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CONFLICT MANAGEMENT IN DIALECTICAL INQUIRY, DEVIL'S ADVOCACY AND CONSENSUS-BASED DECISION MAKING APPROACHES IN A GSS ENVIRONMENT

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Abstract

Previous research in Dialectical Inquiry (DI), Devil's Advocacy (DA) and Consensus (C) based approaches has primarily evaluated outcome variables such as the performance outcome quality, process and solution satisfaction and attraction to group. However, no prior study has looked at the process level variables such as the type and management strategies of conflict, nor the productivity of the conflict resulting from the use of these approaches. This study looks into the generation and management of conflict in DI, DA and C based approaches to decision making in a GSS environment. The primary objective is to find out if there is a superior decision making approach in the GSS environment, and the circumstances under which it will prevail.

We take a laboratory based experimental research approach that consists of 37 groups averaging 5 members each and compares the consensus-based (C) approach against dialectical inquiry (DI) and devil's advocacy (DA) approaches to decision making. The results suggest that DA and DI approaches are superior to the C approach in group decision making under GSS environment. However, a mixed result is established in the comparison of DA and DI approaches, in turn indicating the importance of carefully selecting the right approach for different stages of group decision process.

Keywords: GSS, Dialectical Inquiry, Devil's Advocacy, Consensus, Experiment, Decision Making, Conflict Management

1. Introduction

Past research has found that Group Support System (GSS), an interactive computer-based system to facilitate the solution of unstructured problems by a set of decision makers working together as a group (DeSanctis and Gallupe, 1987), increase the amount of conflict experienced by groups (Miranda and Bostrom, 1993). This is not necessarily bad as evidence has shown that effectively managed conflict can improve decision making in ill- structured and highly uncertain environments (Schwenk, 1989; Tung, 1992). Conflict generation approaches (inquiry methods), for example Devil's Advocacy (DA) and Dialectical Inquiry (DI), are often used to artificially generate conflicts in group decision making. Some benefits of these approaches include challenging and testing the underlying assumptions, thus leading to better solutions, as well as helping to avoid some negative effects of consensus-based decision making approach such as groupthink (Moorhead, 1982; Von Bergen and Kirk, 1978), uncertainty and prematurely smoothing over conflict (Broadwin and Bourgeois, 1984).

In spite of the benefits mentioned above, organizations using GSS have not been eager to adopt conflict-

based approaches for decision making. Lack of familiarity with the benefits and use of these approaches could be possible reasons for the low adoption. Another reason could be the lack of understanding of what goes on in the group process when conflict does occur. For instance, is one conflict-based approach superior to another at a particular stage of the group decision making? Are there differences between the conflict-based approaches in terms of the amount of conflict generated, the way that conflict is managed, and the productivity of the conflict? If so, under what circumstances is one approach superior to another? This paper will attempt to answer these questions, and in doing so, hope to offer organizations other effective alternatives to consensus-based decision approach for group meetings.

This study is also important because it adds to the ongoing stream of research by comparing the type of conflict and conflict resolution strategy used for the various decision approaches in the GSS environment. There have only been a few prior studies on DI and DA in a GSS environment (Lee, et al., 1995; Tung, 1992; Tung and Heminger, 1993). Furthermore, these studies mainly deal with outcome variables like satisfaction, performance and critical evaluation, and not with process variables.

Although there have been a few studies ((Miranda and Bostrom, 1993; Poole, et al., 1991; Quaddus, et al., 1997; Souza, 1993)) looking at process variables including an assessment of the types of conflict generated and conflict resolution strategies, these studies essentially investigated conflict that arose naturally from the group interactions, and not from the introduction of structured conflict into the group via DI and DA. This study, therefore, will be the first to look at the conflict that arises from the introduction of additional inquiry methods, DI and DA, into the process. Lastly, while previous studies (such as (Miranda and Bostrom, 1993; Poole, et al., 1991; Tung, 1992)) used only one task, our study uses two tasks in order to compare the effects of task differences on the process variables.

To sum up, this paper has three main objectives. First, it examines the differences in the type and level of conflict that is generated amongst the different decision approaches. Second, it compares the different decision approaches in terms of the conflict management strategies used. Third, it compares the different decision approaches in terms of the perceived conflict productivity.

Following this section, the background for this study is presented. The research model driving the empirical study, as well as specific research hypotheses are then presented. Next, the research methodology of the laboratory study is described, followed by the presentation of the results. Finally, we present the discussion of the empirical results as well as the conclusions and implications of the results for practice and further research.

2. Background

2.1 Dimensions of conflict

Prior research has indicated that the nature of group conflict affects the choice of conflict management style used. According to Deutsch (1969), there are two dimensions of conflict: issue-based and interpersonal.

