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ABSTRACT

Strategic management, defined as the overall process of formulating and implementing goals, policies and plans of organizational strategy, is an important organizational task that is typically performed by groups of managers. While information technology has long been used to support strategic management, it has only recently been used to support the group processes of strategic management through the provision of Electronic Meeting Systems (EMS). An EMS can affect meetings by providing process support, process structure, task structure, and task support. Process support improves communication among group members (via an electronic communication channel), while process structure directs the pattern or content of discussion (via an agenda). Task structure refers to the use of a structured technique to analyze the task (a mathematical or conceptual model), while task support refers to the provision of information or computation support without additional structure (a data base or calculator). The objective of this paper is to evaluate the capability of EMS to support strategic management. The results of a series of seventeen case studies indicate that use of EMS technology can enhance six capabilities that prior research has linked to increased strategic management success. Process support and process structure were perceived to be more important than task structure and task support in contributing to success. An analysis of less successful meetings suggests that a lack of communication between the group leader/meeting organizer and meeting participants and extenuating external circumstances were primary causes for the lack of success.

1. INTRODUCTION

A 1986 survey of 1,000 chief executive officers found that their top concern was Strategic Management (SM), defined as the overall process of formulating and implementing goals, policies and plans of organizational strategy. SM is a complex and iterative task typically conducted by groups of managers. While information technology has long been used to support quantitative SM analytical techniques, more recent developments in information technology have also made it possible to support the group meeting processes of SM with information technology. Researchers have built and tested a wide variety of information technology-based group meeting environments under a number of names, including Group Decision Support Systems (e.g., DeSanctis and Gallupe 1987), Computer-Supported Cooperative Work (e.g., Kraemer and King 1988), Groupware (e.g. Richman 1987) and Electronic Meeting Systems (EMS) (Dennis et al. 1988).

Although laboratory research with small groups has found the impact of EMS on meeting effectiveness, efficiency and member satisfaction to be mixed, case studies and field studies of larger groups performing SM and other tasks suggest that EMS can improve performance.

The purpose of this paper is to evaluate the capability of one form of EMS technology to support SM (where participants meet face-to-face in the same room at the same time, with electronic communication used to support or replace verbal communication). This paper has four major sections. First, we consider the theoretical issues underlying EMS support for SM. Second, we discuss our research methodology. Third, we present the results of a series of case studies of seventeen organizations that have used EMS to support SM. In the final section, we attempt to better understand the reasons for these results by examining the experiences of groups for whom EMS support was seen to be successful and unsuccessful.

2. EMS SUPPORT FOR STRATEGIC MANAGEMENT

Strategy is a term that is commonly used, but difficult to define. In general, strategy is "the pattern or plan that integrates an organization's major goals, policies and action sequences into a cohesive whole" (Quinn, Mintzberg and James 1988, p. 3). Strategic Management (SM) refers to the overall process of developing and implementing a strategy and typically involves a series of interrelated strategic decisions (Quinn, Mintzberg and James 1988).

While there are many ways of categorizing the various activities (or types of strategic decisions) in the SM process, the model developed by Schendel and Hofer (1979) is particularly useful. They argue that SM involves six activities: goal formulation, environmental analysis, strategy formulation, strategy evaluation, strategy implementation, and strategic control. While some of these activities have a natural progression (i.e., strategy formulation occurs before strategy evaluation), the SM process is usually iterative and cyclical (Mintzberg, Raisinghani and Theoret 1976; Schendel and Hofer 1979).

Due to the scope and complexity of the issues involved, SM typically requires firm-wide participation, as no one person or organizational level has all of the information and insight needed to address all of the issues. However, this is not to suggest that SM is a democratic process in which the group as a whole makes decisions; instead, group members generally provide information to specific individuals who have responsibility for specific aspects of the strategic decision (Eisenhardt 1989). The involvement of many participants introduces complexity into the SM process due to differences in participants' information, viewpoints, goals, and power, and to the potential for political bargaining among coalitions (Mangham 1979; Mintzberg 1983). While large group meetings involving all stakeholders are one of the most effective ways to reduce equivocality (Daft and Lengel 1986), large group meetings have significantly more communication problems than small group meetings (Steiner 1972). EMS support for SM therefore needs to consider political issues ([Mason and Mitroff 1981; Schwenk 1988]), and the social, psychological and communication aspects of group work (Shaw 1981) as well as analytical techniques that support various SM activities (Porter 1980 1985).

An EMS can affect these aspects of SM in at least four ways: process support, process structure, task structure, and task support. Process support is the use of technology to support communication among group members (an electronic communication channel or electronic blackboard). Process structure is the use of process rules that systematically directs the pattern of discussion, such as an agenda or a formal process technique (Nominal Group Technique). Task structure refers to the use of a mathematical model or conceptual framework to analyze the task (Strategic Assumption Surfacing and Testing [Mason and Mitroff 1981]). Task support is the provision and use of information or computation support without the imposition of additional structure, such as databases or calculators. For example, suppose a group was charged with developing a plan to encourage more European tourists to visit the U.S. Providing each member with a computer workstation that enabled him/her to exchange typed comments with other members would be process support. Having each member take turns to contribute ideas (round-robin) or agreeing not to criticize the ideas of others would be process structure. Task support could include providing information on when, where and how many European tourists visited last year or about tourist programs run by other governments. Task structure could involve a framework encouraging group members to consider each U.S. region separately (e.g., New England) or to identify different types of tourists (independent travellers, tour clients, businessmen). We now consider how each of these functions can affect group performance.

2.1 Process Support

One way in which the EMS can support the SM group is by providing an electronic communication channel. In this case, group members use computer workstations connected via a network, with this electronic communication either supplementing or replacing verbal communication. This electronic communication channel can be configured to provide three functions (i.e., theoretical constructs): parallel communication, group memory and anonymity. Each of these functions are distinct and can be provided separately or jointly. (for example parallel communication without group memory (Siegel et al. 1986) or parallel communication and group memory with and without anonymity (Connolly, Jessup and Valacich, in press). Depending upon the circumstances, each function has the potential to minimize or strengthen factors that reduce performance (process losses [Steiner 1972]).

