convergent phase deals with trying to summarize the results of the discussion and eventually making decisions.

Our hypothesis is that the pre-meeting and the divergent part of the meeting can be done in an asynchronous and distributed way. This is convenient for people, since they do not have to agree on specific times and places and do not have to spend time traveling or moving. We think the convergent part of the meeting may require face-to-face involvement from meeting participants and thus, we rather concentrate on supporting the previous activities.

Daft and Lengel (1986) distinguish two types of confusion people may have concerning a discussion item. The first concerns ambiguity or *equivocality*. Examples of it are questions such as “why are we concerned with this matter?”, “is this the right time to decide on this issue?” The second type of confusion is called *uncertainty* and refers to lack of answers to questions and issues which need further elucidation, although there is already an understanding about their importance.

Both equivocality and uncertainty can be reduced if participants can discuss the agenda items at the beginning of the meeting. It is not necessary the participants be physically present; i.e., the discussion can be *distributed*. Moreover, the discussion can be made so that each member participates in it whenever he has time or opportunity to do so, i.e., the discussion may be *asynchronous*. Duration of a few days for the discussion is also desirable, because people have the necessary time to get new ideas and ponder arguments.

A computer-based tool was developed to support work done by facilitator, client and meeting participants. In particular, an argumentation model is used in this tool to allow participants to discuss the content of the agenda. A real experiment was conducted at a large organization and the results are presented below.

The remaining of this article is organized as follows. Section 2 presents the discussion model we used in our tool. The basic tool design is developed in Sect. 3. Section 4 includes initial feedback from the target users. Evaluation from users of the real experiment is described in Sect. 5. Section 6 presents the Conclusions.

2 Argumentation Model

Rittel has characterized a class of problems he named “wicked”, as opposed to “tame” problems (Rittel and Webber 1973). Wicked problems have these features (Shum 2003):

- they cannot be easily defined so that all stakeholders agree on the problem to solve,
- they require complex judgments about the level of abstraction at which to define the problem,
- they have no clear stopping rules,
- they have better or worse solutions, not right and wrong ones,
- they have no objective measure of success,
- they require iteration — every attempt to build a solution changes the problem,
- they often have strong, moral, political or professional dimensions, particularly for failure.

Rittel and Webber also claimed that an “argumentative process” was the most effective way to tackle such problems. What is, then, an argument? Kanselaar et al. (2003) proposes an argument is a structured connection of claims, evidence and rebuttals. A minimal argument is a claim for which at least doubt or disbelief is expressed. Such doubt may be presented by an individual (if working alone) or by a partner in an argumentative dialog. In response to such doubts a complex structure may be eventually produced, including chaining of arguments, qualifications, contraindications, counter-arguments and rebuttals. Thus, the argument is the product, while the process of argument production is called argumentation.

Argumentation can be modeled. A very influential model has been Issue Based Information Systems (IBIS), first proposed by Kunz and Rittel (1970). The three basic IBIS entities are issues, positions and arguments. These entities can be linked by relationships such as supports, objects-to, replaces, temporal-successor-of, more-general-than and their converses.

Argumentation can also be computer supported. The computer may provide a repository to store the arguments and also, some visual and retrieval facilities to examine the arguments built so far. If a group of people have a structured discussion that can be done synchronously or asynchronously. Various studies have confirmed both types of argumentation are quite different (Kanselaar et al. 2003; Conklin 2003). Kanselaar et al., e.g., reports an experiment in which subjects working synchronously feel psychologically pressured to read and respond each other’s contributions within seconds or at most minutes. By contrast, in the corresponding asynchronous argumentation, the subjects took hours, days, weeks, and sometimes even longer to read, write, and think about contributions that triggered their interest. “More time may afford re-reading and reflection, keeping track of the line of discussion and treating non-task related interactions or technical disturbances for what they are: temporary, peripheral interruptions” (Kanselaar et al. 2003).

The divergent part of a decision meeting can be considered to deal with mainly wicked problems. Therefore, the argumentation process could be used to support it. Next section

presents the model used by our tool. This model is an IBIS extension including elements suitable for the introductory sub-stage of the meeting.