Issue-based conflict, which focuses on task-related issues, is highly desirable as it brings out the differing views and issues of the task. It helps groups to better understand the task and hence develop better solutions. Interpersonal conflict tends to draw attention away from the task as it is usually targeted at persons within the group. This type of conflict can be detrimental to group functioning and hence undesirable (Cosier and Rose, 1977; Deutsch, 1969; Riecken, 1952; Torrance, 1957).

2.2 Conflict resolution strategies

The three common patterns of conflict resolution strategies identified by Sillars (1980) are avoidance, distributive and integrative strategies.

Avoidance is the failure to confront or attempt to resolve conflict (Hocker and Wilmot, 1985). Avoidance strategy minimizes explicit acknowledgement and communication about conflicts by suppressing and ignoring them. This strategy demonstrates low concern for the outcomes of either party and is used to avoid any possible negative reactions of other group members (Sillars, 1980).

Distributive strategy emphasizes the achievement of the outcomes of one party over those of the others (Rahim, 1990). It demonstrates a high concern for self and low concern for others. There is explicit acknowledgment and discussion of conflict that promotes individual over mutual outcomes by seeking concessions or expressing a negative evaluation of other group members.

Integrative strategy attempts to identify and achieve outcomes that are mutually satisfying to all parties. It promotes information exchange, neutral or positive effect, and mutual or bilateral goal orientation (Bisno, 1988). Integrative strategy encourages an examination of differences to reach an effective solution acceptable to members of the group. This strategy is used predominantly when the other group members are expected to be cooperative and the bases of conflict is viewed to be more controllable (Sillars, 1980).

2.3 Productivity of conflict

For conflict to be managed functionally, one style may be more appropriate than another depending on the situation. However, for conflicts to be productive, all group members have to be satisfied with the outcomes and feel that they have gained as a result of the conflict. Conversely, if all group members are dissatisfied with the outcomes and feel that they have lost as a result of the conflict, a dysfunctional conflict will result (Deutsch, 1969).

2.4 Inquiry methods

Devil's Advocacy (DA), Dialectical Inquiry (DI) and Consensus (C) represent three inquiry methods studied in this research. Among these approaches, DA and DI rely on the constructive use of conflict while C does not (Janis, 1972).

DA is based on developing a position in a given area of interest followed by generating criticisms of this set of recommendations and its assumptions (Schweiger, et al., 1986). Typically, a DA implementation might involve dividing a working group into two sub-groups. The first sub-group will develop assumptions and strategies to address a given problem. The other group, being the devil's advocate group, does not take part in this process. Instead, after the assumptions and strategies are developed, the devil's advocates will strive to find fault with them. After listening to the devil's advocates present their case, the first group will re-think its position in light of any perceived valid criticism, modifying its assumptions and recommendations as appropriate. This process proceeds interactively until each side finally agrees to accept the outcome.

DI uses debates based on diametrically opposed sets of recommendations and assumptions to surface important issues for the group's consideration (Bourgeois, 1980; Mason, 1969). A typical use of this technique might involve dividing a larger group into two sub-groups. One group will surface a set of working assumptions and a set of recommendations that follow from them. The second group will be assigned counter-assumptions and follow them through to a different set of recommendations. Then, an extended debate will be held by the two groups, with each side supporting its position. At the end of the debate, the entire group will be asked to reach an agreement on assumptions and strategies.

The consensus approach (C) focuses on creating a shared understanding of the problem and its preferred solution. Rather than dividing the larger group into adversarial sub-groups, everyone works together

through a common process to solve the group's problem. Emphasis is placed on shared understanding, with the GSS technology being used to make information available to all. Typically, process facilitation is employed to help the group to work smoothly together. This model is frequently implemented in reported GSS sessions (Nunamaker, et al., 1989).

Proponents of the DA approach argue that it should lead to less conflict than the DI approach as there will be less interpersonal conflict but more issue-based conflict. DA requires only one set of assumptions and recommendations, and those who developed the critiques may develop smaller emotional stakes in their views than those who develop alternate recommendations. Hence, DA may produce better group performance and satisfaction than DI (Schweiger, et al., 1986).

2.5 Prior studies of DI, DA and C in a GSS environment

As previously mentioned, prior studies of DI and DA in a GSS environment have focused on outcome variables rather than process variables. Outcome variables include validity and importance of assumptions, quality of recommendations, participants' assessment of their satisfaction of the process and outcome, quality of the meeting, depth of evaluation as well as members' attractiveness to the group.

For instance, in terms of the recommendations and assumptions, Tung (1992) found that both DI and DA groups made assumptions of higher validity than C groups, while Tung and Heminger (1993) found that the only difference amongst DI, DA and C is that DI groups made assumptions with higher validity than C groups. On the other hand, Lee et al. (1995) found no differences for the validity of the assumptions, although they found that DI and DA made higher quality recommendations than C. In all of the above cases, no significant differences were found between DI and DA.

