THE EMPIRICAL LITERATURE OF EVALUATING THE EFFECTIVENESS OF INDIVIDUAL AND GROUP DECISION SUPPORT SYSTEMS: A META-ANALYSIS AND A NARRATIVE REVIEW

BY

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INTRODUCTION

1.1 Introduction to the Problem

Computerized decision aid systems are playing an increasingly significant role in all aspects of managerial decision making in modern organizations [Koester and Luthans, 1979; Huber, 1984; Gallupe, 1986; Cooper, 1988]. Such systems provide the managers with specific decision analytic techniques that help managers to structure their decision processes and quantify their preferences and supposedly make better decisions [Aldag and Power, 1986]. As a result, considerable investments are being made in the technological development of decision aids. Consequently, a need is established to determine the effects of decision aids on the effectiveness and efficiency of human decision making. Beginning in the middle 1970's, there has been an upsurge of interest in the effectiveness of decision aids [e.g., Kozar, 1972; Mason & Mitroff, 1973; Swanson, 1974; Lucas, 1975a, 1975b; Schewe, 1976]. Several review studies have attempted to explain inconsistencies in the results of prior studies regarding the effectiveness and efficiency of Decision Support Systems (DSS) [Dickson et al., 1977;

Courtney et al., 1983; Aldag and Power, 1986; Sharda et al., 1988] and Group Decision Support Systems (GDSS) [Gallupe, DeSanctis & Dickson, 1988; Dennis, George, Jessup, Nunamaker & Vogel, 1988; Pinsonneault & Kraemer, 1989]. However, these inconsistencies are not yet resolved and still cloud understanding of DSS/GDSS effectiveness.

Some past reviews of DSS/GDSS effectiveness literature have attempted to explain these inconsistencies [i.e., Sharda et al., 1988] but such explanations have been incomplete and unsupported by empirical evidence. Part of the problem is that these reviews have been narrative. Though a narrative review affords the opportunity for special insight about the classification of phenomena and limitations of the studies, it is not the most effective way of generating a consistent summary of results that is readily comparable across studies [Hedges and Olkin, 1985; Montazemi and Wang, 1988-89]. Because previous reviews of empirical literature on DSS/GDSS effectiveness [e.g., Courtney et al., 1983; Cooper, 1988; Dennis et al., 1988] have relied on narrative procedures, competing explanations of variation in estimates and conflicting findings are often put forth as conclusions rather than hypotheses in need of testing.

Research reviews can be classified in four categories [Jackson, 1980; Cooper, 1982]. The first type identifies and discusses new developments in a field. The second type uses *empirical evidence to highlight, illustrate, or assess a particular theory or to tentatively propose new theoretical frameworks. The third type organizes knowledge from divergent lines of research. The fourth type is an integrative review that attempts to compare and contrast findings across studies in a particular area.*

Meta-analysis is a technique that belongs to the fourth type and has recently been used to integrate research findings [Glass, 1979; Glass, McGaw, and Smith, 1981]. It treats the findings of individual studies as dependent variables and examines those findings as a function of one or more independent variables in an attempt to account for the variation in results across studies. The independent variables investigated, typically, include both the substantive (moderator) and methodological (i.e., sampling and measurement error) factors that can influence results. In essence, "meta-analysis is the application of the principles of primary research methodology to the review and integration of the findings of a body of studies" [Churchill and Peter, 1984]. Meta-analysis offers a systematic procedure for reviewing evidence from available studies, permitting not only statistical aggregation of research findings, but also a formal assessment of the influence of between-study moderators of the relationship.

This study examines empirical studies of the effectiveness of DSS/GDSS; and using meta-analysis it *compares and contrasts the findings and investigates the variables that moderate the magnitude of these findings across studies. Differences across studies are explained and reconciled, and a resulting foundation for further research is established.*

1.2 Purpose of the Study

A basic premise of DSS/GDSS implementation is that more effective decisions will be made with the DSS/GDSS than without. Traditional cost/benefit analysis is rarely applicable to justify the expenditures spent on DSS/GDSS due to the fact that most of their payoffs are intangible [Oxenfeldt, 1979; Keen, 1981; Melone and Wharton, 1984; Money, Tromp, and Wegner, 1988]. Therefore, many DSS/GDSS are justified by measuring the improvement in decision making effectiveness [Burkhard, 1984]. This study will investigate the effects of DSS/GDSS on decision making effectiveness and efficiency through a meta-analysis of relevant empirical studies. The use of meta-analysis will permit aggregation of the empirical evidence of previous research to validate or invalidate the claim that DSS/GDSS improve decision making effectiveness. This will provide information to address the question of how effective are DSS/GDSS, by testing the relationship between the availability (use) of DSS/GDSS technology and the effectiveness of decision making as reported in the *literature.*

The use of the meta-analysis technique is expected to result in conclusions that are more substantive and more generalizable than the previous narrative ones. The goal of meta-analysis according to Glass [1979] is larger than simply summarizing the outcomes of sample research. Its purpose is not only to evaluate a treatment and its effect (e. g., the level of decision aid technology and the effectiveness of decision making) but the method of research and the taxonomical (the natural classification of relationships) structure used by researchers in a field.

Applying the meta-analysis technique can help to direct future research more efficiently [Cooper, 1979]; increase the effectiveness with which policy decisions are made [Light, 1979]; and disseminate scientific information to wider audiences [Cooper & Rosenthal, 1980].

1.3 Significance of the Study

It is argued that DSS/GDSS should be treated as any other input into the firm and as such should be evaluated against resulting outputs. Consequently, evaluating MIS/DSS/GDSS system effectiveness is of great concern to managers and researchers. DeSanctis and Gallupe [1987] propose that effectiveness and efficiency be considered the long term objectives of GDSS. Vogel, Nunamaker, Applegate and Konsynski [1987] list effectiveness, efficiency as goals *of a GDSS. Huber [1984] also suggests effectiveness and efficiency as necessary for a successful GDSS. Several studies have been done in the past to determine the relative importance of measuring management information systems (MIS) effectiveness among other key issues in the field of management information systems as perceived by business executives. In a study by Dickson et al. [1984], measuring and improving information systems effectiveness/productivity was ranked fifth among the top ten key MIS issues as perceived by managers. In the Hartog and Herbert survey [1986], measuring productivity and effectiveness of MIS was ranked fourteenth. In a later survey study done by the same authors [Herbert and Hartog, 1986], measuring information system productivity was rated nineteenth among the other twenty three key issues, whereas it was ranked second in an earlier study by Ball and Harris [1982]. In a recent study done by Brancheau and Wetherbe [1987], measuring information system effectiveness and productivity was ranked ninth among twenty other key issues. From these studies we can see a general agreement among business executives that DSS/GDSS should be evaluated to determine their effectiveness and efficiency in decision making contexts.*

Regardless of the differences in the outcomes of these studies, it is clear that measuring the effectiveness of MIS, in general, is of great concern to business executives. Meanwhile, effectiveness measurement continues to be a critical problem as organizations invest more and more money in DSS/GDSS. This investment along with the conflicting results of past research regarding the usefulness or effectiveness of DSS/GDSS [Crowston and Treacy, 1986; Sharda et al., 1988] underscores the need for more conclusive research on effectiveness of DSS/GDSS.

1.4 Organization of the Dissertation

This dissertation is organized as follows. Chapter I (this chapter), introduces the research area, presents the purpose and scope of the study, and identifies its importance. Chapter II provides an in depth discussion of literature upon which this study is based. In Chapter III, the research methodology used in this study to determine the DSS/GDSS effectiveness as reported in the literature is outlined and discussed. A description of the analysis and the detailed results are presented in Chapter IV. The final chapter, Chapter V, contains a summary of the research methodology and the findings, limitations, and implications of the study. The contribution made by this research and a discussion of important future research complete the chapter.

CHAPTER II

THE LITERATURE REVIEW

2.1 Introduction

In the 1950's and early 1960's business applications of computer, with the advent of Electronic Data Processing (EDP), focused on a data-oriented approach which involves the mechanization of transaction processes. This was called Transaction Processing Systems (TPS). Typical applications of TPS are payroll, record keeping, inventory, etc. They apply predefined procedures with emphasis on data management rather than information management [Pracht, 1984]. The data focus in these systems is at the operational level and not at middle or top managerial levels.

2.1.1 Management Information Systems (MIS)

The development in the 1960's of time sharing systems, direct access to data, and interaction with models gave rise to systems with an information-oriented focus and predefined aggregation and reporting capabilities. These systems, called Management Information Systems (MIS) were developed for the main purpose of management decisions. These systems were quite large and complex and required highly skilled *systems analysts and programmers for their development. Although, the concentration was on information, the data base consisted almost exclusively of data internal to the organization. Information assembled from the data was most often disseminated via printed reports. A commonly used definition of the MIS concept is:*

> *An integrated man/machine system for providing information to support decision making functions in an organization. The system utilized computer hardware and software, manual procedures, management and decision models, and a data base [Davis, 1974].*

MIS today are mainly used in business organizations at the middle level management.

2.1.2 Decision Support Systems (DSS)

The rapid changes in computer technology in the late 1970's and early 1980's permitted relatively low-cost interactive access to models, systems, and data bases through the use of user-oriented system interfaces; and gave rise to Decision Support Systems (DSS). The emerging area of DSS is largely an outgrowth of MIS. Emphasis on the three following issues distinguishes DSS from MIS: (1) more general methods for incorporating models, (2) a decision-oriented focus which provides support for decision activities that are semi-structured or unstructured, and (3) user-oriented languages for problem solving [Sprague and Carlson, 1982; Keen and Scott Morton, 1978; Davis, Davis and Shrode, 1987]. The use of DSS is mainly focused at the executive decision maker level.

2.1.3 Expert Systems (ES)

The breakthrough of expert systems begins in the 1980's with the activation of artificial intelligence (AI). They are complex computer programs that manipulate knowledge to solve problems efficiently and effectively in a specific problem domain [Waterman, 1986]. Expert systems offer advice and solutions that would be offered by a human expert. They are like human experts in using heuristics and making mistakes, but have the capacity to learn from their errors and explain the reasoning that led to a given solution. The objective of both decision support systems and expert systems is to improve the effectiveness of decision making. However, expert systems are different from DSS in that DSS models tend to be causal in nature (typically used in support of decision making), whereas expert system models are judgmental and can potentially make decisions [Blanning, 1984]. In addition, expert systems focus on knowledge and are mostly used at corporate level.

2.2 Individual Decision Support Systems

The term Decision Support Systems (DSS) appeared first in a work by Gorry and Scott Morton [1971] to distinguish the type of information systems needed to solve unstructured or semi-structured problems from those used to solve *structured tasks. DSS refers to that segment of the MIS which is designed to help managers in dealing with semistructured or unstructured decision-making [Alter, 1977a; Vazsonyi, 1978 Keen & Wagner, 1979]. DSS have been defined as:*

> *It is a system linked to the process by which managers arrive at decisions. Its role is not to replace the decision maker, but to enhance his or her effectiveness [Alavi and Henderson, 1981].*
>
> *A flexible computer-based system that can assist decision makers in dealing with semistructured to unstructured problems [Goslar, Green and Hughes, 1986].*

Definitions of DSS are several in the literature and there is not an agreement on the precise meaning of the term. One school of thought [Keen and Wagner, 1979; Rockart, 1979] recognizes a system as DSS only when it helps the executives decision makers, while another believes DSS support managers from all organizational levels [Kingston, 1981; Sprague and Carlson, 1982]. Some believe that DSS only help dealing with semistructured or unstructured decision problems [Keen and Scott Morton, 1978; Kingston, 1981; Watson and Hill, 1983], while others think that they contribute to structured as well as unstructured decisions [Sprague and Carlson, 1982]. Some theorize DSS are a subset of Management Information Systems (MIS) [Davis and Olson, 1984], while others postulate DSS pick up where MIS leave off [Keen and Scott Morton, 1978]. However, in general a DSS is defined as an interactive, computer-based system which supports (rather *than replaces) managers in making semistructured and unstructured decisions [Scott Morton, 1980; Sprague, 1980].*

The components of DSS include: user-friendly interactive interfaces (e.g., query languages), model or data-based systems, integrated problem-solving capabilities, and problem solving tools (i.e., spreadsheet software). A DSS is usually capable of performing tasks such as what-if analysis, goal-seeking, sensitivity analysis, exception reporting, and modeling analysis. An example of DSS application in business is Target-USA, a DSS developed by Nova Research, Inc., and S and O Consultants, Inc. [Agnew, 1986], to help marketers of new products promote their merchandise effectively in marketplaces where cultural differences affect sales. Target is a three-phase process that focuses on (1) defining the marketplace and identifying competitors, (2) developing marketing strategies based on this research and the client corporation's long-range plans, and (3) naming products, developing packages, market testing and marketing the newly created product.

DSS, or computer-based tools for managerial problem solving, have been the object of study in organizational research since the early 1970's. The theory of DSS is based on Simon's [1960] bounded rationality model of decision making for adding structure to what is otherwise an unstructured problem solving. The goal of a DSS is to improve the quality and efficiency of human decision making.

Along with this goal, significant attention has been given to studying the impact of DSS technology on decision efficiency, quality, and satisfaction [Keen & Scott Morton, 1978; Bonczek, Holsapple & Whinston, 1979; Huber, 1982a]. The empirical studies that address the effectiveness of DSS will be discussed in the following section.

2.3 Group Decision Support Systems

Group activities in organizations consume large amounts of time and cost [Mintzberg, 1973; Argyris and Schon, 1974; Hoffman, 1979; Stefik et al., 1987], but they rarely produce tangible outcomes, and the resultant decisions are rarely up to the aggregate potential of the group membership [Johnston et al., 1977]. The inefficiency of unsupported group decision making is quite clear in large group meetings with one member speaking at a time while the other members are listening. While in automated group decision support, every member of the group is able to participate at the same time [Nunamaker, Vogel, and Konsynski, 1989]. GDSS have been proposed to provide interactive, computer-based decision support to solve complex and unstructured problems by groups of decision makers [Gray et al., 1981; Huber, 1982b; Huber, 1984; DeSanctis and Gallupe, 1985]. The objective of using this technology to support group decision making is twofold: 1) to increase efficiency by reducing the costs of meetings, and 2) to increase effectiveness by creating better quality *outcomes [Huber, 1984]. GDSS have been defined in the literature as:*

> *An interactive computer-based system which facilitates solution of unstructured problems by a set of decision makers working together as a group. [DeSanctis and Gallupe, 1985]*

> *A GDSS consists of a set of software, hardware, and language components and procedures that support a group of people engaged in a decision related meeting. [Huber, 1984]*

An example of GDSS is the Planning Laboratory established in 1985 at The University of Arizona's Management Information Department which has been used by several organizations. A group of executives from a business firm may meet for several times at this location to discuss a certain issue. This system is process oriented rather than goal oriented [Heminger, 1989]. The University of Arizona GDSS is general in its application and has been used for more than one purpose, including idea generation and issue analysis [Applegate et al., 1986]; organizational planning [Applegate, 1986]; strategic planning [Dennis et al., 1987]; and information sharing, deliberation and choosing [Nunamaker, 1987].

This system includes five major components [Heminger, 1989]: facility, hardware, software, procedures and facilitation. The main physical facility of this GDSS is a decision room with a U-shaped table for a face-to-face communication. A group of decision makers using a friendly user-interface language has access to a data base, a model *base, and a GDSS applications software during the process of decision-related meeting. There are several terminals, one for each participant, connected to each other by a local area network (LAN), one input/output device, and one viewing screen. A meeting facilitator may provide an interface between the group and the technology, and coordinates the group's use of the technology. Among the software provided in the Planning Laboratory are facilities for (1) electronic brainstorming which enhances a form of Nominal Group Technique (NGT), (2) stakeholder identification and analysis which examines planning issues and looks for discrepancies between stakeholder and organizational interests, and (3) an enterprise analyzer used to determine the relationships among organizational components and to determine the potential impacts that stakeholders have on the organization.*

A GDSS is a technology-based system that is typically comprised of four components [Kraemer and King, 1984]. These are: (1) software (including generalized system software and specialized decision-making software), (2) hardware (including the conference facility, computing equipment, audiovisual equipment and telecommunications), (3) procedures (including the organizational data, management processes and group process), and (4) people (including the organizational decision-makers and support staff facilitating the decision making process and activities).

GDSS combine communication, computer, and decision support technologies to support different stages of decision making process (i.e., problem formulation) in group settings [Poole & DeSanctis, 1987; DeSanctis & Gallupe, 1987]. Communication technologies available within a GDSS include electronic messaging, local and wide-area networks, teleconferencing, and store and forward facilities. Computer technologies include multi-user operating systems, fourth generation languages, databases, data analysis facilities, and data storage and modification capabilities. Decision support technologies include agenda setting, decision modeling methods (such as decision trees), structured group methods (e.g., the Nominal group and Delphi techniques), and rules for directing group discussion.

A GDSS subsumes conventional individual DSS within it. Where the group size shrinks to one, a GDSS reduces to a DSS [Gray, 1987b]. Both DSS and GDSS include a data base and a human interface [Sprague and Carlson, 1982]. However, in moving from a DSS to a GDSS, some additional requirements need to be added. Examples of these requirements are a communication base, and a software determining consensus.

According to Huber [1982a], the benefits of GDSS can be seen in reducing the process losses (information loss, information distortion, or sub-optimal decision making):

$$\text{Actual Decision Making Effectiveness} = \text{Potential Decision Making Effectiveness} + \text{Group Process Losses} - \text{Group Process Gains}$$

GDSS can reduce these losses by allowing anonymity of participation in the discussion, searching of databases and doing analyses to answer questions, and displaying individuals' input to the public screen for open group discussion [Kraemer & King, 1985]. Process gains include increased decision quality from the creation of new ideas by a group member based on hearing the discussion of others [Gray, 1987b].

The support of group decision making has been getting recent attention, with some of the earliest published papers dating from 1981 and 1982 [Steeb and Johnston, 1981; Turoff and Hiltz, 1982; Kull, 1982]. The need for GDSS is caused by two forces: the great demand for more information sharing in organizations and the resistance to allocating more managerial and professional time to attend meetings [Ein-Dor and Segev, 1982].

Although, GDSS have been a rapidly emerging field of the 1980's, GDSS technology is still in a laboratory stage [Gray, 1987a]. At the present time, most GDSS applications are centered in university research laboratories (i.e., the University of Arizona, the University of Minnesota, and the Claremont Graduate College) and have not moved to business locations. Part of the problem is that GDSS require large capital investments in physical facilities [Gray, 1987a]. A typical GDSS requires an elegantly furnished conference room with a lot of display and communication hardware.

2.3.1 Classifications of GDSS

The most common classification of GDSS is based on two dimensions: Space and time [DeSanctis and Gallupe, 1985]. Under this classification there are four types of GDSS: (1) decision room (close proximity, synchronous), (2) local decision networks (close proximity, asynchronous), (3) linked decision room (dispersed proximity, synchronous), and (4) remote decision networks (dispersed proximity, asynchronous). Based on this approach, DeSanctis and Gallupe [1987] suggest a multidimensional taxonomy of GDSS using a contingency approach. Three environmental contingencies were identified as critical to GDSS design: group size, member proximity, and the task confronting the group.

DeSanctis & Gallupe [1987] advocate an information-exchange view of group decision making, that is based on the assumption that the effects of GDSS occur due to changes in the pattern of interpersonal communi-cation brought about by the technology intervention. Specifically, the use of GDSS changes the nature of participation within the group, which in turn affect the decision quality and other group decision outcomes. Based on this view there are three possible levels of systems that represent varying degrees of intervention into the decision process according to the approach taken to supporting the group.

Level 1 GDSS provide technological supports that facilitate information exchange among members to improve the *group's communication. Such technological facilities would include large front screen displays for prompt display of ideas, voting solicitation and compilation, anonymous input of ideas and preferences, and electronic communication channels between members. Level 1 features are found in an electronic board room. Level 2 represents an enhanced GDSS over Level 1. It provides decision modeling and group decision techniques aimed to reduce uncertainty and "noise" in the group decision process. A typical Level 2 GDSS provides automated planning tools, or other aids commonly found in individual DSS [DeSanctis & Gallupe, 1987]. Some of the modeling tools of Level 2 to support analyses are social judgment formation, risk analysis, and multiattribute utility methods. Group structuring techniques such as Delphi, Nominal, and brainstorming methods can be administered within Level 2 technology. Level 3 is the highest level system of GDSS and is characterized by machine-induced group communication patterns which include a rule-based expert system to select and arrange rules to monitor and direct the group's communication patterns. Such rules might be used for controlling the pattern, e.g., Robert's Rules of Order [Eisner, 1986], timing or content of information exchange. The sophistication of technology increases and the level of intervention into the group's natural decision process increases as the level of GDSS increases.*

This research does not cover all types of GDSS. It is mainly concerned with face-to-face settings of GDSS that are mostly operated under Level 1 systems. This limited domain of coverage is imposed by previous research literature which have presented only little research on the effectiveness of other types of GDSS yet. Because the GDSS technology is young [Straub and Beauclair, 1988], DeSanctis and Gallupe [1987] suggest for GDSS researchers to start with Level 1 and Level 2 systems and not to proceed to Level 3 systems until some understandings of the features and effectiveness of the lower level systems has been achieved.

2.4 Major Independent and Dependent Variables and Their Measures

Chervany, Dickson, and Kozar [1972] have proposed a research framework that identifies three significant variables that determine decision making effectiveness. These attributes as shown in Table I are the characteristics of the decision maker, the characteristics of the decision environment, and the characteristics of the information system. In terms of this research, all these variables except the availability of decision aids are moderator variables moderating the effectiveness of computer-based decision making.

The main independent variable in this research is the availability of DSS/GDSS support (or the level of decision

TABLE I

INDEPENDENT AND DEPENDENT VARIABLES OF DSS EFFECTIVENESS

Independent Variables					
The decision maker		The decision environment		Characteristics of the DSS	
1.	Indirectly acquired attributes: - Aptitudes - Attitudes	1.	Function - finance - production - marketing - personnel - R & D - etc.	1.	Format - Content - Form - Presentation media
2.	Directly acquired attributes: - Training - Experience	2.	Level - Strategic - Tactical - Operations	2.	Time availability
		3.	Environmental - Stability - Competitiveness - Time pressure	3.	Decision aid

Dependent variables
Decision effectiveness: Quality - Cost - Profit - Time - etc.

Source: Chervany, N.L., G.W. Dickson, and K.S. Kozar, 1972 *support technology). In most cases this variable may take three general conditions:*

(1) no decision support (baseline), where the decision maker is not given any information or help,

(2) computerized decision support (DSS/GDSS), where the decision maker is provided with information and DSS/GDSS support, or

(3) manual decision support (paper-and-pencil for DSS or paper-and-pencil and flip chart for GDSS), where the decision maker is provided with the same information given in the second condition above but with no computerized support.

Some researchers test this variables under two conditions only: (1) no-DSS/GDSS support, and (2) computerized DSS/GDSS support [i.e., King and Rodriguez, 1978; McIntyre, 1982; Eckel, 1983; Gallupe, 1985; Goslar et al., 1986], or manual DSS/GDSS support versus computerized DSS support [i.e., Steeb and Johnston, 1981; Benbasat and Dexter, 1982; Ruble, 1984; Sharda et al., 1988; Zigurs et al., 1988; Dixon, 1989]. Others examine two different levels of computerized DSS/GDSS support versus no-DSS/GDSS support [i.e., Goul et al., 1986]. Moreover, some researchers examine computerized DSS/GDSS support versus manual versus no-DSS/GDSS support [i.e., Lewis, 1982; Killingsworth, 1987; Watson, 1987; A. Easton, 1988; Watson et al., 1988], while others examine two different levels of computerized DSS/GDSS support against manual and no DSS/GDSS support [i.e., Eining, 1987]. Jarvenpaa, Rao and Huber, 1988 test two levels of computerized GDSS support with manual (conventional) support.

The dependent effectiveness variables may be divided into two categories: decision outcome effectiveness variables and decision process effectiveness variables. These variables are presented in Table II for both DSS and GDSS. The DSS process effectiveness deals with how the decision maker is actively involved in the decision process using a decision aid. This would include depth of analysis and degree of DSS utilization. For GDSS, process effectiveness concerns the capacity of the GDSS to actively involve the participants in group focused process. This would include such things as equality of participation and user assessment of the process. Outcome effectiveness concerns the capacity of the DSS/GDSS to help the decision makers to achieve the goals that have been established by them, in individual or group settings.

2.4.1 Decision Outcome Variables

The resultants of decision making are the decision outcomes. This would include variables such as decision quality, decision confidence, decision consistency, satisfaction with decision outcome, and degree of decision improvement. These variables and their measures will be

TABLE II

THE MAIN INDEPENDENT, DEPENDENT AND MODERATOR VARIABLES OF DSS AND GDSS

		Decision Support Systems (DSS)		Group Decision Support Systems (GDSS)
Independent Variables	1.	Availability of decision aid (DSS)	1.	Availability of decision aid (GDSS)
		a. No DSS support		a. No GDSS support
		b. DSS support		b. GDSS support
	2.	Level of DSS support	2.	Level of GDSS support
		a. No DSS support		a No GDSS support
		b Manual DSS support		b. Manual GDSS support
		c. Computerized DSS support		c. Computerized GDSS support
Dependent Variables				
Effectiveness of Decision Outcomes				
	1.	Quality of decision making	1	Quality of decision making
	2	Satisfaction with decision outcome	2	Satisfaction with decision outcome
	3	Decision confidence	3	Decision confidence
	4	Degree of decision improvement	4	Degree of decision improvement
	5	Consistency of decision outcomes	5	Consistency of decision outcomes
	6	Attitude toward the system	6	Group cohesiveness
			7	Degree of decision consensus
			8.	Attitude toward the system
Effectiveness of Decision Process				
	1	Depth of analysis	1	Depth of analysis
		a Number of alternatives considered		a. Number of alternatives considered
		b Number of issues considered		b. Number of issues considered
	2.	Level of DSS utilization	2	Level of GDSS utilization
			3	Satisfaction with decision process
			4	Amount of communication
			5	Amount of uninhibited behavior
			6	Amount of group discussion conflict
Efficiency of Decision Making				
	1	Decision time	1	Decision time
			2	Equality of participation
			3	Amount of task-oriented behavior
Moderator Variables	1	Mode of presentation	1	Mode of presentation
	2	Level of task difficulty	2	Level of task difficulty
	3	Cognitive style	3	Cognitive style
	4	Data level (summarized vs detailed)	4	Data level (summarized vs detailed)
	5	Prior use of decision aid	5	Prior use of decision air
	6	DSS training	6	GDSS training

discussed below.

2.4.1.1 Decision Quality

Decision quality is considered by the vast majority of researchers as the most important criterion of outcome effectiveness of DSS/GDSS. Although there is a relative agreement on the name of the variable, there is a wide disagreement on the measurement of that variable. Some of these different measurements of decision quality are discussed below.

2.4.1.1.1 Absolute Value of a Management Index. In reviewing the literature for the issue of decision quality, it was realized that there is no agreement on what constitutes an effective decision. There are three means to measure the decision quality. One approach deals with the absolute value of a management index (i.e., profit, cost, or forecasting accuracy). Economic consequences of decision making are used as a determinant of decision quality. Most studies of this type use profit as a measure of decision quality [Chakravarti et al., 1979; Lucas, 1980; Benbasat & Dexter, 1982; McIntyre, 1982; Eckel, 1983; Sharda et al., 1988]. Since most organizations operate to realize profit, the use of profit as a measure of decision quality is realistic if control of all activities affecting profit is in the hands of the decision maker(s) [Senn, 1973].

Another more accurate and more realistic measure of *decision quality focuses on cost minimization. Benbasat & Schroeder [1977], Lucas [1981], and Remus [1984] are examples of the studies that use cost reduction as a measure of decision quality. A more direct relationship can be seen in this approach between the measure and the quality of decisions than the previous one. The decision maker is usually responsible for the control of certain costs (i. e., inventory costs: the cost of ordering, the cost of shipping, the cost of holding, and the cost of shortage) where the reduction of these costs can be easily attributed to the use of a decision aid.*

2.4.1.1.2 Normalized Measure of Management Index. The second approach of measuring decision quality is to use a normalized measure of the management index [Benbasat & Dexter, 1985; Benbasat & Dexter, 1986; Benbasat, Dexter, & Todd, 1986a, 1986b]. One example is: [Benbasat, Dexter & Todd, 1986b]

$$\textbf{DECISION QUALITY} = \frac{\left\{\begin{array}{c}\text{Actual}\\ \text{decision results}\end{array}\right\} - \left\{\begin{array}{c}\text{The most intuitive}\\ \text{decision results}\end{array}\right\}}{\left\{\begin{array}{c}\text{Optimal}\\ \text{decision results}\end{array}\right\} - \left\{\begin{array}{c}\text{The most intuitive}\\ \text{decision results}\end{array}\right\}}$$

2.4.1.1.3 Management Judgment. In the third approach, a complex comparison [Washburne, 1927] or a management judgment [Moriarity, 1979; Stock & Watson, 1984] is appropriate to be used to measure the decision quality in the absence of a tangible management index.

The type and measurement of dependent variables in the experimental studies is somewhat dependent on the decision task to be addressed by the individual or the group. Decision quality, for example, in some decision tasks is best measured by comparing the group's decision with that of the experts [Steeb & Johnston, 1981; Turoff & Hiltz, 1982; Gallupe, 1986] to measure the quality of the decision.

2.4.1.2 Decision Time

The main variable related to decision making efficiency is the time required to formulate a decision. This variable can be measured by a post-test questionnaire if the decision making process takes place in the absence of the researcher [i.e., Sharda et al., 1988], or more accurately it can be recorded during the decision making process. Decision time is easier to measure in group decision making settings than in individual decision making.

2.4.1.3 Decision Confidence

This variable measures the amount of confidence the decision maker has in decisions with or without DSS/GDSS support [Dickson et al., 1977; Goslar et al., 1986]. It is measured by a post-test self-reported questionnaire and have not been measured objectively. Some studies investigated the rate of change in decision making caused by the presence of the decision aids [Dickmeyer, 1983; Adrianson and

Hjelmquist, 1985], which is interpreted in this study as the degree of confidence in decision caused by the degree of confidence in the decision aid. This variable is measured by measuring the amount of change caused by the introduction of the decision aid.

2.4.1.4 Satisfaction With Decision Outcome

In a number of research reports, user satisfaction with decision outcome was used as a measure of system effectiveness [Gallagher, 1974; Pearson, 1977; Larcher and Lessing, 1980; Ives et al., 1983]. However, in other studies, user satisfaction with decision outcome was used along with other variables to measure system effectiveness [Steeb and Johnston, 1981; Nunamaker et al., 1987; Watson, 1987; Gallupe et al., 1988; Vogel and Nunamaker, 1988]. In the latter case, decision satisfaction is measured through self-report post-questionnaires.

2.4.1.5 Level of Consensus Among Group Members

Hiltz, Johnson and Turoff [1982] say that although complete consensus is not necessary, there should be enough consensus so that the group can recognize a 'group decision' that its members are willing to 'live with,' even it is not the first choice of all the members.

Hiltz, Johnson, and Turoff [1982] use two measures of consensus. One is the extent of recognition of a group *consensus; this is the coefficient of agreement for the "group decision" specified by the member after discussion. The second is more concrete measure in which the members are asked after discussion to say what they think is the best solution, as compared with the solution arrived at by the group. Hiltz, Johnson, and Turoff [1982] used Kendall's coefficient of concordance for the members to rank their agreement with the final solution of the group. It has a scale of five rankings where 0 indicates no agreement and 1.00 indicates perfect agreement.*

2.4.1.6 Degree of Change/Improvement (Learning) in Decision Making

In a few studies, this variable has been measured by examining the degree of improvement in decision outcome, i.e., preference change [Dickmeyer, 1983], or faster profit improvement, after first use [McIntyre, 1982].

2.4.1.7 Consistency of performance

This variable is measured by examining the degree of variation in the decision outcome, i.e., degree of profit volatility [McIntyre, 1982; Sharda et al., 1988]. The smaller the degree of variation, the more consistent the decision making.

2.4.2 Decision Process Variables

The decision process effectiveness is concerned with how the decision maker is actively involved in the decision process using DSS, or how the members are actively involved in group focused process using GDSS. The decision process measures would include variables such as depth of analysis, degree of DSS/GDSS utilization, equality of participation, and user assessment of the process (i.e., satisfaction with decision process).

2.4.2.1 Depth of Analysis

It is believed that the use of decision aids increases the number of alternatives and issues considered in the decision making process. Ultimately, this will result in more thorough analysis and better decisions. This variable can be figured out by videotaping the decision making process (for GDSS), and/or by analyzing the computer logs (for both DSS and GDSS).

2.4.2.2 Amount of DSS/GDSS Usage (Utilization)

Utilization has been used in a number of studies as a measure of decision aid effectiveness. This variable is difficult to measure accurately. Depending on the task considered, the amount of DSS/GDSS usage can be measured by either recording the amount of time (from video tapes of the session) each group member spent keystroking or reading the *terminal screen, or to analyze the computer log that had been built into the system to record all inputs entered into the system, i.e., counting the number of keystrokes [Schroeder, 1990].*

2.4.2.3 Equality of Participation

The second major variable for measuring group decision making efficiency (beside decision time) is equality of participation among group members. Decision time and equality of participation are measures of efficiency, since both time and member contribution are resources consumed in group decision processes [George, Northcraft, and Nunamaker, 1987]. This variable is used to measure the distribution of participation and distribution of power in the group decision making. Participation by group members is measured by counting the number of comments each group member contributed to the discussion [Gallupe, 1986] by analyzing the audio-video recordings of each experimental session.

2.4.2.4 Satisfaction With Decision Process

This variable is measured by post-test questionnaire to reflect the level of satisfaction a decision maker has in the process of decision making using a DSS/GDSS. This variable has been examined by several researchers [Alavi and Henderson, 1981; Steeb and Johnston, 1981; Lewis, 1982; Applegate et al., 1986; A. Easton, 1988; G. Easton, 1988;

Gallupe et al., 1988; Jarvenpaa et al., 1988; Watson et al., 1988] as a part of determining DSS/GDSS effectiveness.

2.5 The Impact of DSS Use on Decision Making Effectiveness

Although people believe, in general, that users of the computerized DSS are significantly more productive in decision making than the users of manual or no-DSS, the research in this area have conflicting results regarding this issue. In the following sections, the findings of the pervious research will be presented for each measure of DSS effectiveness and DSS efficiency.

2.5.1 Decision Quality

The majority of the experimental studies [Benbasat and Schroeder, 1977; Power and Rose, 1977; Benbasat and Dexter, 1982; McIntyre, 1982; Eckel, 1983; Goul et al., 1986; Cats-Baril and Huber, 1987; Killingsworth, 1987; Dixon, 1989] indicated that DSS significantly improve the quality of decision making. Only four experimental studies [Joyner and Tunstall, 1970; King and Rodriguez, 1978; Aldag and Power, 1986; Goslar et al., 1986] showed no significant effect of DSS on the quality of decision making. Only Chakravarti et al. [1979] showed a significant negative effect of DSS on the quality of decision making.

2.5.2 Decision Time

Due to the nature of intangible outcomes of DSS/GDSS, the only variable used by most researchers to measure DSS/GDSS efficiency was the time it takes the decision maker to reach a decision. Many studies have not considered the decision time as an important factor in evaluating their DSS performance. Also, there is no general agreement in the literature regarding the efficiency of DSS. Benbasat and Schroeder [1977], Benbasat and Dexter [1982], Burkhard, 1984; and Killingsworth [1987] found in their studies that DSS significantly increase the decision time. However, Goslar et al. [1986] found in their study that the use of DSS significantly decreases the decision time.

2.5.3 User Satisfaction Toward the System

Only a few experimental studies have tried to measure user satisfaction in DSS research. Power and Rose [1977] found that DSS increase user satisfaction; Cats-Baril and Huber [1987] found no significant difference.

2.5.4 Depth of Analysis

Depth of analysis refers to the number of alternatives and/or number of issues considered in the decision making process. It is believed that DSS provide systematic and quantitative tools that assist decision makers in enlarging the domain of analysis. However, there is no agreement in *the experimental literature with regard to this issue. Cats-Baril and Huber [1987], and Dixon [1989] showed that the use of DSS increases the depth of analysis. On the contrary, Goslar et al. [1986] showed a negative effect. Whereas, Eckel [1983] and Burkhard [1984] showed no significant effect of DSS use on the depth of analysis.*

2.5.5 Decision Confidence

There is little research that examines the impact of the use of DSS on the level of confidence in the decision making. Dixon [1989] showed in her study that the use of DSS significantly increases the decision confidence. Cats-Baril and Huber [1987] showed a significant negative effect of DSS on the level of decision confidence. Aldag and Power [1986], Burkhard [1984], and Goslar et al. [1986] showed in their studies that there is no significant effect of DSS on decision confidence.

2.5.6 Degree of Decision Improvement

The degree of improvement in decision making performance due to the use of DSS has been tested in a few experimental studies. McIntyre [1982] and Dickmeyer [1983] in their studies both showed a significant degree of improvement in decision making with the use of DSS. On the other hand, Ruble [1984] showed no significant effect of the use of DSS on the degree of decision making improvement.

2.5.7 Degree of Decision Consistency

McIntyre [1982] used the degree of volatility in profit as a measure of consistency and showed a significant negative effect of the use of DSS on the level of consistency.

2.6 The Impact of GDSS Use on Decision Making Effectiveness

GDSS have more decision-making effectivess and efficiency measures than DSS. Among the effectiveness measures that are used only for GDSS are degree of decision consensus, amount of group discussion conflict, and degree of group cohesiveness. While DSS have only the decision time as a measure efficiency, GDSS have two more variables to assess their efficiency. These variables are equality of participation, and amount of task-oriented behavior. Below, the findings of GDSS research is presented for each measure of GDSS effectiveness and GDSS efficiency.

2.6.1 Decision Quality

Several studies that focus on the quality variable showed that GDSS increased the quality of group decision making [Steeb and Johnston, 1981; Lewis, 1982; Gallupe, 1985; Buil et al., 1987; Zigurs et al., 1987; George et al., 1987; Vogel, Nunamaker, Applegate, and Konsynski, 1987; Gallupe et al., 1988; Jarvenpaa et al., 1988; Gallupe et al., 1988; Sharda et al., 1988]. Seven studies [Turoff and Hiltz, 1982; Ruble, 1984; Adrianson and Hjelmquist, 1985; Beauclair, 1987a, 1987b; Watson, 1987; Zigurs, 1987; Chidambaram, 1989] found no significant difference between experimental group and control group in terms of quality of decision making. Watson et al. [1988] found that GDSS was worse than manual but better than "no support" with regard to decision quality. A. Easton [1988] and G. Easton [1988] found no significant difference in decision quality between manual and computer supported groups; however, A. Easton found that the structured groups (both manual and computer supported groups) significantly produce higher decision quality than the no-GDSS support groups.

2.6.2 Decision Time

In experimental settings, only one study [Bui, Sivasankaran, Fijol, and Woodbury, 1987] found GDSS to be more efficient, in terms of time to solution. By taking all the empirical studies, the findings on the impact of GDSS on decision time are inconsistent. Weeks and Chapanis [1976]; Hiltz, Johnson, and Agle [1978]; Siegel et al. [1986]; Bui, Sivasankaran, Fijol, and Woodbury [1987], Nunamaker [1987], Nunamaker et al. [1987], and Vogel and Nunamaker [1988] found a negative relationship. However, Steeb and Johnston [1981], Kiesler et al. [1984]; Rice [1984]; Gallupe [1985]; Siegel et al. [1986], Bui and Sivasankaran, [1987]; Bui et *al. [1987]; Watson [1987], and Gallupe et al. [1988] found a positive relationship; while Gallupe [1985], Beauclair [1987], Bui and Sivasankaran, 1987; George et al. [1987], and Sharda et al. [1988] found no relationship. G. Easton [1988] found that the time to decision is significantly longer for groups using GDSS than for manual supported groups. A. Easton [1988] found that the time to decision is significantly longer for the structured groups (both manual and computer supported groups) than the no-GDSS groups. However, she found no significant difference between the manual and the computer supported groups. Bui and Sivasankaran [1987] found that the GDSS supported groups take longer time in low complexity tasks, but found no significant difference in high complexity tasks.*

The finding of a negative relationship between GDSS and decision time is highly impressionistic, and based on uncontrolled case studies (except Bui et al., 1987). One would expect that because GDSS increase participation, depth of analysis, and clarification efforts, GDSS also increase the time needed to reach decision [Pinsonneault and Kraemer, 1989]. Beside that, most of the studies that showed the use of GDSS to support groups increases the time required to complete the task were done with small groups of size 3 or 4, where the group task may be easier solved manually than by using GDSS [Trumbly, 1988; Vogel, Nunamaker, George, and Dennis, 1988]. The last remark is that many of the existing

GDSS research experiments used intellective tasks, which have right answers [Trumbly, 1988]. In operational settings, the problems that organizational groups tackle are less likely to have right answers. More research is clearly needed in this area to resolve the inconsistencies.

2.6.3 Equality of Participation

There is a greater equality of participation in GDSS than in conventional meetings, in part because every member can be "talking" by typing or "listening" by reading at the same time [Kerr and Hiltz, 1982]. This advantage of GDSS can be seen more clearly when group size is large. The larger the group size, the less likely is the emergence of a dominant leader [Hiltz and Turoff, 1978; Hiltz et al., 1978], because one person no longer dominates the group meeting by leading the discussion and decision making [Kerr and Hiltz, 1982].

A series of controlled experiments on GDSS produced consistent empirical evidence that there is significantly more equality of participation in computerized decision meeting than in non-supported face-to-face conditions [Johansen et al., 1976; Krueger, 1976; Hiltz, 1978a; Hiltz and Turoff, 1978; Hiltz et al., 1978; Hiltz et al., 1980; Lewis, 1982; Kiesler et al., 1984; Rice, 1984; Applegate, 1986; Applegate et al., 1986; Siegel et al., 1986; George, Northcraft & Nunamaker, 1987; Nunamaker, 1987; Vogel, *Nunamaker, Applegate, and Konsynski, 1987; Nunamaker et al., 1987; Zigurs, 1987; Nunamaker, Applegate, and Konsynski, 1988; Vogel and Nunamaker, 1988]. Although, the majority of the empirical investigations suggest that GDSS produce more equality of participation among group members, a few studies found no difference in equality of participation between GDSS and no-GDSS (or manual GDSS). Gallupe [1986] found that GDSS had no effect on equality of participation. In three recent studies [Gallupe, 1987; Watson, 1987; Watson, DeSanctis and Poole [1988], no difference was found between equality of participation among the manual, baseline, and GDSS supported groups. Jarvenpaa et al. [1988] found also no significant difference between the conventional and GDSS supported groups in terms of equality of participation. A. Easton [1988] found that there is a significant difference in equality of participation between the supported groups and the unsupported groups, with the supported groups having more equal participation. A. Easton [1988] and Watson [1987] found no significant difference between the manual groups and the computer supported groups. G. Easton [1988] found that GDSS groups had significantly more equal participation than the manual groups. Ho, Raman, and Watson [1989] found that GDSS is the least even in participation followed by the manual GDSS with the baseline (no-GDSS) having the most even participation, although the differences are not very significant. Most of the experiments that reported no* *significant difference in the equality of participation between GDSS users and non-GDSS users studied small groups where there was less opportunity for the use of GDSS to increase participation.*

The number of comments generated by GDSS supported groups is shown to be less than that of the non-GDSS supported groups [Turoff and Hiltz, 1982; Kiesler et al., 1984; Adrianson and Hjelmquist, 1985; Siegel et al., 1986], probably because it is easier to speak than type [Vogel, Nunamaker, George, and Dennis, 1988].

2.6.4 Level of Decision Consensus

GDSS were found to increase group consensus in a few studies. Steeb and Johnston [1981], and Vogel and Nunamaker [1988] found a positive relationship; and Beauclair [1987], Watson [1987] George et al. [1988], and Watson et al. [1988] found no relationship. These findings might look inconsistent with increased equality of participation, since more people are participating in the discussion. However, this can be explained by the fact that GDSS help members to focus more on task related activities than on social activities. On the other hand, Hıltz, Johnson, and Agle [1978]; Turoff and Hiltz [1982], Eining [1987], and George et al. [1988] found a negative relationship. G. Easton [1988] found also that manual supported groups had significantly more decision consensus than computer supported groups. The findings of the last group of studies are consistent with the findings of increased equality of participation, since more people are participating in the discussion, and therefore conflicting ideas will have more chance to arise. In additions, through the anonymous input of GDSS, members tend to become more critical to others' input which ultimately reduces the degree of consensus.

2.6.5 User Satisfaction With Decision Outcome and Process

Results of user satisfaction with GDSS were mixed. Steeb and Johnston [1981], Nunamaker et al. [1987], and Vogel and Nunamaker [1988] found that GDSS increase the satisfaction of group members with both the group process and outcome. Kiesler et al. [1984], Applegate [1986], Siegel et al. [1986], Applegate et al. [1987], and Nunamaker [1987], reported improved satisfaction with decision process. Bui et al. [1987], and George et al. [1987] found no effect. However, Easton et al. [1988] found increased satisfaction with the process but no difference with the outcome, and Gallupe et al. [1988] found increased satisfaction with the process but decreased satisfaction with the outcome. Gallupe [1985] found decreased satisfaction with the group decision making process. Gallupe et al. [1988] found decreased satisfaction with both the GDSS process and outcome. Watson [1987] found no difference *in satisfaction with decision outcomes between structured (both manual and computer supported groups) and unstructured (no-GDSS) groups, and he also found no difference in satisfaction with decision outcomes in computer supported groups compared to the manual groups. But he also found that the GDSS groups were less satisfied with decision process than the manual supported groups. A. Easton [1988] found no significant satisfaction with decision outcomes between structured groups and the unstructured groups. However, she found significant higher satisfaction with decision outcomes among the computer supported groups compared to the manual groups. In terms of satisfaction with decision process, A. Easton found no significant difference between the supported groups and the unsupported groups, but she found that the computer supported groups were significantly more satisfied with their decision process than the manual supported groups. On the contrary, G. Easton [1988] found that GDSS groups were significantly less satisfied with decision process compared with the manual groups.*

The validity of some of the studies that reported positive relationships between the use of GDSS and group member satisfaction [Nunamaker, 1987; Vogel and Nunamaker, 1988] is questionable. Their results were obtained in case studies and based on impressions. The two studies also lack the use of control groups which limits their outcomes.

2.6.6 Depth of Analysis

Several studies focus on the impact of GDSS on the depth of analysis. Smith [1973], Van de Ven and Delberg [1974], Steeb and Johnston [1981], Lewis [1982] Turoff and Hiltz [1982], Gray [1983], Gallupe [1985], Nunamaker, Applegate and Konsynski [1988], Gallupe et al. [1988], Vogel and Nunamaker [1988] and Chidambaram [1989] found a positive impact of GDSS on depth of analysis, while Sharda, Barr, and McDonnell [1988] found no significant relationship between GDSS and depth of analysis. A. Easton [1988] found that the depth of analysis is significantly higher for the supported (both manual and computerized) groups than the unsupported (no GDSS) groups. However, she found no significant difference between the manual and the computer supported groups. There seems to be a strong evidence about the positive relationship between GDSS and depth of analysis, since the study of Sharda et al. [1988] is more of a DSS than a GDSS, where the model supports the decision process of individuals working in a group, not the group decision process.

2.6.7 Amount of Non-Task Related (Uninhibited) Behavior

The majority of the empirical studies show significantly fewer non-task related comments (uninhibited behavior) in GDSS supported groups [Turoff and Hiltz, 1982; Adrianson and Hjelmquist, 1985; Applegate et al., 1986;

Nunamaker et al., 1987; Vogel, Nunamaker, Applegate, and Konsynski, 1987]. However, other studies found an increase in uninhibited behavior [Kiesler et al., 1984; Siegel et al., 1986; George et al., 1987], or found no difference [Kiesler et al., 1984; Siegel et al., 1986] due to the use of GDSS.

2.6.8 Level of Confidence in Decisions

Steeb and Johnston [1981], Turoff and Hiltz [1982], Nunamaker [1987], and Vogel, Nunamaker, Applegate and Konsynski [1987] found that groups supported by a computer-based decision aid had more confidence in the decision made than the non-supported groups. Gallupe [1985], Gallupe et al. [1988], and Zigurs [1987] found that GDSS groups have less confidence in decisions than non-GDSS groups. However, Watson [1987], Watson et al. [1987], and Sharda et al. [1988] found no significant difference in decision confidence between the experimental and the control groups.

2.6.9 Level of Intra-Group Conflict

The use of GDSS has been shown to increase the level of conflict among group members [Gallupe, 1985; Applegate et al., 1986; Nunamaker, 1987; Nunamaker et al., 1987; Vogel et al., 1987]. The rationale behind that is that under automated GDSS, members of the group tend to enter *challenging comments through the electronic medium without fear of being recognized or retributed [Nunamaker, Vogel, and Konsynski, 1989]. In a recent experimental study, Chidambaram [1989] found no significant difference in ability to manage group conflict between GDSS groups and non-GDSS groups.*

2.6.10 Amount of Group Communication

There are only a few studies that investigated the variable of the amount of group communication. In general, GDSS have less amount of communication or no different than manual or no-GDSS. It has not been shown that the users of GDSS significantly produce more amount of communication than manual or no-GDSS in any of the studies at hand. Jarvenpaa et al. [1988] shown no significant difference between GDSS and manual GDSS, in terms of amount of communication. Siegel et al. [1986] in their first experiment, and Hiltz, Turoff, and Johnson [1982] showed no significant difference between GDSS and no-GDSS, in terms of amount of communication. However, Siegel et al. [1986] in their third experiment, and Hiltz, Johnson, Arnovitch, and Turoff [1980] showed a significant less amount of communication among GDSS users, when compared to no-GDSS users.

2.6.11 Satisfaction Toward the System

In comparing GDSS to no-GDSS, there is no agreement *among the researchers on the amount of satisfaction toward the system. The study of Adrianson and Hjelmquist [1985] suggested strongly that the users of GDSS are significantly more satisfied than the users of no-GDSS. On the other hand, Lewis [1982] showed that there is no significant difference between GDSS and no-GDSS, in terms of satisfaction toward the system. Moreover, Hiltz, Turoff, and Johnson [1985] showed that there was less satisfaction toward the system among GDSS users as compared to no-GDSS users. When comparing GDSS to manual GDSS, there is an agreement among the two available studies [Lewis, 1982; Bui, Sivasankaran, Fijol, and Woodbury, 1987] that the use of GDSS significantly increased satisfaction toward the system.*

2.6.12 Rate of Decision Improvement

Adrianson and Hjelmquist [1985] showed that there was significantly a higher rate of decision improvement, when GDSS were compared to no-GDSS. On the other hand, Tunstall [1969] showed two conflicting results. Under a low difficult task, there rate of decision improvement was significantly higher among GDSS users than no-GDSS users. However, under a high difficulty task, the rate of decision improvement was significantly lower among GDSS users than no-GDSS users.

2.6.13 Group Cohesiveness

Chidambaram [1989] showed no significant difference *between GDSS and manual GDSS in terms of group cohesiveness. In additions, Tunstall [1969] using a low difficulty task, showed no significant difference between GDSS and no-GDSS in terms of group cohesiveness. However, Tunstall [1969] using a high difficulty task, showed that the users of GDSS had significantly less group cohesiveness than the users of no-GDSS.*

2.6.14 Amount of Task-Oriented Behavior

Jarvenpaa, Rao, and Huber [1988] showed that there was no significant difference between the computerized GDSS group and the manual group, in terms of amount of task-oriented behavior. Siegel et al. [1986], in their first experiment, found also that there was no difference in task-oriented behavior across GDSS and no-GDSS. However, in their third experiment, they found that the users of GDSS had significantly less amount of task-oriented behavior than the users of no-GDSS.

2.7 Explanation of Unreconciled Differences in DSS/GDSS Results Across Studies

Explanation of the conflicting results of DSS/GDSS effectiveness cite both theoretical and methodological problems. One major issue that causes the inconclusive findings of empirical research of DSS/GDSS effectiveness is the measurement problem [Jenkins, 1985]. The outcome *variables in most of the empirical studies of DSS/GDSS effectiveness are qualitative measures and there is no single measurement technique that is acceptable by all researchers to measure a certain phenomena under a certain decision task. In addition, different decision tasks may require different measures to be used for the same outcome variable. For that reason, the research of evaluating DSS/GDSS effectiveness suffers from methodological weaknesses, particularly from the problems of reliability which mean errors in measurement; and internal validity which come from the improper manipulation of experimental treatments [Jarvenpaa, Dickson and DeSanctis, 1985].*

Criticisms of DSS/GDSS research methodologies in the 1970's are typically concerned with the lack of theoretical foundation, poor implementation of empirical studies, and poor choice of methodology [Cooper, 1988]. Jarvenpaa et al. [1985] claim that a lack of theoretical grounding has contributed to conflicting results of DSS/GDSS by not providing a common basis for developing experimental hypotheses and interpreting results. Cooper [1988] claims that the relatively current DSS/GDSS research seems to be based more on intuitive, atheoretic exploratory research rather than in strong theoretic referent discipline.

Most of the outcome variables in research of DSS/GDSS effectiveness (i.e., confidence in decision, satisfaction, and attitude) are measured via questionnaire, which results *in user perceptions of variables rather than actual behavior. Moreover, Baroudi and Orlikowski [1986] have found problems with current MIS empirical research. The average power (e.g., the ability to detect treatment effect) of this research is unacceptably low and can result in important effects going unnoticed.*

DSS/GDSS research as a part of MIS research implementation was criticized in the 1980's as confounded by poor operationalization of variables (i.e., measuring decision quality), overuse of surrogate variables (i.e., the use of user satisfaction to measure decision making effectiveness), and omission of key variables [Cooper, 1988].

Another major methodological problem which may contribute largely to the unreconciled differences across studies in the research of DSS/GDSS effectiveness is the large range of sample size used across studies. The sample size in some experimental studies goes from less than thirty subjects [i.e., Kozar, 1972; Chervany and Dickson, 1974; Chakravarti et al., 1979; Jarvenpaa et al., 1988] to more than two hundreds [i.e., Joyner and Tunstall, 1970; Watson, 1987; Zigurs, 1987; Watson et al., 1988]. It is statistically known that the larger the sample size the more reliable the results of the study [Hunter et al., 1982; Hedges and Olkin, 1985]. The other related problem which is common in DSS/GDSS laboratory research is the use of naive *subjects, often undergraduate students, in experiments instead of actual managers or professionals.*

DSS/GDSS research has been criticized in many laboratory studies for a mismatch between the decision task to be accomplished and the decision aid provided [Chidambaram, 1989], which greatly affects the performance of the decision makers.

Vitalari [1985], Watson [1987], Sharda et al. [1988], and Zigurs et al. [1988] suggest that longitudinal research designs are necessary in order to examine time-dependent phenomena such as learning, adaptation, and evolution. In most of the cross-sectional studies in DSS/GDSS effectiveness that consider decision time as a dependent variable, it is concluded that the decision time is longer for DSS/GDSS users than for non DSS/GDSS users. However under some longitudinal studies [i.e., Bui et al., 1987; Nunamaker, 1987; Nunamaker et al., 1987; Sharda et al., 1988; Vogel and Nunamaker, 1988], it was found that DSS/GDSS are as efficient as no-DSS/GDSS or even better (the supported users take equal or less time to reach decisions than the unsupported users). On the other hand, some studies [Clark and Snow, 1975; Kulik, Kulik, and Cohen, 1980; Clark and Salomon, 1986] suggest that they found a novelty effect of DSS where effectiveness has decreased as the time duration for treatment increased.

DSS/GDSS empirical research also suffers from the *omission of important moderator variables, such as decision task difficulty, in most of the studies. The oversimplified view of technological causality that view decision aid technology as a direct, causal influence of decision making effectiveness is the dominant view in most of DSS/GDSS empirical studies. Only recently a few studies [i.e., Gallupe, 1985; Zigurs, 1987; Watson, 1987; Gallupe et al., 1988] have included some moderator variables along with the use of decision aids to test decision making effectiveness. This theory of adaptive structuration (e.g., the inclusion of moderator variables) has been proposed by Poole and DeSanctis [1987] to overcome the simplistic design in the dependent-independent variables relationships of DSS/GDSS effectiveness.*

With regard to GDSS laboratory research, in particular, there are two problems that might contribute to the inconsistency in GDSS research findings. First, most of the laboratory studies in GDSS research have used groups of small sizes, mainly three or four members per group [i. e., Bui and Sivasankaran, 1987; Watson, 1987; Zigurs, 1987; A. Easton, 1988; Gallupe et al., 1988; Sharda et al., 1988]. However, it has been shown in the literature [Slater, 1966] that the "optimal" group size is five. Groups of five have the best performance and the least conflict [Slater, 1958]. In the GDSS literature [Vogel, Applegate, and Konsynski, 1987], it has been found that efficiency and effectiveness *of GDSS increase as group size increases. Vogel, Nunamaker, George, and Dennis [1988], indicate that GDSS enhance group efficiency as group size increases above four. The number of experimental studies that meet this requirement of group size is very small [i. e., Hiltz, Johnson, and Turoff, 1986; G. Easton, 1988]. The second problem that is related to GDSS laboratory research is the use of groups with zero history. With the exception of a few studies [i. e., Zigurs, 1987], all the GDSS laboratory studies use groups that their members have not worked together previously as a group. On the contrary, in field studies, it is often that the group members have some experience working together as a group. This problem of difference in group history may contribute to the conflicting results between laboratory and field studies [Chidambaram, 1989].*

2.8 The Moderator Variables Addressed in the Literature

The potential moderator variables that affect the relationship between the dependent (the effectiveness and efficiency of decision making) and independent variables (the use of DSS/GDSS) were investigated by different researchers. The most significant moderator variables that were studied more frequently in the research of DSS/GDSS effectiveness are presented below (see also Table II, p. 24).

2.8.1 Mode of Presentation

This variable may be divided into three categories: 1) Format (tabular versus graphical, 2) Color, and 3) Level of detail. Several researchers have studied the impact of this variable on DSS/GDSS effectiveness, i.e., Senn, 1973; Benbasat & Schroeder, 1977; Lucas, 1980; Lucas & Nielsen, 1980; Lucas, 1981; Zmud, 1983.

2.8.2 Cognitive Style of Decision Maker

The cognitive style refers to the process behavior that individuals exhibit in the formulation or acquisition, analysis, and interpretation of information used for decision making [Huber, 1984]. It is said that the effectiveness of a decision aid is dependent on whether the decision maker has a systematic or a heuristic cognitive style [Cooper, 1987]. A number of previous studies have examined the effect of individual differences upon the decision aid effectiveness [Benbasat and Dexter, 1977; Benbasat & Schroeder, 1977; Vasarhelyi, 1977; Lusk, 1979; Lusk and Kersnick, 1979; Benbasat & Dexter, 1980; Walkoe, 1980; Benbasat and Dexter, 1982; Huber, 1983; Kasper, 1983; Davis et al., 1987; Dos Santos and Bariff, 1988]. Specifically, there is a controversy regarding the effect of cognitive style on decision aid effectiveness [Slocum, 1978; Huber, 1983]. The rationale behind this hypothesis is that decision makers perform more effectively with decision *support aids which match their particular cognitive styles [Benbasat and Dexter, 1982]. Decision making style in most of the research studies is measured by Myers-Briggs Type Indicator (MBTI) classification [Myers, 1976; Keirsey and Bates, 1984; Evans and Simkin, 1989], or the Group Embedded Figures Test ,GEFT, [Witkin et al., 1971; Witkin et al., 1974; Cox et al., 1978]. GEFT as tested by DeSanctis [1982] has a reliability of 0.82.*

The last two moderators (the mode of presentation and the cognitive style of the decision maker) will not be addressed in this study, since there is not enough studies that investigated these variables along with the level of technological decision support. In fact, many studies have addressed each of these variables as the only independent variable, which makes them not eligible for inclusion in the current meta-analysis. In additions, the effects of mode of presentation have been investigated in a small meta-analysis conducted by Montazemi and Wang [1988-89].

2.8.3 Level of Decision Task Difficulty

There is a general belief that GDSS are more applicable to complex or semistructured and unstructured decisions tasks [Gallupe, DeSanctis and Dickson, 1986]. Even though, this has not been tested thoroughly by empirical work [Straub and Beauclair, 1988], researchers at the University of Arizona specifically advocate the effectiveness of GDSS *for high difficulty tasks [Applegate et al., 1986]. This suggests that GDSS are more effective when used for high difficulty tasks, and the higher the difficultly of the task the more effective the GDSS. Among the studies that have tested the effect of task difficulty on the effectiveness of GDSS are Joyner & Tunstall [1970]; McIntyre [1982]; Turoff & Hiltz [1982]; Kasper [1983]; Gallupe [1985]; Gallupe et al. [1986]; and Gallupe, et al. [1988].*

2.8.4 Group Size

There are a few studies that vary the group size in their experimental design [Watson, 1987; Zigurs, 1987; G. Easton, 1988]. Over the past few years, hundreds of group sessions vary the group size from 3 to 22. Effectiveness and efficiency measures of GDSS become increasingly apparent as group size increases [Vogel et al., 1987]. Vogel et al. [1988] suggested that as group size increases above 4 members, GDSS enhance efficiency by facilitating input from all group members in a relatively simultaneous manner. When the group size becomes larger, the effectiveness of GDSS becomes apparent in eliciting and organizing large numbers of issues associated with a complex task. On the other hand, user satisfaction with the group process is enhanced when the group size is larger [Vogel et al., 1988]. Without the use of decision aid technology, groups were also found to be more effective as the group size becomes larger [Hare, 1962;

Cartwright & Zander, 1968; Hoffman, 1979].

2.8.5 Data Level (Summary vs. Detailed)

This variable has been investigated in several studies (i.e., Benbasat & Schroeder, 1977; Lucas & Nielsen, 1980; Goslar et al., 1986) as a factor that effects the level of performance in decision making. It is suggested that there is a certain level of information summarization required to avoid overloading the managers with extra unneeded information, that jeopardize the task of decision making.

2.8.6 Prior Use of Decision Aids

It is suggested in several studies (i.e., Aldag & Power, 1986; Killingsworth, 1987) that the prior use of decision aids will help people to get acquainted with the system faster than inexperienced people. For that reason, people with computerized decision aid experience are expected to perform better in decision making than people with no past experience.

2.8.7 DSS/GDSS training

By the same token, people after training in using DSS/GDSS will perform better in decision making than before training [Goslar et al., 1986; Delone, 1988].

Poole and DeSanctis [1987] are planning to test (in a 3-year program) the effect of five moderator factors that

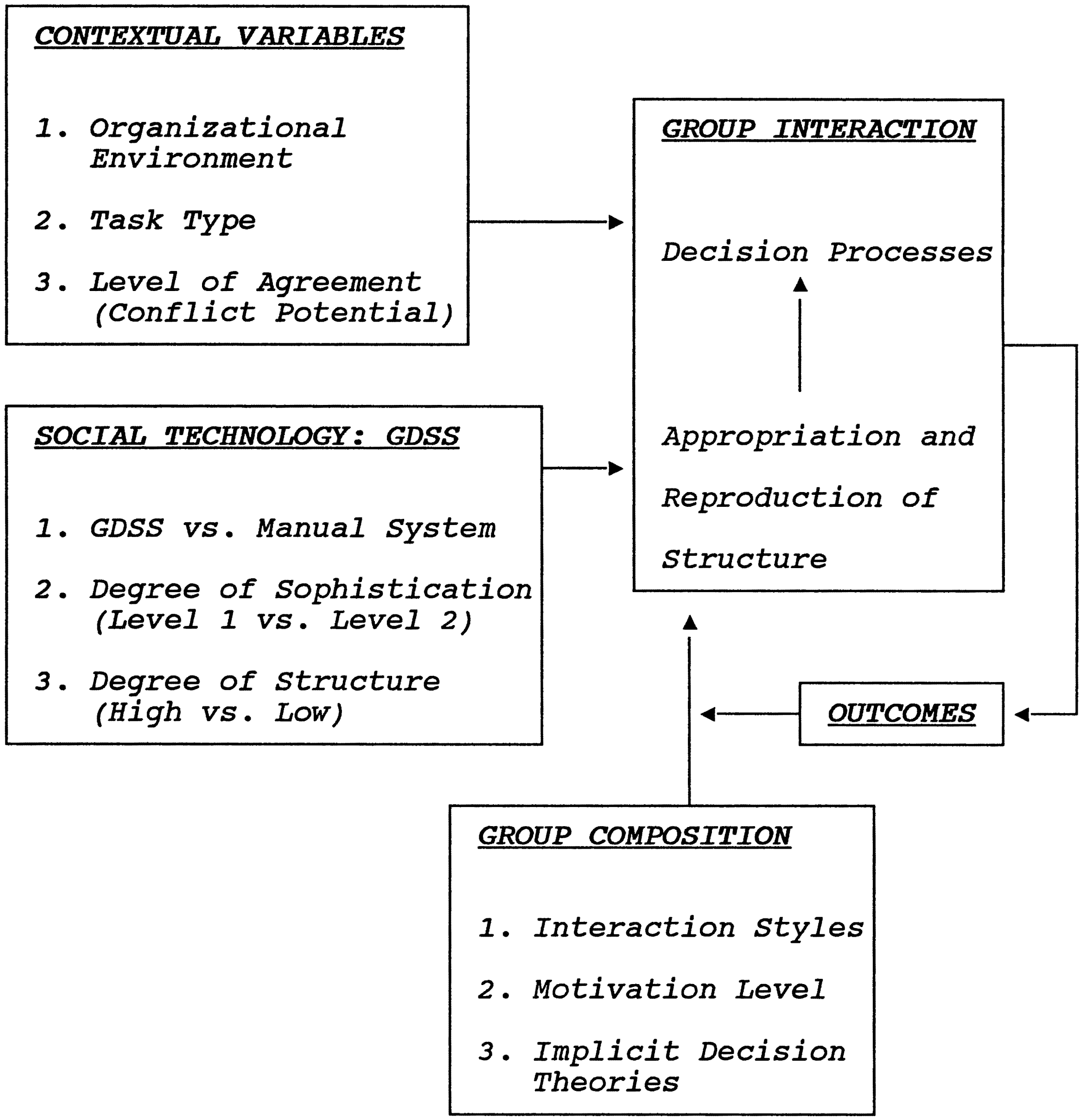

FIGURE 1. Some Potential Moderator Variables That Affect GDSS Performance

Source: Poole and DeSanctis, 1987

are believed to influence the impact of GDSS technology on group performance. These factors as shown in Figure 1 are as follows:

(1) the nature of the group's task,

(2) the degree of agreement, or potential conflict among group members,

(3) the group's composition in terms of members' skill, interacting styles, and basic motivational sets,

(4) internal group structure, particularly the power and communication structures, and

(5) the group's environment, or the larger organization in which it functions.

There are several moderator variables that were not tested or could not be tested under a single study level. These moderators are: (1) DSS versus GDSS, (2) laboratory versus field tests versus field studies, (3) published versus unpublished studies, (4) subject type, (5) cross-sectional versus longitudinal studies, and (6) old versus new studies. The moderator variables that are going to be examined in this study, and their data across all the available studies are shown in Table III.

2.9 Literature Review on Meta-Analysis

Replication of experimental results has long been a central feature of scientific research, and it raises questions concerning how to integrate studies when results

TABLE III

MODERATOR VARIABLES' DATA ACROSS ALL STUDIES

Study	Year (Old/ New)	DSS or GDSS	Lab or Field	Task[a] Diffi- culty Level	Longi-[b] tudi- nal or cross- sectional	Group Size	Pub-[c] lished or Unpub- ished	Subjects[d] (Students or practitioners)	Remarks
Burkhard	1984 New	DSS	Lab	H	L	1	U	S	
Sharda, Barr, & McDonnel	1988 New	GDSS	Lab	H	L	3	S	S	
Cats-Baril & Huber	1987 New	DSS	Lab	H	1	1	P	S	
Heminger	1989 New	GDSS	Field	H	L	8	U	P	
Zigurs, Poole, & DeSanctes	1988 New	GDSS	Lab	M-H	1	3 & 4	P	S	
Watson, DeSanctis & Poole	1988 New	GDSS	Lab	M-H	1	3 & 4	P	S	separate analysis for group size
Gallupe, Desanctis, & Dickson	1988 New	GDSS	Lab	L & H	1	3	P	S	separate task difficulty levels
Easton, G.	1988 New	GDSS	Lab	H	1	6	U	S	Leadership & anonymity were tested
Easton, A.	1988 New	GDSS	Lab	M-H	1	4	U	S	
Hiltz, Johnson, Arnovitch & Turoff	1980 Old	GDSS	Lab	L & H	1	5	P	S	separate task difficulty levels
Goul, Shane, & Tonge	1986 New	DSS	Lab	H	1	1	P	S	
Jarvenpaa, Rao & Huber	1988 New	GDSS	Field	H	L	7	P	P	subjects were software designers
Bui & Sivasankaran	1987 New	GDSS	Lab	L & H	1	3	U	S	separate task complexity levels
Christen & Samet	1980 Old	DSS	Lab	L & H	1	1	U	P	separate task complexity levels
Steeb & Johnston	1981 New	GDSS	Lab	H	1	3	P	S	
Pracht	1984 New	DSS	Lab	H	L	1	U	S	used high & low analytic subjects

TABLE III (CONTINUED)

MODERATOR VARIABLES' DATA ACROSS ALL STUDIES

Study	Year (Old/ New)	DSS or GDSS	Lab or Field	Task[a] Diffi-culty Level	Longi-[b] tudi-nal or cross-sectional	Group Size	Pub-[c] lished or Unpub-ished	Subjects[d] (Students or practitioners)	Remarks
McIntyre	1982 New	DSS	Lab	M	L	1	P	S	
Dickmeyer	1983 New	DSS	Lab	H	1	1	P	Mixed	50% students & 50% practitioners
Siegel, Dubrovsky, Kiesler, & McGuire	1986 New	GDSS	Lab	H	1	3	P	S	for both exp.1 & exp 3
Scott	1987 New	DSS	Field	M	1	1	U	P	
Hiltz, Turoff, & Johnson	1985 New	GDSS	Lab	L-M	1	5	U	P	subjects were managers
Lamberti & Newsome	1989 New	DSS	Field	H	1	1	P	P	diagnositc programmer subjects
Dixon	1989 New	DSS	Lab	H	1	1	U	Mixed	mix of students and others
Fudge & Lodish	1977 Old	DSS	Field	M	L	1	P	P	subjects were salesmen
Joyner & Tunstall	1970 Old	GDSS	Lab	L & H	2 days	5	P	S	
King & Rodriguez	1978 Old	DSS	Lab	H	1	1	P	P	Managers
Barki & Huff	1984 New	DSS	Field	H	1	1	U	P	Managers
Aldag & Power	1986 New	DSS	Lab	H	1	1	P	S	
Goslar, Gran & Hughes	1986 New	DSS	Lab	H	1	1	P	P	Sales & marketing people
Yang	1987 New	DSS	Field	L-H	1	1	U	P	
Tsai	1987 New	DSS	Lab	H	1	1	U	S	

TABLE III (CONTINUED)

MODERATOR VARIABLES' DATA ACROSS ALL STUDIES

Study	Year (Old/New)	DSS or GDSS	Lab or Field	Task[a] Difficulty Level	Longitudinal or cross-sectional[b]	Group Size	Published or Unpublished[c]	Subjects[d] (Students or practitioners)	Remarks
Peterson	1988 New	DSS	Lab	H	1	1	U	P	Managers
Hansen & Messier	1986 New	DSS	Lab	H	1	1	P	P	Computer audit
Benbasat & Schroeder	1977 Old	DSS	Lab	M	L	1	P	S	
Benbasat & Dexter	1982 New	DSS	Lab	M	L	1	P	S	
Linn	1987 New	GDSS	Lab	H	1	4	U	S	
King, Premkumar, & Ramamurthy	1988 New	DSS	Lab	H	L	1	U	S	
Killingsworth	1987 New	DSS	Lab	H	1	1	U	P	Auditors, No descriptive statistices
Bui, Sivasankaron, Fijol & Woodbury	1987 New	GDSS	Lab	H	1	3	U	S	
Chidambaram	1989 New	GDSS	Lab	H	L	5	U	S	
Weber	1977 Old	DSS	Lab	H	1	1	U	P	Auditors
Lewis	1982 New	GDSS	Lab	M-H	1	3	U	S	
Hiltz, Johnson & Turoff	1982 New	GDSS	Field	L	1	5	U	P	Managers
George, Northcraft, & Nunamaker	1987 New	GDSS	Lab	M	1	6	U	S	
Goslar	1984 New	DSS	Lab	H	1	1	U	P	

TABLE III (CONTINUED)

MODERATOR VARIABLES' DATA ACROSS ALL STUDIES

Study	Year (Old/ New)	DSS or GDSS	Lab or Field	Task[a] Diffi- culty Level	Longi-[b] tudi- nal or cross- sectional	Group Size	Pub-[c] lished or Unpub- lished	Subjects[d] (Students or practitioners)	Remarks
Ruble	1984 New	DSS	Lab	M-H	L	1	U	S	
Hardaway	1988 New	DSS	Lab	L	1	1	U	S	
Pecoraro	1984 New	DSS	Field	L-H	1	1	U	P	Managers
Goul	1985 new	DSS	Lab	H	1	1	U	S	
Gettys, Moy, & O'Bar	1976 New	DSS	Lab	L & H	1	1	U	P	Naval officers
Adrianson & Hjemquist	1985 New	GDSS	Lab	H	1	4	P	P	Actual Users
Sanders, Courtney & Loy	1984 New	DSS	Field	M-H	1	1	P	P	Actual Users
Loy	1986 New	GDSS	Lab	H	L	4	U	S	
Isett	1987 New	DSS	Field	H	1	1	U	P	Military Officers
Beauclair	1987 New	GDSS	Lab	M	1	3-5	U	S	
Chu	1987 new	DSS	Lab	M-H	1	1	U	S	
Power & Rose	1977 Old	DSS	Lab	H	1	1	U	S	
Eckel	1983 New	DSS	Lab	H	L	1	P	S	
Davis & Mount	1984 New	DSS	Lab	M	1	1	P	p	Managers
Ho, Raman, & Watson	1989 New	GDSS	Lab	H	1	5	U	S	

TABLE III (CONTINUED)

MODERATOR VARIABLES' DATA ACROSS ALL STUDIES

Study	Year (Old/ New)	DSS or GDSS	Lab or Field	Task[a] Diffi- culty Level	Longi-[b] tudi- nal or cross- sectional	Group Size	Pub-[c] lished or Unpub- ished	Subjects[d] (Students or practitioners)	Remarks
Pentland	1990 New	DSS	Field	M	1	1	U	P	Accounting
Van Schaik	1988 New	GDSS	Lab	H	L	4	P	P	Managers
Hiltz, Johnson & Agle	1978 Old	GDSS	Lab	H	1	5	U	S	
Tunstall	1969 Old	GDSS	Lab	L & H	1	5	U	S	separate task difficulty levels
Polister	1982 New	GDSS	Lab	H	1	4	U	Mixed	subjects were students and others
Reding	1988 New	DSS	Lab	H	1	1	U	S	
Schuldt	1988 New	DSS	Field	H	L	1	U	P	Sergeants, etc
Smith & Vanecek	1988 New	GDSS	Lab	L	1	2	P	S	
Luthans & Koester	1976 Old	DSS	Lab	H	1	1	P	S	
Koester & Luthans	1979 Old	DSS	Lab	H	1	1	P	P	Accountants

[a]H = high difficulty task, M = medium difficulty task, L = low difficulty task
[b]P = published study, U = unpublished study
[c]S = Students, P = practitioners (actual users)
[d]L = Longitudinal study, 1 = cross-sectional (one period) study

differ. In the early part of this century modern statistical methods were constructed for the individual agricultural experiments, and shortly thereafter statistical methods for combining the results of such experiments were developed [Hedges and Olkin, 1985]. There have been two distinct directions for combining evidence from different studies in agriculture [Hedges and Olkin, 1985]. One approach is based on testing for statistical significance of combined results across studies, and the other is based on estimating treatment effects across studies. This study will use the second approach. The details of this approach will be discussed in Chapter III.

2.9.1 Definition of Meta-Analysis

Meta-analysis is a technique that uses quantitative methods to integrate the results of studies in a statistical sense. This type of analysis can correct disparities which arise from isolated investigations of individual experiments and can reconcile conflicting outcomes of separate studies. Thus, the meta-analysis technique is a fruitful tool that allows the pooling and the meaningful aggregation of the results of previous experiments. In general, meta-analysis has two contributions to make to replication research [Whitley, McHugh & Frieze, 1986]. First, it provides a set of quantitative research techniques for assessing the validity, reliability, and generalizability of research *findings. Second, meta-analysis provides the means of determining the source of inconsistency if a body of research is found to be inconsistent. If sources of variation in effect sizes are identified, they can be tested as independent variables in experiments [e. g., Cooper, Burger & Good, 1981]. Therefore, meta-analysis does not terminate research, but represents one step in a cycle of experimentation, replication, evaluation, and further experimentation [Whitley, McHugh & Frieze, 1986].*

It has been said that meta-analysis is one of the most significant progresses in methodology for conducting integrative interviews [Glass, 1976], or the use of quantitative methods to summarize the results of research studies. Such integrative reviews serve as crucial links that provide researchers with access to the results of primary research studies on a given subject [Hedges and Becker, 1986]. However, meta-analysis is not a panacea [Linn and Petersen, 1986]. The quality of a meta-analysis depends on the merit of the studies that go into it.

Meta-analysis has been defined as follows:

> *Meta-analysis is the quantitative cumulation and analysis of descriptive statistics across studies [Hunter, Schmidt & Jackson, 1982].*
>
> *The approach to research integration referred to as "meta-analysis" is nothing more than the attitude of data analysis applied to quantitative summaries of individual experiments [Glass, McGaw & Smith, 1981, p. 21].*
>
> *The meta-analysis is concerned about collecting a group of studies that investigate the same*

> *question through roughly similar procedures... The main derive for meta-analysis is the diversity of study outcomes [Bangert-Drowns, 1986].*
>
> *Meta analysis is a quantitative approach to the integration of findings from individual studies of a research question. It is the statistical summary of those findings . . . and seeks to explain the observed variation in findings across studies [Churchill and Peter, 1984, p. 360].*
>
> *Meta-analysis is the rubric used to describe quantitative methods for combining evidence across studies [Hedges & Olkin, 1985, p. 13].*

2.9.2 Applications of Meta-Analysis

The original work of Glass and his colleagues [Glass, 1976, 1977, 1980; Smith & Glass, 1977; Smith, Glass, & Miller, 1980; Glass, McGaw, & Smith, 1981] is greatly responsible for introducing meta-analysis to the social sciences. Before that, there were some attempts [Tippett, 1931; Fisher, 1932; K. Pearson, 1933; E. Pearson, 1938; and Yates & Cochran, 1938] to combine the statistical results (probabilities) of the studies of agricultural experiments. Jones and Fiske [1953] started in applying the meta-analytic attitude of agricultural research to the social sciences. Mosteller & Bush [1954] argued also that combined probabilities are a useful tool in social science integration.

2.9.3 Introducing Meta-Analytic Techniques to MIS

In the field of business administration, the application of meta-analysis was initially applied to *studies in organizational behavior. Before 1988, there had been no meta-analysis applied to the field of decision sciences. Since then three studies have been published in that field. Pettingell, Marshall, & Remington [1988] conducted a meta-analysis to review the influence of user involvement on information system success. In 1989, Montazemi and Wang also used a meta-analysis to review the effects of modes of information presentation on decision-making. In 1990, Hwang and Wu [1990] used a meta-analysis covering the same subject covered by Montazemi and Wang [1989], however, they seemed not be aware of the existence of that work.*

2.9.4 Meta-Analysis Versus Conventional Review Methods

Inconsistent results about the relationship between the use of DSS/GDSS and DSS/GDSS effectiveness make meaningful integration of research findings imperative. Several methods of achieving this integration are available. One is the narrative review method which allows broad, qualitative judgments [DeSanctis, 1984]. However, this method is non-quantitative and does not lend itself to statistical analysis. Although, many statistical integration methods exist [Bangert-Drowns, 1986], the meta-analysis method formulated by Hunter, Schmidt, and Jackson [1982] provides the "state of the art" method and thus was selected for use here to augment the narrative review method.

Although, some researchers [Dickson et al., 1977; Courtney et al., 1983; Jarvenpaa et al., 1985; Gallupe et al., 1988; Dennis et al., 1988; Sharda et al., 1988; Pinsonneault and Kraemer, 1989] provide some efforts of detailed descriptive comparisons and/or summaries of the previous research, their reviews are non-quantitative and fail to integrate statistically the results of individual research efforts. Previous reviews not using meta-analysis may be misleading because the methods used to draw conclusions have potentially serious flaws.

These problems are the main weaknesses of the narrative method of review. First, it is very subjective [Hyde and Linn, 1986]. Two different reviewers working on the same set of studies may arrive at different conclusions because of personal biases and by attaching higher weights to some studies than others. Second, it is imprecise [Hyde and Linn, 1986]. When the number of studies becomes large, the information begins to exceed the human capacity to process it and identify trends in the outcomes. Third, it is insensitive to the specific details of the studies thereby reviewed [Hyde and Linn, 1986]. The reviewer will not be able to determine the effect size, if he finds some effect across the studies. Perhaps the simplest method used previously that reflects an improvement over the standard narrative review is the "voting method" in which the reviewer treats each study as a separate entity. The *researcher tabulates the number of the studies that show significant effects in the hypothesized direction, the number that show no significance, and the number that show significant effect in the direction opposite to the hypothesis [Light and Smith, 1971]. Intuitively, if a large proportion of studies has statistically significant results, then this could be an indication that the effect size is different from zero. On the other hand, if few studies have obtain statistically significant results, then the combined evidence for a non-zero effect is not supported and would seem to be weak [Hedges and Olkin, 1985].*

This method can sometimes lead to false conclusions, because it treats studies as equal without any regard to their statistical power [Hedges & Olkin, 1980]. Because many studies in a review may have poor power and fail to detect true effects. It also may create the illusion of conflicting results when the results are actually not so [Hyde and Linn, 1986]. This problem follows quickly from the first one. The apparent inconsistency in results across studies may result from variation in the statistic used (i.e., t-test) and the poor power of that statistic. Finally, even if the reviewer is able to reach the conclusion that there is some effect, the conclusion is not quantitative, and he has no way of knowing how large the effect size is [Hyde and Linn, 1986].

Meta-analysis on the other hand, avoids some problems *that are associated with conventional review methods [Hunter et al., 1982; Hedges and Olkin, 1985; Hyde and Linn, 1986].*

2.9.5 Types of Meta-Analysis

There are five main types of meta-analysis (see Table IV) which are distinguished from each other on the basis of purpose, unit of analysis, treatment of study variation, and outcomes of analysis [Bangert-Drowns, 1986]. However, they do not constitute totally separate approaches, and users may in fact select and apply elements of these different approaches without committing themselves to any one approach.

The meta-analytic technique that is used in this study is the Schmidt-Hunter meta-analysis Method. This procedure represents an improvement over Glass's methods and the Study Effect method by (1) estimating the effect size more accurately by weighted estimates, (2) removing the artifactual errors of unreliability and range restriction, from effect size, and (3) providing tests of the hypothesis that the variance in observed effect sizes is due solely to artifacts. The properties and techniques of this method are explained later in Chapter III.

2.10 Hypotheses of the Study

The hypotheses of this dissertation are based on the tested dependent measures in the empirical studies

TABLE IV

METHODS OF META-ANALYSIS

Descriptive Label	Purpose	Unit of Analysis	Study Variation	Outcomes of Analysis
Glassian meta-analysis	To review what a literature says about the scientific process in a given area	Study finding	Examine relations between effect sizes and pre-established categories	Average effect size, comparisons of effect sizes in preestablished categories; regression models
Study effect meta-analysis	To review what a literature says about a treatment's effectiveness	Study	Examine relations between effect sizes and preestablished categories, apply strict study inclusion criteria	Average effect size, comparisons of effect sizes in preestablished categories; regression models
Combined probability	To estimate a treatment effect and the reliability of this finding	Study for effect size, subject for combined probability	Crude division of studies into groups analyzed separately	Average effect size, combined probability fail-safe N
Approximate data pooling with tests of homogeneity	To estimate population treatment effect	Subject	Apply tests of homogeneity	Average effect sizes for homogeneous groups
Approximate data pooling with sampling error correction	To estimate population treatment effects	Subject	Compare variation among studies to variation attributable to sampling error	Average effect size, study variation, variation attributable to sampling error, list of moderators accounting for remaining variation, regression models

Source R L Bangert-Drowns (1986)

evaluating the effectiveness and efficiency of DSS/GDSS. The attempt of this study is to hypothesize regarding the dependent variables based on the integration of the results of these empirical studies. Instead of breaking down the hypotheses into groups that are related to either decision outcome variables or decision process variables, the hypotheses are arranged in three groups according to effectiveness and efficiency variables of DSS/GDSS and the outlier variables that moderate the relationship between the use of DSS/GDSS and the dependent variables. These hypotheses are based on the interaction among dependent, independent, and moderator variables as shown in Figure 2. After each hypothesis the empirical studies that support, do not support, or negate the hypothesis as stated are listed.

2.10.1 Hypotheses of Effectiveness Variables

The hypotheses concerning the dependent variables of DSS/GDSS effectiveness are as follows:

H1: *The literature shows that the use of DSS/GDSS will result in more effective decisions than those with a manual or without a decision aid.*

H1.1 *The literature shows that the quality of decisions will be significantly enhanced when decision making is supported by DSS/GDSS, as compared to manual DSS/GDSS or no-support at all.*

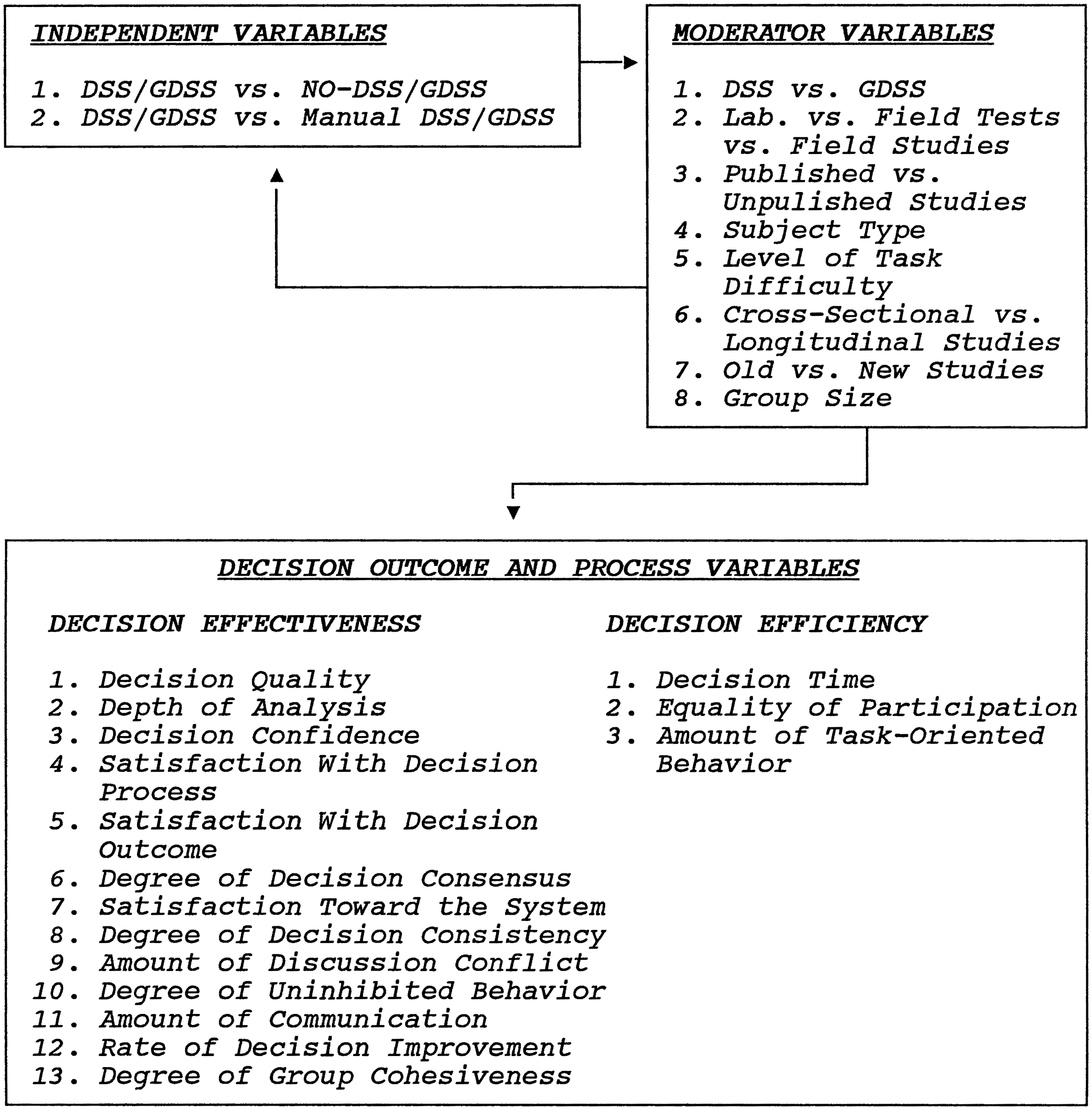

FIGURE 2. Interaction of Dependent, Independent, and Moderator Variables Included in the Study

<u>DSS studies supporting the hypothesis:</u>

Benbasat & Schroeder, 1977; Power and Rose, 1977; Benbasat & Dexter, 1982; McIntyre, 1982; Eckel, 1983; Sanders, Courtney, and Loy, 1984; Goul et al., 1986;Cats-Baril & Huber, 1987; Isett, 1987; Killingsworth, 1987; Yang, 1987; Dixon, 1989; Pentland, 1990]

<u>DSS studies negating the hypothesis:</u>

[Fudge and Lodish, 1977; Chakravarti et al., 1979]

<u>DSS studies of no significant effect:</u>

[Joyner & Tunstall, 1970; Weber, 1977; King & Rodriguez, 1978; Sanders, Courtney, and Loy, 1984; Aldag & Power, 1986; Goslar et al., 1986; Hardaway, 1988]

<u>GDSS studies supporting the hypothesis:</u>

[Steeb and Johnston, 1981; Lewis, 1982; Gallupe, 1985; Bui et al., 1987; George et al., 1987; Nunamaker, Applegate, and Konsynski, 1987; Dixon, 1989; Zigurs et al., 1987; Gallupe et al., 1988; Jarvenpaa et al., 1988; Sharda et al., 1988; Eining, 1987]

<u>GDSS studies negating the hypothesis:</u>

[Linn, 1987; Beauclair, 1987; G. Easton, 1988]

<u>GDSS studies of no significant effect:</u>

[Joyner & Tunstall, 1970; Turoff and Hiltz, 1982; Ruble, 1984; Beauclair, 1987; Watson, 1987; G. Easton, 1988; Chidambaram, 1989]

H1.2 *The literature shows that the level of satisfaction will increase significantly among users, regarding the decision aid and outcome of decision making, when using DSS, as opposed to manual or no-DSS.*

<u>Studies supporting the hypothesis:</u>

[Power and Rose, 1977]

<u>Studies negating the hypothesis:</u>

[none]

<u>Studies of no significant effect:</u>

[none]

H1.3 *The literature shows that a DSS aided decision maker reports significantly greater level of confidence in his decisions than manual or no-DSS aided decision maker.*

<u>Studies supporting the hypothesis:</u>

[Weber, 1977; Dickmeyer, 1983; Hardaway, 1988; Schuldt, 1988; Dixon, 1989]

Studies negating the hypothesis:

[Cats-Baril & Huber, 1987]

Studies of no significant effect:

[Aldag & Power, 1986; Goslar et al., 1986; Sharda et al., 1988]

H1.4 *The literature shows that the level of confidence in decisions, the level of satisfaction with the group process and satisfaction with decision all will be higher in GDSS supported groups than non-GDSS supported groups.*

Studies supporting the hypothesis:

1) *Level of confidence in decision: [Steeb and Johnston, 1981; Nunamaker, 1987]*
2) *Level of satisfaction with group process: [Steeb and Johnston, 1981; Applegate et al., 1986; Siegel, et al., 1986; Nunamaker, 1987; Nunamaker et al., 1987; Nunamaker et al., 1988; Vogel and Nunamaker, 1988]*
3) *Level of satisfaction with decision: [Steeb and Johnston, 1981; Applegate et al., 1986; Nunamaker et al., 1987; A. Easton, 1988; Vogel and Nunamaker, 1988]*

Studies negating the hypothesis:

1) *Level of confidence in decision: [Gallupe et al., 1988]*

2) Level of satisfaction with group process: [Gallupe et al., 1988; Watson et al., 1988]

3) Level of satisfaction with decision: [Watson, 1987]

<u>Studies of no significant effect:</u>

1) Level of confidence in decision: [Sharda et al., 1988]

2) Level of satisfaction with group process: [Lewis, 1982; A. Easton, 1988; G. Easton, 1988; Jarvenpaa, et al., 1988]

3) Level of satisfaction with decision: [Beauclair, 1987; Bui and Sivasankaran, 1987]

H1.5 *The literature shows that the level of consensus will increase when using GDSS in group decision making, as opposed to manual or no-GDSS.*

<u>Studies supporting the hypothesis:</u>

[Steeb and Johnston, 1981; Vogel and Nunamaker, 1988]

<u>Studies negating the hypothesis:</u>

[Eining, 1987]

<u>Studies of no significant effect:</u>

[George et al., 1987; Watson, 1987; Watson et al., 1988]

H1.6 *The literature shows that the depth of analysis (i.e., number of alternatives considered) in decision* *making increases significantly with DSS/GDSS, as opposed to manual or no-DSS/GDSS. The literature shows also that the amount clarification efforts will significantly increase when using GDSS as opposed to manual or no-GDSS.*

<u>DSS studies supporting the hypothesis:</u>

[Cats-Baril & Huber, 1987; Dixon, 1989]

<u>DSS studies negating the hypothesis:</u>

[Goslar et al., 1986]

<u>DSS studies of no significant effect:</u>

[Eckel, 1983; Sharda et al., 1988]

<u>GDSS studies supporting the hypothesis:</u>

1) *Depth of analysis: [Steeb and Johnston, 1981; Lewis, 1982; Gray, 1983; Nunamaker, Applegate and Konsynski, 1988; Vogel and Nunamaker, 1988; Chidambaram, 1989]*
2) *Clarification efforts: [Jessup, Tansik and Laase, 1988; Nunamaker et al., 1988]*

<u>GDSS studies negating the hypothesis:</u>

1) *Depth of analysis: [none]*
2) *Clarification efforts: [none]*

<u>GDSS studies of no significant effect:</u>

1) *Depth of analysis: [Sharda et al., 1988]*
2) *Clarification efforts: [none]*

H1.7 The literature shows that GDSS are more likely to generate conflict in group problem solving sessions, are less likely to help groups reach agreement, and more likely to produce uninhibited behavior.

