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# GROUP SUPPORT SYSTEMS: THE EFFECTS OF MIXING SUPPORT SYSTEMS ON INFORMATION POOLING, DECISION TIME, AND DECISION QUALITY

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## Abstract

*Most group support systems (GSS) laboratory studies compare face-to-face groups with groups assigned to either a synchronous or asynchronous decision support system. Research findings have been inconclusive. A laboratory study that compared face-to-face groups with mixed support mode groups was conducted to determine the effectiveness of selectively using information technology to support the group process and explain some of the variability in research findings. Groups that shared information using a Web-based asynchronous system and discussed the shared information in a face-to-face meeting environment, assembled more information and made higher quality decisions in less time than groups that shared and discussed information in a face-to-face meeting environment.*

**Keywords:** Group decision support systems, Web-based GDSS.

## INTRODUCTION

Most important decisions in organizations are made by groups or by an individual with the advice of a group (Mintzberg 1983). However, it has been long established that groups can be ineffective decision makers because of group process losses that can outweigh group process gains (Maier 1967). Over the years research has been conducted aimed at finding ways of making groups more productive. Solutions have ranged from manual group process structuring techniques such as the Delphi method (Dalkey 1969) and the nominal group technique (NGT) (Delbecq et al. 1975), to contemporary group decision support systems (GDSS) (DeSanctis and Gallupe 1987). Decision support systems were an area of heavy research during the last decade of the twentieth century. A meta-analysis of laboratory studies by Fjermestad and Hiltz (1998/99) included 230 studies that had been reported in academic journals and conferences by August 1998. Researchers have noted with concern that research results have been inconclusive. Research has not been able to conclusively establish superiority of GDSS over the traditional face-to-face meeting (Kiesler and Sproull 1992). Fjermestad and Hiltz's meta-analysis of laboratory studies show a paltry 16.3% of hypotheses that have compared outcomes of groups assigned to GSS with the baseline traditional face-to-face in favor of the GDSS groups. Possible reasons for this are varied and include poor experimental designs and the subjects used in laboratory experiments.

There are two major problems with the subjects used in reported experiments. First, most of the experiments have used students. Student subjects are problematic in the sense that there is always a question of how motivated they are when participating in these experiments even in cases where some form of incentive is offered. Second, there is the issue of ad hoc versus established groups. Student subjects are mostly ad hoc groups assembled for the experiment only and hence lack the motivation and social cohesion to work as a unit. Experiments using professional subjects have not produced consistent results either. Some laboratory experimental studies that used professionals as subjects (Adrianson and Hjelmquist 1991; Hiltz et al. 1986) show higher dominance, more consensus and higher degree of information exchange in face-to-face groups than in GSS groups. Other laboratory studies that also used professional subjects show GSS groups performing better than face-to-face groups (Lam 1997).

As Fjermestad and Hiltz point out, most laboratory experiments have used either groups that are too small, that is, groups of four or less participants, or too few groups to produce meaningful generalizable results. In most cases, groups are made small to boost group numbers. Another design problem is the nature of the tasks. Tasks that are too simple may not enable the unveiling of the effects of a GSS on the group process. A consistent design feature in reported laboratory studies is the comparison of face-to-face groups with groups using either a synchronous or asynchronous group support system. No reasons have been advanced for not exploring other forums. "The standard of comparison is face-to-face meetings, not because they are always preferable to other forums but because they are ubiquitous" (Kiesler and Sproull 1992). Very few experiments have focused on using a mixture of decision support systems to support the group decision-making process (Ocker et al. 1998).

This research explores the effect of splitting the group decision-making process and using different support systems to support each phase. We develop and test a methodology for configuring support for decision-making groups. The methodology considers three distinct aspects of the group decision-making process: the group task, structuring the decision making process, and using information technology to support the process. The task is guided by three questions (Bales 1950): What are the facts? How should the facts be organized and analyzed? What conclusions are justified from an examination of the facts? The nominal group technique (NGT; Delbecq et al. 1975) is one way of structuring a group decision-making process. The three guiding questions are matched to four steps of the NGT supported with an appropriate type of group decision support system (GDSS). Three types of support systems are considered: asynchronous GDSS, synchronous GDSS, and face-to-face meeting with no technological support.