In terms of perception of the sessions, the only difference that Tung (1992) found is that both DI and DA group members reported higher process satisfaction than C group members. Lee et al.(1995), on the other hand, found that C group members reported higher attraction to the group than the DI group members. Again, no significant differences were found between DI and DA.

Valacich and Schwenk's (1995a) laboratory experiment on the effects of DA and DI within face-to-face and computer-mediated groups gave results that suggest that groups given the DA treatment developed and considered more alternative solutions to a case problem and selected a higher quality recommendation than those in the DI and expert-based treatments.

The results of the above computer-mediated studies as well as studies in the manual environment indicate that while DI and DA are superior to C on the subjectively judged quality of assumptions and recommendations (Evan, 1965; Tung and Heminger, 1993), C groups exhibited greater acceptance of the group decision and greater satisfaction with the group process (Schweiger, et al., 1988; Tung and Heminger, 1993). Meanwhile, results regarding the comparative advantage of DI versus DA are mixed.

2.6 Task differences

Several studies indicated that the choice of task might mediate the differences found between the approaches. Herbert & Estes (1977) suggest that the DA approach to decision making should be applied in major strategic decisions in turbulent environments where the outcome criteria are subjective or value-laden. Murrell et.al. (1993) found that high conflict decision processes such as DA enhances decision making in disjunctive tasks; retard decision making in additive tasks but has no effect on decision making in conjunctive tasks.

In addition, task differences might have implications for the appropriate choice of conflict resolution strategy as well. Lawrence and Lorsch (1969) and Rahim (1989) state that when the issues of a task are complex, the integrative style is good for utilising the skills and information the different parties have in order to come up with solutions and successful implementations.

3. Research Model and Hypotheses

The research model tested in this study is shown in Figure 1.

3.1 Hypotheses Related To Conflict

3.1.1 Issue-Based Conflict

DI and DA are proposed to encourage issue-based conflict during the decision process for ill-structured decisions because of the inherent processes. DI allows interactive debate of two opposing sets of recommendations and assumptions, while DA requires a formal criticism of one set of recommendations and assumptions. Such interaction increases the evaluation of assumptions and alternatives (Lee, et al., 1995; Tung, 1992; Tung and Heminger, 1993). Therefore, the level of issue-based conflict is expected to be higher in DI and DA than in C as the task would be in greater focus.

On the other hand, research comparing the two conflict-based approaches DI and DA in terms of their superiority in focusing the group on the task at hand or the relative impact on task conflicts is mixed. This and the lack of direct research in this area led us to hypothesise that there is no difference between the two conflict-based approaches. Therefore, we hypothesise that:

H1: There is a difference in the level of issue-based conflict amongst the three approaches.

The following specific subhypotheses were tested:
For both tasks,

H1a: The level of issue-based conflict will be the same for DI and DA group participants
H1b: More issue-based conflict will surface in DI and DA group participants when compared to those in C groups.

3.1.2 Interpersonal Conflict

Interpersonal conflict that is directed at group members detracts attention from the task and can be dysfunctional for the group if it leads to group member frustration. The literature is mixed in terms of which conflict-based approaches raises interpersonal conflict higher than the other. Therefore, we hypothesise that there are no differences in terms of interpersonal conflicts between the two conflict-based approaches.

Due to the nature of the introduction of DI and DA processes, it is likely that DI and DA group members experience higher interpersonal conflict as compared to the C group members. At the same time, we have presented arguments in prior sections that suggest that the GSS environment increase interpersonal conflict for all three approaches through its anonymity feature. In view of the lack of direction of past researches on interpersonal conflict, we hypothesize that:

For both tasks,

H2: There are no differences in the level of interpersonal conflict amongst the three approaches.

3.2 Hypotheses Related To Conflict Management Strategies

3.2.1 Integrative Strategy Hypotheses

A greater level of discussion and exchange of information is expected in a decision group consisting of two opposing parties. The criticism of one set of recommendations and assumptions is always supported by another set of opinions. This encourages explicit discussion and resolution of conflict. Therefore, conflict-

based approaches like DI and DA will tend to encourage the use of the integrative strategy more than C approaches. On the other hand, between the two conflict-based approaches, it is unclear which is superior in terms of promoting integrative conflict management strategies. Therefore, we hypothesise that:

H3: There is a difference in the use of integrative strategy amongst the three approaches.