Studies supporting the hypothesis:

[Kull, 1982; Gallupe, 1985; Gallupe, DeSanctis, and Dickson, 1986; Hiltz and Johnson, and Turoff, 1986; Siegel et al., 1986; Watson, DeSanctis, and Poole, 1987].

Studies negating the hypothesis:

[none]

Studies of no significant effect:

[G. Easton, 1988; Chidambaram, 1989]

H1.8 The literature shows that the use of DSS/GDSS helps in reducing the effect of uncertainty which will reduce the variance in decision maker(s) performance. In other words, DSS/GDSS will help in establishing a consistent performance in decision making.

Studies supporting the hypothesis:

[Sharda et al., 1988]

Studies negating the hypothesis:

[McIntyre, 1982]

Studies of no significant effect:

[none]

H1.9 *The literature shows that the use of DSS/GDSS increases the rate of improvement (change) in decision making performance.*

Studies supporting the hypothesis:

[McIntyre, 1982; Dickmeyer, 1983]

Studies negating the hypothesis:

[none]

Studies of no significant effect:

[Ruble, 1984]

H1.10 *The literature reports that the users of GDSS will have significantly less group cohesiveness than the users of no-GDSS.*

Studies supporting the hypothesis:

[Tunstall, 1969, in a high difficulty task]

Studies negating the hypothesis:

[none]

Studies of no significant effect:

[Tunstall, 1969, in a low difficulty task;

Chidambaram, 1989]

H1.11 *The literature reports that the users of GDSS will have significantly more amount of group communication (verbal and non-verbal) than those with manual or no-GDSS.*

Studies supporting the hypothesis:

[none]

Studies negating the hypothesis:

[Hiltz, Arnovitch, and Turoff, 1980; Siegel et al., 1986, experiment #3]

Studies of no significant effect:

[Hiltz, Johnson, and Turoff, 1982; Siegel et al., 1986, experiment #1; Jarvenpaa, Rao, and Huber, 1988]

2.10.2 Hypotheses of Efficiency Variables

The hypotheses that are related to DSS/GDSS efficiency are as follows:

H2: *The literature shows that the use of DSS/GDSS will result in less efficient decisions than those made without a decision aid.*

H2.1 The literature shows that the time required to reach a decision will increase significantly when using DSS/GDSS as opposed to manual or no-DSS/GDSS.

DSS studies supporting the hypothesis:

[Benbasat & Schroeder, 1977; Benbasat & Dexter, 1982; Killingsworth, 1987]

DSS studies negating the hypothesis:

[none]

DSS Studies of no significant effect:

[Goslar et al., 1986; Sharda et al., 1988]

GDSS studies supporting the hypothesis:

[Steeb and Johnston, 1981; Turoff and Hiltz, 1982; Siegel et al., 1986; Bui, Sivasankaran, Fijol, and Woodbury, 1987; Nunamaker, 1987; Watson, 1987; G. Easton, 1988; Gallupe et al., 1988; Nunamaker et al., 1988; Vogel and Nunamaker, 1988]

GDSS studies negating the hypothesis:

[Eining, 1987]

GDSS studies of no significant effect:

[Beauclair, 1987; Bui and Sivasankaran, 1987; A. Easton, 1988; Sharda et al., 1988]

H2.2 The literature shows that the equality of participation among group members, in problem solving, increases when using GDSS in group decision making. Also, the degree of domination by a few members decreases among GDSS supported groups.

Studies supporting the hypothesis:

1) *Equality of participation: [Krueger, 1976; Applegate et al., 1986; Kiesler, Siegel & McGuire, 1986; George, Northcraft, and Nunamaker, 1987; Nunamaker et al., 1987; Zigurs, 1987; Zigurs et al., 1987; Nunamaker, Applegate, and Konsynski, 1988; G. Easton, 1988; Vogel and Nunamaker, 1988]*
2) *Degree of domination (distribution of influence): [Lewis, 1982; Zigurs, 1987; Nunamaker et al., 1987; Nunamaker et al., 1988; Zigurs et al., 1988]*

Studies negating the hypothesis:

1) *Equality of participation: [none]*
2) *Degree of domination: [none]*

Studies of no significant effect:

1) *Equality of participation: [Turoff and Hiltz, 1982; Beauclair, 1987; A. Easton, 1988; Jarvenpaa, et al., 1988]*
2) *Degree of domination (distribution of influence): [Watson, 1987]*

H2.3 *The literature shows that the, the amount task oriented communication will significantly increase when using GDSS as opposed to manual or no-GDSS.*

Studies supporting the hypothesis:

[Gray, 1983; Applegate, et al., 1986; Siegel et al.,

1986; Sharda et al.,1988]

<u>Studies negating the hypothesis:</u>

[Siegel et al., 1986]

<u>Studies of no significant effect:</u>

[none]

2.10.3 <u>Hypotheses of the Potential Moderators</u>

The hypotheses concerning the potential moderator variables are of two types: 1) the moderator variables that have been tested on the individual level of the empirical studies, and 2) the moderator variables that have not been tested or cannot be tested in a single study. The first category refers to the moderators variables that have been reported in the empirical literature of DSS/GDSS. While the latter refers to the moderator variables that have not been tested in the previous empirical work or can not be tested under the individual study level.

2.10.3.1 <u>Hypotheses of the Empirically Tested Moderators</u>

H3: *The literature shows that the moderator variables such as the level of task difficulty and group size can affect the impact of DSS/GDSS on effectiveness and efficiency of decision making.*

H3.1 *The literature shows that DSS/GDSS will produce* *significantly more effective and more efficient decision making in high difficulty (unstructured) decision tasks than in medium (semi-structured) or low difficulty (structured) decision tasks, when they are compared to manual or no-DSS/GDSS.*

DSS studies supporting the hypothesis:

[none]

DSS studies negating the hypothesis:

[none]

DSS studies of no significant effect:

[none]

GDSS studies supporting the hypothesis:

[Gallupe, 1985; Gallupe, DeSanctis, and Dickson, 1986; Bui and Sivasankaran, 1990; Gallupe et al., 1988].

GDSS studies negating the hypothesis:

[none]

GDSS studies of no significant effect:

[none]

H3.2 *The literature shows that GDSS are significantly more effective and more efficient in large group meetings than in small ones.*

Studies supporting the hypothesis:

[Vogel, Nunamaker, Applegate, Konsynski, 1987]

Studies negating the hypothesis:

[none]

Studies of no significant effect:

[Watson, 1987]

2.10.3.2 Hypotheses of the Untested Moderators

H3.3 *The literature reports that the individual automated decision support systems (DSS) are significantly more efficient, but significantly less effective than the group automated decision support systems (GDSS), when computerized decision aids are compared to manual or no decision aids.*

H3.4 *The literature reports that there is a significant difference in effectiveness and efficiency of DSS/GDSS across the laboratory studies, field tests and field studies. The laboratory studies report the most effective and efficient results of DSS/GDSS followed by the field test, and then by the field studies.*

H3.5 *The literature shows that the studies published in journals will report significantly higher effectiveness and higher efficiency of decision* *making than those unpublished studies, when DSS/GDSS are compared to no-DSS/GDSS.*

H3.6 *Studies of DSS/GDSS that are conducted with student subjects will report significantly higher effectiveness and efficiency of decision making than those of actual users, when both are compared to manual or no-DSS/GDSS.*

H3.7 *The literature shows that the longitudinal studies (experiments that use multiple decision making periods) will report significantly higher effectiveness and higher efficiency of decision making than the cross-sectional studies (experiments that use single decision making periods), when DSS/GDSS are compared to manual or no-DSS/GDSS.*

H3.8 *On the average, the old studies of the 1970's (1969-1980) significantly report less effective and less efficient decision making than the new the studies of the 1980's (1981-1990), when DSS/GDSS are compared to manual or no-DSS/GDSS.*

CHAPTER III

RESEARCH METHODOLOGY

3.1 The Schmidt-Hunter Technique of Meta-Analysis

The purpose of the Schmidt-Hunter technique [Hunter, Schmidt, and Jackson, 1982; Hunter and Schmidt, 1990) in this study is to estimate the strength of the relationship between the independent variable (the availability of the decision aid) and several other variables, i.e., the decision quality, and to identify the influence of any moderators of that relationship. The study outcomes which are the findings of the studies regarding the dependent variables (DSS/GDSS effectiveness measures) will be used as the unit of analysis. This technique has the following characteristics [Bangert-Drowns, 1986; Hunter and Schmidt, 1990]:

(1) It focuses on the cumulation of effect sizes, rather than significance level, across studies,

(2) It is designed to check for moderator variables,

(3) Each study is represented by one effect size,

(4) All studies that bear on the question of interest are included regardless of methodological adequacy,

(5) Effect sizes for each study are individually corrected for unreliability or other statistical artifacts when appropriate information is given, and

(6) It uses a test of homogeneity.

For the laboratory experiments, the effect size is the difference between the means of the experimental group and the control group expressed in standard score form, by dividing it by the within group standard deviation. In terms of the current study, the control group is the one that uses decision aid support, while the control group is the one that either uses no decision aid support or uses a manual support. Effect sizes will be calculated for each of the dependent variables of DSS/GDSS effectiveness and DSS/GDSS efficiency.

The Hunter et al. [1982] method is straightforward in calculating the effect size. The mean effect size, $\mu(d)$, across studies can be computed by weighing each study's effect size by the sample size. This corrected (weighted) mean effect size is considered the most accurate estimate of the population effect. The next step is to compute the variance of the distribution of individual effect sizes across studies, and then to remove the portion of this variance that is due to certain statistical artifacts. If the residual variance is insignificant, then the true (population) effect has been estimated, and the meta-analysis is concluded. However, statistically significant residual variance indicates that a potential moderator (i.e., task difficulty) may be causing differences in the magnitude of the dependent variable (e.g., decision quality) across studies. According to Hunter, Schmidt and Jackson [1982], a moderator variable is indicated when the average correlation across subgroups and the corrected variance averages are lower in the subsets than for the whole data.

The removal of the artifactual variance around the mean effect size is what distinguishes this particular method from other meta-analysis methods. The other methods of meta-analysis do not consider that the variance among studies may be due to methodological factors. Only when the variance in effect size is due to the types of artifactual error which can be identified and removed, one is able to have more confidence in the overall mean results.

The Schmidt-Hunter technique of meta-analysis is the instrument to be used in this study to estimate population treatment effects of DSS/GDSS effectiveness across studies. This technique has the advantage over other types of meta-analysis in that it has no strict study inclusion criteria, rather it includes all studies pertaining to the same question regardless of their statistical power which will be accounted for by correction of sampling error. Another advantage of this technique is that it tests for moderating variables [Bangert-Drowns, 1986].

The spurious variation of results across studies may be caused by two factors. First are the artifacts peculiar to statistics which include:

(1) Sampling error. Sampling error tends to account for the greatest proportion of variance among reported effect sizes across studies [Hunter, Schmidt & Jackson, 1982]. Unlike at the level of the single experiment where the sampling error is random and thus impossible to correct, at the level of meta-analysis sampling error can be estimated and therefore corrected [Montazemi and Wang, 1988-89].

(2) Measurement unreliability. The second largest source of variance across studies in most research areas is variation in error of measurement across studies. That is, a study validity will be systematically lower than true validity to the extent that a dependent variable (i.e., decision quality) is measured with random error. These differences in measurement, if not corrected, produce errors of measurement that would be treated as if they are differences due to moderator variables [Hunter et al., 1982]. Variables are never perfectly measured, and since most of the reviewed studies have not reported their measurement reliability coefficients, the error caused by unreliable measurement is hard to assess. The major reason for the lack of

reliability coefficients is that only a few researcher report the reliabilities for dependent variables, because they are usually hard criterion measures.

(3) Differences in treatment strength across studies. Range variation on the independent variable produces differences of an artifactual nature in correlations and effect size statistics. In experimental studies, range variation is the result of differences in the strength of the treatment. The range variation could be eliminated across studies if the range size in each study is known (i.e., if treatment strengths are measured or if standard deviations are published), or the distribution of range variation is known.

(4) computational and typographical errors.

(5) reporting error, etc.

Second, the variation of results across studies may be caused by the effect of real moderators (i.e., task difficulty). Therefore, to obtain consistent conclusions based on the results of various studies, artifacts must be corrected and if there is substantial variance among correlated measures of association, then a search for moderators is pursued.

3.2 Computation of Artifactual Errors

The main artifactual errors that are going to be corrected for are the sampling error, and to some extent the measurement reliability. The error of treatment strength can not be removed, since the range variation or the distribution of range variation are not reported in the original studies.

In the following three sections, the computation of both the effect size and the product moment correlation, and the removal of sampling error will be discussed.

3.2.1 The Effect Size (d)

The effect size is the difference between the means in standard score form. This study will use the within-group standard deviation of analysis of variance to calculate the effect size. Let S_e^2 be the variance for the experimental group, and S_c^2 be the variance of the control group. Then the within-group variance, that is the pooled sample estimate of the variance for both the experimental and the control group, as defined by Hunter et al., 1982, and Hedges and Olkin, 1985, is

$$S^2 = \frac{(N_e - 1)S_e^2 + (N_c - 1)S_c^2}{N_e + N_c - 2}$$

The effect size statistic d is then calculated as

$$d = \frac{\mu(Y_e) - \mu(Y_c)}{S}$$

where $\mu(Y_e)$ and $\mu(Y_c)$ are the means of the experimental and control group, respectively, and S is the within-group standard deviation. For this study, the effect sizes of each primary study are shown in Appendix A, for every dependent/independent variable.

In order to calculate the corrected variance of effect size for sampling error, we need to compute the frequency weighted mean and variance of the effect size over studies. The cumulated average effect size is:

$$\mu(d) = \frac{\Sigma\ [N_i\ d_i]}{\Sigma\ N_i}$$

The variance of the observed effect sizes over studies:

$$\sigma_d^2 = \frac{\Sigma\ [N_i(d_i - \mu(d))^2]}{\Sigma\ N_i}$$

The variance due to sampling error is calculated as:

$$\sigma_e^2 = \frac{\Sigma\ [N_i\ 4/N_i\ (1 + \mu(d)^2/8)]}{\Sigma\ N_i}$$

$$= \frac{4(1 + \mu(d)^2/8)K}{N}$$

where K is the number of independent studies and N is the total sample size of all studies. The corrected variance of effect size for sampling error (it is also called the unbiased estimate of the population variance or the residual *variance) is*

$$\sigma_p^2 = \sigma_d^2 - \sigma_e^2$$

3.2.2 The Product-Moment Correlation

The weighted average correlation $\mu(r)$ is analogous to the population effect size $\mu(d)$ which is discussed above. The population effect size $\mu(d)$ can be converted to $\mu(r)$ by treating the experimental/control group distinction as a dichotomization of a continuous variable [Hedges and Olkin, 1985]. That is

$$\mu(r)^2 = \frac{\mu(d)^2}{\mu(d)^2 + (N_e + N_c - 2)/N'},$$

where $N' = N_e N_c/(N_e + N_c)$. If $N_e = N_c = N/2$ this formula reduces to

$$\mu(r)^2 = \frac{\mu(d)^2}{\mu(d)^2 + 4(N - 2)/N}$$

According to Hunter et al. [1982], three steps are needed to test for the impact of inter-study differences. In the first step, a sample-weighted average mean value of the product-moment correlation across all studies is computed. Because sampling error cancels out in an average correlation across studies, the mean of the sample correlations is the best estimate of the population. The weighted average correlation $\mu(r)$ is calculated as follows:

$$\mu(r) = \frac{\Sigma\ (N_1\ r_1)}{\Sigma\ N_1}$$

where r_1 and N_1 are the individual correlations and sample sizes, respectively. Second, the observed sample variance (σ_r^2) must be corrected by subtracting the variance caused by sampling error (σ_e^2) to obtain the unbiased estimate of the population variance (σ_p^2). Thus,

$$\sigma_p^2 = \sigma_r^2 - \sigma_e^2$$

where, $$\sigma_r^2 = \frac{\Sigma[N_1(r_1-\mu(r))^2]}{\Sigma\ N_1} \quad \text{and} \quad \sigma_e^2 = \frac{[1-\mu(r)^2]K}{\Sigma\ N_1}$$

and, K = number of correlations obtained from the population of studies.

Since the majority of the studies are laboratory experiments, effect size (d) is the most appropriate measure rather than the product moment correlation. In order to transform r to d where the control and the experimental group have equal sample sizes ($N_e = N_c = N/2$), then [Hunter and Schmidt, 1990, p. 273]

$$d = 2r\ \sqrt{[(N-2)/N]}\ /\ \sqrt{(1-r^2)}$$

When the sample sizes are equal and the value of r is relatively small with a range of $-0.2 \leq r \leq +0.2$, then simply [Hunter and Schmidt, 1990]

$$d = 2r$$

If the sample sizes are not equal, then the point biserial correlation needs to be corrected for attenuation effect of unequal sampling before we transform it to d. The formula for this correction [Hunter and Schmidt, 1990, p. 274] is

$$r_c = ar/\sqrt{[a^2-1)r^2+1]}$$

where $a = \sqrt{[0.25/pq]}$, *and p and q are the proportion of persons in the two groups.*

If sample sizes are not equal, then we need to replace the "2" by $1/\sqrt{pq}$ *[Hunter and Schmidt, 1990, p. 273] in converting r to d to be*

$$d = \sqrt{[(N-2)/N]}\ (1/\sqrt{pq})r\ /\sqrt{(1-r^2)}$$

3.2.3 Obtaining Effect Size From Different Statistics

Unfortunately, it is not unusual that studies do not report the descriptive statistics of their results. Many empirical studies neglect to report the means and standard deviations of the tested variables. In order to overcome this problem, the test statistics (F-test, t-test, etc.) are used in lieu of the descriptive statistics. The formulas in Table V are used to calculate the effect size from the test statistics.

In some instances, studies neither report the mean and

TABLE V

FORMULAS FOR CONVERTING SOME TEST STATISTICS INTO PRODUCT MOMENT CORRELATIONS

Reported Statistics	Transformation to r_{xy}	References
a) $t = \frac{\mu(X_1)-\mu(X_2)}{\sqrt{S^2(1/n_1+1/n_2)}}$	$r_{pb} = \sqrt{t^2/(t^2+n_1+n_2-2)}$	Glass and Stanley [1970, p. 318]
b) $F = MS_b/MS_w$ for $J = 2$ groups.	$\sqrt{F} = \|t\|$ then proceed via a) above	
c) $F = MS_b/MS_w$ for $J > 2$ groups.	1) Collapse J groups to 2, then proceed via b) above, or 2) $r_{xy} = \sqrt{SS_b/(SS_b+SS_w)}$	Hays [1973, pp. 683-684]
d) χ^2 only (i.e., no frequencies reported) for a contingency table.	$r_{xy} \approx \sqrt{\chi^2/(\chi^2+n)}$ n = total sample size	Kendall & Stuart [1967, pp. 557 ff]
e) Spearman's rank correlation, r_s.	r_{xy} = rs since the translation of r_s to r_{xy} under bivariate normality is nearly a stright line	Kruskal [1958]
f) Mann-Whiney U.	Transform U to r-rank-biserial via $r_{pb} = 1-2U/(n_1n_2)$.	Wilson [1976]

Source: Glass, McGaw, and Smith, 1981

the standard deviations nor do they report the values of the summary statistics. Some of these studies, however, only report the significance level of the tests. Product moment correlation can be calculated from the significance level which then can be transformed to d. The steps used to calculate r from the significance level [Rosenthal, 1979] are: (1) Obtain the exact p associated with the test statistic, (2) find the Z associated with that p in tables of normal distribution, and (3) finally compute r

$$r = Z/\sqrt{N}$$

where N is the total sample size

Typically, 75 to 90% of the observed sampling variance is accounted for by sampling error variance [Hunter and Schmidt, 1990]. If so, a null hypothesis (i. e., interstudy differences had no impact on estimates) cannot be rejected. However, if even after correction for statistical artifacts, significant unexplained variance remains, then a search for moderator variables is appropriate [Hunter et al., 1982].

3.2.4 Artifact Distribution

The lack of standardized measurement procedures for the investigated variables in the social sciences results in poorly measured variables [Hunter, Schmidt, and Jackson, 1982]. Therefore, in order to have uniformity in the literature, results need to be corrected by eliminating the *measurement error. There are two reliabilities that are used to assess the measurement error: r_{XX} and r_{YY}, where X and Y are the independent and dependent variables respectively. If the reliability coefficients of the variables in each study are reported, then the effect of measurement error can be eliminated by correcting for attenuation for each study separately.*

However, as in this study, when the reliabilities of the used scales are not reported in every study, then the reliability distribution can be used instead to correct the variance of the uncorrected effect sizes. In this case, there are two steps to follow: (1) the variance of the observed effect size is corrected for sampling error, and then (2) the observed mean effect size and the corrected variance are then corrected for the effects of measurement errors using the distribution information on reliabilities.

If either the independent variable or the dependent variable is imperfectly measured, then the effect size of the imperfectly measured variables will be systematically lower than the effect size of the true score.

For the experimental studies, we are mainly concerned about the reliability of the dependent variables. Many experimenters believe that error of measurement in the dependent variables needs to be omitted in experiments since it averages out in the group means. In fact, error of measurements is included in the variance of the dependent variable, and therefore it affects the effect size [Hunter and Schmidt, 1990]. The error of measurement of experimental studies in the independent variable is also important to correct for [Hunter and Schmidt, 1990]. However, it is neglected by all experimenters of the studies on hand, and therefore no correction can be done to the measurement error of the independent variables.

3.2.4.1 Correction for Effect Size Measurement Error

For the dependent variables, the attenuated populationn (actual) effect size δ is given by

$$\delta_0 = a\delta$$

where the attenuation factor, a, is the square root of the reliability of the dependent variable ($\sqrt{r_{YY}}$), and δ_0 is the corrected effect size from the bare bones meta-analysis (i.e., corrected for only the sampling error). The formula relating to the actual effect size and the sample effect size [Hunter and Schmidt, 1990, p. 311], then is

$$d_0 = \delta_0 + e = a\delta + e$$

where d_0 is the sample effect size, and e is the sampling error. The mean observed uncorrected effect size, across studies is

$$\mu(d_0) = \mu(a\delta + e) = \mu(a\delta) + \mu(e)$$

The mean sampling error, $\mu(e)$, is equal to zero, if the slight error in d is ignored.

$$\mu(d_0) = \mu(a\delta)$$

If the true effect size is independent of the level of reliability, then the mean of their product equals to the product of their means.

$$\mu(d_0) = \mu(a)\mu(\delta)$$

The average of the attenuation factors for individual studies is used for attenuating the desired average true effect size. If the mean attenuation factor, $\mu(a)$, is known, then the observed average effect size can be corrected using the same formula that is used to correct an individual effect size (i.e., when every study reports its reliability coefficient).

$$\mu(\delta) = \mu(d_0) \ / \ \mu(a)$$

There is no need to know the attenuation factor (i.e., the square root of the reliability) for each study. Only the mean of the attenuation factor across studies is needed, assuming that the studies that report their reliability coefficients are representing the rest of the studies. In this case, the distribution of the available reliabilities is used to correct for the measurement error. If the reliability of each study is given, then every reliability *is converted to its square root before computing the mean and standard deviation.*

3.2.4.2 Correction of Variance of Effect Size

The variance of the observed effect size is given by

$$Var(d_0) = Var(\delta_0 + e) = Var(\delta_0) + Var(e).$$

In the bare bones meta-analysis, the variance of study population effect size $Var(\delta_0)$ *is computed by subtracting the sampling error variance* $Var(e)$ *from the variance of observed effect sizes* $Var(d_0)$. *The residual variance which is corrected for sampling error, but not for error of measurement, is connected to the desired variance of true effect sizes* $Var(\delta)$ *by [Hunter and Schmidt, 1990, p. 312]*

$$Var(\delta_0) = Var(a\delta).$$

If the true effect size across studies and the level of reliability are independent from each other, then

$$Var(\delta_0) = [\mu(a)]^2 Var(\delta) + [\mu(\delta) + [\mu(\delta)]^2 \; Var(a).$$

From the above equation, the desired variance $Var(\delta)$ *becomes*

$$Var(\delta) = \{Var(\delta_0) - [\mu(\delta)]^2 Var(a)\} \; / \; [\mu(a)]^2,$$

where $Var(\delta_0)$ *is the corrected variance from the bare bones meta-analysis,* $\mu(a)$ *is the average attenuation factor across studies,* $Var(a)$ *is the variance of the attenuation factor* *across studies, and $\mu(\delta)$ is the average true effect size as computed above.*

The reported reliabilities of the dependent variables are reported in Appendix B, along with other information for every set of studies

3.3 Homogeneity Tests for Moderator Variables

Current procedures allow researchers to detect interaction between the variables of interest and the conditions under which performance is measured in the studies. This can be done by testing the homogeneity (consistency) of effect sizes across studies. Homogeneity tests mean assessing whether each study is a replication of each other study [Linn, 1986; Linn & Petersen, 1986]. Lack of homogeneity among the effect sizes means that at least some of the studies in the meta-analysis are not true replicates of each other [Linn, 1986]. The three techniques of homogeneity test are discussed below.

3.3.1 The Chi-Square Test for Moderator Variables

After correcting for sampling and other artifactual error, if the residual variance (the corrected variance) of effect size across studies is approximately zero, the population effect size, $\mu(d)$, is estimated. It is possible then to draw a conclusion about the relationship between the use of DSS/GDSS and decision making effectiveness. However, *if, after correction, the residual variance is far from zero, moderators may exist. Thus, a chi-square test to determine the significant residual variance of effect size is conducted. The following formula is used:*

$$\chi^2[df = (K - 1)] = (\sigma_d^2/\sigma_e^2)K.$$

where K is the number of independent studies [Hunter et al., 1982; Premack and Wanous, 1985].

A significant chi-square value indicates the possible existence of a moderator. The search for moderators entails breaking the data into subsets, each according to the level of the potential moderator. For each subset, the analytical procedures of correcting for artifacts and performing a chi-square test must be repeated. Since distributional formulas are used on subsets, then only the observed correlations would be averaged within subsets. The artifact distributions for the overall set of studies would still be used within subsets. If large differences in the mean effect size between subsets or a reduction in variance within subsets exists, the identified moderator may be confirmed. Otherwise, the existence of a moderator is not supported.

This search is accomplished by grouping studies according to hypothesized moderators (e.g., level of task difficulty, group size, and time length of the study) and performing subgroup meta-analysis. If there are large differences in the means across subgroups and there is a *corresponding reduction in within-subgroup variation, one may infer that hypothesized moderating effect does indeed exist.*

3.3.2 Credibility Intervals to Test for Moderators

When effect sizes across studies are accumulated and statistically corrected for experimental artifacts such as sampling error and error of measurement, the corrected mean effect size is interpreted as an estimate of the population mean effect size. The variance in the effect sizes is also statistically corrected for experimental artifacts then is used to generate a "credibility intervals" to assess the extent to which moderators might account for the unexplained variance in effect sizes [Whitener, 1990].

The credibility intervals will help in determining whether the population or the subpopulations are homogeneous or heterogeneous. The credibility interval is generated using the corrected standard deviation around the mean corrected observed effect size, $\mu(d)$*. Under* $\alpha = 0.05$*, the credibility interval becomes*

$$\mu(d) - 1.96\ \sigma_\delta < \delta < \mu(d) + 1.96\ \sigma_\delta .$$

If this interval is sufficiently large and/or does include zero, then the mean corrected effect size is probably the mean of several subpopulations (the heterogeneous case) identified by the existence of moderators.

If the interval is small and/or does not include zero, then the mean corrected effect size is probably the estimate of one population parameter (the homogeneous case) and there are no moderator variables in operation [Kemery, Mossholder and Dunlap, 1989; Pearlman, Schmidt and Hunter, 1980].

The first case is when credibility interval suggests that the average corrected effect size is the estimate of one population parameter and no moderators are operating. Then a confidence intervals using the standard error for the mean effect size for homogeneous studies would be generated around the sample-size weighted mean effect size to estimate the accuracy of the estimate of the mean effect size. The standard error in the mean correlation for homogeneous studies is

$$SE = (1-\mu(d)^2) \;/\; (N - K)^{1/2}$$

where $\mu(d)$ is the sample-size weighted mean uncorrected effect size, N is the total sample size and K is the number of studies.

The second case is when credibility interval suggests that there are several subpopulations based on moderators that are identified from theory or previous research, and that no further subgrouping is possible. First, meta-analytic procedures are conducted on each subpopulation to generate sample-size weighted mean effect sizes. Then, within each homogeneous subpopulation a confidence interval *is generated using the standard error of the homogeneous case. Finally, a confidence interval is generated around the mean of the subpopulations using the standard error of the heterogeneous case [Schmidt, Hunter and Raju, 1988]:*

$$SE = \{[(1 - \mu(d)^2)^2 / (N - K)] + (SD_{res}^2 / K)\}^{1/2}$$

The chi-square test has a low power in detecting moderators, if the number of studies is small (i.e., less than 60). It also has a low power if the total sample size is small (i.e., less than 500). Therefore, the power of the chi-square test in detecting moderators is dependent on the number of studies and the total sample size. The credibility interval test is a more powerful test than the chi-square test in detecting moderators, in the sense that it does not depend on the total sample size or the number of studies. It is mainly a function of the observed corrected mean effect size and the corrected variance of the effect size.

3.3.3 Schmidt-Hunter 75% Rule

The third technique to test for moderator variables is the Schmidt-Hunter 75% rule. This rule suggests that if the residual variance accounts for at least 25% of the observed variance in the effect size, then there should be some moderator variables. In other words, the correctable artifacts should account for at least 75% of the observed variation in the effect size, to say that there is no moderator variable. This rule is shown to be good for small sample size research domain [Hunter and Schmidt, 1990], and found to have statistical power greater than (or equal to) the chi-square method [Sackett et al, 1986]. However, this rule is showed to have a higher Type I error rate, in concluding that there is a moderator when there is not [Hunter and Schmidt, 1990]. The three methods of detecting moderator variables provide information that moderators are operating, but can not identify which moderators are working. A method discussed in the next section, called confidence intervals for second order sampling error is used to confirm the existence of a certain moderator variable.

In this study, eight potential moderator variables will be tested for each dependent variables. The data of these moderators for each study is shown in Table III, pages 59-63.

3.4 Second Order Sampling Error

Second order sampling error occurs when the outcome of meta-analysis is based on a small number of studies that usually happen to be available, and where the outcome of the analysis depends in part on study properties that vary randomly across studies [Hunter and Schmidt, 1990]. It is like the ordinary, or first order, sampling error in that it affects meta-analytic estimates of standard deviations more than it affects estimates of means. However, the first order *sampling error stems from the finite number of subjects in each primary studies, while the second order sampling error stems from the finite number of studies in the meta-analysis.*

The issue of second order sampling error is related to the issue of statistical power in meta-analysis with respect to both the mean and the variance [Hunter and Schmidt, 1990]. There are two types of second order sampling error: sampling error due to incompletely averaged sampling error in the primary studies (secondary sampling error) and sampling error produced by variation in effect sizes across studies (primary sampling error). The problem of second order sampling error can be resolved as suggested by Hunter and Schmidt [1990] by conducting meta-analyses based on substantial number of studies, or by conducting meta-analyses of similar meta-analyses (second order meta-analysis). The average observed d for the meta-analysis is

$$\mu(d) = \mu(\delta) + \mu(e),$$

where $\mu(\delta)$ *is the average population effect size and* $\mu(e)$ *is the average sampling error across studies. If the number of studies is small then there will be second order sampling error in the mean effect size.* $\mu(d)$ *will differ from* $\mu(\delta)$ *because* $\mu(e)$ *will not equal to 0 and probably because of chance variation in the mean population effect size.*

Since most of our primary studies have a sample of 100 or less, then the largest component of second order sampling error in meta-analysis is secondary sampling error, i.e., unresolved sampling error in the primary studies [Hunter and Schmidt, 1990]. The question of whether or not there is a primary second order sampling error depends on whether there is a homogeneous or a heterogeneous case. In the homogeneous case the population study effect δi *does not vary across studies. That is*

$$\delta_1 = \delta \quad \text{for each study } i \text{ in the domain,}$$

and

$$\mu(\delta_1) = \delta \quad \text{for any set of studies from the domain}$$

$$Var(\delta_1) = 0 \quad \text{for any set of studies from the domain}$$

$$= Var(e_1)$$

The meta-analysis mean observed effect size is

$$\mu(d_1) = \mu(\delta_1) + \mu(e_1)$$

$$= \delta + \mu(e_1)$$

Thus the meta-analytic effect size differs from the population effect size δ *only to the extent that the average of the sampling errors in the meta-analysis differs from 0. As a result, in the homogeneous case the only second order sampling error in the mean effect size and variance of observed effect size in the meta-analysis is the secondary sampling error, i.e., the unresolved primary study sampling* error. In the heterogeneous case, both the mean and the standard deviation of population effect sizes in the meta-analysis will differ from the research domain values because the studies observed are only a sample of studies. This is the primary second order sampling error.

In the homogeneous case, the sampling error in the mean effect size for a bare bones meta-analysis (e.g., a meta-analysis that is corrected for only the sampling error) is obtained from the sampling error equation

$$D = \delta + \epsilon$$

where D is the mean effect size and ϵ is the average sampling error. The distribution of meta-analytic sampling error ϵ is described by

$$E(\epsilon) = 0$$

$$Var(\epsilon) = Var(e) / K$$

where K is the number of studies and $Var(e)$ is the variance of the sampling error in the meta-analysis. Thus under the assumption of homogeneity, the 95% confidence interval for the mean effect size is

$$\mu(d) - 1.96\ SD_\epsilon < \delta < \mu(d) + 1.96\ SD_\epsilon$$

The sampling error in the variance of effect sizes for a bare bones meta-analysis is determined by a variance ratio. For a large number of studies, the condition of *homogeneity could be identified by computing the following ratio*

$$Var(d) \ / \ Var(e) = 1$$

However, for a small number of studies, the ratio will be different from 1 due to sampling error. The chi-square test can estimate that error. Thus

$$Q = K \ Var(d) \ / \ Var(e)$$

Q is the comparison variance ratio multiplied by the number of studies. In the homogeneous case, Q has a chi-square distribution with K-1 degrees of freedom. The problem with the homogeneity test is that when the number of studies is small, then a real moderator variable must be enormous in order to be detected. On the other hand, if the number of studies is large, then any small departure from homogeneity will suggest the presence of a moderator variable where there may be none (type I errors).

In the heterogeneous case, there can be primary second order sampling error that is due to the fact that the number of studies is infinite. In this case the chi-square test is untrustworthy, and it is better to assume the heterogeneity case. The size of the primary second order sampling error for the mean effect size is

$$Var[\mu(d)] = Var(\delta) \ / \ K$$

3.4.1 The Theoretically Predicted Moderators

The power of the chi-square test depends to a great extent on the average sample size and the total sample size of the primary studies [Hunter and Schmidt, 1990]. Comparison of the means for the moderator groups has more power than the chi-square test. Thus, it was shown by Hunter and Schmidt [1990] that the theoretically predicted moderator (tested by comparison of the means) has far higher statistical power to be detected than the unsuspected moderator variable (tested by chi-square).

In the comparison method, there is a possibility that the observed difference between means is due to second order sampling error and not to a moderator variable. To account for this possibility, the confidence intervals for mean effect size is computed for each subset.

$$D_1 - 1.96\sqrt{Var(\epsilon_1)} < \delta_1 < D_1 + 1.96\sqrt{Var(\epsilon_1)}$$

$$D_2 - 1.96\sqrt{Var(\epsilon_2)} < \delta_2 < D_2 + 1.96\sqrt{Var(\epsilon_2)}$$

where D_1 and D_2 are the observed mean effect sizes for subsets 1 and 2 respectively. Second, the smaller the overlap between these confidence intervals the more confirmed the predicted moderator variable. To measure the extent of overlap of the confidence intervals, a significance test is computed on the difference between the two mean effect sizes.

$$C = D_1 - D_2$$
$$= (\delta_1 + \epsilon_1) - (\delta_2 + \epsilon_2)$$
$$= (\delta_1 - \delta_2) + (\epsilon_1 - \epsilon_2)$$

where C is the comparison statistic difference. Thus the sampling error variance of C is

$$Var(C) = Var(\epsilon_1 - \epsilon_2) = Var(\epsilon_1) - Var(\epsilon_2)$$
$$= Var(d_1) / K_1 + Var(d_2) / K_2$$

where $K_1 + K_2 = K$. *The calculated z value is*

$$z = C / \sqrt{Var(C)}$$

At 5% critical value, using one tailed test, the calculated z is significant if it is greater than the critical z value of 1.645. The statistical power of the significance test is the probability that the null hypothesis will be rejected; i.e.

$$Power = P \{ z > 1.645 \}$$
$$= P \{ C / S > 1.645 \}$$
$$= P \{ C > 1.645 S \}$$

where $S = \sqrt{Var(C)}$. *Since C has mean* $(\delta_1 - \delta_2)$ *and standard deviation S,*

$$Power = P \{[C - (\delta_1 - \delta_2) / S > [1.645 S - (\delta_1 - \delta_2)] / S\}$$
$$= P \{ x > c \}$$

where x is standard normal, and the cutoff value c is

$$c = 1.645 - (\delta_1 - \delta_2) / S$$

Power is therefore computed from the normal distribution using

$$Power = Q(c)$$

where Q is the function defined by the upper tail of the normal distribution function

3.5 Study Availability Bias

It is very usual that a typical meta-analytic study will not include all the relevant published and unpublished studies, and that there are usually some missing studies that can not be found or included by the researcher. This fact applies also to this meta-analytic study as well. In order to make sure that the unlocated studies will or will not effect the results of a meta-analysis of existing studies, several authors have developed some techniques to deal with this problem. Rosenthal and Rubin [1979] have advanced their "File Drawer Analysis" (or Fail-Safe N) as an approach to deal with the problem of availability bias. This method estimates the number of unlocated studies averaging null results (i.e., $\mu(d) = 0$ or $\mu(r) = 0$) that would have to exist to bring the significance level for a set of studies down to the "just significant" level; that is, to $p = 0.05$

(or critical z value = 1.645). It focuses only on statistical significance and not effect sizes.

The first step in applying the "Fail-Safe N" method is to compute the overall significance level across studies, then convert the p-values for each of the k effect sizes to their corresponding z values using ordinary normal curve, using the formula in Rosenthal and Rubin [1979]. Next, the direction of the hypothesis difference is determined since it is one tailed test. If z values come from independent studies, then each has a variance of 1.00, and the variance of all the zs across the k studies is $\Sigma zk = (1)(k) = k$. *Then the* $SD = \sqrt{k}$. *The* z_c, *the z score corresponding to the significance level of the total set of studies, is then*

$$z_c = \Sigma zk / \sqrt{k} = k\mu(zk) / \sqrt{k} = \sqrt{k}\ \mu(zk)$$

Let the additional number of studies be x. Since these studies have $\mu(z) = 0$, *the* $\Sigma zk{+}1 = \Sigma zk$, *but the number of studies will increase from k to k+x. Thus the SD for* $\Sigma zk{+}x$ *will be* $\sqrt{(k+x)}$. *If z is set equal to 1.645, where p-value = 0.05, then*

$$1.645 = k\mu(zk) / \sqrt{(k+x)}$$

Solving for x:

$$x = k / 2.706\ [k(\mu(zk)^2 - 2.706]$$

However, since the combined study results can be highly *significant statistically even though the mean effect size is small or even tiny, it would be more informative to know how many missing studies averaging null findings would have to exist to bring $\mu(d)$ or $\mu(r)$ down to some specific level. The following formulas are derived independently by Schmidt et al. [1979] and Orwin [1983].*

If k is the number of studies, then the observed average effect size:

$$\mu(dk) = \Sigma dk / k$$

The question is: how many "lost" studies (x) exist to bring $\mu(dk)$ down to $\mu(d_c)$, the critical value for mean d (which may be the smallest mean value that is considered theoretically or practically significant). The new total number of studies will be k+x. Σdk will remain unchanged, since $\Sigma d = 0$ for the x new studies. If $\mu(dk)$ is set equal to $\mu(d_c)$:

$$\mu(d_c) = \Sigma dk / k+x$$

then

$$x = [k\mu(dk) / \mu(d_c)] - k$$

$$x = k [\mu(dk) / \mu(d_c) - 1]$$

3.6 Procedures of Conducting the Analysis

The general steps of conducting meta-analysis in this research is as suggested by Hunter, Schmidt and Jackson

[1982]. The analysis begins with searching for and gathering relevant studies, then extracting statistical information from the studies, and finally cumulating the information extracted.

3.6.1 Population of the Study

The primary goal in selecting data sources for a meta-analysis is to secure a representative sample and avoid potential bias. The lack of a sampling frame, however, ultimately dictates that a meta-analyst attempts a census of all studies pertaining to a research question.

Figure 3 illustrates the procedures used to identify investigations of DSS/GDSS effectiveness. A typical literature review focuses on published literature. However, meta-analysis recognizes the fact that some research may not be published. Thus, a careful search of relevant published reference sources, indices, and journals were utilized in the first stage of the research, whereas in the second search effort an attempt was made to identify both published and unpublished literature by examining the references of the first stage for new citation.

For the purpose of conducting meta-analysis, only laboratory studies, field tests, and field studies are included in the analysis. Case studies are not considered because they lack generalizability and do not provide enough statistics of measures, mainly because they do not have a

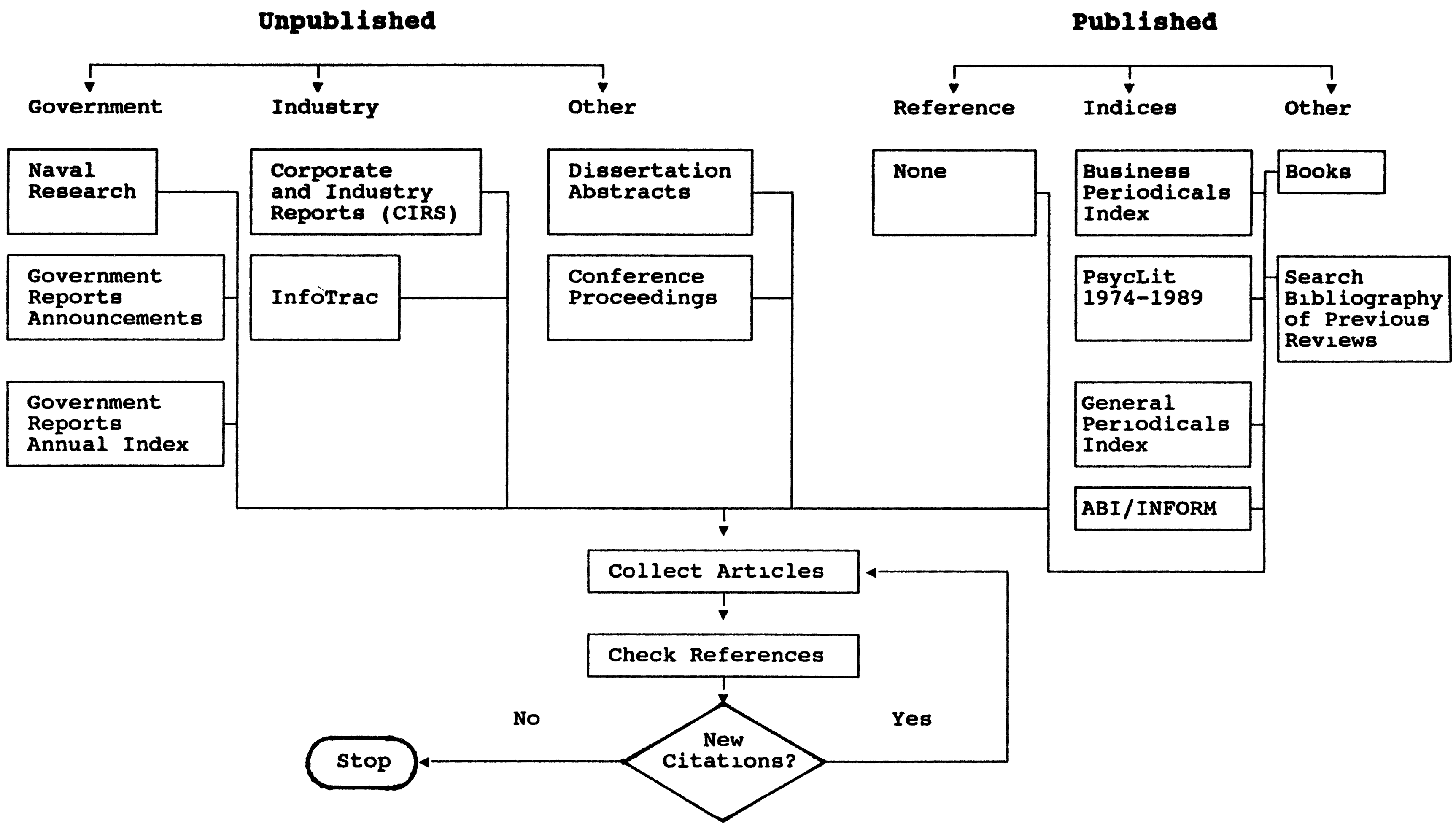

Figure 3. Meta-Analysis Search Process to Collect the Studies

control group. The research also will not include studies having all or some of the concerned moderator variables unless these variables were tested along with the main independent variable, i.e., availability of DSS/GDSS technology.

The literature search identifies 70 empirical studies covering a period of two decades from 1970 to 1990. The search of published literature identifies 38 citations from 21 different journals. Whereas, the search of unpublished literature identifies 28 dissertations and 14 unpublished articles. Unlike most, if not all, meta-analyses, this study contains more unpublished than published studies. Through a careful and extensive search, this was able to reject the availability bias hypothesis [Hunter and Schmidt, 1990] which states that the unpublished studies are less frequently available to be included in meta-analysis. The majority of the studies are laboratory experiments with few field studies and field experiments. The number of studies broken down by the type of decision aid (DSS or GDSS), and the type of empirical research (laboratory studies, field tests and field studies) are shown in Table VI. The names of the included and excluded studies are shown in Appendix B.

3.6.2 Coding the Studies

After gathering the relevant studies, every study was carefully read by the author to extract and interpret the

TABLE VI

CATEGORIZATION OF THE EMPIRICAL DSS AND GDSS EFFECTIVENESS STUDIES

TYPE OF RESEARCH	DSS	GDSS	TOTAL
LABORATORY STUDIES	31	26	57
FIELD STUDIES	7	1	8
FIELD TESTS	3	2	5
TOTAL	41	29	70

statistical results that are needed to conduct the meta-analysis. For each study the following information was recorded (see Appendix A):

(1) All statistics on each variances of DSS/GDSS effectiveness in the aggregation measures, including means, standard deviations, t, F, or χ^2 *tests.*

(2) The number of subjects in each study and the number of subjects in each cell (or treatment)

(3) The group size for GDSS

(4) The nature of the design, whether experimental or naturalistic/correlational

(5) The method of measurement, whether, direct observation, self-report, or other

(6) Type of sample, whether students or actual managers

(7) sampling design

(8) Decision task type, whether difficult (unstructured) or simple (structured) task

(9) Phase of decision making, whether it is problem finding and structuring or problem solving

(10) Type of decision aid, whether it is a DDS or a GDSS

(11) Date of publication

(12) The independent variables

(13) The dependent variables

(14) Time length of the study, whether it is cross-sectional or longitudinal

In order to establish a confidence in the judgment *calls made by the author with regard to study interpretation of characteristics and results, a 25% random sample of the collected studies was examined by four independent raters. All three raters are professors in the Management Department of Oklahoma State University, and are familiar with the subject matter. An inter-rater reliability of slightly more than 0.80 was obtained and thought to be acceptable.*

Studies will be split into groups to perform subgroup meta-analysis based on the following factors:

(1) the moderator variables investigated in the literature (group size, and decision task difficulty),

(2) the type of decision support system (DSS versus GDSS),

(3) the type of study (laboratory versus field studies),

(4) the type of subjects (students versus actual users,

(5) cross sectional versus longitudinal studies,

(6) published versus unpublished studies, and

(7) old versus recent studies

The set of moderator variables is determined by the focus of the available studies and data provided by them. Available studies do not permit inclusion of some theoretically relevant moderator variables such as anonymity (the identifiability of group member contributions), proximity (face-to-face versus dispersed group decision making), nature of the group or individual task, user *acceptance of the system, design method of the decision aid i.e., evolutionary versus traditional [Alavi and Henderson, 1981; Mahmood and Medewitz, 1985], group cohesiveness, and user involvement.*

3.7 The Expected Results

The following summarizes the general expected results of the meta-analysis:

(1) The most effective system is the computerized DSS/GDSS, followed by the manual decision aids. The least effective system is the one with no-support at all.

(2) Some moderator variables have an impact on the effectiveness and efficiency of DSS/GDSS. These are:

- *Task difficulty (positive relationship): The higher the task difficulty, the more effective and more efficient the DSS/GDSS.*
- *Group size (positive relationship): The larger the size of the group, the more effective and efficient the GDSS.*
- *Length of experiment time (positive relationship): Longitudinal studies will report significantly higher effectiveness and efficiency of computerized DSS/GDSS as opposed to manual or no-DSS/GDSS than the cross-sectional (one period) studies.*
- *New studies (1981-1990) report significantly higher*

results of effectiveness and efficiency of computerized DSS/GDSS as compared to manual or no-DSS/GDSS than old studies (1970-1980), mainly because of recent development of DSS/GDSS and better measurement methods in recent studies.

- *Published studies will produce significantly higher results in favor of computerized DSS/GDSS use in terms of effectiveness and efficiency than unpublished studies. The hypothesis of availability bias suggests that the unpublished studies have smaller effect sizes than the unpublished studies [Hunter and Schmidt, 1990]*
- *Studies with actual subjects (i. e., managers) will produce significantly higher results in favor of DSS/GDSS effectiveness and efficiency than studies with student subjects.*
- *Laboratory studies will produce significantly higher results in favor of DSS/GDSS effectiveness and efficiency than field tests or field studies.*

(3) Both DSS and GDSS are, in general, more effective than the manual DSS/GDSS or the no-DSS/GDSS.

(4) GDSS are significantly more effective than DSS, because of the communication element in GDSS, and that GDSS studies use more objective measures than DSS.

(5) DSS/GDSS groups are less efficient than non-DSS/GDSS

groups in terms of decision time, due to increase in depth of analysis, increase in equality of participation, and time required to use the technology. However, the benefits of DSS/GDSS greatly outweigh the disadvantages.

(6) GDSS are less efficient than DSS due to increase in participation as a result of anonymity of input, and the sophistication of their technology.

In the next chapter, the actual results will be discussed for each independent, dependent, and moderator variable. The summary of the results and the tests of the hypotheses will be discussed in Chapter V.

CHAPTER IV

ANALYSIS AND RESULTS

4.1 Introduction

The data analysis was performed using a program developed by Schmidt [Hunter and Schmidt, 1990], and modified and extended by the author. The program is written in Quick BASIC and is listed in Appendix C. Results of the availability of DSS/GDSS, without consideration to any moderator variables are considered first, and shown in Tables VII and VIII (pp. 132, 136). Then results are presented for each moderator variable (i.e., level of task difficulty) on a binary basis (one at a time) to test for their effects. These results are shown in Tables IX to XXIV.

4.2 The Interpretation of the Meta-Analysis Results

The first column in Tables VII and VIII (No. of D's) represents the number of studies (also denoted by K) included in the analysis. The second column (total N) represents the total sample size of all studies included. The third column (mean corrected D) represents the average corrected effect size across the studies. If the average corrected D is less than 0.2, then it is small. It has a *moderate size between 0.2 and 0.5, and a large size, when it is above 0.5. The fourth column (SD of corrected D) is the standard deviation of the average corrected D. The fifth column (credibility intervals) represents the 80% interval surrounding the corrected D. This interval is used to decide on the homogeneity of the population of the studies (i.e., if it is large and/or includes zero, then the population is heterogeneous and moderator variables may exist). The sixth column (% of var due to sampling error) represents the percentage of variation in D that is attributable only to sampling error. The seventh column (mean uncorrected D) represents the uncorrected average effect size across the studies. The eighth column (mean SQR of* R_{YY}*) represents the square root of the average reliability coefficient of the dependent variable. The ninth column (confidence intervals) represents the 80% interval surrounding the average uncorrected D (i.e., if the confidence interval includes zero, the average corrected D is not significantly different from zero). The tenth column (var of obs. D's) is the variance of the average uncorrected (observed) D. The eleventh column (sampling error of obs. D's) represents the size of the variation in observed D corrected for sampling error. The twelfth column (var due to* R_{YY} *diff.) represents the size of the variation in the observed D corrected for measurement error. The thirteenth column (residual var) represents the remaining variation in the observed D after* *deducting sampling error and measurement error (i.e., column 13 = column 10 - column 11 - column 12). The fourteenth column (chi-sq, χ_{k-1}^2) is the chi-square test for homogeneity (i.e., if the test is significant, then the population is heterogeneous, otherwise it is homogeneous). The last column (fail-safe N) represents the number of unlocated (missing) studies with null average results (i.e., D = 0) that would bring the average corrected D_k to the level of critical D (i.e., D_c = 0.05, which is the smallest value of D that would be considered theoretically significant). If 10 or less studies are needed, then there is no practical significance. Between 11 and 25 studies, there is weak practical significance. From 26 to 50 studies there is moderate significance. Beyond 26 studies, there is strong practical significance.*

4.3 The Main Effects of the Independent Variables

There are 16 dependent variables, and two independent variables. Every dependent variable (i.e., decision quality) will be discussed, first with the independent variable of DSS/GDSS versus no-DSS/GDSS, and second with the independent variable of DSS/GDSS versus manual DSS/GDSS.

4.3.1 Decision Quality (DSS/GDSS Versus No-DSS/GDSS)

Individuals using computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .381, K =

43, $N = 5446$) than do individuals who use no decision support at all (Table VII). Although the difference in the quality of decisions produced by computerized DSS/GDSS and no-DSS/GDSS is relatively moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.21 to .93), suggesting that the average difference in quality is not significantly different from zero (i.e., no difference in quality) at $p < .10$. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in higher quality decisions than no-DSS/GDSS, the fail-safe n suggests that it is likely that the difference is large and reliable enough to be of practical significance (as opposed to statistical significance). The fail-safe n shows that it would take 285 studies with average null results (i.e., $D = 0$) to reduce the average corrected D from .381 to .05 (the smallest value that would be considered theoretically significant).

The magnitude of the difference in the quality of decisions between computerized DSS/GDSS and no-DSS/GDSS may be influenced by moderator variables. The presence of moderators (i.e., true difference in results across studies after controlling for sampling error and measurement error) in this set of studies is indicated in three ways. First, sampling error accounts for only 14.15% of the differences in results across studies, well below Hunter and Schmidt's 75% rule [Hunter, Schmidt, and Jackson, 1982] which states

TABLE VII

THE MAIN EFFECTS OF THE INDEPENDENT VARIABLE OF DSS/GDSS VERSUS NO-DSS/GDSS WITH NO MODERATOR VARIABLES

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality	43	5445	.381	.472	-.22, .98	14.15	.3589	.941
Decision Time	20	3542	-.0344	.848	-1.12, 1.05	3.08	-.0344	1
Depth of Analysis	17	1051	.239	.933	-.955, 1.43	8.80	.214	.895
Decision Confidence	16	1199	.166	.688	-.7148, 1.048	11.40	.158	.949
Satisfaction w/Decision Process	13	1228	-.148	.708	-.105, .758	9.04	-.138	.933
Satisfaction w/Decision Outcome	9	694	.2646	.1317	.096, .433	75.59	.2646	1
Equality of Participation	16	1138	1.17	1.709	-1.020, 3.35	2.71	1.049	.898
Degree of Decision Consensus	14	1045	-.627	.98	-1.88, .634	6.19	-.594	.948
Satisfaction Toward the System	6	714	.423	.804	-.587, 1.47	5.88	.411	.929
Degree of Decision Consistency	1	96	d = .4922					
Amount of Discussion Conflict	2	162	.297	1.07	-1.07, 1.66	4.30	.297	1
Degree of Uninhibited Behavior	6	327	.179	.247	-.137, .496	55.5	.179	1
Amount of Communication	5	310	-.701	.933	-1.89, .49	8.24	-.665	.949
Rate of Decision Improvement	8	945	.7296	.7145	-.185, 1.64	9.97	.581	.797
Degree of Group Cohesiveness	2	200	-.403	.195	-.652, -.153	52.24	-.403	1
Amount of Task-Oriented Behavior	2	90	-.048	.45	-.625, .529	31.39	-.048	1

TABLE VII (CONTINUED)

THE MAIN EFFECTS OF THE INDEPENDENT VARIABLE OF DSS/GDSS VERSUS NO-DSS/GDSS WITH NO MODERATOR VARIABLES

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs D's	Var due to R_{YY} Diff	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Fail Safe N
Decision Quality	-.21, .93	.230	.0326	.0001	.1977	303.8	285
Decision Time	-1.12, 1.05	.741	.0228	0	.7184	648.8	$D_K<D_C$
Depth of Analysis	-.854, 1.28	.764	.0673	.000038	.697	193.1	64
Decision Confidence	-.679, .995	.483	.0550	0	.428	140.3	37
Satisfaction w/Decision Process	-.984, .707	.479	.043	0	.436	143.8	25
Satisfaction w/Decision Outcome	.096, .433	.0711	.0537	0	.0173	11.9	39
Equality of Participation	-.917, 3.02	2.43	.0658	.00087	2.36	589.68	358
Degree of Consensus	-1.79, .602	.929	.0575	0	.872	226.2	162
Satisfaction Toward the System	-.545, 1.37	.593	.035	0	.558	101.9	45
Degree of Decision Consistency							
Amount of Discussion Conflict	-1.07, 1.66	1.19	.051	0	1.14	46.48	9
Degree of Uninhibited Behavior	-.137, .496	.138	.0765	0	.061	10.8	15
Amount of Communication	-1.79, .468	.853	.0704	0	.783	60.0	65
Rate of Decision Improvement	-.147, 1.31	.360	.0359	0	.324	80.24	109
Degree of Group Cohesiveness	-.652, -.153	.0797	.0416	0	.0381	3.82	14
Amount of Task-Oriented Behavior	-.625, .529	.296	.0931	0	.203	6.37	$D_K<D_C$

that a set of studies is homogeneous (i.e., no moderator) if 75% of the variance is attributable to sampling error. Second, the 80% credibility interval surrounding the corrected D includes zero (-.22 to .98), also suggesting that there are true differences across this set of studies on decision quality. Recall that the credibility interval is the most powerful method of detecting moderator variables. Finally, the omnibus chi-squared test (which is less powerful than the credibility interval, and cannot be trusted for a set of small number of studies), also indicates the presence of moderators. Because of these supporting results, the hypothesized moderators (i.e., new versus old studies, DSS versus GDSS, students versus actual users, laboratory versus field tests versus field studies, cross-sectional versus longitudinal studies, small versus large groups, published versus unpublished studies, and low versus moderate versus high task difficulty) will be examined to determine whether they affect the average difference in the quality of decisions across computerized DSS/GDSS and no-DSS/GDSS.

4.3.2 Decision Quality (DSS/GDSS Versus Manual DSS/GDSS)

Individuals using computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .6078, K = 27, N = 1899) than individuals who use manual decision support (Table VIII). Although the difference in the quality *of decisions produced by computerized DSS/GDSS and manual DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.389 to 1.462), suggesting that the average difference in quality is not significantly different from zero at $p < .10$. However, the fail-safe n suggests that it is likely that the difference is large and reliable enough to be of practical significance, because it would take 301 studies with average null results to reduce the average corrected D from .6078 to .05.*

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 10.39% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-.441 to 1.657). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.3 Decision Time (DSS/GDSS Versus No-DSS/GDSS)

Individuals using computerized DSS/GDSS take no more decision time on average (mean corrected D = -.0344, K = 20, N = 3542) than individuals who use no decision support at all (Table VII, p. 132). This is confirmed by the fact that the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.12 to 1.05), suggesting that the average difference in decision time is not significantly different

TABLE VIII

THE MAIN EFFECTS OF THE INDEPENDENT VARIABLE OF DSS/GDSS VERSUS MANUAL DSS/GDSS WITH NO MODERATOR VARIABLES

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality	27	1899	.6078	.819	-.441, 1.657	10.39	.536	.882
Decision Time	11	969	-.136	1.12	-1.57, 1.299	3.56	-.136	1
Depth of Analysis	15	1220	.3309	.49	-.296, .958	19.05	.314	.95
Decision Confidence	9	876	.104	.552	-.602, .8108	13.82	.0968	.927
Satisfaction w/Decision Process	5	172	.628	.749	-.3309, 1.588	21.64	.573	.911
Satisfaction w/Decision Outcome	5	372	-.0353	.366	-.5044, .4338	29.15	-.0353	1
Equality of Participation	7	577	.0532	.397	-.454, .5611	27.74	.0483	.907
Degree of Decision Consensus	3	383	-.771	.202	-1.03, -.512	45.49	-.771	1
Satisfaction Toward the System	7	555	.755	.34	.3198, 1.19	37.16	.672	.894
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	2	28	-.1888	0	-.1888, -.1888	827.6	-1.888	1
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	2	28	-.1367	0	-.1367, -.1367	105.3	-.1367	1

TABLE VIII (CONTINUED)

THE MAIN EFFECTS OF THE INDEPENDENT VARIABLE OF DSS/GDSS VERSUS MANUAL DSS/GDSS WITH NO MODERATOR VARIABLES

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs. D's	Var due to R_{YY} Diff	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Fail Safe N
Decision Quality	-.389, 1.462	.588	.0607	0	.523	259.8	301
Decision Time	-1.57, 1.299	1.30	.046	0	1.259	308.3	19
Depth of Analysis	-.282, .910	.268	.051	.000044	.2169	78.7	84
Decision Confidence	-.558, .752	.304	.042	0	.262	65.13	10
Satisfaction w/Decision Process	-.301, 1.44	.595	.1287	0	.466	23.1	58
Satisfaction w/Decision Outcome	-.5044, .4338	.1896	.0553	0	.1343	17.15	$D_K < D_C$
Equality of Participation	-.412, .509	.179	.0497	0	.129	25.22	1
Degree of Decision Consensus	-1.03, -.512	.0752	.0342	0	.0409	6.59	43
Satisfaction Toward the System	.286, 1.06	.147	.0547	0	.0925	18.83	99
Degree of Decision Consistency	No Study Available						
Amount of Discussion Conflict	No Study Available						
Degree of Uninhibited Behavior	No Study Available						
Amount of Communication	-1.888, -1.888	.0409	.339	0	-.298	.242	6
Rate of Decision Improvement	No Study Available						
Degree of Group Cohesiveness	No Study Available						
Amount of Task-Oriented Behavior	-.1367, -.1367	.321	.338	0	-.016	1.899	3

from zero (i.e., no difference in decision time) at $p < .10$. The absolute value of the mean corrected D is already below the stated critical value of $D_c = 0.05$, therefore no more studies with null average results are needed to reduce the average corrected D to the lowest level of significance.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 3.08% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D included zero (-1.12 to 1.05). Finally, the omnibus chi-square test, also indicated the presence of moderators.

4.3.4 <u>Decision Time (DSS/GDSS Versus Manual DSS/GDSS)</u>

Individuals using computerized DSS/GDSS take more decision time on average (mean corrected D = -.136, K = 11, N = 969) than individuals who use manual decision support (Table VIII, p. 136). In addition to the small difference in decision time produced by computerized DSS/GDSS and manual DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.57 to 1.299), suggesting that the average difference in decision time is not significantly different from zero (i.e., no difference in decision time) at $p < .10$. Furthermore, the fail-safe n suggests that it is likely that the difference is not large enough to be of practical significance, because it would *take only 19 studies with average null results to increase the average corrected D from -.136 to -.05*

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 3.56% of the differences in results across studies. Second, the confidence interval surrounding the corrected D includes zero (-1.57 to 1.299). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.5 Depth of Analysis (DSS/GDSS Versus No-DSS/GDSS)

Individuals using computerized DSS/GDSS produce more depth of analysis on average (mean corrected D = .239, K = 17, N = 1051) than individuals who use no decision support at all (Table VII, p. 132). Although the difference in the depth of analysis produced by computerized DSS/GDSS and no-DSS/GDSS is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.854 to 1.28), suggesting that the average difference in depth of analysis is not significantly different from zero (i.e., no difference in depth of analysis) at $p < .10$. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in more depth of analysis than no-DSS/GDSS, the fail-safe n suggests that it is likely that the difference is large and reliable enough to be of practical significance. This shows that it would take 64 studies with average null results to reduce the average *corrected D from .239 to .05.*

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 8.80% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-.955 to 1.43). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.6 Depth of Analysis (DSS/GDSS Versus Manual DSS/GDSS)

Individuals using computerized DSS/GDSS produce more depth of analysis on average (mean corrected D = .3309, K = 15, N = 1220) than individuals who use manual decision support (Table VIII, p. 136). Although the difference in the depth of analysis produced by computerized DSS/GDSS and manual DSS/GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.282 to .910), suggesting that the average difference in quality is not significantly different from zero (i.e., no difference in depth of analysis) at $p < .10$. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in more depth of analysis than manual DSS/GDSS, the fail-safe n suggests that it is likely that the difference is large and reliable enough to be of practical significance. This shows that it would take 84 studies with average null results to reduce the average *corrected D from .3309 to .05.*

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 19.05% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-.296 to .958). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.7 Decision Confidence (DSS/GDSS Versus No-DSS/GDSS)

Individuals using computerized DSS/GDSS have more decision confidence on average (mean corrected D = .166, K = 16, N = 1199) than individuals who use no decision support at all (Table VII, p. 132). In addition to the small difference in the decision confidence produced by computerized DSS/GDSS and no-DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.679 to .995), suggesting that the average difference in decision confidence is not significantly different from zero (i.e., no difference in decision confidence) at p < .10. Moreover, the fail-safe n suggests that the difference is of low reliability and has only moderate practical significance, because it would take only 37 missing studies with average null results to reduce the average corrected D from .166 to .05.

The presence of moderators in this set of studies is *indicated in three ways. First, sampling error accounts for only 11.40% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-.7148 to 1.048). Finally, the omnibus chi-square test, also indicates the presence of moderators.*

4.3.8 Decision Confidence (DSS/GDSS Versus Manual DSS/GDSS)

Individuals using computerized DSS/GDSS have more decision confidence on average (mean corrected D = .104, K = 9, N = 876) than individuals who use manual decision support (Table VIII, p. 136). In addition to the small difference in the decision confidence produced by computerized DSS/GDSS and manual DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.558 to .752), suggesting that the average difference in decision confidence is not significantly different from zero at p < .10. Furthermore, the fail-safe n suggests that the difference is small and not reliable enough to be of practical significance, because it would take only 10 studies with average null results to reduce the average corrected D from .104 to .05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 13.82% of the differences in results across studies. Second, the 80% credibility interval surrounding the

corrected D includes zero (-.602 to .8108). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.9 Satisfaction With Decision Process (DSS/GDSS Versus No-DSS/GDSS)

Individuals using computerized DSS/GDSS have less satisfaction with decision process on average (mean corrected D = -.148, K = 13, N = 1228) than individuals who use no decision support at all (Table VII, p. 132). In addition to the small difference in the satisfaction with decision process produced by computerized DSS/GDSS and no-DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.984 to .707), suggesting that the average difference in satisfaction with decision process is not significantly different from zero at p < .10. The fail-safe n suggests that the difference is not large or reliable enough to be of practical significance, because it would take only 25 studies with average null results to increase the average corrected D from -.148 to -.05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 9.04% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-.7148 to 1.048). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.10 <u>Satisfaction With Decision Process (DSS/GDSS Versus Manual DSS/GDSS)</u>

Individuals using computerized DSS/GDSS have more satisfaction with decision process on average (mean corrected $D = .628$, $K = 5$, $N = 172$) than individuals who use manual decision support (Table VIII, p. 136). Although the difference in the satisfaction with decision process produced by computerized DSS/GDSS and manual DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.301 to 1.44), suggesting that the average difference in satisfaction with decision process is not significantly different from zero (i.e., no difference in satisfaction with decision process) at $p < .10$. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in higher satisfaction with decision process than manual DSS/GDSS, the fail-safe n suggests that it is likely that the difference is large and reliable enough to be of practical significance. It would take 58 studies averaging null results to reduce the average corrected D from .628 to .05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 21.64% of the differences in results across studies. Second, the 80% credibility interval surrounding the *corrected D includes zero (-.3309 to 1.588). Finally, the omnibus chi-square test, also indicates the presence of moderators.*

4.3.11 Satisfaction With Decision Outcome (DSS/GDSS Versus No-DSS/GDSS)

Individuals using computerized DSS/GDSS have more satisfaction with decision outcome on average (mean corrected D = .2646, K = 9, N = 694) than individuals who use no decision support at all (Table VII, p. 132). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (.096 to .433), suggesting that the average difference in satisfaction with decision outcome is significantly different from zero (i.e., there is a difference in satisfaction with decision outcome) at p < .10. In addition to the confidence interval that suggests the computerized DSS/GDSS always result in more satisfaction with decision outcome than no-DSS/GDSS, the fail-safe n suggests that it is also likely that the difference is moderate and reliable enough to be of moderate practical significance. It would take 39 missing studies (in additions to the available 9 studies) averaging null results to reduce the average corrected D from .2646 to .05.

The nonexistence of moderators in this set of studies is indicated in three ways. First, sampling error accounts *for 75.59% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D does not include zero (.096 to .433). Finally, the omnibus chi-square test (the calculated chi-square of 11.9 is less than the critical chi-square of 15.51), also indicates no presence of moderators.*

4.3.12 Satisfaction With Decision Outcome (DSS/GDSS Versus Manual DSS/GDSS)

Groups using computerized DSS/GDSS have no more satisfaction with decision outcome on average (mean corrected D = -.0353, K = 5, N = 372) than groups who use manual decision support (Table VIII, p. 136). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which includes zero (-.5044 to .4338), suggesting that the average difference in satisfaction with decision outcome is not significantly different from zero at $p < .10$*. The absolute value of the mean corrected D is already below the stated critical value of* $D_c = 0.05$*, therefore no more studies with null average results are needed to reduce the average corrected D to the lowest level of significance.*

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 29.15% of the differences in results across studies. Second, the 80% credibility interval surrounding the

corrected D includes zero (-.5044 to .4338). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.13 Equality of Participation (GDSS Versus No-GDSS)

Groups using computerized GDSS have more equality of participation on average (mean corrected D = 1.17, K = 16, N = 1138) than groups who use no decision support at all (Table VII, p. 132). Although the difference in the equality of participation produced by computerized DSS/GDSS and no-DSS/GDSS is very large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.917 to 3.02), suggesting that the average difference in equality of participation is not significantly different from zero at $p < .10$. There are a few studies with very large effect sizes that cause the mean corrected D to be that large. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in more equality of participation than no-DSS/GDSS, the fail-safe n suggests that it is likely that the difference is large and reliable enough to be of practical significance. It would take 358 missing studies averaging null results to reduce the average corrected D from 1.17 to .05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 2.71% of the differences in results across studies.

Second, the 80% credibility interval surrounding the corrected D includes zero (-1.020 to 3.35). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.14 Equality of Participation (GDSS Versus Manual GDSS)

Groups using computerized DSS/GDSS have no more equality of participation on average (mean corrected D = .0532, K = 7, N = 577) than groups who use manual decision support (Table VIII, p. 136). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which includes zero (-.412 to .509), suggesting that the average difference in equality of participation is not significantly different from zero at $p < .10$. The value of the mean corrected D is not far above the stated critical value of D_c = 0.05, and only one more study is needed with null average result to reduce the average corrected D to the lowest level of significance.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 27.74% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-.454 to .5611). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.15 Degree of Decision Consensus (GDSS Versus No-GDSS)

Groups using computerized GDSS have less degree of decision consensus on average (mean corrected D = -.627, K = 14, N = 1045) than groups who use no decision support at all (Table VII, p. 132). Although the difference in the degree of decision consensus produced by computerized DSS/GDSS and no-DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.79 to .602), suggesting that the average difference in degree of decision consensus is not significantly different from zero at $p < .10$. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in less degree of decision consensus than no-DSS/GDSS, the fail-safe n suggests that it is likely that the difference is large and reliable enough to be of practical significance. It would take 162 unlocated studies averaging null results to increase the average corrected D from -.627 to -.05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 6.19% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-1.88 to .634). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.16 Degree of Decision Consensus (GDSS Versus Manual GDSS)

Groups using computerized DSS/GDSS have less degree of decision consensus on average (mean corrected D = -.771, K = 3, N = 383) than groups who use manual decision support (Table VIII, p. 136). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (-1.03 to -.512), suggesting that the average difference in degree of decision consensus is significantly different from zero at $p < .10$. In addition to the confidence interval that suggests the computerized DSS/GDSS always result in less degree of decision consensus than manual DSS/GDSS, the fail-safe n suggests that it is also likely that the difference is large and reliable enough to be of moderate practical significance. It would take 43 missing studies averaging null results to increase the average corrected D from -.771 to -.05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 45.49% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-1.03 to -.512). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.17 Satisfaction Toward the System (DSS/GDSS Versus No-DSS/GDSS)

Individuals using computerized GDSS have more satisfaction toward the system on average (mean corrected D = .423, K = 6, N = 714) than individuals who use no decision support at all (Table VII, p. 132). Although the difference in the satisfaction toward the system produced by computerized DSS/GDSS and no-DSS/GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.545 to 1.37), suggesting that the average difference in satisfaction toward the system is not significantly different from zero at p < .10. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in more satisfaction toward the system than no-DSS/GDSS, the fail-safe n suggests that it is likely that the difference is large and reliable enough to be of moderate practical significance. It would take 45 missing studies averaging null results to reduce the average corrected D from .423 to .05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 5.88% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-.587 to 1.47). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.18 Satisfaction Toward the System (DSS/GDSS Versus Manual DSS/GDSS)

Individuals using computerized DSS/GDSS have more satisfaction toward the system on average (mean corrected D = .755, K = 7, N = 555) than individuals who use manual decision support (Table VIII, p. 136). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (.286 to 1.06), suggesting that the average difference in satisfaction toward the system is significantly different from zero at p < .10. In addition to the confidence interval which suggests that computerized DSS/GDSS always results in higher satisfaction toward the system than manual DSS/GDSS, the fail-safe n suggests that it is also likely that the difference is large and reliable enough to be of practical significance. This shows that it would take 99 studies with average null results to reduce the average corrected D from .755 to .05.

The nonexistence of moderators in this set of studies is indicated in two ways. First, the 80% credibility interval surrounding the corrected D does not include zero (.3198 to 1.19), suggesting that there are no true differences across this set of studies on satisfaction toward the system. Second, the omnibus chi-square test, also does not indicate the presence of moderators. However, the sampling error accounts for only 37.16% of the differences in results across studies. Because one of the indicators *shows that moderators variables do exist, the hypothesized moderators will be examined to determine whether they affect the average difference in the satisfaction toward the system across computerized DSS/GDSS and manual DSS/GDSS.*

4.3.19 Degree of Decision Consistency (DSS/GDSS Versus No-DSS/GDSS)

There is only one study with a sample size of 96 and an effect size of .4922 (Table VII, p. 132). The study suggests that the users of computerized DSS/GDSS produce more consistent decisions than the users of no-DSS/GDSS. The results of a single study can happen by chance [Hunter and Schmidt, 1990], therefore no considerable confidence can be placed on its findings. Unlike the meta-analysis across several studies, at the individual study level it is impossible to correct for errors of sampling and measurement.

4.3.20 Degree of Decision Consistency (DSS/GDSS Versus Manual DSS/GDSS)

There is no study available for this variable.

4.3.21 Amount of Discussion Conflict (GDSS Versus No-GDSS)

Groups using computerized GDSS have more discussion conflict on average (mean corrected D = .297, K = 2, N =

162) than groups who use no decision support at all (Table VII, p. 132). Although the difference in the amount of discussion conflict produced by computerized DSS/GDSS and no-DSS/GDSS is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.07 to 1.66), suggesting that the average difference in amount of discussion conflict is not significantly different from zero at $p < .10$. In addition to the confidence interval which suggests that computerized DSS/GDSS may not always result in more discussion conflict than no-DSS/GDSS, the fail-safe n suggests that the difference is not large or reliable enough to be of practical significance. It would take only 9 missing studies averaging null results to reduce the average corrected D from .297 to .05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 4.30% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-1.07 to 1.66). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.22 Amount of Discussion Conflict (GDSS Versus Manual GDSS)

There is no study available for this variable.

4.3.23 Degree of Uninhibited Behavior (GDSS Versus No-GDSS)

Groups using computerized GDSS have more degree of uninhibited behavior (non-task-oriented comments directed to other members of the group) on average (mean corrected D = .179, K = 6, N = 327) than individuals who use no decision support at all (Table VII, p. 132). In addition to the small difference in the degree of uninhibited behavior produced by computerized DSS/GDSS and no-DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.137 to .496), suggesting that the average difference in degree of uninhibited behavior is not significantly different from zero at p < .10. In addition to the confidence interval which suggests that computerized DSS/GDSS may not always result in more degree of uninhibited behavior than no-DSS/GDSS, the fail-safe n suggests that it is likely that the difference is small and not reliable enough to be of practical significance. It would take only 15 unlocated studies averaging null results to reduce the average corrected D from .179 to .05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 55.5% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-.137 to .496). Finally, the omnibus chi-square test, also indicates the presence of *moderators.*

4.3.24 Degree of Uninhibited Behavior (GDSS Versus Manual GDSS)

There is no study available for this variable.

4.3.25 Amount of Communication (GDSS Versus No-GDSS)

Groups using computerized GDSS have less communication on average (mean corrected $D = -.701$, $K = 5$, $N = 310$) than groups who use no decision support at all (Table VII, p. 132). Although the difference in the amount of communication produced by computerized DSS/GDSS and no-DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.79 to .468), suggesting that the average difference in amount of communication is not significantly different from zero at $p < .10$. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in less communication than no-DSS/GDSS, the fail-safe n suggests that it is likely that the difference is large and reliable enough to be of practical significance. It would take 65 studies with average null results to reduce the average corrected D from -.701 to -.05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 8.24% of the differences in results across studies. Second, the 80% credibility interval surrounding the

corrected D includes zero (-1.89 to .49). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.26 Amount of Communication (GDSS Versus Manual GDSS)

Groups using computerized DSS/GDSS have less communication on average (mean corrected D = -.1888, K = 2, N = 28) than groups who use manual decision support (Table VIII, p. 136). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (-.1888 to -.1888), suggesting that the average difference in amount of communication is significantly different from zero at p < .10. However, the fail-safe n suggests that the difference is not large or reliable enough to be of practical significance. It would take only 6 missing studies averaging null results to increase the average corrected D from -.1888 to -.05.

The nonexistence of moderators in this set of studies is indicated in two ways. First, sampling error accounts for 827.6% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D does not include zero (-.1888 to -.1888). On the other hand, the omnibus chi-square test indicates the presence of moderators. However, since there are only two studies available, it is not possible to consider moderator *variables.*

4.3.27 Rate of Decision Improvement (DSS/GDSS Versus No-DSS/GDSS)

Individuals using computerized DSS/GDSS have a higher rate of decision improvement on average (mean corrected D = .7296, K = 8, N = 945) than individuals who use no decision support at all (Table VII, p. 132). Although the difference in the rate of decision improvement produced by computerized DSS/GDSS and no-DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.147 to 1.31), suggesting that the average difference in rate of decision improvement is not significantly different from zero at $p < .10$. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in higher rate of decision improvement than no-DSS/GDSS, the fail-safe n suggests that it is likely that the difference is large enough and reliable enough to be of practical significance. It would take 109 missing studies averaging null results to reduce the average corrected D from .7296 to .05.

The presence of moderators in this set of studies is indicated in three ways. First, sampling error accounts for only 9.97% of the differences in results across studies. Second, the 80% credibility interval surrounding the corrected D includes zero (-.185 to 1.64). Finally, the omnibus chi-square test, also indicates the presence of moderators.

4.3.28 Rate of Decision Improvement (DSS/GDSS Versus Manual DSS/GDSS)

There is no study available for this variable.

4.3.29 Degree of Group Cohesiveness (GDSS Versus No-GDSS)

Groups using computerized DSS/GDSS are less cohesive on average (mean corrected $D = -.403$, $K = 2$, $N = 200$) than individuals who use no decision support at all (Table VII, p. 132). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (-.652 to -.153), suggesting that the average difference in degree of group cohesiveness is significantly different from zero at $p < .10$. However, the fail-safe n suggests that the difference is not large or reliable enough to be of practical significance. It would take only 14 missing studies averaging null results to increase the average corrected D from -.403 to -.05.

The nonexistence of moderators in this set of studies is indicated in two ways. First, the 80% credibility interval surrounding the corrected D does not include zero (-.652 to -.153). Second, the omnibus chi-square test (the calculated chi-square of 3.82 is less than the critical chi-

square of 3.84), also indicates no presence of moderators. On the other hand, sampling error accounts for 52.24% of the differences in results across studies, suggesting the presence of moderators. However, since there are only two studies available, it is not possible to consider moderator variables.

4.3.30 Degree of Group Cohesiveness (GDSS Versus Manual GDSS)

There is no study available for this variable.

4.3.31 Amount of Task-Oriented Behavior (GDSS Versus No-GDSS)

Groups using computerized DSS/GDSS are no more task-oriented on average (mean corrected D = -.048, K = 2, N = 90) than groups who use no-decision support (Table VIII, p. 136). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which includes zero (-.625 to .529), suggesting that the average difference in the amount of task-oriented behavior is not significantly different from zero at $p < .10$. The absolute value of the mean corrected D is already below the critical value of D_c = 0.05, and no more studies with null average results are needed to reduce the average corrected to the lowest level of significance.

The presence of moderators in this set of studies is *indicated in three ways. First, sampling error accounts for only 31.39% of the differences in results across studies. Second, the credibility interval includes zero (-.625 to .529). Finally, the omnibus chi-square test, also indicates the presence of moderators.*

4.3.32 Amount of Task-Oriented Behavior (GDSS Versus Manual GDSS)

Groups using computerized DSS/GDSS are less task-oriented on average (mean corrected D = -.1367, K = 2, N = 28) than groups who use manual decision support (Table VIII, p. 136). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (-.1367 to -.1367), suggesting that the average difference in amount of task-oriented behavior is significantly different from zero at p < .10. However, fail-safe n suggests that it would take only three missing studies averaging null results to increase the average corrected D from -.1367 to -.05, indicating that the average corrected D has no practical significance.

The nonexistence of moderators in this set of studies is indicated in two ways. First, sampling error accounts for 105.3% of the differences in results across studies. Second, the 80% credibility interval surrounding the average corrected D does not include zero (-.1367 to -.1367), suggesting that there are no true differences across this set of studies on amount of task-oriented behavior. Finally, the omnibus chi-square test indicates no presence of moderators. For all these reasons, and because there are only two studies available, it is not possible to look for moderator variables.

4.4 The Effects of Moderator Variables

The effects of each of the eight moderators are examined across the applicable dependent variables. Tables IX to XXXIII present the meta-analysis of these moderators. These tables have two new columns (confidence interval for second order sampling error, and overlap Z-value). The first column calculates the new confidence interval after accounting for the error of number of studies in each subset. The second column confirms or disconfirms the existence of moderator variables.

4.4.1 DSS Versus GDSS

In this section, the moderator variable is checked by splitting the available studies for each dependent measure (i.e., decision quality) into DSS studies, or GDSS studies. For each dependent variable, the moderator variable is tested under two different independent variables (computerized decision aids versus no decision aids, and computerized decision aids versus manual decision aids). Some dependent variables are not applicable under the *current moderator variable (Tables IX and X, pp. 164, 167), either because the set of studies is homogeneous, there are two or fewer studies available, or because all the available studies lie in one side of the moderator's subsets (i.e., all the studies are DSS studies).*

4.4.1.1 Decision Quality (DSS/GDSS Versus No-DSS/GDSS)

The users of computerized DSS produce higher quality decisions on average (mean corrected D = .541, K = 22, N = 3834) than the users of no decision support at all (Table IX). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (.2155 to .825), suggesting that the average difference in decision quality is statistically different from zero at $p < 10$*. In addition to the confidence interval which suggests that computerized DSS always result in better quality decisions than no-DSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance (in addition to statistical significance). The formula for the fail-safe n shows that it would take 216 missing studies averaging null findings that would have to exist to bring the average corrected D down from .541 to 0.05.*

The users of computerized GDSS produce no different quality decisions on average (mean corrected D = -.0278, K = 21, N = 1612) than the users of no decision support at all

TABLE IX

THE EFFECTS OF THE MODERATOR VARIABLE OF DSS VERSUS GDSS USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality-DSS	22	3834	.541	.248	.224, .858	29.66	.521	.962
GDSS	21	1612	-.0278	.617	-.819, .763	14.23	-.0256	.919
Decision Time-DSS	7	2538	.406	.292	.0324, .780	11.72	.406	1
GDSS	13	1004	-1.48	.759	-2.12, -.176	9.69	-1.48	1
Depth of Analysis-DSS	6	341	.325	.758	-.645, 1.29	13.41	.296	.911
GDSS	11	710	-.0252	1.02	-1.336, 1.28	7.18	-.0224	.888
Decision Confidence-DSS	11	673	.535	.426	-.011, 1.08	29.89	.508	.949
GDSS	5	526	-.271	.641	-1.09, .549	8.68	-.271	1
Satisfaction w/Decision Process-DSS	2	453	.112	.128	-.0519, .275	55.56	.104	.932
GDSS	11	775	-.280	.792	-1.29, .734	8.59	-.280	1
Satisfaction w/Decision Outcome	No DSS study available							
Equality of Participation	Not Applicable							
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward the System-DSS	3	499	.369	.434	-.186, .925	13.19	.343	.929
GDSS	3	215	.569	1.20	-.966, 2.10	3.98	.569	1
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior	Not Applicable							
Amount of Communication	Not Applicable							
Rate of Decision Improvement-DSS	5	681	.967	.291	.595, 1.34	37.31	.771	.797
GDSS	3	264	.093	.831	-.970, 1.15	6.32	.093	1
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE IX (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF DSS VERSUS GDSS USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs. D's	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Confidence Interval for 2nd Order Sampl Error(95%)	Over Lap Z Value Z_C=1.645	Fail Safe N
Decision Quality-DSS	.2155, .825	.0809	.024	.0568	74.15	.402, .639	No	216
GDSS	-.752, .701	.376	.0535	.322	147.51	-.288, .237		$D_K<D_C$
Decision Time-DSS	.0324, .780	.096	.0113	.0853	59.7	.176, .636	No	50
GDSS	-2.12, -.176	.639	.0619	.577	134.06	-1.58, -.714		372
Depth of Analysis-DSS	-.587, 1.18	.551	.0738	.477	44.77	-.297, .890	2.60	33
GDSS	-1.19, 1.14	.892	.064	.828	153.29	-.580, .536		$D_K<D_C$
Decision Confidence-DSS	-.010, 1.03	.234	.0698	.164	36.83	.222, .794	2.42	107
GDSS	-1.09, .549	.450	.0391	.411	57.58	.859, .317		22
Satisfaction w/Decision Process-DSS	-.048, .257	.032	.0178	.0143	3.59	-.144, .353	.59	3
GDSS	-1.29, .734	.6869	.059	.628	128.0	-.77, .209		51
Satisfaction w/Decision Outcome	No DSS Study Available							
Equality of Participation	Not Applicable							
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward the System-DSS	-.173, .859	.187	.0247	.1626	22.74	-.146, .833	.27	19
GDSS	-.966, 2.10	1.50	.0597	1.44	75.29	-.816, 1.95		31
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior	Not Applicable							
Amount of Communication	Not Applicable							
Rate of Decision Improvement-DSS	.474, 1.07	.086	.032	.054	13.40	.514, 1.03	1.70	92
GDSS	-.970, 1.15	.736	.046	.69	47.44	-.878, 1.064		4
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

(Table IX, p. 164). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which includes zero (-.752 to .701), indicating that the difference in decision quality between GDSS and no-GDSS is not significantly different from zero. The average corrected D is already below the stated critical value of $D_c = 0.05$, which suggests that no more studies with null results are needed to reduce the average corrected D to the minimum level of significance.

The confidence intervals for second order sampling error of DSS and GDSS are significantly different (they do not overlap), suggesting that those two subsets of DSS and GDSS affect decision quality differently (the users of DSS as opposed to users of GDSS will have statistically higher quality decisions when both are compared to the users of no decision support at all).

In summary, the results show that the use of DSS as opposed to the use of GDSS produces better quality decisions if both are compared to no decision support.

4.4.1.2 Decision Quality (DSS/GDSS Versus Manual DSS/GDSS

The users of computerized DSS produce higher quality decisions on average (mean corrected D = .8298, K = 19, N = 1140) than the users of manual DSS (Table X). Although the difference in quality of decisions produced by computerized

TABLE X

THE EFFECTS OF THE MODERATOR VARIABLE OF DSS VERSUS GDSS USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality-DSS	19	1140	.8298	.941	-.375, 2.03	9.58	.734	.885
GDSS	8	759	.270	.385	-.223, .764	27.30	.238	.881
Decision Time-DSS	7	270	.318	1.41	-1.49, 2.13	5.24	.318	1
GDSS	4	699	-.312	.926	-1.498, .874	2.66	-.312	1
Depth of Analysis-DSS	8	472	.428	.332	.0037, .853	39.48	.428	1
GDSS	7	748	.255	.547	-.445, .956	12.44	.243	.950
Decision Confidence-DSS	7	283	.584	0	.584, .584	198.6	.542	.927
GDSS	2	593	-.116	.519	-.780, .549	4.80	-.116	1
Satisfaction w/Decision Process	Not Applicable							
Satisfaction w/Decision Outcome-DSS	1	40	d = .7747					
GDSS	4	332	-.133	.273	-.482, .216	39.96	-.133	1
Equality of Participation	Not Applicable							
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward the System-DSS	5	459	.805	.379	.319, 1.29	29.24	.719	.894
GDSS	2	96	.463	0	.463, .463	422.27	.463	1
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE X (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF DSS VERSUS GDSS USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs D's	Residual Var	Chi-SQ ($\chi^2_{K-1, .05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over Lap Z Value Z_c=1.645	Fail Safe N
Decision Quality-DSS	-.332, 1.80	.768	.0736	.695	198.17	.340, 1.13	2.28	296
GDSS	-.196, .673	.1588	.043	.115	29.29	-3.78, .514		35
Decision Time-DSS	-1.49, 2.13	2.111	.111	2.00	133.5	-.759, 1.39	.87	38
GDSS	-1.498, .874	.882	.023	.858	150.5	-1.23, .608		21
Depth of Analysis-DSS	.0037, .853	.182	.0718	.110	20.26	.133, .724	.67	60
GDSS	-.423, .908	.309	.0384	.270	56.27	-.169, .654		29
Decision Confidence-DSS	.542, .542	.054	.108	-.054	3.52	.269, .715	1.81	75
GDSS	-.780, .549	.283	.014	.269	41.66	-.853, .622		3
Satisfaction w/Decision Process	Not Applicable							
Satisfaction w/Decis. Outcome-GDSS	-.482, .216	.124	.049	.0744	10.01	-.478, .212		7
Equality of Participation	Not Applicable							
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward the System-DSS	.286, 1.15	.162	.047	.115	17.10	.366, 1.07	1.65	75
GDSS	.463, .463	.0212	.089	-.068	.474	.261, .665		17
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

DSS and manual DSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.332 to 1.80), suggesting that the average difference in decision quality is not statistically different from zero (i.e., no difference in quality) at $p < 10$. Even though, the confidence interval suggests that computerized DSS may not always result in better quality decisions than manual DSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 296 missing studies averaging null findings that would have to exist to bring the average corrected D down from .8298 to 0.05.