3 The PRIME Initial Design

PRIME (Pre-decisions Information Management Engine) is a tool intended to support discussions of the agenda items. It models the divergent part of a decision meeting with issues, positions, and arguments of the IBIS proposal. Besides, it incorporates agenda items, objectives, tasks, remarks, proposals and constraints (Bellassai et al. 1996). The rationale for these new entities is to incorporate the specifics of the meeting into the structured discussion. Thus, e.g., a decision meeting typically is not initially presented as a heap of issues (questions) but it is a pre-prepared list of agenda items, which, of course, may include issues. In the same vein, a task is a description of an activity to be done by a responsible group participant, typically to obtain relevant data to be used in the discussion. PRIME has been implemented as a Web tool.

The PRIME approach encourages all types of communication among group members, including conventional communication means. However, the emphasis is on using the discussion database as a communication channel. In fact, one way of viewing a collaboration process in which various users are contributing is they are having a conversation. This is because participants are incorporating elements which reflect their way of analyzing facts, opinions, data, comments, etc. These elements are read by the other group members and thus a communication path is completed.

Four roles are included in the PRIME model: Client, Facilitator, Contributor and Observer. The Client and Facilitator define the agenda items. The Facilitator supervises the discussion of the agenda items. The Contributors produce the actual discussion. The Observers are persons authorized to read but not write contributions to the discussion.

It may be noticed no decisions are to be made with a PRIME-based discussion; they are reserved for the face-to-face meeting. Member contributions are saved in a Group Memory, for persistent storage and later retrieval.

Therefore, it could be used from anywhere and with any device supporting a Web browser. A significant difference with the design of our previous implementations is that this tool was not experimental: it was intended for real users.

The PRIME basic goal was: to be useful for an asynchronous distributed meeting discussion. Besides allowing users to read other participants' contributions and incorporate their own, PRIME should let group members attach any type of file to the discussion. These files may include multimedia documents, spreadsheets, etc. enriching the possibilities of carrying out an informed discussion.

The development of PRIME was inspired by early prototypes (Borges et al. 1999; Espinosa et al. 1997; Parra and Pino 1995). It was also somehow influenced by GroupSystems (Nunamaker et al. 1989), although this system is intended to support a complete decision meeting and its divergent part of the discussion is not based on an IBIS-like argumentation model. A close relative is gIBIS (Conklin and Begeman 1988), although the visualization of the discussion is different: gIBIS provides a graph in which the nodes represent the discussion elements and the edges stand for the relationships among nodes. PRIME, as it will be reported below, presents discussion elements in a graphical hierarchy. gIBIS later evolved to QuestMap and then to Compendium (Conklin et al. 2003).

The first PRIME release was developed with the following features. After validating user login identification and password, the system presents the open meetings in which the user



Fig. 1 Discussions list for a user of the PRIME system



Fig. 2 Discussion hierarchy for the first PRIME version

is a member (Fig. 1). These meetings were probably prepared by electronic mail. For each meeting, it is possible to see its name, a brief description, the number of contributions received until the current time, the first agenda items being discussed, starting and closing dates, and the user name of the meeting facilitator.

The PRIME discussion structure can be seen as a hierarchy of these components: agenda item, objective of the item, issue, position, argument and remarks. In previous implementations, these components were presented in this way (Fig. 2). Agenda items and objectives for each item are pre-defined by the Facilitator. The Facilitator is also in charge of making Contributors create structured discussions about these items, using issues, positions, arguments (in favor and against) and remarks. The problem with this manner of organizing the discussion is that having so many levels, the visualization of the hierarchy takes a significant display space. Even worse, users get confused with so much information. On the other hand, if some information is hidden, users get lost: they may not identify the discussion component “owning” a certain discussion element.

