

## **Can GSS Groups Make Better Decisions and Feel Good at the Same Time? A Longitudinal Study of Asynchronous GSS Groups**

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### **Abstract**

A comprehensive review of GSS research literature indicates that in over 200 different GSS research experiments done in the last decade, GSS generally increases group decision quality or effectiveness. However, 90% of the experiments report that GSS does not increase and frequently even decreases group satisfaction. This can lead to the rejection of adoption and/or use of GSS in organizations, and has understandably become a main concern in GSS research literature. The current research explores this important issue. With a theoretical framework specifically aiming to support group development and team building, it is hypothesized that GSS embedded within such a framework may help groups make better decisions and at the same time, feel good. A longitudinal study was conducted using a second generation GSS. The suggested results reported that GSS embedded within this framework generally enhance decision quality and increase group satisfaction at the same time.

### **1. Introduction**

Over the last decade, nearly 200 research experiments were conducted in the Group Support Systems (GSS) field (Fjermestad and Hiltz 1999). Some prior studies reported that GSS can increase group work performance in terms of decision quality or effectiveness, number of creative ideas generated, and equality of group participation (e.g., Gallupe, DeSanctis and Dickson 1988; Huang and Wei 1997; Jarvenpaa 1988; Nunamaker et al. 1991); however, some other

studies reported that GSS cannot increase and sometimes even decreases group satisfaction in terms of group decision satisfaction and group decision process satisfaction (e.g., Gallupe and McKeen 1990; George et al. 1990; Huang, Wei and Tan 1999). These inconsistent research findings on GSS have resulted in the principal concerns discussed in meta-analyses of prior GSS studies (e.g., Benbasat and Lim 1993; Dennis, Haley and Vandenberg 1996) and in a comprehensive assessment of GSS research literature (Fjermestad and Hiltz 1999). In fact, 90% of the 200 GSS experiments have reported the failure of GSS at increasing and sometimes even decreasing group satisfaction. Unsatisfactory results mean that organizations are less likely to adopt and use the GSS technology. Hence, the question – “how can group satisfaction with GSS be improved?” – has become an important research issue in GSS research literature (Fjermestad and Hiltz 1999, p.59). As yet it has no satisfactory answer.

Recently the term “electronic commerce” has become a new buzzword in both academic and industrial fields, more and more business organizations are going regional and global. Asynchronous (or virtual) group work and meetings are mainly supported by information technology such as an asynchronous GSS. Because of its advantages, organizations still choose GSS to save on travel costs, for its convenience and other related costs, despite the inconsistent research findings that exist in GSS research literature (Fjermestad and Hiltz 1999). Further, GSS software itself is evolving. Now, second generation GSS software, i.e., an Internet based GSS system, has

appeared on the market and is gradually being more broadly adopted (Dennis, Pootheri and Natarajan 1997). As a result, more research needs to be done to study how second generation GSS can be used to enhance group work and performance in an asynchronous group setting (Fjermestad and Hiltz 1999). An asynchronous group is a group with at least one group member who is geographically located at a distance from other group members (Kinney and Panko 1996).

Moreover, the majority of prior GSS studies were conducted in a single short meeting with groups that had neither a history nor a future (e.g., Chidambaram 1996; Nunamaker et al. 1997). Group behaviors and performance may differ when observe in a single short group meeting session compared to many consecutive group meeting sessions (e.g., Burke and Chidambaram 1995; Chidambaram 1996; McGrath and Hollingshead 1994; Walther 1995). Therefore, more longitudinal studies should be conducted in the GSS field.

In summary, current research examines whether a GSS can be used to enhance both group decision quality and group satisfaction simultaneously in asynchronous groups, using second generation GSS systems.

The following section briefly reviews relevant research literature and presents a conceptual research model. Section 3 formulates research hypotheses and discusses research methodology. Section 4 reports research results, and the research findings and implications are discussed in Section 5.

## 2. Literature Review on Relevant Prior Research

Previous meta-analyses and comprehensive reviews of GSS literature show that GSS use generally results in decreased group satisfaction (Benbasat and Lim 1993; Fjermestad and Hiltz 1999; McLeod 1992). However, relatively little research has been conducted to specifically explore why GSS use does not improve group satisfaction. Two notable exceptions are the studies of Dennis, Haley and Vandenberg (1996), and Huang, Wei, and Tan (1999).

Dennis, Haley and Vandenberg (1996) tried to explore this important issue in their meta-analysis of GSS research findings. They differentiated prior GSS research results in terms of small and large group sizes: a group consisting less than five is considered a small group whereas one with greater than five members is defined as a large group. Their research findings support the moderating effect of group size: although GSS use decreases group satisfaction for small groups, it actually increases group satisfaction in large groups.