The next section presents a pictorial view of the group support configuration methodology and the rationale for assigning each of three group task questions to a particular step of the NGT and the choice of GDSS to support each of the four NGT steps. A laboratory experiment that was conducted to test the methodology is then presented followed by a discussion of the results. Results implications and suggestions for future related research conclude the paper.

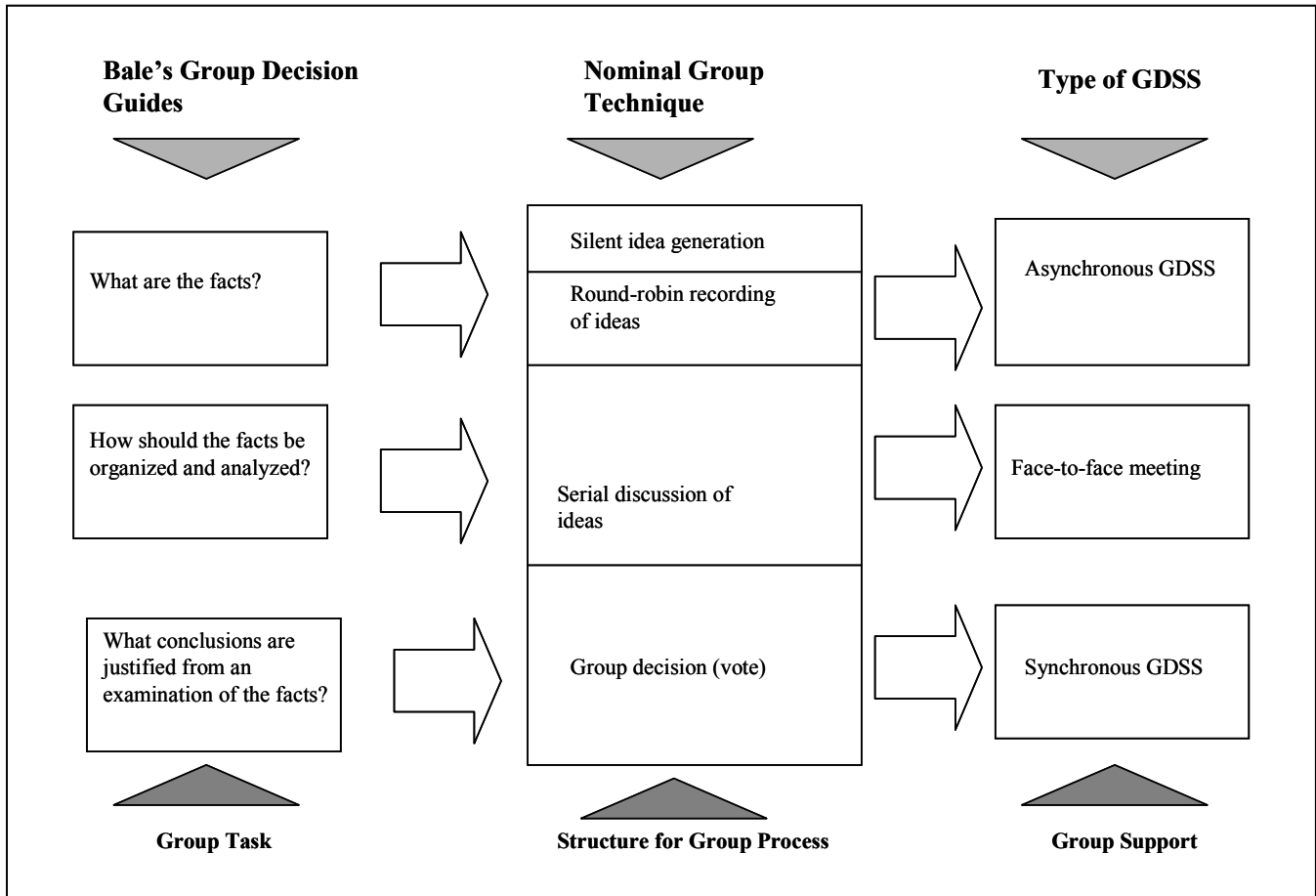
## **GROUP SUPPORT CONFIGURATION METHODOLOGY BASED ON THE NOMINAL GROUP TECHNIQUE**

The nominal group technique (NGT) consists of four main steps: silent idea generation, round-robin recording of ideas, preliminary voting on items of importance and discussion, and final group decision making or voting. The first two activities—silent idea generation and round robin recording of ideas—mirror Bales's first question, what are the facts? The second question—how should the facts be organized?—matches the third step of NGT, preliminary voting on items of importance and group discussion. The third question—What conclusions are justified from an examination of the facts?—matches the last step of NGT, final vote or group decision.