Parallel communication enables group members to contribute ideas, information and opinions simultaneously, thus reducing the process losses due to *air time*, the need to partition the available speaking time among group members, *domination*, the exercise of undue influence or the monopolization of the group's time in an ineffective manner by one member, and *production blocking*, which has been defined as the need to wait for others to finish speaking before contributing – arguably the single most important inhibitor of group performance (Diehl and Stroebe 1987). (The term "production blocking" has also been used by other authors to refer to other forms of blocking as discussed below.) Parallel communication may also reduce *free riding*, as the cost to participate is reduced because members no longer need to compete for air time (Albanese and Van Fleet 1985). A potential drawback to parallel communication is that it may increase the amount of information to be processed such that *information overload* becomes a problem (Hiltz and Turoff 1981).

A group memory may reduce process losses due to difficulties in *listening* to others and *remembering* comments (Diehl and Stroebe 1987; Jablin and Seibold 1978), *interruptions* in the decision process (Mintzberg, Raisinghani and Theoret 1976), and other aspects of *production blocking*, such as the need to continuously listen rather than think of new contributions (Jablin and Seibold 1978; Lamm and Trommsdorff 1973). A group memory may reduce *information overload*, as members can queue and filter information (Hiltz and Turoff 1981; Miller 1960).

Anonymity may reduce process losses due to *evaluation apprehension*, the fear of negative evaluation that can cause individuals (particularly low status members) withhold ideas and opinions and *pressure to conform* to the opinions of others, whether the pressure is intentional (due to the fear of political sanctions) or not. Previous research indicates that anonymity can mitigate these effects in some cases, but not in all. While anonymity has the potential to increase *free riding*, as members contributions are less identifiable (Albanese and Van Fleet 1985), empirical research suggests that it generally does not have a significant impact. Anonymity may also promote *depersonalization*, the separation of ideas from the contributor, which can have positive and negative effects (Williams 1977), and *deindivduation*, the loss of awareness of one's own individuality and that of others (Festinger, Pepitone and Newcomb 1952; Diener 1979), which may increase uninhibited behavior ("flaming") (Hiltz and Turoff 1981; Siegel et al. 1986).

In addition to these three functions electronic communication may introduce media effects that are not due to specific functions, but reflect inherent differences between electronic and verbal media. One major difference between the electronic and verbal channels is *media speed*: typing comments is slower than speaking, while reading comments is faster than listening (Hiltz, Johnson and Turoff 1982; Williams 1977). Second, electronic communication has a lower *media richness* than face-to-face communication, as it is slower in providing feedback and provides fewer information cues (voice inflection) (Daft and Lengel 1986; Daft, Lengel and Trevino 1987). The information richness of a medium is important for tasks with multiple and potentially conflicting viewpoints (equivocality). As richer media facilitate equivocality reduction, electronic communication may be a less effective medium for equivocal tasks. Finally, electronic communication may reduce dysfunctional *socializing* and other non-task behavior (Foster and Flynn 1984), although some socializing is necessary.

The way in which electronic communication is used can be as important as the functions it provides. When electronic communication replaces verbal communication (see Connolly, Jessup and Valacich in press), which we term an interactive meeting process, these functions have their strongest impacts, both positive (reduced production blocking) and negative (reduced media richness). When electronic communication is used to supplement verbal communication (see Gallupe, DeSanctis and Dickson 1988), a supported meeting process, these effects are generally reduced (which again may have both positive and negative impacts), but problems due to *information overload* and *production blocking* will be increased beyond the levels if either channel was used separately (Jarvenpaa, Rao and Huber 1988).

A second way in which EMS can provide process support is through an electronic blackboard, essentially an automated version of a traditional blackboard (Stefik et al. 1987). Group members discuss the issues verbally, with key ideas and issues recorded by one group member or a meeting facilitator on the electronic blackboard (in a chauffeured meeting process). This group memory can reduce problems of *remembering* and *information overload*, and may also provide additional task focus to reduce *socializing* (Rao and Jarvenpaa 1989).

2.2 Process Structure

Two types of process structure (global and local) have long been used by non-EMS-supported groups to attempt to improve group performance. Global process structure refers to the agenda, plan or rules for the overall process by which the meeting will be conducted. Use of an agenda may reduce the probability of *premature decisions* and *incomplete consideration of relevant information* (Hirokawa and Pace 1983; Van de Ven and Delbecq 1971). The planning and use of global process structure is particularly important for larger groups (Shaw 1981) and for groups whose members do not share common information (Hackman and Kaplan 1974). However, in some cases, it can reduce performance and/or have little effect on performance (Hackman and Kaplan 1974; Hegedus and Rasmussen 1986). Local process structure refers to process structure provided within one meeting activity, such as idea generation. For example, classical brainstorming provides four rules to structure the process of group brainstorming (Osborn 1957). Some group methodologies provide both global and local process structure; e.g. Nominal Group Technique prescribes a four-step global process as well as specific process rules within each step (Delbecq, Van de Ven and Gustafson 1975).

An EMS can provide process structure in two ways: by using a meeting facilitator (Vogel 1988) and by embedding it in the EMS software. The facilitator can provide global process structure by assisting the group in developing an agenda and ensuring that the group maintains it during the meeting and local process structure by chairing verbal discussions. Software can provide global process structure via agenda development and maintenance tools and local process structure through talk queues (Wagner and Nagasundaram 1988) or by providing specific discussion patterns among participants. For example, one idea generation software tool developed at the University of Arizona (Electronic Brainstorming) divides the meeting into several separate simultaneous discussions. This technique has been shown to reduce *cognitive inertia* (Easton et al. in press), defined as the tendency of discussions to move along one line of thought without deviating from the current topic.

2.3 Task Structure

Task structure is one of the key benefits provided to individual decision makers by Decision Support Systems.

