Case and Field Studies of Group Support Systems: An Empirical Assessment

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Abstract

This paper presents the results of 38 case and field studies from 57 published papers spanning two decades of group support systems (GSS) research. It organizes the methodology and results of these studies into a four-factor framework consisting of contextual factors, intervening factors, adaptation factors, and outcome factors. The results show that the modal outcome for a GSS in field settings is to improve performance relative to manual or other methods as measured by effectiveness, efficiency, consensus, usability, and satisfaction in 91.5% of the cases. These are much more positive results than have been obtained in laboratory experiments. The reasons for the differences in findings and the research and development issues raised by the findings are explored.

1. Introduction

In the era of the Internet, millions of people are glued to their work stations for hours a day, and even "old style" Fortune 500 companies are adapting some characteristics of the virtual organization. Yet, though Group Support Systems (GSS) are far from "dead" and "more like "a cathedral whose foundations have been laid and whose supporting pillars are under construction" [4, p. 18], one wonders why the GSS spaces are relatively empty while the online shopping malls are crowded. This paper completes an empirical summary and analysis of the foundation research and provides some speculations about how the research and development pillars for GSS should be designed. It summarizes published field studies on GSS use (by "real" groups in "real" meetings) to date, and compares them to the results of laboratory experiments.

DeSanctis and Gallupe's [12] seminal paper defined Group Support Systems (GSS) as combining "communication, computer, and decision technologies to support problem formulation and solution in group meetings" (p. 589). Nunamaker [30, p. 357] defines GSS as "a set of techniques, software and technology designed to focus and enhance the communication, deliberations and decision making of groups... [They] ease the cognitive load of teams working in concert toward a mutual goal." Briggs, Adkins, Mittleman, Kruse, Miller, and Nunamaker [3, p. 153] define GSS as "a suite of network-based software tools to support coordinated and concerted team efforts toward a goal." Our definition of GSS, building on earlier formulations and looking at what is being used now, is: "a computer-mediated communication system that includes software designed to support a group of people in carrying out a task by providing tools and/or embedded structures to support cognitive and interaction processes." Generally there is a "suite" of tools and processes that can be selected from to match the type of task being performed and the size and characteristics of the group. Thus, electronic mail is generally excluded from definitions of GSS because it is not specifically designed for groups and does not have specific tools to support group work. Likewise, we would exclude video conferencing which may include software to connect people meeting or working together in different places, but which does not have any software that could be considered a "decision support" or "cognitive load easing" set of tools.

In a prior series of papers, more than 200 published experiments on Group Support Systems (GSS) were codified and analyzed in order to summarize the state of research in this area, including the methods of study used and the findings [16,17,18]. This paper presents the results of a parallel study of case and field studies of GSS described in refereed journal articles or conference proceedings, including a comparison of the results of the two types of studies, and some suggestions and research questions that should be taken into account in order to improve the usefulness of future field studies to the research community.

This study can be viewed as an updating of prior papers [9,42] which compared laboratory and field research on GSS conducted in same-time, same-place decision rooms. It includes many more studies of course; the prior paper found ten field studies and 24 experiments that had been published in journals through the summer of 1990, whereas this one, a decade later, is based on 38 field studies and 200 experiments. The technology scope of the present

study is also different, since it includes distributed and asynchronous GSS as well as decision room studies. Besides looking at any differences in findings which we identify, we will also compare the current situation to that reported a decade ago.

2. Conceptual Framework and Analytical Process

The distinctions among "field studies," "case studies" and "action research" are not totally clear nor consistently agreed upon. They all have in common that a naturally occurring group is working on a task of interest or importance to it. A case study usually means a field study that is an in depth set of observations about a single example, involving the observation or description of the phenomenon of interest over a period of time. In conventional case and field studies, the researcher tries to limit active intervention that would affect the outcome of interactions among the subjects being observed. In "action research," on the other hand, the researcher tries to use his or her skills or knowledge to help the participants to successfully implement a social change, and/or to achieve their objectives. For example, in GSS action research, the researcher is often also the facilitator who helps the subjects to choose an agenda and procedures and technology and who actually guides the group through its decision making process. The lines between "case," "field," and "action" research are somewhat blurred, and all three are included in the analysis reported in this article.