The users of computerized GDSS produce higher quality decisions than the users of manual GDSS (mean corrected D = .270, K = 8, N = 759). Although the difference in quality of decisions produced by computerized GDSS and manual GDSS is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.196 to .673), indicating that the difference in decision quality between GDSS and manual GDSS is not significantly different from zero at $p < .10$. Even though, the confidence interval suggests that computerized GDSS may not always result in better quality decisions than manual GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of moderate practical *significance. The formula for the fail-safe n shows that it would take 35 missing studies averaging null findings that would have to exist to bring the average corrected D down from .270 to 0.05.*

The confidence intervals for second order sampling error of DSS and GDSS are significantly different (overlap Z = 2.28 > Z_c = 1.645), suggesting that those two subsets of DSS and GDSS affect decision quality differently (the users of computerized DSS will have statistically higher quality decisions than the users of computerized GDSS when both are compared to the users of manual support).

In summary, the results show that although the use of both DSS and GDSS produces better quality decisions than the use of manual support, the use of DSS produces higher quality decisions than the use of GDSS when both are compared to manual decision support.

4.4.1.3 Decision Time (DSS/GDSS Versus No-DSS/GDSS)

The users of computerized DSS are more efficient (i.e., take less decision time) on average (mean corrected D = .406, K = 7, N = 2538) than the users of no decision support at all (Table IX, p. 164). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (.0324 to .780), suggesting that the average difference in decision time is statistically different from zero (i.e., there is difference in decision *time) at $p < 10$. In addition to the confidence interval which suggests that computerized DSS always result in less decision time than no-DSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance (in addition to statistical significance). The formula for the fail-safe n shows that it would take 50 missing studies averaging null findings that would have to exist to bring the average corrected D down from .406 to 0.05.*

The users of computerized GDSS are less efficient (take more decision time) on average than the users of no decision support at all (mean corrected $D = -1.48$, $K = 13$, $N = 1004$). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (-2.12 to -.176), indicating that the difference in decision quality between GDSS and no-GDSS is significantly different from zero at $p < .10$. The reason for the wide range of the difference is that there are three studies with large negative effect sizes. In addition to the confidence interval which suggests that computerized GDSS always result in more decision time than no-GDSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 372 missing studies averaging null findings that would have to exist to bring the average corrected D up from -1.48 to

-0.05.

The confidence intervals for second order sampling error of DSS and GDSS are significantly different (they do not overlap), suggesting that those two subsets of DSS and GDSS affect decision time differently (the users of DSS will have significantly shorter decision time than the users of GDSS when both are compared to the users of no decision support at all). In fact, DSS are shown to be statistically more efficient in decision time than no-DSS, while GDSS are shown to be statistically far less efficient in decision time than no-GDSS.

4.4.1.4 Decision Time (DSS/GDSS Versus Manual DSS/GDSS

The users of computerized DSS are more efficient (take less decision time) on average (mean corrected D = .318, K = 7, N = 699) than the users of manual DSS (Table X, p. 167). Although the difference in decision time produced by computerized DSS and manual DSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.49 to 2.13), suggesting that the average difference in decision time is not statistically different from zero (i.e., no difference in decision time) at p < 10. Even though, the confidence interval suggests that computerized DSS may not always result in less decision time than manual DSS, the fail-safe n shows that it is likely *that the difference is large enough and reliable enough to be of moderate practical significance. The formula for the fail-safe n shows that it would take 38 missing studies averaging null findings that would have to exist to bring the average corrected D down from .318 to 0.05.*

The users of computerized GDSS are less efficient (take longer time in making decisions) on average than the users of manual GDSS (mean corrected D = -.312, K = 4, N = 699). Although the difference in decision time produced by computerized GDSS and manual GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.498 to .874), indicating that the difference in decision time between GDSS and manual GDSS is not significantly different from zero at p < .10. Moreover, the fail-safe n shows that it is likely that the difference is not large and reliable enough and has only weak practical significance. The formula for the fail-safe n shows that it would take only 21 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.312 to -0.05.

The confidence intervals for second order sampling error of DSS and GDSS are not significantly different (overlap $Z = .87 < Z_c = 1.645$*), suggesting that those two subsets of DSS and GDSS do not affect decision time differently (the users of computerized DSS will not take statistically less decision time than the users of* *computerized GDSS when both are compared to the users of manual support).*

4.4.1.5 Depth of Analysis (DSS/GDSS Versus No-DSS/GDSS

The users of computerized DSS produce more depth of analysis on average (mean corrected D = .325, K = 6, N = 341) than the users of no-DSS (Table IX, p. 164). Although the difference in depth of analysis produced by computerized DSS and no-DSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.587 to 1.18), suggesting that the average difference in depth of analysis is not statistically different from zero (i.e., no difference in depth of analysis) at $p < 10$. Even though, the confidence interval suggests that computerized DSS may not always result in more depth of analysis than no-DSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of moderate practical significance. The formula for the fail-safe n shows that it would take 33 missing studies averaging null findings that would have to exist to bring the average corrected D down from .325 to 0.05.

The users of computerized GDSS produce no more depth of analysis than the users of no-GDSS (mean corrected D = -.0252, K = 11, N = 710). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which *includes zero (-1.19 to 1.14), indicating that the difference in depth of analysis between GDSS and no-GDSS is not significantly different from zero at $p < .10$. In addition, the fail safe n requires no more studies averaging null results to be located in order to bring the average corrected D to 0.05, since the average corrected D is already below 0.05, the minimum stated significant level.*

The confidence intervals for second order sampling error of DSS and GDSS are significantly different (overlap Z = 2.60 > Z_c = 1.645), suggesting that those two subsets of DSS and GDSS affect depth of analysis differently (the users of computerized DSS will have statistically more depth of analysis than the users of computerized GDSS when both are compared to the users of no decision support at all).

4.4.1.6 Depth of Analysis (DSS/GDSS Versus Manual DSS/GDSS)

The users of computerized DSS produce more depth of analysis on average (mean corrected D = .428, K = 8, N = 472) than the users of manual support (Table X, p. 167). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (.0037 to .853), suggesting that the average difference in depth of analysis is statistically different from zero (i.e., there is a difference in depth of analysis) at $p < 10$. In addition to the confidence interval which suggests that computerized

DSS always result in more depth of analysis than manual DSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 60 missing studies averaging null findings that would have to exist to bring the average corrected D down from .428 to 0.05.

The users of computerized GDSS produce also more depth of analysis on average than the users of manual GDSS (mean corrected D = .255, K = 7, N = 748). Although the difference in depth of analysis produced by computerized GDSS and manual GDSS is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.423 to .908), indicating that the difference in depth of analysis between GDSS and manual GDSS is not significantly different from zero at p < .10. Even though, the confidence interval suggests that computerized GDSS may not always result in more depth of analysis than manual GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of moderate practical significance. The formula for the fail-safe n shows that it would take 29 missing studies averaging null findings that would have to exist to bring the average corrected D down from .255 to 0.05.

The confidence intervals for second order sampling error of DSS and GDSS are not significantly different *(overlap Z = .67 < Z_c = 1.645), suggesting that those two subsets of DSS and GDSS do not affect the depth of analysis differently (the users of computerized DSS will not produce statistically more depth of analysis than the users of computerized GDSS when both are compared to the users of manual support).*

4.4.1.7 Decision Confidence (DSS/GDSS Versus No-DSS/GDSS

The users of computerized DSS have more decision confidence on average (mean corrected D = .535, K = 11, N = 673) than the users of no-DSS (Table IX, p. 164). Although the confidence interval surrounding the mean uncorrected D includes zero (-.010 to 1.03), it shows for more than 99% of the time that the observed D is positive, suggesting that the average difference in decision confidence is statistically different from zero (i.e., there is a difference in decision confidence) at p < 10. In addition, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 107 missing studies averaging null findings that would have to exist to bring the average corrected D down from .535 to 0.05.

The users of computerized GDSS have less decision confidence on average (mean corrected D = -.271, K = 5, N =

526) than the users of no-GDSS. Although the difference in decision confidence between GDSS and no-GDSS is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.09 to .549), indicating that the difference in decision confidence between GDSS and no-GDSS is not significantly different from zero at p < .10. Moreover, the fail-safe n shows that it is likely that the difference is small and not reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 22 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.271 to -0.05.

The confidence intervals for second order sampling error of DSS and GDSS are significantly different (overlap Z = 2.42 > Z_c *= 1.645), suggesting that those two subsets of DSS and GDSS affect decision confidence differently (in addition to the fact that the two average corrected D's are in the opposite direction, the users of computerized DSS will have statistically more decision confidence than the users of computerized GDSS when both are compared to the users of no decision support).*

4.4.1.8 Decision Confidence (DSS/GDSS Versus Manual DSS/GDSS)

The users of computerized DSS have more decision confidence on average (mean corrected D = .584, K = 7, N =

283) than the users of manual support (Table X, p. 167). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (.584 to .584), suggesting that the average difference in decision confidence is statistically different from zero (i.e., there is a difference in decision confidence) at p < 10. In addition to the confidence interval which suggests that computerized DSS always result in more decision confidence than manual DSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 75 missing studies averaging null findings that would have to exist to bring the average corrected D down from .584 to 0.05.

The users of computerized GDSS have relatively less decision confidence on average (mean corrected D = -.116, K = 2, N = 593) than the users of manual GDSS. However, the size of the difference is about only one tenth of a standard deviation, indicating a small difference in decision confidence between GDSS ana manual GDSS. Although there is a difference in decision confidence between computerized GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.780 to .549), indicating that the difference in decision confidence between GDSS and manual GDSS is not significantly different from zero at p < .10. In addition to the confidence interval which suggests that *computerized GDSS may not always result in less decision confidence than manual GDSS, the fail-safe n shows that it would take only 3 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.116 to -0.05.*

The confidence intervals for second order sampling error of DSS and GDSS are significantly different (overlap Z = 1.81 > Z_c = 1.645), suggesting that those two subsets of DSS and GDSS do affect the decision confidence differently (in addition to the opposite direction of the two effects, the users of computerized DSS will have statistically more decision confidence than the users of computerized GDSS when both are compared to the users of manual support).

4.4.1.9 Satisfaction With Decision Process (DSS/GDSS Versus No-DSS/GDSS

The users of computerized DSS have relatively more satisfaction with decision process on average (mean corrected D = .112, K = 2, N = 453) than the users of no-DSS (Table IX, p. 164). In addition to the fact that the difference in satisfaction with decision process produced by computerized DSS and no-DSS is small, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.048 to .257), suggesting that the average difference in satisfaction with decision process is not statistically different from zero (i.e., no difference in satisfaction *with decision process) at $p < 10$. Besides, the confidence interval which suggests that computerized GDSS may not always result in more decision confidence than no-GDSS, the fail-safe n shows that it would take only 3 missing studies averaging null findings that would have to exist to bring the average corrected D down from .112 to 0.05.*

The users of computerized GDSS have less satisfaction with decision process on average (mean corrected $D = -.280$, $K = 11$, $N = 775$) than the users of no-GDSS. Although there is a moderate difference in satisfaction with decision process between computerized GDSS and no-GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.29 to .734), indicating that the difference in satisfaction with decision process between GDSS and no-GDSS is not significantly different from zero at $p < .10$. Even though, the confidence interval suggests that computerized GDSS may not always result in less satisfaction with decision process than no-GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 51 missing studies averaging null findings that would have to exist to bring the average corrected D down from -.280 to 0.05.

The confidence intervals for second order sampling error of DSS and GDSS are not significantly different (overlap $Z = .59 < Z_c = 1.645$), suggesting that those two *subsets of DSS and GDSS do not affect satisfaction with decision process differently (the users of computerized DSS will have statistically no more satisfaction with decision process than the users of computerized GDSS when both are compared to the users of no decision support at all).*

4.4.1.10 Satisfaction with Decision Outcome (DSS/GDSS Versus Manual DSS/GDSS)

There is only one study available that represents the comparison between DSS and no-DSS regarding the satisfaction with decision outcome. The study indicates that users of computerized DSS produce more satisfaction with decision outcome ($d = .7747$, $N = 40$) than the users of manual support (Table X, p. 167).

The users of computerized GDSS have relatively less satisfaction with decision outcome on average (mean corrected $D = -.133$, $K = 4$, $N = 332$) than the users of manual GDSS. However, the size of the difference is about only one eighth of a standard deviation, indicating a small difference in satisfaction with decision outcome between GDSS ana manual GDSS. Although there is a difference in satisfaction with decision outcome between computerized GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.482 to .216), indicating that the difference in satisfaction with decision outcome between GDSS and manual GDSS is not significantly different from *zero at $p < .10$. In addition to the confidence interval which suggests that computerized GDSS may not always result in less satisfaction with decision outcome than manual GDSS, the fail-safe n shows that it would take only 7 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.133 to -0.05.*

Although there is a large difference in satisfaction with decision outcome between computerized DSS and computerized GDSS when both are compared to manual support (the users of DSS produce more satisfaction with decision outcome than the users of GDSS, when both are compared to manual decision support), there is no way to confirm that the difference is statistically significant, since there is only one study in the DSS subset.

4.4.1.11 Satisfaction Toward the System (DSS/GDSS Versus No-DSS/GDSS

The users of computerized DSS have more satisfaction toward the system on average (mean corrected $D = .369$, $K = 3$, $N = 499$) than the users of no-DSS (Table IX, p. 164). Although the difference in satisfaction toward the system between DSS and no-DSS is moderate, the confidence interval surrounding the mean uncorrected D includes zero (-.173 to .859), suggesting that the average difference in satisfaction toward the system is not statistically different from zero (i.e., no difference in satisfaction *toward the system) at $p < 10$. Furthermore, the fail-safe n shows that it is likely that the difference is small and not reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 19 missing studies averaging null findings that would have to exist to bring the average corrected D down from .369 to 0.05.*

The users of computerized GDSS have more satisfaction toward the system than the users of no-GDSS (mean corrected $D = .569$, $K = 3$, $N = 215$). Although the difference in satisfaction toward the system between GDSS and no-GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.966 to 2.10), indicating that the difference in satisfaction toward the system between GDSS and no-GDSS is not significantly different from zero at $p < .10$. Even though, the confidence interval suggests that computerized GDSS may not always result in more satisfaction toward the system than no-GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of moderate practical significance. The formula for the fail-safe n shows that it would take 31 missing studies averaging null findings that would have to exist to bring the average corrected D up from .569 to 0.05.

The confidence intervals for second order sampling error of DSS and GDSS are not significantly different (overlap $Z = .27 < Z_c = 1.645$), suggesting that those two subsets of DSS and GDSS do not affect satisfaction toward *the system differently (although they both have a positive effect, the users of computerized GDSS will have statistically no more satisfaction toward the system than the users of computerized DSS when both are compared to the users of no decision support at all).*

4.4.1.12 Satisfaction Toward the System (DSS/GDSS Versus Manual DSS/GDSS)

The users of computerized DSS produce more satisfaction toward the system on average (mean corrected $D = .805$, $K = 5$, $N = 459$) than the users of manual support (Table X, p. 167). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (.286 to 1.15), suggesting that the average difference in satisfaction toward the system is statistically different from zero (i.e., there is a difference in satisfaction toward the system) at $p < 10$. In addition to the confidence interval which suggests that computerized DSS always result in more satisfaction toward the system than manual DSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 75 missing studies averaging null findings that would have to exist to bring the average corrected D down from .805 to 0.05.

The users of computerized GDSS produce also more *satisfaction toward the system on average (mean corrected D = .463, K = 2, N = 96) than the users of manual GDSS. In addition to the confidence interval which suggests that the difference in satisfaction toward the system between computerized GDSS and manual GDSS is moderate to large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.463 to .463), indicating that the difference in satisfaction toward the system between GDSS and manual GDSS is significantly different from zero at $p < .10$. Besides the confidence interval which suggests that computerized GDSS always result in more satisfaction toward the system than manual GDSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 17 missing studies averaging null findings that would have to exist to bring the average corrected D down from .463 to 0.05.*

The confidence intervals for second order sampling error of DSS and GDSS are significantly different (overlap Z = 1.65 > Z_c = 1.645), suggesting that those two subsets of DSS and GDSS do affect the satisfaction toward the system differently. Although both DSS and GDSS are significantly increasing the satisfaction toward the system, the users of computerized DSS will produce statistically more satisfaction toward the system than the users of computerized GDSS when both are compared to the users of *manual support.*

4.4.1.13 Rate of Decision Improvement DSS/GDSS Versus No-DSS/GDSS

The users of computerized DSS produce higher rate of decision improvement on average (mean corrected D = .967, K = 5, N = 681) than the users of no decision support at all (Table IX, p. 164). This is confirmed by the 80% confidence interval surrounding the mean uncorrected D which does not include zero (.474 to 1.07), suggesting that the average difference in decision quality is statistically different from zero (i.e., there is a difference in the rate of decision improvement) at p < 10. In addition to the confidence interval which suggests that computerized DSS always result in higher rate of decision improvement than no-DSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 92 missing studies averaging null findings that would have to exist to bring the average corrected D down from .967 to 0.05.

The users of computerized GDSS produce slightly more rate of decision improvement on average (mean corrected D = .093, K = 3, N = 264) than the users of no decision support at all. Although there is a difference in rate of decision improvement between GDSS and no-GDSS, the magnitude of the *difference is less than a tenth of a standard deviation. In addition, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.970 to 1.15), indicating that the difference in rate of decision improvement between GDSS and no-GDSS is not significantly different from zero. In addition to the confidence interval which suggests that computerized GDSS may not always result in higher rate of decision improvement than no-GDSS, the fail-safe n shows that it is also likely that the difference has no practical significance. The formula for the fail-safe n shows that it would take only 4 missing studies averaging null findings that would have to exist to bring the average corrected D down from .093 to 0.05.*

The confidence intervals for second order sampling error of DSS and GDSS are significantly different (overlap Z = 1.70 > Z_c = 1.645), suggesting that those two subsets of DSS and GDSS affect decision quality differently (the users of computerized DSS will have statistically higher rate of decision improvement than the users of computerized GDSS when both are compared to the users of no decision support at all).

4.4.2 Laboratory Studies Versus Field tests Versus Field Studies

In this section, the moderator variable is based on separating the available studies for each dependent measure *(i.e., decision quality) into laboratory studies, field tests, or field studies. For each dependent variable, the moderator variable is tested under two different independent variables (computerized decision aids versus no decision aids, and computerized decision aids versus manual decision aids). Some dependent variables are not applicable under the current moderator variable (Tables XI and XII, pp. 190, 194), either because there are two or fewer studies available, or because all the available studies lie in one side of the moderator's subsets (i.e., all the studies are laboratory experiments).*

4.4.2.1 Decision Quality (DSS/GDSS Versus No-DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS have relatively higher quality decisions on average (mean corrected D = .1352, K = 36, N = 2406) than the users of no-DSS/GDSS (Table XI). However, in additions to the fact that the magnitude of the difference is relatively small, the confidence interval includes zero (-.568 to .823), suggesting that the average difference in decision quality is not statistically different from zero (i.e., no difference in quality) at p < 10. However, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 61

TABLE XI

THE EFFECTS OF THE MODERATOR VARIABLE OF LABORATORY STUDIES VERSUS FIELD TESTS VERSUS FIELD STUDIES USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality-Lab	36	2406	.1352	.5718	-.605, .875	17.32	.127	.940
Field Test	2	120	-.0253	0	-.0253, -.0253	2128	-.0253	1
Field Study	5	2920	.5783	.1916	.333, .8236	16.89	.5657	.978
Decision Time-Lab	17	1140	-1.1096	.710	-2.02, -.200	12.32	-1.1096	1
Field Study	3	2402	.476	.0749	.3799, .5718	47.84	.476	1
Depth of Analysis-Lab	16	975	.124	.871	-.991, 1.24	10.06	.111	.895
Field Study	1	76	d = 1.539					
Decision Confidence-Lab	15	1155	.149	.695	-.74, 1.04	11.18	.140	.938
Field Study	1	44	d = .8435					
Satisfaction w/Decision Process	Not Applicable							
Satisfaction w/Decision Outcome	Not Applicable							
Equality of Participation	Not Applicable							
Degree of Decision Consensus-Lab	12	925	-.664	.993	-1.93, .607	5.93	-.629	.948
Field Test	2	120	-.316	.813	-1.36, .726	9.54	-.316	1
Satisfaction Toward the System-Lab	5	668	.349	.752	-.612, 1.32	5.92	.325	.930
Field Study	1	46	d = 1.658					
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior	Not Applicable							
Amount of Communication-Lab	4	190	-.829	1.18	-2.34, .686	6.99	-.786	.949
Field Test	1	120	d = .4729					
Rate of Decision Improvement-Lab	7	869	.661	.710	-.248, 1.57	9.56	.527	.797
Field Study	1	76	d = 1.2079					
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XI (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF LABORATORY STUDIES VERSUS FIELD TESTS VERSUS FIELD STUDIES USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs. D's	Residual Var	Chi-SQ ($\chi^2_{K-1, .05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over-Lap Z Value Z_c=1.645	Fail Safe N
Decision Quality-Lab	-.568, .823	.357	.0618	.295	207.84	-.0681, .322	LFt=1.49	61
Field Test	-.0253, -.0253	.0032	.069	-.0657	.0939	-.104, .0536	FtFs=No	$D_K<D_C$
Field Study	.3257, .8057	.0423	.0071	.0351	29.58	.385, .746	LFs=No	53
Decision Time-Lab	-2.02, -.200	.576	.0759	.5049	137.9	-1.47, -.749	No	360
Field Study	.3799, .5718	.0107	.00515	.0056	6.27	.358, .5932		26
Depth of Analysis-Lab	-.887, 1.109	.676	.068	.608	159.03	-.292, .513		24
Decision Confidence-Lab	-.694, .975	.478	.0535	.425	134.02	-.209, .490		30
Satisfaction w/Decision Process	Not Applicable							
Satisfaction w/Decision Outcome	Not Applicable							
Equality of Participation	Not Applicable							
Degree of Decision Consensus-Lab	-1.83, .576	.943	.056	.887	202.4	-1.179, -.080	.52	147
Field Test	-1.36, .726	.732	.0698	.662	20.97	-1.50, .870		11
Satisfaction Toward System-Lab	-.569, 1.22	.519	.0308	.489	84.38	-.306, .957		30
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior	Not Applicable							
Amount of Communication-Lab	-2.22, .650	1.35	.095	1.26	57.18	-1.93, .354		62
Rate of Decision Improvement-Lab	-.198, 1.25	.354	.039	.320	73.18	.086, .968		86
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

missing studies averaging null findings that would have to exist to bring the average corrected D down from .1352 to 0.05.

In the field tests, the users of computerized DSS/GDSS have no different quality decisions on average (mean corrected D = -.0253, K = 2, N = 120) than the users of no-DSS/GDSS (Table XI, p. 190). Although the confidence interval does not include zero (-.0253 to -.0253), indicating that the difference in decision quality between DSS/GDSS and no-DSS/GDSS is significantly different from zero at p < .10, the size of the difference is very small and not far from zero. In addition, the fail-safe n shows that it would take no more missing studies averaging null findings that would have to exist to bring the average corrected D to -0.05, since the average corrected D is already below this critical level in absolute terms.

In the field studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .5783, K = 5, N = 2920) than the users of no decision support at all (Table XI, p. 190). This is confirmed by the confidence interval which does not include zero (.3257 to .8057), suggesting that the average difference in decision quality is statistically different from zero (i.e., there is a difference in quality) at p < 10. In addition to the confidence interval which suggests that in field studies, the computerized DSS/GDSS always *result in higher quality decisions than no-DSS/GDSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 53 missing studies averaging null findings that would have to exist to bring the average corrected D down from .5783 to 0.05.*

The confidence intervals for second order sampling error of laboratory and field tests are not significantly different (overlap $Z = 1.49 < Z_c = 1.645$), suggesting that those two subsets do not affect decision quality differently (in laboratory studies, the users of computerized DSS/GDSS will have statistically no more quality decisions than the users of computerized DSS/GDSS in field tests when both are compared to the users of no decision support at all). However, the confidence interval for second order sampling error of the field studies is significantly different from the confidence intervals of both the laboratory studies and the field tests (no overlap), suggesting that the average difference in decision quality across DSS/GDSS and no-DSS/GDSS in field studies, is significantly different from those of laboratory or field tests. In other words, across DSS/GDSS and no-DSS/GDSS, the users produce significantly higher quality decisions in field studies than in either laboratory studies or field tests.

4.4.2.2 Decision Quality (DSS/GDSS Versus Manual DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS have higher quality decisions on average (mean corrected D = .485, K = 16, N = 956) than the users of manual DSS/GDSS (Table XII). Although the difference in decision quality across DSS/GDSS and manual DSS/GDSS is large, the confidence interval includes zero (-.343 to 1.20), suggesting that the average difference in decision quality is not statistically different from zero (i.e., no difference in quality) at p < 10. Even though the difference is not statistically different from zero, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 139 missing studies averaging null findings that would have to exist to bring the average corrected D down from .485 to 0.05.

In the field tests, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .341, K = 7, N = 505) than the users of manual DSS/GDSS (Table XII). Although, the confidence interval includes zero (-.021 to .704), the difference in decision quality is positive for more than 90% of the time, suggesting that the average difference in decision quality is statistically different from zero. Besides that, the fail-safe n shows

TABLE XII

THE EFFECTS OF THE MODERATOR VARIABLE OF LABORATORY STUDIES VERSUS FIELD TESTS VERSUS FIELD STUDIES USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality-Lab	16	956	.485	.683	-.389, 1.36	16.31	.428	.882
Field Test	7	505	.341	.283	-.021, .704	41.89	.341	1
Field Study	4	438	.996	1.05	-.347, 2.34	3.66	.996	1
Decision Time-Lab	7	442	.418	1.34	-1.30, 2.14	3.5	.418	1
Field Test	3	467	-.800	.153	-.996, -.604	54.54	-.800	1
Field Study	1	60	d = .9436					
Depth of Analysis-Lab	12	756	.401	.605	-.373, 1.175	16.56	.385	.959
Field Test	3	464	.221	0	.221, .221	100.99	.200	.905
Decision Confidence-Lab	7	459	-.0501	.741	-.999, .899	11.76	-.046	.927
Field Study	2	417	.254	0	.254, .254	1038.5	.254	1
Satisfaction w/Decision Process-Lab	3	144	.694	.726	-.235, 1.62	14.90	.694	1
Field Test	2	28	-.058	0	-.058, -.058	14715	-.053	.911
Satisfaction w/Decision Outcome	Not Applicable							
Equality of Participation-Lab	5	549	.038	.423	-.5036, .5806	20.09	.0349	.907
Field Test	2	28	.311	0	.311, .311	53432	.311	1
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward the System-Lab	4	177	.265	.307	-.129, .658	55.83	.237	.894
Field Study	3	378	.881	0	.881, .881	903.5	.881	1
Degree of Decision Consistency	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XII (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF LABORATORY STUDIES VERSUS FIELD TESTS VERSUS FIELD STUDIES USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs.D's	Residual Var	Chi-SQ ($\chi^2_{K-1, .05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over-Lap Z Value Z_c=1.645[a]	Fail Safe N
Decision Quality-Lab	-.343, 1.20	.434	.0708	.3636	98.07	.105, .751	LF_t=.66	139
Field Test	-.021, .704	.138	.058	.0803	16.71	.066, .617	F_sF_t=1.13	41
Field Study	-.347, 2.34	1.143	.0418	1.10	109.3	-.052, 2.04	LF_s=.91	76
Decision Time-Lab	-1.30, 2.14	1.88	.067	1.809	196.4	-.596, 1.43	2.28	52
Field Test	-.996, -.604	.0515	.028	.023	5.50	-1.06, -.543		45
Depth of Analysis-Lab	-.358, 1.13	.403	.067	.337	72.47	.025, .744	.87	84
Field Study	.200, .200	.026	.0264	-.00026	2.97	.017, .383		10
Decision Confidence-Lab	-.926, .833	.535	.063	.472	59.52	-.588, .495	1.09	1
Field Test	.254, .254	.00188	.0193	-.0176	.1926	.194, .314		8
Satisfaction w/Dec. Process-Lab	.235, 1.62	.619	.092	.527	20.13	-1.96, 1.58	1.65	39
Field Test	-.053, -.053	.0023	.338	-.335	.0136	-.1197, .013		1
Satisfaction w/Dec. Outcome	Not Applicable							
Equality of Participation-Lab	-.457, .526	.1847	.0371	.1476	24.88	-.342, .4117	1.41	$D_k<D_c$
Field Test	.311, .311	.000649	.3417	-.341	3.74	.276, .346		10
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward System-Lab	-.115, .588	.1709	.095	.0755	7.16	-.168, .642	No	17
Field Study	.881, .881	.0039	.035	-.0315	.332	.809, .951		50
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

[a] LFt is the Z value between laboratory studies and field tests; FtFs is Z the value between field tests and field studies; LFs is the Z value between laboratory and field studies.

that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 41 missing studies averaging null findings that would have to exist to bring the average corrected D down from .341 to 0.05.

In the field studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected $D = .996$, $K = 4$, $N = 438$) *than the users of manual support (Table XII, p. 195). Although the difference in decision quality across DSS/GDSS and manual DSS/GDSS in field studies is large, the confidence interval includes zero (-.347 to 2.34), suggesting that the average difference in decision quality is not statistically different from zero (i.e., no difference in quality) at* $p < 10$. *Even though the confidence interval suggests that in field studies DSS/GDSS may not always result in higher quality decisions than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 76 missing studies averaging null findings that would have to exist to bring the average corrected D down from .996 to 0.05.*

The confidence intervals for second order sampling error of laboratory, field tests, and field studies are not significantly different from each other (overlap Z for experiments versus field tests = .66, for field tests versus *field studies = 1.13, and for experiments versus field studies = .91; all < Z_c = 1.645), suggesting that those three subsets do not affect decision differently. In other words, across DSS/GDSS and manual DSS/GDSS, subjects of laboratory studies will not produce higher quality decisions than the subjects of either the field tests, or field studies.*

4.4.2.3 Decision Time (DSS/GDSS Versus No-DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS take more decision time on average (mean corrected D = -1.1096, K = 17, N = 2920) than the users of no-DSS/GDSS (Table XI, p. 190). This is confirmed by the confidence interval which does not include zero (-2.02 to -.200), suggesting that the average difference in decision time is statistically different from zero. In addition, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 360 missing studies averaging null findings that would have to exist to bring the average corrected D up from -1.1096 to -0.05.

In the field studies, the users of computerized DSS/GDSS are more efficient (take less decision time) on average (mean corrected D = .476, K = 3, N = 2402) than the *users of no-DSS/GDSS (Table XI, p. 190). This is confirmed by the confidence interval which does not include zero (.3799 to .5718), suggesting that the average difference in decision time is statistically different from zero. In addition, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 26 missing studies averaging null findings that would have to exist to bring the average corrected D down from .476 to 0.05.*

The confidence intervals for second order sampling error of laboratory and field studies are significantly different (no overlap), reinforcing the different signs of the two effects and suggesting that those two subsets do affect decision time differently (in laboratory studies, the users of computerized DSS/GDSS will be statistically less efficient in decision time than the users of computerized DSS/GDSS in field tests when both are compared to the users of no decision support at all).

4.4.2.4 Decision Time (DSS/GDSS Versus Manual DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS are more efficient (take less decision time) on average (mean corrected D = .418, K = 7, N = 442) than the users of manual DSS/GDSS (XII, p. 195). Although the *difference in decision time across DSS/GDSS and manual DSS/GDSS is large, the confidence interval includes zero (-1.30 to 2.14), suggesting that the average difference in decision time is not statistically different from zero. Although the difference is not statistically different from zero, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 52 missing studies averaging null findings that would have to exist to bring the average corrected D down from .418 to 0.05.*

In the field tests, the users of computerized DSS/GDSS are less efficient in decision time on average (mean corrected D = -.800, K = 3, N = 467) than the users of manual DSS/GDSS (XII, p. 195). This is confirmed by the confidence interval which does not includes zero (-.996 to -.604), suggesting that the average difference in decision time is statistically different from zero. Besides that, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 45 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.800 to -0.05.

There is only one field study available that investigates the decision time, across DSS/GDSS and manual

DSS/GDSS. The study shows that the users of computerized DSS/GDSS are more efficient (take less decision time) than the users of manual DSS/GDSS (d = .9436, N = 60).

The confidence intervals for second order sampling error of laboratory and field tests are significantly different from each other (overlap $Z = 2.28 > Z_c = 1.645$), suggesting that those two subsets do affect decision time differently and in the opposite direction. In other words, across DSS/GDSS and manual DSS/GDSS, subjects of laboratory studies will take less decision time than the subjects of the field tests.

4.4.2.5 Depth of Analysis (DSS/GDSS Versus No-DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS have relatively more depth of analysis on average (mean corrected D = .124, K = 16, N = 975) than the users of no-DSS/GDSS (Table XI, p. 190). However, in additions to the fact that the magnitude of the difference is relatively small, the confidence interval includes zero (-.887 to 1.109), suggesting that the average difference in depth of analysis is not statistically different from zero. However, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 24 missing studies averaging null findings that *would have to exist to bring the average corrected D down from .124 to 0.05.*

There is only one field study available that investigates the depth of analysis, across DSS/GDSS and no-DSS/GDSS (Table XI, p. 190). The study shows that the users of computerized DSS/GDSS produce more depth of analysis than the users of no-DSS/GDSS (d = 1.539, N = 76).

Although there is a large difference in depth of analysis between computerized DSS/GDSS and no-DSS/GDSS across laboratory and field studies (when compared to no-DSS/GDSS, the users of DSS/GDSS in laboratory studies produce less depth of analysis than the users of DSS/GDSS in field studies), there is no way to confirm that the difference is statistically significant, since there is only one study in the subset of field studies.

4.4.2.6 Depth of analysis (DSS/GDSS Versus Manual DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS produce more depth of analysis on average (mean corrected D = .401, K = 12, N = 756) than the users of manual DSS/GDSS (Table XII, p. 195). Although the difference in depth of analysis across DSS/GDSS and manual DSS/GDSS is large, the confidence interval includes zero (-.358 to 1.13), suggesting that the average difference in depth of analysis is not statistically different from zero. Although *the difference is not statistically different from zero, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 84 missing studies averaging null findings that would have to exist to bring the average corrected D down from .401 to 0.05.*

In the field tests, the users of computerized DSS/GDSS produce more depth of analysis on average (mean corrected D = .221, K = 3, N = 464) than the users of manual DSS/GDSS (Table XII, p. 195). This is confirmed by the confidence interval which does not include zero (.200 to .200), suggesting that the average difference in depth of analysis is statistically different from zero. Given the fact that there are only three studies available, the formula for the fail-safe n shows that it would take only 10 missing studies averaging null findings that would have to exist to bring the average corrected D down from .221 to 0.05.

The confidence intervals for second order sampling error of laboratory and field tests are not significantly different from each other (overlap $Z = .87 < Z_c = 1.645$*), suggesting that those two subsets do not affect depth of analysis differently. In other words, across DSS/GDSS and manual DSS/GDSS, subjects of laboratory studies produce no more depth of analysis than the subjects of the field tests.*

4.4.2.7 Decision Confidence (DSS/GDSS Versus No-DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS have relatively more decision confidence on average (mean corrected D = .149, K = 15, N = 1155) than the users of no-DSS/GDSS (Table XI, p. 190). However, in additions to the fact that the magnitude of the difference is relatively small, the confidence interval includes zero (-.694 to .975), suggesting that the average difference in decision confidence is not statistically different from zero. However, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 30 missing studies averaging null findings that would have to exist to bring the average corrected D down from .149 to 0.05.

There is only one field study available that investigates the decision confidence, across DSS/GDSS and no-DSS/GDSS (Table XI, p. 190). The study shows that the users of computerized DSS/GDSS produce more decision confidence than the users of no-DSS/GDSS (d = .8435, N = 44).

Although there is a large difference in decision confidence between computerized DSS/GDSS and no-DSS/GDSS across laboratory and field studies (when compared to no-DSS/GDSS, the users of DSS/GDSS in laboratory studies *produce less decision confidence than the users of DSS/GDSS in field studies), there is no way to confirm that the difference is statistically significant, since there is only one study in the subset of field studies.*

4.4.2.8 Decision Confidence (DSS/GDSS Versus Manual DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS produce no less decision confidence on average (mean corrected D = -.0501, K = 7, N = 459) than the users of manual DSS/GDSS (Table XII, p. 195). In addition to the fact that the average corrected D is very small, the confidence interval includes zero (-.926 to .833), suggesting that the average difference in decision confidence is not statistically different from zero. Moreover, the fail-safe n shows that it would take one missing study with null finding (i.e., d = 0) that would have to exist to bring the average corrected D up from -.0501 to -0.05.

In the field tests, the users of computerized DSS/GDSS produce more decision confidence on average (mean corrected D = .254, K = 2, N = 417) than the users of manual DSS/GDSS (Table XII, p. 195). This is confirmed by the confidence interval which does not include zero (.254 to .254), suggesting that the average difference in decision confidence is statistically different from zero. Given the *fact that there are only two studies available, the formula for the fail-safe n shows that it would take only 8 missing studies averaging null findings that would have to exist to bring the average corrected D down from .254 to 0.05.*

The confidence intervals for second order sampling error of laboratory and field tests are not significantly different from each other (overlap $Z = 1.09 < Z_c = 1.645$), suggesting that those two subsets do not affect decision confidence differently. In other words, across DSS/GDSS and manual DSS/GDSS, subjects of laboratory studies produce no less decision confidence than the subjects of the field tests.

4.4.2.9 Satisfaction With Decision Process (DSS/GDSS Versus Manual DSS/GDSS)

In the laboratory studies, the users of computerized DSS/GDSS have more satisfaction with decision process on average (mean corrected D = .694, K = 3, N = 144) than the users of manual DSS/GDSS (Table XII, p. 195). Although the difference in satisfaction with decision process across DSS/GDSS and manual DSS/GDSS is large, the confidence interval includes zero (-.235 to 1.62), suggesting that the average difference in satisfaction with decision process is not statistically different from zero. Although the difference is not statistically different from zero, the fail-safe n shows that it is likely that the difference is *large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 84 missing studies averaging null findings that would have to exist to bring the average corrected D down from .694 to 0.05.*

In the field tests, the users of computerized DSS/GDSS produce no more satisfaction with decision process on average (mean corrected D = -.058, K = 2, N = 28) than the users of manual DSS/GDSS (Table XII, p. 195). Although the confidence interval does not include zero (-.053 to -.053), the average corrected D is very small and not far from zero, suggesting that the average difference in satisfaction with decision process is not statistically different from zero. Given the fact that there are only two studies available, the formula for the fail-safe n shows that it would take only one missing study averaging null finding (i.e., d = 0) that would have to exist to bring the average corrected D up from -.058 to -0.05.

The confidence intervals for second order sampling error of laboratory and field tests are significantly different from each other (overlap $Z = 1.65 > Z_c = 1.645$*), suggesting that those two subsets do affect satisfaction with decision process differently. In other words, compared to manual DSS/GDSS, the DSS/GDSS subset of laboratory studies produces significantly more satisfaction with decision process than the DSS/GDSS subjects of the field* *tests.*

4.4.2.10 Equality of participation (DSS/GDSS Versus Manual DSS/GDSS)

In the laboratory studies, the users of computerized DSS/GDSS produce no more equality of participation on average (mean corrected D = .038, K = 5, N = 549) than the users of manual DSS/GDSS (Table XII, p. 195). In addition to the fact that the average corrected D is very small, the confidence interval includes zero (-.457 to .526), suggesting that the average difference in equality of participation is not statistically different from zero. Moreover, the fail-safe n shows that it would take no missing studies with null findings that would have to exist to bring the average corrected D to 0.05, since the average corrected D is already below that value. In the field tests, the users of computerized DSS/GDSS produce more equality of participation on average (mean corrected D = .311, K = 2, N = 28) than the users of manual DSS/GDSS (Table XII, p. 195). This is confirmed by the confidence interval which does not include zero (.311 to .311), suggesting that the average difference in equality of participation is statistically different from zero. Given the fact that there are only two studies available, the formula for the fail-safe n shows that it would take only 10 missing studies averaging null findings that would have to exist to bring the average *corrected D down from .311 to 0.05.*

The confidence intervals for second order sampling error of laboratory and field tests are not significantly different from each other (overlap $Z = 1.41 < Z_c = 1.645$*), suggesting that those two subsets do not affect equality of participation differently. In other words, across DSS/GDSS and manual DSS/GDSS, subjects of laboratory studies produce no significantly different equality of participation from the subjects of the field tests.*

4.4.2.11 Degree of Decision Consensus (DSS/GDSS Versus No-DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS have lower degree of decision consensus on average (mean corrected D = -.664, K = 12, N = 925) than the users of no-DSS/GDSS (Table XI, p. 190). Although the difference is relatively large, the confidence interval includes zero (-1.83 to .576), suggesting that the average difference in degree of decision consensus is not statistically different from zero. Even though the confidence interval suggests that in laboratory studies the DSS/GDSS may not always result in lower degree of decision consensus over no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 147 missing studies averaging null findings that *would have to exist to bring the average corrected D up from -.664 to -0.05.*

In the field tests, the users of computerized DSS/GDSS have less degree of decision consensus on average (mean corrected D = -.316, K = 2, N = 120) than the users of no-DSS/GDSS (Table XI, p. 190). Although the difference is relatively large, the confidence interval includes zero (-1.36 to .726), indicating that the difference in degree of decision consensus between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Given the fact that there are only two field tests available, the fail-safe n shows that it would take 10 more missing studies averaging null findings that would have to exist to bring the average corrected D up from -.316 to -0.05.

The confidence intervals for second order sampling error of laboratory and field tests are not significantly different (overlap $Z = .52 < Z_c = 1.645$), suggesting that those two subsets do not affect degree of decision consensus differently (in laboratory studies, the users of computerized DSS/GDSS will have statistically no more degree of decision consensus than the users of computerized DSS/GDSS in field tests when both are compared to the users of no decision support at all).

4.4.2.12 Satisfaction Toward the System (DSS/GDSS Versus No-DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS produce more satisfaction toward the system on average (mean corrected D = .349, K = 5, N = 668) than the users of no-DSS/GDSS (Table XI, p. 190). Although the difference in satisfaction toward the system ıs moderate, the confidence interval includes zero (-.569 to 1.22), suggesting that the average difference in satisfaction toward the system is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in higher satisfaction toward the system than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The formula for the fail-safe n shows that it would take 30 missing studies averaging null findings that would have to exist to bring the average corrected D down from .349 to 0.05.

There is only one field study available that investigates the satisfaction toward the system, across DSS/GDSS and no-DSS/GDSS (Table XI, p. 190). The study shows that the users of computerized DSS/GDSS produce more satisfaction toward the system than the users of no-DSS/GDSS (d = .1.658, N = 46).

Although there is a large difference in satisfaction toward the system between computerized DSS/GDSS and no-

DSS/GDSS across laboratory and field studies (when compared to no-DSS/GDSS, the users of DSS/GDSS in laboratory studies produce less satisfaction toward the system than the users of DSS/GDSS in field studies), there is no way to confirm that the difference is statistically significant, since there is only one study in the subset of field studies.

4.4.2.13 Satisfaction Toward the System (DSS/GDSS Versus Manual DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS have relatively more satisfaction toward the system on average (mean corrected D = .265, K = 4, N = 177) than the users of manual DSS/GDSS (Table XII, p. 195). Although the difference in satisfaction toward the system is small to moderate, the confidence interval includes zero (-.115 to .588), suggesting that the average difference in satisfaction toward the system is not statistically different from zero. Given the fact the there are only four laboratory studies available, the fail-safe n shows that it is likely that the difference is relatively large enough to be of practical significance. The formula for the fail-safe n shows that it would take 10 missing studies averaging null findings that would have to exist to bring the average corrected D down from .265 to 0.05.

In the field studies, the users of computerized DSS/GDSS have more satisfaction toward the system on average *(mean corrected D = .881, K = 3, N = 378) than the users of manual DSS/GDSS (Table XII, p. 195). This is confirmed by the confidence interval which does not include zero (.881 to .881), indicating that the difference in satisfaction toward the system between DSS/GDSS and manual DSS/GDSS is significantly different from zero. In addition to the confidence interval which suggests that DSS/GDSS always result in higher satisfaction toward the system than manual DSS/GDSS, the fail-safe n shows that it would take 50 more missing studies averaging null findings that would have to exist to bring the average corrected D down from .881 to 0.05.*

The confidence intervals for second order sampling error of laboratory and field studies are significantly different (no overlap), suggesting that those two subsets do affect satisfaction toward the system differently (although both subsets increase the satisfaction toward the system, in laboratory studies, the users of computerized DSS/GDSS will have statistically less satisfaction toward the system than the users of computerized DSS/GDSS in field studies when both are compared to the users of no decision support at all).

4.4.2.14 Amount of Communication (DSS/GDSS Versus No-DSS/GDSS)

In the laboratory studies, the users of computerized

DSS/GDSS produce less communication on average (mean corrected D = -.829, K = 4, N = 190) than the users of no-DSS/GDSS (Table XI, p. 190). Although the difference in the amount of communication is large, the confidence interval includes zero (-2.22 to .650), suggesting that the average difference in the amount of communication is not statistically different from zero. Even though the confidence interval suggests that GDSS does not always result in more communication than no-GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 62 missing studies with null findings that would have to exist to bring the average corrected D up from -.829 to -0.05.

There is only one field test available that investigates the amount of communication among group members, across GDSS and no-GDSS (Table XI, p. 190). The study shows that the users of computerized GDSS produce more communication than the users of no-GDSS (d = .4729, N = 120). Although there is a large difference in the amount of communication between computerized GDSS and no-GDSS across laboratory and field tests (i.e., when compared to no-GDSS, the users of GDSS in laboratory studies produce less communication than the users of GDSS in field tests), there is no way to confirm that the difference is statistically significant, since there is only one study in the subset of *field tests.*

4.4.2.15 Rate of Decision Improvement DSS/GDSS Versus No-DSS/GDSS

In the laboratory studies, the users of computerized DSS/GDSS produce higher rate of decision improvement on average (mean corrected D = .661, K = 7, N = 869) than the users of no-DSS/GDSS (Table XI, p. 190). Although the difference in the rate of decision improvement is large, the confidence interval includes zero (-.198 to 1.25), suggesting that the average difference in the rate of decision improvement is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS do not always result in higher rate of decision improvement than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 86 missing studies with null findings that would have to exist to bring the average corrected D down from .661 to 0.05.

There is only one field study available that investigates the rate of decision improvement among group members, across DSS/GDSS and no-DSS/GDSS (Table XI, p. 190). The study shows that the users of computerized DSS/GDSS produce higher rate of decision improvement than the users of no-DSS/GDSS (d = 1.2079, N = 76).

Although there is a large difference in the rate of decision improvement between computerized DSS/GDSS and no-DSS/GDSS across laboratory and field studies (i.e., when compared to no-DSS/GDSS, the users of DSS/GDSS in laboratory studies produce lower rate of decision improvement than the users of DSS/GDSS in field studies), there is no way to confirm that the difference is statistically significant, since there is only one study in the subset of field studies.

4.4.3 Published Versus Unpublished Studies

In this section, the moderator variable is based on separating the available studies for each dependent measure (i.e., decision quality) into published or unpublished studies. For each dependent variable, the moderator variable is tested under two different independent variables (computerized decision aids versus no decision aids, and computerized decision aids versus manual decision aids). Some dependent variables are not applicable under the current moderator variable (Tables XIII and XIV, pp. 218, 221), either because there are two or fewer studies available, the population is homogeneous, or because all the studies lie in one side of the moderator's subsets (i.e., all the available studies are published).

4.4.3.1 Decision Quality (DSS/GDSS Versus No-DSS/GDSS

In the published studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .1928, K = 21, N = 1573) than the users of no-DSS/GDSS (Table XIII). In addition to the small difference in the decision quality, the confidence interval includes zero (-.437 to .800), suggesting that the average difference in decision quality is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS do not always result in higher decision quality than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 60 missing studies with null findings that would have to exist to bring the average corrected D down from .1928 to 0.05.

In the unpublished studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .458, K = 22, N = 3873) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference is relatively large, the confidence interval includes zero (-.089 to .951), suggesting that the difference in decision quality between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS do not always

TABLE XIII

THE EFFECTS OF THE MODERATOR VARIABLE OF PUBLISHED VERSUS UNPUBLISHED STUDIES USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality - Pub	21	1537	.1928	.513	-.464, .849	19.08	.1816	.942
Unpublished	22	3873	.458	.431	-.094, 1.01	12.6	.4309	.941
Decision Time - Pub	7	457	-1.60	.525	-2.27, -.929	23.26	-1.60	1
Unpublished	13	3085	.1976	.603	-.574, .969	4.48	.1976	1
Depth of Analysis - Pub	7	449	.223	.581	-.520, .966	19.71	.1972	.884
Unpublished	10	602	.283	1.106	-1.13, 1.698	6.235	.2616	.923
Decision Confidence - Pub	10	837	.2598	.735	-.681, 1.20	8.37	.2598	1
Unpublished	6	362	-.053	.305	-.443, .337	45.01	-.050	.949
Satisfaction w/Dec. Process-Pub	4	590	.045	.389	-.454, .543	17.22	.0416	.932
Unpublished	9	638	-.305	.812	-1.34, .735	8.18	-.305	1
Equality of Participation - Pub	5	441	.250	.587	-.502, 1.00	14.72	.221	.885
Unpublished	11	697	1.73	1.89	-.695, 4.16	2.79	1.57	.908
Degree of Decision Consensus - Pub	5	410	-.212	.702	-1.11, .687	10.17	-.201	.948
Unpublished	9	635	-.847	.992	-2.12, .422	6.07	-.847	1
Satisfaction Toward the System-Pub	3	518	.524	.779	-.473, 1.52	4.39	.487	.930
Unpublished	3	196	.228	.883	-.838, 1.29	9.72	.2099	.922
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior-Pub	4	240	.019	.078	-.081, .119	91.83	.019	1
Unpublished	2	87	.620	0	.621, .621	225.29	.621	1
Amount of Communication - Pub	3	130	-1.34	1.12	-2.77, .0901	9.40	-1.27	.949
Unpublished	2	180	-.228	.273	-.577, .121	38.09	-.228	1
Rate of Decision Improvement - Pub	5	669	.701	.181	.469, .933	49.48	.701	1
Unpublished	3	276	.367	1.19	-1.167, 1.90	4.69	.292	.797
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XIII (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIALBE OF PUBLISHED VERSUS UNPUBLISHED STUDIES USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs.D's	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over-Lap Z Value Z_C=1.645	Fail Safe N
Decision Quality-Pub	-.437, .800	.289	.0551	.234	110.08	-.048, .411	1.67	60
Unpublished	-.089, .951	.1887	.023	.165	176.5	.249, .612		180
Decision Time-Pub	-2.27, -.929	.359	.0835	.2754	30.09	-2.04, -1.57	No	217
Unpublished	-.574, .969	.381	.071	.364	289.7	-.138, .533		38
Depth of Analysis-Pub	-.459, .854	.328	.0647	.263	35.51	-.227, .622	.15	24
Unpublished	-1.04, 1.568	1.11	.069	1.043	160.4	-.392 .915		47
Decision Confidence-Pub	-.681, 1.20	.590	.0494	.5409	119.5	-.216, .736	.92	42
Unpublished	-.421, .320	.1525	.0686	.0838	13.33	-.362, .262		1
Satisfaction w/Dec. Process-Pub	-.424, .507	.159	.0275	.132	23.22	-.349, .433	.75	$D_K<D_C$
Unpublished	-1.34, .735	.718	.0587	.659	110.01	-.858, .248		46
Equality of Participation-Pub	-.444, .887	.317	.0467	.270	33.96	-.272, .715	2.53	20
Unpublished	-.631, 3.78	3.05	.085	2.97	393.2	.541, 2.61		370
Degree of Decision Consensus-Pub	-1.05, .651	.494	.050	.444	49.15	-.817, .415	1.37	16
Unpublished	-2.12, .422	1.05	.064	.983	148.1	-1.51, -.178		143
Satisfaction Toward System-Pub	-.440, 1.415	.549	.0241	.525	68.30	-.351, 1.33	.47	28
Unpublished	-.773, 1.193	.653	.0635	.589	30.8	-.705, 1.12		11
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behav-Pub	-.081, .119	.0751	.069	.0061	4.35	-.249, .288	No	$D_K<D_C$
Unpublished	.621, .621	.0448	.101	-.056	.888	.327, .914		23
Amount of Communication-Pub	-2.63, .085	1.23	.116	1.12	31.91	-2.53, -.0111	1.62	77
Unpublished	-.577, .121	.120	.0457	.0744	5.25	-.708, .252		7
Rate of Decision Improvement-Pub	.469, .933	.065	.032	.033	10.10	.477, .924	.58	65
Unpublished	-.930, 1.51	.957	.0449	.912	63.91	-.815, 1.40		19
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

result in higher decision quality than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 18 more missing studies averaging null findings that would have to exist to bring the average corrected D down from .458 to 0.05.

The confidence intervals for second order sampling error of published and unpublished studies are significantly different from each other (overlap $Z = 1.67 > Z_c = 1.645$), suggesting that those two subsets do affect decision quality differently (in published studies, the users of computerized DSS/GDSS will have statistically less decision quality than the users of computerized DSS/GDSS in unpublished studies when both are compared to the users of no decision support at all).

4.4.3.2 Decision Quality (DSS/GDSS Versus Manual DSS/GDSS

In the published studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .684, K = 10, N = 752) than the users of manual DSS/GDSS (Table XIV). Although the difference in the decision quality is large, the confidence interval includes zero (-.439 to 1.808), suggesting that the average difference in decision quality is not statistically

TABLE XIV

THE EFFECTS OF THE MODERATOR VARIABLE OF PUBLISHED VERSUS UNPUBLISHED STUDIES USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality - Pub	10	752	.684	.877	-.439, 1.808	6.98	.684	1
Unpublished	17	1147	.497	.657	-.344, 1.34	15.67	.439	.882
Decision Time - Pub	2	248	.267	.336	-.164, .697	22.63	.267	1
Unpublished	9	721	-.275	1.256	-1.88, 1.33	3.17	-.275	1
Depth of Analysis - Pub	6	341	.207	0	.207, .207	128.57	.188	.905
Unpublished	9	879	.379	.569	-.350, 1.11	12.46	.364	.959
Decision Confidence - Pub	2	226	-.623	.576	-1.36, .114	10.21	-.623	1
Unpublished	7	650	.374	0	.374, .374	117.89	.347	.927
Satisfaction w/Decision Process-Pub	2	28	-.058	0	-.058, -.058	14715	-.053	.911
Unpublished	3	144	.694	.726	-.235, 1.62	14.90	.694	1
Satisfaction w/Decision Outcome-Pub	1	188	d = -.3499					
Unpublished	4	184	.286	.295	-.0913, .663	51.39	.286	1
Equality of Participation - Pub	4	314	.230	0	.230, .230	264.5	.209	.907
Unpublished	3	263	-.143	.505	-.790, .503	15.50	-.143	1
Degree of Decision Consensus - Pub	1	188	d = -.5386					
Unpublished	2	195	-.995	0	-.995, -.995	103.99	-.995	1
Satisfaction Toward The System - Pub	3	378	.881	0	.881, .881	903.5	.881	1
Unpublished	4	177	.265	.307	-.129, .658	55.83	.237	.894
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XIV (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF PUBLISHED VERSUS UNPUBLISHED STUDIES USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs. D's	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over Lap Z Value Z_c=1.645	Fail Safe N
Decision Quality - Pub	-.439, 1.808	.828	.0578	.771	143.17	.120, 1.248	1.76	127
Unpublished	-.304, 1.18	.399	.0626	.337	108.48	.138, .739		152
Decision Time - Pub	-.164, .697	.146	.033	.113	8.84	-.263, .797	1.07	9
Unpublished	-1.88, .133	1.63	.0517	.158	283.6	-1.11, .559		40
Depth of Analysis - Pub	.188, .188	.057	.073	-.016	4.67	-.0034, .379	.79	19
Unpublished	-.336, 1.06	.341	.0425	.299	72.23	.0179, .745		59
Decision Confidence - Pub	-.136, .114	.370	.0378	.332	19.59	-.1.47, .219	2.28	23
Unpublished	.347, .347	.0379	.045	-.00678	5.94	.203, .491		45
Satisfaction w/Decision Process-Pub	-.053, -.053	.0023	.338	-.335	.0136	-.1197, .013	1.65	1
Unpublished	-.235, 1.62	.619	.092	.527	20.13	-.196, 1.58		39
Satisfaction w/Dec. Outcome-Unpub	-.0913, .663	.179	.0919	.0869	7.78	-.128, .7006		20
Equality of Participation - Pub	.209, .209	.0193	.052	-.0327	1.51	.071, .347	1.15	14
Unpublished	-.790, .503	.302	.0468	.255	19.35	-.765, .478		6
Degree of Dec. Consensus - Unpub	-.995, -.995	.045	.047	-.0018	1.92	-1.29, -.700		38
Satisfaction Toward The System - Pub	.881, .881	.0039	.035	-.0315	.332	.809, .951	No	50
Unpublished	-.155, .588	.1709	.095	.0755	7.16	-.168, .642		17
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

different from zero. Even though the confidence interval suggests that DSS/GDSS do not always result in higher decision quality than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 127 missing studies with null findings that would have to exist to bring the average corrected D down from .684 to 0.05.

In the unpublished studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .497, K = 17, N = 248) than the users of manual DSS/GDSS (Table XIV, p. 221). Although the difference in decision quality is moderate, the confidence interval includes zero (-.304 to 1.18), suggesting that the difference in decision quality between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS do not always result in higher decision quality than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 152 more missing studies averaging null findings that would have to exist to bring the average corrected D down from .497 to 0.05.

The confidence intervals for second order sampling error of published and unpublished studies are significantly *different from each other (overlap $Z = 1.76 > Z_c = 1.645$), suggesting that those two subsets do affect decision quality differently (in published studies, the users of computerized DSS/GDSS will have statistically more decision quality than the users of computerized DSS/GDSS in unpublished studies when both are compared to the users of manual support).*

4.4.3.3 Decision Time (DSS/GDSS Versus No-DSS/GDSS

In the published studies, the users of computerized DSS/GDSS are less efficient in decision time (take more decision time) on average (mean corrected D = -1.60, K = 7, N = 457) than the users of no-DSS/GDSS (Table XIII, p. 218). This is confirmed by the confidence interval which does not include zero (-2.27 to -.929), suggesting that the average difference in decision time is statistically different from zero. In addition to the confidence interval which suggests that DSS/GDSS do always result in more decision time than no-DSS/GDSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 217 missing studies with null findings that would have to exist to bring the average corrected D up from -1.60 to -0.05.

In the unpublished studies, the users of computerized DSS/GDSS are more efficient in decision time (take less *decision time) on average (mean corrected D = .1976, K = 13, N = 3085) than the users of no-DSS/GDSS (Table XIII, p. 218). In addition to the small difference in decision time, the confidence interval includes zero (-.574 to .969), suggesting that the difference in decision time between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS do not always result in less decision time than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 38 more missing studies averaging null findings that would have to exist to bring the average corrected D down from .1976 to 0.05.*

The confidence intervals for second order sampling error of published and unpublished studies are significantly different from each other (no overlap), suggesting that those two subsets do affect decision time differently (in published studies, the users of computerized DSS/GDSS will have statistically more decision time than the users of computerized DSS/GDSS in unpublished studies when both are compared to the users of no-support at all).

4.4.3.4 Decision Time (DSS/GDSS Versus Manual DSS/GDSS

In the published studies, the users of computerized

DSS/GDSS take less decision time on average (mean corrected D = .267, K = 2, N = 248) than the users of manual DSS/GDSS (Table XIV, p. 221). Although the difference in the decision time is small to moderate, the confidence interval includes zero (-.164 to .697), suggesting that the average difference in decision time is not statistically different from zero. Given the fact that there are only two studies available, the fail-safe n shows that it would take 9 missing studies with null findings that would have to exist to bring the average corrected D down from .267 to 0.05.

In the unpublished studies, the users of computerized DSS/GDSS take more decision time on average (mean corrected D = -.275, K = 9, N = 721) than the users of manual DSS/GDSS (Table XIV, p. 221). Although the difference in decision time is small to moderate, the confidence interval includes zero (-1.88 to 1.33), suggesting that the difference in decision time between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS do not always result in more decision time than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 40 more missing studies averaging null findings that would have to exist to bring the average corrected D up from .275 to -0.05.

The confidence intervals for second order sampling

error of published and unpublished studies are not significantly different from each other (overlap $Z = 1.07 < Z_c = 1.645$), suggesting that those two subsets do not affect decision time differently (in published studies, the users of computerized DSS/GDSS will take statistically no less decision time than the users of computerized DSS/GDSS in unpublished studies when both are compared to the users of manual support).

4.4.3.5 Depth of Analysis (DSS/GDSS Versus No-DSS/GDSS

In the published studies, the users of computerized DSS/GDSS produce more depth of analysis on average (mean corrected $D = .223$, $K = 7$, $N = 449$) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference in the depth of analysis is small to moderate, the confidence interval includes zero (-.459 to .969), suggesting that the average difference in depth of analysis is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in higher depth of analysis than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 24 missing studies with null findings that would have to exist to bring the average corrected D down from .223 to 0.05.

In the unpublished studies, the users of computerized DSS/GDSS produce more depth of analysis on average (mean corrected $D = .283$, $K = 10$, $N = 602$) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference is small to moderate, the confidence interval includes zero (-1.04 to 1.568), suggesting that the difference in depth of analysis between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in higher depth of analysis than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 47 more missing studies averaging null findings that would have to exist to bring the average corrected D down from .283 to 0.05.

The confidence intervals for second order sampling error of published and unpublished studies are not significantly different from each other (overlap $Z = .15 < Z_c = 1.645$), suggesting that those two subsets do not affect depth of analysis differently (in published studies, the users of computerized DSS/GDSS will have statistically no lower depth of analysis than the users of computerized DSS/GDSS in unpublished studies when both are compared to the users of no-support at all).

4.4.3.6 Depth of Analysis (DSS/GDSS Versus Manual DSS/GDSS

In the published studies, the users of computerized DSS/GDSS produce more depth of analysis on average (mean corrected D = .207, K = 6, N = 341) than the users of manual DSS/GDSS (Table XIV, p. 221). This is confirmed by the confidence interval which does not include zero (.188 to .188), suggesting that the average difference in depth of analysis is statistically different from zero. In addition to the confidence interval which suggests that DSS/GDSS always result in more depth of analysis than manual DSS/GDSS, the fail-safe n suggests that it would take 19 missing studies averaging null findings that would have to exist to bring the average corrected D down from .207 to 0.05.

In the unpublished studies, the users of computerized DSS/GDSS produce more depth of analysis on average (mean corrected D = .379, K = 9, N = 879) than the users of manual DSS/GDSS (Table XIV, p. 221). Although the difference in depth of analysis is moderate, the confidence interval includes zero (-.336 to 1.06), suggesting that the difference in depth of analysis between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS do not always result in more depth of analysis than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 59 more missing studies averaging null findings that would have to exist to bring the average corrected D down from .379 to 0.05.

The confidence intervals for second order sampling error of published and unpublished studies are not significantly different from each other (overlap $Z = .79 < Z_c = 1.645$), suggesting that those two subsets do not affect depth of analysis differently (in published studies, the users of computerized DSS/GDSS produce statistically no less depth of analysis than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of manual support).

4.4.3.7 Decision Confidence (DSS/GDSS Versus No-DSS/GDSS

In the published studies, the users of computerized DSS/GDSS have more decision confidence on average (mean corrected $D = .2598$, $K = 10$, $N = 602$) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference in decision confidence is small to moderate, the confidence interval includes zero (-.681 to 1.20), suggesting that the average difference in decision confidence is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS may not always *result in higher decision confidence than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 42 missing studies with null findings that would have to exist to bring the average corrected D down from .2598 to 0.05.*

In the unpublished studies, the users of computerized DSS/GDSS have no different decision confidence on average (mean corrected D = -.053, K = 6, N = 362) from the users of no-DSS/GDSS (Table XIII, p. 218). This is confirmed by the confidence interval which includes zero (-.421 to .320), suggesting that the difference in decision confidence between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. In addition to the confidence interval which suggests that DSS/GDSS may not result in higher decision confidence than no-DSS/GDSS, the fail-safe n shows that it would take one more missing study with null finding (i.e., d = 0) that would have to exist to bring the average corrected D up from -.053 to -0.05.

The confidence intervals for second order sampling error of published and unpublished studies are not significantly different from each other (overlap Z = .92 < Z_c *= 1.645), suggesting that those two subsets do not affect decision confidence differently (in published studies, the users of computerized DSS/GDSS have statistically no higher decision confidence than the users of computerized DSS/GDSS* *in unpublished studies, when both are compared to the users of no-support at all).*

4.4.3.8 <u>Decision Confidence (DSS/GDSS Versus Manual DSS/GDSS</u>

In the published studies, the users of computerized DSS/GDSS produce less decision confidence on average (mean corrected D = -.623, K = 2, N = 226) than the users of manual DSS/GDSS (Table XIV, p. 221). Although the difference in decision confidence is large, the confidence interval includes zero (-1.36 to .114), suggesting that the difference in decision confidence between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS do not always result in less decision confidence than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 23 more missing studies (in addition to the two available studies) averaging null findings that would have to exist to bring the average corrected D up from -.623 to -0.05.

In the unpublished studies, the users of computerized DSS/GDSS produce more decision confidence on average (mean corrected D = .374, K = 7, N = 650) than the users of manual DSS/GDSS (Table XIV, p. 221). This is confirmed by the *confidence interval which does not include zero (.347 to .347), suggesting that the average difference in decision confidence is statistically different from zero. In addition to the confidence interval which suggests that DSS/GDSS always result in more decision confidence than manual DSS/GDSS, the fail-safe n suggests that it would take 45 missing studies with null findings that would have to exist to bring the average corrected D down from .374 to 0.05.*

The confidence intervals for second order sampling error of published and unpublished studies are significantly different from each other (overlap $Z = 2.28 > Z_c = 1.645$), suggesting that those two subsets do affect decision confidence differently (in published studies, the users of computerized DSS/GDSS produce statistically less decision confidence than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of manual support).

4.4.3.9 Satisfaction With Decision Process (DSS/GDSS Versus No-DSS/GDSS

In the published studies, the users of computerized DSS/GDSS have no more satisfaction with decision process on average (mean corrected D = .045, K = 4, N = 362) than the users of no-DSS/GDSS (Table XIII, p. 218). This is confirmed by the confidence interval which includes zero (-.424 to .507), suggesting that the average difference in satisfaction with decision process is not statistically different from zero. In addition to the confidence interval which suggests that DSS/GDSS may not always result in higher satisfaction with decision process than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is small enough to be of no practical significance. The fail-safe n shows that it would take no more missing studies with null findings that would have to exist to bring the average corrected D to 0.05, since the average corrected D is already below 0.05.

In the unpublished studies, the users of computerized DSS/GDSS have less satisfaction with decision process on average (mean corrected D = -.305, K = 9, N = 638) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference in satisfaction with decision process is moderate, the confidence interval which includes zero (-1.34 to .735), suggesting that the difference in satisfaction with decision process between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in less satisfaction with decision process than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 46 more missing studies averaging null findings that would have to exist to bring the average corrected D up from

-.305 to -0.05.

The confidence intervals for second order sampling error of published and unpublished studies are not significantly different from each other (overlap $Z = .75 < Z_c = 1.645$), suggesting that those two subsets do not affect satisfaction with decision process differently (in published studies, the users of computerized DSS/GDSS have statistically no higher satisfaction with decision process than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of no-support at all).

4.4.3.10 Satisfaction With Decision Process (DSS/GDSS Versus Manual DSS/GDSS

In the published studies, the users of computerized DSS/GDSS have no more satisfaction with decision process on average (mean corrected $D = -.058$, $K = 2$, $N = 28$) than the users of manual DSS/GDSS (Table XIV, p. 221), since the mean corrected D is very small and not far from zero. Although the confidence interval does not include zero (-.058 to -.058), suggesting that the average difference in satisfaction with decision process is different from zero, the magnitude of the average corrected D is too small to be of any significant effect. The fail-safe n suggests that it would take only one more missing study with null finding (i.e., $d = 0$) that would have to exist to bring the average *corrected D up from -.058 to -0.05.*

In the unpublished studies, the users of computerized DSS/GDSS produce more satisfaction with decision process on average (mean corrected D = .694, K = 3, N = 144) than the users of manual DSS/GDSS (Table XIV, p. 221). Although the difference in satisfaction with decision process is large, the confidence interval includes zero (-.235 to 1.62), suggesting that the difference in satisfaction with decision process between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS do not always result in more satisfaction with decision process than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 39 more missing studies averaging null findings that would have to exist to bring the average corrected D down from .694 to 0.05.

The confidence intervals for second order sampling error of published and unpublished studies are significantly different from each other (overlap $Z = 1.65 > Z_c = 1.645$*), suggesting that those two subsets do affect satisfaction with decision process differently (in published studies, the users of computerized DSS/GDSS have statistically less satisfaction with decision process than the users of computerized DSS/GDSS in unpublished studies,* *when both are compared to the users of manual support).*

4.4.3.11 Satisfaction With Decision Outcome (DSS/GDSS Versus Manual DSS/GDSS

There is only one published study available that investigates the satisfaction with decision outcome, across DSS/GDSS and no-DSS/GDSS (Table XIV, p. 221). The study shows that the users of computerized DSS/GDSS have less satisfaction with decision outcome than the users of manual DSS/GDSS ($d = -.3499$, $N = 188$).

In the unpublished studies, the users of computerized DSS/GDSS produce more satisfaction with decision outcome on average (mean corrected $D = .286$, $K = 4$, $N = 184$) than the users of manual DSS/GDSS (Table XIV, p. 221). Although, the difference in satisfaction with decision outcome is small to moderate, the confidence interval includes zero (-.0913 to .663), suggesting that the average difference in satisfaction with decision outcome is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in more satisfaction with decision outcome than manual DSS/GDSS, the fail-safe n suggests that it would take 20 more missing studies averaging null findings that would have to exist to bring the average corrected D down from .286 to 0.05.

Although there is a large difference in the satisfaction with decision outcome between published and *unpublished studies across computerized DSS/GDSS and manual DSS/GDSS (i.e., when compared to manual DSS/GDSS, the users of DSS/GDSS in published studies produce less satisfaction with decision outcome than the users of DSS/GDSS in unpublished studies), there is no way to confirm that the difference is statistically significant, since there is only one study in the subset of published studies.*

4.4.3.12 Equality of Participation (DSS/GDSS Versus No-DSS/GDSS

In the published studies, the users of computerized DSS/GDSS produce more equality of participation on average (mean corrected D = .250, K = 5, N = 441) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference in the equality of participation is small to moderate, the confidence interval includes zero (-.444 to .887), suggesting that the average difference in equality of participation is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in higher equality of participation than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 20 missing studies with null findings that would have to exist to bring the average corrected D down from .250 to 0.05.

In the unpublished studies, the users of computerized DSS/GDSS produce more equality of participation on average (mean corrected $D = 1.73$, $K = 11$, $N = 697$) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference is very large, the confidence interval includes zero (-.631 to 3.78), suggesting that the difference in equality of participation between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in higher equality of participation than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 370 more missing studies averaging null findings that would have to exist to bring the average corrected D down from 1.73 to 0.05.

The confidence intervals for second order sampling error of published and unpublished studies are significantly different from each other (overlap $Z = 2.53 > Z_c = 1.645$), suggesting that those two subsets do affect equality of participation differently (in published studies, the users of computerized DSS/GDSS have statistically less equality of participation than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of no-support at all).

4.4.3.13 Equality of Participation (DSS/GDSS Versus Manual DSS/GDSS

In the published studies, the users of computerized DSS/GDSS produce more equality of participation on average (mean corrected D = .230, K = 4, N = 314) than the users of manual DSS/GDSS (Table XIV, p. 221). This is confirmed by the confidence interval which does not include zero (.209 to .209), suggesting that the average difference in equality of participation is statistically different from zero. In addition to the confidence interval which suggests that DSS/GDSS always result in more equality of participation than manual DSS/GDSS, the fail-safe n suggests that it would take 14 more missing studies averaging null findings that would have to exist to bring the average corrected D down from .230 to 0.05.

In the unpublished studies, the users of computerized DSS/GDSS produce less equality of participation on average (mean corrected D = -.143, K = 3, N = 263) than the users of manual DSS/GDSS (Table XIV, p. 221). In addition to the small difference in equality of participation, the confidence interval includes zero (-.790 to .503), suggesting that the difference in equality of participation between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Beside the confidence interval which suggests that DSS/GDSS do not always result in less equality of participation than manual DSS/GDSS, the fail-safe n shows *that it is likely that the difference is small enough to be of no practical significance. The fail-safe n shows that it would take only 6 more missing studies averaging null findings that would have to exist to bring the average corrected D up from -.143 to -0.05.*

The confidence intervals for second order sampling error of published and unpublished studies are not significantly different from each other (overlap $Z = 1.15 < Z_c = 1.645$), suggesting that those two subsets do not affect equality of participation differently (in published studies, the users of computerized DSS/GDSS have statistically no more equality of participation than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of manual support).

4.4.3.14 Degree of Decision Consensus DSS/GDSS Versus No-DSS/GDSS

In the published studies, the users of computerized DSS/GDSS produce more degree of decision consensus on average (mean corrected $D = -.212$, $K = 5$, $N = 410$) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference in the degree of decision consensus is small to moderate, the confidence interval includes zero (-1.05 to .651), suggesting that the average difference in degree of decision consensus is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS *may not always result in lower degree of decision consensus than no-DSS/GDSS, the fail-safe n shows that it would take 16 missing studies with null findings that would have to exist to bring the average corrected D up from -.212 to -0.05.*

In the unpublished studies, the users of computerized DSS/GDSS produce lower degree of decision consensus on average (mean corrected D = -.847, K = 9, N = 635) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference is large, the confidence interval includes zero (-2.12 to .422), suggesting that the difference in degree of decision consensus between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in lower degree of decision consensus than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 143 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.847 to -0.05.

The confidence intervals for second order sampling error of published and unpublished studies are not significantly different from each other (overlap $Z = 1.37 < Z_c = 1.645$*), suggesting that those two subsets do not affect degree of decision consensus differently (in published* *studies, the users of computerized DSS/GDSS have statistically no higher degree of decision consensus than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of no-support at all).*

4.4.3.15 Degree of Decision Consensus (DSS/GDSS Versus Manual DSS/GDSS

There is only one published study available that investigates the degree of decision consensus, across DSS/GDSS and manual DSS/GDSS (Table XIV, p. 221). The study shows that the users of computerized DSS/GDSS have less degree of decision consensus than the users of manual DSS/GDSS ($d = -.5386$, $N = 188$).

In the unpublished studies, the users of computerized DSS/GDSS produce lower degree of decision consensus on average (mean corrected $D = -.995$, $K = 2$, $N = 195$) than the users of manual DSS/GDSS (Table XIV, p. 221). This large difference in degree of decision consensus is confirmed by the confidence interval which does not include zero (-.995 to -.995), suggesting that the average difference in degree of decision consensus is statistically different from zero. In addition to the confidence interval which suggests that DSS/GDSS always result in lower degree of decision consensus than manual DSS/GDSS, the fail-safe n suggests that it would take 38 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.995 *to -0.05.*

Although there is a large difference in the degree of decision consensus between published and unpublished studies across computerized DSS/GDSS and manual DSS/GDSS (i.e., when compared to manual DSS/GDSS, the users of DSS/GDSS in published studies produce higher degree of decision consensus than the users of DSS/GDSS in unpublished studies), there is no way to confirm that the difference is statistically significant, since there is only one study in the subset of published studies.

4.4.3.16 Satisfaction Toward the System DSS/GDSS Versus No-DSS/GDSS

In the published studies, the users of computerized DSS/GDSS have more satisfaction toward the system on average (mean corrected D = .524, K = 3, N = 518) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference in the satisfaction toward the system is moderate, the confidence interval includes zero (-.440 to 1.415), suggesting that the average difference in satisfaction toward the system is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in higher satisfaction toward the system than no-DSS/GDSS, the fail-safe n shows that it would take 28 missing studies with null findings that would have to exist to bring the average corrected D down from .524 to

0.05.

In the unpublished studies, the users of computerized DSS/GDSS produce higher satisfaction toward the system on average (mean corrected D = .228, K = 3, N = 196) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference in satisfaction toward the system is small to moderate, the confidence interval includes zero (-.773 to 1.193), suggesting that the difference in satisfaction toward the system between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. The fail-safe n shows that it would take 11 missing studies averaging null findings that would have to exist to bring the average corrected D down from .228 to 0.05.

The confidence intervals for second order sampling error of published and unpublished studies are not significantly different from each other (overlap $Z = .47 < Z_c = 1.645$), suggesting that those two subsets do not affect satisfaction toward the system differently (in published studies, the users of computerized DSS/GDSS have statistically no higher satisfaction toward the system than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of no-support at all).

4.4.3.17 Satisfaction Toward the System (DSS/GDSS Versus Manual DSS/GDSS

In the published studies, the users of computerized

DSS/GDSS produce more satisfaction toward the system on average (mean corrected D = .881, K = 3, N = 378) than the users of manual DSS/GDSS (Table XIV, p. 221). This is confirmed by the confidence interval which does not include zero (.881 to .881), suggesting that the average difference in satisfaction toward the system is statistically different from zero. In addition to the confidence interval which suggests that DSS/GDSS always result in more satisfaction toward the system than manual DSS/GDSS, the fail-safe n suggests that it would take 50 missing studies averaging null findings that would have to exist to bring the average corrected D down from .881 to 0.05.

In the unpublished studies, the users of computerized DSS/GDSS produce higher satisfaction toward the system on average (mean corrected D = .265, K = 4, N = 177) than the users of manual DSS/GDSS (Table XIV, p. 221). Although the difference in satisfaction toward the system is small to moderate, the confidence interval includes zero (-.790 to .503), suggesting that the difference in satisfaction toward the system between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. However, despite the confidence interval which suggests that DSS/GDSS do not always result in less satisfaction toward the system than manual DSS/GDSS, the fail-safe n shows that it would take 17 missing studies averaging null findings that would have to exist to bring the average corrected D down from .265 to

0.05.

The confidence intervals for second order sampling error of published and unpublished studies are significantly different from each other (no overlap), suggesting that those two subsets do affect satisfaction toward the system differently (in published studies, the users of computerized DSS/GDSS have statistically higher satisfaction toward the system than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of manual support).

4.4.3.18 Degree of Uninhibited Behavior DSS/GDSS Versus No-DSS/GDSS

In the published studies, the users of computerized DSS/GDSS have no higher degree of uninhibited behavior on average (mean corrected D = .019, K = 4, N = 240) than the users of no-DSS/GDSS (Table XIII, p. 218). In addition to the fact that the difference in the degree of uninhibited behavior is close to zero, the confidence interval includes zero (-.081 to .119), suggesting that the average difference in degree of uninhibited behavior is not statistically different from zero. Moreover, the fail-safe n shows that it would no more missing studies with null findings that would have to exist to bring the average corrected D down to 0.05, since the average corrected D is already below that value.

In the unpublished studies, the users of computerized

DSS/GDSS produce higher degree of uninhibited behavior on average (mean corrected D = .620, K = 2, N = 87) than the users of no-DSS/GDSS (Table XIII, p. 218). The large difference in satisfaction toward the system is confirmed by the confidence interval which does not include zero (.621 to .621), suggesting that the difference in degree of uninhibited behavior between DSS/GDSS and no-DSS/GDSS is significantly different from zero. Given the fact that there are only two available studies, the fail-safe n shows that it would take 23 missing studies averaging null findings that would have to exist to bring the average corrected D down from .620 to 0.05.

The confidence intervals for second order sampling error of published and unpublished studies are significantly different from each other (no overlap), suggesting that those two subsets do affect degree of uninhibited behavior differently (in published studies, the users of computerized DSS/GDSS have statistically lower degree of uninhibited behavior than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of no-support at all).

4.4.3.19 Amount of Communication (DSS/GDSS Versus No-DSS/GDSS

In the published studies, the users of computerized DSS/GDSS produce less communication on average (mean corrected $D = -1.34$, $K = 3$, $N = 130$) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the confidence interval includes zero (-2.63 to .085), more than 97% of the interval is above zero, suggesting that the average difference in amount of communication is statistically different from zero. In addition to the confidence interval which suggests that DSS/GDSS usually result in less communication than no-DSS/GDSS, the fail-safe n shows that it would take 77 missing studies with null findings that would have to exist to bring the average corrected D up from -1.34 to -0.05.

In the unpublished studies, the users of computerized DSS/GDSS produce less communication on average (mean corrected $D = -.228$, $K = 2$, $N = 180$) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference in satisfaction toward the system is small to moderate, the confidence interval includes zero (-.577 to .121), suggesting that the difference in amount of communication between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. The fail-safe n shows that it would take only 7 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.228 to -0.05.

The confidence intervals for second order sampling error of published and unpublished studies are not significantly different from each other (overlap $Z = 1.62 <$

Z_c = 1.645), suggesting that those two subsets do not affect amount of communication differently (in published studies, the users of computerized DSS/GDSS have statistically no less communication than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of no-support at all).

4.4.3.20 <u>Rate of Decision Improvement (DSS/GDSS Versus No-DSS/GDSS</u>

In the published studies, the users of computerized DSS/GDSS produce higher rate of decision improvement on average (mean corrected D = .701, K = 5, N = 669) than the users of no-DSS/GDSS (Table XIII, p. 218). The large difference in rate of decision improvement is confirmed by the confidence interval which does not include zero (.469 to .933), suggesting that the average difference in rate of decision improvement is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in higher rate of decision improvement than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 65 missing studies with null findings that would have to exist to bring the average corrected D down from .701 to 0.05.

In the unpublished studies, the users of computerized

DSS/GDSS produce higher rate of decision improvement on average (mean corrected $D = .367$, $K = 3$, $N = 276$) than the users of no-DSS/GDSS (Table XIII, p. 218). Although the difference in satisfaction toward the system is moderate, the confidence interval includes zero (-.930 to 1.51), suggesting that the difference in rate of decision improvement between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Given the fact that there are only three available studies, the fail-safe n shows that it would take 19 missing studies averaging null findings that would have to exist to bring the average corrected D down from .367 to 0.05.

The confidence intervals for second order sampling error of published and unpublished studies are not significantly different from each other (overlap $Z = .58 < Z_c = 1.645$), suggesting that those two subsets do not affect rate of decision improvement differently (in published studies, the users of computerized DSS/GDSS have statistically no higher rate of decision improvement than the users of computerized DSS/GDSS in unpublished studies, when both are compared to the users of no-support at all).

4.4.4 Subject Type

In this section, the moderator variable is tested by splitting the available studies for each dependent measure (i.e., decision quality) into studies that use students as *users, studies that use actual users (i.e., managers), or the studies that use mixed subjects (i.e., students and actual users). For each dependent variable, the moderator variable is tested under two different independent variables (computerized decision aids versus no decision aids, and computerized decision aids versus manual decision aids). Some dependent variables are not applicable under the current moderator variable (Tables XV and XVI, pp. 253, 257), because the population is homogeneous, there are only two or fewer studies available, or because all the studies lie in one side of the moderator's subsets (i.e., all the available studies use students as their subjects).*

4.4.4.1 Decision Quality (DSS/GDSS Versus No-DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS produce slightly higher quality decisions on average (mean corrected D = .0726, K = 27, N = 1781) than the users of no-DSS/GDSS (Table XV). In addition to the small difference in decision quality which is close to zero, the confidence interval includes zero (-.672 to .805), suggesting that the average difference in decision quality is not statistically different from zero. The fail-safe n shows that it would take 12 missing studies averaging null findings that would have to exist to bring the average corrected D down from .0726 to 0.05.

TABLE XV

THE EFFECTS OF THE MODERATOR VARIABLE OF SUBJECT TYPE USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality-Students	27	1781	.0726	.627	-.731, .876	15.82	.067	.919
Actual Users	16	3665	.516	.273	.166, .866	20.54	.5009	.970
Decision Time-Students	16	1097	-1.124	.723	-2.05, -.198	11.74	-1.124	1
Actual Users	4	2445	.4544	.1717	.2346, .674	18.59	.4544	1
Depth of Analysis-Students	15	932	.153	.883	-.978, 1.28	9.64	.1367	.895
Actual Users	2	119	.8196	.917	-.354, 1.99	8.23	.8196	1
Decision Confidence-Students	8	795	-.048	.582	-.793, .697	10.82	-.048	1
Actual Users	8	404	.619	.593	-1.40, 1.38	21.34	.558	.949
Satisfaction w/Decision Process-Stu.	9	620	-.387	.839	-1.46, .686	7.97	-.387	1
Actual Users	4	608	.124	.199	-.131, .379	43.57	.115	.932
Satisfaction w/Decision Outcome	Not Applicable							
Equality of Participation-Students	15	1078	1.23	1.74	-.994, 3.45	2.67	1.105	.898
Actual Users	1	60	d = .0545					
Degree of Decision Consensus-Stu	11	835	-.754	1.01	-2.04, .535	5.93	-.715	.948
Actual Users	3	210	-.111	.644	-.936, .714	12.42	-.111	1
Satisfaction Toward System-Students	1	60	d = .0924					
Actual Users	5	654	.492	.827	-.566, 1.55	5.12	.457	.929
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior	Not Applicable							
Amount of Communication-Students	3	130	-1.34	1.12	-2.77, .0901	9.40	-1.27	.949
Actual Users	2	180	-.228	.273	-.577, .121	38.09	-.228	1
Rate of Decision Improvement-Stu	3	296	.059	.762	-.917, 1.03	6.65	.059	1
Actual Users	5	649	1.03	.199	.774, 1.28	57.39	.8197	.797
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XV (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF SUBJECT TYPE USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs. D's	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over Lap Z Value Z_c=1.645	Fail Safe N
Decision Quality-Students	-.672, .805	.396	.0626	.333	170.67	-.170, .304	No	12
Actual Users	.1616, .840	.0885	.0182	.0703	77.89	.355, .6467		149
Decision Time-Students	-2.05, -.198	.593	.069	.523	136.28	-1.50, -.747	No	34
Actual Users	.2346, .674	.0362	.0067	.0295	21.5	.268, .6409		32
Depth of Analysis-Students	-.875, 1.149	.692	.0667	.625	155.56	-.284, .558	.94	31
Actual Users	-.354, 1.99	.916	.075	.871	24.29	-.507, 2.15		31
Decision Confidence-Students	-.793, .697	.379	.041	.339	73.92	-.475, .379	2.13	$D_K<D_C$
Actual Users	-.133, 1.31	.404	.0861	.3177	37.53	.148, 1.03		91
Satisfaction w/Decision Process	-1.46, .686	.765	.061	.704	112.9	-.959, .184	1.61	61
Actual Users	-.122, .354	.061	.0267	.0346	9.18	-.127, .358		6
Satisfaction w/Decision Outcome	Not Applicable							
Equality of Participation-Students	-.893, 3.10	2.504	.066	2.34	569	.304, 1.906		354
Degree of Decision Consensus-Stu	-.194, .508	.970	.057	.913	185.3	-1.297, -.133	1.29	155
Actual Users	-.936, .714	.474	.0589	.415	24.15	-.89, .668		4
Satis. To System-Actual Users	-.526, 1.44	.622	.032	.590	97.63	-.234, 1.15		44
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior	Not Applicable							
Amount of Communication-Students	-2.63, .085	1.23	.116	1.12	31.91	-2.53, -.0111	1.62	77
Actual Users	-.577, .121	.120	.0457	.0744	5.25	-.708, .252		7
Rate of Decision Improvement-Stu	-.917, 1.03	.623	.0414	.581	45.12	-.834, .952	2.07	1
Actual Users	.616, 1.02	.059	.034	.025	8.71	.606, 1.03		98
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

In the studies that use actual users, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .516, K = 16, N = 3665) than the users of no-DSS/GDSS (Table XV, p. 253). In addition to the fact that the difference in decision quality is moderate, the confidence interval does not include zero (.1616 to .840), suggesting that the difference in decision quality between DSS/GDSS and no-DSS/GDSS is significantly different from zero. Moreover, the fail-safe n shows that it would take 149 missing studies averaging null findings that would have to exist to bring the average corrected D down from .516 to 0.05.

The confidence intervals for second order sampling error of students' subset and actual users' subset are significantly different from each other (no overlap), suggesting that those two subsets do affect decision quality differently (in studies that use students, the users of computerized DSS/GDSS have statistically lower quality decisions than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of no-support at all).

4.4.4.2 Decision Quality (DSS/GDSS Versus Manual DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS produce higher quality decisions on *average (mean corrected D = .317, K = 12, N = 788) than the users of manual DSS/GDSS (Table XVI). Although the difference in decision quality is relatively moderate, the confidence interval includes zero (-.242 to .802), suggesting that the average difference in decision quality is not statistically different from zero. Even though, the confidence interval suggests that computerized DSS/GDSS may not always result in higher quality decisions than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 64 missing studies averaging null findings that would have to exist to bring the average corrected D down from .317 to 0.05.*

In the studies that use actual users, the users of computerized DSS/GDSS also produce higher quality decisions on average (mean corrected D = .620, K = 12, N = 983) than the users of manual DSS/GDSS (Table XVI, p. 257). Although the difference in decision quality is large, the confidence interval includes zero (-.407 to 1.648), suggesting that the difference in decision quality between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Even though, the confidence interval suggests that computerized DSS/GDSS may not always result in higher quality decisions than manual DSS/GDSS, the fail-safe n shows that it would take 137 missing studies averaging null findings that would

TABLE XVI

THE EFFECTS OF THE MODERATOR VARIABLE OF SUBJECT TYPE USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{yy}
Decision Quality-Students	12	788	.317	.462	-.274, .909	27.61	.279	.882
Actual Users	12	983	.620	.803	-.407, 1.648	7.53	.620	1
Mixed	3	128	1.47	.665	.616, 2.32	22.03	1.47	1
Decision Time-Students	6	402	.317	1.37	-1.44, 2.07	3.198	.317	1
Actual Users	5	567	-.457	.751	-1.42, .504	6.13	-.457	1
Depth of Analysis-Students	9	633	.270	.570	-.459, 1.00	16.48	.259	.959
Actual Users	4	507	.251	0	.251, .251	100.99	.227	.905
Mixed	2	80	1.302	0	1.302, 1.302	17131.8	1.302	1
Decision Confidence-Students	3	301	-.415	.713	-1.33, .498	8.64	-.385	.927
Actual Users	3	457	.289	0	.289, .289	193.14	.289	1
Mixed	3	118	.582	0	.582, .582	1035.8	.582	2
Satisfaction w/Decision Process	3	144	.694	.726	-.235, 1.62	14.90	.694	1
Actual Users	2	28	-.058	0	-.058, -.058	14715	-.053	.911
Satisfaction w/Decision Outcome	4	332	-.133	.273	-.482, .216	39.96	-.133	1
Actual Users	1	40	d = .7747					
Equality of Participation-Students	5	549	.038	.423	-.5036, .5806	20.09	.0349	.907
Actual Users	2	28	.311	0	.311, .311	53432	.311	1
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward the System	4	177	.265	.307	-.129, .658	55.83	.237	.894
Actual Users	3	378	.881	0	.881, .881	903.5	.881	1
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XVI (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF SUBJECT TYPE USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs D's	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over Lap Z Value $Z_c=1.645$	Fail Safe N
Decision Quality-Students	-.242, .802	.229	.0634	.166	43.46	.0085, .351	SA=1.09	64
Actual Users	-.407, 1.648	.697	.0524	.644	159.38	.148, 1.09	AM=1.71	137
Mixed	.616, 2.32	.567	.125	.442	13.62	.614, 2.32	SM=2.53	85
Decision Time-Students	-1.44, 2.07	1.95	.062	1.886	187.6	-.800, 1.43	1.16	32
Actual Users	-1.42, .504	.601	.037	.564	81.53	-1.14, .222		41
Depth of Analysis-Students	-.441, .959	.358	.059	.299	54.61	-.132, .650	SA= .09	40
Actual Users	.227, .227	.0319	.032	-.00032	3.96	.052, .402	AM=No	50
Mixed	1.302, 1.302	.00074	.1278	.1270	1.167	1.36, 1.34	SM=No	50
Decision Confidence-Students	-1.23, .462	.479	.0414	.438	34.69	-1.17, .398	SA=1.74	22
Actual Users	.589, .589	.0139	.0269	-.013	1.55	.115, .422	AM=No	14
Mixed	.582, .582	.0108	.112	-.101	.289	.464, .699	SM=No	32
Satisfaction w/Dec Process-Students	-.235, 1.62	.619	.092	.527	20.13	-.196, 1.58	1.65	39
Actual Users	-.053, -.053	.0023	.338	-.335	.0136	-.1197, .013		1
Satisfaction w/Dec Outcome-Students	-4.82, .216	.124	.049	.0744	10.01	-.478, .212		7
Equality of Participation-Students	-.457, .526	.1847	.0371	.1476	24.88	-.342, .4117	1.41	$D_K<D_C$
Actual Users	.311, .311	.00064	.3417	.341	3.74	.276, .346		10
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward the System	-.115, .588	.1709	.095	.0755	7.16	-.168, .642	No	17
Actual Users	.881, .881	.0039	.035	-.0315	.332	.809, .951		50
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

have to exist to bring the average corrected D down from .620 to 0.05.