GSS and process structuring techniques are designed to eliminate or minimize group process losses and/or promote group process gains (Nunamaker et al. 1991). However, when used inappropriately, information technology tools can be a source of group process losses (Dennis 1996; McLeod et al. 1997). Support for each of the three questions posed above to guide group decision making should be tailored to reduce or avoid group process losses and/or increase group process gains. Assigning all three questions to the same support system may have resulted in group process losses introduced while answering one question countering group process gains, gained answering another question, hence, the inconsistent results.

In a manual NGT, the meeting facilitator/leader asks participants to generate ideas on the posed nominal question silently and independently. Although the designers of the technique believed that adequate time could be allocated in a meeting setting for thinking and reflection, in reality this may not be the case. Time for idea generation can be too short for some participants. There can be added social pressure if some leaders perceive that they need to come up with better ideas because of their status in the organization. The round robin recording of ideas that follows the generation of ideas can be another source of group process losses. Some participants may not contribute because of fear of social retribution. When the technique was conceived it was believed that several rounds of recording ideas and the resultant long list of ideas would make participants forget who contributed what fact (Delbecq et al. 1975). While in some cases this might be true, the assumption that a long list of ideas will always be generated or that people will forget idea contributors cannot always be expected to hold. Besides, the author of an idea may always think other participants know who contributed the idea.

Most GSS are built with an anonymity feature implemented through either no author identification at all or the use of pen names. A laboratory experiment by Jessup and Tansik (1991) found that groups working anonymously and apart generated more ideas than identified groups working in the same room.



**Figure 1. Methodology for Configuring Support for a Decision-Making Group**

Synchronous GSS do not eliminate group process losses caused by time pressure. Participants are still expected to type in their facts and share them with the group over a limited meeting session. Another feature of GSS, parallel communication, designed to prevent attention and production blocking, can also introduce group process losses. Participants may post duplicate facts, worded differently, to the group information pool because of lack of time to analyze what others are posting. An asynchronous GSS can offer all the benefits offered by synchronous GSS without the group process losses caused by time pressure. In particular, participants have more time to reflect on other participants' contributions, so the probability of duplicate entries and the attendant unnecessary information overload is greatly diminished. Participants with poor keyboard skills, for instance senior executives or users in less developed countries (De Vreede et al. 1998/99), are also not inhibited as is the case in a synchronous GSS setting. We, therefore, propose an asynchronous GSS to support the question, what are the facts, or the first two steps of the nominal group technique.

Step three of the NGT, serial discussion of ideas, requires participants to convince their colleagues of the strengths or weaknesses of each of the facts generated and ranked in the earlier steps. At this stage, it is advantageous for group members to take turns to speak. Parallel communication of GSS, which is meant to minimize production and attention blocking, is not helpful because the facts to be debated are already known at this point. Depending on the type of task, anonymity may not be an issue either. Only in a situation where a group consists of bosses and subordinates would being identified with a particular side of a debate be an issue. The lack of aural and visual cues in electronic communication makes it less effective for emphasizing points, compared to verbal communication. Discussion, or the Bales question, how should the facts be organized and analyzed, is best supported by the face-to-face mode of communication.

By taking a vote or having each group member rank the alternatives under consideration, the group can reach a consensus or make a final decision. In a manual (face-to-face) NGT process, this step can introduce domination, fear of non-conformance with the

group, and free riding group process losses. Research has shown that choice shift is higher for groups under identified face-to-face conditions than for GSS groups in anonymous situations (Adrianson and Hjelmquist 1991). The higher choice shift is evidence of group members shifting to conform to the rest of the group or “group think,” as the phenomenon is often called. Anonymity is the key feature that makes use of a GSS, whether synchronous or asynchronous, ideal for the final decision making step. However, a synchronous GSS has the advantage of enabling the group to iterate between discussion and voting until a consensus is reached. We, therefore, suggest that a synchronous GSS be used to answer the last Bale question, what conclusions are justified from an evaluation of the facts?

