The role of controlled and dynamic process environments in group decision making: An exploratory study

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Information systems have focussed on controlling the decision-making environment, whereas in real life groups operate in an uncontrolled, asynchronous environment. In this article, we examine existing information system research on groups, analyze the role played by the process environment on the quality of group decisions, and argue the need for the design and research into information systems for uncontrolled dynamic environments. The recent growth of the Internet and Internet-mediated simulations provide unique uncontrolled environments for group decision making. We recommend that researchers in information systems and in group decision making these Internet-mediated simulations for additional research in the area of decision making in uncontrolled dynamic environments.

KEYWORDS: *group decision making; Internet-mediated simulations; process environment; group decision support systems*

Research on groups has been conducted for the past 50 years. In recent years, studies have focused on utilizing information technology in helping groups make decisions. Although early research provided aids or tools that group members could use for decision making without affecting the process environment in which decisions are made, more recent research has concentrated on controlling group interaction with the objective of making it more efficient.

Information systems for group decision making can be categorized into two types: systems that utilize a controlled environment in which groups make decisions and systems that enable groups to make decisions in an uncontrolled or dynamic environment. In a controlled environment, the information system controls all communication between group members, whereas in a dynamic environment, the information system used makes no attempt to control group interaction but provides tools and techniques for decision making in an uncontrolled setting. Group Support Systems (GSS) are information systems that provide a controlled environment for group decision making.

Although GSS have their distinct advantages, most group decisions in real life are still made in a uncontrolled, asynchronous environment. Therefore, it is very important that we study the differences between various types of group decision making research. Moreover, recent advances in Internet technology, and Internet-mediated

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simulations in particular, provide unique opportunities for the study of uncontrolled process environments. The objective of this study is to analyze existing research in information systems for group decision making and analyze the role played by the process environment in the success of these systems. The organization of this article is as follows. First, we describe two types of information systems used in group decision making. Then, we provide a framework for analyzing group research. We use the framework to analyze research using a controlled and dynamic environment. We then compare findings from research on different types of information systems. In the discussion and conclusion section, we propose that Internet-mediated simulations can provide a dynamic process environment in which group decision making can be studied.

Global Support System

A Global Support System (GSS) is a computer-based information system used to support intellectual collaborative work (Jessup & Valacich, 1991). Ellis, Vogel, and Nunamaker (1989) define GSS or Groupware as computer-based systems that support groups of people engaged in a common task or goal by providing an interface to a shared environment. The purpose of a GSS is to improve the process of decision making by removing common communication barriers, providing techniques for structured decision analysis, and systematically directing the pattern, timing, or content of discussion. In group decision making, communication activities exhibited include proposal exploration, analysis, expressions of preference, argumentation, socializing, information seeking, information giving, proposal development, and proposal negotiation (DeSanctis & Gallupe, 1987).

In addition to a common task and a shared environment, time and place also play an important role. GSS allow groups to meet when group members are at the same place or different distributed locations and when members meet at the same time (synchronous) or at different times (asynchronous). Based on the differences in task, time, and place dimensions, GSS research has been conducted under a variety of names: Group Decision Support Systems (GDSS), Electronic Meeting Systems, Computer Supported Collaborative Work (CSCW), Computer-Mediated Communication Systems, Group Communication Support Systems (GCSS), and Group Negotiation Support Systems (Ellis et al., 1989; Jessup & Valacich, 1991; Pinsonneault & Kraemer, 1990).

Components of a GSS

According to Kraemer and King (1988), GSS can be conceived as a sociotechnical package composed of hardware, software, organizationware, and people. Hardware includes the equipment for computing, audiovisual, and telecommunications, as well as the facility or room in which the group meets. Software includes general information processing, decision modeling, or communication software. Organizationware includes organizational data, group processes, and managerial procedures for group

work. People in GSS include support staff who facilitate group activities as well as group members making decisions. Benbasat and Nault (1990) do not consider organizationware to be a component of GSS. According to them, a GSS consists of only hardware, software, and people.

Classification of GSS

The greater the degree of change in communication introduced by technology, the more is the effect on decision processes. DeSanctis and Gallupe (1987) classified GSS into three levels based on an information-exchange view of group decision making. The goal of GSS is to alter communication process within groups. DeSanctis and Gallupe identified three levels of GSS depending on the information-exchange provided by the system. The three levels are described below:

Level 1. Level 1 GSS provide technical features aimed at removing common communication barriers, such as large screens for instantaneous display of ideas, voting solicitation and compilation, anonymous input of ideas and preferences, and electronic message exchange between members. By facilitating information exchange among members in electronic meeting rooms or computer-supported conference rooms, Level 1 systems improve decision processes in groups.