In the studies that use mixed subjects, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected $D = 1.47$, $K = 3$, $N = 128$) than the users of manual DSS/GDSS (Table XVI, p. 257). In addition to the fact that the difference in decision quality is very large, the confidence interval does not include zero (.616 to 2.32), suggesting that the average difference in decision quality is statistically different from zero. Moreover, the fail-safe n shows that it would take 85 missing studies averaging null findings that would have to exist to bring the average corrected D down from 1.47 to 0.05.

The confidence intervals for second order sampling error of students' subset and actual users' subset are not significantly different from each other (overlap $Z = 1.09 < Z_c = 1.645$), suggesting that those two subsets do not affect decision quality differently (in studies that use students, the users of computerized DSS/GDSS have statistically no different quality decisions than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of manual support). The confidence intervals for second order sampling error of mixed subjects' subset and actual users' subset are significantly different from each other (overlap $Z = 1.71 > Z_c = 1.645$), suggesting that those two subsets do affect decision quality *differently (in studies that use mixed subjects, the users of computerized DSS/GDSS produce statistically higher quality decisions than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of manual support). However, the confidence intervals for second order sampling error of mixed subjects' subset and students' subset are significantly different from each other (overlap $Z = 2.53 > Z_c = 1.645$), suggesting that those two subsets do affect decision quality differently (in studies that use mixed subjects, the users of computerized DSS/GDSS produce statistically higher quality decisions than the users of computerized DSS/GDSS in studies that use students, when both are compared to the users of manual support).*

4.4.4.3 Decision Time (DSS/GDSS Versus No-DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS take more decision time on average (mean corrected $D = -1.124$, $K = 16$, $N = 1097$) than the users of no-DSS/GDSS (Table XV, p. 253). In addition to the fact that the difference in decision time which is large, the confidence interval does not include zero (-2.05 to -.198), suggesting that the average difference in decision time is statistically different from zero. Moreover, the fail-safe n shows that it would take 344 missing studies averaging null *findings that would have to exist to bring the average corrected D up from -1.124 to -0.05.*

In the studies that use actual users, the users of computerized DSS/GDSS take less decision time on average (mean corrected D = .4544, K = 4, N = 2445) than the users of no-DSS/GDSS (Table XV, p. 253). In addition to the fact that the difference in decision time is large, the confidence interval does not include zero (.2346 to .674), suggesting that the difference in decision time between DSS/GDSS and no-DSS/GDSS is significantly different from zero. Moreover, the fail-safe n shows that it would take 32 missing studies averaging null findings that would have to exist to bring the average corrected D down from .4544 to 0.05.

The confidence intervals for second order sampling error of students' and actual users' subsets are significantly different from each other (no overlap), suggesting that those two subsets do affect decision time differently (in studies that use students, the users of computerized DSS/GDSS take statistically more decision time than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of no-support at all). In fact, students using DSS/GDSS take significantly more decision time than students using no-DSS/GDSS; whereas, actual users using DSS/GDSS take less decision time than actual users using no-DSS/GDSS.

4.4.4.4 Decision Time (DSS/GDSS Versus Manual DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS take less decision time on average (mean corrected D = .317, K = 6, N = 402) than the users of manual DSS/GDSS (Table XVI, p. 257). Although the difference in decision time is relatively moderate, the confidence interval includes zero (-1.44 to 2.07), suggesting that the average difference in decision time is not statistically different from zero. Even though, the confidence interval suggests that computerized DSS/GDSS may not always result as more efficient in decision time than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 32 missing studies averaging null findings that would have to exist to bring the average corrected D down from .317 to 0.05.

In the studies that use actual users, the users of computerized DSS/GDSS also take more decision time on average (mean corrected D = -.457, K = 5, N = 567) than the users of manual DSS/GDSS (Table XVI, p. 257). Although the difference in decision time is moderate, the confidence interval includes zero (-1.42 to .504), suggesting that the difference in decision time between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Even *though, the confidence interval suggests that computerized DSS/GDSS may not always result as less efficient in decision time than manual DSS/GDSS, the fail-safe n shows that it would take 41 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.457 to -0.05.*

The confidence intervals for second order sampling error of students' and actual users' subsets are not significantly different from each other (overlap $Z = 1.16 < Z_c = 1.645$*), suggesting that those two subsets do not affect decision time differently (in studies that use students, the users of computerized DSS/GDSS are statistically more efficient in decision time than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of manual support).*

4.4.4.5 Depth of Analysis (DSS/GDSS Versus No-DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS produce slightly more depth of analysis on average (mean corrected D = .153, K = 15, N = 932) than the users of no-DSS/GDSS (Table XV, p. 253). In addition to the small difference in depth of analysis, the confidence interval includes zero (-.875 to 1.149), suggesting that the average difference in depth of analysis is not statistically different from zero. Even though the *confidence interval suggests that DSS/GDSS may not always result in more depth of analysis than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 31 missing studies averaging null findings that would have to exist to bring the average corrected D down from .153 to 0.05.*

In the studies that use actual users, the users of computerized DSS/GDSS produce more depth of analysis on average (mean corrected D = .8196, K = 2, N = 119) than the users of no-DSS/GDSS (Table XV, p. 253). Although the difference in depth of analysis is large, the confidence interval includes zero (-.354 to 1.99), suggesting that the difference in depth of analysis between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in more depth of analysis than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 31 missing studies averaging null findings that would have to exist to bring the average corrected D down from .8196 to 0.05.

The confidence intervals for second order sampling error of students' and actual users' subsets are not significantly different from each other (overlap Z = .94 <

Z_c =1.645), suggesting that those two subsets do not affect depth of analysis differently (in studies that use students, the users of computerized DSS/GDSS produce statistically no different depth of analysis than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of no-support at all).

4.4.4.6 Depth of Analysis (DSS/GDSS Versus Manual DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS produce more depth of analysis on average (mean corrected D = .270, K = 9, N = 633) than the users of manual DSS/GDSS (Table XVI, p. 257). Although the difference in depth of analysis is relatively moderate, the confidence interval includes zero (-.441 to .959), suggesting that the average difference in depth of analysis is not statistically different from zero. Even though, the confidence interval suggests that computerized DSS/GDSS may not always result in more depth of analysis than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 40 missing studies averaging null findings that would have to exist to bring the average corrected D down from .270 to 0.05.

In the studies that use actual users, the users of *computerized DSS/GDSS also produce more depth of analysis on average (mean corrected D = .251, K = 4, N = 507) than the users of manual DSS/GDSS (Table XVI, p. 257). In addition to the fact that the difference in depth of analysis is relatively large, the confidence interval does not include zero (.227 to .227), suggesting that the difference in depth of analysis between DSS/GDSS and manual DSS/GDSS is significantly different from zero. Moreover, the fail-safe n shows that it would take 16 missing studies averaging null findings that would have to exist to bring the average corrected D down from .251 to 0.05.*

In the studies that use mixed subjects, the users of computerized DSS/GDSS produce highly more depth of analysis on average (mean corrected D = 1.302, K = 2, N = 80) than the users of manual DSS/GDSS (Table XVI, p. 257). In addition to the fact that the difference in depth of analysis is large, the confidence interval does not include zero (1.302 to 1.302), suggesting that the average difference in depth of analysis is statistically different from zero. Moreover, the fail-safe n shows that it would take 50 missing studies averaging null findings that would have to exist to bring the average corrected D down from 1.302 to 0.05.

The confidence intervals for second order sampling error of students' subset and actual users' subset are not significantly different from each other (overlap Z = .09 <

Z_c = 1.645), suggesting that those two subsets do not affect depth of analysis differently (in studies that use students, the users of computerized DSS/GDSS have statistically no different depth of analysis than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of manual support). The confidence interval for second order sampling error of mixed subjects' subset is significantly different from either students' or the actual users' subsets (no overlap), suggesting that the mixed subjects' subset does affect depth of analysis differently than either of the two remaining subsets (in studies that use mixed subjects, the users of computerized DSS/GDSS produce statistically more depth of analysis than the users of computerized DSS/GDSS in studies that either use students or actual users, when all are compared to the users of manual support).

4.4.4.7 Decision Confidence (DSS/GDSS Versus No-DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS have no more decision confidence on average (mean corrected D = -.048, K = 8, N = 795) than the users of no-DSS/GDSS (Table XV, p. 253). In addition to the fact that the difference in decision confidence is very small and not far from zero, the confidence interval includes zero (-.793 to .697), suggesting that the average *difference in decision confidence is not statistically different from zero. The fail-safe n shows that it would take no more missing studies averaging null findings that would have to exist to bring the average corrected D down to 0.05, since the average corrected D is already below that value.*

In the studies that use actual users, the users of computerized DSS/GDSS have more decision confidence on average (mean corrected D = .619, K = 8, N = 404) than the users of no-DSS/GDSS (Table XV, p. 253). Although the difference in decision confidence is large, the confidence interval includes zero (-.133 to 1.31), suggesting that the difference in decision confidence between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in more decision confidence than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 91 missing studies averaging null findings that would have to exist to bring the average corrected D down from .619 to 0.05.

The confidence intervals for second order sampling error of students' and actual users' subsets are significantly different from each other (overlap $Z = 2.13 > Z_c = 1.645$*), suggesting that those two subsets do affect* *decision confidence differently (in studies that use students, the users of computerized DSS/GDSS have statistically less decision confidence than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of no-support at all).*

4.4.4.8 Decision Confidence (DSS/GDSS Versus Manual DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS have less decision confidence on average (mean corrected D = -.415, K = 3, N = 301) than the users of manual DSS/GDSS (Table XVI, p. 257). Although the difference in decision confidence is moderate, the confidence interval includes zero (-1.23 to .462), suggesting that the average difference in decision confidence is not statistically different from zero. Even though, the confidence interval suggests that computerized DSS/GDSS may not always result in less decision confidence than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 22 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.415 to -0.05.

In the studies that use actual users, the users of computerized DSS/GDSS have more decision confidence on *average (mean corrected D = .289, K = 3, N = 457) than the users of manual DSS/GDSS (Table XVI, p. 257). In addition to the fact that the difference in decision confidence is relatively moderate, the confidence interval does not include zero (.289 to .289), suggesting that the difference in decision confidence between DSS/GDSS and manual DSS/GDSS is significantly different from zero. Moreover, the fail-safe n shows that it would take 14 missing studies averaging null findings that would have to exist to bring the average corrected D down from .289 to 0.05.*

In the studies that use mixed subjects, the users of computerized DSS/GDSS have more decision confidence on average (mean corrected D = .582, K = 3, N = 118) than the users of manual DSS/GDSS (Table XVI, p. 257). In addition to the fact that the difference in decision confidence is moderate to large, the confidence interval does not include zero (.582 to .582), suggesting that the average difference in decision confidence is statistically different from zero. Moreover, the fail-safe n shows that it would take 32 missing studies averaging null findings that would have to exist to bring the average corrected D down from .582 to 0.05.

The confidence intervals for second order sampling error of students' subset and actual users' subset are significantly different from each other (overlap $Z = 1.74 > Z_c = 1.645$*). In addition, the confidence interval for second* *order sampling error of the mixed subjects' subset is significantly different from either the students' or the actual users' subsets (no overlap). This suggests that those three subsets do affect decision confidence differently (in studies that use students, the users of computerized DSS/GDSS have statistically less decision confidence than the users of computerized DSS/GDSS in studies that either use actual users or mixed students, when all are compared to the users of manual support). Moreover, the actual users have significantly less decision confidence than the mixed subjects (in studies that use actual users, the users of computerized DSS/GDSS have statistically less decision confidence than the users of computerized DSS/GDSS in studies that use mixed subjects, when both are compared to the users of manual support).*

4.4.4.9 Satisfaction With Decision Process (DSS/GDSS Versus No-DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS have less satisfaction with decision process on average (mean corrected D = -.387, K = 9, N = 620) than the users of no-DSS/GDSS (Table XV, p. 253). Although the difference in satisfaction with decision process is moderate, the confidence interval includes zero (-1.46 to .686), suggesting that the average difference in satisfaction with decision process is not statistically *different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in less satisfaction with decision process than no-DSS/GDSS, the fail-safe n shows that it would take 61 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.387 to -0.05.*

In the studies that use actual users, the users of computerized DSS/GDSS have slightly more satisfaction with decision process on average (mean corrected D = .124, K = 4, N = 608) than the users of no-DSS/GDSS (Table XV, p. 253). In addition to the small difference in satisfaction with decision process, the confidence interval includes zero (-.122 to .354), suggesting that the difference in satisfaction with decision process between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. In addition to the fact that the confidence interval suggests that DSS/GDSS may not always result in more satisfaction with decision process than no-DSS/GDSS, the fail-safe n shows that it would take only 6 missing studies averaging null findings that would have to exist to bring the average corrected D down from .124 to 0.05.

The confidence intervals for second order sampling error of students' and actual users' subsets are not significantly different from each other at p = .05 (overlap $Z = 1.61 < Z_c = 1.645$*), suggesting that those two subsets do not affect satisfaction with decision process differently* *(in studies that use students, the users of computerized DSS/GDSS have statistically less satisfaction with decision process than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of no-DSS/GDSS.*

4.4.4.10 Satisfaction With Decision Process DSS/GDSS Versus Manual DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS have more satisfaction with decision process on average (mean corrected D = .694, K = 3, N = 144) than the users of manual DSS/GDSS (Table XVI, p. 257). Although the difference in satisfaction with decision process is large, the confidence interval includes zero (-.235 to 1.62), suggesting that the average difference in satisfaction with decision process is not statistically different from zero. Even though, the confidence interval suggests that computerized DSS/GDSS may not always result in less satisfaction with decision process than manual DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 39 missing studies averaging null findings that would have to exist to bring the average corrected D down from .694 to 0.05.

In the studies that use actual users, the users of *computerized DSS/GDSS have no less satisfaction with decision process on average (mean corrected $D = -.058$, $K = 2$, $N = 28$) than the users of manual DSS/GDSS (Table XVI, p. 257). Although the confidence interval does not include zero (-.053 to -.053), the average corrected D is too small to claim a significant difference. Moreover, the fail-safe n shows that it would take only one missing study with null finding (i.e., $d = 0$) that would have to exist to bring the average corrected D up from -.058 to -0.05.*

The confidence intervals for second order sampling error of students' subset and actual users' subset are significantly different from each other (overlap $Z = 1.65 > Z_c = 1.645$), suggesting that those two subsets do affect satisfaction with decision process differently (in studies that use students, the users of computerized DSS/GDSS have statistically higher satisfaction with decision process than the users of computerized DSS/GDSS in studies that use actual users, when all are compared to the users of manual support).

4.4.4.11 Satisfaction With Decision Outcome (DSS/GDSS Versus Manual DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS have lower satisfaction with decision outcome on average (mean corrected $D = -.133$, $K = 4$, $N = 332$) than the users of manual DSS/GDSS (Table XVI, p. 257).

In addition to the small difference in satisfaction with decision outcome, the confidence interval includes zero (-.482 to .216), suggesting that the average difference in satisfaction with decision outcome is not statistically different from zero. Beside the confidence interval which suggests that computerized DSS/GDSS may not always result in lower satisfaction with decision outcome than manual DSS/GDSS, the fail-safe n shows that it would take only 7 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.133 to -0.05.

There is only one available study that investigates the satisfaction with decision outcome across DSS/GDSS and manual DSS/GDSS using actual users (Table XVI, p. 257). The study shows that the users of computerized DSS/GDSS have higher satisfaction with decision outcome than the users of manual DSS/GDSS (d = .7747, N = 40).

Although there is a large difference in satisfaction with decision outcome between studies that use students and studies that use actual users, across computerized DSS/GDSS and manual DSS/GDSS (i.e., when compared to manual DSS/GDSS, the users of DSS/GDSS in studies that use students have higher satisfaction with decision outcome than the users of DSS/GDSS in studies that use actual users), there is no way to confirm that the difference is statistically significant, since there is only one study in the subset of actual users.

The credibility interval of studies that use students includes zero (-.482 to .216), suggesting that the subset is heterogeneous and moderator variables may exist in that subset.

4.4.4.12 Equality of Participation (DSS/GDSS Versus No-DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected D = 1.23, K = 15, N = 1078) than the users of no-DSS/GDSS (Table XV, p. 253). Although the difference in equality of participation is large, the confidence interval includes zero (-.893 to 3.10), suggesting that the average difference in equality of participation is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in more equality of participation than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 354 missing studies averaging null findings that would have to exist to bring the average corrected D down from 1.23 to 0.05.

There is only one available study that investigates the equality of participation across DSS/GDSS and no-DSS/GDSS using actual users (Table XV, p. 253). The study shows that *the users of computerized DSS/GDSS have no more equality of participation than the users of no-DSS/GDSS (d = .0545, N = 60), since d is very small and not far from zero.*

Although there is a large difference in equality of participation between studies that use students and studies that use actual users, across computerized DSS/GDSS and no-DSS/GDSS (i.e., when compared to no-DSS/GDSS, the users of DSS/GDSS in studies that use students have more equality of participation than the users of DSS/GDSS in studies that use actual users), there is no way to confirm that the difference is statistically significant, since there is only one study in the subset of actual users.

4.4.4.13 Equality of Participation DSS/GDSS Versus Manual DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS have no more equality of participation on average (mean corrected D = .038, K = 5, N = 549) than the users of manual DSS/GDSS (Table XVI, p. 257). In addition to the fact that the difference in equality of participation is close to zero, the confidence interval includes zero (-.457 to .526), suggesting that the average difference in equality of participation is not statistically different from zero. Moreover, the fail-safe n shows that it would take no more missing studies averaging null findings that would have to exist to bring the average corrected D to

0.05, since the average corrected D is already below that value.

In the studies that use actual users, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected D = .311, K = 2, N = 28) than the users of manual DSS/GDSS (Table XVI, p. 257). In addition to the fact that the difference in equality of participation is relatively moderate, the confidence interval does not include zero (.311 to .311), suggesting that the difference is significantly different from zero. Given the fact that there are two studies available, the fail-safe n shows that it would take 10 missing studies averaging null finding that would have to exist to bring the average corrected D down from .311 to 0.05.

The confidence intervals for second order sampling error of students' and actual users' subsets are not significantly different from each other (overlap $Z = 1.41 < Z_c = 1.645$*), suggesting that those two subsets do not affect equality of participation differently (in studies that use students, the users of computerized DSS/GDSS have statistically no different equality of participation than the users of computerized DSS/GDSS in studies that use actual users, when all are compared to the users of manual support).*

4.4.4.14 Degree of Decision Consensus (DSS/GDSS Versus No-DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS have lower degree of decision consensus on average (mean corrected D = -.754, K = 11, N = 835) than the users of no-DSS/GDSS (Table XV, p. 253). Although the difference in degree of decision consensus is large, the confidence interval includes zero (-1.94 to .508), suggesting that the average difference in degree of decision consensus is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in less degree of decision consensus than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 55 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.754 to -0.05.

In the studies that use actual users, the users of computerized DSS/GDSS have slightly lower degree of decision consensus on average (mean corrected D = -.111, K = 3, N = 211) than the users of no-DSS/GDSS (Table XV, p. 253). In addition to the small difference in degree of decision consensus, the confidence interval includes zero (-.936 to .714), suggesting that the difference in degree of decision consensus between DSS/GDSS and no-DSS/GDSS is not *significantly different from zero. Beside the fact that the confidence interval suggests that DSS/GDSS may not always result in lower degree of decision consensus than no-DSS/GDSS, the fail-safe n shows that it would take only 4 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.111 to -0.05.*

The confidence intervals for second order sampling error of students' and actual users' subsets are not significantly different from each other at p = .05 (overlap $Z = 1.29 < Z_c = 1.645$*), suggesting that those two subsets do not affect degree of decision consensus differently (in studies that use students, the users of computerized DSS/GDSS have statistically lower degree of decision consensus than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of no-support at all).*

4.4.4.15 Satisfaction Toward the System (DSS/GDSS Versus No-DSS/GDSS

There is only one available study that investigates the satisfaction toward the system across DSS/GDSS and no-DSS/GDSS using students (Table XV, p. 253). The study shows that the users of computerized DSS/GDSS have slightly less satisfaction toward the system than the users of no-DSS/GDSS (d = -.0924, N = 60).

In the studies that use actual users, the users of computerized DSS/GDSS have more satisfaction toward the system on average (mean corrected D = .492, K = 5, N = 654) than the users of no-DSS/GDSS (Table XV, p. 253). Although the difference in satisfaction toward the system is moderate, the confidence interval includes zero (-.526 to 1.44), suggesting that the average difference in satisfaction toward the system is not statistically different from zero. Even though the confidence interval suggests that DSS/GDSS may not always result in higher satisfaction toward the system than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 44 missing studies averaging null findings that would have to exist to bring the average corrected D down from .492 to 0.05.

Although there is a large difference in satisfaction toward the system between studies that use students and studies that use actual users, across computerized DSS/GDSS and no-DSS/GDSS (i.e., when compared to no-DSS/GDSS, the users of DSS/GDSS in studies that use students have lower satisfaction toward the system than the users of DSS/GDSS in studies that use actual users), there is no way to confirm that the difference is statistically significant, since there is only one study in the subset of students.

4.4.4.16 Satisfaction Toward the System DSS/GDSS Versus Manual DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS have more satisfaction toward the system on average (mean corrected D = .265, K = 4, N = 177) than the users of manual DSS/GDSS (Table XVI, p. 257). Although the difference in satisfaction toward the system is relatively moderate, the confidence interval includes zero (-.115 to .588), suggesting that the average difference in satisfaction toward the system is not statistically different from zero. However, the fail-safe n shows that it would take 17 missing studies averaging null findings that would have to exist to bring the average corrected D down from .265 to 0.05.

In the studies that use actual users, the users of computerized DSS/GDSS have more satisfaction toward the system on average (mean corrected D = .881, K = 3, N = 378) than the users of manual DSS/GDSS (Table XVI, p. 257). In addition to the fact that the difference in satisfaction toward the system is large, the confidence interval does not include zero (.881 to .881), suggesting that the difference is significantly different from zero. On top of that, the fail-safe n shows that it would take 50 missing studies averaging null finding that would have to exist to bring the average corrected D down from .881 to 0.05.

The confidence intervals for second order sampling

error of students' and actual users' subsets are significantly different from each other (no overlap), suggesting that those two subsets do affect satisfaction toward the system differently (in studies that use students, the users of computerized DSS/GDSS have statistically less satisfaction toward the system than the users of computerized DSS/GDSS in studies that use actual users, when all are compared to the users of manual support).

4.4.4.17 Amount of Communication (DSS/GDSS Versus No-DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS produce less communication on average (mean corrected D = -1.34, K = 3, N = 130) than the users of no-DSS/GDSS (Table XV, p. 253). Although the confidence interval includes zero (-2.63 to .085), it is below zero for more than 98% of the time, suggesting that the average difference in amount of communication is statistically different from zero. In addition to the confidence interval which suggests that DSS/GDSS usually result in less communication than no-DSS/GDSS, the fail-safe n shows that it is also likely that the difference is large enough and reliable enough to be of practical significance. The fail-safe n shows that it would take 77 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.134 to -0.05.

In the studies that use actual users, the users of computerized DSS/GDSS produce less communication on average (mean corrected $D = -.228$, $K = 2$, $N = 180$) than the users of no-DSS/GDSS (Table XV, p. 253). Although the difference in amount of communication is small to moderate, the confidence interval includes zero (-.577 to .121), suggesting that the difference in amount of communication between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n shows that it would take only 7 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.228 to -0.05.

The confidence intervals for second order sampling error of students' and actual users' subsets are not significantly different from each other (overlap $Z = 1.62 < Z_c = 1.645$) at $p = .05$, suggesting that those two subsets do not affect amount of communication differently (in studies that use students, the users of computerized DSS/GDSS have statistically no less communication than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of no-support at all).

4.4.4.18 Rate of Decision Improvement (DSS/GDSS Versus No-DSS/GDSS

In the studies that use students, the users of computerized DSS/GDSS produce no different rate of decision *improvement on average (mean corrected D = .059, K = 3, N = 296) than the users of no-DSS/GDSS (Table XV, p. 253). In addition to the difference in rate of decision improvement which is close to zero, the confidence interval includes zero (-.917 to 1.03), suggesting that the average difference in rate of decision improvement is not statistically different from zero. Moreover, the fail-safe n shows that it would take only one missing study with null finding that would have to exist to bring the average corrected D down from .059 to 0.05.*

In the studies that use actual users, the users of computerized DSS/GDSS produce higher rate of decision improvement on average (mean corrected D = 1.03, K = 5, N = 649) than the users of no-DSS/GDSS (Table XV, p. 253). In addition to the fact that the difference in rate of decision improvement is large, the confidence interval does not include zero (.616 to 1.02), suggesting that the difference in rate of decision improvement between DSS/GDSS and no-DSS/GDSS is significantly different from zero. Moreover, the fail-safe n shows that it would take 98 missing studies averaging null findings that would have to exist to bring the average corrected D down from 1.03 to 0.05.

The confidence intervals for second order sampling error of students' subset and actual users' subset are significantly different from each other (overlap $Z = 2.07 > Z_c = 1.645$*), suggesting that those two subsets do affect* rate of decision improvement differently (in studies that use students, the users of computerized DSS/GDSS have statistically lower rate of decision improvement than the users of computerized DSS/GDSS in studies that use actual users, when both are compared to the users of no-decision support).

4.4.5 Level of Decision Task Difficulty

In this section, the moderator variable is based on separating the available studies for each dependent measure (i.e., decision quality) into studies that are of high, medium, or low task difficulty. For each dependent variable, the moderator variable is tested under two different independent variables (computerized decision aids versus no decision aids, and computerized decision aids versus manual decision aids). Some dependent variables are not applicable under the current moderator variable (Tables XVII and XVIII, pp. 288, 292), because the population of the studies is homogeneous, there are only two or fewer studies available, or because all the studies lie in one side of the moderator's subsets (i.e., all the available studies use high difficulty tasks).

4.4.5.1 Decision Quality (DSS/GDSS Versus No-DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS produce higher quality decisions on average (mean *corrected D = .361, K = 28, N = 1450) than the users that have no decision support at all (Table XVII). Although the difference in quality of decisions produced by computerized DSS/GDSS and no-DSS/GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.59 to 1.28), suggesting that the average difference in decision quality is not statistically different from zero at p < 10. Even though, the confidence interval suggests that computerized DSS/GDSS may not always result in higher quality decisions than no-DSS/GDSS, the fail-safe n shows that it is likely that the difference is large enough and reliable enough to be of practical significance (as opposed to statistical significance). It would take 174 missing studies averaging null findings that would have to exist to bring the average corrected D down from .361 to 0.05.*

In medium difficulty tasks, the users of computerized DSS/GDSS produce higher quality decisions than no-DSS/GDSS on average (mean corrected D = .510, K = 10, N = 3397). In addition to the fact that the difference in decision quality is moderate, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.2413 to .734), indicating that the difference in decision quality between DSS/GDSS and no-DSS/GDSS is significantly different from zero. Moreover, the fail-safe n indicates that it would take 92 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.510 to

TABLE XVII

THE EFFECTS OF THE MODERATOR VARIABLE OF LEVEL OF TASK DIFFICULTY USING DSS/GDSS VERSUS NO DSS/GDSS

Dependent Variables[a]	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality-High Difficulty	28	1450	.361	.767	-.621, 1.343	13.27	.343	.951
Medium Difficulty	10	3397	.510	.201	.252, .768	24.68	.487	.955
Low Difficulty	9	723	-.1432	.213	-.417, .130	56.79	-.132	.923
Decision Time-High Difficulty	12	795	-1.298	.787	-2.30, -.292	10.86	-1.298	1
Medium Difficulty	7	2575	.403	.279	.045, .761	12.48	.403	1
Low Difficulty	3	172	-.961	1.11	-2.38, .461	6.14	-.961	1
Depth of Analysis-High Difficulty	9	441	.612	.964	-.622, 1.84	10.29	.557	.911
Medium Difficulty	5	242	.759	.544	.0626, 1.457	26.59	.701	.923
Low Difficulty	4	368	-.646	.411	-1.173, -.1196	26.68	-.5597	.866
Decision Confidence-High Difficulty	13	867	.348	.705	-.554, 1.25	12.26	.331	.949
Medium Difficulty	2	286	-.317	.398	-.827, .194	42.65	-.632	1
Low Difficulty	3	148	-.632	.345	-1.07, -.189	42.65	-.632	1
Satisfaction w/Decision Proc-High	7	441	-.493	.867	-1.60, .616	8.26	-.493	1
Medium	4	561	.2139	.348	-.233, .660	21.58	.199	.932
Low	3	226	.115	.466	-.481, .712	20.09	.115	1
Equality of Participation-High	9	564	1.95	1.98	-.587, 4.49	2.86	.175	.893
Medium	5	382	.655	.813	-.386, 1.69	7.89	.655	1
Low	3	232	-.276	.316	-.682, .129	40.56	-.245	.885
Degree of Decision Consensus-High	10	609	-1.05	1.35	-2.78, .681	4.44	-.995	.948
Medium	2	280	-.068	0	-.068, -.068	115.2	-.068	1
Low	4	196	-.782	.846	-1.86, .301	12.38	-.741	.948
Satisfaction Toward the System-High	2	111	2.28	.175	2.06, 2.51	81.63	2.11	.922
Medium	3	513	.187	0	.187, .187	114.1	.174	.930
Low	1	90	d = -.3286					
Amount of Discussion Conflict-High	1	36	d = 1.964					
Low	2	126	-.172	.759	-1.14, .801	10.24	-.1721	
Amount of Communication-High	3	130	-1.41	1.22	-2.98, .155	8.07	1.34	.949
Low	3	220	-.980	1.58	-3.01, 1.04	2.68	-.93	.949
Rate of Decision Improvement-High	3	207	-.243	.689	-1.12, .64	11.23	-.2431	
Medium	4	638	1.00	.278	.649, 1.36	35.79	.801	.797
Low	1	100	d = .8829					

TABLE XVII (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF LEVEL OF TASK DIFFICULTY USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables[a]	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs D's	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over-Lap Z Value Z_c=1.645[b]	Fail Safe N
Decision Quality-High Difficulty	-591, 1.28	.615	.0816	.533	210.92	.0529, .633	HM=.91	174
Medium Difficulty	.2413, .734	.0494	.0122	.0370	40.52	.349, .625	ML=No	92
Low Difficulty	-.384, .120	.0901	.0512	.0399	15.84	-.328, .064	HL=2.82	17
Decision Time-High Difficulty	-2.3, -.292	.694	.0754	.619	110.49	-1.77, -.827	HM=No	300
Medium Difficulty	.045, .761	.0894	.0111	.0782	56.08	.181, .624	HL=2.03	49
Low Difficulty	-2.38, .461	1.314	.0807	1.234	48.88	-2.25, .337	HL=.48	55
Depth of Analysis-High Difficulty	-.566, 1.68	.859	.0885	.771	87.41	-.048, 1.163	HM=.36	101
Medium Difficulty	.0478, 1.34	.344	.0916	.253	18.81	.187, 1.22	ML=No	71
Low Difficulty	-1.016, -.1036	.1732	.0462	.1269	14.99	-.967, -.152	HL=No	48
Decision Confidence-High Difficulty	-.526, 1.19	.511	.0627	.448	106.0	-.058, .719	HM=1.82	77
Medium Difficulty	-.827, .194	.1875	.0287	.1588	13.06	-.917, .283	ML=.78	11
Low Difficulty	-1.07, -.189	.2082	.0888	.1194	7.03	-1.15, -.115	HL=2.97	35
Satisfaction w/Decision Proc-High	-1.60, .616	.8187	.0676	.751	84.77	-1.16, .177	HM=1.82	62
Medium	-.216, .615	.1347	.029	.1056	18.53	-.16, .559	ML=.29	13
Low	-.481, .712	.272	.0546	.217	14.9	-.475, .705	HL=1.33	4
Equality of Participation-High	-.525, 4.02	3.24	.091	3.15	320	.570, 2.92	HM=1.82	347
Medium	-.386, 1.69	.717	.0566	.661	63.3	-.087, 1.39	ML=2.15	60
Low	-.603, .114	.132	.0535	.0785	7.41	-.656, .166	HL=No	14
Degree of Decision Consensus-High	-2.64, .646	1.72	.076	1.64	225.3	-1.81, -.182	HM=2.28	200
Medium	-.068, -.068	.0252	.029	-.0038	1.73	-.288, .151	ML=1.61	1
Low	-1.77, .286	.735	.091	.644	32.3	-1.58, .098	HL=.45	59
Satisfaction toward System-High	1.89, 2.31	.142	.116	.026	2.45	1.58, 2.63	HM=No	89
Medium	.174, .143	.0208	.0237	-.0029	2.63	.011, .337		8
Amount of Discussion Conflict-Low	-1.14, .801	.643	.066	.577	19.53	-1.28, 9.39		5
Amount of Communication-High	-2.83, .147	1.46	.118	1.35	37.15	.271, .0308	.38	82
Low	-2.85, .992	2.32	.062	2.25	111.8	-2.65, .792		56
Rate of Decision Improvement-High	-1.12, .64	.535	.0601	.475	26.70	-1.07, .585	2.79	12
Medium	.517, 1.08	.077	.0271	.049	11.17	.530, 1.07		76

[a]Satisfaction with decision outcome, degree of decision consistency, degree of uninhibited behavior, amount of group cohesiveness, and amount of task-oriented behavior are not applicable.

[b]HM is the Z value for high and medium difficulty tasks; ML is the Z value for medium and low difficulty tasks; HL is the Z value for high and low difficulty tasks.

0.05. The average corrected D is not going to be significantly altered by having more studies, since it is highly unlikely to have that many "lost" studies that investigate the decision quality of DSS/GDSS as compared to no-DSS/GDSS.

Although the average corrected effect size of the low difficulty tasks (average corrected D = -.1432, K = 9, N = 723) may suggest, at first glance, that the use of computerized DSS/GDSS may produce lower quality decisions than the no-DSS/GDSS, it is not statistically different from zero. This is concluded from the confidence interval (-.384 to .120) which includes zero, suggesting that in low difficulty tasks, computerized DSS/GDSS may not always result in lower quality decisions than no-DSS/GDSS. In addition to the confidence interval, The fail-safe n indicates that it would take only 17 additional studies averaging null results to bring the mean corrected effect size up from -.1432 to -.05.

The confidence intervals for second order sampling error of high and medium difficulty tasks are not significantly different (overlap $Z = .91 < Z_c = 1.645$*), suggesting that those two levels of task difficulty do not affect decision quality differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS do not have statistically different quality decisions as a result of using either high or medium difficulty tasks). The average difference in* *decision quality across DSS/GDSS and no-DSS/GDSS in low difficulty tasks, is significantly different from those of high and medium difficulty tasks (the confidence intervals for second order sampling error of the low and medium difficulty tasks do not overlap, and the confidence intervals of the low and high difficulty tasks only slightly overlap, $Z = 2.82 > Z_c = 1.645$), meaning that in moving from either high or medium difficulty tasks to low difficulty tasks, there would be a significant reduction in decision quality among DSS/GDSS users as opposed to no-DSS/GDSS users.*

In summary, the results show that the use of DSS/GDSS as opposed to the use of no-DSS/GDSS produces higher quality decisions in high and medium difficulty tasks, and produces lower quality decisions in low difficulty tasks. This is partially consistent with the theory [i.e., Tunstall, 1969; Gallupe, 1985; Bui and Sivasankaran, 1987] in claiming that DSS/GDSS are more effective in high difficulty tasks than in low difficulty tasks.

4.4.5.2 Decision Quality (DSS/GDSS Versus Manual DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected $D = .673$, $K = 20$, $N = 1321$) than the users that have manual decision support (Table XVIII). Although the

TABLE XVIII

THE EFFECTS OF THE MODERATOR VARIABLE OF LEVEL OF TASK DIFFICULTY USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Decision Quality-High Difficulty	20	1321	.673	.901	-.479, 1.83	9.35	.594	.882
Medium Diffic.	6	506	.459	.518	-.204, 1.12	15.68	.459	1
Low Difficulty	1	72	d = .018					
Decision Time-High Difficulty	9	733	-.235	1.27	-1.86, 1.39	3.04	-.235	1
Medium Difficulty	2	236	.171	.148	-.019, .361	61.11	.171	1
Depth of Analysis-High Difficulty	13	1120	.365	.491	-.264, .993	18.15	.347	.950
Medium Difficulty	2	100	-.045	.253	-.368, .278	56.63	-.045	1
Decision Confidence-High Difficulty	7	616	.353	0	.353, .353	146.39	.327	.927
Medium Diffic.	1	188	d = -.8971					
Low Difficulty	1	72	d = -.722					
Satisfaction w/Decision Proc-High	3	64	.048	0	.048, .048	2502	.0436	.911
Medium	2	108	.886	.771	-.1005, 1.87	12.46	.886	1
Satisfaction w/Dec. Outcome-High	2	76	.180	.530	-.498, .859	28.45	.180	1
Medium	3	296	-.091	.285	-.455, .274	33.82	-.091	1
Equality of Participation-High	3	183	-.384	.135	-.557, -.211	78.98	-.384	1
Medium	4	394	.2747	.2535	-.0498, .599	44.12	.249	.907
Degree of Decision Consensus-High	2	195	-.995	0	-.995, -.995	103.99	-.995	1
Medium	1	188	d = -.5386					
Satisfaction Toward the System-High	3	117	.199	.418	-.336, .735	43.73	.178	.894
Medium	4	438	.808	0	.808, .808	109.98	.808	1
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XVIII (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF LEVEL OF TASK DIFFICULTY USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs D's	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over-Lap Z Value, Z_c=1.645	Fail Safe N
Decision Quality-High Difficulty	-.423, 1.611	.697	.0652	.631	213.7	.228, .96	.72	249
Medium Diffic.	-.204, 1.12	.318	.0498	.268	38.27	.0075, .910		49
Low Difficulty								
Decision Time-High Difficulty	-1.86, 1.39	1.67	.051	1.617	295.9	-1.08, .608	.88	33
Medium Difficulty	-.019, .361	.0566	.0346	.0202	3.27	-.159, .501		5
Depth of Analysis-High Difficulty	-.251, .944	.266	.048	.218	71.71	.066, .627	1.34	82
Medium Difficulty	-.368, .278	.147	.083	.064	3.53	-.577, .487		$D_K<D_C$
Decision Confidence-High Difficulty	.327, .327	.032	.0471	-.0149	4.78	.194, .459		42
Satisfaction w/Decision Proc-High	.0436, .0436	.0083	.208	-.199	.12	-.059, .147	1.43	$D_K<D_C$
Medium	-1.005, 1.87	.679	.084	.594	16.06	-.256, 2.03		33
Satisfaction w/Dec. Outcome-High	-.498, .859	.393	.112	.281	7.03	-.688, 1.05	.56	5
Medium	-.455, .274	.122	.041	.081	8.87	-.487, .305		2
Equality of Participation-High	-.557, -.211	.087	.0691	.0184	3.798	-.719, -.0497	2.87	20
Medium	-.0451, .5436	.0947	.0418	.0529	9.06	-.0523, .5508		18
Degree of Decision Consensus-High	-.995, -.995	.045	.047	-.0018	1.92	-1.29, -.700		38
Satisfaction Toward the System-High	-.300, .657	.248	.109	.1398	6.86	-.386, .742	2.01	9
Medium	.808, .808	.0365	.040	-.0036	3.64	.620, .995		61
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Decision Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

difference in quality of decisions produced by computerized DSS/GDSS and manual DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.423 to 1.611), suggesting that the average difference in decision quality is not statistically different from zero at $p < 10$. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in higher quality decisions than manual DSS/GDSS, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 249 missing studies averaging null findings that would have to exist to bring the average corrected D down from .673 to 0.05.

In medium difficulty tasks, the computerized DSS/GDSS produces higher quality decisions than manual DSS/GDSS on average (mean corrected D = .459, K = 6, N = 506). Although the difference in decision quality is moderate, the confidence interval suggests that the difference in decision quality between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. However, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 92 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.459 to 0.05. The average corrected D is not going to be significantly altered by having more studies, since it is highly unlikely *to have that many "lost" studies that investigate the decision quality of DSS/GDSS as compared to manual DSS/GDSS.*

There is only study of the low difficulty task that investigates the decision quality across computerized and manual DSS/GDSS (Table XVIII, p. 292). The study shows that there is no difference in decision quality across computerized and manual DSS/GDSS ($d = .018$, $N = 72$) in low difficulty tasks.

The confidence intervals for second order sampling error of high and medium difficulty tasks are not significantly different (overlap $Z = .72 < Z_c = 1.645$), suggesting that those two levels of task difficulty do not affect decision quality differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS do not have statistically different quality decisions as a result of using either high or medium difficulty tasks). The difference in decision quality across DSS/GDSS and manual DSS/GDSS in low difficulty tasks, is far below that of either high or medium difficulty tasks. However, there is no way to confirm the significance of that difference, since there is only one study in the subset of low difficulty tasks.

4.4.5.1 <u>Decision Time (DSS/GDSS Versus No-DSS/GDSS)</u>

In high difficulty tasks, the users of computerized DSS/GDSS take more decision time on average (mean corrected

D = -1.298, K = 12, N = 795) than the users that have no decision support at all (Table XVII, p. 288). In addition to the fact that the difference in decision time across computerized DSS/GDSS and no-DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-2.3 to -.292), suggesting that the average difference in decision time is statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 300 missing studies averaging null findings that would have to exist to bring the average corrected D up from -1.298 to -0.05.

In medium difficulty tasks, the computerized DSS/GDSS take less decision time than no-DSS/GDSS on average (mean corrected D = .403, K = 7, N = 2575). In addition to the fact that the difference in decision time is moderate, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.045 to .761), indicating that the difference in decision time between DSS/GDSS and no-DSS/GDSS is significantly different from zero. Moreover, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 49 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.403 to 0.05.

In low difficulty tasks, the users of computerized DSS/GDSS take more decision time on average (average corrected $D = -.961$,$K = 3$, $N = 172$) than the users of no-DSS/GDSS. Although the difference is large, the confidence interval includes zero (-2.38 to .461), suggesting that the difference in decision time is not statistically different from zero. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 55 additional studies averaging null results to bring the mean corrected effect size up from -.961 to -.05.

The confidence intervals for second order sampling error of high and medium difficulty tasks are significantly different (no overlap), suggesting that those two levels of task difficulty do affect decision time differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS take statistically different decision time as a result of using either high or medium difficulty tasks). The average difference in decision time across DSS/GDSS and no-DSS/GDSS in medium difficulty tasks, is significantly different from that of low difficulty tasks (overlap $Z = 2.03 > Z_c = 1.645$), meaning that in the medium difficulty tasks, there would be less decision time across DSS/GDSS and no-DSS/GDSS than in low difficulty tasks. However, there is no difference in decision time across DSS/GDSS and no-DSS/GDSS between high and low difficulty tasks, since their *confidence intervals overlap significantly (overlap $Z = .48 < Z_c = 1.645$). This suggests that the computerized DSS/GDSS are more efficient than no-DSS/GDSS in medium difficulty tasks, and less efficient in high or low difficulty tasks.*

4.4.5.4 Decision time (DSS/GDSS Versus Manual DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS take more decision time on average (mean corrected $D = -.235$, $K = 9$, $N = 733$) than the users that have manual decision support (Table XVIII, p. 292). Although the difference in decision time across computerized DSS/GDSS and manual DSS/GDSS is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.86 to 1.39), suggesting that the average difference in decision time is not statistically different from zero at $p < 10$. In addition to the confidence interval which suggests that computerized DSS/GDSS may not always result in more decision time than manual DSS/GDSS, the fail-safe n shows that there is a moderate support for claiming that the difference is large enough and reliable enough to be of practical significance. It would take only 33 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.235 to -0.05.

In medium difficulty tasks, the computerized DSS/GDSS take less decision time than manual DSS/GDSS on average *(mean corrected D = .171, K = 2, N = 236). In addition to the small difference in decision time, the confidence interval (-.019 to .361) suggests that the difference in decision time between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n indicates that the difference is not large enough to be of any practical significance. It would take only five additional studies averaging null results that would have to exist to reduce the average corrected D from 0.171 to 0.05.*

The confidence intervals for second order sampling error of high and medium difficulty tasks are not significantly different (overlap $Z = .88 < Z_c = 1.645$), suggesting that those two levels of task difficulty do not affect decision time differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS do not have statistically different decision time as a result of using either high or medium difficulty tasks).

4.4.5.5 Depth of Analysis (DSS/GDSS Versus No-DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS analyze decision tasks in more depth on average (mean corrected D = .612, K = 9, N = 441) than the users that have no decision support at all (Table XVII, p. 288). Although the difference in the depth of analysis across computerized DSS/GDSS and no-DSS/GDSS is large, the 80%

confidence interval surrounding the mean uncorrected D includes zero (-.566 to 1.68), suggesting that the average difference in depth of analysis is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 101 missing studies averaging null findings that would have to exist to bring the average corrected D down from .612 to 0.05.

In medium difficulty tasks, the users of computerized DSS/GDSS analyze decision problems in more depth on average (mean corrected D = .759, K = 5, N = 242) than the users of no-DSS/GDSS. In addition to the fact that the difference in depth of analysis is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.0578 to 1.34), indicating that the difference in depth of analysis between DSS/GDSS and no-DSS/GDSS is significantly different from zero. Moreover, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 71 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.759 to 0.05.

In low difficulty tasks, the users of computerized DSS/GDSS analyze decision problems in less depth on average (average corrected D = -.646, K = 4, N = 368) than the users of no-DSS/GDSS. In addition to fact that the difference is *large, the confidence interval does not include zero (-1.016 to -.1036), suggesting that the difference in depth of analysis is statistically different from zero. Moreover, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 48 additional studies averaging null results to bring the mean corrected effect size up from -.646 to -.05.*

The confidence intervals for second order sampling error of high and medium difficulty tasks are not significantly different (overlap $Z = .36 < Z_c = 1.645$), suggesting that those two levels of task difficulty do not affect depth of analysis differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS produce statistically no different depth of task analysis as a result of using either high or medium difficulty tasks). The average difference in depth of analysis across DSS/GDSS and no-DSS/GDSS in medium difficulty tasks, is significantly different from those of either high or low difficulty tasks (no overlap), meaning that in the medium difficulty tasks, there would be significantly less depth of analysis across DSS/GDSS and no-DSS/GDSS than in either high or low difficulty tasks.

4.4.5.6 Depth of Analysis (DSS/GDSS Versus Manual DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS analyze decision tasks in more depth on average *(mean corrected D = .365, K = 13, N = 1120) than the users that have manual decision support (Table XVIII, p. 292). Although the difference in depth of analysis across computerized and manual DSS/GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.251 to .944), suggesting that the average difference in depth of analysis is not statistically different from zero at $p < 10$. Even though the confidence interval suggests that computerized DSS/GDSS may not always result in more depth of analysis than manual DSS/GDSS, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take only 82 missing studies averaging null findings that would have to exist to bring the average corrected D down from .365 to 0.05.*

In medium difficulty tasks, the users of computerized DSS/GDSS analyze decision tasks in more depth on average (mean corrected D = -.045, K = 2, N = 100) than the users of manual DSS/GDSS. In addition to the fact that the difference in depth of analysis is very small and not far from zero, the confidence interval includes zero (-.368 to .278) suggesting that the difference in depth of analysis between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n suggests that it would take no more additional studies averaging null results that would have to exist to reduce the average corrected D to

0.05, since the absolute value of the average corrected D is already below .05.

The confidence intervals for second order sampling error of high and medium difficulty tasks are not significantly different (overlap $Z = 1.34 < Z_c = 1.645$*), suggesting that those two levels of task difficulty do not affect depth of analysis differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS do not produce statistically different depth of analysis as a result of using either high or medium difficulty tasks).*

4.4.5.7 Decision Confidence (DSS/GDSS Versus No-DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have more decision confidence on average (mean corrected $D = .348$*,* $K = 13$*,* $N = 867$*) than the users that have no decision support at all (Table XVII, p. 288). Although the difference in decision confidence across computerized DSS/GDSS and no-DSS/GDSS is moderate in size, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.526 to 1.19), suggesting that the average difference in decision confidence is not statistically different from zero at* $p < 10$*. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 77 missing studies averaging null findings that would have to* *exist to bring the average corrected D down from .348 to 0.05.*

In medium difficulty tasks, the users of computerized DSS/GDSS have less decision confidence than no-DSS/GDSS on average (mean corrected D = -.317, K = 2, N = 286). Although the difference in decision confidence is moderate in size, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.827 to .194), indicating that the difference in decision confidence between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n indicates that the difference is not large enough or reliable enough to be of practical significance. It would take only 11 additional studies averaging null results that would have to exist to increase the average corrected D from -0.317 to -0.05.

In low difficulty tasks, the users of computerized DSS/GDSS have less decision confidence on average (average corrected D = -.632, K = 3, N = 148) than the users of no-DSS/GDSS. In addition to fact that the difference is large, the confidence interval does not include zero (-1.07 to -.189), suggesting that the difference in decision confidence is statistically different from zero. Moreover, the fail-safe n shows that the difference is large enough and reliable enough to be of moderate practical significance. It would take 35 additional studies averaging null results to bring the mean corrected effect size up from

-.632 to -.05.

The confidence intervals for second order sampling error of high difficulty tasks is significantly different from those of either medium or low difficulty tasks (overlap Z for high versus medium difficulty tasks = 1.82, overlap Z for high versus low difficulty tasks = 2.97, both > Z_c *= 1.645), suggesting that the high difficulty tasks affect decision confidence differently than medium or low difficulty tasks (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have statistically higher decision confidence in high difficulty tasks than in either medium or low difficulty tasks). The average difference in depth of analysis across DSS/GDSS and no-DSS/GDSS in medium difficulty tasks, is not significantly different from that of low difficulty tasks (overlap Z = .78), meaning that in medium difficulty tasks, there would be no significantly different decision confidence across DSS/GDSS and no-DSS/GDSS than in low difficulty tasks.*

4.4.5.8 Decision Confidence (DSS/GDSS Versus Manual DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have more decision confidence on average (mean corrected D = .353, K = 7, N = 616) than the users that have manual decision support (Table XVIII, p. 292). In addition to the fact that the difference in decision confidence *across computerized DSS/GDSS and manual DSS/GDSS is moderate in size, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.353 to .353), suggesting that the average difference in decision confidence is statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is large enough and reliable enough to be of some practical significance. It would take 42 missing studies averaging null findings that would have to exist to bring the average corrected D down from .353 to 0.05.*

There is only one study of medium difficulty task that investigates the decision confidence across computerized and manual DSS/GDSS (Table XVIII, p. 292). The study shows that there is significantly less decision confidence among users of computerized DSS/GDSS than users of manual DSS/GDSS (d = -.8971, N = 188) in medium difficulty tasks.

There is only one study of low difficulty task that investigates the decision confidence across computerized and manual DSS/GDSS (Table XVIII, p. 292). The study shows that there is significantly less decision confidence among users of computerized DSS/GDSS than users of manual DSS/GDSS (d = -.722, N = 72) in low difficulty tasks.

Although the difference in decision confidence across DSS/GDSS and manual DSS/GDSS in high difficulty tasks, is far more than that of either medium or low difficulty tasks, there is no way to confirm the significance of that *difference, since there is only one study in each subset of medium and low difficulty tasks.*

4.4.5.9 Satisfaction With Decision Process (DSS/GDSS Versus No-DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have less satisfaction with decision process on average (mean corrected D = -.493, K = 7, N = 441) than the users that have no decision support at all (Table XVII, p. 288). Although the difference in satisfaction with decision process across computerized DSS/GDSS and no-DSS/GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.60 to .616), suggesting that the average difference in satisfaction with decision process is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 62 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.493 to -0.05.

In medium difficulty tasks, the users of computerized DSS/GDSS have more satisfaction with decision process than no-DSS/GDSS on average (mean corrected D = .2139, K = 4, N = 561). Although the difference in satisfaction with decision process is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.216 to

.615), indicating that the difference in satisfaction with decision process between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n indicates that the difference is not large enough or reliable enough to be of practical significance. It would take only 13 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.2139 to 0.05.

In low difficulty tasks, the users of computerized DSS/GDSS have slightly more satisfaction with decision process on average (average corrected D = .115, K = 3, N = 226) than the users of no-DSS/GDSS. In addition to the small difference, the confidence interval includes zero (-.481 to .712), suggesting that the difference in satisfaction with decision process is not statistically different from zero. Moreover, the fail-safe n shows that the difference is small and not reliable enough to be of practical significance. It would take only 4 additional studies averaging null results to bring the mean corrected effect size down from .115 to .05.

The confidence intervals for second order sampling error of high difficulty tasks is significantly different from that of medium difficulty tasks (overlap $Z = 1.82 > Z_c = 1.645$*), suggesting that the high difficulty tasks affect satisfaction with decision process differently than medium difficulty tasks (the users of DSS/GDSS as opposed to users* *of no-DSS/GDSS have statistically less satisfaction with decision process in high difficulty tasks than in medium difficulty tasks). The average difference in satisfaction with decision process across DSS/GDSS and no-DSS/GDSS in low difficulty tasks is not significantly different from those of either high or low difficulty tasks (overlap Z of high versus low difficulty tasks = 1.33, overlap Z of medium versus low difficulty tasks = .29, both > Z_c), meaning that in low difficulty tasks, there would be no significantly different satisfaction with decision process across DSS/GDSS and no-DSS/GDSS than in either high or medium difficulty tasks.*

4.4.5.10 Satisfaction With Decision Process (DSS/GDSS Versus Manual DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have no more satisfaction with decision process on average (mean corrected D = .048, K = 3, N = 64) than the users of manual decision support (Table XVIII, p. 292). In addition to the fact that the difference is very small and not far from zero, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.0436 to .0436), suggesting that the average difference in satisfaction with decision process is not statistically different from zero at p < 10. Moreover, the fail-safe n shows that it would take no more missing studies averaging null findings that would *have to exist to bring the average corrected D to 0.05, since the average corrected D is already below that value.*

In medium difficulty tasks, the users of computerized DSS/GDSS have in more satisfaction with decision process on average (mean corrected $D = .886$, $K = 2$, $N = 108$) than the users of manual DSS/GDSS. Although, the difference in satisfaction with decision process is large, the confidence interval includes zero (-1.005 to 1.87), suggesting that the difference in satisfaction with decision process between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. However, the fail-safe n suggests that the difference is large enough and reliable enough to be of some practical significance. It would take 33 additional studies averaging null results to bring the mean corrected effect size down from .886 to .05.

The confidence intervals for second order sampling error of high and medium difficulty tasks are not significantly different (overlap $Z = 1.43 < Z_c = 1.645$), suggesting that those two levels of task difficulty do not affect satisfaction with decision process differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS do not have statistically different satisfaction with decision process as a result of using either high or medium difficulty tasks).

4.4.5.11 Satisfaction With Decision Outcome (DSS/GDSS Versus Manual DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have more satisfaction with decision outcome on average (mean corrected D = .180, K = 2, N = 76) than the users of manual decision support (Table XVIII, p. 292). In addition to the small difference, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.498 to .859), suggesting that the average difference in satisfaction with decision outcome is not statistically different from zero at p < 10. Moreover, the fail-safe n suggests that the difference is small and not reliable enough to be of any practical significance. It would take only 5 missing studies averaging null findings that would have to exist to bring the average corrected D down from .180 to 0.05.

In medium difficulty tasks, the users of computerized DSS/GDSS have slightly less satisfaction with decision outcome on average (mean corrected D = -.091, K = 3, N = 296) than the users of manual DSS/GDSS. In addition to the fact that the difference in satisfaction with decision outcome is small and not far from zero, the confidence interval includes zero (-.455 to .274), suggesting that the difference in satisfaction with decision outcome between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n suggests that the *difference is small and not reliable enough to be of any practical significance. It would take only two additional studies averaging null results to bring the mean corrected effect size up from -.091 to -.05.*

The confidence intervals for second sampling error of high and medium difficulty tasks are not significantly different (overlap $Z = .56 < Z_c = 1.645$), suggesting that those two levels of task difficulty do not affect satisfaction with decision outcome differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS do not have statistically different satisfaction with decision outcome as a result of using either high or medium difficulty tasks).

4.4.5.12 Equality of Participation (DSS/GDSS Versus No-DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected $D = 1.95$, $K = 9$, $N = 564$) than the users with no decision support at all (Table XVII, p. 288). Although the difference in equality of participation across computerized DSS/GDSS and no-DSS/GDSS is very large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.525 to 4.02), suggesting that the average difference in equality of participation is not statistically *different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 347 missing studies averaging null findings that would have to exist to bring the average corrected D down from 1.95 to 0.05.*

In medium difficulty tasks, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected D = .655, K = 5, N = 382) than the users of no-DSS/GDSS. Although the difference in equality of participation is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.386 to 1.69), indicating that the difference in equality of participation between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 60 missing studies averaging null findings that would have to exist to bring the average corrected D down from .655 to 0.05.

In low difficulty tasks, the users of computerized DSS/GDSS have less equality of participation on average (average corrected D = -.276, K = 3, N = 232) than the users of no-DSS/GDSS. Although the difference is small to moderate, the confidence interval includes zero (-.603 to .114), suggesting that the difference in equality of *participation is not statistically different from zero. Moreover, the fail-safe n shows that the difference is not large enough or reliable enough to be of practical significance. It would take only 14 additional studies averaging null results to bring the mean corrected effect size up from -.276 to -.05.*

The confidence intervals for second order sampling error of high, medium, and low difficulty tasks are significantly different from each other (overlap Z between high and medium difficulty tasks is 1.82; overlap Z between medium and low difficulty tasks is 2.15; no overlap between high and low difficulty tasks; all are greater than the critical value of Z), suggesting that those three levels of task difficulty do affect equality of participation differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly more equality of participation as they move from low to high difficulty tasks). This result is very consistent with the theory [Gallupe, 1985; Bui and Sivasankaran, 1987] in claiming that DSS/GDSS are more effective in high than in low difficulty tasks.

4.4.5.13 Equality of Participation (DSS/GDSS Versus Manual DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have less equality of participation on average *(mean corrected D = -.384, K = 3, N = 183) than the users of manual decision support (Table XVIII, p. 292). In addition to the fact that the difference is moderate in size, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.557 to -.211), suggesting that the average difference in equality of participation is statistically different from zero at p < 10. Moreover, the fail-safe n suggests that the difference is relatively small and not reliable enough to be of practical significance. It would take only 20 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.384 to -0.05.*

In medium difficulty tasks, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected D = .2747, K = 4, N = 394) than the users of manual DSS/GDSS. Although the difference in equality of participation is small to moderate, the confidence interval includes zero (-.0451 to .5436), suggesting that the difference in equality of participation between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n suggests that the difference is small and not reliable enough to be of any practical significance. It would take only 18 additional studies averaging null results to bring the mean corrected effect size up from .2747 to .05.

The confidence intervals for second order sampling

error of high and medium difficulty tasks are significantly different (overlap $Z = 2.87 > Z_c = 1.645$), suggesting that those two levels of task difficulty do affect equality of participation differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS have statistically less equality of participation in high than in medium difficulty tasks).

4.4.5.14 Degree of Decision Consensus (DSS/GDSS Versus No-DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have lower degree of decision consensus on average (mean corrected D = -1.05, K = 10, N = 609) than the users with no decision support at all (Table XVII, p. 288). Although the difference in degree of decision consensus across computerized DSS/GDSS and no-DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-2.64 to .646), suggesting that the average difference in degree of decision consensus is not statistically different from zero at $p < 10$. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 200 missing studies averaging null findings that would have to exist to bring the average corrected D down from 1.05 to 0.05.

In medium difficulty tasks, the users of computerized DSS/GDSS have no higher degree of decision consensus on *average (mean corrected D = -.068, K = 2, N = 280) than the users of no-DSS/GDSS. Although the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.068 to -.068), indicating that the difference in degree of decision consensus between DSS/GDSS and no-DSS/GDSS is significantly different from zero, the fail-safe n shows that the difference is small and not reliable enough to be of any practical significance. It would take only one missing study with null finding that would have to exist to bring the average corrected D up from -.068 to -0.05.*

In low difficulty tasks, the users of computerized DSS/GDSS have lower degree of decision consensus on average (average corrected D = -.782 ,K = 4, N = 196) than the users of no-DSS/GDSS. Although the difference is large, the confidence interval includes zero (-1.77 to .286), suggesting that the difference in degree of decision consensus is not statistically different from zero. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 59 additional studies averaging null results to bring the mean corrected effect size up from -.782 to -.05.

The confidence intervals for second order sampling error of high difficulty tasks is significantly different from medium difficulty tasks (overlap $Z = 2.28 > Z_c$), suggesting that those two levels of task difficulty do affect degree of decision consensus differently (the users *of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly lower degree of decision consensus in high than in medium difficulty tasks). The confidence intervals for second order sampling error of low difficulty tasks is significantly different from either high or medium difficulty tasks (overlap Z between high and low difficulty tasks = .45; overlap Z between medium and low difficulty tasks = 1.61; both are less than Z_c), suggesting that the low levels of task difficulty do affect degree of decision consensus differently than either high or medium difficulty tasks (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly no higher degree of decision consensus in low than in either high or medium difficulty tasks).*

4.4.5.15 Degree of Decision Consensus (DSS/GDSS Versus Manual DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have lower degree of decision consensus on average (mean corrected D = -.995, K = 2, N = 195) than the users of manual decision support (Table XVIII, p. 292). In addition to the fact that the difference in degree of decision consensus across computerized DSS/GDSS and manual DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.955 to -.955), suggesting that the average difference in degree of decision *consensus is statistically different from zero at $p < 10$. Moreover, the fail-safe n shows that the difference is large enough and reliable enough to be of some practical significance. It would take 38 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.955 to -0.05.*

There is only one study of medium difficulty task that investigates the degree of decision consensus across computerized and manual DSS/GDSS (Table XVIII, p. 292). The study shows that there is significantly lower degree of decision consensus among users of computerized GDSS than users of manual GDSS ($d = -.5386$, $N = 188$) in medium difficulty tasks.

Although in both high and medium difficulty tasks, the users of GDSS have lower degree of decision consensus than the users of no-GDSS, there is no way to confirm that the two subsets are not significantly different, since there is only one study in the subset of medium difficulty tasks.

4.4.5.16 Satisfaction Toward the System (DSS/GDSS Versus No-DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have higher satisfaction toward the system on average (mean corrected $D = 2.28$, $K = 2$, $N = 111$) than the users with no decision support at all (Table XVII, p. 288). In addition to the large size of the difference in *satisfaction toward the system across computerized DSS/GDSS and no-DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D does not include zero (1.89 to 2.31), suggesting that the average difference in satisfaction toward the system is statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 89 missing studies averaging null findings that would have to exist to bring the average corrected D down from 2.28 to 0.05.*

In medium difficulty tasks, the users of computerized DSS/GDSS have slightly higher satisfaction toward the system on average (mean corrected D = .187, K = 3, N = 513) than the users of no-DSS/GDSS. Although the difference is small, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.174 to .174), indicating that the difference in satisfaction toward the system between DSS/GDSS and no-DSS/GDSS is significantly different from zero. However, the fail-safe n shows that the difference is small and not reliable enough to be of some practical significance. It would take only 8 missing studies averaging null findings that would have to exist to bring the average corrected D down from .187 to 0.05.

There is only one study of low difficulty task that investigates the satisfaction toward the system across computerized DSS/GDSS and no-DSS/GDSS (Table XVII, p. 288).

The study shows that there is significantly lower satisfaction toward the system among users of computerized DSS/GDSS than users of no-DSS/GDSS ($d = -.3286$, $N = 90$) in low difficulty tasks.

The confidence intervals for second order sampling error of high difficulty tasks is significantly different from medium difficulty tasks (no overlap), suggesting that those two levels of task difficulty do affect satisfaction toward the system differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly higher satisfaction toward the system in high than in medium difficulty tasks).

4.4.5.17 Satisfaction Toward the System (DSS/GDSS Versus Manual DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have higher satisfaction toward the system on average (mean corrected $D = .199$, $K = 3$, $N = 117$) than the users of manual DSS/GDSS (Table XVIII, p. 292). In addition to the small difference in satisfaction toward the system across computerized DSS/GDSS and manual DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.300 to .657), suggesting that the average difference in satisfaction toward the system is not statistically different from zero at $p < 10$. Moreover, the fail-safe n shows that the difference is small and has no *practical significance. It would take 9 missing studies averaging null findings that would have to exist to bring the average corrected D down from .199 to .05.*

In medium difficulty tasks, the users of computerized DSS/GDSS have higher satisfaction toward the system on average (mean corrected D = .808, K = 4, N = 438) than the users of manual DSS/GDSS. In addition to the fact that the difference is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.808 to .808), indicating that the difference in satisfaction toward the system between DSS/GDSS and manual DSS/GDSS is significantly different from zero. Moreover, the fail-safe n shows that the difference is large enough and reliable enough to be of some practical significance. It would take 61 missing studies averaging null findings that would have to exist to bring the average corrected D down from .808 to .05.

The confidence intervals for second order sampling error of high and medium difficulty tasks are significantly different from each other (overlap $Z = 2.01 > Z_c = 1.645$*), suggesting that those two levels of task difficulty do affect satisfaction toward the system differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS have significantly lower satisfaction toward the system in high than in medium difficulty tasks).*

4.4.5.18 Amount of Group Discussion (DSS/GDSS Versus No-DSS/GDSS)

There is only one study of high difficulty task that investigates the amount of group discussion across computerized DSS/GDSS and no-DSS/GDSS (Table XVII, p. 288). The study shows that there is significantly more amount of group discussion among users of computerized DSS/GDSS than users of no-DSS/GDSS (d = 1.964, N = 36) in low difficulty tasks.

In low difficulty tasks, the users of computerized DSS/GDSS have slightly less amount of group discussion on average (mean corrected D = -.172, K = 2, N = 126) than the users of no-DSS/GDSS. In addition to the fact that the difference is small, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.14 to .801), indicating that the difference in amount of group discussion between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n shows that the difference is small and not reliable enough to be of any practical significance. It would take only 5 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.172 to -0.05.

Although there is a large difference in amount of group discussion between high and low difficulty tasks, there is no way to confirm that the two subsets are not significantly different, since there is only one study in the subset of *high difficulty tasks.*

4.4.5.19 *Amount of Communication (DSS/GDSS Versus No-DSS/GDSS)*

In high difficulty tasks, the users of computerized DSS/GDSS have less communication on average (mean corrected D = -1.41, K = 3, N = 130) than the users with no decision support at all (Table XVII, p. 288). Although the difference in amount of communication across computerized DSS/GDSS and no-DSS/GDSS is very large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-2.83 to .147), suggesting that the average difference in amount of communication is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 82 missing studies averaging null findings that would have to exist to bring the average corrected D up from -1.41 to -0.05.

In low difficulty tasks, the users of computerized DSS/GDSS have less of communication on average (mean corrected D = -.980, K = 3, N = 220) than the users of no-DSS/GDSS. Although the difference in amount of communication is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-2.85 to .147), indicating that the difference in amount of communication between DSS/GDSS and no-DSS/GDSS is not significantly different from zero.

However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 56 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.980 to -0.05.

The confidence intervals for second order sampling error of high and low difficulty tasks are not significantly different from each other (overlap $Z = .38 < Z_c = 1.645$), suggesting that those two levels of task difficulty do not affect amount of communication differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have no significantly different amount of communication as a result of having either high or low difficulty tasks).

4.4.5.20 Degree of Decision Improvement (DSS/GDSS Versus No-DSS/GDSS)

In high difficulty tasks, the users of computerized DSS/GDSS have lower degree of decision improvement on average (mean corrected $D = -.243$, $K = 3$, $N = 207$) than the users with no decision support at all (Table XVII, p. 288). Although the difference in degree of decision improvement across computerized DSS/GDSS and no-DSS/GDSS is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.12 to .64), suggesting that the average difference in degree of decision improvement is not statistically different from zero at $p < 10$. Moreover, *the fail-safe n shows that the difference is small enough and not reliable enough to be of practical significance. It would take only 12 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.243 to -0.05.*

In medium difficulty tasks, the users of computerized DSS/GDSS have higher degree of decision improvement on average (mean corrected D = 1.00, K = 4, N = 638) than the users of no-DSS/GDSS (Table XVII, p. 288). In addition to the fact that the difference is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.517 to 1.08), indicating that the difference in degree of decision improvement between DSS/GDSS and no-DSS/GDSS is significantly different from zero. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 76 missing studies averaging null findings that would have to exist to bring the average corrected D down from 1.00 to 0.05.

There is only one study of low difficulty task that investigates the degree of decision improvement across computerized DSS/GDSS and no-DSS/GDSS (Table XVII, p. 288). The study shows that there is significantly higher degree of decision improvement among users of computerized DSS/GDSS than users of no-DSS/GDSS (d = .8829, N = 100) in low difficulty tasks.

The confidence intervals for second order sampling error of high difficulty tasks is significantly different from medium difficulty tasks (overlap $Z = 2.79 > Z_c = 1.645$), suggesting that those two levels of task difficulty do affect degree of decision improvement differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly lower degree of decision improvement in high than in medium difficulty tasks).

4.4.6 Cross-Sectional Versus Longitudinal Studies

In this section, the moderator variable is based on separating the available studies for each dependent measure (i.e., decision quality) into studies that are cross-sectional (i.e., one period) or longitudinal (i.e., multi-periods). For each dependent variable, the moderator variable is tested under two different independent variables (computerized decision aids versus no decision aids, and computerized decision aids versus manual decision aids). Some dependent variables are not applicable under the current moderator variable (Tables XIX and XX, pp. 329, 332), either because the population is homogeneous, there are only two or fewer studies available, or because all the studies lie in one side of the moderator's subsets (i.e., all the available studies are longitudinal).

4.4.6.1 <u>Decision Quality (DSS/GDSS Versus No-DSS/GDSS)</u>

In the cross-sectional studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .397, K = 37, N = 4956) than the users that have no decision support at all (Table XIX). Although the difference in quality of decisions produced by computerized DSS/GDSS and no-DSS/GDSS is moderate in size, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.210 to .965), suggesting that the average difference in decision quality is not statistically different from zero at $p < 10$. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 257 missing studies averaging null findings that would have to exist to bring the average corrected D down from .397 to 0.05.

In the longitudinal studies, the users of computerized DSS/GDSS produce slightly higher quality decisions on average (mean corrected D = .189, K = 6, N = 490) than no-DSS/GDSS (Table XIX). In addition to the fact that the difference in decision quality is small, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.0396 to .382), indicating that the difference in decision quality between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n indicates that the difference is small and not reliable

TABLE XIX

THE EFFECTS OF THE MODERATOR VARIABLE OF CROSS-SECTIONAL VERSUS LONGITUDINAL STUDIES USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Dec. Quality-Cross Sectional	37	4956	.397	.482	-.221, 1.01	12.77	.377	.952
Longitudinal	6	490	.189	.182	-.0438, .422	64.98	.171	.905
Decision Time-Cross Sectional	17	3449	-.0121	.849	-1.099, 1.07	2.68	-.0121	1
Longitudinal	3	93	-.859	0	-.859, -.859	737.9	-.859	1
Depth of Analysis-Cross Sec.	16	970	.300	.948	-.913, 1.51	8.73	.269	.895
Longitudinal	1	81	d = -.4444					
Decision Confidence-Cross Sec.	15	1103	.163	.716	-.753, 1.08	10.82	.155	.949
Longitudinal	1	96	d = .2925					
Satisfaction w/Decision Process	Not Applicable							
Satisfaction w/Decision Outcome	Not Applicable							
Equality of Participation	Not Applicable							
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward the System	Not Applicable							
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior	Not Applicable							
Amount of Communication	Not Applicable							
Rate of Dec. Improvement-Cross	7	849	.769	.748	-.188, 1.73	8.99	.613	.797
Longitudinal	1	96	d = .2982					
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XIX (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF CROSS-SECTIONAL VERSUS LONGITUDINAL STUDIES USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Samp-ling Error of Obs D's	Res-idual Var	Chi-SQ ($\chi^2_{K-1,\ .05}$)	Confidence Interval for 2nd Order Sampling Error(95%)	Over-Lap Z Value, Z_c=1.645	Fail Safe N
Dec. Quality-Cross Sectional	-.210, .965	.242	.0308	.211	289.8	.219, .536	1.49	257
Longitudinal	-.0396, .382	.077	.0504	.027	9.23	-.051, .3941		17
Decision Time-Cross Sectional	-1.099, 1.075	.742	.0199	.722	633.3	-.421, .397	No	D_K<D_C
Longitudinal	-.859, -.859	.020	.151	.1305	.406	-1.02, -.698		49
Depth of Analysis-Cross Sec.	-.817, 1.35	.789	.0689	.7197	183.2	-.166, .704		80
Longitudinal								
Decision Confidence-Cross Sec.	-.715, 1.025	.518	.0561	.4624	138.62	-.209, .519		34
Longitudinal								
Satisfaction w/Decision Process	Not Applicable							
Satisfaction w/Decision Outcome	Not Applicable							
Equality of Participation	Not Applicable							
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward the System	Not Applicable							
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior	Not Applicable							
Amount of Communication	Not Applicable							
Rate of Dec. Improvement-Cross	-.149, 1.38	.390	.035	.356	77.89	.150, 1.08		101
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

enough to be of practical significance. It would take only 17 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.189 to 0.05.

The confidence intervals for second order sampling error of cross-sectional and longitudinal studies are not significantly different (overlap $Z = 1.49 < Z_c = 1.645$), suggesting that those two subsets do not affect decision quality differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS do not have statistically different quality decisions when cross-sectional studies are compared to longitudinal studies).

4.4.6.2 Decision Quality (DSS/GDSS Versus Manual DSS/GDSS)

In the cross-sectional studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected $D = .8116$, $K = 16$, $N = 933$) than the users of manual decision support (Table XX). Although the difference in quality of decisions produced by computerized DSS/GDSS and manual DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.381 to 2.00), suggesting that the average difference in decision quality is not statistically different from zero at $p < 10$. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical

TABLE XX

THE EFFECTS OF THE MODERATOR VARIABLE OF CROSS-SECTIONAL VERSUS LONGITUDINAL STUDIES USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Dec. Quality-Cross Sectional	16	933	.8116	.932	-.381, 2.00	8.138	.8116	1
Longitudinal	11	966	.306	.236	.0035, .609	51.93	.270	.882
Decision Time-Cross Sectional	9	501	.657	1.00	-.625, 1.939	7.27	.657	1
Longitudinal	2	468	-.986	.361	-1.45, -.524	12.92	-.986	1
Depth of Analysis-Cross Sec.	8	357	.347	.771	-.639, 1.33	13.81	.347	1
Longitudinal	7	863	.317	.251	-.011, .644	36.05	.301	.950
Decision Confidence-Cross Sec.	6	418	-.053	.727	-.983, .877	10.07	-.053	1
Longitudinal	3	458	.252	0	.252, .252	432.6	.233	.927
Satisfaction w/Dec. Process-Cross	3	144	.694	.726	-.235, 1.62	14.90	.694	1
Longitudinal	2	28	-.058	0	-.058, -.058	14715	-.053	.911
Satisfaction w/Dec. Outcome	Not Applicable							
Equality of Participation-Cross	5	549	.038	.423	-.5036, .5806	20.09	.0349	.907
Longitudinal	2	28	.311	0	.311, .311	53432	.311	1
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward System-Cross	6	514	.768	0	.768, .768	122.3	.768	1
Longitudinal	1	41	d = -.4906					
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Dec. Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XX (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF CROSS-SECTIONAL VERSUS LONGITUDINAL STUDIES USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs D's	Residual Var	Chi-SQ ($X^2_{K-1, .05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over Lap Z Value, Z_c=1.645	Fail Safe N
Dec. Quality-Cross Sectional	-.381, 2.00	.945	.0769	.868	196.6	.335, 1.288	1.95	244
Longitudinal	.0031, .537	.0906	.047	.0435	21.18	.0924, .448		56
Decision Time-Cross Sectional	-.625, 1.939	1.08	.0786	1.003	123.8	-.022, 1.34	No	109
Longitudinal	-1.45, -.524	.149	.019	.130	15.48	-1.52, -.449		37
Depth of Analysis-Cross Sec.	-.639, 1.33	.690	.095	.595	57.92	-.228, .923	.09	48
Longitudinal	-.0106, .612	.0926	.033	.059	19.44	.075, .526		37
Decision Confidence-Cross Sec.	-.983, .877	.587	.059	.528	59.58	-.666, .560	.96	1
Longitudinal	.233, .233	.0062	.027	-.0205	.693	.144, .322		12
Satisfaction w/Dec. Process-Cross	-.235, 1.62	.619	.092	.527	20.13	-1.96, 1.58	1.65	39
Longitudinal	-.053, -.053	.0023	.338	-.335	.0136	-.1197, .013		1
Satisfaction w/Dec. Outcome	Not Applicable							
Equality of Participation-Cross	-.457, .526	.1847	.0371	.1476	24.88	-.342, .4117	1.41	$D_K < D_C$
Longitudinal	.311, .311	.00064	.3417	.341	3.74	.276, .346		10
Degree of Decision Consensus	Not Applicable							
Satisfaction Toward System-Cross	.768, .768	.0419	.051	-.0094	4.90	.604, .932		86
Longitudinal								
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Dec. Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

significance. It would take 244 missing studies averaging null findings that would have to exist to bring the average corrected D down from .8116 to 0.05.

In the longitudinal studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .306, K = 11, N = 966) than manual DSS/GDSS (Table XX, p. 331). Although the difference in decision quality is moderate in size, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.0031 to .537), indicating that the difference in decision quality between DSS/GDSS and manual DSS/GDSS is significantly different from zero. Moreover, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 56 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.306 to 0.05.

The confidence intervals for second order sampling error of cross-sectional and longitudinal studies are significantly different (overlap $Z = 1.95 > Z_c = 1.645$*), suggesting that those two subsets do affect decision quality differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS produce statistically higher quality decisions in cross-sectional than in longitudinal studies).*

4.4.6.3 Decision Time (DSS/GDSS Versus No-DSS/GDSS)

In the cross-sectional studies, the users of *computerized DSS/GDSS take no more decision time on average (mean corrected D = -.0121, K = 17, N = 3449) than the users that have no decision support at all (Table XIX, p. 329). In addition to the fact that the difference in decision time across computerized DSS/GDSS and no-DSS/GDSS is very small and not far from zero, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.099 to 1.075), suggesting that the average difference in decision time is not statistically different from zero at p < 10. Moreover, the fail-safe n shows that it would take no more missing studies averaging null findings that would have to exist to bring the average corrected D to -0.05, since the average corrected D is already above that value.*

In the longitudinal studies, the users of computerized DSS/GDSS take more decision time than no-DSS/GDSS on average (mean corrected D = -.859, K = 3, N = 93). In addition to the fact that the difference in decision time is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.859 to .859), indicating that the difference in decision time between DSS/GDSS and no-DSS/GDSS is significantly different from zero. Moreover, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 49 additional studies averaging null results that would have to exist to increase the average corrected D from -0.859 to -0.05.

The confidence intervals for second order sampling error of cross-sectional and longitudinal studies are significantly different from each other (no overlap), suggesting that those two subsets do affect decision time differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS take significantly more decision time when cross-sectional studies are compared to longitudinal studies).

4.4.6.4 Decision Time (DSS/GDSS Versus Manual DSS/GDSS)

In the cross-sectional studies, the users of computerized DSS/GDSS take less decision time on average (mean corrected D = .657, K = 9, N = 501) than the users of manual decision support (Table XX, p. 332). Although the difference in decision time across computerized DSS/GDSS and manual DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.625 to 1.939), suggesting that the average difference in decision time is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 109 missing studies averaging null findings that would have to exist to bring the average corrected D down from .657 to 0.05.

In the longitudinal studies, the users of computerized

DSS/GDSS take more decision time on average (mean corrected D = -.986, K = 2, N = 468) than manual DSS/GDSS (Table XX, p. 332). In addition to the fact that the difference in decision time is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.45 to -.524), indicating that the difference in decision time between DSS/GDSS and manual DSS/GDSS is significantly different from zero. Given the fact that there are only two available studies, fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 37 additional studies averaging null results that would have to exist to increase the average corrected D from -0.986 to -0.05.

The confidence intervals for second order sampling error of cross-sectional and longitudinal studies are significantly different from each other (no overlap), suggesting that those two subsets do affect decision time differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS take significantly less decision time in cross-sectional than in longitudinal studies).

4.4.6.5 Depth of Analysis (DSS/GDSS Versus No-DSS/GDSS)

In the cross-sectional studies, the users of computerized DSS/GDSS analyze decision tasks in more depth on average (mean corrected D = .300, K = 16, N = 970) than *the users that have no decision support at all (Table XIX, p. 329). Although the difference in depth of analysis across computerized DSS/GDSS and no-DSS/GDSS is moderate in size, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.817 to 1.35), suggesting that the average difference in depth of analysis is not statistically different from zero at $p < 10$. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 80 missing studies averaging null findings that would have to exist to bring the average corrected D down from .300 to 0.05.*

There is only one longitudinal study that investigates the degree of depth of analysis across computerized DSS/GDSS and no-DSS/GDSS (Table XIX, p. 329). The study shows that there is significantly less depth of analysis among users of computerized DSS/GDSS than users of no-DSS/GDSS ($d = -.4444$, $N = 81$).

Although there is a large difference in depth of analysis across DSS/GDSS and no-DSS/GDSS, there is no way to confirm that the two subsets are significantly different, since there is only one study in the subset of longitudinal studies.

4.4.6.6 Depth of Analysis (DSS/GDSS Versus Manual DSS/GDSS)

In the cross-sectional studies, the users of computerized DSS/GDSS analyze decision tasks in more depth on average (mean corrected D = .347, K = 8, N = 357) than the users of manual decision support (Table XX, p. 332). Although the difference in depth of analysis across computerized DSS/GDSS and manual DSS/GDSS is moderate in size, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.639 to 1.33), suggesting that the average difference in depth of analysis is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 48 missing studies averaging null findings that would have to exist to bring the average corrected D down from .347 to 0.05.

In the longitudinal studies, the users of computerized DSS/GDSS analyze decision tasks in more depth on average (mean corrected D = .317, K = 7, N = 863) than manual DSS/GDSS (Table XX, p. 332). Although the confidence interval surrounding the mean uncorrected D includes zero (-.0106 to .612), it is positive for more than 98% of the time, indicating that the difference in depth of analysis between DSS/GDSS and manual DSS/GDSS is significantly different from zero. The fail-safe n indicates that the *difference is moderate and has some practical significance. It would take 37 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.317 to 0.05.*

The confidence intervals for second order sampling error of cross-sectional and longitudinal studies are not significantly different from each other (overlap $Z = .09 < Z_c = 1.645$), suggesting that those two subsets do not affect depth of analysis differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS produce no significantly different depth of analysis in cross-sectional than in longitudinal studies).

4.4.6.7 Decision Confidence (DSS/GDSS Versus No-DSS/GDSS)

In the cross-sectional studies, the users of computerized DSS/GDSS have slightly more decision confidence on average (mean corrected $D = .163$, $K = 15$, $N = 1103$) than the users that have no decision support at all (Table XIX, p. 329). In addition to the small difference in decision confidence across computerized DSS/GDSS and no-DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.715 to 1.025), suggesting that the average difference in decision confidence is not statistically different from zero at $p < 10$. Furthermore, the fail-safe n shows that the difference is small and has only moderate *practical significance. It would take only 34 missing studies averaging null findings that would have to exist to bring the average corrected D down from .163 to 0.05.*

There is only one longitudinal study that investigates the degree of decision confidence across computerized DSS/GDSS and no-DSS/GDSS (Table XIX, p. 329). The study shows that there is relatively more decision confidence among users of computerized DSS/GDSS than users of no-DSS/GDSS (d = .2925, N = 96).

Although both cross-sectional and longitudinal studies, have small effect sizes, there is no way to confirm that the two subsets are not statistically different, since there is only one study in the subset of longitudinal studies.

4.4.6.8 Decision Confidence (DSS/GDSS Versus Manual DSS/GDSS)

In the cross-sectional studies, the users of computerized DSS/GDSS have no more decision confidence on average (mean corrected D = -.053, K = 6, N = 418) than the users of manual decision support (Table XX, p. 332). In addition to the fact that the difference in decision confidence across computerized DSS/GDSS and manual DSS/GDSS is very small and not far from zero, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.983 to .877), suggesting that the average difference in decision confidence is not statistically different from zero *at $p < 10$. Moreover, the fail-safe n shows that the difference is very small and has no practical significance. It would take only one missing study averaging null finding that would have to exist to bring the average corrected D down from .053 to 0.05.*

In the longitudinal studies, the users of computerized DSS/GDSS have more decision confidence on average (mean corrected $D = .252$, $K = 3$, $N = 458$) than manual DSS/GDSS (Table XX, p. 332). Although the difference is relatively small, the confidence interval surrounding the mean uncorrected D does not include zero (.233 to .233), indicating that the difference in decision confidence between DSS/GDSS and manual DSS/GDSS is significantly different from zero. However, the fail-safe n indicates that the difference is small and has weak practical significance. It would take only 12 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.252 to 0.05.

The confidence intervals for second order sampling error of cross-sectional and longitudinal studies are not significantly different from each other (overlap $Z = .96 < Z_c = 1.645$), suggesting that those two subsets do not affect decision confidence differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS have significantly no different decision confidence in cross-sectional versus longitudinal studies).

4.4.6.9 Satisfaction With Decision Process (DSS/GDSS Versus Manual DSS/GDSS)

In the cross-sectional studies, the users of computerized DSS/GDSS have more satisfaction with decision process on average (mean corrected D = .694, K = 3, N = 144) than the users of manual decision support (Table XX, p. 332). Although the difference in satisfaction with decision process across computerized DSS/GDSS and manual DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.235 to 1.62), suggesting that the average difference in satisfaction with decision process is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference has a moderate practical significance. It would take 39 missing studies averaging null findings that would have to exist to bring the average corrected D down from .694 to 0.05.

In the longitudinal studies, the users of computerized DSS/GDSS have no more satisfaction with decision process on average (mean corrected D = -.058, K = 2, N = 28) than manual DSS/GDSS (Table XX, p. 332). Although the confidence interval surrounding the mean uncorrected D does not include zero (-.053 to -.053), the difference is very small and not far from zero, indicating that the difference in satisfaction with decision process between DSS/GDSS and manual DSS/GDSS is not significantly different from zero.

Moreover, the fail-safe n indicates that the difference is too small to be of any practical significance. It would take only one additional study with null result that would have to exist to increase the average corrected D from -0.058 to -0.05.

The confidence intervals for second order sampling error of cross-sectional and longitudinal studies are significantly different from each other (overlap $Z = 1.65 > Z_c = 1.645$), suggesting that those two subsets do affect satisfaction with decision process differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS have significantly more satisfaction with decision process in cross-sectional studies than in longitudinal studies).

4.4.6.10 Equality of Participation (DSS/GDSS Versus Manual DSS/GDSS)

In the cross-sectional studies, the users of computerized DSS/GDSS have no more equality of participation on average (mean corrected D = -.038, K = 5, N = 549) than the users of manual decision support (Table XX, p. 332). In addition to the fact that the difference in equality of participation across computerized DSS/GDSS and manual DSS/GDSS is very small and not far from zero, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.457 to .526), suggesting that the average difference in equality of participation is not statistically *different from zero at $p < 10$. Moreover, the fail-safe n shows that the difference is very small and has no practical significance. It would take no more missing studies averaging null findings that would have to exist to bring the average corrected D to 0.05, since the average corrected D is already below that value.*

In the longitudinal studies, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected $D = .311$, $K = 2$, $N = 28$) than manual DSS/GDSS (Table XX, p. 332). In addition to the fact that the difference is moderate in size, the confidence interval surrounding the mean uncorrected D does not include zero (.311 to .311), indicating that the difference in equality of participation between DSS/GDSS and manual DSS/GDSS is significantly different from zero. However, the fail-safe n indicates that the difference is small and has weak practical significance. It would take only 10 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.311 to 0.05.

The confidence intervals for second order sampling error of cross-sectional and longitudinal studies are not significantly different from each other (overlap $Z = 1.41 < Z_c = 1.645$), suggesting that those two subsets do not affect equality of participation differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS have significantly no different equality of participation in cross-sectional *studies versus longitudinal studies).*

4.4.6.11 *Satisfaction Toward the System (DSS/GDSS Versus Manual DSS/GDSS)*

In the cross-sectional studies, the users of computerized DSS/GDSS have more satisfaction toward the system on average (mean corrected D = .768, K = 6, N = 514) than the users of manual decision support (Table XX, p. 332). In addition to the fact that the difference in satisfaction toward the system across computerized DSS/GDSS and manual DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.768 to .768), suggesting that the average difference in satisfaction toward the system is statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 86 missing studies averaging null findings that would have to exist to bring the average corrected D down from .768 to .05.

There is only one longitudinal study that investigates the satisfaction toward the system across computerized DSS/GDSS and manual DSS/GDSS (Table XX, p. 332). The study shows that there is significantly less satisfaction toward the system among users of computerized DSS/GDSS than users of manual DSS/GDSS (d = -.4906, N = 41).

Although there is a large difference in satisfaction *toward the system across DSS/GDSS and manual DSS/GDSS, there is no way to confirm that the two subsets are significantly different, since there is only one study in the subset of longitudinal studies.*

4.4.6.12 <u>Rate of Decision Improvement (DSS/GDSS Versus No- DSS/GDSS)</u>

In the cross-sectional studies, the users of computerized DSS/GDSS have higher rate of decision improvement on average (mean corrected D = .769, K = 7, N = 849) than the users that have no decision support at all (Table XIX, p. 329). Although the difference in rate of decision improvement across computerized DSS/GDSS and no-DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.149 to 1.38), suggesting that the average difference in rate of decision improvement is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 101 missing studies averaging null findings that would have to exist to bring the average corrected D down from .769 to 0.05.

There is only one longitudinal study that investigates the rate of decision improvement across computerized DSS/GDSS and no-DSS/GDSS (Table XIX, p. 329). The study shows that there is higher rate of decision improvement among users of computerized DSS/GDSS than users of no-DSS/GDSS ($d = .2982$, $N = 96$).

Although there is a large difference in rate of decision improvement across cross-sectional and longitudinal studies when DSS/GDSS are compared to no-DSS/GDSS, there is no way of telling that the two subsets are significantly different, since there is only one study in the subset of longitudinal studies.

4.4.7 Old Versus New Studies

In this section, the moderator variable is tested by splitting the available studies for each dependent measure (i.e., decision quality) into studies that are old (1969-1980) or new studies (1981-1990). For each dependent variable, the moderator variable is tested under two different independent variables (computerized decision aids versus no decision aids, and computerized decision aids versus manual decision aids). Some dependent variables are not applicable under the current moderator variable (Tables XXI and XXII, pp. 350, 353), either because the population of the studies is homogeneous, there are only two or fewer studies available, or because all the studies lie in one side of the moderator's subsets (i.e., all the available studies are new).

4.4.7.1 Decision Quality (DSS/GDSS Versus No-DSS/GDSS)

In the old studies, the users of computerized DSS/GDSS produce slightly more quality decisions on average (mean corrected D = .128, K = 10, N = 598) than the users that have no decision support at all (Table XXI). In addition to the small difference in quality of decisions produced by computerized DSS/GDSS and no-DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.319 to .553), suggesting that the average difference in decision quality is not statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is small and not reliable enough to be of any practical significance. It would take only 16 missing studies averaging null findings that would have to exist to bring the average corrected D down from .128 to 0.05.