The problem was solved in PRIME by splitting the display window in several parts (Fig. 3). The upper sub-window (marked with (1)) shows only agenda items and objectives. The discussion components belonging to the chosen objectives are “opened” in the second sub-window (marked with (2)). This sub-window then contains issues, positions, arguments in favor or against, and task proposals. The third sub-window shows the detailed text of any

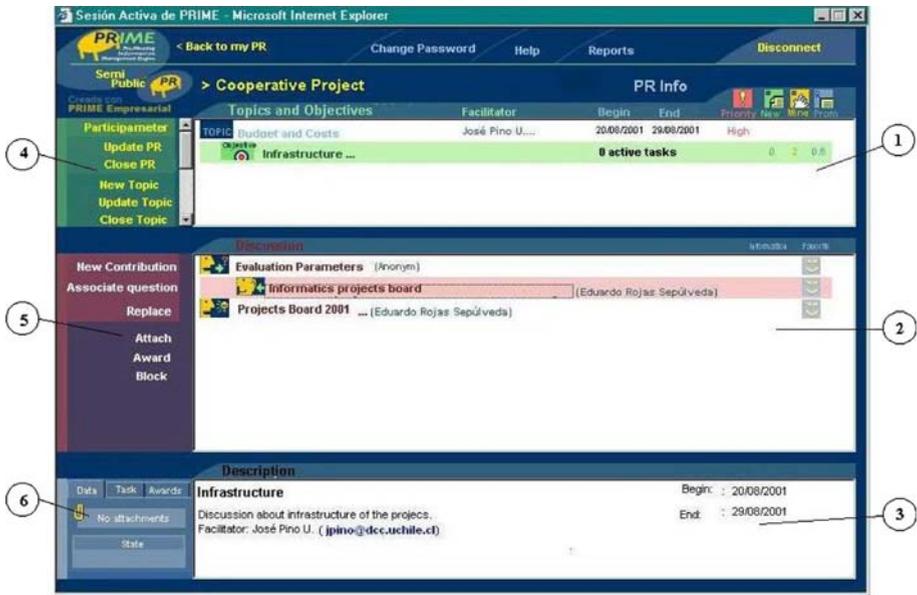


Fig. 3 PRIME discussion screen

selected discussion element in the second sub-window, as well as any remarks added to this element.

There are discussion awareness features incorporated in these sub-windows. In the first one, there are indications of the number of new contributions for each displayed objective. Also, the average number of submissions per contributor and the number of submissions from the user himself are shown for each objective. These latter figures are intended to provide quantitative awareness on the participation of users in the discussion.

The PRIME discussion window also has three groups of buttons at the left hand side. The first group (4) concerns actions which can be performed on agenda items and objectives. This menu is visible only to the Facilitator. He can add new items, modify them, etc. The second group (5) contains the menu available to all contributors. By using this menu, group members can make new contributions, attach documents and modify part of the contributions. The last menu (6) lets participants see the attached documents and the tasks assigned to each person.

PRIME supports the Facilitator during discussion in several of his/her identified actions reported by Clawson et al. (1993). In particular, some of the generic critical facilitative behaviors assisted by PRIME are the following ones:

- He/she listens to Contributors (reading, in this case), clarifies and integrates information (the Facilitator must clarify goals, agenda, terms and definitions with group; backtracks participant's responses; remember previous comments to reconnect information; helps organize information into themes).
- He/she creates and reinforces an open, positive and participative environment (the Facilitator uses activities and technology to get people involved early on; he/she handles dominant people to ensure equal participation; he/she provides anonymity and confidentiality when needed).
- He/she presents information to the group (the Facilitator submits written information to the group; he/she provides research and background information to the group, and he/she makes sure important information is visible to the group).

- He/she demonstrates flexibility (the Facilitator adapts agenda or meeting activities on the spot as needed).
- He/she plans and designs the meeting process (the Facilitator plans the meeting ahead of time; he/she designs agenda and activities based on outcomes, and he/she explores potential changes in agenda ahead of time).

4 Feedback from the Users

Alpha Corporation is a large natural resources Chilean company with operations distributed over several sites.¹ As many organizations, Alpha wanted to improve the quality of its executive decision meetings. We offered our help to develop a GSS to support the divergent part of such meetings by allowing participants to discuss the agenda items.

We had been working on discussion prototype systems in our laboratory for several years. Five prototypes had been previously developed as student graduation projects at our university and Universidade Federal do Rio de Janeiro (Cavalcanti et al. 1997; Espinosa et al. 1997; Muñoz 2000; Parra and Pino 1995; Romero et al.). However, all of them were experimental and none was appropriate for professional usage.

A prototype implementation developed by a student was used to familiarize a few Alpha employees with the corresponding concepts. The comments we obtained were useful to develop the initial PRIME design. In fact, experience with the system built on this design allowed us to make the final design. The system has yet to be tuned and deployed as a standard tool within Alpha, but we have some feedback from the users.