2.1 Studies Included

We located 38 different case and field studies, published through mid-1999, that met our criteria for this analysis. First, the study had to be published in an English Language refereed journal or conference proceeding, e.g., unpublished dissertations or conference presentations are not included. Secondly, they were studies of one or more specific groups, which we defined as comprising at least three members. Third, they used a computer-based system with at least minimal features designed to support group communication and decision making processes. The study had to be an action research, case or field study that required the group to work on a specific task, and that posed some sort of research question and collected some data to help to answer this question. The task in most cases was a "real world" task with no right or wrong solution. In three cases the task was part of the requirements for a course.

Examples of studies that were excluded because they did not meet one or more of these criteria include Vandenbosch and Ginzberg's [44] field study of the use of Lotus Notes in an insurance company. It looked at the use and impacts of the system across the organization, rather than focusing on any particular group doing any specific task. Also a study by Williams and Wilson [47] was excluded because it was primarily an assessment of individuals' perceptions about GSS systems.

The results of some studies were presented in more than one paper; if the design of the study and description of the organization, subjects and task were the same, the different papers were determined to be on the same study, and were given only one number. We thus have a total of 57 papers on the 38 different studies.

2.2 The Theoretical Framework

To organize the information in the studies, we used a modification of the comprehensive theoretical framework previously developed to integrate and analyze all of the information for experimental studies of GSS. This integrated framework was developed on the basis of various contingency theory approaches to explaining GSS success, to provide complete coverage of factors present in the literature as a whole, and has been previously published [15,19] and will not be reproduced here. It classifies for coding, aspects of the methodology of the studies, the contextual factors (independent variables), intervening and adaptation variables, outcomes (dependent variables), and conclusions.

3.3 Categorization of the Studies and Results

The major aspects of the methodology and outcomes of field studies on GSS, using the study as the unit of analysis, have been coded and put into a database and organized into charts. Appendix 1 shows what studies are included and the references. The two authors both coded several studies until agreement was reached on an appropriate set of categories, and reliability attained for the coding itself. Appendix 2 summarizes the methodology and other parameters for each study, and Appendix 3 summarizes the results. Tables 1 to 3 are summary counts of the variables from these charts (the appendices are available from the first author).

There are 13 different journals and three conference proceedings represented in the list of published case and field studies. As with experimental studies of GSS, the Hawaii International Conference on Systems Sciences (HICSS) is the most frequent forum for presentation of GSS field studies; a total of 12 studies have appeared only in HICSS proceedings thus far, and another 8 were published there first, and subsequently in a journal. Fourteen papers have been published in *Journal of Management Information Systems*, and five *in Journal of Organizational Computing.*

The following information was recorded and stored in the data bases:

- Studies classified by author number and study number.
- Journal: Journal, conference, and year.

- Technology characteristics: type of GSS/CMC, brand name, time (synchronous/asynchronous), proximity (decision room, distributed).
- Design: (i.e. Case, Field, and Action Research).
- Theoretical or conceptual framework used, if any
- Data collection methods
- Organizational context: nature and size of organization
- Study parameters: group sizes, total number and type of subjects, session lengths, number of sessions, etc.
- Intervening factors: Training, number of sessions, session length, and data collection methods.
- Results: Listing of Outcomes, focusing on any reported results for effectiveness, efficiency, consensus, process satisfaction, outcome satisfaction, usability and participation from the studies; but reporting any results and conclusions presented by the authors.

2.4 What Has Been Studied: Contextual Factors

Table 1 shows the counts for the technology sub-factor. Table 2 highlights the counts for group and context sub-factors of the contextual factors and the intervening sub-factors.

2.4.1 Technology

Communication Mode: Group Support Systems have been classified into three primary types (Table 1): "DSS" (Decision Support Systems) GSS, or "CMC" (Computer-Mediated Communication). A DSS is designed to support an individual decision-maker with a specific application; one of the studies employed this sort of system, with one terminal available for the group to use. "GSS" refers to a system primarily designed for a "decision room" application or other synchronous (same time) situation, which allows communication to take place via audio and/or video media. The GSS consists of tools to enforce structure (e.g., anonymous brainstorming, parallel communication, group memory) on portions of the group's communication and deliberation, or to assist decision-making (e.g., voting tools and other organizing tools). The majority of the studies (76.3%) used a GSS.