In the new studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .44, K = 33, N = 4848) than the users of no-DSS/GDSS (Table XXI). Although the difference in decision quality is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.117 to .954), indicating that the difference in decision quality between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. However, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 257 additional studies averaging null results

TABLE XXI

THE EFFECTS OF THE MODERATOR VARIABLE OF OLD VERSUS NEW STUDIES USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Dec. Quality-Old	10	598	.128	.373	-.349, .606	37.40	.117	.912
New	33	4848	.44	.4398	-.123, 1.00	13.86	.418	.952
Decision Time-Old	3	232	-.549	0	-.549, -.549	223.7	-.549	1
New	17	3310	.0016	.866	-1.11, 1.11	2.69	.0016	1
Depth of Analysis-Old	2	200	-.669	.497	-1.305, -.032	14.84	-.669	1
New	15	851	.471	.847	-.613, 1.55	11.51	.421	.895
Decision Confidence-Old	8	584	.398	.529	-.280, 1.076	16.98	.398	1
New	8	615	-.057	.713	-.969, .856	10.44	-.0539	.949
Satisfaction w/Dec. Process-Old	2	200	-.144	0	-.144, -.144	478.6	-.144	1
New	11	1028	-.147	.778	-1.14, .849	7.67	-.137	.932
Satisfaction w/Dec. Outcome	Not Applicable							
Equality of Participation-Old	2	100	.460	0	.460, .460	302	.436	.948
New	14	1038	1.24	1.79	-1.04, 3.53	2.44	1.11	.893
Degree of Decision Consensus-Old	2	80	-1.50	0	-1.50, -1.50	164077	-1.42	.948
New	12	965	-.525	.944	-1.73, .684	5.59	-.525	1
Satisfaction Toward System	Not Applicable							
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior	Not Applicable							
Amount of Communication-Old	1	40	d = 2.8287					
New	4	270	-.344	.349	-.792, .103	33.67	-.344	1
Rate of Dec. Improvement-Old	2	200	-.0557	.917	-1.23, 1.117	4.63	-.0557	1
New	6	745	.944	.272	.596, 1.29	42.74	.752	.797
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XXI (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF OLD VERSUS NEW STUDIES USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs D's	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over-Lap Z Value, Z_c=1.645	Fail Safe N
Dec. Quality-Old	-.319, .553	.185	.069	.1161	26.7	-.149, .384	1.99	16
New	-.117, .954	.203	.028	.1752	238.15	.265, .573		257
Decision Time-Old	-.549, -.549	.0246	.0551	.0305	1.34	-.726, -.372	2.36	30
New	-1.11, 1.11	.772	.0207	.7509	631.95	-.416, .419		$D_K<D_C$
Depth of Analysis-Old	-1.305, -.032	.290	.0431	.247	13.47	-1.41, .078	2.63	25
New	-.548, 1.39	.649	.0747	.5743	130.27	.014, .829		126
Decision Confidence-Old	-.280, 1.076	.338	.0574	.2808	47.09	-.0051, .801	1.39	56
New	-.920, .813	.512	.0535	.458	76.60	.549, .442		1
Satisfaction w/Dec. Process-Old	-.144, -.144	.00855	.0409	-.0323	.418	-.272, -.0159	.01	4
New	-1.06, .792	.571	.044	.527	143.37	-.584, .309		21
Satisfaction w/Dec. Outcome	Not Applicable							
Equality of Participation-Old	.436, .436	.028	.085	-.057	.661	.203, .669	1.74	16
New	-.937, 3.15	2.62	.064	2.55	572.9	.261, 1.96		333
Degree of Decision Consensus-Old	-1.42, -1.42	.00008	.132	-.132	.0012	-1.43, -1.41	No	58
New	-1.73, .684	.945	.053	.892	214.8	-1.07, 2.51		114
Satisfaction Toward System	Not Applicable							
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behavior	Not Applicable							
Amount of Communication-Old								
New	-.792, .103	.184	.062	.122	11.88	-.765, .076		24
Rate of Dec. Improvement-Old	-1.23, 1.117	.881	.0408	.840	43.15	-1.36, 1.24	1.48	1
New	.475, 1.03	.082	.0351	.0469	14.04	.523, .982		107
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

that would have to exist to reduce the average corrected D from 0.44 to 0.05.

The confidence intervals for second order sampling error of old and new studies are significantly different from each other (overlap $Z = 1.99 > Z_c = 1.645$), suggesting that those two subsets do affect decision quality differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS produce statistically less quality decisions in the old studies than in the new studies).

4.4.7.2 Decision Quality (DSS/GDSS Versus Manual DSS/GDSS)

In the old studies, the users of computerized DSS/GDSS produce only slightly less quality decisions on average (mean corrected $D = -.0766$, $K = 2$, $N = 60$) than the users of manual decision support (Table XXII). Although the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.0766 to -.0766), the difference in quality of decisions produced by computerized DSS/GDSS and manual DSS/GDSS is too small to have any statistical significance at $p < 10$. Moreover, the fail-safe n shows that the difference is too small to have any practical significance. It would take only one missing study with null finding that would have to exist to bring the average corrected D up from -.0766 to -0.05.

In the new studies, the users of computerized DSS/GDSS

TABLE XXII

THE EFFECTS OF THE MODERATOR VARIABLE OF OLD VERSUS NEW STUDIES USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Dec. Quality-Old	2	60	-.0766	0	-.0766, -.0766	584.7	-.0766	1
New	25	1839	.630	.826	-.427, 1.688	9.85	.556	.882
Decision Time-Old	1	40	d = 1.4403					
New	10	929	-.204	1.098	-1.61, 1.20	3.54	-.204	1
Depth of Analysis	Not Applicable							
Decision Confidence-Old	1	40	d = .6454					
New	8	836	.076	.554	-.634, .786	12.87	.0705	.927
Satisfaction w/Dec. Process	Not Applicable							
Satisfaction w/Dec. Outcome-Old	1	40	d = .7747					
New	4	332	-.133	.273	-.482, .216	39.96	-.133	1
Equality of Participation	Not Applicable							
Degree of Decision Consensus-Old	1	40	d = -1.4142					
New	2	343	-.696	.027	-.787, -.605	83.15	-.696	1
Satisfaction Toward System	Not Applicable							
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Dec. Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XXII (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF OLD VERSUS NEW STUDIES USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs D's	Residual Var	Chi-SQ ($\chi^2_{K-1, .05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over Lap Z Value, Z_c=1.645	Fail Safe N
Dec. Quality-Old	-.0766, -.0766	.0245	.143	-.1188	0.34	-.293, .140	No	1
New	-.377, 1.489	.589	.058	.531	253.6	.255, .857		290
Decision Time-Old								
New	-1.61, 1.20	1.25	.044	1.21	282.6	-.897, .489		31
Depth of Analysis	Not Applicable							
Decision Confidence-Old								
New	-.588, .729	.303	.039	.2644	62.17	-.311, .452		4
Satisfaction w/Dec. Process	Not Applicable							
Satisfaction w/Dec. Outcome-Old								
New	-.482, .216	.124	.049	.0744	10.01	-.478, .212		7
Equality of Participation	Not Applicable							
Degree of Decision Consensus-Old								
New	-.787, -.605	.0301	.025	.0051	2.405	-.937, -.456		26
Satisfaction Toward System	Not Applicable							
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhibited Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Dec. Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

produce higher quality decisions on average (mean corrected D = .630, K = 25, N = 1839) than manual DSS/GDSS (Table XXII, p. 352). Although the difference in decision quality is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.377 to 1.489), indicating that the difference in decision quality between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. However, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 290 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.630 to 0.05.

The confidence intervals for second order sampling error of old and new studies are significantly different from each other (no overlap), suggesting that those two subsets do affect decision quality differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS produce statistically less quality decisions in old than in new studies).

4.4.7.3 Decision Time (DSS/GDSS Versus No-DSS/GDSS)

In the old studies, the users of computerized DSS/GDSS take more decision time on average (mean corrected D = -.549, K = 3, N = 232) than the users that have no decision support at all (Table XXI, p. 350). In addition to the fact that the difference in decision time across computerized

DSS/GDSS and no-DSS/GDSS is moderate to large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.549 to -.549), suggesting that the average difference in decision time is statistically different from zero at p < 10. However, the fail-safe n shows that the difference has only moderate practical significance. It would take only 30 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.549 to -0.05.

In the new studies, the users of computerized DSS/GDSS take no more decision time on average (mean corrected D = .0016, K = 17, N = 3310) than the users of no-DSS/GDSS (Table XXI, p. 350). In addition to the fact that the difference in decision time is very small and almost equals to zero, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.11 to 1.11), indicating that the difference in decision time between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n indicates that it would take no additional studies averaging null results that would have to exist to reduce the average corrected D to 0.05, since the average corrected D is already below that value.

The confidence intervals for second order sampling error of old and new studies are significantly different from each other (overlap $Z = 2.36 > Z_c = 1.645$*), suggesting that those two subsets do affect decision time differently* *(the users of DSS/GDSS as opposed to users of no-DSS/GDSS take significantly more decision time in the old studies than in the new studies).*

4.4.7.4 Decision Time (DSS/GDSS Versus Manual DSS/GDSS)

There is only one old study that investigates decision time across computerized DSS/GDSS and manual DSS/GDSS (Table XXII, p. 353). The study shows that the users of computerized DSS/GDSS take significantly less decision time than the users of manual DSS/GDSS (d = 1.4403, N = 40).

In the new studies, the users of computerized DSS/GDSS take more decision time on average (mean corrected D = -.204, K = 10, N = 929) than manual DSS/GDSS (Table XXII, p. 353). Although the difference in decision time is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.61 to 1.20), indicating that the difference in decision time between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n indicates that the difference has only moderate practical significance. It would take 30 additional studies averaging null results that would have to exist to increase the average corrected D from -0.204 to -0.05.

Although there is a large difference in decision time across old and new studies when DSS/GDSS are compared to manual DSS/GDSS, there is no way of telling that the two *subsets are significantly different, since there is only one study in the subset of old studies.*

4.4.7.5 Depth of Analysis (DSS/GDSS Versus No-DSS/GDSS)

In the old studies, the users of computerized DSS/GDSS analyze decision tasks in less depth on average (mean corrected D = -.669, K = 2, N = 200) than the users that have no decision support at all (Table XXI, p. 350). In addition to the fact that the difference in depth of analysis across computerized DSS/GDSS and no-DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-1.305 to -.032), suggesting that the average difference in depth of analysis is statistically different from zero at $p < 10$. However, the fail-safe n shows that the difference has weak practical significance. It would take only 25 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.669 to -0.05.

In the new studies, the users of computerized DSS/GDSS analyze decision tasks in more depth on average (mean corrected D = .471, K = 15, N = 851) than the users of no-DSS/GDSS (Table XXI, p. 350). Although the difference in depth of analysis is moderate in size, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.548 to 1.39), indicating that the difference in depth of *analysis between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. However, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 126 additional studies averaging null results that would have to exist to reduce the average corrected D from .471 to 0.05.*

The confidence intervals for second order sampling error of old and new studies are significantly different from each other (overlap $Z = 2.63 > Z_c = 1.645$), suggesting that those two subsets do affect depth of analysis differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS analyze decision tasks significantly in less depth in the old studies than in the new studies).

4.4.7.6 Decision Confidence (DSS/GDSS Versus No-DSS/GDSS)

In the old studies, the users of computerized DSS/GDSS have more decision confidence on average (mean corrected $D = .398$, $K = 8$, $N = 584$) than the users who have no decision support at all (Table XXI, p. 350). Although the difference in decision confidence across computerized DSS/GDSS and no-DSS/GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.280 to 1.076), suggesting that the average difference in decision confidence is not statistically different from zero at $p <$ 10. However, the fail-safe n shows that the difference is *large enough and reliable enough to be of practical significance. It would take only 56 missing studies averaging null findings that would have to exist to bring the average corrected D down from .398 to 0.05.*

In the new studies, the users of computerized DSS/GDSS have no more decision confidence on average (mean corrected $D = -.057$, $K = 8$, $N = 615$) than the users of no-DSS/GDSS (Table XXI, p. 350). In addition, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.920 to .813), indicating that the difference in decision confidence across DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n indicates that the difference is very small and has no practical significance. It would take only one additional study with null result that would have to exist to increase the average corrected D from -.057 to -0.05.

The confidence intervals for second order sampling error of old and new studies are not significantly different from each other (overlap $Z = 1.39 < Z_c = 1.645$), suggesting that those two subsets do not affect decision confidence differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly no different decision confidence in the old studies from the new studies).

4.4.7.7 Decision Confidence (DSS/GDSS Versus Manual DSS/GDSS)

There is only one old study that investigates decision confidence across computerized DSS/GDSS and manual DSS/GDSS (Table XXII, p. 353). The study shows that the users of computerized DSS/GDSS have significantly more decision confidence than the users of manual DSS/GDSS (d = .6454, N = 40).

In the new studies, the users of computerized DSS/GDSS have no more decision confidence on average (mean corrected D = .076, K = 8, N = 836) than manual DSS/GDSS (Table XXII, p. 353). In addition, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.588 to .729), indicating that the difference in decision confidence between DSS/GDSS and manual DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n indicates that the difference is very small and has no practical significance. It would take only 4 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.076 to 0.05.

Although there is a large difference in decision confidence across old and new studies when DSS/GDSS are compared to manual DSS/GDSS, there is no way of telling that the two subsets are significantly different, since there is only one study in the subset of old studies.

4.4.7.8 Satisfaction With Decision Process (DSS/GDSS Versus No-DSS/GDSS)

In the old studies, the users of computerized DSS/GDSS have slightly less satisfaction with decision process on average (mean corrected D = -.144, K = 2, N = 200) than the users who have no decision support at all (Table XXI, p. 350). Although the difference in satisfaction with decision process across computerized DSS/GDSS and no-DSS/GDSS is very small, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.144 to -.144), suggesting that the average difference in satisfaction with decision process is statistically different from zero at p < 10. However, the fail-safe n shows that the difference is very small and has no practical significance. It would take only 4 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.144 to -0.05.

In the new studies, the users of computerized DSS/GDSS have slightly less satisfaction with decision process on average (mean corrected D = -.147, K = 11, N = 1028) than the users of no-DSS/GDSS (Table XXI, p. 350). In addition to the small difference, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.06 to .792), indicating that the difference in satisfaction with decision process across DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n *indicates that the difference is very small and has weak practical significance. It would take only 21 additional study with null result that would have to exist to increase the average corrected D from -.147 to -0.05.*

The confidence intervals for second order sampling error of old and new studies are not significantly different from each other (overlap $Z = .01 < Z_c = 1.645$), suggesting that those two subsets do not affect satisfaction with decision process differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly no different satisfaction with decision process in the old studies from the new studies).

4.4.7.9 <u>Satisfaction With Decision Outcome (DSS/GDSS Versus Manual DSS/GDSS)</u>

There is only one old study that investigates the satisfaction with decision outcome across computerized DSS/GDSS and manual DSS/GDSS (Table XXII, p. 353). The study shows that there is more satisfaction with decision outcome among users of computerized DSS/GDSS than users of manual DSS/GDSS ($d = .7747$, $N = 40$).

In the new studies, the users of computerized DSS/GDSS have slightly less satisfaction with decision outcome on average (mean corrected $D = -.133$, $K = 4$, $N = 332$) than the users of manual decision support (Table XXII, p. 353). In addition to the small difference in satisfaction with *decision outcome across computerized DSS/GDSS and manual DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.482 to .216), suggesting that the average difference in satisfaction with decision outcome is not statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is very small and has no practical significance. It would take only 7 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.133 to -0.05.*

Although there is a large difference in satisfaction with decision outcome across old and new studies when DSS/GDSS are compared to manual DSS/GDSS, there is no way of telling that the two subsets are significantly different, since there is only one study in the subset of old studies.

4.4.7.10 Equality of Participation (DSS/GDSS Versus No-DSS/GDSS)

In the old studies, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected D = .460, K = 2, N = 100) than the users that have no decision support at all (Table XXI, p. 350). In addition to the moderate difference, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.436 to .436), suggesting that the average difference in equality of participation is statistically different from *zero at p < 10. However, the fail-safe n shows that the difference is not reliable and has only weak practical significance. It would take only 16 missing studies averaging null findings that would have to exist to bring the average corrected D down from .460 to 0.05.*

In the new studies, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected D = 1.24, K = 14, N = 1038) than the users of no-DSS/GDSS (Table XXI, p. 350). Although the difference in equality of participation is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.04 to 3.53), indicating that the difference in equality of participation between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. However, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 333 additional studies averaging null results that would have to exist to reduce the average corrected D from 1.24 to 0.05.

The confidence intervals for second order sampling error of old and new studies are significantly different from each other (overlap $Z = 1.74 > Z_c = 1.645$*), suggesting that those two subsets do affect equality of participation differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have statistically less equality of participation in the old studies than in the new studies).*

4.4.7.11 Degree of Decision Consensus (DSS/GDSS Versus No-DSS/GDSS)

In the old studies, the users of computerized DSS/GDSS produce lower degree of decision consensus on average (mean corrected D = -1.50, K = 2, N = 80) than the users that have no decision support at all (Table XXI, p. 350). In addition to the very large difference, the 80% confidence interval surrounding the mean uncorrected D does not include zero (1.42 to 1.42), suggesting that the average difference in degree of decision consensus is statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 58 missing studies averaging null findings that would have to exist to bring the average corrected D up from -1.50 to -0.05.

In the new studies, the users of computerized DSS/GDSS produce less degree of decision consensus on average (mean corrected D = -.525, K = 12, N = 965) than the users of no-DSS/GDSS (Table XXI, p. 350). Although the difference in degree of decision consensus is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.73 to .684), indicating that the difference in degree of decision consensus between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. However, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 114 additional studies averaging null results that would have to exist to increase the average corrected D from -.525 to -0.05.

The confidence intervals for second order sampling error of old and new studies are significantly different from each other (no overlap), suggesting that those two subsets do affect degree of decision consensus differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have statistically less degree of decision consensus in the old studies than in the new studies).

4.4.7.12 Degree of Decision Consensus (DSS/GDSS Versus Manual DSS/GDSS)

There is only one old study that investigates the degree of decision consensus across computerized DSS/GDSS and manual DSS/GDSS (Table XXII, p. 353). The study shows that there is lower degree of decision consensus among users of computerized DSS/GDSS than users of manual DSS/GDSS (d = -1.4142, N = 40).

In the new studies, the users of computerized DSS/GDSS have lower degree of decision consensus on average (mean corrected D = -.696, K = 2, N = 343) than the users of manual decision support (Table XXII, p. 353). In addition to the large difference in degree of decision consensus across computerized DSS/GDSS and manual DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D does *not include zero (-.787 to -.605), suggesting that the average difference in degree of decision consensus is statistically different from zero at p < 10. However, the fail-safe n shows that the difference has only moderate practical significance. It would take only 26 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.696 to -0.05.*

Although there is a large difference in degree of decision consensus across old and new studies when DSS/GDSS are compared to manual DSS/GDSS, there is no way of knowing that the two subsets are significantly different, since there is only one study in the subset of old studies.

4.4.7.13 Amount of Communication (DSS/GDSS Versus No-DSS/GDSS)

There is only one old study that investigates the amount of communication across computerized DSS/GDSS and no-DSS/GDSS (Table XXI, p. 350). The study shows that there is significantly less communication among users of computerized DSS/GDSS than users of no-DSS/GDSS (d = -2.8287, N = 40).

In the new studies, the users of computerized DSS/GDSS produce less communication on average (mean corrected D = -.344, K = 4, N = 270) than the users of no-decision support (Table XXI, p. 350). Although the difference in amount of communication across computerized DSS/GDSS and no-DSS/GDSS is moderate, the 80% confidence interval surrounding the *mean uncorrected D includes zero (-.792 to .103), suggesting that the average difference in amount of communication is not statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is small and has only weak practical significance. It would take only 24 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.344 to -0.05.*

Although there is a large difference in amount of communication across old and new studies when DSS/GDSS are compared to no-DSS/GDSS, there is no way of knowing that the two subsets are significantly different, since there is only one study in the subset of old studies.

4.4.7.14 Degree of Decision Improvement (DSS/GDSS Versus No-DSS/GDSS)

In the old studies, the users of computerized DSS/GDSS have no different degree of decision improvement on average (mean corrected D = -.0557, K = 2, N = 200) from the users that have no decision support at all (Table XXI, p. 350). In addition to the very small difference, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.23 to 1.117), suggesting that the average difference in degree of decision improvement is not statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is very small and has no practical significance. It would take only one missing study with null finding that would have to exist to bring the average corrected D up from -.0557 to -0.05.

In the new studies, the users of computerized DSS/GDSS have more degree of decision improvement on average (mean corrected $D = .944$, $K = 6$, $N = 745$) than the users of no-DSS/GDSS (Table XXI, p. 350). In addition to the fact that the difference in degree of decision improvement is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.475 to 1.03), indicating that the difference in degree of decision improvement between DSS/GDSS and no-DSS/GDSS is significantly different from zero. However, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 107 additional studies averaging null results that would have to exist to reduce the average corrected D from .944 to 0.05.

The confidence intervals for second order sampling error of old and new studies are not significantly different from each other (overlap $Z = 1.48 < Z_c = 1.645$), suggesting that those two subsets do not affect degree of decision improvement differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have statistically no different degree of decision improvement in the old studies from the new studies).

4.4.8 Group Size (Small Versus Large)

In this section, the moderator variable is tested by splitting the available studies for each dependent measure (i.e., decision quality) into studies that use small size groups (1-4) or studies that use large size groups (5 or more). For each dependent variable, the moderator variable is tested under two different independent variables (computerized decision aids versus no decision aids, and computerized decision aids versus manual decision aids). Some dependent variables are not applicable under the current moderator variable (Tables XXIII and XXIV, pp. 372, 376), if the population of the studies is homogeneous, there are only two or fewer studies available, or all the studies lie in one side of the moderator's subsets (i.e., all the available studies use large-size groups).

4.4.8.1 Decision Quality (DSS/GDSS Versus No-DSS/GDSS)

In the small group studies, the users of computerized DSS/GDSS produce more quality decisions on average (mean corrected D = .4536, K = 33, N = 4635) than the users that have no decision support at all (Table XXIII). Although the difference in quality of decisions produced by computerized DSS/GDSS and no-DSS/GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.118 to .981), suggesting that the average difference in decision quality is not statistically different from zero at

TABLE XXIII

THE EFFECTS OF THE MODERATOR VARIABLE OF GROUP SIZE USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Dec. Quality-Small Group	33	4635	.4536	.451	-.124, 1.03	13.82	.432	.952
Large Group	10	811	-.0624	.292	-.436, .311	41.68	-.0569	.912
Decision Time-Small	14	3102	.092	.781	-.908, 1.09	2.89	.092	1
Large	6	440	-.927	.748	-1.88, .0304	9.98	-.927	1
Depth of Analysis-Small	15	851	.471	.847	.613, 1.55	11.51	.421	.895
Large	2	200	-.669	.497	-1.305, -.032	14.84	-.669	1
Decision Confidence-Small	14	999	.279	.711	-.632, 1.18	11.30	.265	.949
Large	2	200	-.326	0	-.326, -.326	765.2	-.326	1
Satis w/Dec. Process-Small	6	698	.137	.476	-.472, .746	15.08	.1278	.932
Large	7	530	-.489	.730	-1.42, .446	9.48	-.489	1
Satisfaction w/Dec. Outcome	Not Applicable							
Equality of Participation-Small	8	593	.503	.968	-.736, 1.74	7.47	.435	.866
Large	8	545	1.703	2.17	-1.08, 4.49	1.95	1.557	.914
Degree of Decision Consensus-Small	4	370	-.068	.567	-.794, .657	12.08	-.068	1
Large	10	675	-.929	1.02	-2.23, .377	6.68	-.881	.948
Satisfaction Toward System-Small	5	624	.557	.801	-.468, 1.58	5.72	.518	.929
Large	1	90	d = -.3286					
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhib. Behavior-Small	2	87	.621	0	.621, .621	225.29	.621	1
Large	4	240	.019	.078	-.081, .119	91.83	.091	1
Amount of Communication-Small	2	90	-.578	.365	-1.04, -.110	42.09	-.578	1
Large	3	220	-.739	1.09	-2.12, .641	5.29	-.701	.949
Rate of Dec. Improvement-Small	6	745	.944	.272	.596, 1.29	42.74	.752	.797
Large	2	200	-.0557	.917	-1.23, 1.117	4.63	-.0557	1
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XXIII (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF GROUP SIZE USING DSS/GDSS VERSUS NO-DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs D's	Residual Var	Chi-SQ ($\chi^2_{K-1,.05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Over-Lap Z Value, Z_c=1.645	Fail Safe N
Dec. Quality-Small Group	-118, .981	.214	.029	.184	238.79	.274, .589	No	260
Large Group	-.397, .284	.121	.0506	.0708	23.9	-.213, .159		2
Decision Time-Small	-.908, 1.09	.629	.0182	.611	482.8	-.323, .508	2.64	12
Large	-1.88, .0304	.622	.062	.5601	60.1	-1.56, -.296		105
Depth of Analysis-Small	-.548, 1.39	.649	.0747	.5743	130.27	.01, .829	2.63	126
Large	-1.305, -.032	.290	.0431	.247	13.47	-1.41, .078		25
Decision Confidence-Small	-.600, 1.13	.5147	.0582	.4566	123.8	-.111, .641	No	64
Large	-.326, -.326	.0054	.0414	-.0359	.261	-.428, -.224		11
Satis w/Dec. Process-Small	-.441, .696	.232	.035	.197	39.77	-.257, .513	1.79	10
Large	-1.42, .446	.589	.0559	.533	73.81	-1.06, .0798		61
Satisfaction w/Dec. Outcome	Not Applicable							
Equality of Participation-Small	-.638, 1.509	.76	.0567	.703	107.1	-.168, 1.039	1.55	72
Large	-.986, 4.10	4.03	.0788	3.95	408.8	.166, 2.95		264
Degree of Decision Consensus-Small	-.794, .657	.366	.044	.322	33.10	-.661, .525	1.97	1
Large	-2.12, .357	1.00	.067	.937	149.8	-1.50, -.260		176
Satisfaction Toward System-Small	-.435, 1.47	.588	.034	.555	87.39	-.154, 1.19		51
Degree of Decision Consistency	Not Applicable							
Amount of Discussion Conflict	Not Applicable							
Degree of Uninhibited Behav-Small	.621, .621	.0448	.101	-.056	.888	.327, .914	No	29
Large	-.081, .119	.0751	.069	.0061	4.35	-.249, .288		$D_K < D_C$
Amount of Communication-Small	-1.04, -.110	.230	.097	.133	4.75	-1.24, .087	.23	21
Large	-2.10, .608	1.10	.059	1.04	55.66	-1.89, .489		41
Rate of Dec. Improvement-Small	.475, 1.03	.082	.0351	.0469	14.04	.523, .982	1.48	107
Large	-1.23, 1.117	.881	.0408	.840	43.15	-1.36, 1.24		1
Degree of Group Cohesiveness	Not Applicable							
Amount of Task-Oriented Behavior	Not Applicable							

p < 10. However, the fail-safe n shows that the difference is large enough reliable enough to be of any practical significance. It would take 260 missing studies averaging null findings that would have to exist to bring the average corrected D down from .4536 to 0.05.

In the large-group studies, the users of computerized DSS/GDSS produce no different quality decisions on average (mean corrected D = -.0624, K = 10, N = 811) than the users of no-DSS/GDSS (Table XXIII, p. 371). In addition to the fact that the difference in decision quality is very small and not far from zero, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.397 to .284), indicating that the difference in decision quality between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n indicates that the difference is very small and has no practical significance. It would take only two additional studies averaging null results that would have to exist to increase the average corrected D from -.0624 to -0.05.

The confidence intervals for second order sampling error of small and large-group studies are significantly different from each other (no overlap), suggesting that those two subsets do affect decision quality differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS produce statistically more quality decisions in the small group studies than in the large-group studies).

4.4.8.2 Decision Quality (DSS/GDSS Versus Manual DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .772, K = 23, N = 1326) than the users of manual decision support (Table XXIV). Although the difference in decision quality is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.369 to 1.74), suggesting that the difference in decision quality across computerized and manual DSS/GDSS is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 332 missing studies averaging null findings that would have to exist to bring the average corrected D down from .772 to 0.05.

In the large-group studies, the users of computerized DSS/GDSS produce higher quality decisions on average (mean corrected D = .2216, K = 4, N = 573) than manual DSS/GDSS (Table XXIV). Although the difference in decision quality is small, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.195 to .195), indicating that the difference in decision quality between DSS/GDSS and manual DSS/GDSS is significantly different from zero. However, the fail-safe n indicates that the difference is small and has weak practical significance. It would take

TABLE XXIV

THE EFFECTS OF THE MODERATOR VARIABLE OF GROUP SIZE USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	No. of D's	Total N	Mean Corrected D's	SD of Corrected D's	Credibility Intervals (80%)	% Var due to Sampling Error	Mean Uncorrected D's	Mean SQR R_{YY}
Dec. Quality-Small Group	23	1326	.772	.928	-.416, 1.96	10.12	.683	.885
Large Group	4	573	.2216	0	.2216, .2216	103.47	.195	.881
Decision Time-Small	10	542	.438	1.227	-1.13, 2.01	4.96	.438	1
Large	1	427	d = -.8660					
Depth of Analysis-Small	11	616	.261	.582	-.483, 1.01	18.08	.261	1
Large	4	604	.388	.309	-.0086, .784	24.01	.368	.950
Decision Confidence-Small	8	471	-.035	.730	-.970, .900	13.29	-.032	.927
Large	1	405	d = .2470					
Satis w/Dec. Process-Small	2	28	-.058	0	-.048, -.058	14715	-.053	.911
Large	3	144	.694	.726	-.235, 1.62	14.90	.694	1
Satisfaction w/Dec. Outcome	Not Applicable							
Equality of Participation-Small	4	394	.2747	.2535	-.0498, .599	44.12	.249	.907
Large	3	183	-.384	.135	-.557, -.211	78.98	-.384	1
Degree of Decision Consensus-Small	1	188	d = -.5386					
Large	2	195	-.995	0	-.995, -.995	103.99	-.995	1
Satisfaction Toward System	Not Applicable							
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhib. Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Dec. Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

TABLE XXIV (CONTINUED)

THE EFFECTS OF THE MODERATOR VARIABLE OF GROUP SIZE USING DSS/GDSS VERSUS MANUAL DSS/GDSS

Dependent Variables	Confidence Intervals (80%)	Var of Obs D's	Sampling Error of Obs D's	Residual Var	Chi-SQ ($\chi^2_{K-1,\ .05}$)	Confidence Interval for 2nd Order Sampling Error (95%)	Overlap Z Value, Z_C=1.645	Fail Safe N
Dec. Quality-Small Group	-.369, 174	.752	.076	.676	227.29	.329, 1.04	2.77	332
Large Group	.195, .195	.0275	.028	-.00095	3.86	.0328, .358		14
Decision Time-Small	-1.13, 2.01	1.58	.078	1.506	201.8	-.342, 1.219		78
Large								
Depth of Analysis-Small	-.483, 1.01	.413	.0748	.339	60.83	-.118, .641	.49	46
Large	-.0081, .745	.114	.027	.0866	16.69	.0377, .699		27
Decision Confidence-Small	-.899, .835	.529	.0703	.459	60.17	-.536, .472		$D_K < D_C$
Large								
Satis w/Dec. Process-Small	-.053, -.053	.0023	.338	-.335	.0136	-.1197, .013	1.65	1
Large	-.235, 1.62	.619	.092	.527	20.13	-.196, 1.58		39
Satisfaction w/Dec. Outcome	Not Applicable							
Equality of Participation-Small	.0451, .5436	.0947	.0418	.0529	9.06	-.0523, .5508	2.87	18
Large	-.557, -.211	.087	.0691	.0184	3.798	-.719, -.0497		20
Degree of Decision Consensus-Small								
Large	-.995, -.995	.045	.047	-.0018	1.92	-1.29, -.700		38
Satisfaction Toward System	Not Applicable							
Degree of Decision Consistency	No Study Available							
Amount of Discussion Conflict	No Study Available							
Degree of Uninhib. Behavior	No Study Available							
Amount of Communication	Not Applicable							
Rate of Dec. Improvement	No Study Available							
Degree of Group Cohesiveness	No Study Available							
Amount of Task-Oriented Behavior	Not Applicable							

only 14 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.2216 to 0.05.

The confidence intervals for second order sampling error of small and large-group studies are significantly different from each other (overlap $Z = 2.27 > Z_c = 1.645$*), suggesting that those two subsets do affect decision quality differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS produce statistically more quality decisions in the small-group studies than in the large-group studies).*

4.4.8.3 <u>Decision Time (DSS/GDSS Versus No-DSS/GDSS)</u>

In the small-group studies, the users of computerized DSS/GDSS take slightly less decision time on average (mean corrected $D = .092$, $K = 14$, $N = 3102$*) than the users that have no decision support at all (Table XXIII, p. 372). In addition to the fact that the difference in decision time across computerized DSS/GDSS and no-DSS/GDSS is small, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.908 to 1.09), suggesting that the average difference in decision time is not statistically different from zero at* $p < 10$*. Moreover, the fail-safe n shows that the difference is small and has no practical significance. It would take only 12 missing studies averaging null findings that would have to exist to bring the average corrected D down from .092 to 0.05.*

In the large-group studies, the users of computerized DSS/GDSS take more decision time on average (mean corrected D = -.927, K = 6, N = 440) than the users of no-DSS/GDSS (Table XXIII, p. 372). Although the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.88 to .0304), it is below zero for more than 98% of the time, indicating that the difference in decision time between DSS/GDSS and no-DSS/GDSS is significantly different from zero. Moreover, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 105 additional studies averaging null results that would have to exist to increase the average corrected D from -.927 to -0.05.

The confidence intervals for second order sampling error of small and large-group studies are significantly different from each other (overlap $Z = 2.64 > Z_c = 1.645$), suggesting that those two subsets do affect decision time differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS statistically take less decision time in the small group studies than in the large-group studies).

4.4.8.4 Decision Time (DSS/GDSS Versus Manual DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS take less decision time on average (mean corrected D = .438, K = 10, N = 542) than the users of manual decision *support (Table XXIV, p. 376). Although the difference in decision time is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.13 to 2.01), suggesting that the difference in decision time across computerized and manual DSS/GDSS is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 78 missing studies averaging null findings that would have to exist to bring the average corrected D down from .438 to 0.05.*

There is only one large-group study that investigates decision time across computerized DSS/GDSS and manual DSS/GDSS (Table XXIV, p. 376). The study shows that the users of computerized DSS/GDSS take significantly more decision time than the users of manual DSS/GDSS (d = -.8660, N = 427).

Although there is a large difference in decision time across small and large-group studies when DSS/GDSS are compared to manual DSS/GDSS, there is no way of knowing that the two subsets are significantly different, since there is only one study in the subset of large-group studies.

4.4.8.5 Depth of Analysis (DSS/GDSS Versus No-DSS/GDSS)

In the small-group studies, the users of computerized

DSS/GDSS analyze decision tasks in more depth on average (mean corrected D = .471, K = 15, N = 851) than the users that have no decision support at all (Table XXIII, p. 372). Although the difference in depth of analysis across computerized DSS/GDSS and no-DSS/GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.548 to 1.39), suggesting that the average difference in depth of analysis is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 126 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.471 to -0.05.

In the large-group studies, the users of computerized DSS/GDSS analyze decision tasks in less depth on average (mean corrected D = -.669, K = 2, N = 200) than the users of no-DSS/GDSS (Table XXIII, p. 372). In addition to the fact that the difference in depth of analysis is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-1.305 to -.032), indicating that the difference in depth of analysis between DSS/GDSS and no-DSS/GDSS is significantly different from zero. However, the fail-safe n indicates that the difference has only weak practical significance. It would take only 25 additional studies averaging null results that would have to exist to *increase the average corrected D from -.669 to -0.05.*

The confidence intervals for second order sampling error of small and large-group studies are significantly different from each other (overlap $Z = 2.63 > Z_c = 1.645$), suggesting that those two subsets do affect depth of analysis differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS statistically analyze decision tasks in more depth, in the small-group studies than in the large-group studies).

4.4.8.6 Depth of Analysis (DSS/GDSS Versus Manual DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS analyze decision tasks in more depth on average (mean corrected D = .261, K = 11, N = 616) than the users of manual decision support (Table XXIV, p. 376). Although the difference in depth of analysis is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.483 to 1.01), suggesting that the difference in depth of analysis across computerized and manual DSS/GDSS is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 46 missing studies averaging null findings that would have to exist to bring the average corrected D down from .261 to 0.05.

In the large-group studies, the users of computerized DSS/GDSS analyze decision tasks in more depth on average (mean corrected $D = .388$, $K = 4$, $N = 604$) than manual DSS/GDSS (Table XXIV, p. 376). Although the 80% confidence interval surrounding the mean uncorrected D includes zero (-.0081 to .745), it is positive almost 99% of the time, indicating that the difference in depth of analysis between DSS/GDSS and manual DSS/GDSS is significantly different from zero. However, the fail-safe n indicates that the difference is small and has only moderate practical significance. It would take only 27 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.388 to 0.05.

The confidence intervals for second order sampling error of small and large-group studies are not significantly different from each other (overlap $Z = .49 < Z_c = 1.645$), suggesting that those two subsets do not affect depth of analysis differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS do not significantly analyze decision tasks in more depth, in the small-group studies than in the large-group studies).

4.4.8.7 Decision Confidence (DSS/GDSS Versus No-DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS have more decision confidence on average (mean *corrected D = .279, K = 14, N = 999) than the users that have no decision support at all (Table XXIII, p. 372). Although the difference in decision confidence across computerized DSS/GDSS and no-DSS/GDSS is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.600 to 1.13), suggesting that the average difference in decision confidence is not statistically different from zero at p < 10. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 64 missing studies averaging null findings that would have to exist to bring the average corrected D down from .279 to 0.05.*

In the large-group studies, the users of computerized DSS/GDSS have less decision confidence on average (mean corrected D = -.326, K = 2, N = 200) than the users of no-DSS/GDSS (Table XXIII, p. 372). In addition to the fact that the difference in decision confidence is moderate, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.326 to -.326), indicating that the difference in decision confidence between DSS/GDSS and no-DSS/GDSS is significantly different from zero. However, the fail-safe n indicates that the difference has only weak practical significance. It would take only 11 additional studies averaging null results that would have to exist to increase the average corrected D from -.326 to -0.05.

The confidence intervals for second order sampling error of small and large-group studies are significantly different from each other (no overlap), suggesting that those two subsets do affect decision confidence differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly more decision confidence in the small-group studies than in the large-group studies).

4.4.8.8 Decision Confidence (DSS/GDSS Versus Manual DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS do not have different decision confidence on average (mean corrected D = -.035, K = 8, N = 471) from the users of manual decision support (Table XXIV, p. 376). In addition to the fact that the difference in decision confidence is very small and not far from zero, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.899 to .835), suggesting that the difference in decision confidence across computerized and manual DSS/GDSS is not statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is negligible and has no practical significance. It would take no more missing studies averaging null findings that would have to exist to bring the average corrected D to -0.05, since the average corrected D is already above that value.

There is only one large-group study that investigates decision confidence across computerized DSS/GDSS and manual DSS/GDSS (Table XXIV, p. 376). The study shows that the users of computerized DSS/GDSS have more decision confidence than the users of manual DSS/GDSS ($d = .2470$, $N = 405$).

Although there is a moderate difference in decision confidence across small and large-group studies when DSS/GDSS are compared to manual DSS/GDSS, there is no way of knowing that the two subsets are significantly different, since there is only one study in the subset of large-group studies.

4.4.8.9 Satisfaction With the Decision Process (DSS/GDSS Versus No-DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS have slightly more satisfaction with decision process on average (mean corrected $D = .137$, $K = 6$, $N = 698$) than the users that have no decision support at all (Table XXIII, p. 372). In addition to the small difference in satisfaction with decision process across computerized DSS/GDSS and no-DSS/GDSS, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.441 to .696), suggesting that the average difference in satisfaction with decision process is not statistically different from zero at $p < 10$. Moreover, the fail-safe n shows that the difference is small and has no practical *significance. It would take only 10 missing studies averaging null findings that would have to exist to bring the average corrected D down from .137 to 0.05.*

In the large-group studies, the users of computerized DSS/GDSS have less satisfaction with decision process on average (mean corrected D = -.489, K = 7, N = 530) than the users of no-DSS/GDSS (Table XXIII, p. 372). Although the difference in satisfaction with decision process is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.42 to .446), indicating that the difference in satisfaction with decision process between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. However, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 61 additional studies averaging null results that would have to exist to increase the average corrected D from -.489 to -0.05.

The confidence intervals for second order sampling error of small and large-group studies are significantly different from each other (overlap $Z = 1.79 > Z_c = 1.645$*), suggesting that those two subsets do affect satisfaction with decision process differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly more satisfaction with decision process in the small-group studies than in the large-group studies).*

4.4.8.10 Satisfaction With Decision Process (DSS/GDSS Versus Manual DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS have no more satisfaction with decision process on average (mean corrected D = -.058, K = 2, N = 28) than the users of manual decision support (Table XXIV, p. 376). Although the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.053 to -.053), the difference in satisfaction with decision process is very small and not far from zero, suggesting that the difference in satisfaction with decision process across computerized and manual DSS/GDSS is not statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is very small and has no practical significance. It would take only one missing study with null finding that would have to exist to bring the average corrected D up from -.058 to -.05.

In the large-group studies, the users of computerized DSS/GDSS have more satisfaction with decision process on average (mean corrected D = .694, K = 3, N = 144) than manual DSS/GDSS (Table XXIV, p. 376). Although the difference in satisfaction with decision process is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.235 to 1.62), indicating that the difference in satisfaction with decision process between DSS/GDSS and manual DSS/GDSS is not significantly different *from zero. Moreover, the fail-safe n indicates that the difference is not reliable enough and has only moderate practical significance. It would take only 39 additional studies averaging null results that would have to exist to reduce the average corrected D from 0.694 to 0.05.*

The confidence intervals for second order sampling error of small and large-group studies are significantly different from each other (overlap $Z = 1.65 > Z_c = 1.645$), suggesting that those two subsets do affect satisfaction with decision process differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS have significantly less satisfaction with decision process in the small-group studies than in the large-group studies).

4.4.8.11 *Equality of Participation (DSS/GDSS Versus No-DSS/GDSS)*

In the small-group studies, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected $D = .503$, $K = 8$, $N = 593$) than the users that have no decision support at all (Table XXIII, p. 372). Although the difference in equality of participation across computerized DSS/GDSS and no-DSS/GDSS is moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.638 to 1.509), suggesting that the average difference in equality of participation is not statistically different from zero at $p < 10$. However, the fail-safe n *shows that the difference is large enough and reliable enough to be of practical significance. It would take 72 missing studies averaging null findings that would have to exist to bring the average corrected D down from .503 to 0.05.*

In the large-group studies, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected D = 1.703, K = 8, N = 545) than the users of no-DSS/GDSS (Table XXIII, p. 372). Although the difference in equality of participation is very large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.986 to 4.10), indicating that the difference in equality of participation between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. However, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 264 additional studies averaging null results that would have to exist to reduce the average corrected D from 1.703 to 0.05.

The confidence intervals for second order sampling error of small and large-group studies are not significantly different from each other (overlap $Z = 1.55 < Z_c = 1.645$*), suggesting that those two subsets do not affect equality of participation differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS do not have significantly less equality of participation in the small-group studies than in* *the large-group studies).*

4.4.8.12 Equality of Participation (DSS/GDSS Versus Manual DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS have more equality of participation on average (mean corrected D = .2747, K = 4, N = 394) than the users of manual decision support (Table XXIV, p. 376). Although the difference in equality of participation is small to moderate, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.0451 to .5436), suggesting that the difference in equality of participation across computerized and manual DSS/GDSS is not statistically different from zero at p < 10. Moreover, the fail-safe n shows that the difference is small and has only weak practical significance. It would take only 18 missing studies averaging null findings that would have to exist to bring the average corrected D down from .2747 to .05.

In the large-group studies, the users of computerized DSS/GDSS have less equality of participation on average (mean corrected D = -.384, K = 3, N = 183) than manual DSS/GDSS (Table XXIV, p. 376). In addition to the fact that the difference in equality of participation is moderate, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.557 to -.210), indicating that the difference in equality of participation *between DSS/GDSS and manual DSS/GDSS is significantly different from zero. However, the fail-safe n indicates that the difference is relatively small and has only weak practical significance. It would take only 20 additional studies averaging null results that would have to exist to increase the average corrected D from -.384 to -.05.*

The confidence intervals for second order sampling error of small and large-group studies are significantly different from each other (overlap $Z = 2.87 > Z_c = 1.645$), suggesting that those two subsets do affect equality of participation differently (the users of DSS/GDSS as opposed to users of manual DSS/GDSS have significantly more equality of participation in the small-group studies than in the large- group studies).

4.4.8.13 Degree of Decision Consensus (DSS/GDSS Versus No-DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS have no higher degree of decision consensus on average (mean corrected D = -.068, K = 4, N = 370) than the users that have no decision support at all (Table XXIII, p. 372). In addition to the fact that the difference in degree of decision consensus across computerized DSS/GDSS and no-DSS/GDSS is very small and not far from zero, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.794 to .657), suggesting that the average *difference in degree of decision consensus is not statistically different from zero at $p < 10$. However, the fail-safe n shows that the difference is very small and has no practical significance. It would take only one missing study with null finding that would have to exist to bring the average corrected D up from -.068 to -.05.*

In the large-group studies, the users of computerized DSS/GDSS have lower degree of decision consensus on average (mean corrected D = -.929, K = 10, N = 545) than the users of no-DSS/GDSS (Table XXIII, p. 372). Although the difference in degree of decision consensus is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-2.12 to .357), indicating that the difference in degree of decision consensus between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. However, the fail-safe n indicates that the difference is large enough and reliable enough to be of practical significance. It would take 176 additional studies averaging null results that would have to exist to increase the average corrected D from -.929 to -.05.

The confidence intervals for second order sampling error of small and large-group studies are significantly different from each other (overlap $Z = 1.97 > Z_c = 1.645$), suggesting that those two subsets do affect degree of decision consensus differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly lower *degree of decision consensus in the small group studies than in the large-group studies).*

4.4.8.14 Degree of Decision Consensus DSS/GDSS Versus Manual DSS/GDSS)

There is only one small group study that investigates degree of decision consensus across computerized DSS/GDSS and manual DSS/GDSS (Table XXIV, p. 376). The study shows that the users of computerized DSS/GDSS have significantly lower degree of decision consensus than the users of manual DSS/GDSS ($d = -.5386$, $N = 188$).

In the large-group studies, the users of computerized DSS/GDSS have lower degree of decision consensus on average (mean corrected $D = -.995$, $K = 2$, $N = 195$) than the users of manual decision support (Table XXIV, p. 376). In addition to the fact that the difference in degree of decision consensus is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-.995 to -.995), suggesting that the difference in degree of decision consensus across computerized and manual DSS/GDSS is statistically different from zero at $p < 10$. However, the fail-safe n shows that the difference is not reliable enough be of strong practical significance. It would take only 38 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.995 to -.05.

Although there is a large difference in degree of decision consensus across small and large-group studies when DSS/GDSS are compared to manual DSS/GDSS, there is no way of knowing that the two subsets are significantly different, since there is only one study in the subset of small-group studies.

4.4.8.15 <u>Satisfaction Toward the System (DSS/GDSS Versus No-DSS/GDSS)</u>

In the small-group studies, the users of computerized DSS/GDSS have more satisfaction toward the system on average (mean corrected $D = .557$, $K = 5$, $N = 624$) than the users of no-decision support (Table XXIII, p. 372). Although the difference in satisfaction toward the system is moderate to large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.435 to 1.47), suggesting that the difference in satisfaction toward the system across computerized and no-DSS/GDSS is not statistically different from zero at $p < 10$. However, the fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 51 missing studies averaging null findings that would have to exist to bring the average corrected D down from .557 to 0.05.

There is only one large-group study that investigates satisfaction toward the system across computerized DSS/GDSS and no-DSS/GDSS (Table XXIII, p. 372). The study shows that *the users of computerized DSS/GDSS have less satisfaction toward the system than the users of no-DSS/GDSS ($d = -.3286$, $N = 90$).*

Although there is a large difference in satisfaction toward the system across small and large-group studies when DSS/GDSS are compared to no-DSS/GDSS, there is no way of knowing that the two subsets are significantly different, since there is only one study in the subset of large-group studies.

4.4.8.16 Degree of Uninhibited Behavior (DSS/GDSS Versus No-DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS produce higher degree of uninhibited behavior on average (mean corrected $D = .621$, $K = 2$, $N = 87$) than the users that have no decision support at all (Table XXIII, p. 372). In addition to the fact that the difference in degree of uninhibited behavior produced by computerized DSS/GDSS and no-DSS/GDSS is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.621 to .621), suggesting that the average difference in degree of uninhibited behavior is statistically different from zero at $p < 10$. However, the fail-safe n shows that the difference is not reliable enough and has only weak practical significance. It would take 29 missing studies averaging null findings that would have to exist to bring *the average corrected D down from .621 to .05.*

In the large-group studies, the users of computerized DSS/GDSS produce no different degree of uninhibited behavior on average (mean corrected D = .019, K = 4, N = 240) from the users of no-DSS/GDSS (Table XXIII, p. 372). In addition to the fact that the difference in degree of uninhibited behavior is very small and not far from zero, the 80% confidence interval surrounding the mean uncorrected D includes zero (-.081 to .119), indicating that the difference in degree of uninhibited behavior between DSS/GDSS and no-DSS/GDSS is not significantly different from zero. Moreover, the fail-safe n indicates that the difference is very small and has no practical significance. It would take no additional studies averaging null results that would have to exist to bring the average corrected D to 0.05, since the average corrected D is already below that value.

The confidence intervals for second order sampling error of small and large-group studies are significantly different from each other (no overlap), suggesting that those two subsets do affect degree of uninhibited behavior differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS produce statistically higher degree of uninhibited behavior in the small-group studies than in the large-group studies).

4.4.8.17 Amount of Communication (DSS/GDSS Versus No-DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS have less communication on average (mean corrected $D = -.578$, $K = 2$, $N = 90$) than the users of no-decision support (Table XXIII, p. 372). In addition to the fact that the difference in amount of communication is moderate to large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (-1.04 to -.110), suggesting that the difference in amount of communication across computerized and no-DSS/GDSS is statistically different from zero at $p < 10$. However, the fail-safe n shows that the difference is not reliable enough and has only weak practical significance. It would take only 21 missing studies averaging null findings that would have to exist to bring the average corrected D up from -.578 to -.05.

In the large-group studies, the users of computerized DSS/GDSS have less communication on average (mean corrected $D = -.739$, $K = 3$, $N = 220$) than the users of no-DSS/GDSS (Table XXIII, p. 372). Although the difference in amount of communication is large, the 80% confidence interval surrounding the mean uncorrected D includes zero (-2.10 to .608), indicating that the difference in amount of communication between DSS/GDSS and no-DSS/GDSS is not statistically different from zero. However, the fail-safe n *indicates that the difference is large enough and reliable enough to be of moderate practical significance. It would take 41 additional studies averaging null results that would have to exist to increase the average corrected D from -.739 to -.05.*

The confidence intervals for second order sampling error of small and large-group studies are not significantly different from each other (overlap $Z = .23 < Z_c = 1.645$), suggesting that those two subsets do not affect amount of communication differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly no different amount of communication in the small-group studies from the large-group studies).

4.4.8.18 Degree of Decision Improvement (DSS/GDSS Versus No-DSS/GDSS)

In the small-group studies, the users of computerized DSS/GDSS have higher degree of decision improvement on average (mean corrected $D = .944$, $K = 6$, $N = 745$) than the users of no-decision support (Table XXIII, p. 372). In addition to the fact that the difference in degree of decision improvement is large, the 80% confidence interval surrounding the mean uncorrected D does not include zero (.475 to 1.03), suggesting that the difference in degree of decision improvement across computerized and no-DSS/GDSS is statistically different from zero at $p < 10$. Moreover, the *fail-safe n shows that the difference is large enough and reliable enough to be of practical significance. It would take 107 missing studies averaging null findings that would have to exist to bring the average corrected D down from .944 to .05.*

In the large-group studies, the users of computerized DSS/GDSS have no different degree of decision improvement on average (mean corrected $D = -.0557$, $K = 2$, $N = 200$) from the users of no-DSS/GDSS (Table XXIII, p. 372). In addition to the fact that the difference in degree of decision improvement is very small and not far from zero, the 80% confidence interval surrounding the mean uncorrected D includes zero (-1.23 to 1.117), indicating that the difference in degree of decision improvement between DSS/GDSS and no-DSS/GDSS is not statistically different from zero. Moreover, the fail-safe n indicates that the difference is very small and has no practical significance. It would take one additional study with null result that would have to exist to increase the average corrected D from -.0557 to -.05.

The confidence intervals for second order sampling error of small and large-group studies are not significantly different from each other (overlap $Z = 1.48 < Z_c = 1.645$), suggesting that those two subsets do not affect degree of decision improvement differently (the users of DSS/GDSS as opposed to users of no-DSS/GDSS have significantly no *different degree of decision improvement in the small-group studies from the large-group studies). However, the magnitude of the difference is large enough to suggest that the decision quality is improving at a higher rate among small-size groups than among large-size groups.*

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR FUTURE RESEARCH

5.1 Summary

This research tries to quantitatively integrate the findings across studies regarding the effectiveness and efficiency of DSS/GDSS use in decision making. The Schmidt-Hunter meta-analysis technique is used as a tool to accomplish this task. The measures of DSS/GDSS impacts on decision making are those associated with decision making outcome, i.e., decision quality, or those associated with decision making process, i.e., depth of analysis. Several moderator variables (i.e., task difficulty) were tested to see if they have moderating effects on each of the dependent measures. Table XXV (p. 404) shows the summary results of the main effects of the independent variables, and Tables XXVI to XXXIII show the summary results of the effects of the moderator variables. The hypotheses are stated in the form of D > 0 (or D < 0), meaning that the average corrected D of a particular hypothesis is greater (or less) than zero (indicating a positive or negative effect). The discussion of these tables will be presented below.

5.1.1 The Main Effects of the Independent Variables

Table XXV represents a summary of the main effects of the two independent variables which are discussed in Chapter IV. This summary table presents results of testing the hypotheses presented in Chapter II, and integrates the analyses to arrive at a final outcome.

The confidence in the results are determined by the number of studies in each cell. A small number of studies (i.e., $n \leq 10$) will provide only preliminary results that are subject to change. If the number of studies are between 11 and 40, then there are enough studies to form tentative conclusions. Beyond 40 studies, there are enough studies to have confidence in the results. In addition, the value of the "fail-safe n" indicates for a particular hypothesis how many additional studies averaging null results it would take to reduce the mean corrected D to the level of insignificance, 0.05.

It has been hypothesized that the users of computerized DSS/GDSS are more effective than the users with no decision support whatsoever. In terms of decision making efficiency, it has been hypothesized in some measures (i.e., equality of participation and amount of task-oriented behavior) that the users of computerized DSS/GDSS are more efficient than the users of no decision support, but less efficient with regard to decision time. Table XXV (pp. 404-405), verifies that the majority of the hypotheses are accepted. The users of

TABLE XXV

SUMMARY RESULTS OF THE MAIN EFFECTS OF THE INDEPENDENT VARIABLES

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Strength of Effect
DSS/GDSS vs. no-DSS/GDSS	Decision quality	$D > 0$	Accept	No	Moderate
	Decision time	$D < 0$	Reject	No	No Effect
	Depth of analysis	$D > 0$	Accept	No	Moderate
	Decision confidence	$D > 0$	Accept	No	Weak
	Satisfaction w/decision process	$D > 0$	Reject	Yes	Weak
	Satisfaction w/decision outcome	$D > 0$	Accept	No	Moderate
	Equality of participation	$D > 0$	Accept	No	Strong
	Degree of decision consensus	$D > 0$	Reject	Yes	Strong
	Satisfaction toward the system	$D > 0$	Accept	No	Moderate
	Amount of discussion conflict	$D > 0$	Reject	Yes	Moderate
	Degree of uninhibited behavior	$D > 0$	Reject	Yes	Weak
	Amount of communication	$D > 0$	Reject	Yes	Strong
	Rate of decision improvement	$D > 0$	Accept	No	Strong

TABLE XXV (CONTINUED)

SUMMARY RESULTS OF THE MAIN EFFECTS OF THE INDEPENDENT VARIABLES

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Strength of Effect
	Degree of group cohesiveness	$D > 0$	Reject	Yes	Moderate
	Amount of task-oriented behavior	$D > 0$	Reject	No	No Effect
DSS/GDSS vs. manual DSS/GDSS	Decision quality	$D > 0$	Accept	No	Strong
	Decision time	$D < 0$	Accept	No	Weak
	Depth of analysis	$D > 0$	Accept	No	Moderate
	Decision confidence	$D > 0$	Reject	No	Weak
	Satisfaction w/decision process	$D > 0$	Accept	No	Strong
	Satisfaction w/decision outcome	$D > 0$	Reject	No	No Effect
	Equality of participation	$D > 0$	Reject	No	No Effect
	Degree of decision consensus	$D > 0$	Reject	Yes	Strong
	Satisfaction toward the system	$D > 0$	Accept	No	Strong
	Amount of communication	$D > 0$	Reject	Yes	Weak
	Amount of task-oriented behavior	$D > 0$	Reject	No	Weak

[a]Only the applicable dependent variables are included
[b]D is the average corrected D

DSS/GDSS produce significantly higher quality decisions than no-DSS/GDSS. Although the difference is moderate, it is significant and not subject to change (n = 43, fsn = 285). It would take 285 additional studies averaging null results to reduce the average corrected D to 0.05. The users of DSS/GDSS are not less efficient in terms of decision time than the users of no-DSS/GDSS. This result is tentative since it is based on relatively a small number of studies (n = 20). Individuals using DSS/GDSS engage in moderately more depth of analysis than the users of no-DSS/GDSS. Although the results are tentative (n = 17), the difference is not subject to change, at least, in the near future (fsn = 64). The users of DSS/GDSS have slightly more decision confidence than the users of no-DSS/GDSS. In spite of the small size of the mean corrected D, and the limited number of studies (n = 16), it would take 37 additional studies averaging null results to reduce the effect size to the level of insignificance. Along with the results of decision confidence, the users of DSS/GDSS have significantly more satisfaction with their decisions and more satisfaction toward the system than the users of no-DSS/GDSS. Both results are preliminary and subject to change ($n \leq 10$). However, it would take relatively a considerable number of studies (fsn = 39 and 45 respectively) averaging null results to make the moderate differences insignificant. Consistent with the results of decision quality, the users *of DSS/GDSS have significantly higher rate of decision improvement than the users of no-DSS/GDSS. Although the result is preliminary (n = 8), it is not likely to change in the coming few years (fsn = 109). Groups using GDSS are not more task-oriented than the users of no-GDSS. However, this result is preliminary (n = 2), and is subject to change. More investigative studies in the future are believed to find out that GDSS users are more task-oriented than the no-GDSS users.*

It was expected that the degree of decision consensus, the amount of discussion conflict, the degree of uninhibited behavior, and the degree of group cohesiveness would relate negatively to the use of GDSS. Results show a tradeoff between the increase in effectiveness and efficiency of decision making on one side and the degradation of social and psychological relationships of the groups and individuals of GDSS users on the other side.

Since there is more depth of analysis and more equality of participation among GDSS users, it is natural to find that the users of GDSS have significantly less degree of decision consensus and more discussion conflict than the users of no-GDSS. Moreover, most of the GDSS systems provide for anonymity in discussion which gives encourages expression existing different and conflicting opinions among the group members. Although the difference in degree of decision consensus is tentative (n = 14), it is large and is *highly unlikely to be changed to insignificance level in the near future (fsn = 162). The result of amount of task-oriented behavior is preliminary and is subject to change (n = 2). Only 9 additional studies averaging null results would reduce the difference to the level of insignificance. Due to anonymity and lack of face-to-face communication, the GDSS users have significantly more uninhibited behavior than the users of no-GDSS. However, this result is preliminary and is subject to change (n = 6). It is possible that the difference will become insignificant in the near future. (fsn = 15).*

The groups using GDSS are significantly less cohesive than the groups using no-GDSS. However, the result is preliminary and is subject to change (n = 2). Despite the moderate difference, it is not unlikely to be reduced to the level of insignificance (fsn = 14). Due to the reduction of verbal communication among GDSS groups, and the relative ease of talking rather than typing, there is significantly less communication (both verbal and non-verbal) among GDSS groups than the groups of no-GDSS. The result is preliminary and is subject to change (n = 5). However, the difference is large enough to keep the same direction if not the same magnitude (fsn = 65). The users of DSS/GDSS have slightly less satisfaction with decision process than the users of no-DSS/GDSS. However, the result is tentative (n = 13), and the difference is small enough to be not reliable (fsn =25).

The users of DSS/GDSS make significantly higher quality decisions than the users of manual DSS/GDSS. Although the result is tentative (n = 27), the difference is strong, and is not subject to change in the coming few years (fsn = 301). The users of DSS/GDSS have slightly more decision time than the users of manual DSS/GDSS. The result is highly tentative (n = 11), and the difference is small enough to be subject to change (fsn = 19). The users of DSS/GDSS produce more depth of analysis than the users of manual DSS/GDSS. The result is tentative (n = 15); however, it is very unlikely to be reduced to the level of insignificance (fsn = 84). There is no significant difference in terms of decision confidence and satisfaction with decision outcome between the users of DSS/GDSS and the users of manual DSS/GDSS. The results are preliminary and are subject to change ($n \leq 10$). The difference in satisfaction with decision outcome is already below 0.05. In addition, only 10 studies averaging null results are needed to reduce the difference in decision confidence to 0.05. The users of DSS/GDSS have more satisfaction with decision process and more satisfaction toward the system than the users of manual DSS/GDSS. Although both results are tentative ($n \leq 10$), the differences are large and are unlikely to be reduced to the level of insignificance (fsn = 58 and 99 for satisfaction with decision process and satisfaction toward the system, respectively). There is no significant difference in terms *of equality of participation and amount of task-oriented behavior between the users of GDSS and the users of manual GDSS. Both results are preliminary ($n \leq 10$), and are not far from the insignificance level (fsn = 1 and 3 for equality of participation and amount of task-oriented behavior respectively). As expected, the users of GDSS have less degree of decision consensus than the manual GDSS. The result is preliminary and is subject to change ($n = 3$). However, the direction of the effect will not be affected for some time (fsn 43). The users of GDSS also have slightly less communication than the users of manual GDSS. However, the result is preliminary ($n = 2$), and could be easily reduced to the level of insignificance (fsn = 6).*

In general, DSS/GDSS are more effective, but not more efficient than the manual DSS/GDSS.

5.1.2 The Effects of the Moderator Variables

Tables XXVI to XXXIII represent a summary of the effects of the moderator variables on the effectiveness and efficiency of computerized DSS/GDSS over manual DSS/GDSS or no-DSS/GDSS. The effects of each moderator variable across the applicable dependent variables are summarized below.

5.1.2.1 The Effects of DSS Versus GDSS

It has been hypothesized that the users of DSS are less effective but more efficient than the users of GDSS. On the contrary, Table XXVI shows that DSS produce significantly higher quality decisions than the users of GDSS. The result is tentative (n = 22 and 21 for DSS and GDSS respectively); however, it would take a considerable number of studies to make the difference insignificant (fsn = 216 and 0 for DSS and GDSS respectively). The users of DSS will take significantly less decision time than the users of GDSS. This result is expected, since the use of GDSS requires considerable time for communication. The result is tentative (n = 7 and 13); however, the difference is in the opposite direction, large, and unlikely to be changed in direction, or reduced to the level of insignificance (fsn = 50 and 372). The users of DSS have significantly more depth of analysis than the users of GDSS. Although the difference is moderate, the number of studies permits at best a tentative conclusion (n = 6 and 11). The size of the difference could be changed dramatically by a small number of studies (fsn = 33 and 0 for DSS and GDSS respectively). The users of DSS have significantly more confidence in their decisions than the users of GDSS. Although the result is preliminary to tentative (n = 11 and 5), the difference is large and is unlikely to be reduced to insignificance (fsn = 107 and 22). Individuals using DSS have higher rate of decision improvement than groups using GDSS. Although the finding is preliminary (n = 92 and 4), the difference is large and unlikely to be changed substantially (fsn = 92 and 4). The

TABLE XXVI

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF DSS VERSUS GDSS

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Between D's
DSS/GDSS vs. no-DSS/GDSS	Decision quality	$D_{DSS} < D_{GDSS}$	Reject	Yes	Moderate
	Decision time	$D_{DSS} > D_{GDSS}$	Accept	No	Strong
	Depth of analysis	$D_{DSS} < D_{GDSS}$	Reject	Yes	Moderate
	Decision confidence	$D_{DSS} < D_{GDSS}$	Reject	Yes	Strong
	Satisfaction w/process	$D_{DSS} < D_{GDSS}$	Reject	No	Moderate
	Satisfaction toward system	$D_{DSS} < D_{GDSS}$	Reject	No	Weak
	Rate of decision improvement	$D_{DSS} < D_{GDSS}$	Reject	Yes	Strong
DSS/GDSS vs. manual DSS/GDSS	Decision quality	$D_{DSS} < D_{GDSS}$	Reject	Yes	Moderate
	Decision time	$D_{DSS} > D_{GDSS}$	Accept	No	Strong
	Depth of analysis	$D_{DSS} < D_{GDSS}$	Reject	Yes	Weak
	Decision confidence	$D_{DSS} < D_{GDSS}$	Reject	Yes	Strong
	Satisfaction toward system	$D_{DSS} < D_{GDSS}$	Reject	Yes	Moderate

[a]Only the applicable dependent variables are included
[b]D_{DSS} is mean corrected effect size of DSS, and D_{GDSS} is mean corrected effect size of GDSS

users of GDSS are found to be more satisfied with decision process and more satisfied toward the system than the users of DSS. However, the result is preliminary, and the size of the difference is moderate to weak.

In summary, DSS are significantly more effective and more efficient than GDSS, when both are compared to no decision aid. Only in terms of satisfaction with decision process and satisfaction toward the system, GDSS are shown to be slightly more effective than DSS.

DSS are hypothesized to be less effective but more efficient than GDSS, when both are compared to manual DSS and manual GDSS respectively. However, Table XXVI (p. 412) shows that DSS produce significantly higher quality decisions, more decision confidence, more satisfaction toward the system, and take less decision time than GDSS, when both are compared to manual decision aid. The result for decision quality is tentative (n = 19 and 8), but unlikely to be changed to insignificance level (fsn = 296 and 35). The results for depth of analysis, decision confidence, and satisfaction toward the system are preliminary ($n \leq 10$), but unlikely to be reduced to the level of insignificance. The effect sizes of decision time are in the opposite direction, however, the result is preliminary and subject to change in spite of the strong difference ($n \leq 10$).

5.1.2.2 <u>The Effects of Study Type</u>

It has been hypothesized that the difference in effectiveness and efficiency of decision making between the users of computerized DSS/GDSS and the users of no-DSS/GDSS is affected by the type of the study (i.e., laboratory study, field test, or field study). The difference is hypothesized to be decreasing as we move from laboratory experiments to field tests to field studies. More significant results are expected to be reported in studies that have better design and control and studies that are conducted in actual settings.

In terms of decision quality between DSS/GDSS and no-DSS/GDSS, the hypothesis is rejected (Table XXVII), suggesting that the decision quality of the field studies is significantly higher than that of both the laboratory experiments and the field tests. Although the result is preliminary for field tests and field studies (n = 2 and 5), the result for laboratory studies is tentative (n = 36). The difference between the field studies and the experiments (both laboratory and field experiments) is unlikely to be reduced to the insignificance level. However, there is no difference between the laboratory and field experiments in terms of decision quality. These results are consistent with the fact that decision quality is measured by objective measures in the experimental studies, whereas it reflects perceptions of users in the field studies. The perceptions

TABLE XXVII

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF LABORATORY STUDIES VERSUS FIELD TESTS VERSUS FIELD STUDIES

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Between D's
DSS/GDSS vs. no-DSS/GDSS	Decision quality	$D_1 > D_2 > D_3$	Reject	$D_1<D_3, D_2<D_3$	Moderate
	Decision time	$D_1 > D_3$	Reject	Yes	Strong
	Degree of decision consensus	$D_1 > D_2$	Reject	Yes	Moderate
DSS/GDSS vs. manual DSS/GDSS	Decision quality	$D_1 > D_2 > D_3$	Reject	$D_1<D_3, D_2<D_3$	Moderate
	Decision time	$D_1 > D_2$	Accept	No	Moderate
	Depth of analysis	$D_1 > D_2$	Reject	No	Weak
	Decision confidence	$D_1 > D_3$	Reject	No	Weak
	Satisfaction w/decision process	$D_1 > D_2$	Accept	No	Strong
	Equality of participation	$D_1 > D_2$	Reject	No	Weak
	Satisfaction toward the system	$D_1 > D_3$	Reject	Yes	Strong

[a]Only the applicable dependent variables are included

[b]D_1 is D for laboratory studies, D_2 is D for field tests, and D_3 is D for field studies

have more tendency for exaggeration and deviation from reality. For decision time, it is found that DSS/GDSS are more efficient in field studies than in laboratory experiments. Their effect sizes are in the opposite direction, resulting in a strong difference that is unlikely to be altered in direction or reduced to the insignificance level (fsn = 360 and 26). Finally, in the field tests, the users of DSS/GDSS have more decision confidence than in the laboratory studies. Although the difference is moderate, the result is preliminary (n = 12 and 2), the two effect sizes are in the same direction, and there is a significant overlap between the two subsets.

It is also hypothesized that the difference in effectiveness and efficiency of decision making between the users of computerized DSS/GDSS and the users of manual DSS/GDSS is affected by the type of the study (i.e., laboratory study, field test, or field study). The difference is hypothesized to be decreasing as we move from laboratory experiments to field tests to field studies.

In terms of decision quality between DSS/GDSS and manual DSS/GDSS, the hypothesis is rejected (Table XXVII, p. 415), suggesting that the decision quality of the field studies is significantly higher than that of both the laboratory experiments and the field tests. Although the result is preliminary for field tests and field studies (n = 7 and 4), the result for laboratory studies is tentative (n

= 16). The difference between the field studies and the experiments (both laboratory and field experiments) is unlikely to be reduced to the insignificance level. However, there is no difference between the laboratory and field experiments in terms of decision quality. These results can also be explained by the subjective measures of the field studies. The hypothesis for decision time is accepted, indicating that DSS/GDSS are more efficient in laboratory studies than in field tests. Although the result is preliminary (n = 7 and 3), it is not likely that the difference is going to be reduced to insignificance level (fsn 52 and 45). The DSS/GDSS users have no significant difference in depth of analysis between laboratory studies and field tests. The two subsets increase the depth of analysis, and show no big difference between them. However, this result is preliminary and subject to change (n = 12 and 3). There is also no significant difference in equality of participation between laboratory studies and field tests. However, the result is preliminary and subject to change (n = 5 and 2). The users of DSS/GDSS have more satisfaction with decision process in laboratory studies than in field tests. Although there is no overlap between the two subsets, and the difference between the two average corrected D's is large, the result is preliminary and subject to change (n = 3 and 2). There is no difference between laboratory and field studies in terms of decision confidence. This finding

is temporary and subject to change. What makes the result more reasonable is that this variable is measured subjectively in both types of studies. The field studies produce more satisfaction toward the system among the DSS/GDSS users than the laboratory studies. The result is preliminary (n = 4 and 3 for laboratory and field studies respectively), however, the difference is large and is not likely to be reduced to insignificance level (fsn = 17, 50).

In summary, the moderator variable of study type shows no significant difference between the laboratory studies and the field tests. On the other hand, the field studies indicate more effective and more efficient decision making than either laboratory studies or field test. These findings are preliminary or at best tentative results.

5.1.2.3 The Effects of Published Versus Unpublished Studies

It has been hypothesized that the difference in effectiveness and efficiency of decision making is significantly better in the published studies than in the unpublished studies, when the users of DSS/GDSS are compared to the users of manual DSS/GDSS or to the users of no-DSS/GDSS (Table XXVIII). All the results are preliminary except for decision quality where there is a reasonable number of studies to draw a tentative conclusion (n = 21 and 22 for the published and unpublished studies respectively).

TABLE XXVIII

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF PUBLISHED VERSUS UNPUBLISHED STUDIES

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Between D's
DSS/GDSS vs. no-DSS/GDSS	Decision quality	$D_1 > D_2$	Reject	Yes	Weak
	Decision time	$D_1 > D_2$	Reject	Yes	Strong
	Depth of analysis	$D_1 > D_2$	Reject	No	Weak
	Decision confidence	$D_1 > D_2$	Accept	No	Weak
	Satisfaction w/decision process	$D_1 > D_2$	Accept	No	Weak
	Equality of participation	$D_1 > D_2$	Reject	Yes	Strong
	Degree of decision consensus	$D_1 > D_2$	Accept	No	Moderate
	Satisfaction toward the system	$D_1 > D_2$	Accept	No	Weak
	Degree of uninhibited behavior	$D_1 > D_2$	Accept	No	Moderate
	Amount of communication	$D_1 > D_2$	Reject	Yes	Strong
	Rate of decision improvement	$D_1 > D_2$	Accept	No	Moderate

TABLE XXVIII (CONTINUED)

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF PUBLISHED VERSUS UNPUBLISHED STUDIES

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Between D's
DSS/GDSS vs. manual DSS/GDSS	Decision quality	$D_1 > D_2$	Accept	No	Weak
	Decision time	$D_1 > D_2$	Accept	No	Moderate
	Depth of analysis	$D_1 > D_2$	Reject	Yes	Weak
	Decision confidence	$D_1 > D_2$	Reject	Yes	Strong
	Satisfaction w/decision process	$D_1 > D_2$	Reject	Yes	Strong
	Equality of participation	$D_1 > D_2$	Reject	Yes	Moderate
	Satisfaction toward the system	$D_1 > D_2$	Accept	No	Strong

[a]Only the applicable dependent variables are included
[b]D_1 is D for published studies, and D_2 is D for unpublished studies

The unpublished studies are found to report higher quality decisions among DSS/GDSS users than the published studies. Although the difference is weak, it is unlikely to be reduced to the level of insignificance (fsn = 60 and 18). The users of DSS/GDSS are reported to take significantly less decision time, have more equality of participation, and have more communication in the unpublished studies than the published studies. Although the results are preliminary, the differences are large, and unlikely to be reduced to the insignificance level. There is no significant difference between the published and unpublished studies in terms of depth of analysis. However, the result is preliminary and subject to change. On the other hand, the users of DSS/GDSS are found to have more decision confidence, more satisfaction with decision process, higher degree of decision consensus, more satisfaction toward the system, and higher rate of decision improvement, in the published studies than the unpublished studies. Although the results are preliminary, they are unlikely to be reduced to the level of insignificance. The effects of DSS/GDSS are not consistent across the published and unpublished studies.

The results comparing DSS/GDSS to manual DSS/GDSS across the published and unpublished studies are not consistent (Table XXVIII, p. 419). It is found that the use of DSS/GDSS produce higher quality decisions across both the published and unpublished studies. However, the published *studies report higher quality decisions than unpublished studies. Although the result is tentative (n = 10 and 17), it is unlikely to reduce the difference to the level of insignificance (fsn = 127 and 152). The users of DSS/GDSS are found to take significantly less decision time in the published than unpublished studies. However, the result is preliminary (n = 2 and 9), but the two effect sizes are not in the same direction, and the difference is not expected to be reduced to 0.05. It is also found that the use of DSS/GDSS produce more satisfaction toward the system across both the published and unpublished studies than the manual DSS/GDSS. However, the published studies report more satisfaction toward the system than unpublished studies. Although the result is preliminary (n = 3 and 4), it is unlikely to reduce the large difference to the level of insignificance (fsn = 50 and 17). On the other hand, the users of DSS/GDSS are found to have more depth of analysis, more decision confidence, more satisfaction with decision process, and more equality of participation in the unpublished studies than published studies. However the results are preliminary and subject to change (n $\leq$ 10).*

Based on the above results, there is no indication that the published studies are methodologically stronger than the unpublished studies, or that they report more significant results than the unpublished studies. Therefore it can be concluded that this moderator variable (published versus *unpublished studies) has no significant and consistent effect across all the dependent variables, when DSS/GDSS are compared to manual DSS/GDSS or no-DSS/GDSS.*

5.1.2.4 The Effects of Subject Type

It has been hypothesized that the difference in effectiveness and efficiency of decision making is significantly worse among students than actual users (i.e., managers), when the users of DSS/GDSS are compared to the users of manual DSS/GDSS or to the users of no-DSS/GDSS.

When DSS/GDSS are compared to no-DSS/GDSS, all the hypotheses are accepted (Table XXIX), meaning that students are significantly less effective and less efficient than actual users. The actual users of DSS/GDSS have tentatively higher quality decisions than students (n = 27 and 16 for students and actual users respectively). There is no overlap between the two subsets and the difference is unlikely to be reduced to insignificance level. The differences in decision time, decision confidence, and satisfaction with decision process are not in the same direction. However, decision time has the largest divergence between effect sizes. Unlike students, the actual users of DSS/GDSS take less decision time than the actual users of no-DSS/GDSS. The actual users are more effective in terms of depth of analysis, decision confidence, satisfaction with decision process, degree of decision consensus, amount of communication, and rate of

TABLE XXIX

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF SUBJECT TYPE

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Between D's
DSS/GDSS vs. no-DSS/GDSS	Decision quality	$D_1 < D_2$	Accept	No	Moderate
	Decision time	$D_1 < D_2$	Accept	No	Strong
	Depth of analysis	$D_1 < D_2$	Accept	No	Strong
	Decision confidence	$D_1 < D_2$	Accept	No	Strong
	Satisfaction w/decision process	$D_1 < D_2$	Accept	No	Moderate
	Degree of decision consensus	$D_1 < D_2$	Accept	No	Strong
	Amount of communication	$D_1 < D_2$	Accept	No	Strong
	Rate of decision improvement	$D_1 < D_2$	Accept	No	Strong

TABLE XXIX (CONTINUED)

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF SUBJECT TYPE

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Between D's
DSS/GDSS vs. manual DSS/GDSS	Decision quality	$D_1 < D_2$	Accept	No	Moderate
	Decision time	$D_1 < D_2$	Reject	Yes	Strong
	Depth of analysis	$D_1 < D_2$	Reject	No	No Effect
	Decision confidence	$D_1 < D_2$	Accept	No	Strong
	Satisfaction w/decision process	$D_1 < D_2$	Reject	Yes	Strong
	Equality of participation	$D_1 < D_2$	Accept	No	Weak
	Satisfaction toward the system	$D_1 < D_2$	Accept	No	Strong

[a]Only the applicable dependent variables are included
[b]D_1 is D for students, and D_2 is D for actual users

decision improvement than students. Although the results are preliminary (n $\leq$ 10), the differences are not likely to be reduced to the level of insignificance, due to the strong differences between the average corrected D's.

When comparing DSS/GDSS to manual DSS/GDSS, the actual users have significantly higher quality decisions, more decision confidence, more equality of participation, and more satisfaction toward the system than the students (Table XXIX, p. 424). Only decision quality have a tentative result (n = 12 and 12), while the other results are preliminary and subject to change (n $\leq$ 10). The students have significantly less decision time, and more satisfaction with decision process than actual users. However, the results are preliminary and subject to change (n $\leq$ 10). In terms of depth of analysis, there is no significant difference between the students and actual users. Although the results of subject type is mixed, when DSS/GDSS are compared to no-DSS/GDSS, in general, actual users are more effective than students in using DSS/GDSS.

Although this moderator (subject type) is shown to have some support for the hypotheses across DSS/GDSS and no-DSS/GDSS, it has less support for the hypotheses across DSS/GDSS and manual DSS/GDSS.

5.1.2.5 The Effects of the Level of Task Difficulty

It has been hypothesized that the difference in *effectiveness and efficiency of decision making is significantly better the higher the level of task difficulty, when the users of DSS/GDSS are compared to the users of manual DSS/GDSS or to the users of no-DSS/GDSS (Table XXX). Only in low difficulty tasks, the users of DSS/GDSS are significantly producing lower quality decisions and producing less depth of analysis than the users of no-DSS/GDSS. Hence, the users of DSS/GDSS produce significantly lower quality decisions and less depth of analysis in low difficulty tasks as compared to high or medium difficulty tasks. The results are tentative for decision quality (n = 28, 10, and 9 for high, medium, and low difficulty tasks respectively) and preliminary for depth of analysis (n = 9, 5, and 4), but strong enough to be unlikely changed to the level of insignificance. For decision time, only in medium difficulty tasks, the users of DSS/GDSS are taking significantly less decision time than the users of no-DSS/GDSS. The users of DSS/GDSS are significantly more efficient in medium difficulty tasks than in either high or low difficulty tasks. Although the results are preliminary (n = 12, 7, and 3 for high, medium, and low difficulty tasks respectively), the differences are large enough to be unlikely changed to the level of insignificance. Only in high difficulty tasks, the users of DSS/GDSS have significantly more decision confidence than the users of no-DSS/GDSS. In high difficulty tasks, the users of DSS/GDSS*

TABLE XXX

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF TASK DIFFICULTY

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Between D's
DSS/GDSS vs. no-DSS/GDSS	Decision quality	$D_1 > D_2 > D_3$	Reject	$D_1>D_3$, $D_2>D_3$	Strong
	Decision time	$D_1 > D_2 > D_3$	Reject	$D_2>D_1$, $D_2>D_3$	Strong
	Depth of analysis	$D_1 > D_2 > D_3$	Reject	$D_1>D_3$, $D_2>D_3$	Strong
	Decision confidence	$D_1 > D_2 > D_3$	Reject	$D_1>D_2$, $D_1>D_3$	Strong
	Satisfaction w/decision process	$D_1 > D_2 > D_3$	Reject	$D_2>D_1$	Strong
	Equality of participation	$D_1 > D_2 > D_3$	Accept	No	Strong
	Degree of decision consensus	$D_1 > D_2 > D_3$	Reject	$D_2>D_1$, $D_2>D_3$	Strong
	Satisfaction toward the system	$D_1 > D_2$	Accept	No	Strong
	Amount of communication	$D_1 > D_3$	Reject	No	Moderate
	Rate of decision improvement	$D_1 > D_2$	Reject	Yes	Strong

TABLE XXX (CONTINUED)

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF TASK DIFFICULTY

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Between D's
DSS/GDSS vs. manual DSS/GDSS	Decision quality	$D_1 > D_2$	Reject	No	Weak
	Decision time	$D_1 > D_2$	Reject	Yes	Moderate
	Depth of analysis	$D_1 > D_2$	Accept	No	Moderate
	Satisfaction w/decision process	$D_1 > D_2$	Reject	Yes	Strong
	Satisfaction w/decision outcome	$D_1 > D_2$	Reject	No	Weak
	Equality of participation	$D_1 > D_2$	Reject	Yes	Strong
	Satisfaction toward the system	$D_1 > D_2$	Reject	Yes	Moderate

[a]Only the applicable dependent variables are included
[b]D_1, D_2, and D_3 are the D's for high, medium, and low difficulty tasks respectively

are producing significantly more decision confidence than in either medium or low difficulty tasks. Although the results are preliminary (n = 13, 2, and 3), they are strong enough to be unlikely changed to the level of insignificance. The users of DSS/GDSS have significantly more satisfaction with decision process and higher rate of decision improvement in medium difficulty tasks than in high difficulty tasks. Although the degree of decision consensus is significantly lower among GDSS users than the users of no-GDSS, the users of GDSS have the highest degree of decision consensus in medium difficulty tasks as compared to the high or low difficulty tasks. In high difficulty tasks, the users of GDSS have significantly more equality of participation than either in medium or low difficulty tasks. In addition, the users of GDSS have significantly more equality of participation in medium difficulty tasks than in low difficulty tasks. The users of DSS/GDSS have significantly more satisfaction toward the system in high than in medium difficulty tasks. However, there is no difference in amount of communication across high, medium, and low difficulty tasks. Except for decision quality, all the above results are based on preliminary results, however, the differences are large enough and are not likely to reduced to the level of insignificance.

Although there are some mixed results, it is clear that DSS/GDSS are least effective and least efficient under low *difficulty tasks. In general, DSS/GDSS are most effective and most efficient under medium difficulty tasks. Therefore there is a bell-shaped curve for effectiveness and efficiency of DSS/GDSS, where its peak is the medium difficulty tasks, and its low ends are the high and low difficulty tasks.*

When comparing DSS/GDSS to manual DSS/GDSS, all the hypotheses are rejected (Table XXIX, pp. 428-429). There is no significant difference in terms of decision quality, and satisfaction with decision outcome as a function of the level of task difficulty. In medium difficulty tasks, the users of DSS/GDSS take significantly less decision time, have more satisfaction with decision process, more equality of participation, and more satisfaction toward the system than in high difficulty tasks. In terms of depth of analysis, the users of DSS/GDSS produce more depth of analysis in high than in low difficulty tasks. The above results are preliminary (except for decision quality where there is a tentative result) and subject to change ($n \leq 10$). However, the significant differences are large enough and unlikely to be reduced to the level of insignificance.

With the exception of depth of analysis, in medium difficulty tasks, the users of DSS/GDSS are as effective or more effective than in high difficulty tasks. These findings also emphasizes that the best results of DSS/GDSS across task difficulty levels are found in medium difficulty tasks.

5.1.2.6 The Effects of Cross-Sectional Versus Longitudinal Studies

It has been hypothesized that the difference in effectiveness and efficiency of decision making is significantly better in the longitudinal studies than the cross-sectional studies, when the users of DSS/GDSS are compared to the users of manual DSS/GDSS or to the users of no-DSS/GDSS.

The hypotheses across DSS/GDSS and no-DSS/GDSS are rejected (Table XXXI). The users of DSS/GDSS have lower decision quality in the cross-sectional studies than in the longitudinal studies. Although the difference is small, it is based on enough number of studies (37 and 6) to draw a tentative conclusion. It is also found that the users of DSS/GDSS take less decision time in the cross-sectional studies than in the longitudinal studies. In addition to the fact that the result is relatively tentative (n = 17 and 3), the difference is large and unlikely to be reduced to the level of insignificance.

In summary, although there are not as many longitudinal studies as cross-sectional studies, it can be concluded that the cross-sectional studies report more effective and more efficient use of DSS/GDSS than longitudinal studies, when DSS/GDSS are compared to no-DSS/GDSS.

In comparing DSS/GDSS to manual DSS/GDSS, the users of DSS/GDSS have significantly higher quality decisions in the

TABLE XXXI

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF CROSS-SECTIONAL VERSUS LONGITUDINAL STUDIES

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Between D's
DSS/GDSS vs. no-DSS/GDSS	Decision quality	$D_1 < D_2$	Reject	Yes	Weak
	Decision time	$D_1 < D_2$	Reject	Yes	Strong
DSS/GDSS vs. manual DSS/GDSS	Decision quality	$D_1 < D_2$	Reject	Yes	Moderate
	Decision time	$D_1 < D_2$	Reject	Yes	Strong
	Depth of analysis	$D_1 < D_2$	Reject	No	No Effect
	Decision Confidence	$D_1 < D_2$	Accept	No	Moderate
	Satisfaction w/decision process	$D_1 < D_2$	Reject	Yes	Strong
	Equality of participation	$D_1 < D_2$	Accept	No	Moderate

[a]Only the applicable dependent variables are included
[b]D_1, and D_2 are the D's for cross-sectional and longitudinal studies respectively

cross-sectional than in the longitudinal studies (Table XXXI, p. 433). Although the difference is only moderate, there are enough number of studies to draw a tentative conclusion (n = 16 and 11). It is also found that the users of DSS/GDSS take less decision time in the cross-sectional studies than in the longitudinal studies. Although the result is preliminary (n = 9 and 2), the two mean corrected effect sizes are large and in the opposite direction, indicating that the difference is strong and not likely to be reduced to the insignificance level. The users of DSS/GDSS have significantly more satisfaction with decision process in the cross-sectional studies than in the longitudinal studies. Although the result is very preliminary (n = 3 and 2), the difference is large enough to indicate the presence of this moderator. The time length of the study is shown to have no significant effect on the depth of analysis across DSS/GDSS and manual DSS/GDSS. However, the longitudinal studies are shown to report moderately higher decision confidence and higher equality of participation among DSS/GDSS users than cross-sectional studies. These results are very preliminary and subject to change (n ≤ 10). Only a few studies are needed to reduce this difference to the insignificance level.

The effects of cross-sectional versus longitudinal studies are not consistent across the dependent variables. However, it can be concluded that the cross-sectional *studies, with a few exceptions, report more effective and more efficient use of DSS/GDSS than longitudinal studies, when DSS/GDSS are compared to manual DSS/GDSS.*

5.1.2.7 The Effects of Old Versus New Studies

It has been hypothesized that the effectiveness and efficiency of decision making is significantly better in the new studies than the old studies, when the users of DSS/GDSS are compared to the users of manual DSS/GDSS or to the users of no-DSS/GDSS.

When comparing DSS/GDSS to no-DSS/GDSS, most of the hypotheses are accepted (Table XXXII). The new studies report significantly higher decision quality, less decision time, more depth of analysis, more decision confidence, more equality of participation, higher degree of decision consensus, and higher rate of decision improvement than old studies, when DSS/GDSS are compared to no-DSS/GDSS. On the other hand, there is no significant difference between old and new studies with regard to satisfaction with decision process across DSS/GDSS and no-DSS/GDSS. Although these differences are based on preliminary or tentative results, the differences are large enough and unlikely to be reduced to the level of insignificance. The moderator variable of old versus new studies is operating, and has a consistent effect across the dependent variables.

Across computerized and manual DSS/GDSS, there is only

TABLE XXXII

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF OLD VERSUS NEW STUDIES

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Between D's
DSS/GDSS vs. no-DSS/GDSS	Decision quality	$D_1 < D_2$	Accept	No	Moderate
	Decision time	$D_1 < D_2$	Accept	No	Moderate
	Depth of analysis	$D_1 < D_2$	Accept	No	Strong
	Decision confidence	$D_1 < D_2$	Accept	No	Moderate
	Satisfaction w/decision process	$D_1 < D_2$	Reject	No	No Effect
	Equality of participation	$D_1 < D_2$	Accept	No	Strong
	Degree of decision consensus	$D_1 < D_2$	Accept	No	Strong
	Rate of decision improvement	$D_1 < D_2$	Accept	No	Strong
DSS/GDSS vs. manual DSS/GDSS	Decision quality	$D_1 < D_2$	Accept	No	Strong

[a]Only the applicable dependent variables are included
[b]D_1 is D for old studies (1969-1980), and D_2 is D for new studies (1981-1990)

one applicable dependent variable (decision quality) which supports the hypothesis that there is significantly higher reported quality decisions in the new studies than the old studies (Table XXXII, p. 436). Although the result is tentative (n = 2 and 25), the difference is strong enough to be unlikely reduced to the level of insignificance. For the most part, it is shown that the new studies report significantly higher effectiveness and higher efficiency than the old studies, when computerized DSS/GDSS are compared to either manual or no-DSS/GDSS. The explanation for this is that, first, the DSS/GDSS that are used in the new studies are more effective and more efficient than the old ones due to the vast development in the technology of DSS/GDSS in the recent years. Second, the difference between old and new studies can be attributed to the fact that there is higher methodological quality (i.e. better measures of dependent variables) in the recent investigations than in the old ones.

5.1.2.8 The Effects of Group Size

It has been hypothesized that the larger the group size, the higher the effectiveness and efficiency of decision making, when the users of DSS/GDSS are compared to the users of manual DSS/GDSS or to the users of no-DSS/GDSS.

In comparing DSS/GDSS to no-DSS/GDSS, most of the hypotheses are strongly rejected (Table XXXIII). Groups of

TABLE XXXIII

SUMMARY RESULTS OF THE EFFECTS OF THE MODERATOR VARIABLE OF GROUP SIZE

Independent Variables	Dependent Variables[a]	Hypotheses[b]	Decision	Reverse Hypotheses True?	Diff Btween D's
DSS/GDSS vs. no-DSS/GDSS	Decision quality	$D_1 < D_2$	Reject	Yes	Moderate
	Decision time	$D_1 < D_2$	Reject	Yes	Strong
	Depth of analysis	$D_1 < D_2$	Reject	Yes	Strong
	Decision confidence	$D_1 < D_2$	Reject	Yes	Strong
	Satisfaction w/decision process	$D_1 < D_2$	Reject	Yes	Strong
	Equality of participation	$D_1 < D_2$	Accept	No	Strong
	Degree of decision consensus	$D_1 < D_2$	Reject	Yes	Strong
	Amount of uninhibited behavior	$D_1 < D_2$	Accept	No	Strong
	Amount of communication	$D_1 < D_2$	Reject	No	Weak
	Rate of decision improvement	$D_1 < D_2$	Reject	Yes	Strong
DSS/GDSS vs. manual DSS/GDSS	Decision quality	$D_1 < D_2$	Reject	Yes	Moderate
	Depth of analysis	$D_1 < D_2$	Reject	No	Weak
	Satisfaction w/decision process	$D_1 < D_2$	Accept	No	Strong
	Equality of participation	$D_1 < D_2$	Reject	Yes	Strong

[a]Only the applicable dependent variables are included
[b]D_1 is D for small-size groups, and D_2 is D for large-size groups

small sizes (between 1 and 4) have higher quality decisions, take less decision time, have more depth of analysis, have more decision confidence, have more satisfaction with decision process, have higher degree of decision consensus, and have higher rate of decision improvement than groups of large sizes (5 and above). Despite the tentative (for decision quality, decision time, depth of analysis, and decision confidence) and preliminary results (for satisfaction with decision process, degree of decision consensus, and rate of decision improvement) the differences are large enough and unlikely to be reduced to the level of insignificance.