## **METHODOLOGY EVALUATION**

The hidden profile problem (Stasser and Titus 1985) is a group task that enables the development of quantifiable measurements for both group process efficiency and effectiveness. “Hidden profile” refers to a selection problem where a group as a whole is given all the information to find a best alternative, but individual members of the group are given information favoring alternatives other than the best. Ideally, effective sharing and synthesis of information should lead members away from their initial biases toward the best alternative. In face-to-face meetings, research suggests selective discussion and weighting as major reasons for group failure to solve the hidden profile problem. Information that is shared by more people has a higher probability of being brought up for discussion than information that is only known by a minority of the group members (Gigone and Hastie 1993). Also, group members tend to bring up for discussion information that reinforces preferences that are held prior to the meeting, and suppress information that contradicts those preferences (Stasser and Stewart 1992).

Group support effectiveness and efficiency can be measured by the extent to which a group is enabled to share unique and partial information and solve the hidden profile problem. Groups that share most unique and partially shared information are expected to uncover the hidden profile in less time than groups that fail to share unique and partially shared information effectively.

To test the mixed group support methodology, a Web-based information sharing system was designed and used as the asynchronous GSS to support the first steps of the NGT, or the first Bales question, what are the facts?

## **LABORATORY EXPERIMENT**

### **Task**

The experimental task was an evaluation of three candidates for a group product manager position at a fictitious company. The task was an adaptation of a management game (Burst and Schlesinger 1987). Participants evaluated the candidates based on the job description for the group product manager position, the company’s hiring policy, and the evaluation comments about each candidate made by the president of the hiring division.

### **Laboratory Experiment Design**

The experiment was a  $2 \times 2$  factorial design crossing two levels of support environment with two levels of information distribution. The two levels of support environment were a mixed group support environment where groups used a Web-based asynchronous system to share information and discussed the facts in a face-to-face meeting and a face-to-face meeting environment for information sharing, discussing, and decision-making. Information distribution levels were same and partial-biased information distribution. In the same information distribution treatment, all three members of a group had the same full set of information. In the biased information distribution groups, information was distributed such that two of the group members had information favoring one candidate and the other had information favoring another candidate. The full set of information consisted of 33 comments made by the division president when he evaluated the three candidates based on their resumes, work histories, and personality reports. The two candidates favored by group members in this treatment were the two that were not the best, according to evaluations by human resources experts. Burst and Schlesinger provide expert evaluation scores of each candidate. The information distribution factor, therefore, created a hidden profile (Stasser and Titus 1985). The treatment cells were coded as follows: A = face-to-face and biased information distribution, B = face-to-face and same information for all group members, C = mixed support environment and biased information distribution, and D = mixed support environment and same information for all group members

## Subjects

The participants used for this research were 144 undergraduate students at a large, southwestern U.S. university. Twelve groups of three students were assigned to each of the four treatment cells resulting from the design described above. In other studies in this stream of research that have used students as experimental units, researchers offered incentives to encourage serious participation that would ensure meaningful research findings. To encourage meaningful participation, participants were awarded extra course credit for participating. In addition, there was a \$60.00 cash prize for the group producing the best ranking of the three candidates in each of the four treatment cells.

## Experimental Procedures

### *Mixed Support Treatment*

Participants were given an information package, which included a cover sheet, a case description, and evaluation sheets, a week before the meeting date. The cover sheet introduced the experimental task and provided a Web site and a unique password for the system. The password included one of the four treatment cells' information, but this information was not revealed to the participants. The information packages were randomly distributed to the students, thereby randomly allocating them to groups. Groupings were revealed on the day participants met to discuss the case. A demonstration was run to show participants how to use the system. Participants had a week to share information. On the meeting day, they were given reports showing the information they had gathered using the Web-based system and were assigned to decision rooms. In the decision rooms, they were seated so that they could not see each other's information sheets and were asked not to let their team members see their sheets. They were instructed to start discussing a ranking of three candidates based on the information in their reports. After discussion, they recorded the group's consensus ranking and the time it took them to reach that consensus. There were up to 50 minutes of discussion time, but groups could stop as soon as they agreed on a consensus ranking.

### *Face-to-Face Treatment*

The face-to-face groups were also given the case study a week before the scheduled meeting date. However, they were admonished not to share information during the preparation period, nor were they told who was in their groups. On the meeting day, the groups to which they would belong were revealed and they were seated so that they could not see each other's information sheets.