Level 2. Level 2 GSS provide decision modeling and group decision techniques aimed at reducing uncertainty and "noise" that occur in the group's decision process. These GSS provide automated planning and modeling tools like risk analysis or multiattribute utility models. Turoff and Hiltz (1982) experimented with automated Delphi method and Nominal group method in Level 2 GSS.

Level 3. Level 3 GSS are characterized by machine-induced communication patterns and can include expert advice in the selecting and arranging of rules to be applied during a meeting. An example of such a system is the computer-mediated communication system developed by Hiltz and Turoff (1985), which actively filters and structures information exchange.

Each of the above three levels of GSS provide different approaches for making decisions. Each of these three levels has a different effect on group decision process by influencing communication exchange. GSS cannot only speed up communication but can also change the nature of communication channels depending on the problem content, timing, or other factors occurring in the group discussion. Exchange of messages and communication can be hastened or smoothened by removing common barriers (as in Level 1 systems), systematic techniques can be used in the decision process (as in Level 2 systems), or rules for controlling the pattern, timing, or content of information exchange can be imposed on the group as in Level 3 systems (DeSanctis & Gallupe, 1987).

Kraemer and King (1988), on the other hand, categorized GSS into six types—Electronic Boardroom, Teleconferencing Facility, Group Network, Information Center, Decision Conference, and Collaboration Laboratory—based on the hardware, software, organizationware, and people involved in the GSS.

Systems using a dynamic environment

Early research in the area of information systems for group decision making did not attempt to control the process environment in which groups made their decisions. Studies conducted were experimental in nature, using business simulations or games. Human participants played the role of managers making decisions in a simulated business environment. DSS created for these studies allowed a dynamic process environment for groups to make decisions, that is, these systems did not control the communication flows and patterns, decision making tools within the group. This is the basic difference between these systems using a dynamic environment and GSS.

A number of studies that involved systems using a dynamic environment utilized some form of a business game. In business gaming research, almost all studies involved experiments in which participants made decisions in a business game. There are two basic differences between studies conducted using business gaming and those using GSS (which we considered earlier). First, business gaming research did not control the group environment, in terms of communication and use of decision support tools, to the extent GSS did. Second, most business gaming studies utilized repetitive decisions made by groups, compared to a single decision in most GSS studies. We provide a framework for analysis of research in the area and then review research in the area of GSS and in information systems that provide an uncontrolled dynamic environment.

Framework for analyzing research in group decision making

Pinsonneault and Kraemer (1990) provided a framework for analyzing the effect of GSS on group processes and outcomes based on their review of literature on information technology and group psychology. We use this framework for analyzing all types of research using information technology in groups.

This framework is based on many factors or variables. The factors can be classified into three main types: context-related factors, process-related factors, and outcome-related factors (of group interaction). Their framework and much of the MIS research in this area focuses on identifying the effects of GSS on group processes while controlling the effects of other contextual variables. Here we utilize a model proposed by Pinsonneault and Kraemer (1990) for analyzing the effect of GDSS and GCSS on group processes and outcomes.

In the model, factors that influence group decision making are classified into three types: contextual, process, and outcome variables. Contextual variables are factors

that consider the immediate environment of the group rather than the broader organizational environment. Group process variables are those factors that refer to characteristics and dynamics of interaction within a group. Outcome variables refer to the results of group interaction and the performance of groups. Contextual variables are of five types: personal factors, situational factors, group structure, technological support, and task characteristics. Personal factors include attitudes, behaviors, and motives of individual group members. Situational factors consider the relationships and social networks among members of the group and characteristics of the development of the group. Group structure includes work group norms, power relationships, and other patterned relationships among members of the group. Activities supported by electronic meeting systems and the extent of support provided are considered in technological support. Task characteristics include attributes of the group's substantive work. There are four important types of group process variables. Decision characteristics consider how group decisions are made. Communication characteristics focus on the process of information exchange within a group. Interpersonal characteristics consider the degree of fit between members of the group. The degree of standardization of group processes is considered in the structure of group processes. Outcome variables have two components: task-related outcomes (the characteristics of decisions made by the group) and group-related outcomes, which consider the perception of group members about group processes and dynamics. Contextual variables affect the group process variables, which in turn affect the task-related and group-related outcomes.