The groups of large sizes are found to have significantly more equality of participation and less amount of uninhibited behavior than the small-size groups. The results are preliminary and subject to change ($n \leq 10$). However, the differences are large enough and unlikely to be reduced to the insignificance level. On the other hand, there is no significant difference in terms of amount of communication due to difference in group size.

For most of the applicable variables, the hypotheses are also rejected, across computerized and manual DSS/GDSS (Table XXXIII). It is found that there is no significant difference in depth of analysis due to difference in group size, when DSS/GDSS are compared to manual DSS/GDSS. In fact, small-size groups are found to have higher quality *decisions than large-size groups. The result for decision quality is tentative (n = 23 and 4), but large enough to be unlikely reduced to the level of insignificance. Additionally, small-size groups have significantly more equality of participation than large-size groups. Although the result is based on a few studies (n = 4 and 3), the two effect sizes are in the opposite direction, indicating a strong difference that is unlikely to be reduced to the level of insignificance. The only variable that is in support of its hypothesis is the satisfaction with decision process, where the large-size groups are shown to have significantly more satisfaction with decision process than the small-size groups, across DSS/GDSS and manual DSS/GDSS. Despite the preliminary result (n = 2 and 3), the difference is large enough to be unlikely reduced to 0.05.*

For most of the variables, the results of the moderator variable of group size are suggesting that the small-size groups are significantly more effective and more efficient in decision making than the large-size groups, when DSS/GDSS are compared to either manual or no-DSS/GDSS. There are some explanations for this unexpected result. First, in this analysis, the studies using individual DSS are included along with the GDSS studies of small-size groups, and assumed to have a group size of one person, which might affected the total results. Second, there is only a few studies of large-size groups, which limits the *generalizability of the results of these studies. Third, the largest available group size is seven, which is relatively small. The computerized GDSS are expected to be more effective and more efficient than manual or no-GDSS when the group size becomes larger and larger.*

5.2 Discussion and Implications of the Findings

In the following section, the implications of the findings of the meta-analysis will be discussed in terms of both the practical and the theoretical point of views.

5.2.1 Practical Implications and Contributions

There are many implications that can be obtained from this study. Computerized DSS and GDSS, for the most part, are significantly more effective and more efficient (in terms of equality of participation, but not decision time or amount of task-oriented behavior) than no-DSS/GDSS. It is also found that DSS/GDSS, for the most part, are significantly more effective and slightly more efficient (in terms of decision time, but not equality of participation or amount of task-oriented behavior) than manual DSS/GDSS. In addition, manual DSS/GDSS are not better than no-DSS/GDSS. Therefore, organizations that are considering the use of DSS/GDSS may not need to look for manual applications of DSS/GDSS.

DSS are reported to be more effective, and more *efficient in decision making than GDSS. This could be attributed to the fact that GDSS, unlike DSS, are still in their infancy stage, and have not been tested in the real world on a large scale. If the tasks that a company is undertaking requires a group decision making, a depth analysis should to be conducted before renting or purchasing a GDSS in order to justify the costs of using GDSS.*

Results of field studies are more significant than the results of either laboratory experiments or field tests. The major explanation for this difference is that the findings of field studies are self-reported. Unlike the experimental studies, the field studies report perceptions rather than actual effects. MIS research in general needs to perform more experimental studies, where the researchers have more control (i.e. in laboratory experiments) and better simulation to reality (i.e., in field tests).

Businesses would be advised to use DSS/GDSS for decision tasks of moderate difficulty rather than those of high or low difficulty. DSS/GDSS are shown to be more effective and more efficient in these circumstances, when compared to no-DSS/GDSS. DSS/GDSS will not produce to its potential under high or low difficulty tasks.

Although, it is indicated by the studies that small groups of DSS/GDSS are more effective and more efficient, in general, than large groups, this concept has not been reasonably tested when the group size is relatively large *(i.e., group size exceeds seven). Therefore, decision making efforts with groups that exceed seven can not be affected by this study.*

5.2.2 Theoretical Implications and Contributions

Even after applying the moderator variables on a binary basis, only a few populations turned out to be homogeneous. This suggests the need for application of hierarchical moderator variables (more than one moderator at a time) to split the heterogeneous populations further to reach homogeneity. The analysis in the current research is limited to binary moderator variables due to the relatively small number of studies available, and the large number of dependent and moderator variables. Should this method have been applied, few studies will end up in each subpopulation, which would greatly have weakened the generalizability of the results.

The major reason for the heterogeneity of the populations is the lack of a common methodological ground in operationalizing the dependent measures. The sources of variation in effect sizes across studies need to be tested in the future as independent variables (i.e., to test a certain dependent variables under two different used measures, to see if they come up with the same results).

Moderator variables need to be tested, when possible, under the level of individual studies. Research should leave *out the simple independent-dependent relationship in their studies to more meaningful investigations of the interaction among independent, dependent, and moderator variables with regard to DSS/GDSS effectiveness and efficiency.*

The majority of the primary studies included in the meta-analysis are of small sample size. Many studies of less than 30 subjects are included, but weigh little in the final conclusions. At least in the experimental studies, where the researcher has more control over the number of subjects, researchers need to always consider large sample sizes in order to have more confidence in their results.

A large number of experimental studies use repeated measures in their experimental designs, instead of independent control and experimental groups. Such experimental designs suffer from lack of history and learning effects, inflate the sample size, and combine incomparable results. The simple design of independent control and experimental groups is straightforward and more precise in measuring the intended effects. Subjects need to be selected randomly and assigned to different treatments randomly in order to have more reliable results. In GDSS laboratory experiments, the groups need to be in the same development stage, and group members need to have some experience in working together as a group prior to the experiment in order to approximate reality.

There is a remarkable result regarding the *effectiveness and efficiency of DSS/GDSS across published and unpublished studies, since it has been found, in general, that there is no significant difference between the published and unpublished studies in terms of effectiveness and efficiency of decision making, when DSS/GDSS are compared to no-DSS/GDSS or manual DSS/GDSS. In fact, the unpublished studies are more effective in some of the results than published studies. As a result, future meta-analyses need not to neglect the importance of unpublished studies, and to give them equal weight with the published studies. It is not true, in this study, that unpublished studies have smaller effect sizes than published studies [McNemar, 1960], or that unpublished studies are methodologically less sound than published ones [Hunter and Schmidt, 1990].*

Actual users are shown to be significantly more effective and more efficient than students, especially in comparing DSS/GDSS to no-DSS/GDSS. Based on this result, more field tests need to be conducted in the evaluation of DSS/GDSS effectiveness in order to have more insight into the practicality of these systems.

The results of this study showed that the use of surrogate subjects (i.e., students) will result in undermining the real effect of DSS and GDSS. Results of studies that use students as their subjects are not necessarily generalizable to actual users. Whenever possible *the primary studies need to avoid having naive subjects to simulate the effect of DSS/GDSS on actual users.*

This study found that cross-sectional studies report more effective and more efficient results than longitudinal studies. More longitudinal studies need to be conducted to resolve the issue of the importance of time function, in learning and adaptation to DSS/GDSS, which should lead to more effective and more efficient use of DSS/GDSS.

For the majority of the dependent/independent variables, populations of studies are heterogeneous across the potential moderators. In these cases, artifacts account for all between-study variance in effect sizes, and that these postulated moderators are, in fact, not moderators. There may be some other real moderators that this study did not account for, like the features of the decision aid, the type of the decision task, and the decision style of the decision maker(s), etc.

5.3 Limitations of the Study

The meta-analysis technique is dependent on the input of studies it integrates. The number of primary DSS/GDSS studies available are not large enough to provide more sound conclusions, indicating the fact that there are many dependent and moderating variables that need further research. Moderator variables are only considered on a binary basis in order to have enough number of studies in *both subpopulations.*

Most of the studies do not report the reliabilities for their independent or dependent measures. For that reason mainly the sampling error is accounted for. The rest of the artifactual errors were not corrected for.

The test of homogeneity is limited to eight potential moderators (i.e., the level of task difficulty). Other meaningful moderators are not included because it is either difficult or impractical to find information about them across the studies.

The field of MIS suffers from the lack of a common methodological ground for measurement. In a situation like this, the task of meta-analysis apparently becomes more difficult in combining the results across studies. The author had to use a lot of subjective judgments in the process of coding the primary studies, giving the fact that there were sixteen different dependent measures that are undertaken in this study.

5.4 Areas of Future Research

When more empirical investigations are available in the field, a better meta-analysis can be done. In addition, more research should be directed to methodological problems to enable better future research. Research in MIS needs to have a common ground for measurement and reporting, and to make investigations based on previous work of others.

Many of the dependent measures (i.e., decision confidence, and satisfaction) are self-reported in most of the studies, suggesting the inaccuracy of results of these measures. As a solution, great efforts need to be undertaken in order to quantify these variables in hard measures. As has been said earlier, since the majority of sets of studies are heterogeneous, even after applying the binary moderators, the major cause of variation in effect sizes is the inconsistency of variable measurement across studies. To solve this problem, the meta-analysis suggests for future investigations of evaluating DSS/GDSS effectiveness to test these measurements of every dependent variable as independent variables at the individual study level.

The greatest problem that faced this study and could face any review study is the lack of important fundamental information in the primary studies. In order to enable the reader to critically evaluate the evidence of a primary study, the study should report and describe the sampling procedure, measurement, analyses and the findings. The direction and magnitude (or mean and standard deviation) of each primary study finding must be reported. In addition, any test statistics and their significance levels are critical to the other researchers. The coefficients of reliability for each dependent and independent variable are important pieces of information in any primary study in order to correct for error of measurement. DSS/GDSS researchers in general have not reported the reliability information in many existing studies. MIS researchers must do a better job of reporting fundamental statistical measures and associated results.

5.5 Conclusions

Meta-analysis is a new technique to the field of MIS. By applying this method, an outsider to MIS could gain a great knowledge about a certain area of MIS without having to read the whole literature. Meta-analysis shows clearly that no single primary research study can ever resolve an issue or answer a question [Hunter and Schmidt, 1990]. The findings of research are inherently probabilistic [Taveggia, 1974], and, thus, the results of a single study could have happen by chance. Only with meta-analytic integration of results across studies can we control chance and other artifacts and come up with a foundation for conclusions. Although meta-analysis is more meaningful than any single primary research study, meta-analysis cannot be applied in vacuum and is not possible unless the needed primary studies are conducted.

Although, the DSS/GDSS technology is not shown to be more efficient than manual or no-DSS/GDSS, in general, this study shows practically that DSS and GDSS provide more effective decision making than the manual or no-DSS/GDSS. In the statistical sense, the study shows that there is a great *variation in the effect sizes across studies, that underlines a methodological problem in the field of MIS research.*

In general DSS are shown to be more effective than GDSS. Managers and actual users are found to be more effective and more efficient than students, mainly, when DSS/GDSS are compared to no-DSS/GDSS. DSS/GDSS are moderately more effective and more efficient in medium difficulty tasks than in high or low difficulty tasks, when compared to no-DSS/GDSS. The cross-sectional studies report more significant results, in favor of use of DSS/GDSS, than longitudinal studies. New studies report more significant results in favor of use of DSS/GDSS than old studies. Groups of small size are shown to be more productive and more efficient than groups of large size.

The moderator variables of study type (laboratory versus field tests versus field studies) are showing that the field studies report significantly more effective and more efficient results than both the laboratory experiments and the field tests. The published versus unpublished studies are shown to have no effect on the effectiveness or efficiency of DSS/GDSS.

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APPENDIXES

APPENDIX A

COMPREHENSIVE DATA FOR INDIVIDUAL STUDIES

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Adrianson and Hjelmquist	1985	published	GCSS called COM used here for closed conference	lab exp to investigate the impact of computer mediated communication on group decision effectiveness and efficiency	unstructured complex tasks	a relation task called "Forest Ranger" and a technical ranking task called "Lost in Arctic"	one period	problem solving	computerized group comunication support systems (GCSS) with exper ienced users
	1985	published	GCSS called COM used here for closed conference	lab exp to investigate the impact of computer mediated communication on group decision effectiveness and efficiency	unstructured complex tasks	a relation task called "Forest Ranger" and a technical ranking task called "Lost in Arctic"	one period	problem solving	no-GCSS with exper ienced users
	1985	published	GCSS called COM used here for closed conference	lab exp to investigate the impact of computer mediated communication on group decision effectiveness and efficiency	unstructured complex tasks	a relation task called "Forest Ranger" and a technical ranking task called "Lost in Arctic"	one period	problem solving	computerized group comunication support systems(GCSS) with inexper ienced users
	1985	published	GCSS called COM used here for closed conference	lab exp to investigate the impact of computer mediated communication on group decision effectiveness and efficiency	unstructured complex tasks	a relation task called "Forest Ranger" and a technical ranking task called "Lost in Arctic"	one period	problem solving	no-GCSS with inexperienced users
	1985	published	GCSS called COM used here for closed conference	lab exp to investigate the impact of computer mediated communication on group decision effectiveness and efficiency	unstructured complex tasks	a relation task called Forest Ranger" and a technical ranking task called "Lost in Arctic"	one period	problem solving	computerized group comunication support systems (GCSS) regardless of computer
	1985	published	GCSS called COM used here for closed conference	lab exp to investigate the impact of computer mediated communication on group decision effectiveness and efficiency	unstructured complex tasks	a relation task called "Forest Ranger" and a technical ranking task called "Lost in Arctic"	one period	problem solving	no-GCSS regardless of computer experience

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Adrianson and Hjelmquist	G1a		16 groups were selected to	decision quality	1		33 5	2 958039892	8 75
			be homogeneous, each 4	perceived idea generation	3		not reported	not reported	
			groups were randomly	perceived disagreement resolving	-11		not reported	not reported	
			assigned to begin in one	perceived decision accuracy	4		not reported	not reported	
			of the four conditions						
			(mode of communication x						
			type of task)						
	G3a		16 groups were selected to	decision quality	1		35 5	9 937303457	98 75
			be homogeneous, each 4	perceived idea generation	3		not reported	not reported	
			groups were randomly	perceived disagreement resolving	11		not reported	not reported	
			assigned to begin in one	perceived decision accuracy	4		not reported	not reported	
			of the four conditions						
			(mode of communication x						
			type of task)						
	G1b		16 groups were selected to	decision quality	1		39	10 44030651	109
			be homogeneous, each 4	perceived idea generation	3		not reported	not reported	
			groups were randomly	perceived disagreement resolving	11		not reported	not reported	
			assigned to begin in one	perceived decision accuracy	4		not reported	not reported	
			of the four conditions						
			(mode of communication x						
			type of task)						
	G3b		16 groups were selected to	decision quality	1		39	10 04987562	101
			be homogeneous, each 4	perceived idea generation	3		not reported	not reported	
			groups were randomly	perceived disagreement resolving	11		not reported	not reported	
			assigned to begin in one	perceived decision accuracy	4		not reported	not reported	
			of the four conditions						
			(mode of communication x						
			type of task)						
	G1	32	groups were selected to	decision quality	1		36 25	8 150920194	66 4375
		32	be homogeneous, each 4	perceived idea generation	3		5	not reported	
		32	groups were randomly	perceived disagreement resolving	-11		3 1	not reported	
		32	assigned to begin in one	perceived decision accuracy	4		not reported	not reported	rpb -->
		32	of the four conditions	attitude toward the media	9		not reported	not reported	rpb -->
		32	(mode of communication x	satisfaction with decision process	5		4 8		rpb -->
		32	type of task)	amount of opinion change	14				rpb -->
	G3	32	groups were selected to	decision quality	1		37 25	10 14581194	102 9375
		32	be homogeneous, each 4	perceived idea generation	3		5 8	not reported	
		32	groups were randomly	perceived disagreement resolving	11		5 5	not reported	
		32	assigned to begin in one	perceived decision accuracy	4		not reported	not reported	
		32	of the four conditions	attitude toward the media	9		not reported	not reported	
		32	(mode of communication x	satisfaction with decision process	5		5 5		
		32	type of task)	amount of opinion change	14				

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Adrianson and Hjelmquist	7.331439149	-0 272797736	0 272797736	G1a-G3a			no sig difference in			compared to experts
							decision quality			posttest questionnaire
							because of mode			posttest questionnaire
							of communication			posttest questionnaire
										compared to experts
										posttest questionnaire
										posttest questionnaire
										posttest questionnaire
	10 24695077	0	0	G1b-G3b						compared to experts
										posttest questionnaire
										posttest questionnaire
										posttest questionnaire
										compared to experts
										posttest questionnaire
										posttest questionnaire
										posttest questionnaire
	9.20258116	-0 108665165	0 108665165	G1-G3			no sig difference in			compared to experts
							decision quality			posttest questionnaire
							because of mode			posttest questionnaire
	0.600247576	1 477695208	1 477695208			F-test, df=1 64	34 92	0 0002	significant +	posttest questionnaire
	0 776233614	2 42431234	2 42431234			F-test, df=1 64	93 99	0 0002	significant +	posttest questionnaire
	0.289930481	0 59649098	0 59649098			F test, df=1,64	5 69	0 02	significant +	posttest questionnaire
	0.272419408	0 5574757	0 5574757			F-test, df=1 61	4 97	0 03	significant +	observation
										compared to experts
										posttest questionnaire
										posttest questionnaire
										posttest questionnaire
										posttest questionnaire
										posttest questionnaire
										observation

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Adrianson and Hjelmquist	4 total sample size is 65	actual users (engineers scientists teachers & consultants)	2x2x2 factorial design (mode x problem type x experience level)	only the decision quality of the Arctic problem was reported in the study	for decision quality the lower the score the better the ranking	
	4 total sample size is 65	actual users (engineers, scientists teachers & consultants)	2x2x2 factorial design (mode x problem type x experience level)	only the decision quality of the Arctic problem was reported in the study	for decision quality the lower the score the better the ranking	
	4 total sample size is 65	actual users (engineers scientists teachers & consultants)	2x2x2 factorial design (mode x problem type x experience level)	only the decision quality of the Arctic problem was reported in the study	for decision quality the lower the score the better the ranking	
	4 total sample size is 65 16 groups of 4 except one group of size 5	actual users (engineers scientists teachers, & consultants)	2x2x2 factorial design (mode x problem type x experience level)	only the decision quality of the Arctic problem was reported in the study	for decision quality the lower the score the better the ranking	
	4 total sample size is 65 16 groups of 4 except one group of size 5	actual users (engineers scientists teachers, & consultants)	2x2x2 factorial design (mode x problem type x experience level)	only the decision quality of the Arctic problem was reported in the study	for decision quality the lower the score the better the ranking	
	4 total sample size is 65 16 groups of 4 except one group of size 5	actual users (engineers scientists, teachers, & consultants)	2x2x2 factorial design (mode x problem type x experience level)	only the decision quality of the Arctic problem was reported in the study	for decision quality the lower the score the better the ranking	

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Aldag and Power	1986	published	DSS, a version of DECision AID (DECAID)	lab exp to examine the effect of DSS on decision quality	unstructured high difficulty tasks	strategic management cases	one period	problem solving	computerized DSS
	1986	published	DSS a version of DECision AID (DECAID)	lab exp to examine the effect of DSS on decision quality	unstructured high difficulty tasks	strategic management cases	one period	problem solving	no-DSS
Applegate same study appeared in Applegate, Konsynski and Nunamaker, 1986 conference proceedings	1986	dissertation	GDSS	lab exp to evaluate an automated GDSS to support complex unstructured group decision process	unstructured complex problem	idea generation for organization strategic planning	3 periods (average) over 3 5 months 4 hrs./session	all phases	computerized GDSS GDSS
Barki and Huff based on Barki's dissertation 1984	1984	conference proceedings	DSS 32 different DSS	field study	semi structured to unstructured	accounting finance marketing and general management	cross-sectional	all phases	computerized DSS
Beauclair	1987	dissertation	GDSS software developed "in house"	lab exp to examine the effects of 2 computer support applications voting/rating and brain-storming on small decision making groups	semi structured moderate difficulty task	a case of student misconduct one person destruction of his roommate's property subjects were asked to resolve the problem	one period	solution finding	computerized GDSS with voting/rating facilities
	1987	dissertation	GDSS software developed "in-house"	lab exp to examine the effects of 2 computer support applications, voting/rating and brain-storming on small decision making groups	semi-structured moderate difficulty task	a case of student misconduct one person destruction of his roommate's property, subjects were asked to resolve the problem	one period	solution finding	computerized GDSS with brainstorming facility
	1987	dissertation	GDSS, software developed "in house"	lab exp to examine the effects of 2 computer support applications, voting/rating and brain-storming on small decision making groups	semi-structured moderate difficulty task	a case of student misconduct one person destruction of his roommate s property subjects were asked to resolve the problem	one period	solution finding	computerized GDSS with both voting/rating and brain storming

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Aldag and Power	D1	46	subjects were randomly	decision quality	1	0 85	40 89	not reported	rpb -->
		46	assigned to 2 groups	depth of analysis	3	0 83	29 5	not reported	rpb -->
		46		decision confidence	4	0 84	not reported	not reported	
		46		attitude toward decision aid	6	0 77	not reported	not reported	
		46		attitude toward decision process	6	0 735	not reported	not reported	
		46		attitude toward decision outcome	5	0 693	not reported	not reported	
	D3	42	subjects were randomly	decision quality	1	0 85	40 79	not reported	
		42	assigned to 2 groups	depth of analysis	3	0 83	27 48	not reported	
		42		decision confidence	4	0 84	not reported	not reported	
		42		attitude toward decision aid	6	0 77	not reported	not reported	
		42		attitude toward decision process	6	0 735	not reported	not reported	
		42		attitude toward decision outcome	5	0 693	not reported	not reported	
Applegate	G1	106	Non-random chioce of subjects	quality of decision	1		9 39	0 52	0 2704
				decision time	2		not reported	not reported	
same study appeared in				depth of analysis	3		not reported	not reported	
Applegate Konsynski,				equality of participation	7		not reported	not reported	
and Nunamaker 1986				satisfaction with outcome	5		8 2	1 37	1 8769
conference proceedings				satisfaction with process	6		9 48	1 06	1 1236
Barki and Huff	D1	44	subjects were selected	decision quality	1	0 957			Pearson r - >
		44		realization of expectation	4	0 933			Pearson r >
based on Barki's		46		user satisfaction	6	0 85			Pearson r >
dissertation, 1984		system use N = 39							
Beauclair	G1a	21	subjects were randomly	decision quality	1	0 8124	not reported	not reported	
		21	assigned to treatments	decision time	2		not reported	not reported	
		21		individual quality of interaction	3	0 8529	3 43571	not reported	rpb -->
		21		equality of participation	7		7 67114	not reported	rpb >
		21		attitude toward decision	5		9 09524	not reported	rpb -->
		21							
	G1b	21	subjects were randomly	decision quality	1	0 8124	not reported	not reported	
		21	assigned to treatments	decision time	2		not reported	not reported	
		21		individual quality of interaction	3	0 8529	3 4734	not reported	rpb -->
		21		equality of participation	7		7 54607	not reported	rpb >
		21		attitude toward decision	5		7 3913	not reported	rpb -->
		21							
	G1c	21	subjects were randomly	decision quality	1	0 8124	not reported	Z score = -1 44359	Pearson r-->
		21	assigned to treatments	decision time	2		not reported	Z score = -0 39	Pearson r-->
		21		individual quality of interaction	3	0 8529	3 21273	not reported	
		21		equality of participation	7		7 1511	not reported	
		21		attitude toward decision	5		7 72727	not reported	
		21							

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Aldag and Power	0	0	0		DSS vs no-DSS	F test	0 00	0 966	NS	evaluated by 3 raters
	0 098351216	0 098451991	0 195401684			F-test	0 84	0 363	NS	evaluated by 3 raters
										posttest questionaire
										posttest questionaire
										posttest questionaire
										posttest questionaire
										evaluated by 3 raters
										evaluated by 3 raters
										posttest questionaire
										posttest questionaire
										posttest questionaire
										posttest questionaire
Applegate	no comparison data avalable				1=manual m better 10=GDSS m. better	no tests have been reported except means min max and std. deviation				posttest questionnaire
										structured observation
same study appeared in Applegate Konsynski and Nunamaker 1986, conference proceedings										structured observation
										structured observation
					1 = dissatisfied 10=very satisfied					posttest questionnaire
Barki and Huff	0 394	0 838505549	0 838505549	D1-D3	DSS use vs	t test	not reported	0 008	significant +	questionaaire
	0 396	0 843551157	0 843551157		other variables	t test	not reported	0 004	significant +	questionaaire
based on Barki's dissertation 1984	0 6466	1 658004826	1 658004826			t test	not reported	0 000	significant +	questionaaire
Beauclair				G1a-G3a	computerized brainstorming					compared to 3 raters observation
	0 052895485	0 1046705	0 1046705		vs	F-test	0 48039	0 49	NS	determind by trained coders
	0 00487424	0 009631842	0 009631842		manual	F test	0 04415	0 834	NS	structured observation
	0 372271825	0 792595428	0 792595428		brainstorming	F test	3 44107	0 067	marginally sig +	posttest questionnaire
				G1b-G3b	computerized voting/rating					compared to 3 raters observation
	0 092833154	0 184238278	0 184238278		vs	F test	0 84496	0 361	NS	determind by trained coders
	0 000247363	0 000488801	-0 000488801		manual	F test	0 00224	0 962	NS	structured observation
	3 20251E 05	6 32831E-05	-6 32831E-05		voting/rating	F-test	0 00029	0 986	NS	posttest questionnaire
	-0 157508582	-0 315178546	-0 315178546	G1-G3	computerized vs	chi-square	0 3884	0 9426	NS	compared to 3 raters
	-0 157508582	-0 315178546	-0 315178546		manual GDSS		0 806	0 848	NS	observation
										determind by trained coders
										structured observation
										posttest questionnaire

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Aldag and Power	1 total sample size is 88	students (graduates and under graduates)	repeated measures design (two groups and two treatments)	only the first part of the experiment is taken where the first group first introduced to the DSS and the second group had no DSS		
	1 total sample size is 88	students (graduates and under graduates)	repeated measures design (two groups and two treatments)	only the first part of the experiment is taken where the first group first introduced to the DSS and the second group had no DSS		
Applegate same study appeared in Applegate Konsynski, and Nunamaker 1986, conference proceedings	15 (average) total sample size is 106	high level managers (org anizational planners)	no control group only experimental group using GDSS	There were 7 groups of sizes 19 16 6 22, 8 13 22 with number of sessions 4 4, 2,2 2 3 1 respectively		The GDSS incorporates idea generation idea structuring and analysis models (elect ronic brainstorming and stakeholder identification and assumption analysis)
Barki and Huff based on Barki's dissertation, 1984	1 total sample size is 46	managers/ users in nine organizations	field study	the system use is accepted here as a surrogate for system availability	It is assumed here that the system use is the independent var	
Beauclair	3 to 5 total sample size is 80	undergrad uate students	2x2 factorial design			
	3 to 5 total sample size is 80	undergrad uate students	2x2 factorial design			
	3 to 5 total sample size is 80	undergrad- uate students	2x2 factorial design			

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Beauclair	1987	dissertation	GDSS software developed "in house"	lab exp to examine the effects of 2 computer support applications voting/rating and brain storming on small decision making groups	semi structured moderate difficulty task	a case of student misconduct one person destruction of his roommate s property subjects were asked to resolve the problem	one period	solution finding	no-GDSS
Benbasat and Dexter	1982	published	DSS a simulated model	lab exp to investigate whether DSS can improve the quality of decision given the individual differences	semi-structured moderate difficulty task	simulated inventory control/production scheduling system	longitudinal (10 periods)	solution finding	computerized DSS high analytic subjects
	1982	published	DSS a simulated model	lab exp to investigate whether DSS can improve the quality of decision given the individual differences	semi-structured moderate difficulty task	simulated inventory control/production scheduling system	longitudinal (10 periods)	solution finding	no-DSS high analytic subjects
	1982	published	DSS, a simulated model	lab exp to investigate whether DSS can improve the quality of decision given the individual differences	semi-structured moderate difficulty task	simulated inventory control/production scheduling system	longitudinal (10 periods)	solution finding	computerized DSS low analytic subjects
	1982	published	DSS, a simulated model	lab exp to investigate whether DSS can improve the quality of decision given the individual differences	semi-structured moderate difficulty task	simulated inventory control/production scheduling system	longitudinal (10 periods)	solution finding	no-DSS low analytic subjects
Benbasat and Schroeder	1977	published	DSS, a first order exponential smoothing forecasting aid	lab exp to determine the impact of decision aid on performance variables	semi structured moderate difficulty task	simulated inventory/ production environment	longitudinal (10 periods)	solution finding	computerized DSS
	1977	published	DSS, a first order exponential smoothing forecasting aid	lab exp to determine the impact of decision aid on performance variables	semi-structured moderate difficulty task	simulated inventory/ production environment	longitudinal (10 periods)	solution finding	no-DSS
Bui and Sivasankaran	1987	conference proceedings	GDSS called Co-Op used for multiple criteria decision making	lab	unstructured high complexity	to recommend a type of armored personnel carrier to be puchased by the Arab nation to face a military threat	one period	solution finding	computerized GDSS in high task difficulty

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Beauclair	G3	21	subjects were randomly	decision quality	1	0 8124	not reported	not reported	
		21	assigned to treatments	decision time	2		not reported	not reported	
		21		individual quality of interaction	3	0 8529	3 482	not reported	
		21		equality of participation	7		7.23018	not reported	
		21		attitude toward decision	5		9 4	not reported	
		21							
Benbasat and Dexter	D1a	24	subjects were randomly	profit (decision quality)	1		94258	Z score = 1 36	Pearson r -->
		24	assigned to treatment conditions	decision time	2		4833	Z score = 3 08	Pearson r -->
	D3a	24	subjects were randomly	profit (decision quality)	1		63104	not reported	
		24	assigned to treatment conditions	decision time	2		2928	not reported	
	D1b	7	subjects were randomly	profit (decision quality)	1		75289	Z score = 1 516	rpb -->
		7	assigned to treatment conditions	decision time	2		4077	Z score = 1 03	rpb -->
	D3b	6	subjects were randomly	profit (decision quality)	1		26282	not reported	
		6	assigned to treatment conditions	decision time	2		3317	not reported	
Benbasat and Schroeder	D1	16	assignment of subjects	cost performance (quality)	1		not reported	Z score - >	1 839
		16	to treatments was not	time performance	2		not reported	Z score -->	2 202
		16	random	number of reports generated	14		not reported	Z score >	not reported
	D [illegible]	16	assignment of subjects	cost performance (quality)	-1		not reported		
		16	to treatments was not	time performance	2		not reported		
		16	random	number of reports generated	14		not reported		
Bui and Sivasankaran	G1a	18	homogeneous groups	decision quality	1		0 81	0 21	0 0441
		18		decision time	2		92 25	20 37	414 9369
		18		satisfaction with decision outcome	5		4 08	0 53	0 2809
		18							
		18	12 groups						

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Beauclair										compared to 3 raters
										observation
										determind by trained coders
										structured observation
										posttest questionnaire
Benbasat and Dexter	0 196299092	0.39195794	0 39195794	D1a D3a	DSS vs no-DSS	not specified	not reported	0 087	NS	profit
	0 444559707	0 971699438	0 971699438		(high analytic)			0 001	significant	seconds per decision
									NS	profit
									significant	seconds per decision
	0.420462749	0 421490557	0 855096829	D1b/D3b	DSS vs no-DSS	not specified	not reported	0 065	significant +	profit
	0.285670601	0 286449985	0 550040671		(low analytic)			approx = 0 15	NS	seconds per decision
									significant +	profit
									NS	seconds per decision
Benbasat and Schroeder	Pearson r -->	0 325092343	0 665697804	D1 D3	DSS vs no-DSS	F test	not reported	0 033	significant +	total inventory costs
	Pearson r -->	0 389262283	-0 81834883				not reported	0 018	significant -	observation
							not reported	not reported	not reported	observation
										total inventory costs
										observation
										observation
Bui and Sivasankaran	0.258940148	0 926855114	0 926855114	G1a-G3a	MANOVA(F-values)	F	5 13	0 03	significant +	compared to experts
	28 90441575	0 167448463	0 167448463		GDSS vs no-GDSS		0 17	0 68	NS	time was recorded
	0 666820816	0 314927182	0 314927182		in high complexity task		1 86	0 18	NS	posttest questionnaire

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Beauclair	3 to 5 total sample size is 80	undergraduate students	2x2 factorial design			
Benbasat and Dexter	1 total sample size is 61	students (seniors and graduates)	2 independent groups			
	1 total sample size is 61	students (seniors and graduates)	2 independent groups			
	1 total sample size is 61	students (seniors and graduates)	2 independent groups			
	1 total sample size is 61	students (seniors and graduates)	2 independent groups			
Benbasat and Schroeder	1 total sample size is 32	students	2 independent groups	the cell sizes for the experimental and control groups were not reported, it is assumed they were equal		
	1 total sample size is 32	students	2 independent groups	the cell sizes for the experimental and control groups were not reported, it is assumed they were equal		
Bui and Sivasankaran	3 total sample is 72	students master students	2*2 factorial design			This GDSS is used for all phases of decision making it has interactive conversation and electronic mail

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Bui and Sivasankaran	1987	conference proceedings	GDSS called Co-Op used for multiple criteria decision making	lab	unstructured high complexity	to recommend a type of armored personnel carrier to be puchased by the Arab nation to face a military threat	one period	solution finding	no-GDSS (no-support) in high task difficulty
	1987	conference proceedings	GDSS called Co-Op used for multiple criteria decision making	lab	structured low complexity	to select a regional director for an overseas branch of a firm	one period	solution finding	computerized GDSS in low task difficulty
	1987	conference proceedings	GDSS called Co-Op used for multiple criteria decision making	lab	structured low complexity	to select a regional director for an overseas branch of a firm	one period	solution finding	no-GDSS (no-support) in low task difficulty
the same experiment regardless of task difficulty	1987	conference proceedings	GDSS called Co-Op used for multiple criteria decision making	lab	structured low complexity	to select a regional director for an overseas branch of a firm	one period	solution finding	computerized GDSS both high and low task difficulty
	1987	conference proceedings	GDSS called Co-Op used for multiple criteria decision making	lab	structured low complexity	to select a regional director for an overseas branch of a firm	one period	solution finding	no-GDSS (no-support) both high and low task difficulty
Bui Sivasankaran, Fjiol and Woodbury	1987	conference proceedings	GDSS using a software called Co-oP	lab	semi-structured high difficulty task	selection of a regional director for an oversea branch in order to test group member interaction	one period	problem solving	computerized distributed GDSS
	1987	conference proceedings	GDSS using a software called Co-oP	lab	semi-structured high difficulty task	selection of a regional director for an oversea branch in order to test group member interaction	one period	problem solving	manual face-to-face GDSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Bui and Sivasankaran	G3a	18	homogeneous groups	decision quality	1		0 57	0 3	0 09
		18		decision time	2		87 41	35 44	1255 9936
		18		satisfaction with decision outcome	5		3 87	0 78	0 6084
		18							
		18	12 groups						
	G1b	18	homogeneous groups	decision quality	1		0 78	0 31	0 0961
		18		decision time	2		48 5	10 3	106 09
		18		satisfaction with decision outcome	5		3 84	0 75	0 5625
		18							
		18	12 groups						
	G3b	18	homogeneous groups	decision quality	1		0 75	0 28	0 0784
		18		decision time	2		21 25	6 32	39 9424
		18		satisfaction with decision outcome	5		4 16	0 05	0 0025
		18							
		18	12 groups						
the same experiment regardless of task difficulty	G1	36	homogeneous groups	decision quality	1		0 79	0 29	0 0841
		36		decision time	2		70 37	27 36	748 5696
		36		satisfaction with decision outcome	5		3 97	0 64	0 4096
		36							
		36	12 groups						
	G3	36	homogeneous groups	decision quality	1		0 66	0 3	0 09
		36		decision time	2		54 33	42	1764
		36		satisfaction with decision outcome	5		4 02	0 67	0 4489
		36							
		36	12 groups						
Bui Sivasankaran Fijol and Woodbury	G1	18	not reported	decision quality	1		0 666666667	0 471404521	0 222222222
		18		decision time (read +input)	2		25 67777778	6 24157704	38 95728395
		18		satisfaction with decision process	6		4 056	0 848018751	0 719135802
		18		attitude toward decision aid	9		3 167	1 118033989	1 25
		18		satisfaction with decision outcome	5		3 278	1 095726829	1 200617284
		18		number of criteria generated	3		5 44	0 314269681	0 098765432
	G2	18	not reported	decision quality	1		0 333333333	0 471404521	0 222222222
		18		decision time	2		45.33333333	6 472162613	41 88888889
		18		satisfaction with decision process	6		3 944	1 025899184	1 052469136
		18		attitude toward decision aid	9		3 889	1 099943882	1 209876543
		18		satisfaction with decision outcome	5		3 833333333	1 213351648	1 472222222
		18		number of criteria generated	3		7 17	1 504127654	2 2624

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Bui and Sivasankaran										compared to experts
										time was recorded
										posttest questionnaire
	0 29538111	0 101563705	0 101563705	G1b-G3b	MANOVA(F values)	F	0 05	0 8	NS	compared to experts
	8 544951726	3 189017431	3 189017431		GDSS vs no-GDSS		59 43	0 0001	significant +	time was recorded
	0 531507291	-0 602061356	0 602061356		in low complexity task		4 52	0 04	significant +	posttest questionnaire
										compared to experts
										time was recorded
										posttest questionnaire
the same experiment regardless of task difficulty	0 29504237	0 440614682	0 440614682	G1-G3	ANOVA(F values)	F	2 75	0 1	NS	compared to experts
	35.44410811	0 452543479	0 452543479		GDSS vs no-GDSS		2 46	0 12	NS	time was recorded
	0 655171733	-0 076315869	-0 076315869		regadless of task difficulty		0 14	0 7	NS	posttest questionnaire
										compared to experts
										time was recorded
										posttest questionnaire
Bui, Sivasankaran, Fijol, and Woodbury	0.471404521	0 707106781	0 707106781	G1-G2	distributed	t-test	not reported		significant +	compared to expert's
	6.357915257	-3 091509522	3 091509522		computerized GDSS		2.078		significant +	direct observation
	0 941170797	0 119000717	0 119000717		vs		1 96	at p = 0 05	NS	posttest questionnaire
	1 109025821	-0 651021812	0 651021812		face-to-face		1 96	at p = 0 025	significant +	posttest questionnaire
	1 156036225	-0 480377104	0 480377104				-1 96	at p = 0 025	NS	
	1 086546233	1 592201001	1 592201001				not reported	at p = 0 025	NS	direct observation
										posttest questionnaire
										compared to expert's
										direct observation
										posttest questionnaire
										posttest questionnaire
										direct observation
										posttest questionnaire

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Bui and Sivasankaran	3 total sample is 72	students master students	2*2 factorial design			This GDSS is used for all phases of decision making it has interactive conversation and electronic mail
	3 total sample is 72	students master students	2*2 factorial design			
	3 total sample is 72	students master students	2*2 factorial design			
the same experiment regardless of task difficulty	3 total sample is 72	students master students	2*2 factorial design			
	3 total sample is 72	students master students	2*2 factorial design			
Bui Sivasankaran, Fijol, and Woodbury	3 total sample is 36 12 groups	students	2 independent groups	the scale to measure attitude toward the system is defined so that the lower the score the more it is in favor to the GDSS		Co-oP is color-based multi-window GDSS Provides electronic mail, 4 techniques of aggregation of preferences and voting procedures
	3 total sample is 36 12 groups	students	2 independent groups	the scale to measure attitude toward the system is defined so that the lower the score the more it is in favor to the GDSS		Co-oP is color-based multi-window GDSS Provides electronic mail, 4 techniques of aggregation of preferences and voting procedures

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Burkhard	1984	dissertation	IFPS-based DSS	lab	semi structured high difficulty task	Game(Financial)	4 periods	solution finding	DSS
	1984	dissertation	IFPS-based DSS	lab	semi structured high difficulty task	Game(Financial)	4 periods	solution finding	MIS
Cats Baril and Huber	1987	published	no heuristics delivered either with pen and-paper or a computer	lab	unstructured complex task	developing a career plan	1 period	problem fomulation	no heuristics (computer)
	1987	published	no heuristic delivered either with pen and-paper or a computer	lab	unstructured complex task	developing a career plan	1 period	problem fomulation	no heuristic with paper and pencil

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Burkhard	D1	19	rank order	profit	1		1418 6	257 9806194	66554
		19		loans/shares ratio	1		0 937	0 109544512	0 012
		19		decision time	2		141 3	28 28603896	800 1
		19		no of alternatives	3a		91 5	19 4010309	376.4
		19		no of analysis	3b		19 2	17 13767779	293 7
		19		utilization			78 3	41 89272013	1755
		19		perceived correctness	4	860	4 38	0 734846923	0 54
		19		perceived usefulness (attitude)	6	0 775	5 11	0 774596669	0 6
		19		perceived ease of use (attitude)	6	0 823	4 86	0 824621125	0 68
	D2	22	rank order	profit	1		1298 9	254 056293	64544 6
		22		loans/shares ratio	1		0 895	0 09486833	0 009
		22		decision time	2		86 2	21 05706532	443 4
		22		no of alternatives	3a		91 7	18 53105502	343 4
		22		no of analysis	3b		15 6	11 14839099	124 3
		22		utilization			76 8	46 7204452	2182 8
		22		perceived correctness	4	860	4 36	1 153256259	1 33
		22		perceived usefulness (attitude)	6	0 775	5 67	0 714142843	0 51
		22		perceived ease of use (attitude)	6	0 823	5 1	1 170469991	1 37
Cats Baril and Huber	D1a	16	subjects were assigned randomly to treatments	decision quality	1		46 9		
				productivity (depth of analysis)					
				number of objectives	3b		8 3		
				number of alternatives	3a		7 3		
				# of prioritized alternatives	3a		6 5		
				decision confidence	4	0 92	27		
				satisfaction with decision aid	6	0 94	139 / 38 9		
				change in attitude toward computer					
				change of attitude toward problem					
	D2a	17	subjects were assigned randomly to treatments	decision quality	1		41 5		
				productivity (depth of analysis)					
				number of objectives	3b		7 6		
				number of alternatives	3a		8 1		
				# of prioritized alternatives	3a		7 5		
				decision confidence	4	0 92	28		
				satisfaction with decision aid	6	0 94	132 / 40 5		
				change in attitude toward computer					
				change of attitude toward problem					

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Burkhard	255 8749995	0 467806547		D1 D2	DSS vs MIS	t	1 49	0 10	marginal +	observation
	0 101904933	0.41214884	-0 41214884			t	1 30	0 10	marginal +	observation
	24 65827993	2.234543535	2.234543535			t	7 13	0 05	+	observation
	18.93754919	-0 010561029				t	0 040	NS	0	self report
	14 2297089	0 252991823	0 121215397			t	0 80	NS	0	self report
	44 55730968	0 03366451	0 03366451			t	0 11	NS	0	self-report
	0 98253988	0 020355408	0 020355408			t	0 058	NS	0	self report
	0 742656355	-0 754049967				t	2 452	0 10	-	self report
	1 025445494	-0 234044619	-0 494047293			t	0 768	NS	0	self report
										observation
										observation
										observation
										self report
										self report
										self report
										self report
										self report
										self report
Cats Baril and Huber						not reported	not reported	NS	NS	raters assessment
								NS	NS	observation
								NS	NS	observation
								NS	NS	observation
								NS	NS	self report
						2 scales used		NS	NS	self-report
										self report
										self report
						Mean		NS	NS	raters assessment
								NS	NS	observation
								NS	NS	observation
								NS	NS	observation
								NS	NS	self report
						2 scales used		NS	NS	self report
										self report
										self report

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Burkhard	1	students	one treatment/group (two groups)	homogeneity test performed to determine group homogeneity based on individual characteristics		interactive
	1	students	one treatment/group	homogeneity test performed to determine group homogeneity based on individual characteristics		
Cats Baril and Huber	1 total sample size is 101	students	one group/treatment 6 treatments and 6 groups	MANOVA was run to determine whether the set of dependent variables was significantly related to the treatments ANOVA was run to determine the effect of differences among rators on the results Correlarion among dependent variables were assessed		interactive, heuristic, and computerized
	1 total sample size is 101	students	one group/treatment, 6 treatments and 6 groups	MANOVA was run to determine whether the set of dependent variables was significantly related to the treatments ANOVA was run to determine the effect of differences among rators on the results Correlarion among dependent variables were assessed		

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Cats Baril and Huber	1987	published	heuristics delivered either with pen and-paper or a computer	lab	unstructured complex task	developing a career plan	1 period	problem formulation	heuristic with computer
	1987	published	heuristics delivered either with pen-and-paper or a computer	lab	unstructured complex task	developing a career plan	1 period	problem formulation	heuristic/ paper and pencil
	1987	published	passive heuristics delivered either with pen and-paper or a computer	lab	unstructured complex task	developing a career plan	1 period	problem formulation	passive heuristic/ computer
	1987	published	passive heuristics delivered either with pen and-paper or a computer	lab	unstructured complex task	developing a career plan	1 period	problem formulation	passive heuristic/ paper and pencil
	1987	published	interactive heuristics delivered either with pen and-paper or a computer	lab	unstructured complex task	developing a career plan	1 period	problem formulation	interactive heuristics with computer

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Cats Baril and Huber	D1b		17 subjects were assigned randomly to treatments	decision quality	1		60 4		
				productivity (depth of analysis)					
				number of objectives	3b		14.2		
				number of alternatives	3a		20 5		
				# of prioritized alternatives	3a		15 3		
				decision confidence	4	0 92	22		
				satisfaction with decision aid	6	0 94	153 5 / 35 8		
				change in attitude toward computer					
				change of attitude toward problem					
	D2b		17 subjects were assigned randomly to treatments	decision quality	1		61 9		
				productivity (depth of analysis)					
				number of objectives	3b		15 2		
				number of alternatives	3a		19 3		
				# of prioritized alternatives	3a		12 9		
				decision confidence	4	0 92	24 5		
				satisfaction with decision aid	6	0 94	146 7 / 35 3		
				change in attitude toward computer					
				change of attitude toward problem					
	D1c		17 subjects were assigned randomly to treatments	decision quality	1		55 2		
				productivity (depth of analysis)					
				number of objectives	3b		12 6		
				number of alternatives	3a		14 3		
				# of prioritized alternatives	3a		11 8		
				decision confidence	4	0 92	23		
				satisfaction with decision aid	6	0 94	149 / 36 4		
				change in attitude toward computer					
				change of attitude toward problem					
	D2c		17 subjects were assigned randomly to treatments	decision quality	1		53 8		
				productivity (depth of analysis)					
				number of objectives	3b		13 7		
				number of alternatives	3a		15 2		
				# of prioritized alternatives	3a		12 3		
				decision confidence	4	0 92	26		
				satisfaction with decision aid	6	0.94	145 / 35 3		
				change in attitude toward computer					
				change of attitude toward problem					
	D1d		17 subjects were assigned randomly to treatments	decision quality	1		65 6		
				productivity (depth of analysis)					
				number of objectives	3b		15 8		
				number of alternatives	3a		26 7		
				# of prioritized alternatives	3a		18 7		
				decision confidence	4	0 92	21		
				satisfaction with decision aid	6	0 94	158 / 35 3		
				change in attitude toward computer					
				change of attitude toward problem					

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Cats Barll and Huber						Mean		NS	NS	raters assessment
								NS	NS	observation
								NS	NS	observation
								NS	NS	observation
								NS	NS	self report
						2 scales used		NS	NS	self report
										self report
										self report
						Mean		NS	NS	raters assessment
								NS	NS	observation
								NS	NS	observation
								NS	NS	observation
								NS	NS	self report
						2 scales used		NS	NS	self report
										self report
										self report
						Mean		NS	NS	raters assessment
								NS	NS	observation
								NS	NS	observation
								NS	NS	observation
								NS	NS	self report
						2 scales used		NS	NS	self report
										self report
										self report
						Mean		NS	NS	raters' assessment
								NS	NS	observation
								NS	NS	observation
								NS	NS	observation
								NS	NS	self report
						2 scales used		NS	NS	self report
										self report
										self report
						Mean		NS	NS	raters assessment
								NS	NS	observation
								NS	NS	observation
								NS	NS	observation
								NS	NS	self report
						2 scales used		NS	NS	self report
										self report
										self report

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Cats Baril and Huber	1 total sample size is 101	students	one group/treatment 6 treatments and 6 groups	MANOVA was run to determine whether the set of dependent variables was significantly related to the treatments ANOVA was run to determine the effect of differences among raters on the results Correlarion among dependent variables were assessed	repeated	
	1 total sample size is 101	students	one group/treatment 6 treatments and 6 groups	MANOVA was run to determine whether the set of dependent variables was significantly related to the treatments ANOVA was run to determine the effect of differences among raters on the results Correlarion among dependent variables were assessed	repeated	
	1 total sample size is 101	students	one group/treatment, 6 treatments and 6 groups	MANOVA was run to determine whether the set of dependent variables was significantly related to the treatments ANOVA was run to determine the effect of differences among raters on the results Correlarion among dependent variables were assessed		
	1 total sample size is 101	students	one group/treatment 6 treatments and 6 groups	MANOVA was run to determine whether the set of dependent variables was significantly related to the treatments ANOVA was run to determine the effect of differences among raters on the results Correlarion among dependent variables were assessed		
	1 total sample size is 101	students	one group/treatment 6 treatments and 6 groups	MANOVA was run to determine whether the set of dependent variables was significantly related to the treatments ANOVA was run to determine the effect of differences among raters on the results Correlanon among dependent variables were assessed	may be the first needed variable	

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Cats Baril and Huber	1987	published	interactive heuristics delivered either with pen and-paper or a computer	lab	unstructured complex task	developing a career plan	1 period	problem formulation	interactive heuristics with paper and pencil
Chidambaram	1989	dissertation	GDSS using PLEXSYS tools	lab	moderate high complexity	strategic decision making about problems facing the firm no a priori right or wrong answer	longitudinal (4 periods)	problem solving	computerized GDSS
	1989	dissertation	GDSS using PLEXSYS tools	lab	moderate high complexity	strategic decision making about problems facing the firm no a priori right or wrong answer	longitudinal (4 periods)	problem solving	manual support
Christen and Samet	1980	unpublished Government project	DSS called Decision and Design s Rapid Screening of Options (OPINT)	lab	unstructured high difficulty version 1 attack	military problem facing the intelligent analyst His job is to recommend one level of alert	one period	problem solving	computerized DSS
	1980	unpublished Government project	DSS called Decision and Design s Rapid Screening of Options (OPINT)	lab	unstructured high difficulty version 1 attack	military problem facing the intelligent analyst.His job is to recommend one level of alert	one period	problem solving	no-DSS (baseline)
	1980	unpublished Government project	DSS called Decision and Design s Rapid Screening of Options (OPINT)	lab	semi structured low difficulty version 2 No attack	military problem facing the intelligent analyst His job is to recommend one level of alert	one period	problem solving	computerized DSS
	1980	unpublished Government project	DSS called Decision and Design s Rapid Screening of Options (OPINT)	lab	semi structured low difficulty version 2 No attack	military problem facing the intelligent analyst His job is to recommend one level of alert	one period	problem solving	no-DSS (baseline)

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Cats Baril and Huber	D2d	17	subjects were assigned randomly to treatments	decision quality	1		70		
				productivity (depth of analysis)					
				number of objectives	3b		16 7		
				number of alternatives	3a		23 3		
				# of prioritized alternatives	3a		13 6		
				decision confidence	4	0 92	23		
				satisfaction with decision aid	6	0 94	147 / 35 2		
				change in attitude toward computer					
				change of attitude toward problem					
Chidambaram	G1	70	random assignment of	decision quality	1	0 7767	61 9943	14 11	199 0921
		70	subjects to groups and	depth of analysis (alternatives)	3	0 92	18.9107	5 632	31 719424
		70	groups to treatments	ability to manage group conflict	11	0 7466	10.2729	1 214	1 473796
		70		degree of group cohesiveness	15	0 8894	19.3091	2.039	4 157521
	G2	70	random assignment of	decision quality	1	0 7767	62 5593	13 791	190 191681
		70	subjects to groups and	depth of analysis (alternatives)	3	0 92	14 0893	4 738	22.448644
		70	groups to treatments	ability to manage group conflict	11	0 7466	10 1827	1 403	1.968409
		70		degree of group cohesiveness	15	0 8894	19.3488	1 978	3 912484
Christen and Samet	D1	12	subjects were randomly	decision quality	1		0 67	not reported	
		12	assigned to 2 groups each problem has two versions attack and no attack	decision confidence	4		0 93	not reported	
	D3	12	subjects were randomly	decision quality	1		0 2	not reported	
		12	assigned to 2 groups each problem has two versions attack and no attack	decision confidence	4		0 43	not reported	
	D1	12	subjects were randomly	decision quality	1		0 1	not reported	
		12	assigned to 2 groups each problem has two versions attack and no attack	decision confidence	4		0 34	not reported	
	D3	12	subjects were randomly	decision quality	1		0 4	not reported	
		12	assigned to 2 groups each problem has two versions attack and no attack	decision confidence	4		0 86	not reported	

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Cats Baril and Huber						Mean		NS	NS	raters assessment
								NS	NS	observation
								NS	NS	observation
								NS	NS	observation
								NS	NS	self report
						2 scales used		NS	NS	self report
										self report
										self report
Chidambaram	13 95141177	-0 040497694	0 040497694	G1-G2	computerized GDSS	t test, df=110	0 21	0 4155	NS	compared to experts
	5.204232316	0 926438273	0 926438273		vs manual	t test df=110	4 9	0 0000	significant +	computer logs flip charts
	1.311907962	0 068754823	-0 068754823			t test df=110	0 36	0 3585	NS	posttest questionnaire
	2 008731565	-0 019763716	-0 019763716		one-tail t test	t test df=110	0 1	0 4585	NS	posttest questionnaire
										compared to experts
										computer logs flip charts
										posttest questionnaire
										posttest questionnaire
Christen and Samet	rpb ->	0 766619949	2.286190427	D1a D3a	Aided users vs	F(1 16)	31 36	<0 001	significant +	compared to the correct
	rpb ->	0 374103045	0 772442015		unaided users	F(4 64)	3 58	<0 025	significant +	computed based on above
	biserial				in high difficulty					
	correlation				task ATTACK					
	obtained from F									
										compared to the correct
										computed based on above
	rpb - >	0 361632892	0 742742665	D1b-D3b	Aided users vs	F(1 16)	3 31	0 05 < p < 0 1	NS	compared to the correct
	rpb - >	0 297740733	0 597215762		unaided users	f(4,64)	2 14	0 05 < p < 0 1	NS	computed based on above
	biserial				in low difficulty					
	correlation				task NO ATTACK					
	obtained from F									
										compared to the correct
										computed based on above

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Cats Baril and Huber	1 total sample size is 101	students	one group/treatment 6 treatments and 6 groups	MANOVA was run to determine whether the set of dependent variables was significantly related to the treatments ANOVA was run to determine the effect of differences among rators on the results Correlarion among dependent variables were assessed	may be the second needed variable	
Chidambaram	5 28 groups total subjects = 140	students	2 factorial repeated measures design with two independent groups	results also are available for repeated measures(taking the change in the dependent variables in each of the four sessions	the power of the study is set at alpha = 0 05. This requires N to be >= 140	the GDSS uses PLEXSYS tools Electronic Brainstorming is used to generate anonymous ideas Public screen is used besides voting facilities
	5 28 groups total subjects = 140	students	2 factorial repeated measures design with two independent groups	results also are available for repeated measures(taking the change in the dependent variables in each of the four sessions	the power of the study is set at alpha = 0 05. This requires N to be >= 140	the GDSS uses PLEXSYS tools Electronic Brainstorming is used to generate anonymous ideas Public screen is used besides voting facilities
Christen and Samet	1	experienced navel intelligence analysts	2 groups each given 2 different tasks	sample size = 24	the two different tasks are grouped together but level of difficul-ty is reported	The DSS package contains models for probability influence Bayesian revision, multiattribute utility and subjective expected utility
	1	navel intelligence analysts			the two different tasks are grouped together, but level of difficul-ty is reported	The DSS package contains models for probability influence, Bayesian revision, multiattribute utility and subjective expected utility
	1	navel intelligence analysts			the two different tasks are grouped together but level of difficul-ty is reported	The DSS package contains models for probability influence Bayesian revision multiattribute utility and subjective expected utility
	1	navel intelligence analysts			the two different tasks are grouped together but level of difficul-ty is reported	The DSS package contains models for probability influence Bayesian revision multiattribute utility and subjective expected utility

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Chu	1987	dissertation	DSS Lotus 1-2 3	lab exp to investigate the influence of DSS and task complexity on decision processes	semi structured moderate and high difficulty (complex) tasks		one period	solution finding	computerized DSS
	1987	dissertation	DSS Lotus 1 2-3	lab exp to investigate the influence of DSS and task complexity on decision processes	semi structured moderate and high difficulty (complex) tasks		one period	solution finding	no-DSS
Davis and Mount	1984	published	DSS Computer Assisted Instructions (CAI)	lab exp to evaluate the effectiveness of performance appraisal training	semi-structured medium difficulty task	appraisal of scenarios describing hypothetical employee s performance	one period after a semester in DSS training	all phases	computer assisted instructions with workshop
	1984	published	DSS Computer Assisted Instructions (CAI)	lab exp to evaluate the effectiveness of performance appraisal training	semi-structured medium difficulty task	appraisal of scenarios describing hypothetical employee's performance	one period after a semester in DSS training	all phases	computer assisted instructions only
	1984	published	DSS, Computer Assisted Instructions (CAI)	lab exp to evaluate the effectiveness of performance appraisal training	semi-structured medium difficulty task	appraisal of scenarios describing hypothetical employee s performance	one period after a semester in DSS training	all phases	no-DSS training
Dickmeyer	1983	published	DSS called TRADES used for university planning	lab	semi-structured	university budget planning	one period	problem solving	computerized DSS
	1983	published	DSS called TRADES used for university planning	lab	semi structured	university budget planning	one period	problem solving	manual DSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Chu	D1	12		number of alternatives	3		3 42	3 26	10 6276
				quantitative evaluation			17	not reported	
				qualitative evaluation			4	not reported	
	D3	12		number of alternatives	3		2 42	1 44	2 0736
				quantitative evaluation			7	not reported	
				qualitative evaluation			12	not reported	
Davis and Mount	D1	88	subjects were randomly	multiple choice exam (learning)	14	0 57	18 83	1 2	1 44
		89	selected for the study	relevant considerations (learning)	14	0 7	3 22	1.2	1 44
		86	subjects were randomly	managerial system satisfaction	6	0 83	12 99	2 28	5 1984
		57	assigned to one of	Leniency error	1		6 12	0 96	0 9216
		57	three treatments	Halo error	1		1 41	0 38	0 1444
		57		development plan	1		4 1	1 01	1 0201
		57		adequacy of documentation	1	0 94	4 12	1 97	3 8809
		84		employee system satisfaction	6	0 9	3 28	0 7	0 49
		84		employee process satisfaction	5	0 87	12 7	2 21	4 8841
	D1b	135	subjects were randomly	multiple choice exam (learning)	14	0 57	18 35	1 33	1 7689
		134	selected for the study	relevant considerations (learning)	14	0 7	2 95	1 1	1 21
		131	subjects were randomly	managerial system satisfaction	6	0 83	12 7	2 07	4 2849
		89	assigned to one of	Leniency error	1		6 13	0 84	0 7056
		89	three treatments	Halo error	-1		1 42	0 45	0 2025
		89		development plan	1		3 97	1 05	1 1025
		89		adequacy of documentation	1	0 94	3 96	1 92	3 6864
		133		employee system satisfaction	6	0 9	3 06	0 7	0 49
		133		employee process satisfaction	5	0 87	11 91	2 45	6 0025
	D3	122	subjects were randomly	multiple choice exam (learning)	14	0 57	16 75	1 37	1 8769
		121	selected for the study	relevant considerations (learning)	14	0 7	2 71	1 2	1 44
		119	subjects were randomly	managerial system satisfaction	6	0 83	12 37	2 2	4 84
		89	assigned to one of	Leniency error	-1		6 05	0 82	0 6724
		89	three treatments	Halo error	1		1 37	0 4	0 16
		89		development plan	1		3 8	1 04	1 0816
		89		adequacy of documentation	1	0 94	3 31	1 47	2 1609
		118		employee system satisfaction	6	0 9	3 02	0 63	0 3969
		118		employee process satisfaction	5	0 87	12 04	2 14	4 5796
Dickmeyer	D1	19	Non random chioce of subjects	confidence (change in preference)	4		0 55	0 33	0 1089
	D2	19	Non random chioce of subjects	confidence (change in preference)	4		0 33	0 27	0 0729

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Chu	2 520039682	0 396819148	0 396819148	D1 D3	DSS vs no-DSS	t test	0 97	p < 0 18	NS	
Davis and Mount	1.301598315	1 598035259		CAIW	DSS (both)	t test	4 85	p < 0 001	significant +	multiple choice exam
	1 2	0 425	1 011517629	vs	vs		2 84	p < 0 01	significant +	# of relevant considerations
	2.233846227	0.2775482	0 2775482	no-aid	no-DSS training		not reported	not reported	NS	posttest survey
	0 87710382	0 079808112		(D1 D3)			not reported	not reported	NS	avg rating assigned by mgr
	0 392343387	0 101951508					not reported	not reported	NS	avg std dev of ratings
	1 028437326	0 291704698					not reported	not reported	NS	posttest appraisals
	1 682197637	0 481512982	0 238744325				3 22	p < 0 001	significant +	written comments by experts
	0 659951892	0 393968111	0 393968111				1 98	p < 0.05	significant +	posttest survey
	2 169324204	0 304242215	0 304242215				1 05	NS	NS	posttest survey
	1.349128259	1 185950994		CAI	DSS training with	t test	1 12	NS	NS	multiple choice exam
	1 14851683	0 208965157	0 697458076	vs	workshop		1 73	NS	NS	# of relevant considerations
	2 132843211	0 154723047	0 154723047	no-aid	vs		0 5	not reported	NS	posttest survey
	0.830060239	0 096378547		(D1b-D3b)	DSS training		2 27	not reported	NS	avg. rating assigned by mgr
	0 425734659	0 117444044					2 48	not reported	NS	avg std dev of ratings
	1 045011962	0 162677564						not reported	NS	posttest appraisals
	1 709868416	0 380146211	0 189161592					NS	NS	written comments by experts
	0 668022617	0 059878212	0 059878212					p < 0 05	significant +	posttest survey
	2 309525586	-0 056288616	0 056288616					p < 0 05	significant +	posttest survey
										multiple choice exam
										# of relevant considerations
										posttest survey
										avg rating assigned by mgr
										avg. std dev of ratings
										posttest appraisals
										written comments by experts
										posttest survey
										posttest survey
Dickmeyer	0 301496269	0 729693939	0 729693939		computerized vs manual DSS	t	2 15	0 025	sig +	direct observation
						Mann Whitney	100	0 01	sig +	
										direct observation

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Chu		students				
		students				
Davis and Mount	1 total sample size is 402	managers (middle level)	posttest only with control group design			
	1 total sample size is 402	managers (middle level)	posttest only with control group design			
	1 total sample size is 402	managers (middle level)				
Dickmeyer	1 total sample size is 38	50% students and 50% admin istration	2 independent groups with 2 treatments			interactive computer-based financial model designed to make trade-offs and finding preferred feasible solutions
	1 total sample size is 38	50% students and 50% admin istration	2 independent groups with 2 treatments			

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Dixon	1989	dissertation	DSS that applies the concept of multiple criteria decision making (MCDM)	lab exp to examine the impact of DSS on decision making performance	semi structured high difficulty tasks(there is no optimum solution) solution)	computer network design (multi-objective decision criteria)	one period	problem solving	computerized DSS 5-node network task
	1989	dissertation	DSS that applies the concept of multiple criteria decision making (MCDM)	lab exp to examine the impact of DSS on decision making performance	semi structured high difficulty tasks(there is no optimum solution) solution)	computer network design (multi-objective decision criteria)	one period	problem solving	manual DSS 5-node network task
	1989	dissertation	DSS that applies the concept of multiple criteria decision making (MCDM)	lab exp to examine the impact of DSS on decision making performance	semi-structured high difficulty tasks(there is no optimum solution) solution)	computer network design (multi-objective decision criteria)	one period	problem solving	computerized DSS 4-node network task
	1989	dissertation	DSS	lab exp to examine the impact of DSS on decision making performance	semi-structured high difficulty tasks(there is no optimum solution) solution)	computer network design (multi-objective decision criteria)	one period	problem solving	manual DSS 4-node network task
Easton A.	1988	dissertation	GDSS called SIAS Level II GDSS	lab	semi-structured meduim to high difficulty (creativity + decision making)	to perform an impact analysis of a policy statement The policy requires students to have access to a personal computer to be admited	one period	organizational planning Phase II (design)	computerized GDSS
	1988	dissertation	GDSS called SIAS Level II GDSS	lab	semi structured meduim to high difficulty (creativity + decision making)	to perform an impact analysis of a policy statement The policy requires students to have access to a personal computer to be admited	one period	organizational planning Phase II (design)	manual GDSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Dixon	D1	20	subjects were randomly	setup cost	-1		1110894 74	221041 7	48859433139
		20	assigned to one of two	operating cost	-1		8010 53	1629 81	2656280 636
		20	groups (DSS or manual)	number of alternatives	3		9 105	6.674	44 542276
		20		decision confidence	-4		3 211	1 99	3 9601
	D2	20	subjects were randomly	setup cost	-1		1004736 82	320858 2	1 0295E+11
		20	assigned to one of two	operating cost	-1		14123 68	4087 26	16705694 31
		20	groups (DSS or manual)	number of alternatives	3		2.737	1 147	1.315609
		20		decision confidence	-4		4 1	1 65	2 7225
	D1	20	subjects were randomly	setup cost	-1		927100	106181 03	11274411132
		20	assigned to one of two	operating cost	-1		6410	1884 4	3550963 36
		20	groups (DSS or manual)	number of alternatives	3		7 118	4 608	21 233664
		20		decision confidence	-4		3 05	1 43	2 0449
	D2	20	subjects were randomly	setup cost	1		868684 21	216976 97	47079005510
		20	assigned to one of two	operating cost	1		10807 37	6868 52	47176566 99
		20	groups (DSS or manual)	number of alternatives	3		2.842	1 119	1.252161
		20		decision confidence	-4		4	2 05	4 2025
Easton, A.	G1	24	random assignment	decision quality	1		7 3333	1.3663	1 86677569
		24	to groups and treatments	decision time	2		75 6667	11 9108	141 8671566
		24		satisfaction with decision outcomes	5		3 9167	0 4125	0 17015625
				depth of analysis					
		24		number of stockholders	3		10 1667	1 7224	2 96666176
		24		number of assumtions	3		44 6667	9 24488	85 46780621
		24		equality of participation	7		3 0825	3 007	9 042049
		24	6 groups	satisfaction with decision process	6		5.3167	0 5654	0 31967716
	G2	24	random assignment	decision quality	1		8 5	1.3784	1 89998656
		24	to groups and treatments	decision time	2		82 6667	9 7912	95 86759744
		24		satisfaction with decision outcomes	5		3 675	0 5495	0 30195025
				depth of analysis					
		24		number of stockholders	3		11	2.2804	5 20022416
		24		number of assumtions	3		49	8 9219	79 60029961
		24		equality of participation	7		2.5962	1 8541	3 43768681
		24	6 groups	satisfaction with decision process	6		4 55	0.2008	0 04032064

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Dixon	275508.0921	0 385316886	0 385316886		DSS vs manual	not reported	not reported	not reported	not reported	direct observation
	1153 336008	-5 300406782	5 300406782		(same group)	not reported	not reported	not reported	not reported	direct observation
	4 788417536	1 329875674	1 329875674			not reported	not reported	0 000	significant +	direct observation
	1.827922318	-0 486344519	0 486344519			not reported	not reported	0 014	significant +	posttest questionnaire
										direct observation
										direct observation
										direct observation
										posttest questionnaire
	170811 9092	0 341988977	-0 341988977		DSS vs manual	not reported	not reported	not reported	not reported	direct observation
	1333 760076	3 296972281	3 296972281		(same group)	not reported	not reported	not reported	not reported	direct observation
	3 353045258	1.275258659	1 275258659			not reported	not reported	0 000	significant +	direct observation
	1 767399219	-0 537512968	0 537512968			not reported	not reported	NS	NS	posttest questionnaire
										direct observation
										direct observation
										direct observation
										posttest questionnaire
Easton A.	1.372363336	-0 850139296	0 850139296	G1-G2	GDSS vs manual	t values df=15	1 437	0 0855	NS	compared to experts
	10 90263166	-0 642046821	-0 642046821		GDSS	t values df=15	0 895	0 1925	NS	time was recorded
	0.485853116	0 497475455	0 497475455			t-values df=69	1 577	0 0595	significant +	posttest questionnaire
	2 020753068	-0 412371018				t-value, df=15	0 624	0 271	NS	count no. of stakeholders
	9 08482542	-0 476982198	0 444676608			t-value df=15	0 947	0 1795	NS	count no. of assumptions
	2 497972759	0 194677864	0 194677864			t-value, df=69	0 434	0 333	NS	counting no of comments
	0.424262772	1 807134752	1 807134752			t value, df=69	3 295	0 001	significant +	posttest questionnaire
					GDSS vs. manual	F-value, df=2 15	15 253	0 0002	significant	compared to experts
					GDSS vs no-GDSS	F value df=2 15	2.754	0 096	significant	time was recorded
					(GDSS <> manual <> no-GDSS)	F-value df=2 69	1 267	0 288	NS	posttest questionnaire
						F value df=2 15	9 241	0 002	significant	count no. of stakeholders
						F value df=2 15	21 425	0	significant	count no. of assumptions
						F value df=2 69	28 469	0	significant	counting no of comments
						F value df=2 69	5 736	0 005	significant	posttest questionnaire

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Dixon	1 total sample size is 40	students academicians businessmen, engineers and non professionals	repeated measures design with different tasks the manual group for task 1 became the DSS group for task 2	for decision confidence a lower number (mean) indicates higher confidence		
	1 total sample size is 40	students academicians businessmen, engineers and non professionals	repeated measures design with different tasks the manual group for task 1 became the DSS group for task 2	for decision confidence a lower number (mean) indicates higher confidence		
	1 total sample size is 40	students academicians, businessmen engineers, and non professionals	repeated measures design with different tasks the manual group for task 1 became the DSS group for task 2	for decision confidence a lower number (mean) indicates higher confidence		
	1 total sample size is 40	students academicians businessmen, engineers and non professionals	repeated measures design with different tasks the manual group for task 1 became the DSS group for task 2	for decision confidence a lower number (mean) indicates higher confidence		
Easton A.	4 total sample size is 72	students	3 treatments and 3 groups	the self report post-session questionnaires for decision satisfaction and process satisfaction were developed and tested by Gouran et al 1978, Green and Taber 1980 they have been used by Watson 1987 and Zigurs 1987		Level II decision room FTF 1) identify stakeholders 2) surface assumptions 3) rate assumtions and 4) graph assumptions it provides support for decision modeling through the use of SIAS model
	4 total sample size is 72	students	3 treatments and 3 groups	the self report post-session questionnaires for decision satisfaction and process satisfaction were developed and tested by Gouran et al 1978, Green and Taber 1980 they have been used by Watson 1987 and Zigurs 1987		Level II decision room FTF 1) identify stakeholders 2) surface assumptions 3) rate assumtions, and 4) graph assumptions it provides support for decision modeling through the use of SIAS model

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Easton A.	1988	dissertation	GDSS called SIAS Level II GDSS	lab	semi-structured medulm to high difficulty (creativity + decision making)	to perform an impact analysis of a policy statement The policy requires students to have access to a personal computer to be admited	one period	organizational planning Phase II (design)	no-GDSS (base line)
Easton G	1988	dissertation	GDSS called The PlexCenter at Univ of Arizona. Level 1	lab	semistructured (high difficulty)	Intellective task requires the allocation of a lucrative sales territory	one period	solution finding	computerized GDSS with no leader and no anonymity of inputs
	1988	dissertation	GDSS called The PlexCenter at Univ of Arizona. Level 1	lab	semistructured (high difficulty)	Intellective task, requires the allocation of a lucrative sales territory	one period	solution finding	no-GDSS (base line) with no anonymity of inputs and no leader
	1988	dissertation	GDSS called The PlexCenter, at Univ of Arizona. Level 1	lab	semistructured (high difficulty)	Intellective task, requires the allocation of a lucrative sales territory	one period	solution finding	computerized GDSS with leader but no anonymity of inputs
	1988	dissertation	GDSS called The PlexCenter at Univ of Arizona. Level 1	lab	semistructured (high difficulty)	Intellective task, requires the allocation of a lucrative sales territory	one period	solution finding	no-GDSS (base line) with leader but no anonymity of inputs
	1988	dissertation	GDSS called The PlexCenter at Univ of Arizona. Level 1	lab	semistructured (high difficulty)	Intellective task requires the allocation of a lucrative sales territory	one period	solution finding	computerized GDSS with anonymous input but with no leader

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Easton, A.	G3	24	random assignment	decision quality	1		4 1667	1 472	2 166784
		24	to groups and treatments	decision time	2		64 5	17 6833	312 6990989
		24		satisfaction with decision outcomes	5		3 825	0 611	0 373321
				depth of analysis					
		24		number of stockholders	3		5.6667	2 8048	7 86690304
		24		number of assumtions	3		21 1667	4 8339	23 36658921
		24		equality of participation	7		10 1479	5 7183	32 69895489
		24	6 groups	satisfaction with decision process	6		4 775	0 8136	0 66194496
Easton G	G1a	30	random assignment of	decision quality	1		8 5	4 6345	21 47859025
		30	individuals to groups	decision time	2		30	0	0
		30	Each group was assigned	degree of consensus	8		0	0	0
		30	to one experiment	equality of participation	7	0 8249	6.1572	2.4353	5 93068609
		30	situation randomly	satisfaction with decision process	6		62 3	4.4149	19 49134201
		30		degree of uninhibited behavior	12		0 4	0 5477	0 29997529
	G3a	30	random assignment of	decision quality	1		5.134	3 7769	14 26497361
		30	individuals to groups	decision time	2		11 4	13 3342	177 8008896
		30	Each group was assigned	degree of consensus	8		0 8	0.4472	0 19998784
		30	to one experiment	equality of participation	7	0 8249	30.8546	7 7003	59 29462009
		30	situation randomly	satisfaction with decision process	6		65 268	2.3678	5 60647684
		30		degree of uninhibited behavior	12		0 4	0 5477	0 29997529
	G1b	30	random assignment of	decision quality	1		7 466	2.4029	5 77392841
		30	individuals to groups	decision time	2		30	0	0
		30	Each group was assigned	degree of consensus	8		0	0	0
		30	to one experiment	equality of participation	7	0 8249	7 4313	1 098	1.205604
		30	situation randomly	satisfaction with decision process	6		59 568	3 541	12 538681
		30		degree of uninhibited behavior	12		1	2.2361	5 00014321
	G3b	30	random assignment of	decision quality	1		7 666	3.2427	10 51510329
		30	individuals to groups	decision time	2		20 2	9 5499	91 20059001
		30	Each group was assigned	degree of consensus	8		0 6	0 5477	0 29997529
		30	to one experiment	equality of participation	7	0 8249	23.6622	7.2915	53 16597225
		30	situation randomly	satisfaction with decision process	6		62 332	3.3509	11 22853081
		30		degree of uninhibited behavior	12		0 8	0 8365	0 69973225
	G1c	30	random assignment of	decision quality	1		6.234	2 0341	4 13756281
		30	individuals to groups	decision time	2		30	0	0
		30	Each group was assigned	degree of consensus	8		0	0	0
		30	to one experiment	equality of participation	7	0 8249	6.6556	2 9257	8 55972049
		30	situation randomly	satisfaction with decision process	6		56 623	4 5733	20 91507289
		30		degree of uninhibited behavior	12		0 2	0 4472	0 19998784

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Easton A.	1.420133742	2.307406441	2.307406441	G1-G3	structured vs	t value df=15	5 333	0	significant +	compared to experts'
	15.07591217	1 024220606	1 024220606		unstructured	t value, df=15	2.166	0 0235	significant -	time was recorded
	0 52128555	0 188740171	0 188740171		(GDSS+manual GDSS vs no-GDSS)	t value df=69	-0 22	0 4135	NS	posttest questionnaire
	2.327398204	2.226892574				t value, df=15	4 254	0 0005	significant +	count no. of stakeholders
	7 37680132	2.58673105	2.406811812			t value df=15	6 477	0	significant +	count no. of assumptions
	4 568424449	-2 828453583	2.828453583			t value df=69	-7 533	0	significant +	counting no of comments
	0 700579089	1 276803046	1 276803046			t value, df=69	0 786	0 2175	NS	posttest questionnaire
Easton G	4.227503037	0 796214685	0 796214685	G1a-G3a	G1a+G1b vs FTF	t values df=24	-1 039	0 845	NS	compared to experts
	9.428703242	1 972699694	1 972699694		GDSS vs FTF	t values df=24	3 725	0 01	significant -	observation
	0 316218153	2 529899038	2.529899038		GDSS vs FTF	t values df=24	4 287	0 00	significant -	std dev of no of remarks
	5 710748908	-4 324721748	4 324721748		GDSS vs FTF	t values df=24	9 8831	0 00	significant +	posttest questionnaire
	3 54244399	-0 837839641	0 837839641		GDSS vs FTF	t values df=24	1 746	0 047	significant +	magnetic disk & videotape
	0 5477	0	0		GDSS vs FTF	t values df=24	0 138	0 892	NS	magnetic disk & videotape
										compared to experts
										observation
										std dev of no. of remarks
										posttest questionnaire
										magnetic disk & videotape
										magnetic disk & videotape
	2.853859816	-0 070080527	0 070080527	G1b-G3b						compared to experts
	6.75279905	1 451250056	1 451250056							observation
	0.387282384	-1 549257143	-1 549257143							std dev of no. of remarks
	5.213999245	3 112946366	3 112946366							posttest questionnaire
	3.447260638	-0 802376232	0 802376232							magnetic disk & videotape
	1 688175859	0 11847107	0 11847107							magnetic disk & videotape
										compared to experts
										observation
										std dev of no of remarks
										posttest questionnaire
										magnetic disk & videotape
										magnetic disk & videotape
	3.033359229	0 362634267	-0 362634267	G1c-G3a						compared to experts'
	9.428703242	1 972699694	1 972699694							observation
	0.316218153	-2 529899038	-2.529899038							std dev of no of remarks
	5.824703451	-4 154546271	4 154546271							posttest questionnaire
	3 641534685	2 373999082	-2.373999082							magnetic disk & videotape
	0.499981565	-0 400014749	-0 400014749							magnetic disk & videotape

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Easton A.	4 total sample size is 72	students	3 treatments and 3 groups	the self report post session questionnaires for decision satisfaction and process satisfaction were developed and tested by Gouran et al 1978, Green and Taber 1980 they have been used by Watson 1987 and Zigurs, 1987		Level II decision room FTF 1) identify stakeholders, 2) surface assumptions 3) rate assumtions, and 4) graph assumptions It provides support for decision modeling through the use of SIAS model
Easton G	6 5 groups total sample is 180	students	2*2*2 factorial design but grouped to 6 conditions because there is no "anonymity" in face-to-face communication	the experiment was conducted over a period of 4 months	the scale for both decision quality and equality of participation is for the lower the better	decision room, fact to-face group interaction The GDSS assists in generating ideas, formulating the ideas into alternative solutions and voting on the alternatives
	6 5 groups total sample is 180	students	2*2*2 factorial design but grouped to 6 conditions because there is no "anonymity" in face-to-face communication	The experiment was coducted over a period of 4 months	the scale for both decision quality and equality of participation is for the lower the better	decision room, fact to-face group interaction The GDSS assists in generating ideas formulating the ideas into alternative solutions and voting on the alternatives
	6 5 groups total sample is 180	students	2*2*2 factorial design but grouped to 6 conditions because there is no "anonymity" in face-to-face communication	The experiment was conducted over a period of 4 months	the scale for both decision quality and equality of participation is for the lower the better	decision room, fact to-face group interaction The GDSS assists in generating ideas, formulating the ideas into alternative solutions and voting on the alternatives
	6 5 groups total sample is 180	students	2*2*2 factorial design but grouped to 6 conditions because there is no "anonymity" in face-to-face communication	The experiment was conducted over a period of 4 months	the scale for both decision quality and equality of participation is for the lower the better	decision room, fact to-face group interaction The GDSS assists in generating ideas formulating the ideas into alternative solutions and voting on the alternatives
	6 5 groups total sample is 180	students	2*2*2 factorial design but grouped to 6 conditions because there is no "anonymity" in face-to-face communication	The experiment was conducted over a period of 4 months	the scale for both decision quality and equality of participation is for the lower the better	decision room, fact to-face group interaction The GDSS assists in generating ideas formulating the ideas into alternative solutions and voting on the alternatives

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Easton G	1988	dissertation	GDSS called The PlexCenter at Univ of Arizona. Level 1	lab	semistructured (high difficulty)	Intellective task, requires the allocation of a lucrative sales territory	one period	solution finding	computerized GDSS with leader and anonymous input
Eckel	1983	published	DSS a program for budget projections	lab exp to examine the effect of a probabilistic DSS on decision performance and behavior	semi structured high difficulty task	experimental gaming for production and advertisement decisions	six periods	solution finding	computerized probabilistic DSS
	1983	published	DSS a program for budget projections	lab exp to examine the effect of a probabilistic DSS on decision performance and behavior	semi structured high difficulty task	experimental gaming for production and advertisement decisions	six periods	solution finding	computerized deterministic DSS
	1983	published	DSS a program for budget projections	lab exp to examine the effect of a probabilistic DSS on decision performance and behavior	semi-structured high difficulty task	experimental gaming for production and advertisement decisions	six periods	solution finding	computerized DSS with access to computer budget
	1983	published	DSS a program for budget projections	lab exp to examine the effect of a probabilistic DSS on decision performance and behavior	semi-structured high difficulty task	experimental gaming for production and advertisement decisions	six periods	solution finding	computerized DSS with no access to computer budget
Ellis Rein and Jarvenpaa	1989-90	published	GDSS	field experiment	high difficulty no single best solution	high level software design problems (realistic) Three different tasks were used	3 periods one hour each for each group in each decision task Total = 27 periods	problem solving requires idea generation and consensus	computerized GDSS (electronic meeting room with only Electronic Blackboard EBB)
	1989-90	published	GDSS	field experiment	high difficulty no single best solution	high level software design problems (realistic) Three different tasks were used	3 periods one hour each for each group in each decision task Total = 27 periods	problem solving requires idea generation and consensus	computerized GDSS (electronic meeting room with only electronic workstations EWS)

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Easton G.	G1d	30	random assignment of	decision quality	1		5 6	3.6721	13 48431841
		30	individuals to groups	decision time	2		17	12 9228	166 9987598
		30	Each group was assigned	degree of consensus	8		0 6	0 5477	0 29997529
		30	to one experiment	equality of participation	7	0 8249	6.0829	0 6807	0 46335249
		30	situation randomly	satisfaction with decision process	6		63 8	3.3323	11 10422329
		30		degree of uninhibited behavior	12		1 6	3 0496	9 30006016
Eckel	D1	49	participation in the	decision quality - profit	1		-163945 37	not reported	rpb -->
		49	experiment was mandatory	accuracy of decision	1	price/advertiz -->	23 6736/175039 325	not reported	rpb -->
		27	subjects were randomly	number of alternatives	3	two measures -->	1 2592/2.9506	not reported	rpb -->
		49	assigned to one of four groups	amount of information requested	3		9598 6394	not reported	rpb -->
	D2	60	participation in the	decision quality profit	1		203017 737	not reported	
		60	experiment was mandatory	accuracy of decision	1	price/advertiz -->	26 1017/202311 967	not reported	
		32	subjects were randomly	number of alternatives	3	two measures -->	0 8219/1 0851	not reported	
		60	assigned to one of four groups	amount of information requested	3		6737 4301	not reported	
	D1	59	participation in the	decision quality profit	1		-176620 453	not reported	rpb -->
		59	experiment was mandatory	accuracy of decision	1	price/advertiz -->	24 957/186535 081	not reported	rpb -->
		59	subjects were randomly	number of alternatives	3		not reported	not reported	
		59	assigned to one of four groups	amount of information requested	3		7756.3739	not reported	rpb -->
	D2	50	participation in the	decision quality - profit	1		-195763 441	not reported	
		50	experiment was mandatory	accuracy of decision	1	price/advertiz -->	25 0656/194121 613	not reported	
		50	subjects were randomly	number of alternatives	3		not reported	not reported	
		50	assigned to one of four groups	amount of information requested	3		8347 826	not reported	
Ellis Rein and Jarvenpaa	G1a	7	subjects were randomly	decision quality	1		11	not reported	
		7	assigned to three teams	overall completeness	1a			not reported	
		7	The teams were randomly	clarity	1b			not reported	
		7	assigned to the meeting	overall impression	1c			not reported	
		7	environments	point by-point grading of each obj.	1d			not reported	
		7		total number of thoughts	3		58	not reported	
		7		number of verbal, nonverbal remarks	13		800	not reported	
		7		satisfaction	9			not reported	
	G1B	7	subjects were randomly	decision quality	1		8	not reported	
		7	assigned to three teams	overall completeness	1a			not reported	
		7	The teams were randomly	clarity	1b			not reported	
		7	assigned to the meeting	overall impression	1c			not reported	
		7	environments	point by-point grading of each obj.	1d			not reported	
		7		total number of thoughts	3		43	not reported	
		7		number of verbal, nonverbal remarks	13		750	not reported	
		7		satisfaction	9			not reported	

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Easton G	3 46405988	-0 596410014	0 596410014	G1d-G3b						compared to experts'
	11 36220379	-0 281635505	0 281635505							observation
	0 5477	0	0							std dev of no of remarks
	5 178287591	-3 394809518	3 394809518							posttest questionnaire
	3.341612941	0 439308809	0 439308809							magnetic disk & videotape
	2.236044768	0.35777459	0 35777459							magnetic disk & videotape
Eckel	0.231154523	0 226312528		D1 D2	probabilistic	F test	6 04	0 0157	significant +	profit before income tax
	0.212695986	0 209063168	0 217687848		DSS vs		5 07	0 0079	significant +	absolute error in price/adv
	0.311151225	0 270488809			deterministic		6 11	0 004	significant +	number of decision inputs
	0.215280773	0.21149082	0 240989815		DSS		5 2	0 0246	significant +	cost of information used
										profit before income tax
										absolute error in price/adv
										number of decision inputs
										cost of information used
	0 160244759	0 158754635		D1 D2	DSS with access to	F test	2 82	0 0961	significant +	profit before income tax
	0.078884204	0 078907678	0 118831156		computer budget		0 67	0 5155	NS	absolute error in price/adv
					vs		not reported	not reported	not reported	number of decision inputs
	0 053747807	0 053853701	0 053853701		DSS without access		0 31	0 5795	NS	cost of information used
					to computer budget					
										profit before income tax
										absolute error in price/adv
										number of decision inputs
										cost of information used
Ellis Rein and Jarvenpaa										evaluated by 4 judges
										evaluated by 4 judges
										evaluated by 4 judges
										evaluated by 4 judges
										evaluated by 4 judges
										observation
										observation
										posttest questionnaire
										evaluated by 4 judges
										evaluated by 4 judges
										evaluated by 4 judges
										evaluated by 4 judges
										evaluated by 4 judges
										observation
										observation
										posttest questionnaire

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Easton G	6 5 groups total sample is 180	students	2*2*2 factorial design but grouped to 6 conditions because there is no "anonymity" in face- to-face communication	The experiment was conducted over a period of 4 months	the scale for both decision quality and equality of participation is for the lower the better	decision room, fact to-face group interaction The GDSS assists in generating ideas, formulating the ideas into alternative solutions and voting on the alternatives
Eckel	1 total sample size is 109	students (under graduates)	4 independent groups			
	1 total sample size is 109	students (under graduates)	4 independent groups			
	1 total sample size is 109	students (under graduates)	4 independent groups			
	1 total sample size is 109	students (under graduates)	4 independent groups			
Ellis Rein, and Jarvenpaa	7 total sample is 21	professional software engineers or computer scientists	3x3 repeated measures Graeco Latin Square Each group goes through the 3 experimental conditions	the study provides insight and observation, rather than statistical conclusions		the GDSS was a prototype and unpolished;the electronic meeting room is equiped with a network of workstations an electronic blackboard and a communication software No anonymous input provided
	7 total sample is 21	professional software engineers or computer scientists	3x3 repeated measures Graeco Latin Square Each group goes through the 3 experimental conditions	the study provides insight and observation rather than statistical conclusions		the GDSS was a prototype and unpolished;the electronic meeting room is equiped with a network of workstations an electronic blackboard and a communication software No anonymous input provided

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Ellis, Rein, and Jarvenpaa	1989-90	published	GDSS	field experiment	high difficulty no single best solution	high level software design problems (realistic) Three different tasks were used	3 periods one hour each for each group in each decision task. Total = 27 periods	problem solving requires idea generation and consensus	no-GDSS (conventional or base line)
Fudge and Lodish	1977	published	DSS called CALLPLAN	field test to examine the impact of DSS on sales and sales forecast	semi-structured moderate task difficulty	sales forecasting (to estimate call frequency policies and anticipated sales for each account)	longitudinal (six months)	problem solving	computerized DSS
	1977	published	DSS called CALLPLAN	field test to examine the impact of DSS on sales and sales forecast	semi-structured moderate task difficulty	sales forecasting (to estimate call frequency policies and anticipated sales for each account)	longitudinal (six months)	problem solving	manual DSS
Gallupe DeSanctis and Dickson It is a replication of Gallupe (1985) dissertation	1988	published	GDSS level 1 called Decision Aid for Groups (DECAID) Developed by the authors	lab exp to examine the effects of group decision support systems (GDSS) technology on group decision quality and individual perceptions within a problem-finding context	semi-structured low and high task difficulty	crisis management A firm losing profits at the same time that sales are rising	1 period	problem finding	computerized GDSS
	1988	published	GDSS level 1 called Decision Aid for Groups (DECAID) Developed by the authors	lab exp to examine the effects of group decision support systems (GDSS) technology on group decision quality and individual perceptions within a problem-finding context	semi structured low and high task difficulty	crisis management A firm losing profits at the same time that sales are rising	1 period	problem finding	no GDSS (base line)

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Ellis Rein and Jarvenpaa	G3	7	subjects were randomly	decision quality	1		5	not reported	
		7	assigned to three teams	overall completeness	1a			not reported	
		7	The teams were randomly	clarity	1b			not reported	
		7	assigned to the meeting	overall impression	1c			not reported	
		7	environments	point-by-point grading of each obj	1d			not reported	
		7		total number of thoughts	3		98	not reported	
		7		number of verbal nonverbal remarks	13		600	not reported	
		7		satisfaction	9			not reported	
Fudge and Lodish	D1	10	subjects were randomly	percentage of sales change	1		11 83	7 5743	57 37002049
		10	assigned to treatments	absolute % deviation of forecast	1		22 98	14 62278	213 8256949
	D2	10	assigned to treatments	percentage of sales change	1		4 27	11 14	124 0996
		10	subjects were randomly	absolute % deviation of forecast	1		6 98	7 13117	50 85358557
Gallupe, DeSanctis and Dickson	G1	36	random assignment of	decision quality	1		7 33	1 61	2 5921
		36	individuals to groups	number of alternatives	3		4 5	0 8	0 64
		36	Each group was assigned	number of issues	3		15 92	4 76	22 6576
It is a replication		36	to one experiment	decision confidence	4		2 69	0 76	0 5776
of Gallupe (1985)		36	situation randomly	agreement with the final solution	9		2 25	0 93	0 8649
dissertation		36		satisfaction with decision process	6		3 19	0 98	0 9604
		36		amount of discussion conflict	11		4 11	1	1
		36		decision time - from starting	2		83 92	23 94	573 1236
		36		decision time - from discussion	2		58 25	12 14	147 3796
	G3	36	random assignment of	decision quality	1		5 5	2 1	4 41
		36	individuals to groups	number of alternatives	3		2 92	0 85	0 7225
		36	Each group was assigned	number of issues	3		16 83	4 89	23 9121
		36	to one experiment	decision confidence	4		2 17	0 64	0 4096
		36	situation randomly	agreement with the final solution	9		1 58	0 21	0 0441
		36		satisfaction with decision process	6		2 39	0 89	0 7921
		36		amount of discussion conflict	11		5 47	0 78	0 6084
		36		decision time - from starting	2		69 5	15 4	237 16
		36		decision time - from discussion	2		46 75	8 02	64 3204