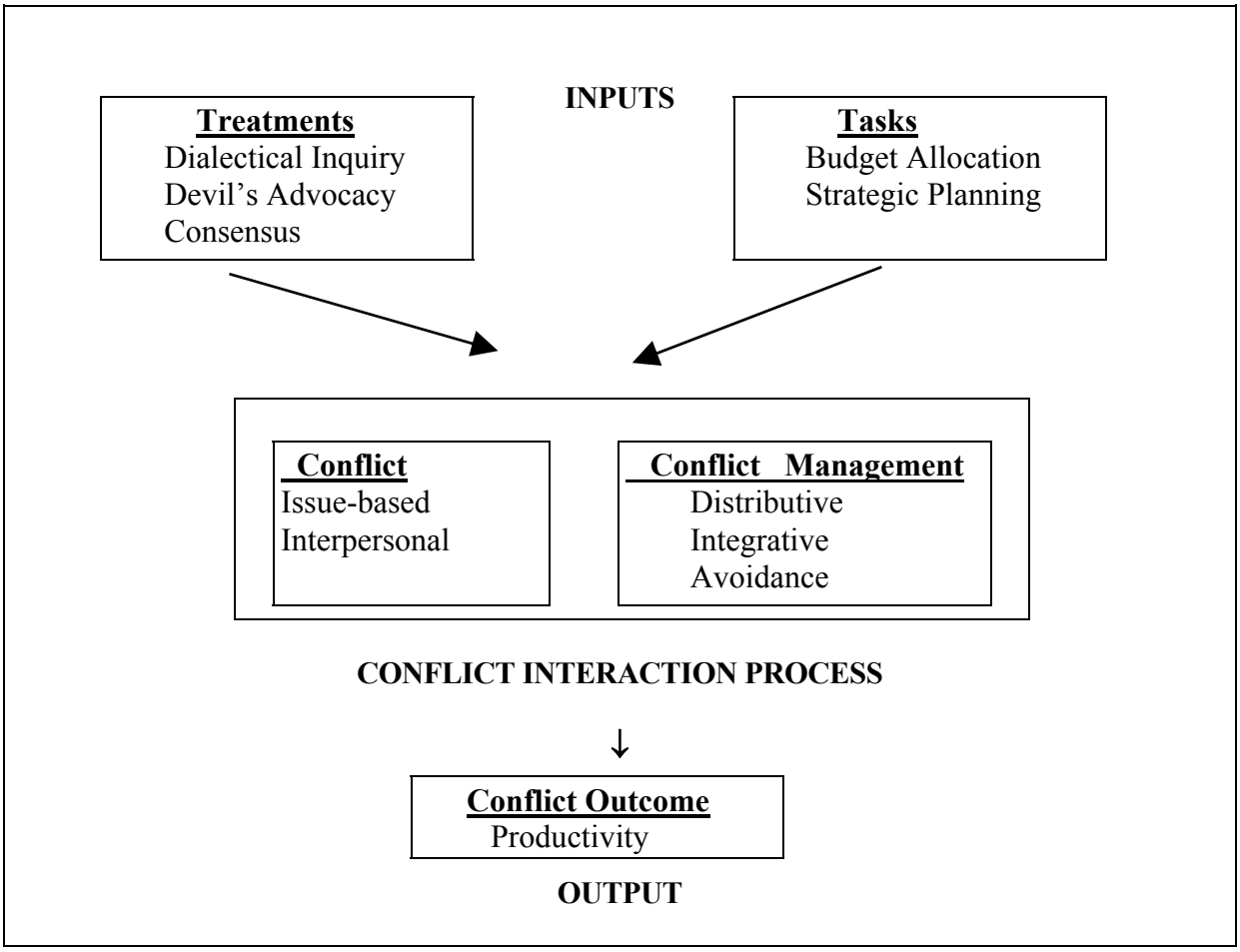

Figure 1: Research Model

The following specific sub-hypotheses were tested:

H3a: The use of integrative strategy will be the same for participants of DI and DA groups
H3b: More integrative strategy will be used by participants of DI and DA groups when compared to those of C groups.

3.2.2 Distributive Strategy Hypotheses

When the roles of one decision sub-group are simply to criticise the recommendations and assumptions of another sub-group, the tendency to express negative judgements over other members is greater. A greater degree of compromise is expected in reaching an outcome, as individuals prefer to minimise intensity of direct conflict. Therefore, we expect that greater distributive conflict will be used in DA and DI groups than in C groups. Therefore, we hypothesise that:

H4: There is a difference in the use of distributive strategy amongst the three approaches.

The following specific subhypotheses were tested:

For both tasks:

H4a: The use of distributive strategy will be the same for participants of DI and DA groups
H4b: More distributive strategy will be used by participants of DI and DA groups when compared to those of C groups.

3.2.3 Avoidance Behaviour Hypotheses

When members seek to arrive at an outcome that is acceptable to the entire group, there will be a greater tendency to compromise. The avoidance strategy allows for greater accommodation of different opinions and thereby reducing the level of conflict tremendously. Therefore, we expect that C groups will adopt greater avoidance strategy than DI and DA groups. Again, we are uncertain of the relative lead of DI versus DA with respect to this. We hypothesise that:

For both tasks,

H5: There is a difference in the use of avoidance strategy amongst the three approaches.