Huang, Wei and Tan (1999) report a GSS use offset effect on group interaction processes. In their study, they video-tape all group meeting processes and use a coding scheme to measure group process variables.

They found that GSS use can result in positive group interaction processes, which in turn can increase group satisfaction. However, such an increase in group satisfaction can be simultaneously offset by some possible negative effects of GSS use on group interaction processes. As a result, the overall effects of GSS use on group satisfaction can also be insignificant or even sometimes negative.

This GSS use offset effect on group interaction processes is actually in line with the GSS theoretical framework of "process gain and loss" (e.g., Nunamaker et al. 1991) – group process gains resulting from GSS structures such as anonymity and parallelism can be offset by group process losses from GSS use such as slower typing input of GSS (Dennis, Haley and Vandenberg 1996) and restriction of media richness (Daft and Lengel 1986). As a result of this offset effect, it is likely that for small groups, the positive effects of GSS use on group satisfaction are generally offset by its negative effects. Whereas for large groups, the positive effects of GSS use are stronger than the negative ones, so that the overall effect is still positive, as reported by Dennis, Haley and Vandenberg (1996). Therefore, in order to simultaneously address both the issues of how to both improve group decision processes and increase group satisfaction, it is important to enhance the possible positive GSS effects on group satisfaction, so that the positive effects will out weight the negative effects that always exist and that result from group process losses in group interaction processes (Nunamaker et al. 1991).

One possible way to enhance positive GSS effects on group satisfaction is to using GSS to enhance team<sup>1</sup> building in group development. The Time, Interaction, and Performance (TIP) theory indicates that any group simultaneously engages in three group functions: production (akin to what is often referred to as problem-solving or task-performance phases), member support (reflecting relations between individual members and the group), and group well-being (reflecting relations among group members), which influence group processes and outcomes (e.g., McGrath 1990; 1991). The two functions of group well-being and member support are directly related to group satisfaction, i.e., groups with enhanced functions of group well-being and member support are more likely to feel satisfaction with group processes and outcomes. Further, team building largely involves issues of group goals, member roles, and interpersonal relationships (Borgatta and Borgatta 1992), which overlap with the group functions of member support and group well-being (e.g., McGrath 1991).

Based on the Dialogue theory (e.g., Bohm 1990; Isaacs 1993; Schein 1993) and a review of GSS literature, Huang et al. (1998) propose a theoretical framework, as shown in Figure 1. It aims to support

team building, which involves the following steps (for more detailed discussion of the framework please refer to Huang et al. (1998)):

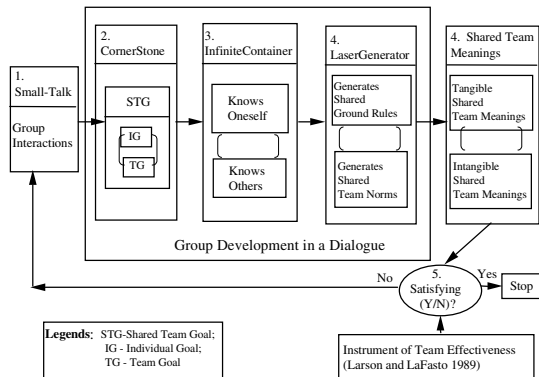


Figure 1 A Conceptual Framework for Enhancing Group Development

- (1) **Small-Talk component.** Team members introduce themselves in terms of their name, sex, individual background information. They may even engage in joke sharing (Jarvenpaa and Knoll 1996).
- (2) **CornerStone component.** Group members have a GSS dialogue to define and generate shared group goals.
- (3) **InfiniteContainer component.** The core of this component of the theoretical framework is a dialogue session guided by the MIT dialogue procedure (Schein 1993):  
*Firstly*, group members are asked to think of their past team working experiences in terms of good team communications. *Secondly*, members disclose and share their past team working experiences; identify related characteristics of their experiences in terms of good team communication protocols and team roles (Turoff et al. 1993). *Thirdly*, given the shared group goals, members exchange and clarify their thoughts towards the above-identified characteristics of good team communications. *Fourthly*, members are not allowed to criticize others' ideas and justifications to meet the requirement of the container and suspension of a dialogue. *Fifthly*, the dialogue is closed when no further exchange or clarification from team members is required. As can be seen, this dialogue procedure also enhances the two group functions of member support and group well-being (McGrath 1991).
- (4) **LaserGenerator component.** The outcomes of a dialogue, described as a laser by Bohm (1990), can be produced. More specifically, *given shared team goals*, team members rank the characteristics of good team communications in a round of pooled coordination activity (Turoff et al. 1993). In other words, team members are asked to determine (by

ranking) what characteristics of team communications are most important to the attainment of the shared team goals. This can result in specific team interaction rules shared by all members, which will guide the team's future communications, interactions, and activities.