Using the Pinsonneault and Kraemer (1990) model, we analyze research on the effect of information systems on group processes and outcomes. We discuss research in GSS first and then evaluate research in systems that provide a dynamic environment.

Analyzing research in GSS

Before reviewing research in GSS, it is necessary to differentiate between two types of GSS: GDSS and GCSS. According to Benbasat and Nault (1990), a GDSS is a computer-based system used by decision-making groups as an aid to decision making in semistructured decision tasks through direct interaction of data and models. GDSS are systems that attempt to structure the group decision process in some way. GDSS correspond to Level 2 of DeSanctis and Gallupe (1987). On the other hand, GCSS are information aids. These systems primarily support the communication process between group members (Pinsonneault & Kraemer, 1990). GCSS provide information control (storage and retrieval of data), representation capabilities (plotting and graph capabilities, large video displays), and collaboration support facilities for idea generation, collection, and compilation. The main purpose of GCSS is to reduce communication barriers in groups. GCSS include Level 1 and Level 3 support of DeSanctis and Gallupe (1987).

Contextual variables

Group size in GDSS studies varied from 3 to 22 members. All studies reported increased participation, task-oriented communication, and clarification efforts. These positive results were obtained with students in a laboratory setting as well as managers in a "real" setting. A majority of the GCSS studies were conducted using small groups of 3 or 4 members. Most of the GCSS studies used students as participants of the experiment, unlike GDSS where few studies were done with executives as participants. Again, similar to GDSS studies, most studies did not account for the effect of the group's stage of development. The research results we consider here were obtained for a diverse set of problems/decisions and can therefore be considered independent of the type of problem.

Group processes

According to a survey of major research in this area, GDSS affect group processes in four major ways: (a) They increase the overall quantity of effort put forth by group members, (b) they focus the efforts of group members on the task, (c) they increase the chances of reaching a consensus, and (d) they decrease the time required to make a decision (Pinsonneault & Kraemer, 1990).

Pinsonneault and Kraemer (1990) cited findings by George et al. (1990); Nunamaker, Applegate, and Konsynski (1987, 1988); and Vogel and Nunamaker (1988), which state that participation is more equal with less domination by one or more members in groups that use GDSS. The extent to which group members focus their efforts on the task has been measured by task-oriented communication and clarification of efforts of group members. An increase in such communication has been found in studies by Gray (1972) and Nunamaker et al. (1988). Steeb and Johnson (1981) reported that GDSS groups had greater decision comprehensiveness and considered a larger range of options or alternatives. Studies by George et al. (1990), Steeb and Johnson (1981), and Vogel and Nunamaker (1988) showed that more GDSS-supported groups reached consensus than nonsupported groups. Most studies in this area have found evidence that GDSS-supported groups took less time to arrive at a decision (Bui, Sivasankaran, Fijol, & Woodbury, 1987; George et al., 1990; Nunamaker et al., 1987; Nunamaker et al., 1988; Vogel & Nunamaker, 1988).

In a study assessing GDSS with a facilitator helping groups make decisions, groups with facilitators had greater cohesion (Anson, Bostrom, & Wynne, 1995). GDSS-supported groups perceived lower amounts of issue-based and interpersonal conflict than control groups (Miranda & Bostrom, 1994). On the other hand, a study by Tung and Heminger (1993) did not find any differences between dialectical inquiry, devil's advocacy, and consensus inquiry methods when used in a GDSS environment.

Research on the effect of GCSS on group process shows the following: (a) GCSS increase the total effort put forth by group members, (b) GCSS groups analyze more alternatives or analyze the same number of alternatives in greater depth, (c) GCSS

groups decrease overall cooperation in groups, and (d) GCSS increase time required by the group to reach a decision (Pinsonneault & Kraemer, 1990).

According to Siegel, Dubrovsky, Kiesler, and McGuire (1986); Turoff and Hiltz (1982); and Hiltz, Turoff, and Johnson (1988), GCSS groups have more participation and are less inclined toward domination by one or few group members. Siegel et al. (1986) and Turoff and Hiltz (1982) also found that groups using GCSS analyze more alternatives or the same number of alternatives in greater depth. These results regarding more participation and analysis of alternatives are consistent with the finding that GCSS groups require more time to reach a decision (Easton, Vogel, & Nunamaker, 1989; Gallupe, DeSanctis, & Dickson, 1988; Jarvenpaa, Rao, & Huber, 1988; Turoff & Hiltz, 1982). GCSS were also found to decrease the efficiency of communication (Hiltz, Johnson, & Turoff, 1986; Siegel et al., 1986), decrease the amount of information exchanged (Jarvenpaa et al., 1988; Siegel et al., 1986; Turoff & Hiltz, 1982), and decrease task-oriented communication (Jarvenpaa et al., 1988; Zigurs, Poole, & DeSanctis, 1988). Table 1 provides a list of studies regarding the effect of GSS on group processes.