The following specific sub-hypotheses were tested:

H5a: The use of avoidance strategy will be the same for participants of DI and DA groups
H5b: Less avoidance strategy will be used by participants of DI and DA groups when compared to those of C groups.

3.3 Hypotheses Related To Productivity Of Conflict

The constructive influence of issue-based conflict on decision making is expected to increase the perception of conflict productivity in DI and DA groups. Therefore, we expect participants of the conflict-based approaches to perceive greater productivity of conflict as compared to the C participants.

Therefore, we hypothesise that:

H6: There is a difference in the perceived productivity of conflict amongst the three approaches.

The following specific sub-hypotheses were tested:

H6a: DI and DA participants will perceive the same level of productivity of conflict.
H6b: DI and DA participants will perceive higher perceived level of productivity when compared to those of C groups.

4. Research Method

All the three treatments (DI, DA and C) were conducted in a GSS environment, GroupSystems ™, and were held in the GSS laboratory.

All subjects went through a short training at the start of the experiments. The two GSS tools, the categoriser and the voting tool, were very easy to use, and the subjects were required to remember only a few function keys for the experiments. This reduces the need for extensive training and potential learning effects of the GSS tools (Tung, 1992). Finally, all sessions were randomly scheduled with regard to the time of the day. This reduces the potential time of the day effects (Tung, 1992).

The physical proximity of members, seating arrangements, lighting, heating, and other physical considerations were kept the same for all groups. Every treatment followed a script that set forth a

specific time limit for each activity. A facilitator who follows the agenda and time limits closely guided each session. His/her role is restricted to providing process support for the groups.

Table 1 summarises the relevant variables and their operationalization for this study. Following that, brief descriptions of the subjects as well as independent, task, and dependent variables are presented.

Table 1: Relevant Variables and Their Operationalisation.

VARIABLES	OPERATIONALISATION
Independent Variables	
Inquiry Methods	DI, DA and C
Controlled Variables	
Task Type	Strategic Planning, Budget Allocation
Task Complexity	Moderate
Group Size	Six-Member Group for DI & DA; four-member group for C
Individual Differences	Randomisation of Subjects to Groups and Groups to Treatment
Physical Environment	Same for All Groups
Time Taken	Enforced by Facilitator
Facilitator Factors	One Facilitator for Each Group
Dependent Variables	
Amount of Conflict	Post-Session Questionnaire
Conflict Management	Post-Session Questionnaire
Productivity of Conflict	Post-Session Questionnaire

4.1 Subjects

The subjects for this project comprise 172 first year students enrolled in an Information Technology course. It is an academic requirement for every student to submit a written assignment (10% of their IT grades) based on the experimental session he/she has attended. Subjects were randomly assigned to one of three treatments. Each DA and DI group consists of six members divided into two subgroups while each C group consists of four members undivided. In total, there were nine groups for the DA treatment, eight groups for the DI treatment, and twenty groups for the C treatment. As some subjects had to withdraw from both the DA and DI treatments in the last minute due to unforeseen circumstances, the average size of the groups for each of these two treatments is five members.

4.2 Independent Variables

Both the DI and DA approaches attempt to introduce conflict that are more task-focused, as well as objective rather than emotional (Valacich and Schwenk, 1995b).

4.2.1 Devil's Advocacy Approach (DA)

Under the DA approach, the subjects were divided into two subgroups – S1 and S2. S2, the devil's advocate subgroup, was asked to leave the GSS laboratory while S1 generates a set of assumptions and recommendations. The assumptions and recommendations were generated on two separate windows of the topic commenter tool of GroupSystems^{TM}. After S1 had done so, S2 returned to the laboratory to read the assumptions and recommendations generated by S1. They then criticised all that S1 had generated. Based on S2's criticism, S1 made modifications to their assumptions and recommendations until either S2 was satisfied or the allocated time was up. The final set of recommendations and

assumptions was put to a vote among the group as a whole using the ranking tool of the GSS. The results of their ranking would be displayed on the facilitator's common screen.

4.2.2 Dialectical Inquiry Approach (DI)

Under the DI approach, the subjects were randomly allocated into subgroups, S1 and S2. Both subgroups would each generate a set of assumptions and recommendations. They would however, generate assumptions that are directly opposite to each other. After both subgroups have completed this stage, all their recommendations and assumptions would be put through a debate. The purpose of the debate is to allow both subgroups to question the validity of each other's contributions. When the time allocated for the debate is up, the final combined set of recommendations and assumptions will be put to vote using the ranking tool of the GSS. As in DA, the results of their ranking would be displayed on the facilitator's common screen.

4.2.3 Consensus Approach (C)

Under the C approach, the subjects would discuss all probable assumptions and recommendations to the task problems as a group. The 'Topic Commentator' tool of the GSS was used to capture all assumptions and recommendations generated. Once the allocated time is up, the set of recommendations generated was put through a vote. No further discussions and revision of recommendations would be necessary if there was unanimous consensus on the vote; otherwise, the process would have to be performed repeatedly until a unanimous consensus is reached.