- (5) The dialogue outcomes can be measured using the instrument of Larson and LaFasto (1989) to check whether or not a team achieves a satisfactory level of team building. If not, the team can repeat the dialogue procedure until a satisfactory level is achieved.

Therefore, the central research issue for this study is whether after the theoretical framework supporting team building is embedded into an Internet-based GSS system, can GSS be expected to enhance both group decision quality and satisfaction simultaneously? Hypotheses based on this research issue are formulated and discussed in the next section.

### 3. Research Hypotheses and Methodology

#### 3.1 Research Hypotheses

This longitudinal research studies whether a GSS embedded within a team building framework can simultaneously enhance both group decision quality and satisfaction. The independent variable is varied with the presence or absence of the framework embedded into a GSS. Dependent variables include group decision quality (Gouran, Brown and Henry 1978), group decision satisfaction and group decision process satisfaction (Green and Taber 1980), group cohesion (Seashore 1954), group conflict management (Chidambaram, Bostrom and Wynne 1991), and group maturity (Kramer and Fiechtner 1984).

*At the initial session of a group meeting*

A GSS embedded within the team building framework allows group members to specifically discuss issues involved in the group functions of member support and group well-being, such as individual and group goals, member roles, group interpersonal relationships, and preferences and values. This leads to the generation of shared group communication norms and ground-rules (see the Figure 1), which establish guidelines for future group interactions. As a result, group members are likely to feel closer to each other because of the shared ground-rules that are generated and accepted by all group members. Groups would also be more mature. However, reports from prior longitudinal research conclude that GSS not embedded within a team building framework initially decrease group relational links such as group cohesion (e.g., Chidambaram, Bostrom and Wynne 1991; Chidambaram 1996;

Walther 1995). Hence, we have the following hypotheses:

H1 At the initial session of a group meeting, group cohesion will be higher in GSS groups that are embedded within a team building framework than in groups without the embedded framework.

H2 At the initial session of a group meeting, group maturity will be higher in GSS groups that are embedded within a team building framework than in groups without the embedded framework.

Further, the enhanced group functions of member support and group well-being will result when the GSS is embedded within the framework. This can facilitate the group task of conflict resolution (i.e., resolving political or non-task conflicts) (McGrath 1991; Hollingshead, McGrath and O'Connor 1993). Consequently, group conflict management may be enhanced.

H3 At the initial session of a group meeting, group conflict will be better managed in GSS groups that are embedded within a team building framework than in groups without the embedded framework.

As discussed above, a GSS embedded within the framework increases group cohesion, conflict management and group maturity in group interaction processes (H1, H2, and H3 formulated). As a result, group members are likely to feel more satisfied with the group decisions that are reached because of the more cohesive and mature group decision processes. Further, while a GSS without the embedded framework can also enhance group decision quality (e.g., Dennis, Haley and Vandenberg 1996; Fjermestad and Hiltz 1999), however, with the support of the framework to enhance group functions of member support and group well-being, a GSS with the embedded framework may further increase group decision quality. Hence, we posit that:

H4 At the initial session of a group meeting, group decision quality will be higher in GSS groups with the embedded framework than in groups without the embedded framework.

H5 At the initial session of a group meeting, group decision satisfaction will be higher in GSS groups with the embedded framework than in groups without the embedded framework.

H6 At the initial session of a group meeting, group decision process satisfaction will be higher in GSS groups with the embedded framework than in groups without the embedded framework.

*At the later session of group meetings*

Some research studies report that as time goes on, GSS (without the embedded framework) gradually supports and increases group relational development (e.g., Chidabaram 1996; Walther 1995), which is likely to bridge the gap that initially existed between GSS

groups with the support of the framework and those without the framework. Hence, we posit that:

H7 At later sessions of group meetings, differences that initially existed in group cohesion are more likely to disappear for GSS groups with the embedded framework than for groups without the embedded framework.

H8 At later sessions of group meetings, differences that initially existed in group maturity are more likely to disappear for GSS groups with the embedded framework than for groups without the embedded framework.

H9 At later sessions of group meetings, differences that initially existed in group conflict management are more likely to disappear for GSS groups with the embedded framework than for groups without the embedded framework.