The groups followed the four steps of the NGT to decide how to rank the three candidates. First they silently listed each candidate's strengths and weaknesses (10 minutes were allocated for this first step). The second step was to share information. Participants took turns in a round robin manner to write on a flip chart visible to the whole group. Up to 20 minutes were allocated for this step. Participants were asked to add to their information sheets any information recorded on the flip chart that they did not have and thought was important in deciding whom to hire. The last two steps were to discuss and come to a consensus ranking of the three candidates. Discussion time to reach consensus was recorded, as was the agreed upon ranking of the three candidates.

### *Dependent Variables*

The dependent variables at the group level were discussion time taken by the group to reach a consensus on the ranking of the three candidates and quality of the group's decision (i.e., ranking of the candidates). Discussion time for face-to-face groups excluded the time taken to share information. Another dependent variable at the group level was the size of the group's information base, operationalized as the number of comments in the group's information space. For face-to-face meeting treatment groups, this was a physical count of facts (comments) listed on the group's flip chart; for Web-system groups, this was a count of facts in the group's database table. Group decision quality was operationalized by allocating points to each of the six possible ranking combinations of the three candidates as shown in Table 1.

**Table 1. Candidate Ranking Scoring Guide**

Candidate Rankings			
First	Second	Third	Points
Candidate 3	Candidate 1	Candidate 2	6
Candidate 3	Candidate 2	Candidate 1	5
Candidate 1	Candidate 3	Candidate 2	4
Candidate 1	Candidate 2	Candidate 3	3
Candidate 2	Candidate 3	Candidate 1	2
Candidate 2	Candidate 1	Candidate 3	1

**Experiment Hypotheses**

Mixed support treatment groups had more time to share and reflect on the shared information. In particular, time and use of a Web-based information sharing system were expected to enable groups in the biased information distribution treatment to overcome the information discrepancy among group members. Groups in the same information distribution treatment were considered control groups that were expected to easily assemble all 33 information pieces given to each group member. In terms of the size of group information pools after sharing, it was hypothesized that,

*Hypothesis 1: Groups assigned to the mixed support environment and biased information distribution will assemble the same number of facts as groups assigned to the same information treatment cells.*

$$1a \quad \begin{matrix} H_0 : \mu_C = \mu_B \\ H_a : \mu_C \neq \mu_B \end{matrix} \quad \text{and} \quad 1b \quad \begin{matrix} H_0 : \mu_C = \mu_D \\ H_a : \mu_C \neq \mu_D \end{matrix}$$

The Web-based group information system was expected to enable groups to share as much information as possible. It was, therefore, expected that the group assigned to the system would pool more information than groups that shared information in a face-to-face meeting environment. Therefore,

*Hypothesis 2: Groups in the mixed communication with biased information distribution cell will assemble more facts than counterpart groups in the face-to-face communication with biased information distribution cell.*

$$2: \quad \begin{matrix} H_0 : \mu_A = \mu_C \\ H_a : \mu_A \neq \mu_C \end{matrix}$$

Groups in the mixed communication treatment cells had more time to share and reflect on shared information. Unlike Dennis’ (1996) groups, which were able to share more information but not use it productively, groups in the biased information distribution cell were expected to share and assimilate most of the information. They were, therefore, expected to take less time to reach a consensus as well as uncover the hidden profile. Therefore,

*Hypothesis 3: Groups in the mixed support environment treatment cells will take less time to reach a consensus than groups in the face-to-face communication mode treatment cells.*

$$3a: \quad \begin{matrix} H_o : \mu_A = \mu_B \\ H_a : \mu_A \neq \mu_B \end{matrix} \quad 3b: \quad \begin{matrix} H_o : \mu_A = \mu_C \\ H_a : \mu_A \neq \mu_C \end{matrix} \quad 3c: \quad \begin{matrix} H_o : \mu_A = \mu_D \\ H_a : \mu_A \neq \mu_D \end{matrix}$$

To solve the hidden profile problem, groups need to share and effectively use the shared information (Dennis 1996). Groups in the same information distribution cells did not have a hidden profile problem; they were, therefore, expected to make high quality decisions. Since Web-based treatment groups were expected to share and assimilate more information, groups in the mixed support environment with biased information distribution treatment cell were expected to make decisions of as high a quality as the groups in the same information treatment cells. Also, the mixed support with biased information distribution treatment cell groups were expected to make decisions of a higher quality than groups in the face-to-face with biased information distribution treatment cell. Therefore, two hypotheses with respect to decision quality were postulated as