4.3 Tasks

There are several reasons for selecting `task' as an independent variable in this study, and for using more than one task. First, in using tasks of different decision types, any variations in the impact of inquiry methods can be examined. Second, GSS is used in a wide range of tasks. Therefore, it is useful to conduct this study with more than one task. Third, using tasks of different decision types also allows investigation as to the suitability of different inquiry methods for different task types.

Two types of decision-making tasks – Budget allocation and Strategic planning, based on factual information that have no right or wrong answer, are used. Both tasks are moderately high in complexity.

4.3.1 Budget Allocation

This case study developed by Watson (1987) requires the participating groups to allocate funds over a list of proposed projects. Each project requires a different level of funding, and the level of funding allocated will determine its success. Members are to allocate funds based on their personal values. It is a preference task that requires the selection of an alternative for which there is no objective criteria of correctness (DeSanctis and Gallupe, 1987).

4.3.2 Strategic Planning

This case study, developed by Whetten and Cameron (1984), requires the participating groups to design strategies to overcome a multitude of problems faced by a college. This task draws upon the creativity of the group members to generate novel ideas (DeSanctis and Gallupe, 1987).

4.4 Dependent Variables

In our study, the dependent variables comprise the amount of conflict (issue-based and interpersonal), conflict management strategies (integrative, distributive, and avoidance), and productivity of conflict.

After every session, subjects were required to fill in post-session questionnaires. To assess subjects' perceptions of the above process variables, three existing self-report instruments were used. These instruments were used in this study because they were used by Miranda and Bostrom (1993) in their research on group conflict in Group Communication Systems (GCS), and had been developed and tested for reliability by them. Furthermore, many researchers (Jarvenpaa, 1988; Jessup and Valacich, 1993; Straub and Carlson, 1989) strongly encourage the use of existing instruments in any Information Systems research. The items in all three instruments had a 7 point Likert-typed scale that the subjects used to record their perceptions.

5. Results

This section presents the results collected from the post-session questionnaires. The unit of analysis for the conflict variables measures is the individual subject (n=172 for each task). See table 2 for details. The main statistical methodology used to analyze the results of this study is the univariate F-test or analysis of variance (ANOVA). However, for those dependent variables that display a significance, a two-tailed independent samples t-test is used to compare the significant differences between the two treatment groups at the 95% confidence level.

Table 2: Subjects and Groups

	DI	DA	C	Total
No. of subjects	* 45	* 47	80	172
No. of groups	8	9	20	37
No. of subjects per group	6	6	4	-
No. of task performed	2	2	2	-

* some subjects withdrawn at the last minutes or else it would be 48 and 54 respectively.

For all the results sections following this, table 3 presents the means and standard deviations under the three treatments while table 4 presents the F test scores and the significance level of the F-test scores across all conditions (DI, DA and C). The independent t-tests for all the results are shown in table 5.

Table 3: Means and Standard Deviations

		Task 1		Task 2	
		Mean	**S.D.**	**Mean**	**S.D.**
Issue-based conflict	DI	32.76	5.19	32.84	8.43
	DA	36.89	6.35	36.70	6.57
	C	32.85	4.80	31.38	7.02
Interpersonal conflict	DI	11.27	4.95	11.22	4.36
	DA	11.81	4.47	11.43	4.61
	C	11.50	4.36	11.68	4.92
Integrative Strategy	DI	17.93	3.90	18.24	3.48
	DA	18.51	2.99	18.68	3.53
	C	17.23	2.78	16.68	4.07
Distributive Strategy	DI	15.71	3.81	14.80	3.14
	DA	16.13	3.14	15.66	3.64
	C	15.30	3.11	12.62	3.94
Avoidance Strategy	DI	15.13	4.80	14.89	4.54
	DA	15.72	3.95	14.45	3.54
	C	17.50	3.78	17.75	4.38
Productivity of Conflict	DI	39.13	5.98	40.81	6.03
	DA	42.16	5.73	42.89	5.84
	C	39.58	6.86	37.85	8.93

Table 4: Summary of ANOVAs

		Approaches	Task	Approach x Task Interaction
Issue-based conflict	**F Value**	13.532	0.427	0.342
	F Prob.	**0.000**	0.514	0.711
Interpersonal conflict	**F Value**	0.216	0.091	0.121
	F Prob.	0.806	0.763	0.887
Integrative Strategy	**F Value**	4.976	0.003	0.367
	F Prob.	**0.008**	0.958	0.693
Distributive Strategy	**F Value**	6.826	9.934	9.934
	F Prob.	**0.001**	**0.001**	**0.002**
Avoidance Strategy	**F Value**	10.548	0.672	0.763
	F Prob.	**0.000**	0.413	0.467
Productivity of Conflict	**F Value**	7.476	0.080	
	F Prob.	**0.001**	0.778	

Table 5: Comparison of Means for DI versus DA, DI versus C, DA versus C.