Similar functions, such as problem modeling, decision analysis, and multi-criteria decision making can be provided to SM groups (McCartt and Rohrbaugh 1989). The objective of providing task structure is to increase the group's *understanding* of the task. While computer-supported task structure has often been provided for quantitative SM tasks, it can also be provided for the qualitative aspects of SM. For example, many SM techniques are available that consider "rational" and/or "political" aspects of general SM (Strategic Assumption Surfacing and Testing [Mason and Mitroff 1981], cognitive mapping [Eden and Ackerman 1989] and specific SM activities (environmental analysis [Steiner and Miner 1977], strategy formulation [Porter 1980 1985], strategy evaluation [Rumelt 1979]).

2.4 Task Support

Task support refers to providing information support and computation support to reduce the deleterious effects of *incomplete use* or *incomplete analysis of information* (Hirokawa and Pace 1983; Mintzberg, Raisinghani and Theoret 1976). Information support can include on-line databases while computation support can include calculators or more complex systems for numerical support, such as spreadsheets or statistical analysis systems.

2.5 Previous Research

The degree of process and task support and structure used in previous SM studies has differed depending upon the needs of the groups, SM activities and meeting phases. For example, in some cases, high degrees of process support were provided via electronic communication, while in other cases no electronic communication was used. In the one study that found EMS use to have positive effects for some SM groups and negative effects for others (McCartt and Rohrbaugh 1989), superior performance was linked to more equal participation, greater goal-centeredness, greater accountability and supportability of the decision, and greater use of data, each of which may be promoted by greater degrees of process support, process structure, task structure and task support, respectively. It is unlikely that any one combination of process support, process structure, task support and task structure will be equally appropriate for all SM situations (or even that all four components will be required in every case). Given the contingent nature of SM (Drazin and Van de Ven 1985), the success of EMS support for SM depends upon having the capability to provide the appropriate support and the actual selection and use of that support (i.e., "fitting" the support to the situation).

In general, case studies of single organizations have found the use of an EMS providing process support, process structure, task support and task structure to lead to successful SM outcomes (Bostrom and Anson 1989; Dennis et al. 1990; Nunamaker et al. 1989). The purpose of this study is to examine whether EMS use leads to SM success on a broader scale by conducting a series of case studies with a variety of organizations.

3. METHOD

3.1 Measuring the Success of Systems to Support Strategic Management

Finding appropriate measures for SM success is difficult as there are no reliable "objective" measures. Previous studies that have evaluated non-EMS systems to support SM have sometimes used financial measures as surrogates for success (Kulda 1980; Thune and House 1970). However, this approach presents two problems. First, it can be difficult to directly attribute financial success to the use of an SM system as this is affected by many other factors (King 1983). Second, SM confers benefits, such as organizational learning, that do not quickly appear in financial measures (Ackoff 1981; Camillus 1975; Lorange 1980) and behavioral benefits such as enhancing communication and participation (King and Cleland 1978; Steiner 1979). Other techniques, such as the use of "objective" raters (bond raters or stock market analysts), are equally flawed. For these reasons, Wood and Laforge (1979) argue that it is inappropriate to use financial measures to evaluate SM systems.

To address the need for alternate ways to evaluate SM, Venkatraman and Ramanujam (1987) developed and validated an operational model for evaluating the success of systems to support SM. Drawing on previous research, they developed a six item set of SM objectives (short- and long-term performance, management development, prediction of future trends, avoiding problems, and evaluating strategic alternatives) and a twelve item set of capabilities hypothesized to improve the successful attainment of these objectives (described below). The construct validity of these measures was then validated by using confirmatory factor analysis (Lisrel) on data from a survey of 202 strategic management units. This analysis found these twelve measures of system capabilities to be reliably predictive of these six measures of SM system success. These subjective measures were then validated against "objective" measures, such as financial performance, and also found to be reliable.

We used Venkatraman and Ramanujam's twelve measures of system capabilities as measures of the success of EMS support for SM. The measuring instrument (see the Appendix) is identical to that used by Venkatraman and Ramanujam, except in two ways. First, the anchors on the five-point Likert scales used to compare SM systems were changed from generic terms comparing different SM systems (the current SM system to the previous one) to specific terms comparing manual to EMS approaches (see the Appendix). Second, a thirteenth item intended to capture perceived overall success was added.

The population of organizations who have used EMS to support SM is small and self-selected so it is impossible to randomly select a large set of EMS-supported groups for study. As there are important differences among EMS that could promote significant differences in outcomes, we chose to enumerate the entire population of organizations that used one EMS to support SM during the duration of this study (the fourteen-month period from May 1988 through June 1989). Thus this is not a cross-sectional random sample from a large population, but is a temporal random sample from a small population. We did not study any "control" groups (groups who performed SM tasks without EMS support) to determine whether the capability ratings given by these EMS-supported groups were different than ratings given non-EMS-supported groups. It would have been virtually impossible to find an equivalent sample of non-EMS-supported groups given that our EMS sample was not a cross-sectional random sample. Instead, we used the ratings given by the 202 randomly selected non-EMS-supported groups from the Venkatraman and Ramanujam survey as our "control." These groups gave their non-EMS-supported planning systems a mean score of 3.65 across these twelve measures. In evaluating the performance of our EMS-supported groups, we used a value of 3.65 as our benchmark: capabilities rated above 3.65 were considered "better" than average, while those rated below 3.65 were considered "worse" than average.

3.2 The EMS Environment

The EMS used in the study was the University of Arizona GroupSystems EMS operated at the two Arizona GroupSystems facilities. Space precludes a complete description of the facilities and software; more complete descriptions are available elsewhere (Dennis et al. 1988; Nunamaker, Applegate and Konsynski 1988; Vogel et al. 1988). Both of the GroupSystems facilities at Arizona have participant work areas (tables or desks) arranged to provide a central focus at the front of the room. Each participant has a separate networked, hard disk-based, color graphics microcomputer workstation that is recessed into the work area. Another one or two workstations serve as the facilitator's consoles which are used to control the EMS software. At least one large screen video display is located at the front of the room as an electronic blackboard, with other audio-visual support also available (typically white boards, 35mm slide projectors, and overhead projectors). The first EMS facility has a large U-shaped table accommodating sixteen participants. As experience demonstrated the need for a larger facility (many SM sessions involved more than the sixteen participants that could comfortably be accommodated), Arizona's second facility has 24 workstations arranged in two concentric rows of tiered seating capable of accommodating 48 participants.