Outcomes

According to Pinsonneault and Kraemer (1990), GDSS increase decision quality. Studies by George et al. (1990), Bui et al. (1987), and Steeb and Johnson (1981) found that GDSS-supported groups performed better than nonsupported groups. According to Nunamaker et al. (1988), Steeb and Johnson (1981), and Vogel and Nunamaker (1988), GDSS increase the confidence of group members in their decisions and satisfaction of members in the group decision.

Studies by Bui et al. (1987), Easton et al. (1989), Gallupe et al. (1988), Jarvenpaa et al. (1988), and Turoff and Hiltz (1982) found that GCSS groups outperform nonsupported groups. Results also indicate that GCSS decrease the confidence group members have with their decisions (Gallupe et al., 1988; Vogel & Nunamaker, 1988; Zigurs et al., 1988). Results were inconclusive regarding satisfaction of groups using GCSS because one study reported lower satisfaction (Gallupe et al., 1988) and two other studies reported no significant difference in the satisfaction of GCSS group members when compared to control groups (Dickson, Lee, Robinson, & Heath, 1989; Easton et al., 1989). Table 2 provides a list of studies that summarize the effect of GSS on group outcomes.

Analyzing research in systems using a dynamic environment

As mentioned earlier, information systems for group decision making use a dynamic environment. The framework by Pinsonneault and Kraemer (1990) is also used here to analyze business gaming research.

TABLE 1: Research in Group Support Systems (GSS): Group Process Variables

Variable	*GSS Type*	*Study*	*Finding*
Equality among group members	GDSS	George et al. (1990); Nunamaker et al. (1988); Vogel and Nunamaker (1988)	Participation is almost equal in GDSS groups
	GCSS	Siegel, Dubrovsky, Kiesler, and McGuire (1986); Turoff and Hiltz (1982); Hiltz, Turoff, and Johnson (1988)	Participation is almost equal in GCSS groups
Task-oriented communication	GDSS	Gray (1972), Nunamaker et al. (1988)	Communication increases
	GCSS	Hiltz, Johnson, and Turoff (1986); Siegel et al. (1986)	Decrease in the efficiency of communication
		Jarvenpaa, Rao, and Huber (1988); Siegel et al. (1986); Turoff and Hiltz (1982)	Decrease in the amount of information exchanged
		Jarvenpaa et al. (1988); Zigurs, Poole, and DeSanctis (1988)	Decrease in task-oriented communication
Consensus	GDSS	George et al. (1990), Steeb and Johnson (1981), Vogel and Nunamaker (1988)	More GDSS groups reach consensus than control groups
	GCSS	No major study	
Decision time	GDSS	Bui, Sivasankaran, Fijol, and Woodbury (1987); George et al. (1990); Nunamaker et al. (1987); Nunamaker et al. (1988); Vogel and Nunamaker (1988)	GDSS groups require less time to reach a decision
	GCSS	Easton, Vogel, and Nunamaker (1989); Gallupe, DeSanctis, and Dickson (1988); Jarvenpaa et al. (1988); Turoff and Hiltz (1982)	GCSS groups require more time to reach a decision

NOTE: GDSS = Group Decision Support Systems; GCSS = Group Communication Support Systems. Finding considers comparisons made between GSS groups and control (non-GSS) groups.