	Test of Hypotheses	T-test value	Significance of t	Hypothesis (p<0.05, two tailed)
Issue-based Conflict	**DI = DA**	- 4.040	**0.000**	REJECT
	DI > C	0.690	0.491	REJECT
	DA > C	4.960	**0.000**	SUPPORT
Interpersonal Conflict	**DA = DI**	0.560	0.577	SUPPORT
	DA = C	-0.050	0.960	SUPPORT
	DI = C	-0.570	0.567	SUPPORT
Integrative Strategy	**DI = DA**	-0.990	0.324	SUPPORT
	DI > C	2.080	**0.039**	SUPPORT
	DA > C	3.210	**0.002**	SUPPORT
Distributive Strategy	**DI=DA**	-1.260	0.211	SUPPORT
	DA > C	3.530	**0.001**	SUPPORT
	DI > C	2.310	**0.022**	SUPPORT
Avoidance Strategy	**DI = DA**	-0.120	0.906	SUPPORT
	C > DI	3.910	**0.000**	SUPPORT
	C > DA	4.230	**0.000**	SUPPORT
Productivity of Conflict	**DI = DA**	2.940	**0.004**	REJECT
	DA > C	3.540	**0.001**	SUPPORT
	DI > C	1.160	0.249	REJECT

5.1 Results Related To Conflict

5.1.1 Issue-Based Conflict

The F-test scores for issue-based conflict as shown in table 4 indicate that there are significant differences in the level of issue-based conflict in terms of approach measure while those for task measure are insignificant. The interaction between approach and task is also insignificant. This means that hypothesis 1 is accepted.

The independent t-tests as shown in table 5 indicate that at p = 0.05 confidence level, there is sufficient evidence that more issue-based conflict will be expected in DA groups than in DI groups. This result is significant but does not support our hypothesis. There are no significant differences in terms of the level of issue-based conflict profile between DI and C groups. Between DA and C groups, the independent t-tests show that more issue-based conflicts are present in DA than in C groups. Hence, we conclude that hypothesis 1b is partially accepted for DA>C and H1a is rejected.

5.1.2 Interpersonal Conflict

From table 4, the F-test scores indicate that there are no significant differences in the level of interpersonal conflict profile either in terms of approach measure or task measure. Thus, hypothesis 2, the hypothesis of no difference amongst the three approaches is supported. The interaction between approach and task measure in this case is also insignificant.

The independent t-tests in table 5 indicate that there are no significant differences on the level of interpersonal conflict profile for both approach and task measures.

5.2 Results Related To Conflict Management Strategies

5.2.1 Integrative Strategy

The F-test scores for integrative strategy in table 4 indicate that there are significant differences in the tendencies toward using integrative conflict management strategy for approach measure whereas there are no significant differences in the tendencies toward using integrative conflict management strategies for task measures. Thus, hypothesis 3 is accepted.

The independent t-tests in table 5 shows that among groups using different approaches to group decision making in a GSS environment, there are higher tendencies toward using integrative strategies in the DI and DA groups than in C groups. However, DI and DA groups tend to use the same amount of integrative strategies. Hence, both **H3a** and **H3b** are supported

5.2.2 Distributive Strategy

According to table 4, the F-test scores indicate that there are significant differences in the tendencies toward using distributive conflict management strategies for approach and task measures. Hypothesis 4 is therefore accepted.

The independent t-tests in table 5 consistently support both **H4a** and **H4b** at p = 0.05 level. Hence, there is sufficient evidence at p = 0.05 confidence level to conclude that more distributive strategies will be used in DA and DI groups than C groups. In addition, the use of distributive strategies is the same in DA and DI groups.

5.2.3 Avoidance Strategy

The F-test scores from table 4 indicate that there are significant differences in the tendencies toward using different avoidance conflict management strategies for approach measure whereas there are no significant differences in the tendencies toward using avoidance conflict management strategies for task measures. This denotes that hypothesis 5 is accepted.

The independent t-tests in table 5 indicate that more avoidance behavior will be demonstrated in C groups than in DA or DI groups. For DA and DI groups the use of avoidance strategy is the same. Hence, **H5a** and **H5b** are supported.

5.3 Results Related To Productivity Of Conflict

In this study, there is only one main hypothesis and two sub-hypotheses that are related to the productivity of conflict. The only measure of productivity variables is therefore the productivity of conflict.

For productivity of conflict, the F-test scores in table 4 indicate that there are significant differences in the perceptions of the productivity of conflict for approach measure while there are no significant differences in the perceptions of the productivity of conflict for task measure. Hypothesis 6 is therefore accepted.