The GroupSystems software tool kit provides tools to support specific SM activities (i.e., policy development and evaluation) as well as generic group activities such as communication (idea generation and organization), decision making, and information management that are common to many SM activities (see Table 1). As these tools offer different levels of process structure, process support, task structure and task support (see Table 2), they enable the EMS to provide the appropriate degree of each of these four functions, depending upon the situation. While there are common sequences of use (idea generation with Electronic Brainstorming followed by idea synthesis with Idea Organizer), the tools can be combined with each other in any manner so that the EMS is highly flexible.

3.3 Data Collection

During the study, numerous groups used the two EMS facilities for a variety of activities, with groups from eighteen different organizations performing some aspect of SM. All but one of these groups agreed to participate in the study. This sample of seventeen organizations included a variety of large and small organizations from both the public and private sector. Seven groups were "repeat" users, in that they, used the EMS on several separate occasions before, during or after the study (groups 1, 3, 8, 11, 12, and 17 in Table 3) or are now building their own EMS facility (group 5).

Our objective was to evaluate the capability of EMS to support SM and to better understand how this EMS affected the SM process. Two distinct styles of data collection were undertaken to triangulate across research methods, instruments and time. The first source of data was a case database. The database contained information collected from a variety of sources pertaining to each SM group. Data accumulation began with an initial contact report completed by the EMS support staff member who was first contacted by the group (typically one of the EMS facility managers). Reports from pre-planning meeting(s) between the group leader and the EMS staff (key issues, agendas, etc.) and final meeting reports completed by the meeting facilitator, meeting assistants, session observers and the authors were also included. Transcripts of all electronic communication that occurred in the meeting were recorded. Other sources of information available for several organizations included interviews with meeting participants other than the group leader, organization planning documents (including those prepared before and after the meetings), corporate annual reports, and newspaper and magazine articles.

The second source of data was an interview conducted using the measures validated by Venkatraman and Ramanujam. This interview was conducted after the organization had the opportunity to use the results of the SM meetings and reflect on their usefulness (typically one to four months after the meetings). Following the procedures of Venkatraman and Ramanujam, this questionnaire was administered to the one member of the group most

Table 1: The GroupSystems Toolkit

Communication Tools

- **Electronic Brainstorming (EBS)** supports idea generation by allowing group members to share comments on specific questions simultaneously and anonymously using an interactive meeting process. Participants are encouraged to be creative or critical depending on the nature of the question and group objectives.
- **Topic Commenter (TC)** facilitates idea generation (simultaneously and anonymously) on a structured list of topics via an interactive meeting process. Participants enter, exchange, and review information on self-selected topics.
- **Issue Analyzer (IA)** assists the group in identifying and consolidating ideas. In an initial identification phase, individuals identify topics that merit further consideration by the group using an interactive process. In the consolidation phase, the group condenses the combined topic list to a manageable size using a chauffeured process.
- **Idea Organizer (IO)** helps group members identify and consolidate key items associated with previously generated text (e.g., ideas from EBS) using an interactive process. Support is also provided for integrating external information to support items.

Decision Making Tools

- A **Voting** tool provides a variety of prioritizing methods including Likert scales, ranking, and multiple choice. Group members cast anonymous ballots via an interactive process. Results are displayed in graphical and tabular formats for discussion.
- **Alternative Evaluator (AE)** provides multi-criteria decision making support via an interactive process. A set of alternatives can be examined under flexibly weighted criteria. Results are displayed in a variety of graphical and tabular formats.

Policy Development and Evaluation Tools

- **Policy Formation (PF)** supports the development of a policy or mission statement through iteration and group consensus using a supported process. Members contribute proposed wording which is then edited through group discussion and returned to participants for further refinement. The process continues until consensus is reached.
- **Stakeholder Identification and Assumption Surfacing (SIAS)** is used to evaluate the implications of a proposed plan via a supported process. Stakeholders and their assumptions are identified, scaled, and presented to the group graphically for discussion.

Information Management Tools

- **Group Dictionary (GD)** supports the formal definition of specific terms that will be used in the current or future meetings using a chauffeured or supported process.
- **Enterprise Analyzer (EA)** helps capture and organize characteristics of an organization using any user-defined modeling technique using a chauffeured process.
- **Semantic Graphics Browser (SGB)** provides a graphic system for examining information from the Enterprise Analyzer using a chauffeured process.
- **File Reader (FR)** provides participants immediate read-only access to previously stored material at any point in a group session during the use of any other tool. Users may browse stored material and return to participate at their own discretion.

Table 2. GroupSystems Tools

	Process Support (communi-cation)	Process Structure (process rules)	Task Support (information/ computation)	Task Structure (task models & frameworks)
Electronic Brainstorming	●	●	◎	○
Topic Commenter	●	○	◎	●
Idea Organizer	◎	◎	●	◎
Issue Analyzer	◎	●	●	◎
Vote	●	●	◎	●
Alternative Evaluator	●	●	◎	●
Stakeholder Identification	◎	●	◎	●
Policy Formation	◎	●	◎	●
Group Dictionary	◎	●	◎	●
Enterprise Analyzer	○	○	●	●
Graphical Browser	○	○	●	●
File Reader	n/a	n/a	●	○

○ Low ◎ Medium ● High

responsible for the organization's SM activities. In nine cases this was the most senior executive present (CEO, COO, Warden, Executive Director); in five cases this was the second most senior executive (VP-Finance, VP-Planning); in three cases this was an internal consultant or external consultant hired by the organization to manage their SM process. The group leader/SM organizer was considered to be the best person to evaluate the EMS capabilities, since this was the individual who would ultimately be held accountable for the quality of the SM activities.