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Ellis, Rein, and										evaluated by 4 judges
Jarvenpaa										evaluated by 4 judges
										evaluated by 4 judges
										evaluated by 4 judges
										evaluated by 4 judges
										observation
										observation
										posttest questionnaire
Fudge and Lodish	9 525482153	0 793660613			DSS vs manual	not reported	not reported	not reported		sales figures
	11 50389674	1 390833068	0 298586228							sales - forecast
										sales figures
										sales - forecast
Gallupe DeSanctis	1.871109297	0 978029452	0 978029452	G1-G3	GDSS	ANOVA (F values)	8 897	0 007	significant +	compared to 3 experts'
and Dickson	0.825378701	1 914272804			vs		22 284	0 001	significant +	video and audio tapes
	4.825437804	-0 188583925	0 862844439		no-support		0 219	0 645	NS	video and audio tapes
it is a replication	0 702586723	0 740143225	-0 740143225		regardless of		3 412	0 08	NS	post test responses
of Gallupe (1985)	0.674166152	0.99382029	-0 99382029		task difficulty		6 698	0 018	significant	posttest questionnaire
dissertation	0.936082261	0 854625745	0 854625745				5 263	0 033	significant -	post test responses
	0.896771989	-1 516550491	1 516550491				13 062	0 002	significant +	posttest questionnaire
	20 12813454	0 716410156					2.917	0 103	NS	recording
	10 28834292	1 117769897	0 917090026				1 741	0 202	NS	recording
										compared to 3 experts
										video and audio tapes
										video and audio tapes
										post test responses
										posttest questionnaire
										post test responses
										posttest questionnaire
										recording
										recording

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Ellis, Rein, and Jarvenpaa	7 total sample is 21	professional software engineers or computer scientists	3x3 repeated measures Graeco Latin Square Each group goes through the 3 experimental conditions.	the study provides insight and observation rather than statistical conclusions		the GDSS was a prototype and unpolished;the electronic meeting room is equiped with a network of workstations an electronic blackboard and a communication software No anonymous input provided
Fudge and Lodish	1 total sample size is 20	salesmen 16 passenger 4 cargo in travel agencies	2x2 factorial design (2 sales territories times 2 decision aid levels)			CALLPLAN is a deterministic in its structure which explains why its forecasts were conservative
	1 total sample size is 20	salesmen 16 passenger 4 cargo in travel agencies	2x2 factorial design (2 sales territories times 2 decision aid levels)			CALLPLAN is a deterministic in its structure which explains why its forecasts were conservative
Gallupe DeSanctis and Dickson it is a replication of Gallupe (1985) dissertation	3 6 groups total sample size is 72	students	2*2 factorial design	the scales for decision confidence agreement with final solution satisfaction with group decision process are the lower the better, for intra-group conflict the lower value the higher the conflict		
	3 6 groups total sample size is 72	students	2*2 factorial design	the scales for decision confidence agreement with final solution satisfaction with group decision process are the lower the better, for intra-group conflict the lower value the higher the conflict		decision room, fact to-face group interaction The GDSS records, stores and displays alternatives and preference rankings and records votes

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Gallupe DeSanctis and Dickson It is a replication of Gallupe (1985) dissertation	1988	published	GDSS level 1 called Decision Aid for Groups (DECAID) Developed by the authers	lab exp to examine the effects of group decision support systems (GDSS) technology on group decision quality and individual perceptions within a problem-finding context	semi structured (low difficulty)	crisis management A firm losing profits at the same time that sales are rising	1 period	problem finding	computerized GDSS with low task difficulty
	1988	published	GDSS level 1 called Decision Aid for Groups (DECAID) Developed by the authers	lab exp to examine the effects of group decision support systems (GDSS) technology on group decision quality and individual perceptions within a problem-finding context	semi structured (high difficulty)	crisis management A firm losing profits at the same time that sales are rising	1 period	problem finding	computerized GDSS with high task difficulty
	1988	published	GDSS level 1 called Decision Aid for Groups (DECAID) Developed by the authers	lab exp to examine the effects of group decision support systems (GDSS) technology on group decision quality and individual perceptions within a problem-finding context	semi-structured (low difficulty)	crisis management A firm losing profits at the same time that sales are rising	1 period	problem finding	no GDSS (base line) with low task difficulty
	1988	published	GDSS level 1 called Decision Aid for Groups (DECAID) Developed by the authers	lab exp to examine the effects of group decision support systems (GDSS) technology on group decision quality and individual perceptions within a problem-finding context	semi-structured (high difficulty)	crisis management A firm losing profits at the same time that sales are rising	1 period	problem finding	no GDSS (base line) with high task difficulty
George Northcraft, and Nunamaker	1987	conference proceedings	GDSS using brainstorming software in PLEXLAB University of Arizona	lab pilot study	semi-structured medium difficulty task	assignment of sales territories in a case study	one period	problem solving idea generation and voting	GDSS non anonymous assigned leader

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Gallupe DeSanctis and Dickson	G1	18	random assignment of	decision quality	1		7 83	0 98	0 9604
		18	individuals to groups	number of alternatives	3		4 33	0 82	0 6724
		18	Each group was assigned	number of issues	3		15 83	4 37	19 0969
it is a replication		18	to one experiment	decision confidence	4		2 94	0 83	0 6889
of Gallupe (1985)		18	situation randomly	agreement with the final solution	8		2 67	1 07	1 1449
dissertation		18		satisfaction with decision process	6		3 72	0 53	0 2809
		18		amount of discussion conflict	11		4 17	0 94	0 8836
		18		decision time from starting	2		78 67	21 92	480 4864
		18		decision time from discussion	2		55	11 4	129 96
	G1	18	random assignment of	decision quality	1		6 83	2 04	4 1616
		18	individuals to groups	number of alternatives	3		4 67	0 82	0 6724
		18	Each group was assigned	number of issues	3		16	5 55	30 8025
		18	to one experiment	decision confidence	4		2 44	0 65	0 4225
		18	situation randomly	agreement with the final solution	8		1 83	0 59	0 3481
		18		satisfaction with decision process	6		2 67	1 07	1 1449
		18		amount of discussion conflict	11		4 06	1 12	1 2544
		18		decision time from starting	2		89 17	26 72	713 9584
		18		decision time - from discussion	2		61 5	13 59	184 6881
	G3	18	random assignment of	decision quality	1		7 17	1 26	1 5876
		18	individuals to groups	number of alternatives	3		3 33	0 84	0 7056
		18	Each group was assigned	number of issues	3		18 33	4 88	23 8144
		18	to one experiment	decision confidence	4		2	0 42	0 1764
		18	situation randomly	agreement with the final solution	8		1 61	0 13	0 0169
		18		satisfaction with decision process	6		2 5	1 21	1 4641
		18		amount of discussion conflict	11		5 28	1 08	1 1664
		18		decision time from starting	2		71 17	19 99	399 6001
		18		decision time - from discussion	2		51 5	10 67	113 8489
	G3	18	random assignment of	decision quality	1		3 83	1 47	2 1609
		18	individuals to groups	number of alternatives	3		2 5	0 54	0 2916
		18	Each group was assigned	number of issues	3		15 33	3 88	15 0544
		18	to one experiment	decision confidence	4		2 33	0 81	0 6561
		18	situation randomly	agreement with the final solution	8		1 55	0 27	0 0729
		18		satisfaction with decision process	6		2 28	0 25	0 0625
		18		amount of discussion conflict	11		5 67	0 3	0 09
		18		decision time from starting	2		67 83	10 74	115 3476
		18		decision time - from discussion	2		42	5 89	34 6921
George Northcraft and Nunamaker	G1a	6	subjects were drwn from	decision quality	1		4 5	not reported	
		6	an MIS class, subjects	degree of consensus	8		no	not reported	
		6	were randomly assigned	decision time	2		15	not reported	
		6	to treatments	degree of uninhibited behavior	12		1	not reported	
		6		equality of participation	7		5 4	not reported	
		6		satisfaction with decision process	6		50 8	not reported	
		6		total number of remarks	13		78	not reported	

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Gallupe DeSanctis	1 128716085	0 584735177	0 584735177	G1-G3	interaction effect	ANOVA (F-values)	3 603	0 072	NS	compared to 3 experts
and Dickson	0.830060239	1.204731841			between level		3 025	0 097	NS	video and audio tapes
	4 632024395	-0 539720819	0 332505511		of support and		0 655	0 428	NS	video and audio tapes
It is a replication	0 657761355	1 429089734	1 429089734		task difficulty		2.127	0 16	NS	post test responses
of Gallupe (1985)	0 76216796	1 390769561	-1 390769561				2.279	0 147	NS	posttest questionnaire
dissertation	0 934077085	1 306102055	-1 306102055				1 408	0 249	NS	post-test responses
	1 012422837	-1 096379852	1 096379852				0 441	0 514	NS	posttest questionnaire
	20 97720787	0 3575309					0 671	0 422	NS	recording
	11 04103482	0 316999272	0 337265086				0 842	0 37	NS	recording
	1 777990439	1 687298162	1 687298162	G1-G3						compared to 3 experts
	0 694262198	3 12562027								video and audio tapes
	4 78836611	0 139922467	1 632771369							video and audio tapes
	0 734370479	0 149788156	0 149788156							post test responses
	0 45880279	0 610283996	0 610283996							posttest questionnaire
	0 776981338	0 501942557	0 501942557							post test responses
	0 81987804	-1 9637067	1 9637067							posttest questionnaire
	20 36303023	1 047977622								
	10 47330416	1 861876606	1 454927114							
					high vs low	ANOVA (F values)	12 426	0 002	significant +	compared to 3 experts
					task difficulty		0 556	0 465	NS	video and audio tapes
					regardless of		0 524	0 477	NS	video and audio tapes
					level of support		0 085	0 774	NS	post test responses
							2.971	0 1	NS	posttest questionnaire
							3 31	0 084	NS	post test responses
							0 136	0 716	NS	posttest questionnaire
							0 18	0 676	NS	
							0 03	0 865	NS	
										compared to 3 experts
										video and audio tapes
										video and audio tapes
										post test responses
										posttest questionnaire
										post test responses
										posttest questionnaire
George Northcraft					no tests were run				quality is better	ranked by researchers
and Nunamaker									under anonymity	direct observation
									and assigned	direct observation
									leadership worse	std dev of remarks
									in face-to-face	counting uninhibited beh
									conditions and	posttest questionnaire
									non anonymous	direct observation

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Gallupe DeSanctis and Dickson It is a replication of Gallupe (1985) dissertation	3 6 groups total sample size is 72	students	2*2 factorial design	the scales for decision confidence, agreement with final solution satisfaction with group decision process are the lower the better; for intra-group conflict the lower value the higher the conflict		decision room, fact to-face group interaction The GDSS records stores and displays alternatives and preference rankings and records votes
	3 6 groups total sample size is 72	students	2*2 factorial design	the scales for decision confidence agreement with final solution satisfaction with group decision process are the lower the better; for intra-group conflict the lower value the higher the conflict		decision room, fact to-face group interaction The GDSS records, stores and displays alternatives and preference rankings, and records votes
	3 6 groups total sample size is 72	students	2*2 factorial design	the scales for decision confidence agreement with final solution satisfaction with group decision process are the lower the better, for intra-group conflict the lower value the higher the conflict		decision room, fact to-face group interaction The GDSS records stores and displays alternatives and preference rankings and records votes
	3 6 groups total sample size is 72	students	2*2 factorial design	the scales for decision confidence, agreement with final solution satisfaction with group decision process are the lower the better, for intra-group conflict the lower value the higher the conflict		decision room, fact-to-face group interaction The GDSS records stores and displays alternatives and preference rankings and records votes
George, Northcraft and Nunamaker	6 total sample ? may be 36	upper division under graduate students	2x2x2 matrix however there were only 6 treatments because of infeasibility to provide anonymity for the manual groups	manual group were supplied with flip chart and a facilitator	the lower the quality of decision maker the better the decision, the lower the equality the better	

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
George, Northcraft, and Nunamaker	1987	conference proceedings	GDSS using brainstorming software in PLEXLAB University of Arizona	lab pilot study	semi structured medium difficulty task	assignment of sales territories in a case study	one period	problem solving idea generation and voting	GDSS, non-anonymous no assigned leader
	1987	conference proceedings	GDSS using brainstorming software in PLEXLAB University of Arizona	lab pilot study	semi structured	assignment of sales territories in a case study	one period	problem solving idea generation and voting	GDSS anonymous assigned leader
	1987	conference proceedings	GDSS using brainstorming software in PLEXLAB University of Arizona	lab pilot study	semi structured	assignment of sales territories in a case study	one period	problem solving idea generation and voting	GDSS anonymous no assigned leader
	1987	conference proceedings	GDSS using brainstorming software in PLEXLAB University of Arizona	lab pilot study	semi-structured	assignment of sales territories in a case study	one period	problem solving idea generation and voting	manual face-to-face non anonymous assigned leader
	1987	conference proceedings	GDSS using brainstorming software in PLEXLAB University of Arizona	lab pilot study	semi-structured	assignment of sales territories in a case study	one period	problem solving idea generation and voting	manual face-to-face non anonymous no assigned leader
Gettys Moy, & 0 Bar	1976	unpublished public report	DSS 2 DSS one risk implicit and one risk explicit Both are based on utility approach	lab exp to investigate empirically the significance of perceived risk considerations in designing DSS for navy tactical decision making	unstructured high and low difficulty tasks	realistic tatical scenarios in navy operational decision making	one period for each condition for each user	problem solving	enhanced computerized DSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
George, Northcraft and Nunamaker	G1b	6	subjects were drwn from	decision quality	1		9 2	not reported	
		6	an MIS class, subjects	degree of consensus	8		no	not reported	
		6	were randomly assigned	decision time	2		15	not reported	
		6	to treatments	degree of uninhibited behavior	12		0	not reported	
		6		equality of participation	7		3 9	not reported	
		6		satisfaction with decision process	6		45.2	not reported	
		6		total number of remarks	13		72	not reported	
	G1c	6	subjects were drwn from	decision quality	1		3	not reported	
		6	an MIS class, subjects	degree of consensus	8		yes	not reported	
		6	were randomly assigned	decision time	2		10	not reported	
		6	to treatments	degree of uninhibited behavior	12		26	not reported	
		6		equality of participation	-7		6 8	not reported	
		6		satisfaction with decision process	5		59 4	not reported	
		6		total number of remarks	13		140	not reported	
	G1d	6	subjects were drwn from	decision quality	-1		3	not reported	
		6	an MIS class, subjects	degree of consensus	8		no	not reported	
		6	were randomly assigned	decision time	2		15	not reported	
		6	to treatments	degree of uninhibited behavior	12		8	not reported	
		6		equality of participation	-7		8	not reported	
		6		satisfaction with decision process	6		62 4	not reported	
		6		total number of remarks	13		92	not reported	
	G2a	6	subjects were drwn from	decision quality	-1		9	not reported	
		6	an MIS class, subjects	degree of consensus	8		yes	not reported	
		6	were randomly assigned	decision time	2		2	not reported	
		6	to treatments	degree of uninhibited behavior	12		2	not reported	
		6		equality of participation	7		18 8	not reported	
		6		satisfaction with decision process	6		61 8	not reported	
		6		total number of remarks	13		255	not reported	
	G2b	6	subjects were drwn from	decision quality	-1		9	not reported	
		6	an MIS class, subjects	degree of consensus	8		no	not reported	
		6	were randomly assigned	decision time	2		15	not reported	
		6	to treatments	degree of uninhibited behavior	12		1	not reported	
		6		equality of participation	-7		25 7	not reported	
		6		satisfaction with decision process	6		58 6	not reported	
		6		total number of remarks	13		260	not reported	
Gettys, Moy & O'Bar	D1	12	no random assignment	decision quality	1		-66 4	Z score = 1 75	rpb -->
		12		decision confidence	4		not reported		
		12		attitude toward the system	6		not reported		

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
George Northcraft and Nunamaker					no tests were run				groups with assigned leaders make faster decisions and make more consensus	ranked by researchers direct observation direct observation std dev of remarks counting uninhibited beh posttest questionnaire direct observation
					no tests were run				participation is much more equal in GDSS groups participation in the anonymous GDSS groups wes less equal	ranked by researchers direct observation direct observation std dev of remarks counting uninhibited beh posttest questionnaire direct observation
					no tests were run				uninhibited behavior is more where there is anonymity and less where there is non-anonymity	ranked by researchers direct observation direct observation std dev of remarks counting uninhibited beh posttest questionnaire direct observation
					no tests were run					ranked by researchers direct observation direct observation std dev of remarks counting uninhibited beh posttest questionnaire direct observation
					no tests were run					ranked by researchers direct observation direct observation std dev of remarks counting uninhibited beh posttest questionnaire direct observation
Gettys Moy, & O'Bar	0 505181486	1 160941664	1 160941664	D1/D3	DSS vs no-DSS (D1 vs D3)	not specified	not reported not reported not reported	0 04 not reported not reported	significant + not reported not reported	cost utility posttest questionnaire posttest questionnaire

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
George, Northcraft and Nunamaker	6 total sample ? may be 36	upper division under-graduate students	2x2x2 matrix however there were only 6 treatments because of infeasibility to provide anonymity for the manual groups	manual group were supplied with flip chart and a facilitator	the lower the quality of decision maker the better the decision the lower the equality the better	
	6 total sample ? may be 36	upper division under graduate students	2x2x2 matrix however there were only 6 treatments because of infeasibility to provide anonymity for the manual groups	manual group were supplied with flip chart and a facilitator	the lower the quality of decision maker the better the decision the lower the equality the better	
	6 total sample ? may be 36	upper division under-graduate students	2x2x2 matrix however there were only 6 treatments because of infeasibility to provide anonymity for the manual groups	manual group were supplied with flip chart and a facilitator	the lower the quality of decision maker the better the decision the lower the equality the better	
	6 total sample ? may be 36	upper division under-graduate students	2x2x2 matrix however there were only 6 treatments because of infeasibility to provide anonymity for the manual groups	manual group were supplied with flip chart and a facilitator	the lower the quality of decision maker the better the decision the lower the equality the better	
	6 total sample ? may be 36	upper division under-graduate students	2x2x2 matrix however there were only 6 treatments because of infeasibility to provide anonymity for the manual groups	manual group were supplied with flip chart and a facilitator	the lower the quality of decision maker, the better the decision the lower the equality the better	
Gettys Moy, & 0 Bar	1 total sample size is 12	naval officers	repeated measures design	the p value for decision quality is < 0 05 estimated to be 0 04		

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Gettys Moy & O'Bar	1976	unpublished public report	DSS 2 DSS one risk implicit and one risk explicit. Both are based on utility approach	lab exp to investigate empirically the significance of perceived risk considerations in designing DSS for navy tactical decision making	unstructured high and low difficulty tasks	realistic tatical scenarios in navy operational decision making	one period for each condition for each user	problem solving	conventional computerized DSS
	1976	unpublished public report	DSS 2 DSS, one risk implicit and one risk explicit Both are based on utility approach	lab exp to investigate empirically the significance of perceived risk considerations in designing DSS for navy tactical decision making	unstructured high and low difficulty tasks	realistic tatical scenarios in navy operational decision making	one period for each condition for each user	problem solving	no-DSS
Goslar	1984	dissertation	DSS	lab experiment to examine the effect of DSS on marketing decision making under varying degree of infor conditions	ill-structured high difficulty task		one period	problem solving	DSS
	1984	dissertation	DSS	lab to examine the effect of DSS on marketing decision making under varying degree of infor conditions	ill-structured high difficulty task		one period	problem solving	no-DSS
Goslar Green and Hughes	1986	published	DSS IFPS-based DSS for the specific problem	lab exp to examine the effects of applying DSS technology to decision making process	unstructured high difficulty task	marketing strategy	one period	problem solving	computerized DSS
	1986	published	DSS IFPS-based DSS for the specific problem	lab exp to examine the effects of applying DSS technology to decision making process	unstructured high difficulty task	marketing strategy	one period	problem solving	manual DSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Gettys Moy & 0 Bar	D2	12	no random assignment	decision quality	1		-60 8		
		12		decision confidence	4		not reported		
		12		attitude toward the system	6		not reported		
	D3	12	no random assignment	decision quality	1		59 63		
		12		decision confidence	4		not reported		
		12		attitude toward the system	6		not reported		
Goslar	D1	28		decision quality	1		not reported	not reported	Pearson r >
		28		number of alternatives considered	3		2.962	2 2	4 84
		28		decision time	2		175 821	5.994	35 928036
		28		decision confidence	4		13 393	19 344	374 190336
		28		amount of data utilized	18		130 929	101 944	10392 57914
		28		change in decision making	14		70 536	32.299	1043 225401
	D2	15		decision quality	1		not reported	not reported	
		15		number of alternatives considered	3		3 962	2.222	4.937284
		15		decision time	2		171 533	5.333	28.440889
		15		decision confidence	4		28 714	25.695	660.233025
		15		amount of data utilized	18		240 333	152.628	23295 30638
		15		change in decision making	14		60 6	30 078	904 686084
Goslar Green, and Hughes	D1	28	subjects were drawn from	decision performance (1 0)	1		not reported	not reported	
		28	19 organizations,	decision time	2		not reported	not reported	
		28	subjects were randomly	number of alternatives	3		not reported	not reported	rpb -->
		28	assigned to treatments	decision confidence	4		not reported	not reported	
	D2	15	subjects were drawn from	decision performance (1 0)	1		not reported	not reported	
		15	19 organizations,	decision time	2		not reported	not reported	
		15	subjects were randomly	number of alternatives	3		not reported	not reported	
		15	assigned to treatments	decision confidence	4		not reported	not reported	

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Gettys Moy & 0 Bar					DSS vs no-DSS (D2 vs D3)	not specified	not reported	not reported	NS	cost utility
							not reported	not reported	not reported	posttest questionnaire
							not reported	not reported	not reported	posttest questionnaire
										cost utility
										posttest questionnaire
										posttest questionnaire
Goslar	0 0022619	0 004745885	0 004745885	D1 D3	DSS vs no-DSS (DSS availability)	chi square	0 00022	95% Quantile=3 841	NS	
	2.207536846	-0 452993571	0 452993571							
	5 776802681	0 742279118	0 742279118							
	21 72241813	-0 705308217	-0 705308217							
	121 648627	-0 899344306	-0 899344306							
	31 558189	0 314846964	0 314846964							
Goslar Green, and Hughes					DSS vs no-DSS	F test	not reported	not reported	NS	compared to what requested
						F-test	not reported	not reported	NS	observation
	0.228085776	0.249543115	0 249543115			F test	2 25	0 143	NS	observation
						F test	not reported	not reported	NS	reported by subjects
										compared to what requested
										observation
										observation
										reported by subjects

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Gettys Moy & O'Bar	1 total sample size is 12	naval officers	repeated measures design	the p value for decision quality is < 0 05 estimated to be 0 04		
	1 total sample size is 12	naval officers	repeated measures design	the p value for decision quality is < 0 05 estimated to be 0 04		
Goslar	1 sample size is 43					
	1 sample size is 43					
Goslar Green, and Hughes	1 total sample size is 43	sales and marketing personnels	2x2x2 factorial design (DSS availability x data level x DSS training)			
	1 total sample size is 43	sales and marketing personnels	2x2x2 factorial design (DSS availability x data level x DSS training)			

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Goul	1985	dissertation	DSS with rule base	lab exp to study the effect of DSS on strategic planning decision making	unstructurd high difficulty task	a corporate audit phase of the strategic planning process	one case but can use the computer more than one time	intelligence phase (problem finding)	computerized DSS with complete rule base
	1985	dissertation	DSS with rule base	lab exp to study the effect of DSS on strategic planning decision making	unstructurd high difficulty task	a corporate audit phase of the strategic planning process	one case but can use the computer more than one time	intelligence phase (problem finding)	computerized DSS with 10% subset of the rule base
	1985	dissertation	DSS with rule base	lab exp to study the effect of DSS on strategic planning decision making	unstructurd high difficulty task	a corporate audit phase of the strategic planning process	one case but can use the computer more than one time	intelligence phase (problem finding)	no-DSS
Goul, Shane and Tonge	1986	published	DSS knowledge-based DSS	lab	unstructured	strategic planning	one period	problem finding stage I	computerized DSS with complete knowledge base
	1986	published	DSS knowledge-based DSS	lab	unstructured	strategic planning	one period	problem finding stage I	computerized DSS with a 10% subset of the comp-lete KB and no-DSS manual
Gray, P	1983	conference proceedings	GDSS includes IFPS a rational data base manager and a long range planning system	lab exp impression	semi structured	equipment replacement company reorganization financial policy new refinery contruction	3 periods		computerized GDSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Goul	D1	22	subjects were randomly	identify strategy determinants	1		1 636363636	0 828221235	0 685950413
		22	assigned to one of	identification of opportunities	1		2 818181818	1 113404429	1 239669421
		22	three groups	identification of problems	1		2.272727273	1 094690416	1 198347108
		22		identification of crisis	1		0 5	0 941468872	0 886363636
		21		evaluation of proposed plans	3		8 523809524	2 921497456	8 535147384
		21		satisfaction with the system	9		4 142857142	0 773717943	0 598639456
		22		perceived helpfulness of system	9		3 863636364	0 693833524	0 481404959
		22		perceived difficulty of use	9		2 5	0 941468872	0 886363636
		22		reported time of use	2		87.45454546	30 2000561	912 0433884
		22		perceived time length of use	2		2 909090909	1 202614232	1 446280992
		19	subjects were randomly	identify strategy determinants	1		1 315789474	0 729284551	0 531855956
	D2	19	assigned to one of	identification of opportunities	1		2 789473684	1 672657748	2.797783934
		19	three groups	identification of problems	1		1 578947368	0 815364915	0 664819945
		19		identification of crisis	1		0 368421053	0 58133479	0 337950139
		17		evaluation of proposed plans	3		7 058823529	2 071390219	4 290657439
		18		satisfaction with the system	9		3 555555555	1 165343165	1 358024691
		18		perceived helpfulness of system	9		3 222222222	0 974996043	0 950617284
		18		perceived difficulty of use	-9		2 444444444	0 895806417	0 802469136
		19		reported time of use	2		67 44736842	38 98005385	1519 444598
		18		perceived time length of use	2		1 666666666	0 816496581	0 666666667
	D3	10	subjects were randomly	identify strategy determinants	1		0 9	0 538516481	0 29
		10	assigned to one of	identification of opportunities	1		3 3	1 004987562	1 01
		10	three groups	identification of problems	1		2 5	1 024695077	1 05
		10		identification of crisis	1		0 4	0 663324958	0 44
		10		evaluation of proposed plans	3		7 4	2 244994432	5 04
Goul, Shane	D1	18	random assignment of	quality of decision	1			Pearson r >	0.284283851
and Tonge		18	subjects to groups	opportunities recognized	3			Pearson r - >	-0 065177273
		18		problems recognized	3			Pearson r - >	0 298151355
		18		crises recognized	3			Pearson r -->	0 038829014
		18		proposed plan of action	3			Pearson r ->	0 343914122
	D2	34	random assignment of	quality of decision	1				
		34	subjects to groups	opportunities recognized	3				
		34		problems recognized	3				
		34	Nc = 17+17	crises recognized	3				
		34		proposed plan of action	3				
Gray P	G1	13		depth of analysis				no statistical	
				task oriented communication				data provided	

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Goul	0 784110894	0 408837787		D1 D2	full DSS	Mann Whitney	58	NS at 0 05	NS	compared to expert's
	1.399571076	0 020512094			vs		58	NS at 0 05	NS	compared to expert's
	0.975758065	0 711016316			partial DSS		58	NS at 0 05	NS	compared to expert's
	0 795769888	0 165347985	0 326428545		vs		58	NS at 0 05	NS	compared to expert's
	2 578508757	0 568152422	0 568152422		no-DSS		58	NS at 0 05	NS	evaluated by instructor
	0 97341984	0 603338418								posttest questionnaire
	0.831453989	0 771436724								posttest questionnaire
	0 921320729	0 060299909	0 438158411							posttest questionnaire
	34 53089064	0 579399392								posttest questionnaire
	1 047619283	1 185950147	0 88267477							posttest questionnaire
	0 671741992	0 618971984								compared to expert s
	1.483865208	-0 344051679								compared to expert's
	0 890625228	-1 034164094								compared to expert's
	0 609890776	-0 051778037								compared to expert's
	2 135514168	-0 15976315								evaluated by instructor
										posttest questionnaire
										posttest questionnaire
										posttest questionnaire
										posttest questionnaire
										posttest questionnaire
	0 753103771	0 939106499		D1-D3						compared to expert s
	1 082020607	-0 344261317								compared to expert's
	1 074170832	-0 232919138								compared to expert's
	0.867441379	0 125664469	0 121897628							compared to expert's
	2 729550599	0 435837001	0 435837001							evaluated by instructor
Goul, Shane and Tonge	0.811170288	1 514346001	1 514346001	D1-D2	complete KB vs the control group	Mann Whitney	2 05	0 0202	significant +	
	-0 134626815	-0 266450574				observed z values	-0 47	0 6808	NS	
	0 643818353	1 650114184				one-tailed test	2 15	0 0158	significant +	
	0 080093074	0 157581689					0 28	0 3879	NS	
	0 754909461	2.257447001	0 949673075				2 48	0 0066	significant +	
Gray P									Increase with GDSS	Impression
									Increase with GDSS	Impression

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Goul	1 total sample size is 51	senior level students	independent group experimental design	the means and standard deviations are calculated from the raw data of the study and are not available in their present form	the last five variables are interpreted from the questionnaire (i. e want to use the program again is judged to be equivelant to satisfaction with the system)	
	1 total sample size is 51	senior level students	independent group experimental design	the means and standard deviations are calculated from the raw data of the study and are not available in their present form	the last five variables are interpreted from the questionnaire (i e want to use the program again is judged to be equivelant to satisfaction with the system)	
	1 total sample size is 51	senior level students	independent group experimental design			
Goul, Shane and Tonge	1	students	3 independent treatments	non-parametric statistics were used because of the ordinal nature of the data Total sample = 52 students average taken for treatments	the no-DSS and the 10% of KB groups were combined as a control group	
	1	students	3 independent treatments	non-parametric statistics were used because of the ordinal nature of the data Total sample = 52 students average taken for treatments	10% of KB group is used as a as second control group with no Hawthorne effect	
Gray, P	4	executive MBA students	no design available because there is no control group	there is no statistical data reported group size is not controlled		

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Hansen and Messier	1986	published	DSS(expert system) called EDP XPERT	lab exp to investigate the effects of EDP EXPERT on the auditing reliabilities of computer audit specialists	semi-structured high difficulty task	auditing to make judgments concerning the reliability of controls in advanced computer environments	one period (presystem and postsystem tests)	problem finding	computerized DSS(ES) posttest
	1986	published	DSS(expert system) called EDP-XPERT	lab exp to investigate the effects of EDP EXPERT on the auditing reliabilities of computer audit specialists	semi-structured high difficulty task	auditing to make judgments concerning the reliability of controls in advanced computer environments	one period (presystem and postsystem tests)	problem finding	no-DSS pretest
Hardaway	1988	dissertation	DSS generator (Lotus 1-2-3)	lab exp to test the effect of DSS usage on on individual s performance and stress	structured low task difficulty	a case of 2 products to determine their selling prices and advertising budget a case of an optimal answer	one session	problem solving	computerized DSS
	1988	dissertation	DSS generator (Lotus 1-2-3)	lab exp to test the effect of DSS usage on on individual s performance and stress	structured low task difficulty	a case of 2 products to determine their selling prices and advertising budget a case of an optimal answer	one session	problem solving	manual DSS
Heminger	1989	dissertation	GDSS general purpose process oriented (Univ of Arizona)	field test	unstructurd complex	idea generation (brain stoorming) idea organization voting for strategic planning	16 periods	problem fomulation and solution finding	GDSS posttest
	1989	dissertation	GDSS general purpose process oriented (Univ of Arizona)	field test	unstructurd complex	idea generation (brain stoorming) idea organization voting for strategic planning	16 periods	problem fomulation and solution finding	GDSS pretest

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Hansen and Messier	D1	17	sample was not random	reliability of supervisory control	1		19 529	18 02	324 7204
		17		reliability of processing control	1		15 588	14 13	199 6569
		17		reliability of input control	-1		24 412	20 926	437.897476
		17		reliability of output control	1		14 706	12.184	148 449856
	D3	17	sample was not random	reliability of supervisory control	-1		36 176	23 36	545 6896
		17		reliability of processing control	-1		22 941	12.255	150 185025
		17		reliability of input control	1		37 941	21 765	473 715225
		17		reliability of output control	1		20 882	11 406	130 096836
Hardaway	D1	36	random assignment	decision quality	1	Pearson r	0 009		
		36	of subjects to	decision confidence	4	Pearson r	0 361		
		36	treatments	transient psychological stress	17	Pearson r	0 214		
	D2	36	random assignment	decision quality	1				
		36	of subjects to	decision confidence	4				
		36	treatments	transient psychological stress	17				
Herninger	G1	405	subjects were selected	perceived decision quality	1		4 143	1 217374223	1 482
		436	by the firm	idea generation	3b		4 265	1 003992032	1 008
		435		identifying key issues	3a		4 143	1 11781036	1 2495
		426 6	average	satisfaction with process	6		4 109	1 117139204	1 248
		426 6	average	efficiency	2		3 946	1 08309741	1 1731
		426 6	average	decision time	2		0 75	0 978927985	0 9583
	G2	405	subjects were selected	perceived decision quality	1		3 817	0 88656641	0 786
		436	by the firm	idea generation	3b		3 945	0 85498538	0 731
		435		identifying key issues	3a		3 91	0 876356092	0 768
		426 6	average	satisfaction with process	6		not reported	not reported	not reported
		426 6	average	efficiency	2		not reported	not reported	not reported
		426 6	average	decision time	2		3 2	3 055977749	9 339

STUDY	WITHIN GROUP STD SEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION	MEASUREMENT
Hansen and Messier	20 86156753	-0 797974552		D1 D3	DSS vs posttest	correlation	0 646	p < 0 05	significant +	structured observation
	13.22576888	-0 555960116					0 407	p < 0 10	sig + at 0 10	structured observation
	21 34962179	-0 633688041					0 494	p < 0 05	significant +	structured observation
	11 80141288	-0 52332717	0 627737469				0 266	NS	NS	structured observation
Hardaway		0 018	0 018	D1 D2	DSS vs	F test, df = 1 71	0 01	0 9158	NS	direct observation-profit
		0 722	0 722		manual	F test, df = 1 71	10 54	0 0018	significant +	posttest questionnaire
		-0 428	-0 428			F test, df = 1,71	8 62	0 0049	signifi.ant +	pre & post questionnaire
										direct observation-profit
										posttest questionnaire
										pre & post questionnaire
Herninger	1.319834072	0 247000746	0 247000746	G1-G2	posttest (GDSS)	not reported	not reported	SIG	significant +	post session questinnaire
	1 165378018	0 274589013			vs	not reported	not reported	SIG	significant +	post session questinnaire
	1.254914798	0 185669976	0 230129494		pretest (manual)	not reported	not reported	SIG	significant +	post session questinnaire
						not reported	not reported	SIG	significant +	post session questinnaire
						not reported	not reported	SIG	significant +	post-session questinnaire
	2.828985834	-0 866034736	0 866034736			not reported	not reported	SIG	significant +	actual
										post session questinnaire
										post session questinnaire
										post session questinnaire
										post session questinnaire
										post session questinnaire
										estimated by the group

STUDY	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Hansen and Messier	1 total sample size is 17	computer audit specialists	pre and post test for one group	the data reported is the absolute difference between the posttest (or pretest) and the system solution		
Hardaway	1 total sample size is 72	MBA students	2 independent groups	computer experience has Pearson r of 0 139 with decision quality and 0 248 with dec confidence, lotus experience has r of -0 05 and 0 303 respectively	the controlled variables are cognitive style, experience with computers and lotus trait stress & task	
	1 total sample size is 72	MBA students	2 independent groups	computer experience has Pearson r of -0 139 with decision quality and 0 248 with dec. confidence, lotus experience has r of -0 05 and 0 303 respectively	the controlled variables are cognitive style, experience with computers and lotus trait stress & task	
Heminger	7 7 [average] total sample size is 436	managers	one group pretest and posttest	There was no demographic data collected on the participants Also there was no information collected on the manual group(control group)	sample and treatments are not randomized	
	7 7 [average] total sample size is 436	managers	one group pretest and posttest	There was no demographic data collected on the participants Also there was no information collected on the manual group(control group)		

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Hiltz Johnson, and Agle	1978	unpublished	GCSS called EIES	lab exp to examine the effect of mode of communication on the group decision process	unstructured complex tasks	human relations problems with no clear solution or answer	one period per a problem	solution finding	computerized conferencing (CC)
	1978	unpublished	GCSS called EIES	lab exp. to examine the effect of mode of communication on the group decision process	unstructured complex tasks	human relations problems with no clear solution or answer	one period per a problem	solution finding	CC with private or anonymous communication
	1978	unpublished	GCSS called EIES	lab exp to examine the effect of mode of communication on the group decision process	unstructured complex tasks	human relations problems with no clear solution or answer	one period per a problem	solution finding	no-GDSS (face to-face)
Hiltz Johnson and Turoff	1982	unpublished	GDSS a simplified version of the Electronic Information Exchange System (EIES)	field experiment to test the impact of GDSS and leadership on decision effectiveness and process	structured technical or information exchange task A simple rank ordering problem	survival problem "Lost in the Arctic" with 15 items to be ordered according to their relative importance	one period	solution finding	computerized GDSS with human leader
	1982	unpublished	GDSS a simplified version of the Electronic Information Exchange System (EIES)	field experiment to test the impact of GDSS and leadership on decision effectiveness and process	structured technical or information exchange task A simple rank ordering problem	survival problem "Lost in the Arctic" with 15 items to be ordered according to their relative importance	one period	solution finding	no-GDSS face-to-face with human leader
	1982	unpublished	GDSS a simplified version of the Electronic Information Exchange System (EIES)	field experiment to test the impact of GDSS and leadership on decision effectiveness and process	structured technical or information exchange task A simple rank ordering problem	survival problem "Lost in the Arctic" with 15 items to be ordered according to their relative importance	one period	solution finding	computerized GDSS with no human leader
	1982	unpublished	GDSS a simplified version of the Electronic Information Exchange System (EIES)	field experiment to test the impact of GDSS and leadership on decision effectiveness and process	structured technical or information exchange task A simple rank ordering problem	survival problem "Lost in the Arctic" with 15 items to be ordered according to their relative importance	one period	solution finding	no-GDSS face-to-face with no human leader

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Hiltz Johnson, and Agle	G1	20	subjects were not	degree of consensus	8		0 5	0 5	0 25
		20	randomly assigned to groups or treatment conditions	inequality of participation	7		not reported	not reported	Z score = 2 054
	G2	20	subjects were not	degree of consensus	8		1	0	0
		20	randomly assigned to groups or treatment conditions	equality of participation	-7		not reported	not reported	
	G3	20	subjects were not	degree of consensus	8		1	0	0
		20	randomly assigned to groups or treatment conditions	equality of participation	-7		not reported	not reported	
Hiltz Johnson, and Turoff	G1a	30	no random sample, no	decision quality	1		35 4	not reported	rpb -->
		30	random assignment to	level of consensus	8		0 956	0 049	rpb -->
		30	groups no complete	amount of communication	13		16.2	not reported	rpb -->
		30	random assignment of	satisfaction with decision process	6		not reported	not reported	
		30	subjects to conditions	equality of participation	7		not reported	not reported	
								consensus - >	0 002401
	G3a	30	no random sample, no	decision quality	1		34 1	not reported	rpb -->
		30	random assignment to	level of consensus	8		0 997	0 007	0 000049
		30	groups, no complete	amount of communication	13		20 2	not reported	rpb -->
		30	random assignment of	satisfaction with decision process	6		not reported	not reported	
		30	subjects to conditions	equality of participation	7		not reported	not reported	
	G1b	30	no random sample, no	decision quality	1		38 5	not reported	
		30	random assignment to	level of consensus	8		0 9855	0 012	0 000144
		30	groups, no complete	amount of communication	13		16.5	not reported	
		30	random assignment of	satisfaction with decision process	6		not reported	not reported	
		30	subjects to conditions	equality of participation	7		not reported	not reported	
	G3b	30	no random sample, no	decision quality	1		35.7	not reported	
		30	random assignment to	level of consensus	8		0 9595	0 067	0 004489
		30	groups, no complete	amount of communication	13		21 8	not reported	
		30	random assignment of	satisfaction with decision process	6		not reported	not reported	
		30	subjects to conditions	equality of participation	7		not reported	not reported	

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
Hiltz Johnson, and	0 353553391	-1 414213562	-1 414213562	G1-G2	computerized vs				
Agle	Pearson r -->	0 26517026	0 573590029	(G1+G2)-G3	face-to-face	Mann Whitney	2	0 05	significant +
					communication				
	0	0	0	G2-G3					
	0 353553391	-1 414213562	-1 414213562	G1-G3					
Hiltz Johnson	0 041134503	0 082269007	-0 082269007	G1/G3	GDSS vs no-GDSS	F-test	0 2	NS	NS
and Turoff	0 043138582	0 086277164	-0 086277164	G1/G3			0.22	0 64	NS
	0 231958676	0 472934104	-0 472934104	G1/G3			6 71	0 02	significant
							not reported	NS	NS
							not reported	NS	NS
	0 035	1 171428571	-1 171428571	G1a/G3a					
	0 015942794	0 031622777	0 031622777	GDSS*leader	GDSS availability x	F test	0 03	NS	NS
	0 166391775	0 334664011	-0 334664011	(G1a/G3b)	leadership		3 36	0 08	NS
	0 024348894	0 048304589	-0 048304589				0 07	NS	NS
							not reported	NS	NS
							not reported	NS	NS
	0 048130032	0 540203254	0 540203254	G1b/G3b					

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Hiltz Johnson, and Agle	observation number of comments	5 total sample size is 60	students	three independent groups			
	observation number of comments	5 total sample size is 60	students	three independent groups			
	observation number of comments	5 total sample size is 60	students	three independent groups			
Hiltz Johnson and Turoff	compared to experts' Kendall's coef of consensus number of comments posttest questionnaire no of comments per person	5 total sample is 120	employees (managers and professionals)	2 x 2 factorial design, six groups per condition	the lower the score the better the quality for consensus 1= total consensus 0 = no consensus		private messages were not allowed, no pen name or anonymous entries were permitted
	compared to experts Kendall's coef of consensus number of comments posttest questionnaire no of comments per person	5 total sample is 120	employees (managers and professionals)	2 x 2 factorial design six groups per condition	the lower the score the better the quality, for consensus 1= total consensus 0 = no consensus		private messages were not allowed, no pen name or anonymous entries were permitted
	compared to experts Kendall's coef of consensus number of comments posttest questionnaire no of comments per person	5 total sample is 120	employees (managers and professionals)	2 x 2 factorial design six groups per condition	the lower the score the better the quality, for consensus 1= total consensus 0 = no consensus		private messages were not allowed, no pen name or anonymous entries were permitted
	compared to experts Kendall s coef of consensus number of comments posttest questionnaire no of comments per person	5 total sample is 120	employees (managers and professionals)	2 x 2 factorial design six groups per condition	the lower the score the better the quality, for consensus 1= total consensus 0 = no consensus		private messages were not allowed, no pen name or anonymous entries were permitted

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Hiltz Johnson, Arnovitch and Turoff	1980	unpublished done in 1980, published in 1982 and 1986	GDSS, uses a language called INTERACT	lab exp. to examine the effects of GDSS on decision outcome and process	structured technical or information exchange task, a complex rank ordering problem	survival problem "Lost in the Arctic" with 15 items to be ordered according to their relative importance	one period	problem solving stage III	Computerized conference Arctic
	1980	published done in 1980, published in 1982 and 1986	GDSS	lab exp to examine the effects of GDSS on decision outcome and process	structured technical or information exchange task, a complex rank ordering problem	survival problem "Lost in the Arctic" with 15 items to be ordered according to their relative importance	one period	problem solving stage III	Face-to-Face conference Arctic problem
	1980	published done in 1980 published in 1982 and 1986	GDSS	lab exp. to examine the effects of GDSS on decision outcome and process	unstructured social-emotional task, it is a medium-complex value-laden problem, no single correct answer	to decide how to motivate and control employees in "The Forest Ranger" task in which the forest is burning while the leaders seek dominance	one period	problem solving stage III	Computerized conference The Forest Ranger problem
	1980	published done in 1980, published in 1982 and 1986	GDSS	lab exp. to examine the effects of GDSS on decision outcome and process	unstructured social-emotional task, it is a medium-complex value-laden problem, no single correct answer	to decide how to motivate and control employees in "The Forest Ranger" task in which the forest is burning while the leaders seek dominance	one period	problem solving stage III	Face-to-Face conference The Forest Ranger problem
the same experiment GDSS vs no-GDSS regardless of task type or difficulty	1986	published	GDSS	lab exp. to examine the effects of GDSS on decision outcome and process	structured to unstructured low to moderate task difficulty	"Lost in the Arctic" and "The Forest Ranger" problems	one period for each task	problem solving stage III	Computerized conference
	1986	published	GDSS	lab exp. to examine the effects of GDSS on decision outcome and process	structured to unstructured, low to moderate task difficulty value laden problem, no single correct answer	"Lost in the Arctic" and "The Forest Ranger" problems	one period for each task	problem solving stage III	Face-to-Face conference

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Hiltz Johnson,	G1	20	random assignment of	decision quality	1	0 9			rpb -->
Arnovitch and Turoff		20	8 groups to treatments	inequality of participation	7	0 9			rpb -->
		20		level of consensus	8	0 9	0 9323	0 063	0 003969
		20		amount of communication	13	0 9	482.8	53 974	2913 192676
				satisfaction with group discussion	6	0 9			
	G3	20	random assignment of	decision quality	1	0 9			
		20	8 groups to treatments	inequality of participation	7	0 9			
		20		level of consensus	8	0 9	0 9964375	0 005	0 000025
		20		amount of communication	13	0 9	1233 2	342 852	117547 4939
				satisfaction with group discussion	6	0 9			
	G1	20	random assignment of	decision quality	1	0 9	52.4	17 095	292 239025
		20	8 groups to treatments	inequality of participation	7	0 9			rpb -->
		20		level of consensus	8	0 9	0 125	0 331	0 109561
		20		amount of communication	13	0 9	301 6	39 312	1545 433344
				satisfaction with group discussion	6	0 9			
	G3	20	random assignment of	decision quality	1	0 9	37 6	11 139	124 077321
		20	8 groups to treatments	inequality of participation	7	0 9			
		20		level of consensus	8	0 9	1	0	0
		20		amount of communication	13	0 9	915 1	208 491	43468.49708
				satisfaction with group discussion	6	0 9			
the same experiment	G1	20	random assignment of	decision quality	1	0 9			rpb -->
GDSS vs no-GDSS		20	8 groups to treatments	inequality of participation	-7	0 9	0 2	0 128	0 016384
regardless of task		20		level of consensus	8	0 9	0 932	0 063	0 003969
type or difficulty		20		amount of communication	13	0 9	392.2	102 165	10437 68723
		20		satisfaction with group discussion	6		2 6	not reported rpb >	
	G3	20	random assignment of	decision quality	1	0 9			
		20	8 groups to treatments	inequality of participation	-7	0 9	0 226	0 095	0 009025
		20		level of consensus	8	0 9	0 996	0 005	0 000025
		20		amount of communication	13	0 9	1074 15	325 276	105804 4762
		20		satisfaction with the system			2.26	not reported	

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION
Hiltz, Johnson	0 114335836	0 224352847	0 224352847	G1/G3	GDSS vs no-GDSS	F test	0 503342	not reported	NS
Arnovitch and Turoff	0 162445175	0 320926627	0 320926627	high task			1 029939	not reported	significant +
	0 044687806	-1 435234929	-1 435234929						significant +
	245 4187101	-3 057631586	3 057631586						significant
	14 42768772	1 025805402	1 025805402	G1/G3	GDSS vs no-GDSS	F test			
	0 25146169	0 506463128	-0 506463128	low task			2 565049	not reported	significant
	0 234052345	3 738479961	-3 738479961	complexity					
	150 0232156	-4 089367087	-4 089367087						
the same experiment	0 114335836	0 224352847	0 224352847	G1-G3	GDSS vs no-GDSS	F test	0 503342	not reported	NS
GDSS vs no-GDSS	0 11271424	-0 230671829	0 230671829						
regardless of task	0 044687806	-1 432158027	1 432158027						
type or difficulty	241 0831427	-2 828692178	2 828692178						
	0 268755249	0 769207384	0 769207384			t test	1 72	0 09	NS

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Hiltz Johnson Arnovitch and Turoff	compared to experts observation observation number of comments posttest questionnaire	5 total sample size is 40	students	2x2 factorial design with repeated measures (2 mode of communication x	the score for satisfaction with group discussion is 1 = total satisfaction		simultaneous inputs are possible but there is no anonymous input No public screen
	compared to experts observation observation number of comments posttest questionnaire	5 total sample size is 40	students	2x2 factorial design with repeated measures were mode of communication (2) and problem type (2)	the score for satisfaction with group discussion is 1 = total satisfaction		simultaneous inputs are possible but there is no anonymous input No public screen
	evaluated by experts observation observation number of comments posttest questionnaire	5 total sample size is 40	students	2x2 factorial design with repeated measures were mode of communication (2) and problem type (2)	the score for satisfaction with group discussion is 1 = total satisfaction		simultaneous inputs are possible but there is no anonymous input No public screen
	evaluated by experts observation observation number of comments posttest questionnaire	5 total sample size is 40	students	2*2 factorial design with repeated measures were mode of communication (2) and problem type (2)	the score for satisfaction with group discussion is 1 = total satisfaction		simultaneous inputs are possible but there is no anonymous input No public screen
the same experiment GDSS vs no-GDSS regardless of task type or difficulty	evaluated by experts	5 total sample size is 40	students	2x2 factorial design with repeated measures were mode of communication (2) and problem type (2)			simultaneous inputs are possible but there is no anonymous input No public screen
		5 total sample size is 40	students	2*2 factorial design with repeated measures were mode of communication (2) and problem type (2)			simultaneous inputs are possible but there is no anonymous input No public screen

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Hiltz Turoff, and Johnson	1985	unpublished published in 1989	GDSS called "Converse", a computerized conferencing support systems	lab exp. to test the impact of mode of communication on choice behavior and decision process	semi-structured low to moderate task difficulty	choice dilemma tasks to state the minimum chance of success needed to make an investment	one period for each problem	problem solving	computerized GDSS with anonymity (pen names)
	1985	unpublished published in 1989	GDSS called "Converse" a computerized conferencing support systems	lab exp to test the impact of mode of communication on choice behavior and decision process	semi-structured low to moderate task difficulty	choice dilemma tasks to state the minimum chance of success needed to make an investment	one period for each problem	problem solving	computerized GDSS with no anonymity (real names)
	1985	unpublished published in 1989	GDSS called "Converse", a computerized conferencing support systems	lab exp. to test the impact of mode of communication on choice behavior and decision process	semi-structured low to moderate task difficulty	choice dilemma tasks to state the minimum chance of success needed to make an investment	one period for each problem	problem solving	no-GDSS (face-to-face)
Ho Raman, and Watson	1989	conference proceedings	GDSS called Software Aided Meeting Management (SAMM)	lab exp. to examine the impact of GDSS on decision outcomes in Singaporean culture and to compare it to a study in the USA	unstructured high difficulty task	preference allocation task under competing personal preference structures to allocate funds to six projects	one period	solution finding	computerized GDSS
	1989	conference proceedings	GDSS called Software Aided Meeting Management (SAMM)	lab exp to examine the impact of GDSS on decision outcomes in Singaporean culture and to compare it to a study in the USA	unstructured high difficulty task	preference allocation task under competing personal preference structures to allocate funds to six projects	one period	solution finding	manual GDSS
	1989	conference proceedings	GDSS called Software Aided Meeting Management (SAMM)	lab exp. to examine the impact of GDSS on decision outcomes in Singaporean culture and to compare it to a study in the USA	unstructured high difficulty task	preference allocation task under competing personal preference structures to allocate funds to six projects	one period	solution finding	no-GDSS (baseline)

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Hiltz Turoff, and Johnson	G1	30	subjects were volunteers	degree of consensus	8		not reported	0	Z(P=0 22)=0 775
		30	they were not randomly	amount of communication, problem 1	13		5 63		rpb -->
		30	assigned to groups but	amount of communication problem 2	13		7 07		rpb -->
		30	groups were randomly	amount of communication problem 3	13		6 17		rpb -->
		30	assigned to treatments	inequality of participation p# 1	-7		0.2		rpb -->
		30		inequality of participation p# 2	7		0.25		rpb -->
		30		inequality of participation p# 3	-7		0.22		rpb -->
		30		satisfaction with the system	9		4 122	Z value -->	1 555
		30		satisfaction with the discussion	5		2 56	Z value -->	0 84
		30		resolving group disagreement	11		4 8	Z value -->	3 08
	G1b	30	subjects were volunteers,	degree of consensus	8		not reported	0 006	0 000036
		30	they were not randomly	amount of communication problem 1	13		4.83		
		30	assigned to groups but	amount of communication problem 2	13		5 4		
		30	groups were randomly	amount of communication, problem 3	13		5 57		
		30	assigned to treatments	inequality of participation p# 1	-7		0.23		
		30		inequality of participation p# 2	-7		0.26		
		30		inequality of participation p# 3	-7		0.23		
		30		satisfaction with the system	9		3 633		
		30		satisfaction with the discussion	5		2.48		
		30		resolving group disagreement	11		4 2		
	G3	30	subjects were volunteers,	degree of consensus	8		not reported	0 0486	0 00236196
		30	they were not randomly	amount of communication	13		not reported		
		30	assigned to groups but	inequality of participation	-7		not reported		
		30	groups were randomly	satisfaction with the system	5		2 7		
		30	assigned to treatments	satisfaction with the discussion	5		2 06		
		30		resolving group disagreement	11		2 8		
Ho, Raman, and Watson	G1	75	assignment of subjects	post meeting consensus	8		0 483	0 12	0 0144
		75	to groups and treatments conditions is not reported, it is assumed to be random	equality of influence	7		1.03	0 91	0 8281
	G2	80	assignment of subjects	post-meeting consensus	8		0 636	0 21	0 0441
		80	to groups and treatments conditions is not reported, it is assumed to be random	equality of influence	7		0.62	0 69	0 4761
	G3	70	assignment of subjects	post meeting consensus	8		0 556	0 18	0 0324
		70	to groups and treatments conditions is not reported, it is assumed to be random	equality of influence	7		0.49	0 26	0 0676

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION
Hiltz Turoff, and Johnson	Pearson r -->	0 081692173	0 162100569	G1-G3	G1 vs G1b vs FTF	F test	1 69	0 22	NS +
	0 122252412	0.242212028			G1a vs G1b		0 88	0 35	NS +
	0 179455394	0 358701361			G1a vs G1b		1 93	0 17	NS +
	0 094264792	0 186189867	0 262367752	G1a-G1b	G1a vs G1b		0 52	0 47	NS +
	0 04729024	0 093094934			G1a vs G1b		0 13	0 72	NS +
	0 013129511	0 025819889			G1a vs G1b		0 01	0 91	NS +
	0 022737062	0 04472136	0 054545394	G1a-G1b	G1a vs G1b		0 03	0 86	NS +
	Pearson r -->	0 163911392	-0 328604195	G1-G3	G1 vs G1b vs FTF		9 17	0 06	significant
	Pearson r -->	0 088543774	-0 175799344	G1-G3	G1 vs G1b vs FTF		3 244	0 23	NS -
	Pearson r -->	0 324660506	-0 67883804	G1-G3	G1 vs G1b vs FTF		13 7	0 001	significant -
Ho, Raman, and Watson	0 172439248	-0 887269007	-0 887269007	G1/G2	GDSS vs manual vs no-support	F test	4 05	0 027	significant
	0 803957938	0 509976929	-0 509976929				not reported	not reported	NS
	0 151938523	0 4233375	-0 4233375	G1/G3					
	0 679076914	0 67167693	0 67167693						

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Hiltz, Turoff and Johnson	std dev of final choices number of comments number of comments number of comments number of lines typed number of lines typed number of lines typed posttest questionnaire posttest questionnaire posttest questionnaire	5 6 groups in each of the 3 treatments sample size = 90	mid-career managers and professionals in a large organization	repeated measures design	the score for participation inequality ranges from 0 for total equality to 1 00 for total inequality, for the questionnaire 1 00 is the completely satisfied and 7 00 is completely unsatisfied		the software used does not allow private messages
	std dev of final choices number of comments number of comments number of comments number of lines typed number of lines typed number of lines typed posttest questionnaire posttest questionnaire posttest questionnaire	5 6 groups in each of the 3 treatments sample size = 90	mid-career managers and professionals in a large organization	repeated measures design	the score for participation inequality ranges from 0 for total equality to 1 00 for total inequality, for the questionnaire 1 00 is the completely satisfied and 7 00 is completely unsatisfied		the software used does not allow private messages
	std dev of final choices number of comments number of lines typed posttest questionnaire posttest questionnaire posttest questionnaire	5 6 groups in each of the 3 treatments sample size = 90	mid-career managers and professionals in a large organization	repeated measures design	the score for participation inequality ranges from 0 for total equality to 1 00 for total inequality, for the questionnaire 1 00 is the completely satisfied		the software used does not allow private messages
Ho, Raman, and Watson	observation observation	5 total sample size is 240 (48 groups)	under-graduate students	3 independent groups	the score for consensus ranges from 0 to 1 where 1 means complete agreement, the score for influence equality means the lower is more even		
	observation observation	5 total sample size is 240 (48 groups)	under graduate students	3 independent groups	the score for consensus ranges from 0 to 1 where 1 means complete agreement, the score for influence equality means the lower is more even		
	observation observation	5 total sample size is 240 (48 groups)	under graduate students	3 independent groups	the score for consensus ranges from 0 to 1 where 1 means complete agreement, the score for influence equality means the lower is more even		

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Isett	1987	dissertation	DSS called Crisis Management Decision Support Systems (CMDSS)	field test to investigate the impact of a computer based decicion aid on decision maker performance	unstructured high difficulty tasks	a simulated crisis scenario of a military tatical combat situation	one period	solution finding	computerized active DSS (provides solutions without query
	1987	dissertation	DSS called Crisis Management Decision Support Systems (CMDSS)	field test to investigate the impact of a computer based decicion aid on decision maker performance	unstructured high difficulty tasks	a simulated crisis scenario of a military tatical combat situation	one period	solution finding	computerized passive DSS (no solution without query)
	1987	dissertation	DSS called Crisis Management Decision Support Systems (CMDSS)	field test to investigate the impact of a computer based decicion aid on decision maker performance	unstructured high difficulty tasks	a simulated crisis scenario of a military tatical combat situation	one period	solution finding	manual non-automated support
Jarvenpaa, Rao and Huber	1988	published MIS Q	GDSS	field experiment	unstructured high level difficulty	high-level conceptual software design problems idea generation and reaching consensus	three periods (sessions)	problem solving	computer based GDSS with electronic blackboard
	1988	published MIS Q	GDSS	field experiment	unstructured high level difficulty	high-level conceptual software design problems idea generation and reaching consensus	three periods (sessions)	problem solving	computer based GDSS with personal workstations
	1988	published MIS Q	GDSS	field experiment	unstructured high level difficulty	high-level conceptual software design problems idea generation and reaching consensus	three periods (sessions)	problem solving	conventional no-GDSS with paper and pencil and flipchart (manual)
Joyner and Tunstall	1970	published	GDSS called CONference COoRDinator (CONCORD)	lab exp. to investigate the impact of GDSS on group decision quality	semi-structured low and high difficulty tasks	human relations	two periods (40 min each) over 2 days	solution finding	GDSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Isett	D1	10	subjects volunteered to	decision quality	1		89 8	13 871	192 404641
		10	participate in the	decision maker perceived stress	-6		11 16	6 05494839	36 6624
		10	experiment subjects	perceived information overload	2		34 4	18 951	359 140401
		10	were assigned to conditions randomly	perceived time to decision	2		2 2	1 077032961	1 16
	D1b	10	subjects volunteered to	decision quality	1		72 8	14 883	221 503689
		10	participate in the	decision maker perceived stress	-6		14 03	6.480285488	41 9941
		10	experiment, subjects	perceived information overload	2		29 6	19 15	366 7225
		10	were assigned to conditions randomly	perceived time to decision	2		2 9	1 577973384	2 49
	D2	10	subjects volunteered to	decision quality	1		62.3	11 586	134 235396
		10	participate in the	decision maker perceived stress	-6		12 04	3 38	11 4244
		10	experiment subjects	perceived information overload	2		19 7	10 404	108 243216
		10	were assigned to conditions randomly	perceived time to decision	2		2 4	1 356465997	1 84
Jarvenpaa, Rao and Huber	G1	7	voluntary participation	quality of performance	1	0 8	0 291	0 903	0 815409
		7	Random assignment to	depth of analysis	3	0.82	5 318	1 887	3 560769
		7	teams and sequence of	amount of communication	13		25 751	4 138	17 123044
		7	treatment manipulations	task oriented behavior	16		0 893	0 051	0 002601
		7		inequality of participation	-7		0 789	0 105	0 011025
		7		perceived equity of participation	7		1 976	0 065	0 004225
		7		satisfaction with meeting process	6	0 83	1 977	0 201	0 040401
	G1a	7	voluntary participation	quality of performance	1	0 8	0 018	1 185	1 404225
		7	Random assignment to	depth of analysis	3	0 82	4.202	0 943	0 889249
		7	teams and sequence of	amount of communication	13		24.208	3 823	14 615329
		7	treatment manipulations	task oriented behavior	16		0 812	0 123	0 015129
		7		inequality of participation	-7		0 736	0 115	0 013225
		7		perceived equity of participation	7		1 923	0 166	0 027556
		7		satisfaction with meeting process	6	0 83	1 996	0 174	0 030276
	G2	7	voluntary participation	quality of performance	1	0 8	-0 309	0 352	0 123904
		7	Random assignment to	depth of analysis	3	0 82	5 022	1 322	1 747684
		7	teams and sequence of	amount of communication	13		25 697	3 788	14 348944
		7	treatment manipulations	task oriented behavior	16		0 875	0 03	0 0009
		7		inequality of participation	-7		0 815	0 139	0 019321
		7		perceived equity of participation	7		1 93	0 125	0 015625
		7		satisfaction with meeting process	6	0 83	1 997	0 194	0 037636
Joyner and Tunstall	G1	105	subjects were volunteers	quality of decision	1	0 82	7 76	not reported	
		105	they were randomly	decision quality -policy approach	1	0 82	8.83	not reported	
		105	assigned to treatment conditions	decision quality -brainstorm	1	0 82	6 8	not reported	rpb >

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION
Isett	14 38590161	1 181712517	1 181712517	D1 D1b	active DSS	Fisher PLSD	16 75	p < 0 001	significant +
	6.271223963	-0 45764591	0 45764591		vs no-DSS	(F test)	not reported	NS	NS
	19 05075984	0.251958454	0 251958454			not reported	12 703	p < 0 10	significant -
	1 350925609	-0 518163247	-0 518163247			not reported	not reported	NS	NS
	13 33677407	0 787296834	0 787296834	D1b-D2	active DSS	Fisher PLSD	16 75	p < 0 01	significant +
	5.168099264	0 385054524	-0 385054524		vs	(F test)	not reported	NS	NS
	15 41047884	0 642420012	0 642420012		passive DSS	not reported	12 703	NS	NS
	1 471393897	0 339813833	0 339813833			not reported	not reported	NS	NS
	12 77967208	1 911593778	1 911593778	D1 D2	passive DSS	Fisher PLSD	10 297	p < 0 10	significant +
	4 903406979	-0 140323485	0 140323485		vs	(F test)	not reported	NS	NS
	15 28698167	0 771622766	0 771622766		no-DSS	not reported	12 703	NS	NS
	1 224744871	-0 148046642	-0 148046642			not reported	not reported	NS	NS
Jarvenpaa, Rao and Huber	0 685314891	0 875509941	0 875509941	G1-G2	ANOVA(F values)	F df=22,14	6 07	<0 05	significant +
	1 629179702	0 181686526	0 181686526		the 2 computer-		1 51	NS	NS
	3 966861984	0 013612775	0 013612775		based groups		1 03	NS	NS
	0 041838977	0 430220844	0 430220844		against the		2 62	NS	NS
	0 123178732	-0 211075399	0 211075399		conventional group		2 01	NS	NS
	0 099624294	0 461734764	0 461734764				0 95	NS	NS
	0 19753101	-0 101249925	-0 101249925				0 09	NS	NS
	0 874107831	0 374095722	0 374095722	G1a-G2					
	1 148244965	-0 714133329	-0 714133329						
	3 805540238	-0 391271648	-0 391271648						
	0 08952374	-0 703723952	-0 703723952						
	0 127565669	-0 619288876	0 619288876						
	0 146937061	-0 047639445	-0 047639445						
	0 184271539	-0 005426774	-0 005426774						
Joyner and Tunstall					GDSS vs no GDSS	not reported	not reported	NS	NS
						not reported	not reported	NS	NS
	0 019607843	0 039215686	-0 039215686			F test	0 08	NS	NS

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Isett	evaluated by experts posttest questionnaire posttest questionnaire posttest questionnaire	1 total sample size is 30 10 per treatment	military officers in US Air Force		no individual comparisons were provided for perceived stress and time to decision in F test		CMDSS features include domain knowledge, simulation tools, automative alternative generation, & recommendation and explanation facilities
	evaluated by experts posttest questionnaire posttest questionnaire posttest questionnaire	1 total sample size is 30 10 per treatment	military officers in US Air Force		no individual comparisons were provided for perceived stress and time to decision in F test		CMDSS features include domain knowledge simulation tools, automative alternative generation, & recommendation and explanation facilities
	evaluated by experts posttest questionnaire posttest questionnaire posttest questionnaire	1 total sample size is 30 10 per treatment	military officers in US Air Force		no individual comparisons were provided for perceived stress and time to decision in F test		CMDSS features include domain knowledge simulation tools automative alternative generation, & recommendation and explanation facilities
Jarvenpaa, Rao and Huber	judged by 4 experts count from videotapes count from videotapes peers rating posttest questionnaire	7 total sample is 21	software designers	3*3 repeated measured Graeco- Latin Square			
	judged by 4 experts count from videotapes count from videotapes peers' rating posttest questionnaire	7 total sample is 21	software designers	3*3 repeated measured Graeco- Latin Square			
	judged by 4 experts count from videotapes count from videotapes peers rating posttest questionnaire	7 total sample is 21	software designers	3*3 repeated measured Graeco- Latin Square			
Joyner and Tunstall	assessed by 3 raters assessed by 3 raters assessed by 3 raters	5 total sample size is 211	senior high school students	2x2x2 factorial design 8 treat conditions augmentation x strategy x order		the sample size for each group is assumed since it is not reported	

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Joyner and Tunstall	1970	published	GDSS called CONference COoRDinator (CONCORD)	lab exp to investigate the impact of GDSS on group decision quality	semi-structured low and high difficulty tasks	human relations	two periods (40 min each) over 2 days	solution finding	no-GDSS
Killingsworth	1987	dissertation	DSS/KBS called AUDPLAN an audit planning knowledge-based decision support system (KBDSS)	lab	semi-structured high difficulty task	audit program planning task	one period	problem formulation	computerized enhanced DSS
	1987	dissertation	DSS/KBS called AUDPLAN, an audit planning knowledge-based decision support system (KBDSS)	lab	semi structured high difficulty task	audit program planning task	one period	problem formulation	computerized conventional DSS
	1987	dissertation	DSS/KBS called AUDPLAN an audit planning knowledge-based decision support system (KBDSS)	lab	semi structured high difficulty task	audit program planning task	one period	problem formulation	manual DSS
King and Rodriguez	1978	published	DSS called Strategic Issue Competitive Information Systems	lab exp to investigate the impact of DSS on decision performance	unstructured high difficulty task	corporate strategic planning in a simulated business environment	one period but DSS used over a summer	problem solving	computerized DSS
	1978	published	DSS called Strategic Issue Competitive Information Systems	lab exp to investigate the impact of DSS on decision performance	unstructured high difficulty task	corporate strategic planning in a simulated business environment	one period but DSS used over a summer	problem solving	no-DSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Joyner and Tunstall	G3	105	subjects were volunteers	quality of decision	1	0.82	7 97	not reported	
		105	they were randomly	decision quality -policy approach	1	0 82	8 63	not reported	
		105	assigned to treatment conditions	decision quality -brainstorm	1	0 82	7.35	not reported	
Killingsworth	D1	25	random assignment of	interrater reliability (quality)	1				
		25	subjects to treatment	specific audit procedures	1 1		0 3113	within MS= 0727	among MS=57.4791
		25	conditions	type of evidence	1 2		0 7806	within MS=0 184	among MS=29 6873
		25		level of tangibility	1 3		0 4326	within MS= 1815	among MS=66 4214
		25		type of audit procedures	1 4		0 5215	within MS= 2516	among MS=71.3504
		25		decision accuracy error	1b		-----	----------	----- -----
		25		decision inconsistency	10		-----	---------	----------
		25		decision incompleteness	-1c		0.43	within MS= 2978	among MS=1 6348
		25		decision time	2		327 35	within MS=11576:	among MS=47469 7
	D1b	24	random assignment of	interrater reliability (quality)	1				
		24	subjects to treatment	specific audit procedures	1 1		0 0833		
		24	conditions	type of evidence	1 2		0 6407		
		24		level of tangibility	1 3		0 1776		
		24		type of audit procedures	1 4		0 2687		
		24		decision accuracy	1b		0 01	within MS=0 004	among MS=0 0033
		24		decision inconsistency	-10		0.21	within MS=0 244	among MS=0 1755
		24		decision incompleteness	1c		0 54		
		24		decision time	2		506 12		
	D2	18	random assignment of	interrater reliability (quality)	1				
		18	subjects to treatment	specific audit procedures	1 1		0 0699		
		18	conditions	type of evidence	1 2		0 5806		
		18		level of tangibility	1 3		0 1911		
		18		type of audit procedures	1 4		0 2509		
		18		decision accuracy	1b		0 00		
		18		decision inconsistency	10		0.26		
		18		decision incompleteness	-1c		0 66		
		18		decision time	2		301 46		
King and Rodriguez	D1	30	subjects were assigned	decision quality	1		21 04	5 28	27 8784
		30	to treatment groups on a randomized blocking basis	confidence in decision	4		0 313	0 193	0 037249
	D3	15	subjects were assigned	decision quality	1		21 64	4 12	16 9744
		15	to treatment groups on a randomized blocking basis	confidence in decision	4		0 035	0 345	0 119025

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION
Joyner and Tunstall									
Killingsworth					manual vs	Fisher's test			
					conventional vs	df=8739 MSE= 0726	0 0145	0 05	(1 vs 2) = NS
					enhanced KBDSS	df=8739 MSE= 1837	0 023	0 05	all significant
						df=8739 MSE= 1810	0 0228	0 05	(1 vs 2) = NS
					1=manual	df=8739 MSE= 2514	0 0269	0 05	(1 vs 2) = NS
					2=conventional	---- -------	-----	-----	
					3=enhanced	----------	-----	-- ---	
						df=399 MSE= 298	0 1319	0 05	only 1 vs 3 sig
						df= 399 mse=115763		0 05	(1 vs 3) = NS
					manual vs conventional KBDSS				
						univariate F test	0 83	0 3644	NS
							0 72	0 3973	NS
King and Rodriguez	4 932368647	-0 121645409	-0 121645409		DSS vs no-DSS	not reported	not reported	NS	NS
	0 252732555	1 099977011	1 099977011			not reported	not reported	0 0189	significant +

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Joyner and Tunstall	assessed by 3 raters assessed by 3 raters assessed by 3 raters	5 total sample size is 211	senior high school students	2x2x2 factorial design 8 treat conditions augmentation x strategy x order			
Killingsworth	direct observation direct observation direct observation direct observation direct observation direct observation direct observation direct observation	1	auditors from 8 firms total sample is 67	3 independent treatments	AUDPLAN II is an enhanced KBDSS It is composed of knowledge system language system problem processing system & intuition support system	univariate tests and Fisher's Least Significant Difference tests were used in addition to Kruskal-Wallis tests	the effect of computer experience with level of technological support was tested on decision time standard deviations are not reported
	direct observation direct observation direct observation direct observation direct observation direct observation direct observation direct observation	1	auditors from 8 firms total sample is 67	3 independent treatments	AUDPLAN I is a conventional KBDSS It is composed of the following components knowledge system language system and a problem processing unit		The KBDSS provides feedback information
	direct observation direct observation direct observation direct observation direct observation direct observation direct observation direct observation	1	auditors from 8 firms total sample is 67	3 independent treatments	demographic information was collected for subjects auditing experience and degree of computer experience		
King and Rodriguez	evaluated by 3 profs pre & post questionnaire	1 total sample size is 45	managers enrolled in a part time MBA program	2 independent groups (the exp group is composed of 2 groups one participated in the design, one didn't		the sample size for each group is assumed, since it is not reported	the SICIS utilizes strategic problem-related questions that the user can use to access competitive information in the SICIS database

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
King, Premkumar, and Ramamurthy	1988	conference proceedings	DSS called Fin-ally used for financial mgmt as a Computer Assisted Instruction	lab	unstructured complex task	a case incorporates the concepts of risk analysis cost of capital and capital budgeting	longitudinal	solution finding	computerized DSS
	1988	conference proceedings	DSS called Fin-ally used for financial mgmt as a Computer Assisted Instruction	lab	unstructured complex task	a case incorporates the concepts of risk analysis cost of capital, and capital budgeting	longitudinal	solution finding	manual DSS
Koester and Luthans	1979	published	DSS	lab exp. to test the degree of confidence in decision aid	semi-structured high difficulty task	20-question multiple choice test similar to the Aptitude Test for Graduate Study in Business	one period	solution finding	DSS
	1979	published	DSS	lab exp. to test the degree of confidence in decision aid	semi structured high difficulty task	20-question multiple choice test similar to the Aptitude Test for Graduate Study in Business	one period	solution finding	no-DSS
Lamberti and Newsome	1989	published	DSS-expert system built using an expert system shell called Expert System Environment (ESE)	field study (quasi experiment) to test the effect of use of system vs no usage on decision speed and accuracy	semi structured high difficulty task	computer diagnostic problem-solving tasks	cross-sectional	problem solving	computerized DSS (ES)
	1989	published	DSS-expert system built using an expert system shell called Expert System Environment (ESE)	field study (quasi experiment) to test the effect of use of system vs no usage on decision speed and accuracy	semi structured high difficulty task	computer diagnostic problem-solving tasks	cross-sectional	problem solving	manual DSS
Lewis	1982	dissertation, published later in 1987	GDSS called FACILITATOR level 1	lab	moderate-to-high difficulty	severe financial problems in a university	one period	problem finding (idea generation)	computerized GDSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
King Premkumar, and Ramamurthy	D1	21	students were randomly	decision quality	1	0 767	43 73	14 99	224 7001
		21	assigned to 2 groups	decision accuracy	1b	0 8	48.3	11 73	137 5929
		21		attitude toward the system	9	0 7952	not reported	not reported	
		21		satisfaction with the system	9	0 909	not reported	not reported	
	D2	21	students were randomly	decision quality	1	0 767	26 78	15 79	249 3241
		21	assigned to 2 groups	decision accuracy	1b	0 8	27 8	12 76	162 8176
		21		attitude toward the system	9	0 7952	not reported	not reported	
		21		satisfaction with the system	9	0 909	not reported	not reported	
Koester and Luthans	D1	29	subjects were randomly	confidence (changes in answers)	4		1 483	2 16	4 6656
		46	assigned to treatments, in each treatment there were two groups exper ienced and nonexperienced	confidence (changes in answers)	4		1 783	2 88	8.2944
	D3	31	subjects were randomly	confidence (changes in answers)	4		0 419	0 84	0 7056
		30	assigned to treatments, in each treatment there were two groups exper- ienced and nonexperienced	confidence (changes in answers)	4		0 333	0 83	0 6889
Lamberti and Newsome	D1	40	subjects were randomly	problem solving time	2		33 9	not reported	rpb >
		40	assigned to either the	decision accuracy	-1		3.55	not reported	rpb >
		40	experimental or control group	decision confidence	4		not reported	not reported	biserial correlation obtained from F value
	D2	20	subjects were randomly	problem solving time	2		62 935	not reported	
		20	assigned to either the	decision accuracy	1		7 05	not reported	
		20	experimental or control group	decision confidence	4		not reported	not reported	
Lewis	G1	30		decision quality	1		4.24	0 47	0 2209
		30		process creativity	3		4.22	0 46	0 2116
		30		number of alternatives (depth)	3		6 8	1 33	1 7689
		30		dominance reduction	7		3 57	0 9	0 81
		30		chance to be heard	7		4.87	0 31	0 0961
		30		satisfaction with the method	6a		3.93	0 54	0 2916
		30		ease of use (system attitude)	6a		3.88	0 79	0 6241
		30		contribution acceptance (w/process)	6		4 56	0 45	0 2025
		30		commitment to solution (w/output)	5		4 18	0 76	0 5776

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION
King, Premkumar and	15 3951973	1 10099271			Aided vs unaided	t	3 57	0 001	significant +
Ramamurthy	12 25582515	1 672673994	1 386833352	D1 D2	group	t	5 42	0 000	significant +
Koester and Luthans	1 617814618	0 657677331	0 657677331	D1 D3	DSS vs no-DSS	F test	not reported	not reported	not reported
	2.305182469	0 629017451	0 629017451						
Lamberti and Newsome	0 937158655	0 94356167	5 602120134			F test df=1 56	418 45	p < 0 0001	significant +
	0 862132214	0 874698002	3 345843192			F test df=1 56	167 92	p < 0 0001	significant +
						not reported			
		corrected rpb for Nc not = Ne							
Lewis	0 495630911	0 92810999	0 92810999	G1-G2	GDSS vs no-GDSS	t test	1 45	0 07	NS
	0 622133426	1 028718235					1 73	0 04	significant +
	2.372266848	0 223415001	0 626066618				2 47	p < 0 01	significant +
	0 880227243	1 113348862					3 52	p < 0 01	significant +
	0 835374168	0 574592821	0 843970842				0 67	0 26	NS
	0 706116138	0 311563478					0 96	0 33	NS
	0 718922805	0 389471579	0 350517529				0 13	0 45	NS
	0 536003731	0 149252692	0 149252692				0 27	0 39	NS
	0 716414684	0 251251131	0 251251131				0 83	0 29	NS

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
King, Premkumar and Ramamurthy	compared to raters' compared to raters posttest questionnaire posttest questionnaire	1 total sample is 42	students	2 indep groups with 2 independent treatments (CAI and non-CAI)	demographic data were collected on prior domain expertise past domain experience, and sex	Pearson correlation between accuracy and decision quality is NA	Fin ally consists of a set of models each deals with a specific aspect of financial management (i e , cash flow, risk analysis etc)
	compared to raters' compared to raters pretest questionnaire posttest questionnaire	1 total sample is 42	students	2 indep groups with 2 independent treatments (CAI and non CAI)	demographic data were collected on prior domain expertise past domain experience and sex	Pearson correlation between accuracy and decision quality is NA	Fin ally consists of a set of models each deals with a specific aspect of financial management (i e , cash flow risk analysis etc)
Koester and Luthans	no of changes in answers no of changes in answers	1 total sample size is 136	professional finance and accounting staff	2 independent groups	the first group represents the experienced subjects the second group represents the inexperienced subjects		
	no of changes in answers no of changes in answers	1 total sample size is 136	professional finance and accounting staff	2 independent groups	the first group represents the experienced subjects the second group represents the inexperienced subjects		
Lamberti and Newsome	direct observation number of errors posttest questionnaire	1 total sample size is 60	diagnostic programmers	2 independent groups	the shell is a general purpose one it provides editors for knowledge definition multiple inference techniques explicit control specification, and a consultation interface for users		
	direct observation number of errors posttest questionnaire	1 total sample size is 60	diagnostic programmers	2 independent groups			
Lewis	posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire	3 total sample size is 90	junior and senior undergrad-uate students	3 independent groups each in one treatment			interactive GDSS it supports 3 phases of group decision making problem definition generation of alternatives, and alternative selection

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Lewis	1982	dissertation, published later in 1987	GDSS called FACILITATOR level 1	lab	moderate-to-high difficulty	severe financial problems in a university	one period	problem finding (idea generation)	manual support
	1982	dissertation published later in 1987	GDSS called FACILITATOR level 1	lab	moderate-to-high difficulty	severe financial problems in a university	one period	problem finding (idea generation)	no support (base line)
Linn	1987	dissertation	GDSS a Computer Mediated Communication System (CMCS)	lab exp. to examine the impact of CMCS as compared to face-to-face communications, on task performance	semi-structured high difficulty task	The Fouraker & Siegel cases a simulated business game of buyers and sellers negotiation	one period	solution finding	computerized CMCS with familiar group members
	1987	dissertation	GDSS a Computer Mediated Communication System (CMCS)	lab exp. to examine the impact of CMCS as compared to face-to-face communications, on task performance	semi-structured high difficulty task	The Fouraker & Siegel cases a simulated business game of buyers and sellers negotiation	one period	solution finding	no-CMCS with familiar group members
	1987	dissertation	GDSS a Computer Mediated Communication System (CMCS)	lab exp. to examine the impact of CMCS as compared to face-to-face communications, on task performance	semi-structured high difficulty task	The Fouraker & Siegel cases a simulated business game of buyers and sellers negotiation	one period	solution finding	computerized CMCS with unfamiliar group members
	1987	dissertation	GDSS a Computer Mediated Communication System (CMCS)	lab exp to examine the impact of CMCS as compared to face-to-face communications on task performance	semi structured high difficulty task	The Fouraker & Siegel cases a simulated business game of buyers and sellers negotiation	one period	solution finding	no-CMCS with unfamiliar group members

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Lewis	G2	30		decision quality	1		3 78	0 52	0 2704
		30		process creativity	3		3 58	0 75	0 5625
		30		number of alternatives (depth)	3		6.27	3 08	9 4864
		30		dominance reduction	7		2 59	0 86	0 7396
		30		chance to be heard	7		4.39	1 14	1 2996
		30		satisfaction with the method	6a		3 71	0 84	0 7056
		30		ease of use (system attitude)	6a		3 6	0 64	0 4096
		30		contribution acceptance (w/process)	6		4.48	0 61	0 3721
		30		commitment to solution (w/output)	5		4	0 67	0 4489
	G3	30		decision quality	1		4 02	0 64	0 4096
		30		process creativity	3		3 96	0 66	0 4356
		30		number of alternatives (depth)	3		5.27	3 01	9 0601
		30		dominance reduction	7		2.66	1	1
		30		chance to be heard	7		4 77	0 77	0 5929
		30		satisfaction with the method	6a		4 09	0 66	0 4356
		30		ease of use (system attitude)	6a		3.85	0 71	0 5041
		30		contribution acceptance (w/process)	6		4 53	0 49	0 2401
		30		commitment to solution (w/output)	5		4.34	0 68	0 4624
Linn	G1a	30	subjects were assigned to groups randomly, and groups were assigned to treatments randomly	decision quality (joint profit)	1		4362 429	352.7578	124438 0655
	G3a	41	subjects were assigned to groups randomly and groups were assigned to treatments randomly	decision quality (joint profit)	1		4669 7069	242 633	58870 77269
	G1b	40	subjects were assigned to groups randomly and groups were assigned to treatments randomly	decision quality (joint profit)	1		4233 0279	490 9196	241002.0537
	G3b	37	subjects were assigned to groups randomly and groups were assigned to treatments randomly	decision quality (joint profit)	1		4585 8823	359 8693	129505 9131

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG LEVEL p-VALUE	DIRECTION
Lewis					GDSS vs manual	t test	3 47	p < 0 01	significant +
							3 5	p < 0 01	significant +
							0 84	0 3	NS
							4 13	p < 0 01	significant +
							2.2	0 02	significant +
							1 17	0 12	NS
							1 22	0 11	NS
							0 6	0 28	NS
							0 92	0 32	NS
	0 561471282	0 443878691	0 443878691	G1-G3	manual vs no-GDSS	t test	1 52	0 07	NS
	0 568858506	0 417916783					1 78	0 04	significant +
	2.326907819	0 644952738	0 531434761				1 16	0 13	NS
	0 95131488	1 033823944					0 27	0 39	NS
	0 586941224	0 119706838	0 576765391				1 42	0 08	NS
	0 602992537	-0 226591621					1 81	0 04	significant +
	0 751065909	0 041729098	-0 092431261				1 16	0 13	NS
	0 470425339	0 05596976	0 05596976				0 34	0 37	NS
	0 721110255	-0.223334339	-0 223334339				1 82	0 04	significant +
Linn	293 9864634	-1 04521105	-0 906969176	G1-G3	CMCS vs no-CMCS	F test	13 28	0 0005	significant -
	432 994118	-0 768727302							

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Lewis	posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire	3 total sample size is 90	junior and senior undergrad-uate students	3 independent groups each in one treatment			interactive GDSS It supports 3 phases of group decision making problem definition generation of alternatives and alternative selection
	posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire	3 total sample size is 90	junior and senior undergrad-uate students	3 independent groups each in one treatment			interactive GDSS It supports 3 phases of group decision making problem definition generation of alternatives and alternative selection
Linn	total joint profit	4 total sample size is 148	students (under graduates)	2x2 factorial design	the profit measure is the joint average profit for both parties in the group		
	total joint profit	4 total sample size is 148	students (under-graduates)	2x2 factorial design	the profit measure is the joint average profit for both parties in the group		
	total joint profit	4 total sample size is 148	students (under-graduates)	2x2 factorial design	the profit measure is the joint average profit for both parties in the group		
	total joint profit	4 total sample size is 148	students (under graduates)	2x2 factorial design	the profit measure is the joint average profit for both parties in the group		

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Loy	1986	dissertation	GDSS called Graphical Interactive Structural Modeling Option (GISMO)	lab exp to investigate the impact of computer generated graphic aids on group decision performance and problem understanding	semistructured high difficulty tasks	strategic planning in a simulated business game	six periods	problem finding	computerized graphical DSS with a conventional DSS
	1986	dissertation	GDSS called Graphical Interactive Structural Modeling Option (GISMO)	lab exp to investigate the impact of computer generated graphic aids on group decision performance and problem understanding	semistructured high difficulty tasks	strategic planning in a simulated business game	six periods	problem finding	no-graphical DSS but only a conventional DSS
Lucas see Lucas 1981	1975	published	DSS	field study to explore the relationship between the use of the system and performance	semi-structured moderate difficulty task	sales force performance	one period	problem solving	computerized DSS use
Luthans and Koester	1976	published	DSS	lab exp. to test the degree of confidence in decision aid	semi-structured high difficulty task	20-question multiple choice test similar to the Aptitude Test for Graduate Study in Business	one period	solution finding	DSS
	1976	published	DSS	lab exp to test the degree of confidence in decision aid	semi-structured high difficulty task	20-question multiple choice test similar to the Aptitude Test for Graduate Study in Business	one period	solution finding	no-DSS
McIntyre	1982	Published	DSS a decision calculas model similar to CALLPLAN	lab	semi-structured meduim difficulty	promotion allocations in a marketing simulation given a fixed budget	9 periods	problem solving	Computerized DSS
	1982	Published	DSS a decision calculas model similar to CALLPLAN	lab	semi-structured meduim difficulty	promotion allocations in a marketing simulation given a fixed budget	9 periods	problem solving	no-DSS (base line)

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Loy	D1	35	two sections of students	decision performance-net profit	1		-8057 63	34440 28	1186132886
		31	each one was assigned randomly to a treatment students were assigned to groups randomly	problem understanding	3	0 804	220 31	not reported	rpb -->
	D2	25	two sections of students,	decision performance-net profit	1		39347 05	69665 43	4853272137
		22	each one was assigned randomly to a treatment students were assigned to groups randomly	problem understanding	3	0 804	206.32	not reported	
Lucas see Lucas, 1981	D1	24	sales force of a company	performance (total dollar booking)	1		not reported	not reported	rpb -->
		41	sales force of a company	performance (total dollar booking)	1		not reported	not reported	rpb -->
		41	sales force of a company	performance (total dollar booking)	1		not reported	not reported	rpb -->
		41	sales force of a company	performance (total dollar booking)	1		not reported	not reported	rpb -->
		22	sales force of a company	performance (total dollar booking)	1		not reported	not reported	rpb -->
		22	sales force of a company	performance (total dollar booking)	1		not reported	not reported	rpb -->
		22	sales force of a company	performance (total dollar booking)	1		not reported	not reported	rpb -->
		22	sales force of a company	performance (total dollar booking)	1		not reported	not reported	rpb -->
Luthans and Koester	D1	61	subjects were randomly	confidence (changes in answers)	4		4.45	3 12	9 7344
		26	assigned to treatments, in each treatment there were two groups exper ienced and nonexperienced	confidence (changes in answers)	4		6.28	3 16	9 9856
	D3	80	subjects were randomly	confidence (changes in answers)	4		2.66	2 57	6 6049
		24	assigned to treatments, in each treatment there were two groups exper-ienced and nonexperienced	confidence (changes in answers)	4		2.62	1 75	3 0625
McIntyre	D1	48	random assignment of	decision quality (profit)	1		not reported	Z value -->	2 575
		48	subjects to treatments	decision confidence	4		not reported	Z value -->	1 432666667
		48		consistency in decision quality	10		not reported	Z value -->	2 365
		48		rate of decision improvement	14		not reported	Z value -->	1 46
	D3	48	random assignment of	decision quality (profit)	1		not reported	not reported	
		48	subjects to treatments	decision confidence	4		not reported	not reported	
		48		consistency in decision quality	10		not reported	not reported	
		48		rate of decision improvement	14		not reported	not reported	

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
Loy	51995.86347	0 601767485	0 601767485	D1 D2	enhanced DSS vs	F-test	3 54	0 047	significant +
	0.23800714	0.234764944	0 47382811		conventional DSS	t test	1 75	0 045	significant +
Lucas	0 28206714	0 562977334	0 562977334	D1 D3	use-> performance	t-test	1 41	p < 0 10	NS +
see Lucas, 1981									
	0 192398191	0 3824389					1.24	NS	NS -
	0 343075655	0 71244686					2 31	p < 0 05	significant -
	0 340450915	0 706278291	-0 129535756	D1 D3			2 29	p < 0 05	significant +
	0 311085508	0 624187784					1 5	p < 0 10	NS -
	0.335126436	0 678284059					1 63	NS	NS +
	0.274855486	0 545123998					1 31	NS	NS -
	0 086956522	0 166450076	-0 081144412	D1 D3			0 4	NS	NS -
Luthans and Koester	2.820596268	0 634617588	0 634617588	D1-D3	DSS vs. no-DSS	F test	not reported	not reported	not reported
	2.582301541	1.417340284	1 417340284						
McIntyre	Pearson r -->	0.262809837	0 539065054	D1 D3	DSS vs no-DSS	t	reg coef = 0 209	0 005	sig +
	Pearson r -->	0 146220929	0.292523611			t	reg coef = 0 103	0 076	sig +
	Pearson r -->	0.241376802	0 49225367			t	reg coef = 0 161	0 009	sig +
	Pearson r -->	0 149010626	0 298230086			t	not reported	0 072	

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Loy	net profit pre & posttest questionr	4 total N = 60 9 treatment groups with a group = 3 7 control groups with 3 groups = 3	senior level students	2x2 factorial design (availability of decision aid -DSS vs no-DSS and group decision making procedures NGT IG)	all subjects have access to Business Management Laboratory (BML) and Simulation Laboratory for Information Management (SLIM)		
	net profit pre & posttest questionr	4 total N = 60 9 treatment groups with a group = 3 7 control groups with 3 groups = 3	senior level students	2x2 factorial design (availability of decision aid -DSS vs no-DSS and group decision making procedures NGT IG)	all subjects have access to Business Management Laboratory (BML) and Simulation Laboratory for Information Management (SLIM)		
Lucas see Lucas, 1981	total dollar bookings	1	account executives and sales represent ltives	field study for 3 departments			
	total dollar bookings total dollar bookings total dollar bookings						
	total dollar bookings total dollar bookings total dollar bookings total dollar bookings	N1 = 24 N2 = 41 N3 = 22					
Luthans and Koester	no of changes in answers no of changes in answers	1 total sample size is 191	under- graduate students	2 independent groups	the first group represents the experienced subjects, the second group represents the inexperienced subjects		
	no of changes in answers no of changes in answers	1 total sample size is 191	under- graduate students	2 independent groups	the first group represents the experienced subjects, the second group represents the inexperienced subjects		
McIntyre	compared to optimal calculated sd of the profit faster profit improvement	1 total sample size is 96	students	2*2*2 factorial, with 12 replications 3 treatments each with 2 levels	used 2 levels of tasks 3 and 6 terretories	cognitive style was measured by MBTI	
	compared to optimal calculated sd of the profit faster profit improvement	1 total sample size is 96	students	2*2*2 factorial, with 12 replications 3 treatments each with 2 levels	used 2 levels of tasks 3 and 6 terretories	cognitive style was measured by MBTI	

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Pecoraro	1984	dissertation	DSS	survey study to investigate the DSS impact on managerial effectiveness in health care	structured to semi-structured	hospital admin. and health care management	cross-sectional (one period)	all decision phases	computerized DSS
Pentland study # 1 subjective data	1990	conference proceedings	DSS called Automated Examination System (AES)	field study to determine the effects of DSS on effectiveness and efficiency	structured moderate difficulty task	auditing for the Internal Revenue Service	cross-sectional	solution finding	computerized DSS (degree of use)
study # 2 objective data	1990	conference proceedings	DSS called Automated Examination System (AES)	field study to determine the effects of DSS on effectiveness and efficiency	structured moderate difficulty task	auditing for the Internal Revenue Service	cross-sectional	solution finding	computerized DSS (degree of use)
Peterson	1988	dissertation	DSS(expert system)	lab exp. to examine the usability and usefulness of a knowledge-based expert system	semi-structured moderate task difficulty	to identify 10 behavioral responses appropriate for the given situation as a subordinate feedback in performance eval	one period	solution finding	computerized DSS (ES)
	1988	dissertation	DSS(expert system)	lab exp. to examine the usability and usefulness of a knowledge-based expert system	semi-structured moderate task difficulty	to identify 10 behavioral responses appropriate for the given situation as a subordinate feedback in performance eval	one period	solution finding	no-DSS
Power and Rose	1977	conference proceedings	DSS, a computer aided learning program called DECision AID (DECAID)	lab exp. to investigate the effect of DSS on decision performance in ill-defined problems	unstructured high difficulty tasks	a critical incident case of a company	one period	all phases	comuterized DSS
PHASE ONE	1977	conference proceedings	DSS, a computer aided learning program called DECision AID (DECAID)	lab exp. to investigate the effect of DSS on decision performance in ill-defined problems	unstructured high difficulty tasks	a critical incident case of a company	one period	all phases	no-DSS
Power and Rose	1977	conference proceedings	DSS, a computer aided learning program called DECision AID (DECAID)	lab exp. to investigate the effect of DSS on decision performance in ill-defined problems	unstructured high difficulty tasks	a critical incident case of a company	one period	all phases	comuterized DSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Pecoraro	D1	61	random sample of	profit	1		3 949	0 912590302	0 832821059
		61	150 hospitals out	cost reduction	1		4 227	0 789601798	0 623471
		61	of 326 hospitals	decision quality	1		3 935	1 120167398	1 254775
				quick and efficient use of DSS	2		4 193	0 895405495	0 801751
				quick diagnostic service	2		4 192	1 031084868	1 063136
				satisfaction with the system	6		3 821	0 993458102	0 986959
Pentland	D1	1010	not a random sample	effectiveness (decision quality)	1		not reported	not reported	rpb -->
		1010		efficiency (decision time)	2		not reported	not reported	rpb -->
study # 1									
subjective data									
	D1	1316	not a random sample	effectiveness (decision quality)	1		not reported	not reported	rpb -->
study # 2		1316		efficiency (decision time)	2		not reported	not reported	rpb -->
objective data									
Peterson	D1	30	subjects were assigned	decision accuracy	1	0 94	53	23 1	533.61
		30	randomly to treatment	decision confidence	4	0 88	3.44	0 53	0.2809
			conditions	perceived usefulness	9	0 93	only done for DSS	only done for DSS	
	D3	30	subjects were assigned	decision accuracy	1	0 94	13	28.2	795.24
		30	randomly to treatment	decision confidence	4	0 88	3.45	0 57	0 3249
			conditions	perceived usefulness	9	0 93	only done for DSS	only done for DSS	
Power and Rose	D1	11	no random assignment of subjects to treatments	decision quality	1		not reported	not reported	rpb -->
PHASE ONE									
	D3	11	no random assignment of subjects to treatments	decision quality	1				
Power and Rose	D1	12	no random assignment of subjects to treatments	decision quality	1		not reported	not reported	rpb -->

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
Pecoraro	no comparison was done								
Pentland	0.348	0 741668911	0 741668911	G1/G3	DSS vs no-DSS	F-test	23 05	p < 0 001	significant +
	0 188	0 382446939	0 382446939				6 17	p < 0 001	significant +
study # 1 subjective data									
	0.236	0 485350881	0 485350881	G1/G3	DSS vs no-DSS	F-test	12 92	p < 0 001	significant +
study # 2	0 253	0 522618066	0 522618066				14 92	p < 0 001	significant +
objective data									
Peterson	25 77644273	1 551804507	1 551804507	D1/D3	DSS vs no-DSS	F test	37 31	p < 0 001	significant +
	0 550363516	-0 018169809	-0 018169809				0 04	NS	NS
Power and Rose	0 493864425	1 083059639	1 083059639	D1 D3	DSS vs no-DSS	t test	2 54	p < 0 01	significant +
PHASE ONE									
Power and Rose	0 489079976	1 073693004	1 073693004	D1 D3	DSS vs no-DSS	t test	2 63	p < 0 05	significant +

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Pecoraro	self-report questionnaire self-report questionnaire self report questionnaire	1 out of 150 only 67 responded and 61 were usable	actual managers	survey	some of the questions in the survey are thought to be relevant and selected, some of them are grouped together to form a single dependent variables		
Pentland study # 1 subjective data	self-report self-report	1 total sample size is 1110	accounting professionals	two seperate field studies with diffetent subjects	DSS include word processor, spreadsheet, database, etc.		
study # 2 objective data	actual case file data actual case file data	1 total sample size is 1851	accounting professionals	two seperate field studies with diffetent subjects	DSS include word processor, spreadsheet, database etc.		
Peterson	compared to 3 raters during test question posttest questionnaire	1 total sample size is 60	managers (white males)	2 X 2 factorial design (level of decision aid x experience)	the subjects were evaluating their purchasing agents performance		
	compared to 3 raters during test question posttest questionnaire	1 total sample size is 60	managers (white males)	2 X 2 factorial design (level of decision aid x experience)	the subjects were evaluating their purchasing agents' performance		
Power and Rose PHASE ONE	posttest	1 totoal sample size is 22	students (12 MBA and 10 under-graduates)	2 independent groups	the sample sizes for the control and treatment groups were not reported it is assumed that they are of equal sample sizes, Ne=Nc=11		DECAID is an interactive computer program that supports the decision maker in defining the problem, looking for possible causes, and seeking for potential solutions
	posttest	1 totoal sample size is 22	students (12 MBA and 10 under-graduates)	2 independent groups	the sample sizes for the control and treatment groups were not reported it is assumed that they are of equal sample sizes Ne=Nc=11		
Power and Rose	posttest	1 totoal sample size is 24	students (under-graduates)	2 independent groups			DECAID is an interactive computer program that supports the decision maker in defining the problem looking for possible causes

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Power and Rose PHASE THREE	1977	conference proceedings	DSS, a computer aided learning program called DECision AID (DECAID)	lab exp. to investigate the effect of DSS on decision performance in ill-defined problems	unstructured high difficulty tasks	a critical incident case of a company	one period	all phases	no-DSS
Pracht, P	1984	dissertation	DSS called SLIM with structural Modeling(SM) tools	lab	semi-structured high difficulty	A business management simulation game	10 periods	problem structuring	DSS with high analytic dec. style
	1984	dissertation	DSS called SLIM with structural Modeling(SM) tools	lab	semi-structured high difficulty	A business management simulation game	10 periods	problem structuring	no DSS with high analytic dec. style
	1984	dissertation	DSS called SLIM with structural Modeling(SM) tools	lab	semi-structured high difficulty	A business management simulation game	10 periods	problem structuring	DSS with low analytic dec. style
	1984	dissertation	DSS called SLIM with structural Modeling(SM) tools	lab	semi-structured high difficulty	A business management simulation game	10 periods	problem structuring	no DSS with low analytic dec. style
Ruble	1984	dissertation	DSS generator called Interactive Fin Planning System (IFPS)	lab exp. to test GDSS effectiveness in a group decision making environment	semi-structured medium to high task difficulty	a total entity business game	longitudinal 16 periods	problem solving	computerized GDSS (no direct access to computers)
	1984	dissertation	DSS generator called Interactive Fin Planning System (IFPS)	lab exp. to test GDSS effectiveness in a group decision making environment	semi-structured medium to high task difficulty	a total entity business game	longitudinal 16 periods	problem solving	manual (MIS)
Sanders, Courtney, and Loy	1984	published	DSS generator called Interactive Financial Planning System (IFPS)	field study to investigate the relationships between DSS usage and organizational communications	semi-structured to unstructured moderate to high difficulty tasks	tasks of financial decision making like strategic planning annual planning profit planning budgeting financial analysis and project analysis	cross-sectional	all phases	computerized DSS
Scott	1987	dissertation	DSS different DSS that automate materials requirement planning	field study (quasi exp) to investigate the impact of a MRP DSS on changes in certain measures of manufacturing performance	semi-structured moderate task difficulty	materials requirement planning	cross-sectional	all phases mainly planning	computerized DSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Power and Rose PHASE THREE	D3	12	no random assignment of subjects to treatments	decision quality	1		not reported	not reported	
Pracht, P	D1	40	The experiment treatment	decision quality(ret ernng/1000)	1				
		40	was randomly assigned to the 2 groups	depth of analysis(env undrstndng)	3		251		rpb -->
	D3	41	The experiment treatment	decision quality(ret ernng/1000)	1				
		41	was randomly assigned to the 2 groups	depth of analysis(env undrstndng)	3		232		
	D1	40	The experiment treatment	decision quality(ret ernng/1000)	1				
		40	was randomly assigned to the 2 groups	depth of analysis(env undrstndng)	3		242		
	D3	41	The experiment treatment	decision quality(ret. ernng/1000)	1				
		41	was randomly assigned to the 2 groups	depth of analysis(env undrstndng)	3		239		
Ruble	G1	31	random assignment of	decision effectiveness	1		-0 0127325	not reported	
		31	of subjects to	rate of learning	14		28 53	not reported	
		31	groups, and random assignments of treatments	group cohesiveness	15		0 04625	not reported	
	G2	31	random assignment of	decision effectiveness	1		0 127325	not reported	
		31	of subjects to	rate of learning	14		28 75	not reported	
		31	groups and random assignments of treatments	group cohesiveness	15		not reported	not reported	
Sanders, Courtney, and Loy	D1	132	the sample was not	decision quality	1				Pearson r -->
		132	random	overall satisfaction with system	9				Pearson r -->
		156	the sample was not	decision quality	1				Pearson r -->
		156	random	overall satisfaction with system	9				Pearson r -->
		90	the sample was not	decision quality	1				Pearson r -->
		90	random	overall satisfaction with system	9				Pearson r -->
Scott	D1	103	assignment of firms to	% improvement in inventory turnover	1		38.7 Z(p = 009)=2 36		Pearson r -->
		117	treatment and control groups was not randomized	% improvement in manufac lead time	1		17 7 Z(p = 04)= 1 75		Pearson r -->

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
Power and Rose PHASE THREE									
Pracht, P	0.21952852	0.444444444	-0 444444444	D1-D3	Aided users vs unaided users	t test	-2	0 033	significant -
Ruble									
Sanders, Courtney, and Loy	0 39 0 4	0 840634086 0 866233658	0 840634086 0 866233658	D1/D2					
	0 35 0 43	0 742459107 0 946435596	0 742459107 0 946435596	D1/D2					
	-0 02 0 37	-0 039560972 0 787628174	-0 039560972 0 787628174	D1/D2					
Scott	0 1624691 0 107909623	0 327841198 0.217586702	0.27271395	D1 D3	DSS uses vs non DSS users	t-test Mann Whitney, and Kolmogorov Smirnov tests	not reported not reported	p < 0 01 p < 0 05	significant + significant +

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Power and Rose PHASE THREE							solutions
Pracht, P		1 total sample size is 81	students	2 independent treatments	DSS is developed by Courtney and extended by Kasper and later by the auther	Cognitive style was measured by GEFT, reliab.= 82	Graphical, interactive, structural modeling tools are incorporated into a DSS
		1 total sample size is 81	students	2 independent treatments	DSS is developed by Courtney and extended by Kasper and later by the auther	Cognitive style was measured by GEFT, reliab.= 82	Graphical, interactive, structural modeling tools are incorporated into a DSS
		1 total sample size is 81	students	2 independent treatments	DSS is developed by Courtney and extended by Kasper and later by the auther	Cognitive style was measured by GEFT, reliab = 82	Graphical, interactive, structural modeling tools are incorporated into a DSS
		1 total sample size is 81	students	2 independent treatments	DSS is developed by Courtney and extended by Kasper and later by the auther	Cognitive style was measured by GEFT reliab.= 82	Graphical, interactive, structural modeling tools are incorporated into a DSS
Ruble	profit, sales, etc. change in profit, sales, etc. pre & post questionnaire	5 for 5 groups, the 6th group size is 6 the total sample size is 62	senior level business students	independent groups	31 experimental subjects, and 31 control subjects	the means are the average of 2 groups & 2 factors, the slope is the avg of 2 factors	
	profit, sales, etc. change in profit, sales, etc. pre & post questionnaire	5 for 5 groups, the 6th group size is 6, the total sample size is 62	senior level business students	independent groups	31 experimental subjects and 31 control subjects	the means are the average of 2 groups & 2 factors, the slope is the avg of 2 factors	
Sanders, Courtney, and Loy	survey questionnaire survey questionnaire --- survey questionnaire survey questionnaire --- survey questionnaire survey questionnaire	1 total sample size is 378 132 managers, 156 financial/ planning analysts, and 90 others	actual users (managers, financial, and planning analysts)	cross-sectional survey			
Scott	questionnaire questionnaire	1 total sample size is 474	actual users	questionnaire one control group and one treatment group	the response rate was 16% the data was gathered around two separate time periods (1975 and 1985) to calculate the degree of improvement	the p values are approximated, p < 0 01 to 0 009 & p < 0 05 = 0 04	the DSS consist of some of the followings MRP, inventory capacity planning, master scheduling, forecasting etc.