The independent t-tests shown in table 5 indicate that there is sufficient evidence at p= 0.05 confidence level that higher conflict productivity will be perceived in DA groups than in DI and C groups. There is however insufficient evidence to support the claim that higher conflict productivity will be perceived in DI groups than in C groups. Hence, we reject H6a and partially support H6b.

6. Discussion of Results

Before discussing the results we present the limitations of this study. First limitation lies with the difference in the group size for the consensus treatment. Both DA and DI groups consist of 6 persons per group whereas the C groups consist of 4 persons per group. However, it does not pose a major problem as the unit of analysis has been used as the individual and comparison is based on the mean. The facilitators for the consensus group treatment are also different. However, they followed structured script which minimizes this effect. Other than group size and facilitator effects, all other aspects of experiment are controlled except for the treatment effect.

As with all experimental study, the increased control of this study was made at the expense of generalizability. The use of student subjects, the choice of the tasks, and the operationalization of the treatments, all place limits to the study's generalizability.

6.1 Group Conflict

The results from this study show that there are significant differences between the three decision-making approaches in terms of issue-based conflict; however there are no significant differences in terms of interpersonal conflict observed between the three approaches.

DA groups have a higher issue-based conflict profile than DI groups. One possible explanation (as observed during the group work) is that the one-way critique of the recommendations and assumptions allows for more focused and intense scrutiny of the task problem. As such, many task-related issues are uncovered during the decision process.

The results also show that there is no significant difference between DI and C groups in terms of issue-based conflict. One possible reason is that the effect of anonymity may encourage individuals in a C group to be more active in contributing their ideas and criticisms. There is less pressure on C group members to agree with one another so as to reach a solution. As a result, the amount of task-related conflict generated is as much as in a DI group.

As hypothesised, DA groups are found to have higher issue-based conflict than C groups. The introductions of structured conflicts into the DA groups create the setting for more formal criticism of recommendations and assumptions. Such a formal setting is not present in C groups where most conflicts are natural.

One possible reason for the lack of significant differences between the three approaches in terms of interpersonal conflict is the effect of anonymity in the GSS environment. Another explanation may be that Asian Singaporeans are more reserved in public and are less willing to be outright in their criticism even in

the GSS environment. The culture and upbringing in a task-oriented society may be an important factor to consider in this study.

6.2 Conflict Management Strategies

The results from this study show that there are significant differences between the three decision making approaches in terms of the conflict management strategies used.

DI and DA groups have greater tendencies to use the integrative strategies as compared to C groups. This finding is consistent with the expected results of our hypotheses. The introduction of structured conflict into the decision process has created the environment for more formal and explicit discussion and resolution of conflict. Such an open environment may not be available under a natural conflict situation (C groups). Results indicate that both DI and DA groups have greater tendencies to adopt the distributive strategies than C groups. This is consistent with our hypothesised expectations that higher levels of conflict experienced in the DI and DA groups will cause individuals to compromise so as to minimise the intensity of direct disagreement.

Results of the study show that C groups have greater tendencies to adopt avoidance strategy than in DI or DA groups. In a natural conflict environment, members tend to avoid every possible disagreement so as to reach a solution welcomed by everybody. As such, the degree of information exchange is minimal and the task receives little scrutiny. One possible reason for this behaviour is the natural propensity of human beings to avoid opposition wherever possible.

6.3 Productivity of Conflict

The results from this study show that there are significant differences between the three decision making approaches in terms of the productivity of conflict.

The perceived conflict productivity in DA groups is greater than in C groups, as in the case of issue-based conflict where DA groups showed greater conflict than C. A possible reason is that the more extensive discussion and conflict resolution process in DA groups allows for better scrutiny of the tasks. As a result, members appreciate the conflict generated in DA environment more than in the C environment in decision making. The consideration here is qualitative, rather than quantitative.

There is no significant difference between DI and C groups in terms of conflict productivity, which is also in line with having insignificant issue-based conflict of DI groups over C groups.

6.4 Task Difference

In this study, with the exception of results pertaining to distributive strategy (see table 4 - task and task interaction effects), there were no significant differences between the three decision making approaches across the two tasks in terms of the group conflict variables discussed above. This observation implies that, with one exception, task type did not matter in the study despite some observations in the literature.

7. Conclusions and Implications for Future

The results in this study show that there are significant differences between DA, DI and C approaches in terms of the conflict management strategies. Even though integrative and distributive approaches involve open discussion of task problems, the tendency to reach a decision through a compromise is higher in distributive approach. This suggests that practitioners may have to carefully select the type of decision making approaches to adopt according to the nature of the task.

For researchers, the results of this study have provided evidence of the superiority of the DI and DA over C approaches in the GSS environment in terms of conflict management strategy and productivity of conflict. Future research that can add value to this stream of research include more in depth studies on understanding and matching the decision approaches to the stages of the decision making process. In addition, field studies of organizations deploying conflict-based GSS approaches will provide a richer environment for the study of conflict-based decision processes.

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