The first PRIME release included a simple window to type a contribution. This was considered insufficient by the first users. They argued they were accustomed to prepare text with tools appropriate for this task: an editor with cut and paste facilities, choice of fonts, etc. Then, they had this concern: when preparing a contribution, they initially thought it was of a certain type, but after seeing it written, they realized it actually was of another type. The problem was they had already indicated the contribution was of the initial type and PRIME did not allow deleting contributions.

This first problem had an easy solution: we provided a simple editor including the most popular word processing features (Fig. 4). The second problem touched a fundamental issue: the tool was supposed to help organize the discussion, not make it difficult for the users. Moreover, it is natural that a person creating ideas has not completely clear if according to the IBIS model, that contribution is going to be an issue, a position or an argument. Indeed, whatever is finally written may well be a combination of two or more of these contribution types.

One tentative solution to the previous problem is to allow contributors to delete contributions. It is not a good solution because, in general, the discussion can not have components suddenly disappearing (some other discussion elements may depend on them). Besides, if only authors could have deletion rights on their own contributions (otherwise, it would not be acceptable), what can be done about anonymous submissions?

A better solution was the following one: a user can edit his new contribution and after he is ready, he decides the submission type. Alternatively, once written, the submission may be split in two or more contributions using the editor. The icons in the lower part of the screen in Fig. 4 allow choosing the submission type. The final design included this solution.

Another problem stated by the users was about the features offered by the system. Alpha Vice-President of Planning found the system too complex for simple use by executives. Our

¹ The names of the organization, its departments, employees and products have all been disguised. Alpha has over 12,000 employees and annual sales over US\$ 2.85 billion.

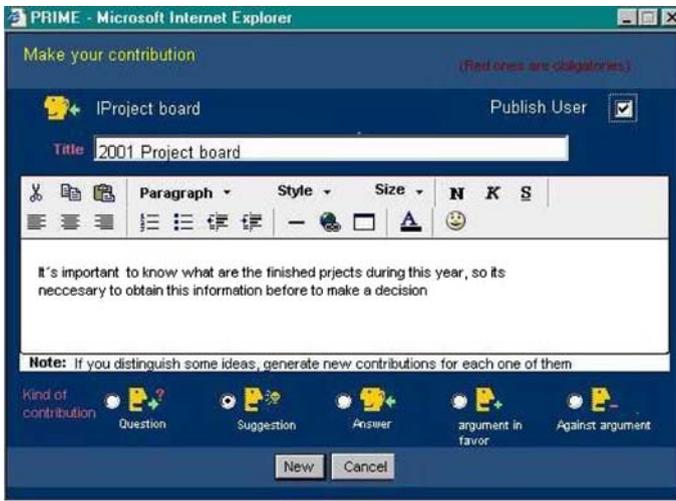


Fig. 4 Adding new contributions in PRIME discussions

approach to solve this problem was to provide three versions of the system. The simplest one would include only the essential tools to provide a basic functionality. The most comprehensive version included all features.

5 Evaluation from Users

We made an initial effectiveness study in Alpha Corp. after some users came into contact with PRIME. The creation of the questionnaire was based on the critical incidents technique proposed by Flanagan (1954). In a first phase we developed an open questionnaire asking positive and negative aspects of the tool. This questionnaire was applied to a first group who used the software tool. Using this information we defined the most mentioned characteristics. Once the critical incidents of the software tool were determined we used them to define dimensions of quality. We defined the final questionnaire using these dimensions of quality for critical incidents. It has a Likert format.

Two groups have been using the system with some regularity. The first group includes 15 middle executives and senior professionals related to technology use within the company; all of them were interviewed. The other group concerns high executives from the Finance Division; we interviewed six persons from this group.

All 21 interviewed people used PRIME in order to have distributed asynchronous discussions. These discussions were followed, a few days later, by the corresponding convergent face-to-face decision making parts of the meeting. The study involved questions about three subjects: activities done by participants before face-to-face decision meetings, activities done when using PRIME, and activities performed during the decision meeting itself.

5.1 Subject 1

In this area of concern, we are interested in comparing activities done by participants before the actual decision meeting to which they are invited both when using PRIME and when they did not have it available. Four questions were asked and the results are presented below.