CMC refers to a system designed primarily to support group discussion, such as a computer conferencing system, that may or may not have GSS tools included. It is usually used asynchronously, through the Internet or other computer networks. A total of eight studies (21%) used a CMC system.

Systems: Eleven different systems were used. GroupSystems (developed at the University of Arizona) and its predecessors accounted for 45% (17/38) of the GSS systems; SAMM from the University of Minnesota and EIES from The New Jersey Institute of Technology were used in four instances.

Tools: The tools included in GroupSystems and its predecessors are the most frequently employed, not surprisingly. The most frequently used task support tool is Brainstorming (17 studies) for idea generation, followed by Voting (10), Topic Commenter (8), Issue organizer (7), and Ranking (4). These tools were primarily used by the groups to elicit new ideas and organize them. It is interesting to note that only a few specialized tools were used: IDEF tools (3), Nominal Group Technique (1) and Multicriteria decision-making (2).

Process Structures: Seventy-nine percent of the studies were synchronous decision room based. Of the eight studies that were asynchronous, six were used in organizational settings [22,25,26] and the EIES field studies [21,24]; the other two were used in an academic environment [23,29]. Anonymity was used in 58% of the studies. As Dennis, Tyran, Vogel and Nunamaker, [11] suggest, anonymity is one part of a three tiered system (anonymity, parallel communication, and group memory) that makes GSS very effective for organizations.

Level: The "level" of the GSS or CMC system is a rough coding of its sophistication in terms of GSS features, and follows the descriptions of "level 1" and "level 2" systems by DeSanctis and Gallupe [12]. The majority of the systems used (84.2%) are level 2 systems.

Facilitation: In contrast to the experimental studies [16] where 70.5% did not employ a group facilitator to help coordinate the interaction, the case and field studies primarily used facilitation methods (79% or 30/38 of the studies). The positive effect is computed as in [16] where the seven categories of results are aggregated by positive or negative results. Those studies that did employ a facilitator achieved a 42.9% overall positive success rate as compared to a 16.3% overall positive outcomes for the studies which did not use a facilitator.

2.4.2 Group

In experiments the group variables (Table 2) have been treated either as independent or as moderator variables [16]. However, in the case and field studies all of the group variables were treated as moderator variables. It was surprising that most studies did not report whether the groups were established or ad-hoc. The bulk (95%) of the experimental work was performed with ad-hoc groups.

Group composition: In contrast to the experimental studies where 73% of the subjects were undergraduates, the case and field studies utilized mostly (92%) professionals. Managers, senior managers or professional staff were utilized in 30

studies, military or Department of Defense personnel in another four instances. Students were used only in three studies [23,29,48].

We [16] discussed the issue of the generalizability of the results of GSS experiments, which are so heavily based on the use of students as subjects. Obviously, one of the benefits from case and field studies is the generalizability of the results, especially since 92% used professionals as opposed to students as subjects.

Leadership: Most organizational project groups have leaders. However, most of the studies (28 instances) did not report if there were assigned leaders for the task groups. There were ten studies that did report that task or group leaders were involved.

2.4.3 Task

Task is the primary reason for the group to exist. Poole, Siebold, and McPhee [34] suggest that it alone can account for 50% of the variance in group performance.

Task Type Implementation: Fourteen different categories of task implementations were used in the case and field studies. Only one was a hypothetical task typically used in the experimental research environment, the foundation task used by [48]. One third of the tasks were strategic planning and seven were business process reengineering tasks.

2.4.4 Context

This includes environmental and organizational variables. The case and field studies did not report many important bits of information, such as the environment, time pressure, and culture. However, for generalizability, 13 different organizational types were used. The largest of them was the US government with seven studies, followed by six from manufacturing and six from university settings. There were also two from foreign governments [14,37,38].

Another surprising finding is that no studies investigated decision making in cross cultural or multi-national organizations. This area has also been relatively neglected in the experimental research, although there have been a number of experiments over the last few years.

2.5. What Has Been Studied: Intervening Factors

The intervening variables include two major categories: methods and summary constructs (summary constructs are beyond the scope of this paper, see [15]. Methods represent the basic manipulation or conditions that are available to the researcher, such as study design, task implementation, session length, number of sessions, and training (Table 2).

2.5.1Method.

Study Design (type): Fifty percent (19 of 38) of the studies were described as case studies and another 29% (11 of 38) were field studies. Six studies were action research [3,6,8,25,26,36]. There were two quasi experimental field studies [5,7].