After the differences that initially existed in group relational variables gradually disappear, differences that initially existed in group outcome variables such as decision quality and satisfaction are also expected to disappear. Therefore, we hypothesize that:

H10 At later sessions of group meetings, differences that initially existed in group decision quality are more likely to disappear for GSS groups with the embedded framework than for groups without the embedded framework.

H11 At later sessions of group meetings, difference that initially existed in group decision satisfaction are more likely to disappear for GSS groups with the embedded framework than for groups without the embedded framework.

H12 At later sessions of group meetings, difference that initially existed in group decision process satisfaction are more likely to disappear for GSS groups with the embedded framework than for groups without the embedded framework.

### 3.1 Research Methodology

This research adopts a 1x2 factorial design. The independent variable is varied by the presence and the absence of the theoretical framework as shown in Figure 1. Dependent variables are adopted from existing measurement instruments. Group cohesion refers to the attraction of a group and the closeness that members feel to each other (Seashore 1954). Conflict management refers to how effectively group conflicts are managed during group interaction processes by a group (Chidabaram, Bostrom and Wynne 1991). Group maturity refers to the level of maturity of group development (Kraymer and Fiechtner 1984). Decision quality refers to group members' perceptions of the quality of the group's final decision (Gouran et al. 1978). Decision satisfaction and decision process satisfaction measure the contentment of a group with its

decisions and its decision making process respectively (Green and Taber 1980).

All groups were supported with a web-based GSS system, TCBWorks (Dennis, Poothari and Natarajan 1997). Subjects in this study were 100 master degree students majoring in general management in a large university, who were taking an information systems course. They were given course credit for participating in this experiment. Group members were instructed not to discuss the experimental tasks using any other communication channels except the GSS system provided. Otherwise, their marks would be decreased by up to 50%. There were 10 groups in each condition (treatment). About half of the subjects were female and the other half was male. The group size was five. Subjects were randomly assigned to the two experimental conditions. The whole experiment lasted for five weeks and all groups went through the following similar experimental procedure:

In the first week, members of GSS groups with the embedded framework were asked to generate shared group communication ground-rules following the framework shown in Figure 1. Members of GSS groups without the embedded framework were asked to perform a filler task. The purpose of this filler task was to equate the time spent for each type of team (Hinsz 1995). Hence, the members of both types of teams, those with and without the framework, spent the same amount of time interacting, cohering, and collaborating with each other. At the end of the week, a questionnaire consisting of two constructs on group cohesion and group maturity was given to groups to fill in.

In Week 2, all groups performed an idea generation task: the library problem adapted from Fellers (1989), which asked groups to generate as many creative ideas as possible to solve the problem of books being mutilated and stolen in a university library. At the end of the week, a questionnaire consisting of constructs to measure all dependent variables was given to groups to fill in.

In Week 3, all groups performed an intellectual task: a university admissions task that requires groups to choose suitable candidates for university programs from an applicant pool (Dennis 1993). At the end of the week, the same questionnaire as Week 2 was given to groups to fill in.

In Week 4, all groups performed a decision making task: a business diversification task that requires groups to choose the most suitable country (or countries) for business diversification (Chidambaram, Bostrom and Wynne 1991). At the end of the week, the questionnaire was given to groups to fill in.

In Week 5, all groups performed a design and writing task (Goel and Pirolli 1989), which requires subjects to design and discuss a new automated post office that is designed to work like an automatic teller

machine. At the end of the week, the questionnaire was given to groups to fill in.

A short post-meeting debriefing was held for all groups.

#### 4. Research Results

Multivariate analysis of variance (MANOVA) test and T-test were used to perform statistical analyses. A significance level of .05 was used for all tests. Firstly, repeated measures of the MANOVA were conducted for dependent variables over five weeks (for the two dependent variables of group cohesion and maturity) or over four weeks (for all other dependent variables) (Chidambaram 1996). The results are reported in Table 2. Secondly, repeated measures of the MANOVA were conducted for each of the dependent variables over four or five weeks. The results are shown in Table 3. Thirdly, T-tests were conducted to detect significant differences between the two specific treatment conditions (Chidambaram, Bostrom and Wynne 1991).

In Table 3, all tests for dependent variables are significant except the one for decision quality. Considering the exploratory nature of this study, we performed T-tests for all dependent variables including the decision quality. The T-test results are shown in Table 4 and 5 below.