Q.1. Did you know the meeting agenda before the face-to-face meeting?

	Always or almost always(%)	Sometimes(%)	Never or almost never(%)
Without PRIME	42.85	42.86	14.29
With PRIME	100	0	0

Q.2. Did you understand the most important agenda items before the meeting?

	Always or almost always(%)	Sometimes(%)	Never or almost never(%)
Without PRIME	23.81	57.14	19.05
With PRIME	80.95	19.05	0

Q.3. Did you read the material sent for the meeting before it took place?

	Always or almost always(%)	Sometimes(%)	Never or almost never(%)
Without PRIME	33.34	28.57	38.09
With PRIME	66.67	33.33	0

Q.4. Did you discuss agenda items with other participants before the meeting?

	Always or almost always(%)	Sometimes(%)	Never or almost never(%)
Without PRIME	9.52	52.38	38.10
With PRIME	66.66	14.29	19.05

A simple analysis of these results shows PRIME is useful to make participants of a meeting aware of the agenda items (100%). Participants also reduced their initial equivocality and uncertainty when using PRIME, by both understanding the agenda items and reading the attached material. Finally, two thirds of the people say they always or almost always discuss agenda items with other participants when using PRIME; this contrasts with only 9.52% who say they do that without PRIME.

5.2 Subject 2

This part of the study is concerned with the participants' opinion about PRIME. In particular, the *value* they assign to the tool.

Q.5. According to my opinion, whatever is to be decided during the meeting and its consequences is clearer when using PRIME than without its support.

Q.6. Subjects to be discussed are studied deeper when using PRIME than without it.

Q.7. There is additional freedom to express ideas when using PRIME than without it.

Q.8. Time used in PRIME supported discussion is good investment.

In general, interviewed participants assign a high value to the use of the system. Note that even the 4.76% who disagree with assertions No. 5 and 6 does assign some value to PRIME or at least is not sure about it (Q.8).

Question	Agree(%)	Not sure(%)	Disagree(%)
Q5	71.43	23.81	4.76
Q6	80.95	14.29	4.76
Q7	57.14	4.76	38.09
Q8	90.48	9.52	0

5.3 Subject 3

The goal of this subject is to compare the complete meetings which have had some discussion using PRIME with those without it, according to the participants.

Q.9. Discussion during a meeting is more meaningful when there has been preparation using PRIME than without it.

Q.10. Meetings are shorter when they have had preparation using PRIME than without it.

Q.11. Decisions made in a PRIME-prepared meeting are of higher quality than those made in unsupported meetings.

Q.12. Participants are more satisfied with the decisions made during a meeting prepared with PRIME than those made in a meeting without preparation.

Question	Agree(%)	Not sure(%)	Disagree(%)
Q9	76.19	19.05	4.76
Q10	57.14	38.10	4.76
Q11	61.90	33.33	4.76
Q12	47.62	52.38	0

It is certainly difficult to evaluate the quality of the meeting. The previous results show better meetings when using PRIME than without it in the eyes of the participants. However, participants did not have any other (formal) preparation for meetings before using PRIME: it may well be that meeting preparation by other means could also be positively evaluated by participants. Results for Question 10 may be biased by satisfaction with PRIME: the actual meetings might have not been actually shorter than before, but participants had the feeling they did not have to discuss too much when they have done that in the divergent phase.² Results for Q.12 are particularly interesting: none of the participants disagreed with the assertion; one can guess people feel they are more deeply involved in the issues discussed, but that does not guarantee people reach consensus. In fact, answers to Q.12 are cautious: more than 50% does not agree either.

6 Discussion and Conclusions

The design of the PRIME system benefited from user feedback. In particular, the user interface was different from that of previous prototypes. Thus, the visualization of discussions and the writing of contributions have been improved.

Concerning the effectiveness of PRIME, an initial approach was to evaluate it according to the opinions of users. They were interviewed by a person who was not a member of the system developing team. The results show they are quite satisfied with the system, finding the time they spent interacting with it a worth investment. They valued the fact they could

² Face-to-face meetings in Chilean culture are less strict with time deadlines than in some other cultures: a meeting which lasts 25% longer than scheduled is typically accepted.

work part of the meeting before actually having it because they worked in several company sites and thus, they expected the meetings be productive: many of them have to take a plane to the headquarters in order to have a face-to-face meeting. This conclusion was obtained based on open comments in the questionnaires.