To determine if the leader/organizer's perceptions matched those of other members of the SM group, three items (items 1, 9, and 13 in the Appendix) were placed on post-session questionnaires completed by all participants of six SM groups (groups 5, 10, 13, 14, 16, and 17 in Table 3). The correlation between the mean response of all members of these groups and that of their leader/organizer was .80, with group members' perceptions being slightly higher. This indicates that the perceptions of the leader/organizer measured after the results had been used were similar to those of the entire SM group recorded immediately after the meetings.

4. RESULTS

Table 3 summarizes the groups, the SM activities and the EMS tools used. In general, the groups were relatively large, representing a range of interests from different parts of the organizations, and included groups with management hierarchies as well as groups of peers. No organization used EMS support for its entire SM process, which should not be surprising; a survey of the SM practices of 78 organizations noted that not one followed a formal SM process in entirety (Nutt 1984).

Table 4 presents a summary of the interview results using measures developed by Venkatraman and Ramanujam. T-tests were used to determine whether the interview responses differed from the aggregate mean rating reported by non-EMS-supported groups in the Venkatraman and Ramanujam survey (i.e., 3.65).

The first four items dealt with the capability of EMS to support the generic activity of generating ideas and information. The EMS was perceived to be more effective at enhancing the generation of new ideas ($p = .001$) and identifying key problem areas ($p = .015$). While the other two measures (identifying new business opportunities and enhancing innovation) were rated above the no-difference value of 3.00, the scores were about the same as previous non-EMS-supported groups.

Items five through eight addressed the capability of EMS to affect communication both horizontally and vertically in the organization. The EMS was perceived to be more effective at communicating the concerns of line managers to top management ($p = .001$), integrating diverse functions and operations ($p = .049$), and fostering organizational learning ($p = .046$). There were no statistically significant differences in ratings for communicating the expectations of top management down the line. Interviews with group leaders confirm that the EMS had little effect on top down communication. When electronic communication was used, top management's voice was seen to be just one voice among many. On those occasions when top management chose to communicate their expectations, they did so verbally, in the same manner they would have in a non-EMS-supported meeting.

Items nine and ten concerned the capability of EMS support to foster motivation and control. While the responses were above the no-difference value of 3.00, there were no significant differences between these responses and those of the non-EMS-supported groups in the prior study.

Items eleven and twelve considered the capability to assist the group in anticipating surprises and adapting to them. Perceptions that the EMS helped the group anticipate surprises and crises approached statistical significance ($p = .092$). While the responses for flexibility were above the no-difference value of 3.00, there were no significant differences between these responses and those of the non-EMS-supported groups in the prior study.

The final item asked the group leaders to rate the overall performance of the EMS to manual processes. The EMS-supported process was seen to be more effective overall ($p = .005$).

5. DISCUSSION

The results of this study suggest that EMS can be successful in supporting SM for many organizations. We studied the use of one EMS (which provided process support, process structure, task support and task structure) by seventeen organizations. This EMS received higher ratings on six out of twelve key capabilities than were given to non-EMS-supported systems by 202 respondents in a prior study using the same instrument. There were no significant differences for the other six capabilities. Overall, the EMS-supported process was perceived to be more effective than the previous manual process. The leaders/organizers of twelve groups (groups 1, 2, 3, 5, 9, 11, 12, 13, 14, 15, 16, and 17) also commented that the process was satisfying (or even fun), promoted team-building and raised morale. These results parallel findings from previous case studies with individual organizations (Bostrom and Anson 1989; Dennis et al. 1990; Nunamaker et al. 1989). In this section, we discuss the impact of each of these four components in contributing to successful outcomes and consider possible explanations for the less successful outcomes, including the weakness in this specific EMS. We also examine other ways EMS use changed the SM process and the generalizability of these conclusions.

Table 3: Summary of Groups, Tasks and Tools

Organization	S[1]	Group[2]	Participants	Length	Task[3]	EMS Tools[4]
1. Electronics Manufacturer	3.8	H 27	All mgmt levels	2 days	EA SE SF	TC,FR EBS,TC,FR TC,FR
2. Natural Resource Firm	2.9	H 24	All mgmt levels	1 day	SF	EBS,IA,Vote,TC
3. International Consultants 1	2.7	P 15	Partners and office managers	1 day	SF	EBS,IA,Vote,TC
4. International Consultants 2	3.7	P 21	Partners and office managers	2 days	SF	EBS,IO,Vote,TC
5. Miltary College	3.9	H 23	Administrators & instructors	3 days	SE	EBS,IO,Vote,TC PF,SIAS
6. Hospital 1	4.8	H 19	Exec. task force	½ day	GF SF	EBS EBS,IA,Vote,TC
7. Hospital 2	4.0	H 16	Administrators	2 days	SF	EBS,IA,Vote,FR
8. Hospital 3	3.8	H 23	Exec. task force	½ day	SF	EBS,IO,Vote
9. Federal Prison	4.4	H 16	All mgmt levels	½ day	SF	EBS,IA,Vote
10. Industry Association 1	2.8	P 19	SM task force	4 days	GF EA SF	EBS,PF,FR TC,IA TC,Vote
11. Industry Association 2	4.8	P 11	SM task force	½ day	SF	EBS,IA,Vote,TC
12. Native Amer. Tribal Nation	3.8	P 22	Health care task force	2 days	SF SE	EBS,IA,TC EBS,TC
13. Student Union Contractor	4.5	H 24	Administrators & staff	3 days	GF SF	EBS EBS,IA,TC,Vote
14. Univ. Dept. (Engineering)	4.3	H 18	All research faculty	½ day	GF EA	EBS TC,Vote
15. Academic Task Force	4.8	P 16	School, state & university reps	½ day	SF	EBS,IA,AE
16. Gas Utility & Bank	4.6	H 29	All mgmt levels	2 days	GF EA SF	EBS,IA EBS EBS,IA
17. Commercial Lender	4.2	H 27	All mgmt levels	3 days	GF EA SF	EBS,Vote TC,IA,Vote TC

Notes:
1. S: This group's mean score on success measures in Table 3
2. Group: H=hierarchical, P=peers, number=number of members
3. Task: GF=goal formulation; EA=environmental analysis; SF=strategy formulation; SE=strategy evaluation
4. Tools used for each task - see Table 1 for abbreviations