#### 5. Discussion and Implementations

Main research findings in this study can be summarized as follows: Firstly, as expected, a GSS system (TCBWorks) embedded within the team building framework was able to enhance group interaction processes and outcomes in terms of group cohesion, conflict management, group maturity, decision satisfaction, and decision process satisfaction, even in the first session of group meetings (H1, H2, H3, H5 and H6 were supported). Secondly, as time went on, the GSS system without the embedded framework also enhanced group processes and outcomes. In the final session of group meetings, no differences still existed in group maturity, conflict management, group decision, group satisfaction, and group process satisfaction between GSS groups with and without the embedded framework (H8, H9, H10, H11, and H12 supported).

The current research is an exploration of how to enhance group decision quality and group satisfaction simultaneously in group meetings. The findings show that when GSS were embedded within the framework, group satisfaction increased compared to GSS without the embedded framework (H5 & H6 supported); no difference in group decision quality was found between the GSS groups with and without the embedded framework (H4 not supported). However, the GSS research literature indicates that GSS (without the

embedded framework) can generally increase group decision quality (e.g., Benbasat and Lim 1993; Dennis, Haley and Vandenberg 1996; Nunamaker et al. 1997). Consequently, it is reasonable to conclude that the GSS with the embedded framework may enhance group decision quality as well as the GSS without the embedded framework. In summary, our research findings generally support our central research proposition: With the framework embedded into a GSS, the GSS can increase both group decision quality and group satisfaction simultaneously.

The unsupported H7 actually indicates that by the fifth session of group meetings, group cohesion was still higher in GSS groups with the embedded framework than in GSS groups without the embedded framework. This further illustrates that a GSS embedded with the framework may be able to enhance the two important group functions of member support and group well-being even when groups develop over time.

For the unsupported H4, we report that in the first session of performing a group task (week 2), there was no difference in group decision quality between GSS groups either with or without the embedded framework. In fact, further statistical analysis showed that such a difference didn't exist in the second, third and fourth session of group meetings either (for the second session:  $t=-1.559$ ,  $p=.136$ ; for the third session,  $t=-.920$ ,  $p=.370$ ; for the fourth session,  $t=-1.650$ ,  $p=.116$ ). This is an interesting finding because it may indicate that even though the embedded framework was able to enhance group cohesion, group maturity, group conflict management, group satisfaction, and group process satisfaction, it didn't significantly increase group decision quality (as compared to groups without the support of the framework). Hence, the framework could be embedded into a GSS system to support group functions of member support and group well-being, but not specifically for supporting the group function of production (McGrath 1991).

Further, our research findings also supported prior research results of longitudinal studies (e.g., Chidambaram, Bostrom and Wynne 1991; Chidambaram 1996; Walther 1995): even though initially, a GSS without the embedded framework may decrease group relational links such as group cohesion. However, as time goes on, the GSS without the framework could enhance group relational links, as well as the GSS with the embedded framework.

Prior studies (e.g., Chidambaram, Bostrom and Wynne 1991) suggest that groups need some time to appropriate a new technology (GSS), and that they may initially feel apprehensive about using the new technology for group communication, and feeling it to be difficult or even uncomfortable by curbing their natural tendency to talk during group interaction

processes. This may explain why initially, GSS groups experience a decrease in group cohesion and conflict management skills, however, as time goes on, GSS groups are able to enhance group cohesion and conflict management skills (e.g., Chidambaram, Bostrom and Wynne 1991). Our study seems to describe another aspect of a similar story. With a suitable structure (e.g., the framework) embedded into a GSS and used to support group interaction processes, groups should be able to enhance group cohesion and conflict management even when technology is still new to them. This would happen because group relational links are built up and the two group functions of member support and group well-being are enhanced by the structure determined in the first session of group meetings. These structure help group members to appropriate new technology faster and better. Future research is needed to further verify this finding.

Gersick (1988; 1989) reported that many different types of groups generally make sudden and dramatic changes at almost exactly the middle of a group's lifespan even though reasons for the dramatic change are still not fully known. From a process perspective of group development (please see the Figure 2, 3, 4, 6, and 7), our research results indicate that week 2 seemed to be such a turning point of group development, especially for GSS groups without the embedded framework. After week 2, group relational links and group satisfaction in the GSS groups without the embedded framework developed faster than before, and quickly converged with groups supported with the embedded framework by week 5. Hence, our research findings are generally in line with Gersick's research results. This changing pattern in group development could not be identified and studied in a one-shot experimental study. Hence, a longitudinal study is an important and suitable research approach that is inadequately used in GSS research literature. Given that most prior GSS research has been conducted in single session meeting (Fjermestad and Hiltz 1999), more longitudinal studies should be conducted in the future.

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