TABLE 2: Research in Group Support Systems (GSS): Group Outcome Variables

Variable	*GSS Type*	*Study*	*Finding*
Performance	GDSS	Bui, Sivasankaran, Fijol, and Woodbury (1987); George et al. (1990); Steeb and Johnson (1981)	GDSS groups perform better and decision quality is higher than control groups
	GCSS	Bui et al. (1987); Easton, Vogel, and Nunamaker (1989); Ellis, Vogel, and Nunamaker (1989); Gallupe, DeSanctis, and Dickson (1988); Jarvenpaa, Rao, and Huber (1988); Turoff and Hiltz (1982)	GCSS groups perform better than control groups
Confidence with decision(s)	GDSS	Nunamaker, Applegate, and Konsynski (1988); Steeb and Johnson (1981); Vogel and Nunamker (1988)	Group members have greater confidence with their decision than control groups
	GCSS	Gallupe et al. (1988); Watson, DeSanctis, and Poole (1988); Zigurs, Poole, and DeSanctis (1988)	Confidence in group decision decreased
Satisfaction with decision(s)	GDSS	George et al. (1990); Jessup et al. (1991); Nunamaker et al. (1987); Nunamaker et al. (1987, 1988); Steeb and Johnson (1981); Vogel and Nunamaker (1988)	GDSS members have higher satisfaction than members of control groups
	GCSS	Gallupe et al. (1988)	Satisfaction decreased
		Dickson, Lee, Robinson, and Heath (1989); Easton et al. (1989)	No relationship between GCSS use and satisfaction

NOTE: GDSS = Group Decision Support Systems; GCSS = Group Communication Support Systems. Finding considers comparisons made between GSS groups and control (non-GSS) groups.

Contextual variables

Early research in business gaming investigated the effect of group member aptitude and achievement on business gaming performance. In their study, McKenney and Dill (1966) formed homogeneous teams based on student grade point average (GPA) and aptitude test scores. High-ability teams outperformed low-ability teams. Estes & Smith (1979) and Gray (1972) found that student GPAs were significantly correlated with group performance. On the other hand, Dill (1961) found no relationship between student aptitude test scores and group performance, and Vance and Gray (1967) found no relationship between either student aptitude or GPA and group performance.

Studies using business gaming have utilized small groups with sizes between 3 and 5. Research on group size has shown that 4-member groups learn more from business games when compared to 1- or 2-member groups (Wolfe & Chacko, 1983). Comparing performance of 2-, 3-, and 4-member teams, it was found that larger teams perform better. Although there was no research on the effect of work experience on business game play, Wolfe (1976) found significant relationship between career success and business game performance. Table 3 summarizes important research in contextual and process variables.

Group processes

Group processes have been studied in some detail using groups making decisions using an information system in a dynamic environment. Team cohesion was studied in the 1960s, and the two studies done during that time did not find any significant relationship between cohesion and group performance (Deep, Bass, & Vaughan, 1967; McKenney & Dill, 1966). McKenney and Dill (1966) retained teams from an earlier course in their study. These teams did not outperform newly assigned teams. Deep et al. (1967) followed a similar methodology, retaining groups which had undergone T-group experience together. These teams, again, did not outperform newly assigned teams. Recent studies have, however, reported that self-selected teams that were more cohesive performed better than randomly assigned teams in a business game (Norris & Neibuhr, 1980). One study reported that teams that were more cohesive had the best performance and teams that were less cohesive had the worst performance (Miesing, 1985). Table 3 summarizes research in the area.

Wolfe and Box (1988) found a significant relationship between cumulative GPA of all group members and group cohesion, and no relationship between aptitude homogeneity within groups and cohesion. They also reported significant positive relationship between cohesion and the group performance in the business game. Group cohesion was also found to have a significant relationship with the satisfaction of group members with their decisions, as well as satisfaction with the group itself (Wolfe, Bowen, & Roberts, 1989).

Another variable that has been studied using business gaming is conflict. Conflict is defined as a natural phenomenon involving individual perceptions of a continuous process between two or more interacting parties with incompatible goals (Chanin &

TABLE 3: Research Using Business Gaming: Contextual and Process Variables

Variable	*Study*	*Finding*
Contextual variable		
Grade point average (GPA)	McKenney and Dill (1966), Estes and Smith (1979), Gray (1972)	Positive correlation between high GPA teams and performance
	Dill (1961), Vance and Gray (1967)	No relationship between GPA and performance
	Wolfe and Box (1988)	Significant relationship between GPA and cohesion
Group size	Wolfe and Chacko (1983)	Four-member teams outperformed one- and two-member teams
	Gentry (1980)	Larger teams perform better
Process variable		
Cohesion	McKenney and Dill (1966); Deep, Bass, and Vaughan (1967)	No relationship between cohesion and performance
	Norris and Niebuhr (1980), Miesing (1982)	Cohesive teams perform better
Conflict	Affisco and Chanin (1990)	No difference in conflict between DSS and non-DSS groups
	Chanin and Schneer (1984)	Personality related to conflict handling behavior
Information usage	Schroeder and Benbasat (1975), O'Reilly (1982)	Information usage increases with increase in environmental uncertainty

Schneer, 1984). According to the behavioral school of organizational theory, conflict is an ever-existing phenomenon in all social organizations. It is also desirable under certain organizational and environmental conditions (V. Thompson, 1961; J. D. Thompson, 1967).