Training is the opportunity for the group to become familiar with the system itself, the tools to be used, the procedures to be followed, and the other group members, before being presented with a task to perform. Eighteen studies do not report on this important detail of the methodology at all. Another 14 mention that some sort of training was given, but no details are provided. Only one study described the training [27].

Number of Sessions: Fifty-three percent (20 out of 38) studies did not report the number of sessions that the groups participated in. 42% of the case and field studies did have at least two or more sessions.

Session Length: In the experimental studies, 50% permitted the groups to spend only one hour or less on the task. By contrast, in the case and field studies, 70% of the groups spent extensive time on their task: either they had multiple sessions (9), or between 1 and 4 days (7), or between 1 and 3 weeks (6), to complete their tasks and seven studies were asynchronous.

Group Size (Subjects per group): The ranges for the number of subjects per group are very variable. All of the ranges go from five or six subjects per group up to 60 plus. In contrast to the experimental studies where the modal group size is three, the case and field studies have large group sizes.

Data Collection: Most of the studies use multiple means to collect data. Thirty percent of the studies use questionnaires, 23% use post case interviews, and 137% use session logs to aid in the analysis.

2.6. Outcome Factors

Table 3 shows the results of the outcome factors for the 38 case and field studies. Unlike the experimental results, most of these results are based on subjective perceptions from questionnaires or interviews.

Efficiency: 66% (25 out of 38) case and field studies conclude that efficiency was improved over manual or face-to-face methods. 96% (25 out of 26) of those that measured efficiency outcomes report improvements. For example, Adkins et. al.'s [2] study of strategic planning for the air force found that groups with GSS spent an average of 8 meeting hours to complete their plans, whereas groups without it spent 17.7 hours. In Dennis et. al.'s [10] study of a multinational corporation, traditional face to face groups took 20 to 100 days to build models for clients, whereas those with GSS took from 4.5 to 13 days. Likewise, members of the Joint Electronic Devices industry standardization committees reported that using asynchronous CMC sped up their formulation and completion of standards significantly [21,24].

Effectiveness: 74% (28 out of 38) of the studies report improved effectiveness. For example, Alavi's [1] study of the use of the Vision Quest GSS in a Fortune 500 company found that it increased the number and quality of ideas. DeSanctis et. al.'s [13]

study of planning teams at Texaco reported that decision quality was improved when the SAMM GSS was used. In a routinized application of GSS in two organizations, Van Genuch, et al [43] found that the effectiveness of GSS meetings was significantly greater than that of traditional meetings, for finding defects in software development documentation.

Satisfaction: Three separate measures of satisfaction are included: process satisfaction, outcome satisfaction, and participation. Process satisfaction was rated high in 13 of 14 instances; there were no measures in 24 instances. In an early field study [9] the EMS group demonstrated satisfaction with the computer-aided process and felt the it was fair and otherwise satisfying. Outcome satisfaction was rated improved in seven instances (there were 31 studies in which there were no measures). Participation due to computer-based systems was reported to be improved over other methods in 9 studies. In one case [13] group members were reticent, contributing little in verbal discussion, but willingly used the GSS to enter their ideas and opinions when the opportunity arose. The results strongly suggest that groups are more satisfied with the technology and processes of GSS, compared to manual or face-to-face meetings.

Consensus was measured only in six instances, five of which are positive. Quaddus, and associates [36] suggested that the use computer-based systems and process permitted the group to agree on the strategic direction to pursue. In another instance [35] noted that the groups spent 11% of there time in consensus sessions.

Usability of the systems is perceived positively in 10 of the 12 studies that measured it.

Overall Outcomes combines all of the results measures listed above. In comparison to the experimental studies, where the overall positive effects of GSS technology were only 16.6%, we report here that the overall positive effects on the outcome measures occurring for the case and field studies is 91.5% (97 out of 106).

3.0 Summary, Discussion, and Conclusions

We have seen that GSS, when used in organizations to support group work, has been declared a "success" 91.5% of the time. Why are the results so different from those for experimental research on GSS? Why don't we have more case studies reporting on GSS use, and what are the problems with case and field studies on GSS? More importantly, why are there so few reported examples of the "institutionalization" of GSS as an everyday tool in organizations?