Nevertheless, there were difficulties during initial use of the system. The first one was that for most groups the concept of asynchronous discussion was unfamiliar. Their typical first reaction was that they did not need to discuss matters beforehand in this case. A second difficulty was with the nature of the discussion: a usual first request was for features to vote and thus to quickly jump to decisions; they had to be explained again that decision-making was left for the face-to-face meeting. Finally, users did not initially grasp the advantage of discussing ideas independently of their proponents: they wanted features to state personal preferences; afterwards they liked the concept of discussing ideas on their own merits, because that gave them freedom to express advantages and disadvantages of various choices without stating *their* affections or inclinations. This freedom is important when participants have inclinations which are different from those of the highest executive (Nunamaker et al. 1991).

It is interesting to contrast our previous findings concerning users' difficulties with those reported by Conklin (2003). He used QuestMap—an IBIS based tool to map dialogs—for 10 years with employees of a company. His conclusion is that despite the apparent simplicity of the tool, users need significant training both on IBIS and on QuestMap to really get the expected results from them. The difficulties we report above could have certainly been reduced with appropriate training, since the training we provided our subjects was very brief (2 hours) and without much practice.

We found the work of the Facilitator to be very valuable. The discussions were most meaningful when the Facilitator was involved and he motivated the rest of the group. Were the decisions made in meetings discussed with PRIME better than the ones made without it? The interviewed users say yes, but this is very difficult to prove. One can guess, however, they may be. By using PRIME, participants can generate and evaluate a large number of optional solutions, all group members get knowledgeable about the subject, they have time to ponder arguments and choices, and they have ample opportunities to participate.

The main objective to develop PRIME was to enable the facilitator's role to make significant work during the discussion. We have involved participants in this task as well. The agenda is now discussed before the face-to-face meeting as a way to let participants get aware on the issues, to make them think on these issues for some time and to let them propose solutions. Even if participants did just a few of these activities, probably the following meeting would benefit from that fact. For instance, if a person just reads but does not contribute ideas, he/she still would be on a better standing for the face-to-face decision meeting than not having read anything at all. Of course, full participation is desirable.

PRIME is not the only way people could discuss a meeting agenda beforehand. For example, electronic mail could also be asynchronously used for this purpose. However, the information structuring and additional services provided by a tool like PRIME should compensate the additional burden of learning a new system. Other discussion structure models could be used as well. One of the added-value services provided by PRIME is data privacy/security, not provided by electronic mail.

The experimental study was not intended as a definitive work on the tool value. First of all, it was applied to a relatively small number of people and thus, results are not statistically significant. Second, as mentioned in the previous section, discussion by other means could have also been positively evaluated by users; hence, some of the results may be contaminated with attitudes towards meeting discussion as a whole.

Will people actually use a system such PRIME? We can anticipate some arguments in favor of using it. One of them is its *political* value. The system lets users discuss ideas on their own merits—not specifying their own preferences—as mentioned before. This will reduce eventual pressures from executives to conform to their preferred solutions. Group members who actively participate will also get exposure as active, creative and interested persons. Another positive argument is *social* value: participants using PRIME may find increased opportunities to interact with the group. As negative argument for the use of PRIME, we may mention the cognitive load to manipulate yet another system. In general, for these purposes, PRIME may be considered a limited “electronic meeting system” (EMS) and thus the discussion on EMS gains and losses by Nunamaker et al. (1991) is largely applicable.

The PRIME database—implemented as an Oracle database—was designed to export its contents to a face-to-face meeting support system. Alpha Corp. does not currently have a software system to support face-to-face decision meetings. Its Information Services Dept., however, evaluated several products in the market with the purpose to purchase one of them, but it finally did not do it because a change in acquisition priorities. Therefore, face-to-face meetings take place in the traditional way. The current PRIME users print the discussion information (or part of it) and take it to the face-to-face meetings. Our plans are to develop an export module to the meeting support system Alpha finally will use or to develop a PRIME extension to assist face-to-face meetings as well. The latter option has the advantage of being able to keep the PRIME look-and-feel for users.

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