*Hypothesis 4: Groups assigned to the mixed support environment and biased information distribution treatment cell will make decisions of the same quality as groups assigned to the same information treatment cells.*

$$4a \quad \begin{matrix} H_0 : \mu_C = \mu_B \\ H_a : \mu_C \neq \mu_B \end{matrix} \quad 4b \quad \begin{matrix} H_0 : \mu_C = \mu_D \\ H_a : \mu_C \neq \mu_D \end{matrix}$$

and,

*Hypothesis 5: Groups in the mixed communication and biased information distribution treatment cell will make decisions of a higher quality than groups in the face-to-face communication with biased information distribution treatment cell.*

$$5 \quad \begin{matrix} H_0 : \mu_C = \mu_A \\ H_a : \mu_C > \mu_A \end{matrix}$$

## RESULTS AND ANALYSIS

Table 2 shows summary statistics and the F values for the cell means model  $Y_{ij} = \mu_i + \epsilon_{ij}$  where  $Y_{ij}$  is the value of dependent measure for group  $j$  in treatment cell  $i$ . The dependent measures or response variables were the number of facts, time to decision, and decision quality. The F statistics is the test of the hypothesis that all mean cells are equal. The null hypothesis is rejected for all three dependent measures. Information distribution and meeting environment affected the three response variables. The Tukey method was used to compare means and test the various hypotheses posed above. Table 3 shows 95% simultaneous confidence intervals for specified linear combinations, by the Tukey method, for number of facts pooled.

**Table 2. Means and Standard Deviations for Group Dependent Variables**

Measures	Cell A		Cell B		Cell C		Cell D		Cell mean equality	
	Means	Std Dev	Means	Std Dev	Means	Std Dev	Means	Std Dev	F	P-value
Number of Facts	28.00	1.65	30.25	2.30	31.83	0.72	32.58	0.67	21.94	0.000
Time to Decision	19.83	3.41	21.00	3.13	15.00	3.05	16.08	2.94	10.18	0.000
Decision Quality	3.92	1.56	5.17	0.83	5.33	0.77	5.42	0.90	5.19	0.037

**Notes**

- Cell A : Face-to-face meeting and biased information distribution
- Cell B: Face-to-face meeting and same information distribution
- Cell C: Mixed support and biased information distribution
- Cell D: Mixed support and same information distribution



**Table 3. 95% Simultaneous Confidence Intervals for Specified Linear Combinations, by the Tukey Method, for Number of Facts**

Interval	Estimate	Lower Bound	Upper Bound	
A - B	-2.25	-3.88	-0.62	***
A - C	-3.83	-5.47	-2.2	***
A - D	-4.58	-6.22	-2.95	***
B - C	-1.58	-3.22	0.05	
B - D	-2.33	-3.97	-0.7	***
C - D	-0.75	-2.38	0.88	

Intervals excluding 0 are flagged by ‘\*\*\*’

Hypothesis 1 was supported; there was no significant mean difference in the number of facts between groups in treatment cell C and groups in the same information treatment cells (B and D).

From the mean difference confidence interval shown in Table 3, the mean difference in number of group facts between groups in treatment cells A and C is significant at the 0.05 confidence level. Groups in the mixed support environment and biased information distribution cell pooled more facts than groups in the face-to-face meeting environment and biased information distribution cell. Hypothesis 2 was, therefore, supported.

From Table 4, the null hypothesis is accepted for hypothesis 3a and rejected for hypotheses 3b and 3c. Groups assigned to a similar support environment did not take significantly different times to reach a consensus; thus, information distribution did not seem to have an impact on time to decision.

**Table 4. 95% Simultaneous Confidence Intervals for Specified Linear Combinations, by the Tukey Method, for Time to Decision**

Interval	Estimate	Lower Bound	Upper Bound	
A - B	-1.17	-4.58	2.25	
A - C	4.83	1.42	8.25	***
A - D	3.75	0.33	7.17	***
B - C	6.0	2.38	9.42	***
B - D	4.92	1.5	8.33	***
C - D	-1.08	-4.5	2.33	

Intervals excluding 0 are flagged by ‘\*\*\*’

Table 5 shows that hypothesis 4 was supported. There was no significant decision quality difference between groups in treatment cell C and those in treatment cells B and D. Table 5 also shows that groups in treatment cell C made decisions that were of significantly higher quality than groups in treatment cell A. Hypothesis 5 was, therefore, supported.