3. 1. Comparison to the Results of Experimental Studies

In looking at the findings of experimental studies of GSS, we found a preponderance of "no difference" results, overall, for measures of the extent to which use of a GSS resulted in a statistically significant improvement to outcomes, compared to unsupported face-to-face meetings. The results of the field studies appear to be much more (91.5%) positive. The findings are not really contradictory, if one also looks at the conditions under which positive outcomes for GSS were statistically more likely to be proven. Below are these conclusions from the experimental studies [16], shown as an italicized, numbered list of factors which tend to produce more positive outcomes in experiments, with comments about how these conditions were "naturally" met in most of the field studies.

1. *Use a "level 2" system with sophisticated analysis tools built in* (Most of the field studies do).
2. *Use subjects who are likely to be knowledgeable and motivated about the task; e.g., graduate students rather than undergraduates.* (By definition, field studies use participants who are normally engaged in the type of task being performed and who are doing their "real" work, thus providing participants who are motivated to achieve a positive group product, and prepared to participate in its creation.)
3. *Aggregate the subjects in medium to large sized groups—at least 6, 10 or more is even better.* (Most field studies are of groups of six or more, and the majority of field study groups are larger than 10 persons).
4. *Make sure that there are sufficient groups per condition to provide adequate statistical power, at least 7 to 10 groups per treatment condition.* (The field studies do not use control groups at all, in most cases; only impressionistic comparisons by participants are gathered; no statistical tests of differences between groups with and without GSS are performed.)
5. *Give the groups a facilitator and plenty of time (ideally, unlimited time).* (Almost all field studies do use a facilitator (or group moderator, in the case of distributed CMC), and do not artificially constrain interaction to one short session of less than an hour, as do most of the laboratory experiments).
6. *Use a task type that is most likely to benefit from GSS and is matched to the communication medium…A planning task is especially likely to benefit from GSS.* (Most of the published field studies of GSS use a type of planning task, such as Business Process Reengineering or strategic planning).

3.2 Research and Development Issues for GSS

One glaring methodological problem with case and field studies is that the vast majority do not use any theoretical constructs to frame their research and analysis. Without a theoretical foundation, a case study is unlikely to be able to contribute to general theories about the conditions under which GSS are more or less useful for groups and organizations.

To what extent do groups that use a GSS once, continue to use it routinely? In other words, do field implementations of GSS tend to be one time events, or a permanent change in organizational communication and collaboration patterns? This question is important to the future of GSS, but generally not answered in the published literature, because it requires a longitudinal study. It would be very desirable for future case studies to include a follow-up 6-12 months later (as did [35,38]) to find out what happened to the innovation, and to document factors related to the successful incorporation of the technology into an organization, or for little or no use following the initial implementation.

In their study of technology adoption for the US Navy, Briggs et al [3] reported that infrequent ad-hoc use hinders self-sustenance. Furthermore, they suggested that in order for the GSS to be continually used it had to support a specific continual process.

Likewise, early asynchronous research Hiltz [20,21] also demonstrated groups that were self-sustaining over a period exceeding seven months. The groups were involved with operational tasks, such as:

- Design and agree on new product standards to be recommended for official adoption by ballot
- Provide scientific information to state legislators, on request
- Update and validate by consensus, contents of a NLM database ("knowledge bank") on viral hepatitis, including reviews of 850 new papers.

The next generation of GSS thus needs to be designed to be used with tailorable repeatable processes, for supporting "routine" tasks. When group members have integrated routine uses into their work patterns, they can then easily use other features of the system to support short-term or sporadic needs, such as annual planning.

Conversations with several GSS researchers have suggested that one problem with institutionalization of "decision room" technology is that it generally was designed to require a skilled, trained facilitator and training for the participants, in order to be used effectively. To achieve widespread diffusion, "the user interface and system functionality must be such that virtually anyone can employ the technology. New users must be able to begin using systems for productive on-task work within 30 minutes and then be able to scale up their sophistication to use new features… " [30, p.365]. The facilitator is usually supplied by the academic researcher during a case study for research purposes. However, a variety of factors may be related to the lack of permanent replacements for such an outside facilitator, even if the organization acquires permanent access to the software. As Briggs et. al. [3] point out in their study of GSS aboard the U.S.S. Coranado, many organizations have very high rates of transfers and other forms of personnel turnover; no sooner is a facilitator trained than he or she is likely to be geographically moved away from the site of the decision room in the organization. Secondly, being a GSS facilitator is not likely to be anywhere near a full time job in an organization, and the motivations and career path for such persons is not clear at all. Thus, there is the suggestion that in order for GSS to be routinely used in organizations, it will need to be constructed so that an internal group leader or leaders can very quickly (e.g., in less than half an hour) learn how to use the software to carry out support functions for the group.