Table 4: Results

		N	Mean	StDev	T	P*
Exploration and Idea Generation						
1.	Enhance idea generation	17	4.41	0.80	3.95	0.001
2.	Identify new business opportunities	8	3.75	1.17	0.24	ns
3.	Identify key problems	17	4.27	1.20	2.40	0.015
4.	Enhance innovation	17	3.74	1.16	0.30	ns
Communication, Learning and Integration						
5.	Communication from top down	10	3.40	1.08	-0.74	ns
6.	Communication from bottom up	15	4.47	0.74	4.26	0.001
7.	Organizational learning	17	4.15	1.17	1.75	0.049
8.	Integration diverse functions	14	4.04	0.08	1.81	0.046
Motivation and Control						
9.	Foster managerial motivation	15	3.53	1.11	-0.41	ns
10.	Foster management control	13	3.73	0.67	0.44	ns
Anticipation and Adaptation						
11.	Anticipate surprises, crises	12	3.96	0.75	1.42	0.092
12.	Flexibility to adapt	15	3.93	1.12	0.98	ns
Overall						
13.	Overall EMS performance	17	4.24	0.81	2.97	0.005

Scale:
1 = The computer supported process is MUCH WORSE than a manual process
2 = The computer supported process is WORSE than a manual process
3 = The computer supported process is NO DIFFERENT than a manual process
4 = The computer supported process is BETTER than a manual process
5 = The computer supported process is MUCH BETTER than a manual process

*P is p-value for HO:$\mu \leq 3.65$ versus H1:$\mu > 3.65$

5.1 EMS Contributions to Success

Before we can consider how the EMS affected these meetings, we need to examine the general nature of the SM tasks undertaken and the composition of the SM groups involved. The general task of all but one of these SM meetings was the provision of information and opinions to the individuals making specific decisions. In only one case (group 10) was the group as a whole charged with actual decision making; in all other cases, as is typical of SM (see Eisenhardt 1989), the group leader and/or specific members of the group had decision making authority in certain areas (in the case of group 1, each division manager was responsible for his/her division's strategic plans, subject to approval by his/her Group Vice-President and the CEO). Only one group used a more complex decision making scheme than simple ranking (group 15 used a multi-criteria decision making process).

The members of these SM groups were selected because they were each experts in certain areas (finance, production) from which information was needed and/or because they represented organizational political coalitions. At least two formal levels in the organizational hierarchy were represented in each group (peers plus the leader), but even within the same formal level, there were status and power differences (group 14 was composed of nominally "equal" research faculty members, but some were more equal than others). In most cases, three or four formal levels of hierarchy were present. Group members typically had different information and understandings of key organizational issues; the group leader wanted to foster organizational development by including members who normally didn't communicate.

The nature of these groups and their tasks can be quickly summarized: the primary objective was the sharing of information among a diverse group of individuals who held fundamentally different information about the task. These groups and tasks differed markedly from previous experimental research: the task was idea generation *not* decision making; and the groups were large and heterogeneous in information, expertise and goals, *not* small cohesive work groups. Any comparisons to previous research and application of these conclusions to future research must be done with these fundamental differences in mind.

The pattern of responses in Table 4 indicates that the EMS was perceived to be particularly capable of supporting idea and problem exploration, communication, learning, and the integration of information. One important reason for the success of EMS support must be the improvement of communication among participants due to process support. In this section, we consider the effects of process support, as well as process structure, task structure and task support.

Process support. All groups used at least one tool with high levels of process support (EBS, TC) providing parallel communication, group memory and anonymity. The leaders/organizers – and other group members – of eight groups (groups 1, 3, 7, 12, 14, 15, 16, and 17) cited parallel communication and group memory as being important in providing the opportunity for greater participation and information exchange. Anonymity was seen to be an important – or *the most important* – contribution by ten leaders/organizers (groups 1, 2, 5, 6, 10, 12, 13, 14, 16, and 17). These ten leaders/organizers and other members of each of these ten groups reported than anonymity encouraged more open and honest discussions than would otherwise have occurred. Anonymity was perceived to reduce organizational politics ("Most organizations bring politics. With anonymity, politics is reduced. It becomes more of a team process" [group 6]) and encourage more participation, particularly of lower status participants ("People usually reluctant to express themselves felt free to take part, and we were surprised by the number of new ideas expressed" [group 17]; and "Faculty – especially senior faculty – tend to minimize the benefit of anonymity, but junior faculty appreciated it" [(group 14]). While the group members interviewed felt that parallel communication and group memory encouraged wide participation and information exchange, they perceived anonymity to improve the quality of that exchange. The effects of high process support were evident when it was not present: when some groups used tools providing lower levels of process support (IO), a few group members dominated the discussions with most lower status participants not participating (groups 5 and 14).

Process structure. The role of the facilitator in providing both global and local process structure (agenda development and chairing verbal portions of the meeting) was seen to be important or "crucial" by thirteen groups (groups 1, 2, 4, 5, 8, 9, 10, 11, 12, 13, 14, 16, and 17). Three different facilitators using different methods supported the meetings of these seventeen organizations (analogous to different professors teaching different sections of the same course). An analysis of the meeting data to determine if there were facilitator effects suggested no discernible pattern. The global process structure provided by these facilitators ensured that meeting objectives and the roles of the participants were developed prior to the meeting. The development of a meeting agenda typically required one meeting between the group leader and the facilitator lasting one to three hours for each separate EMS-supported meeting. However, in several cases, two or three pre-planning meetings were required. The value of local process structure was demonstrated in the meetings of Industry Association 1 (group 10). In a two day non-EMS-supported meeting held the previous year, this committee had developed a mission statement that was rejected by the association's board as being too narrow. As part of the EMS-supported strategic planning cycle, the committee developed a mission statement in less than two hours that was subsequently accepted by the board. The process structure imposed by the Policy Formation tool ensured that every member of the planning committee participated in the development of the statement and all potential objections to the mission statement were voiced and addressed in committee before the statement was submitted to the board.