In a study of three different problem-solving techniques in groups, Affisco and Chanin (1990) used DSS technology for two of the techniques. They reported that there were no significant differences in conflict handling between the various groups (DSS vs. non-DSS, problem-solving technology vs. control). Group members' personalities were found to be significantly related to conflict-handling behavior in a business gaming environment (Chanin & Schneer, 1984). Another area of interest in group processes is information usage within groups. Although a number of studies have investigated the amount of information provided and performance of groups (Biggs & Greenlaw, 1976; Davis & Grove, 1986), few studies have examined the relationship between the use of information and performance.

In an experiment that evaluated the relationship of uncertainty in the environment to information used by decision makers, Schroeder and Benbasat (1975) found that groups used more information in the form of reports as environmental uncertainty, but information usage decreased for groups operating in the most variable environment. O'Reilly (1982), in a field study regarding the use of information sources, found that as the quality and accessibility of information sources increase, so does the frequency of

their use. This research also confirmed the Schroeder and Benbassat finding that information usage increases with an increase in environmental uncertainty.

Outcomes

Among the outcome variables, performance of groups has been the most widely studied variable. A few studies have examined the effect of computer-based decision making in a business gaming environment. Results have been mixed.

Keys, Burns, Case, and Wells (1988) found that the use of computer-based worksheets led to only marginal improvement in performance over the use of hand-scored worksheets. On the other hand, Affisco and Chanin (1989) found no significant relationship between the use of DSS and group performance, that is, groups using DSS did not outperform non-DSS groups.

Group members' satisfaction with their decisions and confidence of group members in their group decisions have not been studied in any research that involved information technology and its effect on group decision making. The only study of note that considered satisfaction of group members with their decisions is a study by Wolfe et al. (1989) in which group cohesion was found to have a significant relationship with the satisfaction of group members with their decisions. Table 4 provides a summary of research in the area.

Discussion and conclusion

In this study, we have analyzed a number of studies that have investigated the effect of information systems on group decision making. We can conclude that there are significant differences in research findings for group decision making systems using a controlled environment and those using a dynamic environment. GSS using a controlled environment provide significant benefits in the quality or decision made and time required to make a decision. On the other hand, results in systems that provide a dynamic environment were inconclusive. This is a cause for concern because a large portion of decision making done in organizations is done in a dynamic and asynchronous environment using e-mail and other information technologies. We recommend additional research in the area of asynchronous decision making in an uncontrolled and dynamic group environment.

The invention of the Internet in the 1960s and the World Wide Web in the early 1990s has changed the world we live in. The Internet provides a decentralized network of computers where there is a relatively free flow of information. A number of simulations and information systems developed using the Web provide group decision support. These systems provide the kind of uncontrolled and dynamic group environment that GSS research should study in the future. A number of simulations, called Internet-mediated simulations, have been developed that utilize the Internet and Web components. An Internet-mediated simulation can provide significant benefits. It can provide a dynamic environment that cannot be controlled by any one user. It can provide a

TABLE 4: Research Using Business Gaming: Group Outcome Variables

Variable	*Study*	*Finding*
Performance	Keys, Burns, Case, and Wells (1988)	Computer-supported groups showed marginally better performance than nonsupported groups
	Affisco and Chanin (1989)	DSS groups did not outperform non-DSS groups
Satisfaction	Wolfe, Bowen, and Roberts (1989)	Cohesion had a significant relationship with satisfaction of members with the group decision

NOTE: DSS = Decision Support System.

medium that can utilize the extensive communication capabilities of the Internet. Moreover, individuals or groups using this simulation do not have to be in the same location at the same time. This presents some interesting possibilities such as development of teams that span departments, organization, countries, and continents. Although in the past simulations could only be used by a group of people, at the same place, at the same time, newer simulations can be used simultaneously or asynchronously by group members who are separated by continents.

Because research on GSS in a dynamic environment is inconclusive, we believe that Internet-mediated simulations should be used to test the role of GSS in Internet-based dynamic environments. This research will make a significant contribution to knowledge in the areas of group decision making, communications, and GSS design. Managers will also benefit from additional research in this area because most group decisions are made in dynamic uncontrolled environments similar to the environment created by Internet-mediated simulations.

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