Besides making it easier for a group facilitator to be able to assume the role with a minimum of training, it also seems obvious that GSS has to get on board the World Wide Web. The most frequent personal and organizational use of information technology today is to fire up a web browser and to use software that is "web compatible" to send and receive things. Though asynchronous GSS actually pre-date synchronous ones [40], most studies of GSS have been of systems that were not accessed via a web browser, and were confined to decision room use, rather than being "anytime-anywhere." The next generation of GSS, if it is to find widespread success, needs to have the sophisticated features of many decision room systems, but also the "anytime-anywhere" ability to have all group work stored for later, asynchronous continued work. In other words, GSS systems need to support group communications 24 hours a day and offer the flexibility of being used synchronously or asynchronously [39, p. 94], with no difference in the form or permanence of the stored record of the group interaction.

Over five years ago, Turoff et. al [41, p. 399] wrote:

> In the 1990's, informational networks are predicted to "help far flung companies and entrepreneurs link up and work together from start to finish" (Business Week, 1993). … The computer systems to support these often temporary and rapidly changing, geographically distributed task forces and partnerships will combine characteristics of computer-mediated communication systems (CMCS) and group decision support systems (GDSS) to create "distributed group support systems" (DGSS). Such computer facilities will need to support the full range of tasks involved in projects, including planning, budgeting, gathering information, resolving conflicts, and making decisions.

These R&D goals remain as a challenge to be realized. Mandviwalla and Gray [28] in their assessment of the current state of GSS provide us with a broader set of action items for GSS research, which they say should:

- Emphasize complex tasks and realistic subjects.
- Emphasize experiments that use similar designs and that focus on a related topic so that results may be pooled for meta-analytic studies.

- Encourage the continued development and use of qualitative methodologies.
- Encourage theory-based and testable systems development research projects and methodologies.
- Embrace new commercially available technologies and maintain a strong link between what is being used in industry and what is being studied.
- Embrace systems that are based on different perspectives.
- Expand beyond face-to-face meetings and focus on asynchronous and distributed work that involves more than just textual interaction.

Nunamaker, Briggs, Mittleman, Vogel, and Balthazard, [31] present a series of lessons learned about GSS in organizations based on over 4,000 working session.

- GSS technology does not replace leadership.
- GSS technology does not imply any particular leadership style.
- GSS can make a well planned meeting better, and it can make a poorly planned meeting worse.
- Individuals must have incentive to contribute to group effort.

These action items [28] and lessons learned [31] suggest that we still have a long way to go in terms of designing and building GSS systems to support organizational groups.

There is a saying from history, "Rome was not built in a day." This also is true for organizational decisions and projects; like the building of Rome, complex tasks take time. Organizations depend upon groups to build these decisions and projects. GSS researchers need to provide them with the right set of tools at the right time. From the experimental research arena Fjermestad and Hiltz, [16] reported that significant improvements in group performance due to GSS use increased to 29% from 16.6% when decision-room GSS was used solely on idea generation tasks (with the proper number of groups per treatment condition). CMC technologies were at their best when used on decision making tasks (53.8% of these experiments showed significant improvement), with the equivalent number of groups per treatment condition. Ocker and associates [32,33] report that groups using a combined from of communication (face-to-face meeting and asynchronous CMC) have higher project quality than groups with a single mode of communication.

Tomorrow's GSS systems will permit groups to work together "anytime, anywhere." Project teams can have decision room meetings and continue work together through the World Wide Web. When a project leader sees that the group is not progressing as needed he/she will be able implement process support changes because the GSS will be flexible and responsive to the needs of the group. When these conditions prevail, then the extraordinarily positive impacts that have been observed for GSS in field research studies should translate to everyday use in organizations that significantly improves their productivity.