Task structure. Task structure was provided to some groups but not all. In most cases, task structure was provided via Topic Commenter which enabled the group to use a user-defined framework to analyze the task. For example, group 1 used a seven-part framework to evaluate divisional strategic plans, group 3 debated the merits of building, buying, developing alliances, or the status quo in the acquisition of base technology, and group 17 used a variant on Porter's value chain model to develop strategies for competitive advantage. While this ability to structure the discussion was seen as important by many groups (groups 1, 2, 16, and 17), it was generally not perceived to be as important as the process support and process structure components of the EMS. Nonetheless, the leader of group 17 noted that this task structure helped "to reshape our mental models of the organization," while the leader of group 16 observed that it "allowed us to take two large and very diverse operations – a parent company and a wholly owned subsidiary – and integrate the agendas of both sets of executives in setting the framework for one strategic plan."

Task support. Task support enabled groups to electronically access and use information developed in earlier stages of the meeting and prior to the meeting. While the access to information developed earlier in the meeting was important to all groups, only a few chose to have access to information developed prior to the meeting. For example, group 1 used File Reader for divisional plans, product forecasts, and competitive analyses of rival firms.

Which of these four components was most important? While tools providing process support and process structure were used by all groups, tools providing task structure (TC) and task support (FR) were used in fewer activities (see Table 3). As most meetings were successful, this suggests that task structure and task support were not as necessary for success as process support and structure. Interviews with leaders/organizers and other participants lead to the same conclusion: while important, task support and task structure were seen to be less essential to success than process support and process structure. This suggests that EMS has the potential to add substantial leverage (through process support and structure) to the use of other SM techniques that provide task structure (Porter 1980 1985).

5.2 Understanding Variations in Success

While the use of EMS was seen to be successful by most groups, there was significant variation in mean success rating from organization to organization (from a low of 2.7

to a high of 4.8 – see Table 3). No statistically significant relationships were found between mean SM success and group size, SM activity, EMS tool, public versus private sector, hierarchy versus peers or the specific facilitator who ran the meeting. Although lacking statistical significance, there is some evidence to suggest that groups with a management hierarchy may have perceived the EMS-supported process to bring greater success than peer groups with members of equal status (hierarchy mean = 4.11, std = .52; peers mean = 3.77, std = .92; t = .84, p = ns). One important difference between hierarchical and peer groups is that hierarchical groups might experience more process losses due to evaluation apprehension and conformance pressure, thus making anonymity more useful. However, the leaders/organizers of two of the six peer groups (groups 10 and 12) cited anonymity as important due to the highly political environment within the organizations.

Three groups gave a mean rating across the thirteen measures of success below 3.0, suggesting that they perceived their EMS experiences to be less successful (groups 2, 3, and 10 in Table 3). If we examine these three groups we see weak evidence to suggest a possible pattern. The objectives of group 2's meeting were to develop short-term strategic action plans and to identify key long-term issues. The development of the meeting agenda and the selection of specific EMS tools were done in a pre-planning meeting between the Arizona EMS staff and an internal consultant. Three issues that reduced meeting success were identified by the CEO: 1) the group was not adequately prepared for a discussion of long term issues, 2) the group did not bring important electronic data (they were unaware that the EMS could provide task support), and 3) a tool providing low task structure (EBS) was used when one providing high task structure (TC) would have been more appropriate.

The objectives of group 3 were to define key aspects of one sub-area of the consulting firm's practice and to determine how the firm would acquire the base technology required to support the practice. The meeting was organized by the partner responsible for the sub-area and was attended by partners and office managers responsible for that sub-area in the major offices in the U.S. This meeting was an initial meeting to begin formulating a national strategy to standardize the practice. The objectives were not accomplished. Each member of the group had significant decision making power for his/her geographic area, but had little accountability in developing the overall U.S. strategy. The group members did not want to address the issues presented by the leader as standardizing the practice could result in a loss of their power. The outcome was not what the leader wanted, but he felt that using the EMS helped communicate the partners' concerns and identify key problems.

Group 10 spent four days over a three month period to formulate goals (resulting in a mission statement), analyze the environment (identify the needs of the association's current and prospective future members) and draft a specific plan to guide the association over the next few years. While the group accomplished these objectives (resulting in a strategic plan that was accepted by the association's board of directors), the SM process was problematic. The group leader was a non-voting member of the task force and was weak politically in the face of several strong coalitions within the task force. The agenda for the four days of meetings had been developed by the leader and was strongly challenged on two occasions during the course of the meetings. There was also confusion between the leader, several task force members, and the Arizona EMS support staff on the responsibility for between-meeting activities, such as conducting a survey of the association's members, performing the statistical analysis of the survey data, and mailing the minutes of the meeting and reminder notices to task force members. The group leader perceived no differences between the EMS-supported and non-EMS-supported SM processes, except in identifying key problem areas and fostering organizational learning, for which the EMS process was less effective.

One common thread linking these three groups was a lack of communication between the group leader/meeting organizer and meeting participants and the pressure of external circumstances that dominated meeting outcomes. With group 2, the CEO was not involved in the session planning and therefore the wrong tool was used, the group lacked complete preparations, and appropriate system capabilities were not used. With group 3, the leader had a different set of objectives than the group. With group 10, there was a lack of agreement on the agenda and poor between-meeting management. A rival hypothesis, for which there is less support, is that the lack of success was due to a politically weak leader facing a strong political coalition(s), as was the case with groups 3 and 10. However, meetings of two other groups with politically weak leaders facing strong coalitions were successful (group 12's leader was an outside consultant assisting in developing four health care delivery systems and group 14's leader was an acting department head from outside the department whose objective in the SM meeting was to determine whether the faculty should refocus their research efforts).