**Table 5. 95% Simultaneous Confidence Intervals for Specified Linear Combinations, by the Tukey Method, for Decision Quality**

Interval	Estimate	Lower Bound	Upper Bound	
A - B	-1.25	-2.41	-0.07	***
A - C	-1.42	-2.58	0.25	***
A - D	-1.5	-2.66	-0.34	***
B - C	-1.67	-1.33	0.99	
B - D	-0.25	-1.41	0.91	
C - D	-0.08	-1.25	1.08	

Intervals excluding 0 are flagged by '\*\*\*'

## DISCUSSION.

The purpose of this research was to test a group support configuration methodology with the aim of finding an explanation for some of the inconsistent results of laboratory studies on group support systems. We postulate that supporting the whole decision making process with one type of decision support system may be the reason why there are no conclusive results attesting to the superiority of GDSS over the traditional face-to-face meeting. Since this research tries to explain the inconsistencies of a stream of research, its findings can only be consolidated and generalized by a stream of research of similar design.

The results of this research show that support given to a group affects how well the group answers the question, "What are the facts?" Groups that were given less than full sets of biased information and asked to share their information using an asynchronous GDSS pooled more information than groups that were assigned less than full sets of biased information and asked to share information in a face-to-face meeting environment. Both groups used an implementation of the NGT to share information. This result has been documented in other research studies, for example Dennis. However, the significant difference of information pools between groups assigned full-unbiased information sets and meeting in a face-to-face environment and groups assigned full-unbiased information sets and sharing information using an asynchronous GDSS has no obvious intuitive explanation. A possible reason is that face-to-face groups chose not to bring up for discussion some facts that they thought were not important and, since everybody had the same information, nobody noticed that the information was missing. In this research, we tested the efficiency of using an asynchronous GDSS for answering the "What are the facts?" question over a face-to-face meeting environment. A variation of the test would be to compare an asynchronous GDSS with a synchronous GDSS, or all three major options at the same time.

Time to decision and decision quality were surrogate measures of the group information sharing effectiveness. Time to decision measured group deliberation time, excluding time to share information. The difference between the meeting environment factor groups was that some groups deliberated on information that was shared over a long period and the other groups deliberated on information that was shared over a very short period preceding the deliberation phase. Both sets of groups did not, however, mix information sharing and discussion. Groups that shared information in a face-to-face meeting environment took longer to reach a consensus than groups that shared information using an asynchronous GDSS. This finding points to the significance of reflecting on shared information. Groups that shared information using an asynchronous GDSS had time to reflect on the shared information and had, therefore, a closer understanding of the facts than the other groups that had just shared the information. We had expected no time to decision difference among groups that were assigned to the full-unbiased information distribution treatment. The significant time to decision difference between groups that shared information in a face-to-face environment and groups that shared information using an asynchronous GDSS is another finding that has no obvious intuitive explanation. Both sets of groups did not gain new information from sharing and had the same information for the same length of time prior to the face-to-face discussion meeting.

Decision quality was a surrogate measure of the effectiveness of the group configuration methodology proposed in this research. Groups than were assigned less than full sets of biased information and using different support systems for different phases of the decision-making process made decisions of equal value to groups that were assigned full-unbiased information sets.

## CONCLUSIONS AND FUTURE RESEARCH

The findings of this research show that the separation of group task activities and using different methods and means to support them has a significant effect on group performance. Three basic ways of supporting group task activities include use of asynchronous GSS, use of synchronous GSS (decision room systems), and the traditional face-to-face meeting using pen and paper. The group decision-making process can, on the other hand, be broken into three distinctive activities: gathering the facts (group information sharing), organizing and evaluating the gathered information, and drawing conclusions from the examination of the facts (Bales 1950). Any one of the above mentioned methods could be used to support any of these activities. This research focused on the use of a Web-based system (hence, an asynchronous system) to support the gathering of facts and the traditional face-to-face meeting to support the evaluation of the gathered facts. Future research will be directed toward other support method/group task activity combinations. The value of this stream of research is that it enables organizations to decide which group tasks to assign to telecommuters, when to call for physical group meetings, and what kinds of information to discuss through e-mail and other on-line electronic forums.

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