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Table 1
FACTORS MODEL
CONTEXTUAL FACTORS
(Unit of measures is Case)

4.1 TECHNOLOGY

Task Support: Tools

Agenda.....1
Computer Model.....1
Alternative Gen....2
Group Outliner.....2
Cross Impact.....1
Topic Commenter....8
Ranking.....4
EBS.....17
IDEF.....3
Voting.. 10
Issue Organizer....7
NGT.....1
Standard Package...5
MCDM.....2
Policy.....3
None..... 3
Catagorizer.....2
Cost Benefit.....1
Other.....8

Process Structure

Group Proximity

Dispersed..... 8
Decision Room..30

Time Dispersion

Synchronous...30
Asynchronous...8

Anonymity

Anonymity (A)...22
Identified (I)..16

Levels

Level 1.....6
Level 2.....32

Facilitation

Facilitator.....29
No Facilitator.....8
Chauffeur.....1

Communication Mode

CMC.....8
DSS.....1
GSS.....29

Design-GSS System

Decision
Conference.....1
DecisionAnalytics.1
EIES.....4
Email.....1
EMS.....1
Facilitator.....1
GroupSystems.....16
Plexcenter.....1
PC Work Station...1
Groupwise.....2
SAMM.....4
TeamFocus.....2
Teamate.....1
Vision Quest.....2

Table 2
FACTORS MODEL
CONTEXTUAL and INTERVIENING FACTORS
(Unit of measures is Case)

4.2 GROUP

Group Composition (Subject Type)

Professionals..... 20
Management..... 3
Senior Management.....7
Military.....4
Software Engineers..... 1
Students..... 3

Leadership

Leader.....10
Not Reported or no Leader ...28

Task Implementation

Alternative..... 1
BPR.....7
Competitive Advantage.....1
Contract Negotiation.....1
Economic Development. 2
Idea Generation.....1
Judgment 2
Manufacturing.. 1
Planning. 5
Models. 1
Software Development. 1
Strategic Planning.....13
Course Project.. 1

4.4 CONTEXT

Organization Types*

University..... 6
Manufacturing.....6
Computer..... 3
Communication.....1
Government..(US)..... 7
Government Non-US..... 2
Medical/Hospital 3
Utility 2
Military/Defense 6
Oil 1
Consulting..... 2
Other..... 5
University Course. 2

Task Structure

Strategic.....21
Tactical..... ..14
Operational.....3

*More than one organization was included in some studies.

INTERVENING

Method

Action Research.....6
Case Study.....19
Field Study.....11
Quasi Experimental
Field Study.....2

Number of Sessions

1.....2
2.....5
3.....3
4.....2
5.....2
6.. 1
8.. 1
13.. 1
29... 1
NR 20

Training

Not Reported.....18
Training Mentioned.....14
None... 2
120+ min..... 2

Session Length

< Day.. 6
1 < 4 Days..... 7
1 < 3 Weeks..... 6
Multiple Sessions.....9
Asynchronous.....7
Not Reported.....3

Group Size
(Subjects per group)

range to 10 or less.....10
range to 20 12
range to 30.....4
range to 40.....2
range to 60 plus.....3
Not Reported.....7

Data Collection

Questionnaires...25 Interviews.....19
Observations... ...16 Session Logs...11
Case Reports.... ... 2 Metrics..... 1
Self Completion. ..1 Project Grade....1
Comparisons.....2 Comments.....1
Ideas generated.... 1 Not Reported.....3

Table 3
FACTORS MODEL
OUTCOME FACTORS
(Unit of measures is measure)

1. EFFICIENCY Measures

Improved.....25
No difference.....1
No Measures.....12

4. CONSENSUS Measures

Improved.....5
Did not improve.....1
No difference.....0
No Measures.....36

5. USABILITY Measures

Improved.....10
Did not improve..... ...1
No difference.....1
No Measures.....26

3. SATISFACTION Measures

Process Satisfaction

Improved.....13
No difference..... 1
No Measures.....24

Outcome Satisfaction

Improved.....7
No difference.....0
No Measures.....31

Participation

Improved.....9
Did not improve.....1
No difference.....0
No Measures.....28

2. EFFECTIVENESS Measures

Improved.....28
No difference.....3
No Measures.....7

Improved:

Process support
Process structure
Task structure
Information exchange
Role perceptions
Communication
Number of ideas
The ability to deal with task complexity
Cohesiveness
Flexibility
Divergent and convergent
Enriched communication
Improved focus
Increased number of ideas
Reduced stress