One general weakness in the specific EMS used in this study was also identified, along with several minor ones. Seven group leaders/organizers (groups 2, 4, 5, 8, 9, 11, and 14) felt that additional technical instruction on using the EMS and a "warm-up" or "practice" session would have improved initial group performance, as the participants were unfamiliar with the basic concept of EMS. Several other problems were identified by at least two group leaders/ organizers: information overload (groups 5 and 10), the need for stronger group dynamics leadership by the facilitator (groups 10 and 14), the need to provide expert advice on the content of the SM activities rather

than just facilitating the process (act as an SM consultant) (groups 2 and 4), the complexity of using the Issue Analyzer and Idea Organization tools (groups 5 and 15), and the difficulty in seeing all group members in the room (groups 2 and 15).

5.3 Other Ways EMS Changed the SM Process

An analysis of the case data (and interviews with the group leaders in particular) suggests that use of EMS changed two other aspects of the SM process. First, in all but two cases (groups 10 and 11), the decision to use the EMS changed the size and composition of the SM group: the group leader chose to increase the size of the SM group to include more participants from more organizational levels and/or departments. The size of the SM groups had previously been constrained to prevent ineffective meetings; the decision to use EMS lessened this constraint. The group leaders' motivations for this increase in size and diversity included increasing the information, knowledge and skills available to the SM group including those charged with implementing the strategy in its development to facilitate implementation promoting management development and organizational learning, and/or gaining political support and co-opting organizational coalitions (as previously speculated, see Dennis et al. 1988; Huber 1990).

Second, the use of EMS resulted in faster resolution of the SM activities. Leaders/organizers of nine groups (groups 1, 2, 3, 5, 7, 13, 15, 16, and 17) reported that the EMS-supported process was faster and saved significant time compared to non-EMS-supported SM processes. For example, the leader of group 16 noted that "we did in two four-hour sessions what would have taken several months to accomplish," while the leader of group 15 observed that "we did in a couple of hours what would have taken a week to do." By providing parallel communication, the EMS was perceived to have reduced the time needed to accomplish the meeting goals. However, the reduction in calendar time was even more important. The EMS focused the group on specific SM activities in a short time span. This focus and the increased size of the SM group reduced scheduling delays (decomposition of complex decisions into smaller decisions separated in time; see Mintzberg, Raisinghani and Theoret 1976), feedback delays (waiting for results of a previous activity; see Mintzberg, Raisinghani and Theoret 1976) and the need to temporarily suspend activities to seek additional information or approval from organizational entities not among the group.

5.4 Generalizability

As this was a temporal random sample (an enumeration of the entire population in a given time span) rather than a cross-sectional random sample (a randomly selected subset of a large, stable population), generalizability becomes an issue. Do these organizations differ in a meaningful way from other organizations in the "general population" of organizations or from the 202 organizations in the previous study used as a control? The organizations in this study were not selected by the researchers, but rather chose to use this EMS based on information they had gathered from a variety of sources (conference presentations, word of mouth). The organizations were about evenly divided between public and private sector (see Table 3) and most tended to be small and medium sized organizations, although two were large organizations (groups 3 and 4). Most were from different industries (although three were hospitals), with the majority being service businesses. One might expect these organizations to be early innovators and leaders in their industries (as they chose to use a new technology), but there is little evidence to support this hypothesis. While a few were recognized as innovators (groups 1 and 17) or the group leader was known as an innovator (group 9), the majority presented little evidence to suggest they were innovative. During interviews, the group leaders and other managers from several organizations suggested that their organization was slow to adopt new ideas. While there appear to be few systematic patterns to suggest that these organizations differ in a meaningful way from other organizations in the "general population," generalizability remains an issue in field-based research of this kind.

6. CONCLUSION

The results of this field study of seventeen organizations suggests that this form of EMS support for SM can enhance six capabilities found to lead to more successful SM outcomes: idea generation, identification of key problems, communication of line managers concerns, organizational learning, integration of diverse functions and operations, and anticipation of surprises and crises. We studied one EMS, the University of Arizona GroupSystems EMS, that provided process support, process structure, task support and task structure. The extent to which these findings apply to other EMS is unclear. If other EMS can provide similar degrees of these four fundamental components, then we speculate that similar effects may be observed. However, if even one aspect is lacking, there may be important differences in findings, as all four aspects were found to be important, albeit in differing degrees.

Process support from parallel communication, group memory and anonymity were key to the success of these SM groups. Process structure from the EMS software and a facilitator to develop and maintain an agenda and chair verbal discussions were also seen to facilitate accomplishing meeting objectives. Task structure and task support were important in many cases by providing needed information and helping the SM group to better analyze and understand it, but in general were less important than process support and process structure. An analysis of less successful meetings suggests a lack of communication between the

group leader/meeting organizer and meeting participants (that resulted in misunderstood meeting objectives or a mismatch between the EMS tools used and the needs of the group) and extenuating external factors were primary causes for the lack of success.

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Appendix

Scale for responses:

1 The computer supported process was MUCH WORSE than a manual process
2 The computer supported process was WORSE than a manual process
3 No difference
4 The computer supported process was BETTER than a manual process
5 The computer supported process was MUCH BETTER than a manual process
NS Not sure or Not Relevant

How would you compare the computer supported process to a manual process in the ability to:

1.	Enhance the generation of new ideas	1	2	3	4	5	NS
2.	Identify new business opportunities	1	2	3	4	5	NS
3.	Identify key problem areas	1	2	3	4	5	NS
4.	Enhance innovation	1	2	3	4	5	NS
5.	Communicate top management's expectation down the line	1	2	3	4	5	NS
6.	Communicate line managers' concerns to top management	1	2	3	4	5	NS
7.	Foster organizational learning	1	2	3	4	5	NS
8.	Integrate diverse functions and operations	1	2	3	4	5	NS
9.	Foster managerial motivation	1	2	3	4	5	NS
10.	Foster management control	1	2	3	4	5	NS
11.	Anticipate surprises and crises	1	2	3	4	5	NS
12.	Flexibility to adapt to unanticipated changes	1	2	3	4	5	NS
13.	Overall, how did the computer supported process compare to your traditional approach to the planning task that you performed?	1	2	3	4	5	NS

If you have any comments about any of the aspects of the system, we would be interested in hearing them. What aspects of the system were useful? What aspects were less helpful and should be improved?