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Scott	1987	dissertation	DSS different DSS that automate materials requirement planning	field study (quasi exp) to investigate the impact of a MRP DSS on changes in certain measures of manufacturing performance	semi structured moderate task difficulty	materials requirement planning	cross-sectional	all phases mainly planning	no-DSS
Sharda, Barr & McDonnell	1988	published	IFPS-based DSS	lab	semi structured high difficulty task	Game(multi-production decisions securities, plant expansion) for upper management	8 periods	solution finding	DSS time
	1988	published	IFPS-based DSS	lab	semi structured high difficulty task	Game(multi-production	8 periods	solution finding	MIS(no-DSS)
Siegel, Dubrovsky, Kiesler, and McGuire Experiment no 1	1986	published	GDSS the program called "Converse" simultaneous input	lab university settings	semi structured	career choice problems to reach consensus, involve selecting acceptable levels of risk for career decisions	one period	problem formulation	computerized GDSS with anonymous input,members separated physically
	1986	published	GDSS the program called "Converse" simultaneous input	lab university settings	semi structured	career choice problems to reach consensus involve selecting acceptable levels of risk for career decisions	one period	problem formulation	computerized GDSS with no anonymous input members separated physically
	1986	published	GDSS the program called "Converse" simultaneous input	lab university settings	semi-structured	career choice problems to reach consensus, involve selecting acceptable levels of risk for career decisions	one period	problem formulation	no-GDSS face-to-face (base line)

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Scott	D3	108	assignment of firms to	% improvement in inventory turnover	1		15.6	not reported	
		146	treatment and control	% improvement in manufac lead time	1		2 3	not reported	
			groups was not						
			randomized						
Sharda, Barr & McDonnell	D1	46	self-selection of groups	profit	1		161988	not reported	
		46	and random assignment to	consistency (volatility in profit)	10		10914	not reported	
		27	industry	decision time	2		3 64 [average]	not reported	
		28		no of alternatives	3a		5 73 [average]	not reported	
		28		decision confidence	4		6 73 [average]	not reported	
	D2	40	self-selection of groups	profit	1		96583	not reported	
		40	and random assignment to	consistency (volatility in profit)	10		18670	not reported	
		20	industry	decision time	2		2 78 [average]	not reported	
		19		no of alternatives	3a		3 4 [average]	not reported	
		19		decision confidence	4		6 15 [average]	not reported	
Siegel, Dubrovsky,	G1	original 54	random assignments of	communication efficiency·					
Kiesler, and McGuire		48	students to conditions	decision time	2		0 17	0 08	0 0064
		42		total remarks	13		10 5	5 99	35 8801
Experiment no 1		42		% of task oriented remarks	16		0 73	0.26	0 0676
		42		% of decision proposal	3		0.35	0 15	0 0225
		42		inequality of participation	-7		3.24	2 69	7 2361
		42		uninhibited behavior	12		0 429	0 561	0 314721
		54		consensus development (dec shift)	8		1 15	0 85	0 7225
	G1b	original 54	random assignments of	communication efficiency					
		48	students to conditions	decision time	2		0 16	0 09	0 0081
		42		total remarks	13		8.39	6 14	37 6996
		42		% of task oriented remarks	16		0 74	0 33	0 1089
		42		% of decision proposal	3		0.33	0 17	0 0289
		42		inequality of participation	-7		1 65	1 73	2 9929
		42		uninhibited behavior	12		0 119	0.281	0 078961
		54		consensus development (dec shift)	8		1.22	0 98	0 9604
	G3	original 54	random assignments of	communication efficiency					
		48	students to conditions	decision time	2		0 06	0 06	0 0036
		42		total remarks	13		14.24	13 96	194 8816
		42		% of task oriented remarks	16		0 67	0.31	0 0961
		42		% of decision proposal	3		0.2	0 13	0 0169
		42		inequality of participation	7		6 53	4 43	19 6249
		42		uninhabited behavior	12		0	0	0
		54		consensus development (dec shift)	8		0 63	0 76	0 5776

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
Scott									
Sharda, Barr & McDonnell						MANOVA(F-test)		0 01	+
								0 01	+
								NS	0
								NS	0
								NS	0
Siegel, Dubrovsky,				G1-G3	Face-to-face	x^2 chi-square			
Kiesler, and McGuire	0 085146932	0 117444044	0 117444044		vs	(2, N = 48)	16 7	<= 0 01	significant -
	6.065463709	0 347871177	0 347871177		computerized	(2, N = 42)	12.8	<= 0 01	significant -
Experiment no 1	0.297069016	-0 033662211	-0 033662211			(2, N = 42)	2 01	NS	NS
	0 160312195	0 124756572	0 124756572			(2, N = 42)	15 02	<= 0 01	significant +
	2.261526033	0 703065088	0 703065088			(2, N = 42)	19 5	<= 0 01	significant +
	0 443667668	0 698721187	0 698721187			(2, N = 42)	13.3	<= 0 01	significant -
	0 917305838	-0 076310427	-0 076310427			(2, N = 54)	6	<= 0 05	significant +
				G1b-G3			Pearson r among		
	0 078485293	1.307440901	1 307440901				the efficiency		
	10 78381194	-0 542479787	-0 542479787				variables		
	0 320156212	0.218643267	0 218643267			total remarks	% of task remarks	% of dec. proposals	
	0 15132746	0 859064181	0 859064181		time	0 2	0 4	-0 11	
	3 362870797	-1 451141092	-1 451141092		total remarks		0 84	-0.44	
	0 198697006	0 598901829	0 598901829		% of task remarks			-0.31	
	0 876926451	0 672804429	0 672804429		% of dec proposals				

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Scott	questionnaire questionnaire	1 total sample size is 474	actual users	questionnaire one control group and one treatment group	the response rate was 16% the data was gathered around two separate time periods (1975 and 1985) to calculate the degree of improvement	the p values are approximated, p < 0 01 to 0 009 & p < 0 05 = 0 04	the DSS consist of some of the followings MRP, inventory capacity planning, master scheduling, forecasting, etc.
Sharda, Barr & McDonnell	observation std error of profit self-report self-report self-report	3 16 groups exp 16 groups control total sample is 96	students	one treatment/group (two groups two treatments)	homogeneity test performed to determine group homogeity based of individual characteristics	analysis is done on the total of all the 8 sessions.	interactive
	observation std error of profit self-report self-report self report	3 16 groups exp 16 groups control total sample is 96	students	one treatment/group (two groups two treatments)	homogeneity test performed to determine group homogeity based of individual characteristics	difference in cell size is caused by some groups by not turning in their decisions sometimes	
Siegel, Dubrovsky, Kiesler, and McGuire Experiment no 1	direct observation direct observation direct observation direct observation direct observation direct observation direct observation	3 total sample is 54, number of groups = 18	students	3x3 (communication condition x problem) repeated measures Latin Square	there is no comparison between the face-to-face and each of the computerized conditions (anonymous and no anonymous input)	problem type is not included because it is not specified in the article	members of the group are separated physically in the computerized decision making conditions
	direct observation direct observation direct observation direct observation direct observation direct observation direct observation	3 total sample is 54, number of groups = 18	students 54 students 18 groups	3x3 (communication condition x problem) repeated measures Latin Square	there is no comparison between the face-to-face and each of the computerized conditions (anonymous and no anonymous input)	problem type is not included because it is not specified in the article	members of the group are separated physically in the computerized decision making conditions
	direct observation direct observation direct observation direct observation direct observation direct observation direct observation	3 total sample is 54, number of groups = 18	students 54 students 18 groups	3x3 (communication condition x problem) repeated measures Latin Square	there is no comparison between the face to-face and each of the computerized conditions (anonymous and no anonymous input)	problem type is not included because it is not specified in the article	members of the group are separated physically in the computerized decision making conditions

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Siegel, Dubrovsky, Kiesler, and McGuire Experiment bo. 3	1986	published	GDSS	lab	semi-structured	career choice problems to reach consensus involve selecting acceptable levels of risk for career decisions	one period	problem formulation	computerized GDSS with simultaneous input members separated physically
	1986	published	GDSS	lab	semi-structured	career choice problems to reach consensus involve selecting acceptable levels of risk for career decisions	one period	problem formulation	computerized GDSS with electronic mail
	1986	published	GDSS	lab	semi-structured	career choice problems to reach consensus involve selecting acceptable levels of risk for career decisions	one period	problem formulation	no-GDSS, face-to-face (base line)
Steeb and Johnston	1981	published	GDSS called Group Decision Aid level 2	lab exo. to test the effectiveness of GDSS in group decision making	unstructured complex (high difficulty) task	international crisis decision problem foreign embassy take-over by terrorists "consensus problem"	one period	solution finding (planning task)	GDSS
	1981	published	GDSS called Group Decision Aid level 2	lab exo. to test the effectiveness of GDSS in group decision making	unstructured complex (high difficulty) task	international crisis decision problem foreign embassy take-over by terrorists "consensus problem"	one period	solution finding (planning task)	no-GDSS
Tsai	1987	dissertation	DSS a graphics-based user language	lab exp to investigate the effects of DSS on decision performance	semi-structured high complexity task	a scenario of a distribution problem	one period	problem structuring	computerized graphical enhanced DSS
	1987	dissertation	DSS a graphics-based user language	lab exp to investigate the effects of DSS on decision performance	semi-structured high complexity task	a scenario of a distribution problem	one period	problem structuring	computerized equation based DSS

STUDY	INDP VAR. CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Siegel Dubrovsky	G1	original 54	random assignments of	communication efficiency					
Kiesler, and McGuire		54	students to conditions	decision time	2		0.33	0 12	0 0144
		48		total remarks	13		17 61	7 82	61 1524
		48		% of task oriented remarks	16		0.83	0 19	0 0361
Experiment bo. 3		42		% of decision proposal	3		0.21	0 12	0 0144
		36		inequality of participation	7		6.59	4 31	18 5761
		45		uninhabited behavior	12		1.02	1 51	2 2801
		54		consensus development (dec shift)	8		1.34	0 92	0 8464
	G1b	original 54	random assignments of	communication efficiency·					
		54	students to conditions	decision time	2		0.38	0 14	0 0196
		48		total remarks	13		14.96	6 88	47.3344
		48		% of task oriented remarks	16		0.96	0 1	0 01
		42		% of decision proposal	3		0.27	0 11	0 0121
		36		inequality of participation	-7		4.87	3 61	13 0321
		45		uninhabited behavior	12		0.4	0 789	0 622521
		54		consensus development (dec shift)	8		1.01	0 61	0 3721
	G3	original 54	random assignments of	communication efficiency·					
		54	students to conditions	decision time	2		0 1	0 06	0 0036
		48		total remarks	13		32 71	21.4	457.96
		48		% of task oriented remarks	16		0.97	0 06	0 0036
		42		% of decision proposal	3		0 17	0 09	0 0081
		36		inequality of participation	-7		12.32	10 1	102.01
		45		uninhabited behavior	12		0 289	0 434	0 188356
		54		consensus development (dec shift)	8		0.64	0 46	0 2116
Steeb and Johnston	G1	15	not reported	decision feasibility	1		not reported	Z score = 0 00	Pearson r -->
		15		decision contents	1		0 54	Z score = 1 75	Pearson r -->
		15		decision breadth	1		0.83	Z score = 1 75	Pearson r -->
		15		decision details	1		7.2	Z score = 1 75	Pearson r -->
		15		no of attributes considered	3		8 6	Z score = 1 75	Pearson r -->
		15		# of actions and events considered	3		55.4	Z score = 1 75	Pearson r -->
	G3	15	not reported	decision feasibility	1		not reported	not reported	
		15		decision contents	1		0.26	not reported	
		15		decision breadth	1		0 66	not reported	
		15		decision details	1		4 6	not reported	
		15		no of attributes considered	3		5.2	not reported	
		15		# of actions and events considered	3		34 2	not reported	
Tsai	D1	34	subjects optionally	decision accuracy	1		9.206	0 88	0 7744
		34	chose their treatment conditions	decision time	2		130 029	32.259	1040 643081
	D2	14	subjects optionally	decision accuracy	1		8 357	2 098	4 401604
		14	chose their treatment conditions	decision time	2		337 857	173 99	30272 5201

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
Slegel Dubrovsky,				G1-G3	Face-to-face	x^2 chi-square			
Kiesler and McGuire	0 09486833	2.424412873	2 424412873		vs.	(2, N = 54)	42.9	<= 0 01	significant -
	16 11074797	-0 937262505	-0 937262505		computerized	(2, N = 48)	15 75	<= 0 01	significant -
	0 140890028	-0 993682817	-0 993682817			(2, N = 48)	23 16	<= 0 01	significant -
Experiment bo 3	0 106066017	0 377123617	0 377123617			(2, N = 42)	5 91	<= 0 05	significant +
	7 764859947	-0 737939903	-0 737939903			(2, N = 36)	12 1	<= 0 01	significant +
	1 110958145	0 657990585	0 657990585			(2, N = 45)	2 85	NS	NS
	0 727323862	0 962432331	0 962432331			(2, N = 54)	12 9	<= 0 01	significant +
				G1b-G3			Pearson r among		
	0 107703296	2 599734734	2.599734734				the efficiency		
	15 89487968	-1 116711819	-1 116711819				variables		
	0 082462113	-0 121267813	-0 121267813			total remarks	% of task remarks	% of dec. proposals	
	0 100498756	0 99503719	0 99503719		time	-0 07	-0 19	-0.38	
	7 584263313	-0 982297119	-0 982297119		total remarks		0 97	-0.35	
	0 636740528	0 174325326	0 174325326		% of task remarks			-0.2	
	0 540231432	0 684891656	0 684891656		% of dec proposals				
Steeb and Johnston	0	0		G1/G3	GDSS vs no-GDSS	t test	not reported	0 5	NS
	0.319504825	0 651490052					not reported	0 04	significant +
	0 319504825	0 651490052					not reported	0 04	significant +
	0 319504825	0 651490052	0 488617539				not reported	0 04	significant +
	0 319504825	0 651490052					not reported	0 04	significant +
	0 319504825	0 651490052	0 651490052				not reported	0 04	significant +
Tsai	1 341446753	0 63289877	0 63289877		graphics-based DSS	t-test	1 461	0 1	sig + at p = 0 10
	96 44597305	-2 154864464	2 154864464		vs equation-based DSS		5 57	0 0005	significant +

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Siegel Dubrovsky, Kiesler, and McGuire Experiment bo 3	direct observation direct observation direct observation direct observation direct observation direct observation direct observation	3	students 54 students 18 groups	3x3 (communication condition x problem) repeated measures Latin Square	there is no comparison between the face-to-face and each of the computerized conditions (simultaneous & electronic mail)	problem type is not included because it is not specified in the article	members of the group are separated physically in the computerized decision making conditions
	direct observation direct observation direct observation direct observation direct observation direct observation direct observation	3	students 54 students 18 groups	3x3 (communication condition x problem) repeated measures Latin Square	there is no comparison between the face-to-face and each of the computerized conditions (simultaneous & electronic mail)	problem type is not included because it is not specified in the article	members of the group are separated physically in the computerized decision making conditions
	direct observation direct observation direct observation direct observation direct observation direct observation direct observation	3	students 54 students 18 groups	3x3 (communication condition x problem) repeated measures Latin Square	there is no comparison between the face-to-face and each of the computerized conditions (simultaneous & electronic mail)	problem type is not included because it is not specified in the article	members of the group are separated physically in the computerized decision making conditions
Steeb and Johnston	compared to experts' structured observation structured observation structured observation observation observation	3 5 groups exp and 5 groups control total sample size is 30	graduate students	two independent groups	the significance levels were approximated since actual values were not reported (e g , p < 0 05 --> 0 04)	it is assumed that both groups have equal sample size	GDSS groups took longer time to decision, have more satisfaction with process and outcome than the no-GDSS groups
	compared to experts' structured observation structured observation structured observation observation observation	3 5 groups exp and 5 groups control total sample size is 30	graduate students	two independent groups	the significance levels were approximated since actual values were not reported (e g , p < 0 05 --> 0 04)	it is assumed that both groups have equal sample size	GDSS groups took longer time to decision, have more satisfaction with process and outcome than the no-GDSS groups
Tsai	# of correct answers time length per decision	1 total sample size is 48	students	2 independent groups			
	# of correct answers time length per decision	1 total sample size is 48	students	2 independent groups			

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Tunstall	1989	dissertation	GDSS called CONference COoRDinator (CONCORD)	lab exp. to investigate the impact of computeized group problem-solving on the quality of final solutions	semistructured simple task	life-relevant task, to determine when it would be appropriate to permit smoking by students	one period for each problem	all phases	computerized GDSS
	1989	dissertation	GDSS called CONference COoRDinator (CONCORD)	lab exp. to investigate the impact of computeized group problem-solving on the quality of final solutions	semistructured simple task	life-relevant task, to determine when it would be appropriate to permit smoking by students	one period for each problem	all phases	no-GDSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Tunstall	G1	50	students were randomly	decision quality	1		7	1 73	2.9929
		50	assigned to treatments	decision quality	1		9	5 29	27 9841
		50		no of categories in final solution	3		3 8	1 1	1.21
		50		no of categories in final solution	3		4 5	2 65	7 0225
		50		count of written responses	3		13	4 18	17 4724
		50		count of written responses	3		20 75	9 74	94 8676
		50		decision confidence	4		27.2	2 28	5 1984
		50		decision confidence	4		23	1 63	2 6569
		50		satisfaction with decision outcome	5		33 4	1 14	1.2996
		50		satisfaction with decision outcome	5		31 75	2.5	6 25
		50		perceived improv in dec. quality	14		16.4	2 97	8 8209
		50		perceived improv in dec. quality	14		18	2 45	6 0025
		50		satisfaction with decision process	6		26.2	2 77	7 6729
		50		satisfaction with decision process	6		26 75	4 57	20 8849
		50		decision time (efficiency)	2		26.8	2 95	8 7025
		50		decision time (efficiency)	2		23 75	7 18	51 5524
		50		group cohesiveness	15		159.4	8 2	67.24
		50		group cohesiveness	15		145.75	3 3	10 89
	G3	50	students were randomly	decision quality	1		7 6	2.7	7.29
		50	assigned to treatments	decision quality	1		11 8	3 03	9 1809
		50		no of categories in final solution	3		4	1 58	2 4964
		50		no of categories in final solution	3		6 4	1 14	1.2996
		50		count of written responses	3		21.2	11 1	123.21
		50		count of written responses	3		9 8	2 59	6 7081
		50		decision confidence	4		26	5.7	32 49
		50		decision confidence	4		25.4	2.7	7 29
		50		satisfaction with decision outcome	5		32.4	2 88	8.2944
		50		satisfaction with decision outcome	5		29.4	4 04	16.3216
		50		perceived improv in dec. quality	14		14.2	6.3	39 69
		50		perceived improv in dec. quality	14		13 4	4 28	18 3184
		50		satisfaction with decision process	6		27.2	5 63	31 6969
		50		satisfaction with decision process	6		26.2	4 44	19 7136
		50		decision time (efficiency)	2		28	4 06	16 4836
		50		decision time (efficiency)	2		29	2 12	4 4944
		50		group cohesiveness	15		154 6	3 85	14 8225
		50		group cohesiveness	15		152.6	9 21	84 8241

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
Tunstall	2.267476571	-0.264611334		G1-G3	GDSS vs no-GDSS (regardless of task difficulty)	F-test			
	4 310742396	-0 649540089	-0 457075712				0 11	0 7536	NS
	1 361322886	-0 146915917							
	2.039665192	-0 931434101					0 5	0 5187	NS
	8.386966078	-0 977707543							
	7 126559478	1 536505804	-0 129887939				0 78	0.4272	NS
	4 34099067	0.276434595							
	2.230123315	-1 076173673	-0.399869539				0 59	0 4868	NS
	2 19020547	0 456578168							
	3 359434476	0 699522499	0 578050333				1 96	0.2341	NS
	4 924982233	0 446702119							
	3 487183677	1 319116062	0 882909091				0 52	0 511	NS
	4 436766841	-0.225389351							
	4 505468899	0 122073865	-0 051657743				1 46	0.2931	NS
	3 548668764	0.225436651							
	5.293713253	-0 991742422	-0 383152886				10 46	0 0319	significant +
	6 405563988	0 749348537							
	6 91787901	-0 990187887	-0 120419675				1 86	0.2439	NS

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Tunstall	multiple measures score multiple measures score observation observation posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire	5 total sample size is 200	high-school students (all girls)	2x3 factorial design (problem-solving sequence x control of sequence x order of task-presentation)	only the data of the first problem for each group are reported to avoid the problem of task order		
	multiple measures score multiple measures score observation observation posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire	5 total sample size is 200	high-school students (all girls)	2x3 factorial design (problem-solving sequence x control of sequence x task complexity)	only the data of the first problem for each group are reported to avoid the problem of task order		

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Tunstall	1989	dissertation	GDSS called CONference COoRDinator (CONCORD)	lab exp. to investigate the impact of computeized group problem-solving on the quality of final solutions	semistructured complex task	to determine the required specifi cations for a successful marriage for a young couple	one period for each problem	all phases	computerized GDSS
	1989	dissertation	GDSS called CONference COoRDinator (CONCORD)	lab exp. to investigate the impact of computeized group problem-solving on the quality of final solutions	semistructured complex task	to determine the required specifi cations for a successful marriage for a young couple	one period for each problem	all phases	no-GDSS
Van Schaik	1988	book	GDSS called Javelin, using a management game called VUMAS	Lab exp examine the impacts of DSS & decision strategy on effectiveness of decision making	semi structured high difficulty task	a simulated business game, every team constitutes an industry	longitudinal (7 periods over 2 months)	solution finding	computerized GDSS
	1988	book	GDSS called Javelin, using a management game called VUMAS	Lab exp examine the impacts of DSS & decision strategy on effectiveness of decision making	semi structured high difficulty task	a simulated business game every team constitutes an industry	longitudinal (7 periods over 2 months)	solution finding	no-GDSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
	G1	50	students were randomly	decision quality	1		5 4	5 46	29 8116
		50	assigned to treatments	decision quality	1		9.2	5 07	25 7049
		50		no of categories in final solution	3		2 8	2 95	8 7025
		50		no of categories in final solution	3		5 2	2 59	6 7081
		50		count of written responses	3		16.2	11 56	133 6336
		50		count of written responses	3		15.8	3 96	15 6816
		50		decision confidence	4		24 4	4 45	19 8025
		50		decision confidence	4		21 6	4 93	24 3049
		50		satisfaction with decision outcome	5		32.8	3 35	11 2225
		50		satisfaction with decision outcome	5		31	6.2	38 44
		50		perceived improv in dec. quality	14		15	5 96	35 5216
		50		perceived improv in dec. quality	14		9 6	1 67	2 7889
		50		satisfaction with decision process	6		25	3 74	13 9876
		50		satisfaction with decision process	6		23.2	7 69	59 1361
		50		decision time (efficiency)	2		23 8	3 77	14.2129
		50		decision time (efficiency)	2		24.8	4 32	18 6624
		50		group cohesiveness	15		148.8	8 56	73 2736
		50		group cohesiveness	15		130.2	23 83	567 8689
	G3	50	students were randomly	decision quality	1		5 4	2 97	8 8209
		50	assigned to treatments	decision quality	1		6.2	4 49	20 1601
		50		no of categories in final solution	3		4	3	9
		50		no of categories in final solution	3		3.2	2.17	4 7089
		50		count of written responses	3		29 8	8 56	73 2736
		50		count of written responses	3		13 4	4 72	22 2784
		50		decision confidence	4		24 8	3.27	10 6929
		50		decision confidence	4		23 2	2 68	7 1824
		50		satisfaction with decision outcome	5		30 8	2 59	6 7081
		50		satisfaction with decision outcome	5		30 6	6 27	39 3129
		50		perceived improv in dec. quality	14		16.8	4 15	17.2225
		50		perceived improv in dec. quality	14		15.4	4 72	22 2784
		50		satisfaction with decision process	6		25 6	4 45	19 8025
		50		satisfaction with decision process	6		25.4	5 59	31.2481
		50		decision time (efficiency)	2		27 8	2 86	8 1796
		50		decision time (efficiency)	2		25	1 22	1 4884
		50		group cohesiveness	15		152.2	7 92	62 7264
		50		group cohesiveness	15		147 8	10 35	107 1225
Van Schaik	G1	46	subjects were assignrd	comprehensive performance score	1		5.85	1 65	2.7225
		46	randomly to groups, and	total profit	1		-2046	2476	6130576
			groups were assigned						
			randomly to treatments						
	G3	44	subjects were assignrd	comprehensive performance score	1		5 75	1 47	2.1609
		44	randomly to groups and	total profit	1		-1684	1418	2010724
			groups were assigned						
			randomly to treatments						

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
	4.395025597	0		G1-G3	GDSS vs no-GDSS				
	4.788788991	0 628463184	0 313231592		(given task		1 62	0.2718	NS
	2.589536838	-0 154467789			difficulty)				
	6.323831908	-3 890046472					1 28	0 3248	NS
	10 17121428	-1 337106821							
	4 356604182	0 550887779	-1.207683326				0 1	0 7682	NS
	3 904830342	-0 102437229							
	3 967826861	-0.403243401	-0 252840315				0 12	0 7482	NS
	2.994211081	0 66795558							
	6.235098235	0 064152959	0 366054269				0 59	0 4843	NS
	5.135372431	-0 350510119							
	3 540289536	-1 638284084	-0 994397101				15 02	0 018	significant +
	4.110358865	-0 145972656							
	6.722506973	-0 327258865	-0 23681576				0 11	0 7562	NS
	3 346079798	-1 195428754							
	3 174177059	-0 063008457	-0 629218606				0 01	0 9131	significant +
	8.246211251	-0 412310563							
	18 37105604	-0 958028758	-0 68516966				0 02	0 9012	NS
Van Schaik	1 564634724	0 063912681		G1-G3	GDSS vs no-GDSS	t test	-0 15	p > 0 10	NS
	2029 154134	-0 178399459	-0 057243389				0 42	p > 0 10	NS

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
	multiple measures score multiple measures score observation observation posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire	5 total sample size is 200	high-school students (all girls)	2x3 factorial design (problem-solving sequence x control of sequence x order of task-presentation)	only the data of the first problem for each group are reported to avoid the problem of task order		
	multiple measures score multiple measures score observation observation posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire posttest questionnaire	5 total sample size is 200	high-school students (all girls)	2x3 factorial design (problem-solving sequence x control of sequence x order of task-presentation)	only the data of the first problem for each group are reported to avoid the problem of task order		
Van Schaik	total profit weighted avarage measure	4 total sample size is 90	middle-level managers	2x2 factorial design DSS availability x decision strategy	there were 23 teams in total, subjects have 2 teams with 3 members each, the rest have 4 members each		decisions submitted by teams include production capacity pricing finance personnel dividends & information policy
	total profit weighted avarage measure	4 total sample size is 90	middle-level managers	2x2 factorial design DSS availability x decision strategy	there were 23 teams in total, subjects have 2 teams with 3 members each, the rest have 4 members each		decisions submitted by teams include production capacity, pricing finance, personnel, dividends & information policy

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Watson, DeSanctis and Poole	1988	published	GDSS called Software Aided Meeting Management (SAMM) Level 1	lab	semi-structured medium to high difficulty task	preference allocation $5 million to be allocated to 6 competing projects	1 period	solution finding	computerized GDSS
	1988	published	GDSS called Software Aided Meeting Management (SAMM) Level 1	lab	semi-structured medium to high difficulty task	preference allocation $5 million to be allocated to 6 competing projects	1 period	solution finding	manual GDSS
	1988	published	GDSS called Software Aided Meeting Management (SAMM) Level 1	lab	semi-structured medium to high difficulty task	preference allocation $5 million to be allocated to 6 competing projects	1 period	solution finding	no GDSS (base line)
the same experiment broken down by group size and level of technological support	1988	published	GDSS called Software Aided Meeting Management (SAMM) Level 1	lab	semi-structured medium to high difficulty task	preference allocation $5 million to be allocated to 6 competing projects	1 period	solution finding	computerized GDSS group size is 3
	1988	published	GDSS called Software Aided Meeting Management (SAMM) Level 1	lab	semi structured medium to high difficulty task	preference allocation $5 million to be allocated to 6 competing projects	1 period	solution finding	manual with group size of 3
	1988	published	GDSS called Software Aided Meeting Management (SAMM) Level 1	lab	semi-structured medium to high difficulty task	preference allocation $5 million to be allocated to 6 competing projects	1 period	solution finding	no-GDSS with group size of 3
	1988	published	GDSS called Software Aided Meeting Management (SAMM) Level 1	lab	semi structured medium to high difficulty task	preference allocation $5 million to be allocated to 6 competing projects	1 period	solution finding	computerized GDSS with group size of 4

STUDY	INDP VAR. CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Watson, DeSanctis and Poole	G1	98	groups were assigned	decision time	2		39 6	12 3	151.29
		98	randomly to experimenal	degree of consensus (pre-meeting)	8		0.24	0 82	0 6724
		98	groups	degree of consensus (post meeting)	8		0 51	0 19	0 0361
		98		equality of influence	7		0 557	0 041	0 001681
		98	28 groups	perceived decision quality-confdnc.	4		38 85	4 11	16 8921
		98		solution satisfaction	5		19	1 75	3 0625
	G2	90	groups were assigned	decision time	2		40 4	18 8	353.44
		90	randomly to experimenal	degree of consensus (pre-meeting)	8		0.25	0 87	0 7569
		90	groups	degree of consensus (post meeting)	8		0 62	0 21	0 0441
		90		equality of influence	7		0 563	0 051	0 002601
		90	27 groups	perceived decision quality-confdnc.	4		42.29	3 51	12 3201
		90		solution satisfaction	5		19 54	1.28	1 6384
	G3	92	groups were assigned	decision time	2		13 7	13 6	184.96
		92	randomly to experimenal	degree of consensus (pre-meeting)	8		0.27	1	1
		92	groups	degree of consensus (post meeting)	8		0 55	0 19	0 0361
		92		equality of influence	7		0 596	0 126	0 015876
		92	27 groups	perceived decision quality-confdnc.	4		41.27	3 63	13 1769
		92		solution satisfaction	5		18 57	1 56	2 4336
the same experiment broken down by group size and level of technological support	G1	39	groups were assigned	decision time	2		43 6	11.8	139.24
			randomly to experimenal	degree of consensus (pre-meeting)	8				
		42	groups	degree of consensus (post meeting)	8		0 55	0 18	0 0324
				equality of influence	7				
		42	14 groups * 3	perceived decision quality-confdnc.	4		39.91	4 01	16 0801
		42		solution satisfaction	5		19 56	1 58	2 4964
	G2	42	groups were assigned	decision time	2		37 2	15 1	228.01
			randomly to experimenal	degree of consensus (pre-meeting)	8				
		42	groups	degree of consensus (post meeting)	8		0.63	0 21	0 0441
				equality of influence	7				
		42		perceived decision quality-confdnc.	4		41.21	2 97	8 8209
		42		solution satisfaction	5		19.42	1 4	1 96
	G3	48	groups were assigned	decision time	2		12.4	11	121
			randomly to experimenal	degree of consensus (pre-meeting)	8				
		48	groups	degree of consensus (post meeting)	8		0 52	0 14	0 0196
				equality of influence	7				
		48		perceived decision quality-confdnc.	4		40 78	4.28	18 3184
		48		solution satisfaction	5		18 54	1 38	1 9044
	G1	56	groups were assigned	decision time	2		35.9	12	144
			randomly to experimenal	degree of consensus (pre-meeting)	8				
		56	groups	degree of consensus (post-meeting)	8		0.47	0.2	0 04
				equality of influence	7				
		56		perceived decision quality-confdnc.	4		37 78	4 07	16 5649
		56		solution satisfaction	5		18.45	1 8	3 24

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
Watson DeSanctis and Poole	15.74857734	-0 050798239	-0 050798239	G1-G2					
	0 844294259	-0 011844212				corr between pre & post consensus	0 457	0 015	
	0 199819811	-0 560495966	-0.281170089						
	0 04605665	-0 130274346	0 130274346						NS
	3.834634608	-0 897086777	-0 897086777					0 0138	
	1 543073494	-0 349950927	-0 349950927					0 038	
						corr between pre & post consensus	0 439	0 025	
									NS
								0 0138	
								0 038	
	12.9455673	1 644592997	1 644592997	G1-G3					
	0 911576843	-0 035532635				corr between pre & post consensus	-0 022	0 913	
	0 19	-0.200180351	-0 117858493						
	0 092476938	-0 846783246	0 846783246						NS
	3 885072085	-0 631090116	-0 631090116					0 0138	
	1 660748517	0.278664627	0.278664627					0 038	
the same experiment broken down by group size and level of technological support	13 61288016	0 470142977	0.470142977	G1-G2					
	0 195578072	-0 409047994	-0.409047994						
	3 528528605	-0 368425733	-0 368425733						
	1 492715646	0 093788794	0 093788794						
	11.36460967	2.291947011	2 291947011	G1-G3					
	0.221143274	0 153392998	0 153392998						
	4.156387335	-0 240893748	-0.240893748						
	1 47655619	0 683318355	0 683318355						
	17 57581827	-0 489308655	-0 489308655	G1-G2					
	0.209453069	-0 668407488	-0 668407488						
	3 942403132	-1 435672561	-1 435672561						
	1 52962537	-0 797580913	-0 797580913						

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Watson, DeSanctis and Poole	scale rating of agreement scale rating of agreement observing posttest questionnaire posttest questionnaire	3 or 4 total sample is 280	graduate and undergraduate students	3 groups, 3 treatments	44 groups of size 3 and 38 groups of size 4, average group size = 3 46 the analysis shows 81 groups instead of the claimed 82	the lower the value for the scale, the more equal the influence	the system incorporates a rational problem solving agenda. develped by authers
	scale rating of agreement scale rating of agreement observing posttest questionnaire posttest questionnaire	3 or 4 total sample is 280	graduate and undergraduate students	3 groups, 3 treatments	44 groups of size 3 and 38 groups of size 4, average group size = 3 46 the analysis shows 81 groups instead of the claimed 82	the lower the value for the scale, the more equal the influence	the system incorporates a rational problem solving agenda. develped by authers
	scale rating of agreement scale rating of agreement observing posttest questionnaire posttest questionnaire	3 or 4 total sample is 280	graduate and undergraduate students	3 groups, 3 treatments	44 groups of size 3 and 38 groups of size 4, average group size = 3 46 the analysis shows 81 groups instead of the claimed 82	the lower the value for the scale, the more equal the influence	the system incorporates a rational problem solving agenda. develped by authers
the same experiment broken down by group size and level of technological support	scale rating of agreement scale rating of agreement observing posttest questionnaire posttest questionnaire	3 total sample is 280	graduate and undergraduate students	3 groups, 3 treatments	44 groups of size 3 and 38 groups of size 4, average group size = 3 46 the analysis shows 81 groups instead of the claimed 82	the lower the value for the scale the more equal the influence	the system incorporates a rational problem solving agenda. develped by authers
	scale rating of agreement scale rating of agreement observing posttest questionnaire posttest questionnaire	3 total sample is 280	graduate and undergraduate students	3 groups 3 treatments	44 groups of size 3 and 38 groups of size 4, average group size = 3 46 the analysis shows 81 groups instead of the claimed 82	the lower the value for the scale the more equal the influence	the system incorporates a rational problem solving agenda. develped by authers
	scale rating of agreement scale rating of agreement observing posttest questionnaire posttest questionnaire	3 total sample is 280	graduate and undergraduate students	3 groups, 3 treatments	44 groups of size 3 and 38 groups of size 4, average group size = 3 46 the analysis shows 81 groups instead of the claimed 82	the lower the value for the scale, the more equal the influence	the system incorporates a rational problem solving agenda. develped by authers
	scale rating of agreement scale rating of agreement observing posttest questionnaire posttest questionnaire	4 total sample is 280	graduate and undergraduate students	3 groups 3 treatments	44 groups of size 3 and 38 groups of size 4, average group size = 3 46 the analysis shows 81 groups instead of the claimed 82	the lower the value for the scale the more equal the influence	the system incorporates a rational problem solving agenda. develped by authers

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Watson, DeSanctis and Poole -- the same experiment broken down by group size and level of technological support	1988	published	GDSS called Software Aided Meeting Management (SAMM) Level 1	lab	semi-structured medium to high difficulty task	preference allocation $5 million to be allocated to 6 competing projects	1 period	solution finding	manual with group with group size of 4
	1988	published	GDSS called Software Aided Meeting Management (SAMM) Level 1	lab	semi-structured medium to high difficulty task	preference allocation $5 million to be allocated to 6 competing projects	1 period	solution finding	no-GDSS with group size of 4
Weber	1977	dissertation	DSS an audit simulation decision aid	lab	high difficulty complex task	to predict errors in four types of inventories of the manufacturing company· raw materials, work in process finished goods and total	cross-sectional	problem solving	computerized DSS
	1977	dissertation	DSS an audit simulation decision aid	lab	high difficulty complex task	to predict errors in four types of inventories of the manufacturing company raw materials work in process finished goods and total	cross-sectional	problem solving	manual DSS
Yang	1987	dissertation	DSS, a graphical mgmt decision support tool	field study to determine the perceived impact of DSS on administration, planning, operations, and finance	structured to unstructured high to low task difficulty	administration, planning operations and finance functions	cross-sectional	all phases	computerized DSS

STUDY	INDP VAR CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
	G2	44	groups were assigned	decision time	2		44 5	22 8	519.84
			randomly to experimenal	degree of consensus (pre-meeting)	8				
		48	groups	degree of consensus (post-meeting)	8		0.61	0 22	0 0484
				equality of influence	7				
		52		perceived decision quality-confdnc.	4		43.44	3 8	14.44
		52		solution satisfaction	5		19 67	1 17	1 3689
	G3	44	groups were assigned	decision time	2		15.5	17 1	292.41
			randomly to experimenal	degree of consensus (pre-meeting)	8				
		44	groups	degree of consensus (post-meeting)	8		0.59	0.25	0 0625
				equality of influence	7				
		44		decision confidence	4		42.01	2 41	5 8081
		44		solution satisfaction	5		18.6	1 86	3 4596
Weber	D1		initial subjects were	decision accuracy	1				
		20	selected (100) then 40	mean measure of accuracy	-1a		35684	17548	307932304
		20	experimental subjects	range measure of accuracy	-1b		104800	18452	340476304
		20	were selected randomly	decision variability (consistency)	10		not reported	not reported	rpb -->
		20	and each subject was	decision confidence	4		not reported	not reported	rpb -->
		20	randomly assigned to	decision time	2		not reported	not reported	rpb -->
		20	a treatment	decision satisfaction	5		27 5	not reported	rpb -->
	D2		initial subjects were	decision accuracy	1				
		20	selected (100), then 40	mean measure of accuracy	-1a		30464	34231	1171761361
		20	experimental subjects	range measure of accuracy	-1b		125756	112696	12700388416
		20	were selected randomly	decision variability (consistency)	-10		not reported	not reported	
		20	and each subject was	decision confidence	4		not reported	not reported	
		20	randomly assigned to	decision time	2		not reported	not reported	
		20	a treatment	decision satisfaction	5		25 15	not reported	
Yang	D1/D3	76	the subjects were	decision quality	1				Pearson r -->
		76	selected and were not	interpretation accuracy	1				Pearson r -->
		76	chosen randomly	decision time	2				Pearson r -->
		76		comprehension speed	2				Pearson r -->
		76		problem comprehension	3				Pearson r -->
		76		resultant task performance	14				Pearson r -->
		76		resultant profitability performance	14				Pearson r -->

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
	14 46093612	1 160685647	1 160685647	G1-G3					
	0.341129078	-0 572920704	-0 572920704						
	3.441668141	-1 072949635	-1 072949635						
	1.826569216	-0 098063227	-0 098063227						
Weber				D1 D2	DSS vs manual				
	27200 1256	0 191175588				Mann-Whitney test	6 708	0 014	significant +
	80749 19418	-0.259519618	0 034172015			Mann Whitney test	6 94	0 013	significant +
	0 005129824	0 010259649	0 010259649			F test	0 001	0 975	NS
	0 322696106	0 645392212	0 645392212			F test	4 417	0 043	significant +
	0 720179369	1 440358738	1 440358738			F test	40 946	0 000	significant +
	0 387350308	0 774700616	0 774700616			F test	6 708	0 014	significant +

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
Yang	0 518671292	1 197232497		D1-D3	DSS vs no-DSS	Chi square	27 97	0 001	significant +
	0 573307258	1 380899582	1.289066039				37 21	0 001	significant +
	0 315646551	0 656493244					8 41	NS	NS
	0 506320134	1 158731755	0 907612499				26.2	0 001	significant +
	0 615121091	1 53969634	1 53969634				46 26	0 001	significant +
	0 540524997	1 267913198					31 37	0 001	significant +
	0 502842881	1 148068352	1.207990775				25 72	0 001	significant +

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
	scale rating of agreement scale rating of agreement observing posttest questionnaire posttest questionnaire	4 total sample is 280	graduate and undergraduate students	3 groups 3 treatments	44 groups of size 3 and 38 groups of size 4, average group size = 3 46 the analysis shows 81 groups instead of the claimed 82	the lower the value for the scale, the more equal the influence	the system incorporates a rational problem solving agenda. develped by authers
	scale rating of agreement scale rating of agreement observing posttest questionnaire posttest questionnaire	4 total sample is 280	graduate and undergraduate students	3 groups, 3 treatments	44 groups of size 3 and 38 groups of size 4, average group size = 3 46 the analysis shows 81 groups instead of the claimed 82	the lower the value for the scale the more equal the influence	the system incorporates a rational problem solving agenda. develped by authers
Weber	compared to simulator compared to simulator direct observation posttest, self-report direct observation posttest questionnaire	1 total sample is 40 20 for each group	practicing auditors from several national public accounting firms	2 independent groups and 2 independent treatments	there are some hypotheses not tested	the experiment process lasted for 9 months	interactive DSS
	compared to simulator compared to simulator direct observation posttest, self-report direct observation posttest questionnaire	1 total sample is 40 20 for each group	practicing auditors from several national public accounting firms	2 independent groups and 2 independent treatments	there are some hypotheses not tested	the experiment process lasted for 9 months	interactive DSS
Yang	mail questionnaire mail questionnaire mail questionnaire mail questionnaire mail questionnaire mail questionnaire mail questionnaire	1 total sample size is 76	supervisory level personnel (owners managers, directors and supervisors)	survey			

STUDY		PUBLISHED ?	DDS/GDSS	LAB/FIELD	TASK TYPE	TASK NATURE	LONGITUDINAL/ CROSSSECTIONAL	DECISION PHASE	INDEPENDENT VARIABLES
Zigurs Poole and DeSanctis	1988	published	GDSS called Software Aided Meeting Management(SAMM) University of Minnesota	lab	semi-structured medium to high difficulty task	evaluate a set of applicants to an international studies program	1 period	solution finding	computerised GDSS
	1988	published	GDSS called Software Aided Meeting Management(SAMM) University of Minnesota	lab	semi-structured medium to high difficulty task	evaluate a set of applicants to an international studies program	1 period	solution finding	manual GDSS
	1988	published	GDSS	lab	semi-structured	evaluating applicants to a program	1 period	solution finding	no GDSS base line

STUDY	INDP VAR. CODE	CELL SIZE	ASSIGNMENT TECHNIQUE	DEPENDENT VARIABLES	DEP VAR CODE	RELIABILITY	MEAN EFFECT	STANDARD DEVIATION	VARIANCE
Zigurs, Poole and DeSanctis	G1	49	groups were assigned	amount of influence behavior	7a	0 839	235.36	98 58	9718 0164
		49	randomly to experimenal	distribution of influence behavior	7b	0 823	0.63	0 17	0 0289
		49	groups. Participation	amount of verbal behavior	7c	0 839	430 1	160 9	25888 81
		49	in the experiment was voluntary	% of verbal behavior/total task			0 512	0 07	0 0049
	G2	49	groups were assigned	amount of influence behavior	7a	0 839	187 14	62 15	3862.6225
		49	randomly to experimenal	distribution of influence behavior	7b	0 823	0 63	0 16	0 0256
		49	groups. Participation	amount of verbal behavior	7c	0 839	469	158 3	25058 89
		49	in the experiment was voluntary	% of verbal behavior/total task			0 402	0 05	0 0025
	G3	14	random assignment	amount of verbal behavior	7c	0 839	413.3	190 1	36138 01
				% of verbal behavior/total task			0 402	0 13	0 0169

STUDY	WITHIN GROUP STD DEVIATION	EFFECT SIZE d	ADJUSTED EFFECT SIZE	EFFECT SIZE COMPARISON	TREATMENT COMPARISON	STATISTIC	STATISTIC VALUE	SIG. LEVEL p-VALUE	DIRECTION
Zigurs, Poole and DeSanctis	82.40339465	0 585170067	0 585170067		GDSS vs manual	non-directional t	1 55	0 134	NS
	0 307327187	0	0			directional t	0 05	0 482	NS
	159 6052944	-0.243726251	-0.243726251			directional t	-0 65	0 262	NS
	0 060827625	1 80838886	1 80838886			directional t	5 14	0	significant -
						non-directional t	1 55	0 134	NS
						directional t	0 05	0 482	NS
						directional t	-0 65	0.262	NS
	167 5501887	0 100268464	0 100268464						
	0 068151895	1 614041683	1 614041683						

STUDY	MEASUREMENT	GROUP SIZE	SUBJECTS	DESIGN	REMARKS	CODING REMARKS	DECISION AID FEATURES
Zigurs, Poole and DeSanctis	coding & counting of acts observer rating coding of verbal acts	3 or 4 3 or 4 3 or 4 average = 3 5 14 groups	students	two groups and two treatments one treatment per a group	no significant difference on the demographic data. The GDSS allows for exchage of comments among members	df=26, power=0.34 df = 26 df = 26 overall measures are reported only	the system incorporates a rational problem solving agenda
	coding & counting of acts observer rating coding of verbal acts	3 or 4 3 or 4 3 or 4 average = 3 5 14 groups	students	two groups and two treatments one treatment per a group	no significant difference on the demographic data. we assumed groups of sizes 3 and 4 are equal	df=26, power=0 34 df = 26 df = 26 overall measures are reported only	
	coding of verbal acts	3 or 4 3 or 4	students			df = 26	

APPENDIX B

NAMES AND EFFECT SIZES OF THE INCLUDED STUDIES FOR EACH INDEPENDENT/DEPENDENT VARIABLE AND THE NAMES OF THE EXCLUDED STUDIES

TABLE XXXIV

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DECISION QUALITY USING DSS/GDSS VERSUS NO-DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Tunstall (1969) High difficulty task	0.313	100	Not Reported
Tunstall (1969) Low difficulty task	-.457	100	Not Reported
Joyner & Joyner (1970)	-.039	211	.82
Gettys, Moy, & O'Bar (1976)	1.161	72	Not Reported
Benbasat & Schroeder (1977)	0.666	32	Not Reported
Power and Rose (1977) Phase I	1.074	24	Not Reported
Power and Rose (1977) Phase II	1.083	24	Not Reported
King and Rodriguez (1978)	-.122	45	Not Reported
Christen and Samet (1980)	0.359	12	Not Reported
Hiltz, Johnston, Arnovitch & Turoff (1980)	0.225	40	0.9
Steeb and Johnston (1981)	0.00	30	Not Reported
Benbasat and Dexter (1982)	0.392	48	Not Reported
Benbasat and Dexter (1982)	0.421	13	Not Reported
Hiltz, Johnson, and Turoff (1982)	-.082	60	Not Reported
Hiltz, Johnson, and and Turoff (1982)	0.032	60	Not Reported
Lewis (1982)	0.444	60	Not Reported
McIntyre (1982)	0.539	96	Not Reported
Barki and Huff (1984)	0.838	44	0.957
Davis and Mount (1984)	0.239	146	0.94
Davis and Mount (1984)	0.189	178	0.94
Goslar (1984)	0.005	43	Not Reported
Adrianson and Heljelmquist (1985)	0.109	65	Not Reported
Goul (1985)	0.122	32	Not Reported

TABLE XXXIV (CONTINUED)

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DECISION QUALITY USING DSS/GDSS VERSUS NO-DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Aldag and Power (1986)	0.0	88	0.85
Hansen and Messier (1986)	0.628	17	Not Reported
Beauclair (1987)	-.315	84	0.8124
Bui and Sivasankaran (1987)	0.441	72	Not Reported
Linn (1987)	-1.045	71	Not Reported
Linn (1987)	-.769	77	Not Reported
Scott (1987)	0.273	474	Not Reported
Yang (1987)	1.29	76	Not Reported
Easton, A. (1988)	2.23	48	Not Reported
Easton, G. (1988) No leader, no anonymity	-.796	60	Not Reported
Easton, G. (1988) No leader, anonymity	-.363	60	Not Reported
Easton, G. (1988) Leader, anonymity	0.596	60	Not Reported
Easton, G. (1988) Leader, no anonymity	0.070	60	Not Reported
Gallupe, DeSanctis, and Dickson (1988)	0.978	72	Not Reported
Peterson (1988)	1.55	60	0.94
Reding (1988)	0.173	46	Not Reported
Smith and Vanecek (1988)	-.552	132	0.89
Van Schaik (1988)	-.057	90	Not Reported
Pentland (1990) part no. 1	0.742	1010	Not Reported
Pentland (1990) part no. 2	0.485	1316	Not Reported

TABLE XXXV

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DECISION QUALITY USING DSS/GDSS VERSUS MANUAL DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Fudge and Lodish (1977)	-.298	20	Not Reported
Weber (1977)	0.034	40	Not Reported
Lewis (1982)	0.928	60	Not Reported
Dickmeyer (1983)	0.633	48	Not Reported
Eckel (1983) Part 1	0.218	109	Not Reported
Eckel (1983) Part 2	0.119	109	Not Reported
Burkhard (1984)	0.439	41	Not Reported
Sanders, Courtney, and Loy (1984) Part 1	0.841	132	Not Reported
Sanders, Courtney, and Loy (1984) Part 2	0.742	156	Not Reported
Sanders, Courtney, and Loy (1984) Part 3	-.039	90	Not Reported
Goul (1985)	0.326	41	Not Reported
Loy (1986)	0.602	60	Not Reported
Bui, Sivankaran, Fijol, and Woodbury (1987)	1.000	36	Not Reported
Isett (1987) Decision Aid 1	1.912	20	Not Reported
Isett (1987) Decision Aid 2	0.787	20	Not Reported
Tsai (1987)	0.633	48	Not Reported
Easton, A. (1988)	-.850	48	Not Reported
Hardaway (1988)	0.018	72	Not Reported
Jarvenpaa, Rao, and Huber (1988) Part 1	0.875	14	Not Reported
Jarvenpaa, Rao, and Huber (1988) Part 2	0.374	14	Not Reported
King, Premkumar, and Ramamurthy (1988)	1.365	42	0.7835
Schuldt (1988)	0.579	12	Not Reported
Chidambaram (1989)	-.040	140	0.7767
Dixon (1989) Task 1	2.457	40	Not Reported
Dixon (1989) Task 2	1.477	40	Not Reported
Heminger (1989)	0.247	405	Not Reported
Lamberti and Newsome (1989)	3.549	60	Not Reported

TABLE XXXVI

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DECISION TIME USING DSS/GDSS VERSUS NO-DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Tunstall (1969) High Difficulty task	-.629	100	Not Reported
Tunstall (1969) Low difficulty task	-.383	100	Not Reported
Benbasat & Schroeder (1977)	-.818	32	Not Reported
Benbasat and Dexter (1982)	-.972	48	Not Reported
Benbasat and Dexter (1982)	-.550	13	Not Reported
Goslar (1984)	-.742	43	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 1	-1.431	48	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 3	-2.512	54	Not Reported
Beauclair (1987)	-.315	80	Not Reported
Bui and Sivasankaran (1987)	-.452	72	Not Reported
Yang (1987)	0.908	76	Not Reported
Easton, A. (1988)	-.741	48	Not Reported
Easton, G. (1988) No leader, no anonymity	-1.973	60	Not Reported
Eeaston, G. (1988) No leader, anonymity	-1.451	60	Not Reported
Easton, G. (1988) Leader, anonymity	-1.973	60	Not Reported
Easton, G. (1988) Leader, no anonymity	0.282	60	Not Reported
Gallupe, DeSanctis, and Dickson (1988)	-.917	72	Not Reported
Watson, DeSanctis, and Poole (1988)	-2.006	190	Not Reported
Pentland (1990) part no. 1	0.382	1010	Not Reported
Pentland (1990) part no. 2	0.523	1316	Not Reported

TABLE XXXVII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DECISION TIME USING DSS/GDSS VERSUS MANUAL DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Weber (1977)	1.44	40	Not Reported
Watson, DeSanctis, and Dickson (1988)	0.051	188	Not Reported
Burkhard (1984)	-2.234	41	Not Reported
Goul (1985)	-.883	41	Not Reported
Bui, Sivankaran, Fijol, and Woodbury (1987)	3.091	36	Not Reported
Isett (1987) Decision Aid 1	0.148	20	Not Reported
Isett (1987) Decision Aid 2	-.339	20	Not Reported
Tsai (1987)	2.155	48	Not Reported
Easton, A. (1988)	0.642	48	Not Reported
Heminger (1989)	-.866	427	Not Reported
Lamberti and Newsome (1989)	0.943	60	Not Reported

TABLE XXXVIII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DEPTH OF ANALYSIS USING DSS/GDSS VERSUS NO-DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Tunstall (1969) High Difficulty task	-1.208	100	Not Reported
Tunstall (1969) Low difficulty task	-.129	100	Not Reported
Steeb and Johnston (1981)	0.651	30	Not Reported
Lewis (1982)	0.531	60	Not Reported
Goslar (1984)	-.453	43	Not Reported
Pracht (1984)	-.444	81	Not Reported
Goul (1985)	0.436	31	Not Reported
Aldag and Power (1986)	0.197	88	.83
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 1	0.964	42	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 3	-.686	42	Not Reported
Beauclair (1987)	0.105	42	0.8529
Beauclair (1987)	0.184	42	0.8529
Chu (1987)	0.397	22	Not reported
Yang (1987)	1.539	76	Not Reported
Easton, A. (1988)	2.559	48	Not Reported
Gallupe, DeSanctis, and Dickson (1988)	0.863	72	Not Reported
Smith and Vanecek (1988)	-.456	132	0.7

TABLE XXXIX

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DEPTH OF ANALYSIS USING DSS/GDSS VERSUS MANUAL DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Lewis (1982)	0.626	60	Not Reported
Eckel (1983) Part 1	0.241	109	Not Reported
Eckel (1983) Part 2	0.054	109	Not Reported
Burkhard (1984)	0.121	41	Not Repor-ted
Goul (1985)	0.568	38	Not Reported
Goslar, Green, and Hughes (1986)	0.523	43	Not Reported
Goul, Shane, and Tonge (1986)	0.323	52	Not Reported
Bui, Sivankaran, Fijol, and Woodbury (1987)	-1.592	36	Not Reported
Easton, A. (1988)	-.445	48	Not Reported
Jarvenpaa, Rao, and Huber (1988) Part 1	0.182	14	0.82
Jarvenpaa, Rao, and Huber (1988) Part 2	-.714	14	0.82
Chidambaram (1989)	0.926	140	0.92
Dixon (1989) Task 1	1.329	40	Not Reported
Dixon (1989) Task 2	1.275	40	Not Reported
Heminger (1989)	0.230	436	Not Reported

TABLE XL

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DECISION CONFIDENCE USING DSS/GDSS VERSUS NO-DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Tunstall (1969) High Difficulty Task	-.253	100	Not Reported
Tunstall (1969) Low difficulty task	-.399	100	Not Reported
Luthans and Koester (1976), experienced students	0.635	141	Not Reported
Luthans and Koester (1976), inexperienced students	1.417	50	Not Reported
King and Rodriguez (1978)	1.099	45	Not Reprted
Koester and Luthans (1979), experienced users	0.658	60	Not Reported
Koester and Luthans (1979), experienced users	0.658	60	Not Reported
Christen and Samet (1980)	0.050	12	Not Reported
McIntyre (1982)	0.292	96	Not Reported
Barki and Huff (1984)	0.843	44	0.933
Goslar (1984)	-.705	43	Not Reported
Adrianson and Hejelmquist (1985)	1.478	64	Not Reported
Gallupe, DeSanctis, and Dickson (1988)	-.740	72	Not Reported
Peterson (1988)	-.018	60	0.88
Reding (1988)	0.227	46	Not Reported
Watson, DeSanctis, and Poole (1988)	-.624	190	Not Reported

TABLE XLI

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DECISION CONFIDENCE USING DSS/GDSS VERSUS MANUAL DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Weber (1977)	0.645	40	Not Reported
Schuldt (1988)	0.506	12	Not Reported
Watson, DeSanctis, and Poole (1988)	-.897	188	Not Reported
Dixon (1989) Task 1	0.486	40	Not Reported
Dixon (1989) Task 2	0.537	40	Not Reported
Burkhard (1984)	.0203	41	.86
Heminger (1989)	.0247	405	Not Reported
Dickmeyer (1983)	0.729	38	Not Reported
Hardaway (1988)	0.722	72	Not Reported

TABLE XLII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR SATISFACTION WITH DECISION PROCESS USING DSS/GDSS VERSUS NO-DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Tunstall (1969) High difficulty task	-.237	100	Not Reported
Tunstall (1969) Low difficulty task	-.052	100	Not Reported
Lewis (1982)	0.056	60	Not Reported
Davis and Mount (1984)	0.304	202	0.87
Davis and Mount (1984)	-.056	251	0.87
Adrianson and Hejelmquist (1985)	0.596	65	Not Reported
Hiltz, Turoff, and Johnson (1985)	-.176	90	Not Reported
Easton, A. (1988)	1.277	48	Not Reported
Easton, G. (1988) No leader, no anonymity	-.838	60	Not Reported
Eeaston, G. (1988) No leader, anonymity	-.802	60	Not Reported
Easton, G. (1988) Leader, anonymity	-2.374	60	Not Reported
Easton, G. (1988) Leader, no anonymity	0.439	60	Not Reported
Gallupe, DeSanctis, and Dickson (1988)	-.855	72	Not Reprted

TABLE XLIII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR SATISFACTION WITH DECISION PROCESS USING DSS/GDSS VERSUS MANUAL DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Lewis (1982)	0.149	60	Not Reported
Bui, Sivankaran, Fijol, and Woodbury (1987)	0.119	36	Not Reported
Easton, A. (1988)	1.807	48	Not Reported
Jarvenpaa, Rao, and Huber (1988) Part 1	-.101	14	0.83
Jarvenpaa, Rao, and Huber (1988) Part 2	-.005	14	0.83

TABLE XLIV

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR SATISFACTION WITH DECISION OUTCOME USING DSS/GDSS VERSUS NO-DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Tunstall (1969) High difficulty task	0.366	100	Not Reported
Tunstall (1969) Low difficulty task	0.578	100	Not Reported
Hiltz, Johnson, Arnovitch and Turoff (1980)	0.415	40	Not Reported
Lewis (1982)	-.223	60	Not Reported
Beauclair (1987) Part 1	0.793	42	Not Reported
Beauclair (1987) Part 2	0.00	42	Not Reported
Bui and Sivasankaran (1987)	-.076	72	Not Reported
Easton, A. (1988)	0.189	48	Not Reported
Watson, DeSanctis, and Poole (1988)	0.259	190	Not Reported

TABLE XLV

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR SATISFACTION WITH DECISION OUTCOME USING DSS/GDSS VERSUS MANUAL DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Weber (1977)	0.775	40	Not Reported
Lewis (1982)	0.251	60	Not Reported
Bui, Sivankaran, Fijol, and Woodbury (1987)	-.480	36	Not Reported
Easton, A. (1988)	0.497	48	Not Reported
Watson, DeSanctis, and Poole (1988)	-.349	188	Not Reported

TABLE XLVI

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR EQUALITY OF PARTICIPATION USING GDSS VERSUS NO-GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Hiltz, Johnson, and Agle (1978)	0.573	60	Not Reported
Hiltz, Johnson, Arnovitch, and Turoff (1980)	0.231	40	0.9
Lewis (1982)	0.577	60	Not Reported
Hiltz, Turoff, and Johnson (1985)	0.054	60	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 1	1.174	42	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 3	0.860	37	Not Reported
Beauclair (1987)	-.009	42	Not Reported
Beauclair (1987)	-.000	42	Not Reported
Easton, A. (1988)	2.828	48	Not Reported
Easton, G. (1988) No leader, no anonymity	4.325	60	0.8249
Easton, G. (1988) No leader, anonymity	3.113	60	0.8249
Easton, G. (1988) Leader, anonymity	4.154	60	0.8249
Easton, G. (1988) Leader, no anonymity	3.395	60	0.8249
Smith and Vanecek (1988)	-.552	132	0.75
Watson, DeSanctis, and Poole (1988)	0.422	190	Not Reported
Ho, Raman, and Watson (1989)	-.672	145	Not Reported

TABLE XLVII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR EQUALITY OF PARTICIPATION USING GDSS VERSUS MANUAL GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Lewis (1982)	0.844	60	Not Reported
Easton, A. (1988)	-.195	48	Not Reported
Jarvenpaa, Rao, and Huber (1988)	0.336	14	Not Reported
Jarvenpaa, Rao, and Huber (1988)	0.286	14	Not Reported
Watson, DeSanctis, and Poole (1988)	0.303	188	Not Reported
Zigurs, Poole, and DeSanctis (1988)	0.00	98	Not Reported
Ho, Raman, and Watson (1989)	-.509	155	Not Reported

TABLE XLVIII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DEGREE OF DECISION CONSENSUS USING GDSS VERSUS NO-GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Hiltz,Johnson, and Agle (1978)	-1.414	40	Not Reported
Hiltz, Johnson, Arnovitch, and Turoff (1980)	-1.432	40	0.9
Hiltz, Johnson, and Turoff (1982) With leader	-1.171	60	Not Reported
Hiltz, Johnson, and Turoff (1982) With no leader	0.540	60	Not Reported
Hiltz, Turoff, and Johnson (1985)	0.162	90	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 1	.659	54	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 3	0.824	54	Not Reported
Easton, G. (1988) No leader, no anonymity	-2.529	60	Not Reported
Eeaston, G. (1988) No leader, anonymity	-1.549	60	Not Reported
Easton, G. (1988) Leader, anonymity	-2.529	60	Not Reported
Easton, G. (1988) Leader, no anonymity	0.00	60	Not Reported
Gallupe, DeSanctis, and Dickson (1988)	-.994	72	Not Reported
Watson, DeSanctis, and Poole (1988)	-.178	190	Not Reported
Ho, Raman, and Watson (1989)	-.423	145	Not Reported

TABLE XLIX

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DEGREE OF DECISION CONSENSUS USING GDSS VERSUS MANUAL GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Hiltz, Johnson, and Agle (1978)	-1.414	40	Not Reported
Watson, DeSanctis, and Poole (1988)	-.539	188	Not Reported
Ho, Raman, and Watson (1989)	-.887	155	Not Reported

TABLE L

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR SATISFACTION TOWARD THE SYSTEM USING DSS/GDSS VERSUS NO-DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Lewis (1982)	-.092	60	Not Reported
Barki and Huff (1984)	1.658	46	Not Reported
Davis and Mount (1984)	0.336	203	Not Reported
Davis and Mount (1984)	0.107	250	Not Reported
Adrianson and Hejelmquist (1985)	2.424	65	Not Reported
Hiltz, Turoff, and Johnson (1985)	-.329	90	Not Reported

TABLE LI

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR SATISFACTION TOWARD THE SYSTEM USING DSS/GDSS VERSUS MANUAL DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Lewis (1982)	0.350	60	Not Reported
Burkhard (1984)	-.490	41	0.799
Sanders, Courtney, and Loy (1984) Part 1	0.866	132	Not Reported
Sanders, Courtney, and Loy (1984) Part 2	0.946	156	Not Reported
Sanders, Courtney, and Loy (1984) Part 3	0.788	90	Not Reported
Goul (1985)	0.438	40	Not Reported
Bui, Sivankaran, Fijol, and Woodbury (1987)	.651	36	Not Reported

TABLE LII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DEGREE OF DECISION CONSISTENCY USING DDS/GDSS VERSUS NO-DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
McIntyre (1982)	.492	96	Not Reported

TABLE LIII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DEGREE OF DECISION CONSISTENCY USING DSS/GDSS VERSUS MANUAL DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Weber (1977)	0.012	40	Not Reported

TABLE LIV

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR AMOUNT OF DISCUSSION CONFLICT USING GDSS VERSUS NO-GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Hiltz, Turoff, and Johnson (1985)	-.679	90	Not Reported
Gallupe, DeSanctis, and Dickson (1988)	1.5161	72	Not Reported

TABLE LV

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR AMOUNT OF DISCUSSION CONFLICT USING GDSS VERSUS MANUAL GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Chidambaram (1989)	-.069	140	0.747

TABLE LVI

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR DEGREE OF UNINHIBITED BEHAVIOR USING GDSS VERSUS NO-GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 1	0.840	42	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 3	0.416	45	Not Reported
Easton, G. (1988) No leader, no anonymity	0.00	60	Not Reported
Easton, G. (1988) No leader, anonymity	0.118	60	Not Reported
Easton, G. (1988) Leader, anonymity	-.400	60	Not Reported
Easton, G. (1988) Leader, no anonymity	0.358	60	Not Reported

TABLE LVII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR AMOUNT OF GROUP COMMUNICATION USING GDSS VERSUS NO-GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Hiltz, Johnson, Arnovitch, and Turoff (1980)	-2.829	40	0.9
Hiltz, Johnson, and Turoff(1982)	-.473	120	Not Reported
Hiltz, Turoff, and Johnson (1985)	0.262	60	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 1	-.065	42	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 3	-1.027	48	Not Reported

TABLE LVIII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR AMOUNT OF GROUP COMMUNICATION USING GDSS VERSUS MANUAL DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Jarvenpaa, Rao, and Huber (1988) Part 1	0.014	14	Not Reported
Jarvenpaa, Rao, and Huber (1988) Part 2	-.391	14	Not Reported

TABLE LIX

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR RATE OF DECISION IMPROVEMENT USING DSS/GDSS VERSUS NO-DSS/GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Tunstall (1969) High difficulty task	-.994	100	Not Reported
Tunstall (1969) Low difficulty task	0.883	100	Not Reported
McIntyre (1982)	0.298	96	Not Reported
Davis and Mount (1984) Part 1	1.011	210	0.635
Davis and Mount (1984) Part 2	0.697	256	0.635
Goslar (1984)	0.315	43	Not Reported
Adrianson and Hejelmquist (1985)	0.557	64	Not Reported
Yang (1987)	1.208	76	Not Reported

TABLE LX

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR GROUP COHESIVENESS USING GDSS VERSUS NO-GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Tunstall (1969) High difficulty task	-.685	100	Not Reported
Tunstall (1969) Low difficulty task	0.120	100	Not Reported

TABLE LXI

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR GROUP COHESIVENESS USING GDSS VERSUS MANUAL GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Chidambaran (1989)	-.019	140	0.889

TABLE LXII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR AMOUNT OF TASK-ORIENTED BEHAVIOR USING GDSS VERSUS NO-GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 1	0.534	42	Not Reported
Siegel, Dubrovsky, Kiesler, and McGuire (1986), Experiment 3	-.557	48	Not Reported

TABLE LXIII

NAMES AND EFFECT SIZES OF INDIVIDUAL STUDIES FOR AMOUNT OF TASK ORIENTED BEHAVIOR USING GDSS VERSUS MANUAL GDSS

STUDY	EFFECT SIZE	SAMPLE SIZE	RELIABILITY COEFFICIENTS
Jarvenpaa, Rao, and Huber (1988) Part 1	0.430	14	Not Reported
Jarvenpaa, Rao, and Huber (1988) Part 2	-.704	14	Not Reported

TABLE LXIV

STUDIES EXCLUDED FROM ALL THE META-ANALYSES

STUDY
REVIEWS AND ESSAYS
Pinsonnealt & Kraemer [1989]
Courtney, DeSanctis, & Kasper [1983]
Gray [1983]
DIFFERENT SURROGATE OF INDEPENDENT VARIABLES
Ellis, Rein, & Jarvenpaa [1989]
Pecoraro [1984]
Ruble [1984]
Schroeder, D. [1989]
Dos Santos [1988]
Trumbly [1988]
NO QUANTIFIABLE EFFECT SIZES
Eining [1987]
Killingsworth [1987]
Applegate [1986]
Nunamaker, Applegate, and Konsynski [1987]
Beauclair [1987]
Sharda et al. [1988]
Cats-Baril & Huber [1987]
George, Northcraft, & Nunamaker [1987]
King, James [1988]

APPENDIX C

COMPUTER PROGRAMS FOR META-ANALYSIS

ARTIFACTUAL DISTRIBUTION META-ANALYSIS OF d VALUES

```
10 REM D VALUE META-ANALYSIS WITH ARTIFACT DISTRIBUTION
20 REM RELIABILITIES OF DEPENDENT VAR ASSUMED UNMATCHED
30 REM THESE RELIABILITIES ARE READ FROM A SEPARATE FILE
32 REM PROGRAM BY F. SCHMIDT, JAN. 1985, CALLED DVALUE2
34 REM TRANSLATED BY JEC, MARCH 1988
36 REM FOR IBM COMPATIBLE PC'S USING GW BASIC VERSION 2.0
50 DIM D(100,2),RY(50,2)
60 PRINT"D VALUE META-ANALYSIS WITH"
70 PRINT"ARTIFACT DISTRIBUTION FOR"
75 PRINT"RELIABILITIES OF DEPENDENT VAR":PRINT
80 PRINT"FIRST, INPUT THE D & N FILE":PRINT
90 INPUT"DISK/DATA FILE NAME";N$
100 INPUT"NUMBER OF ROWS";NR
110 INPUT"NUMBER OF COLUMNS";NC
120 OPEN "I",2,N$
130 REM READ IN D AND N MATRIX
140 FOR I=1 TO NR:FOR J=1 TO NC
150 INPUT#2,D(I,J)
160 NEXT J:NEXT I
170 CLOSE 2
180 REM PRINT D & N MATRIX AS CHECK
190 FOR I=1 TO NR:PRINT I;
200 FOR J=1 TO NC:PRINT D(I,J);:NEXT J
210 PRINT:NEXT I
220 REM READ IN RYY MATRIX
230 PRINT"RYY AND FREQ'S FILE":PRINT
240 INPUT"DISK/DATA FILE NAME";M$
250 INPUT"NUMBER OF ROWS";N1
260 INPUT"NUMBER OF COLUMNS";N2
270 OPEN "I",3,M$
280 FOR I=1 TO N1:FOR J=1 TO N2
290 INPUT#3,RY(I,J)
300 NEXT J:NEXT I
310 CLOSE 3
320 REM PRINT RYY MATRIX AS CHECK
330 FOR I=1 TO N1:PRINT I;
340 FOR J=1 TO N2:PRINT RY(I,J);:NEXT J
350 PRINT:NEXT I
360 REM COMPUTE MEAN UNCORRECTED D
365 DM=0
370 TN=0:SUM=0
380 FOR I=1 TO NR
390 SUM=SUM+D(I,2)*D(I,1)
```

```
400 TN=TN+D(I,2):NEXT I
410 DM=SUM/TN
420 REM COMPUTE SAMPLING VAR OF OBS D'S
430 S1=((TN/NR)-1)/((TN/NR)-3)*(4*(1+(DM^2)/8)*NR)/TN
440 REM COMPUTE VAR OF OBS D'S
450 ND=0
460 FOR I=1 TO NR
470 ND=ND+D(I,2)*(D(I,1)-DM)^2
480 NEXT I
490 V1=ND/TN:SO=SQR(V1)
500 REM COMPUTE PERCENT VAR DUE TO SAMPLING ERROR
510 X1=(S1/V1)*100
520 REM COMPUTE MEAN SQR OF RYY
530 Y=0:Z=0
540 FOR I=1 TO N1
550 Y=Y+SQR(RY(I,1))*RY(I,2)
560 Z=Z+RY(I,2)
570 NEXT I
580 YM=Y/Z
590 REM COMPUTE TRUE SCORE MEAN D
600 DT=DM/YM
610 REM COMPUTE VAR DUE TO RYY DIFFS
620 X4=0:Y4=0:Z4=0:F4=0
630 FOR I=1 TO N1
640 DA=DT*SQR(RY(I,1))
650 X4=DA*RY(I,2)
660 Y4=Y4+X4
670 Z4=Z4+DA^2*RY(I,2)
680 F4=F4+RY(I,2)
690 NEXT I
700 VY=(Z4/F4)-(Y4/F4)^2
710 REM COMPUTE RESIDUAL VAR AND SD
720 RV=V1-S1-VY
730 IF RV<0 THEN RS=0
740 IF RV>0 THEN RS=SQR(RV)
750 REM COMPUTE SD-PREDICTED
760 SP=SQR(S1+VY)
770 REM COMPUTE PERCENT VAR ACC FOR
780 PV=((S1+VY)/V1)*100
790 REM COMPUTE SD OF TRUE SCORE D'S
800 S7=(DT/DM)*RS
810 REM BEST & WORST CASES-CORRECTED D
820 BC=DT+1.28*S7
830 WC=DT-1.28*S7
840 REM BEST & WORST CASES-UNCORRECTED D
850 B1=DM+1.28*RS
860 W1=DM-1.28*RS
861 REM COMPUTE CHI-SQUARE TEST
862 Q=NR*(V1/S1)
863 REM COMPUTE CONFIDENCE INTERVAL FOR SUBSETS
864 SE=SQR(V1/NR)
865 CI1=DM-1.96*SE
```

```
866 CI2=DM+1.96*SE
867 REM COMPUTE FAIL-SAFE N STUDIES
868 XN=NR(D/(0.05-1))
900 REM PRINT OUTPUT ON PRINTER
901 INPUT "IS PRINTER READY (Y/N)";Y$
902 IF Y$="Y" THEN 890 ELSE 1190
903 LPRINT"META-ANALYSIS RESULTS":LPRINT
904 LPRINT"D VALUES WITH ARTIFACT DISTRIBUTION":LPRINT :LPRINT
910 LPRINT"MEAN CORRECTED D=";DT
920 LPRINT"SD OF CORRECTED D=";S7
930 LPRINT"BEST CASE=";BC
940 LPRINT"WORST CASE=";WC
950 LPRINT"PERCENT VAR ACC FOR=";PV
960 LPRINT"TOTAL N=";TN
970 LPRINT"NO. OF D'S=";NR:LPRINT:LPRINT
980 LPRINT"SUPPLEMENTARY RESULTS":LPRINT
990 LPRINT"MEAN UNCORRECTED D=";DM
1000 LPRINT"MEAN SQR OF RYY=";YM
1020 LPRINT"BEST CASE=";B1
1030 LPRINT"WORST CASE=";W1
1040 LPRINT"VAR OF OBSERVED D'S=";V1
1050 LPRINT"SAMPLING ERROR VAR OF OBS D'S=";S1
1060 LPRINT"VAR DUE TO RYY DIFFS=";VY
1070 LPRINT"RESIDUAL VAR=";RV
1080 LPRINT"RESIDUAL SD=";RS
1090 LPRINT"PERCENT VAR ACC FOR=";PV
1100 LPRINT"PERCENT VAR DUE TO SAMPLING ERROR=";X1
1110 LPRINT"SD OF OBSERVED D'S=";SO
1120 LPRINT"PREDICTED SD=";SP:LPRINT:LPRINT
1121 LPRINT"CHI-SQUARE TEST=";Q
1122 LPRINT"UPPER CONFIDENCE INTERVAL=";CI1
1123 LPRINT"LOWER CONFIDENCE INTERVAL=";CI2
1124 LPRINT"FAIL-SAFE N=",XN
1130 LPRINT"OBSERVED D VALUES":LPRINT
1140 FOR I=1 TO NR:LPRINT I;
1150 LPRINT D(I,1);:LPRINT D(I,2):NEXT I:LPRINT
1190 END
```

Source: Hunter and Schmidt, 1990

PROGRAM TO CREATE DATA FILES

```
05 REM PROGRAM BY JOHN HUNTER
10 REM THIS PROGRAM WILL MAKE, REMAKE OR ADD DATA TO
20 REM A SEQUENTIAL DATA FILE. IT IS CALLED MAKEDATA.BAS
30 REM IT CAN ALSO PRINT A DATA FILE AS A CHECK.
35 REM FOR IBM COMPATIBLE PC'S USING GW BASIC VERSION 2.0
40 DIM A(100,10)
50 PRINT "OPTIONS ARE:"
60 PRINT "1. NEW DATA FILE"
70 PRINT "2. REDO EXISTING FILE"
80 PRINT "3. ADD TO EXISTING FILE"
90 PRINT:PRINT "CHOOSE BY ANSWERING THE FOLLOWING QUESTIONS
   YES OR NO"
100 INPUT "1. DO YOU WANT A NEW DATA FILE (Y/N)";Y1$
110 IF Y1$="Y" THEN 160
120 INPUT "2. DO YOU WANT TO REDO A FILE (Y/N)";Y2$
130 IF Y2$="Y" THEN 160
140 INPUT "3. DO YOU WANT TO ADD TO A FILE (Y/N)";Y3$
150 IF Y3$="Y" THEN 300 ELSE 430
160 PRINT "YOU WILL CREATE A NEW FILE IF YOU NAME A
    NONEXISTENT FILE"
170 PRINT "YOU WILL ERASE DATA IF YOU NAME A FILE ON THE
    DISK":PRINT
180 INPUT "DISK/DATA FILE NAME";N$
190 INPUT "NUMBER OF ROWS";NR
200 INPUT "NUMBER OF COLUMNS";NC
210 OPEN "O",1,N$
220 FOR I=1 TO NR:PRINT"ROW:";I
230    FOR J=1 TO NC
240    INPUT "DATA:",A(I,J)
250    PRINT#1,A(I,J);
260    NEXT J
270 PRINT:NEXT I
280 CLOSE 1
290 GOTO 430
300 PRINT "YOU WILL ADD TO THE END OF A FILE IF YOU NAME AN
    EXISTING FILE"
310 PRINT "YOU WILL CREATE A NEW FILE IF YOU NAME A
    NONEXISTING FILE":PRINT
320 INPUT "DISK/DATA FILE NAME";F$
330 INPUT "NUMBER OF ROWS";FR
340 INPUT "NUMBER OF COLUMNS";FC
350 OPEN "A",2,F$
360 FOR I=1 TO FR:PRINT "ROW:";I
```

```
370     FOR J=1 TO FC
380     INPUT "DATA:",A(I,J)
390     PRINT#2,A(I,J);
400     NEXT J
410 PRINT:NEXT I
420 CLOSE 2
430 INPUT "DO YOU WANT TO CHECK YOUR DATA (Y/N)";Y4$
440 IF Y4$="Y" THEN 450 ELSE 580
450 INPUT "DISK/DATA FILE NAME";C$
460 INPUT "NUMBER OF ROWS";CR
470 INPUT "NUMBER OF COLUMNS";CC
480 OPEN "I",3,C$
490 FOR I=1 TO CR:FOR J=1 TO CC
500 INPUT#3,A(I,J)
510 NEXT J:NEXT I
520 CLOSE 3
530 FOR I=1 TO CR:PRINT I;
540 FOR J=1 TO CC:PRINT A(I,J);:NEXT J
550 PRINT:NEXT I
560 INPUT "DO YOU WANT TO RUN THE PROGRAM AGAIN (Y/N)";Y5$
570 IF Y5$="Y" THEN 100
580 END
```

Source: Hunter and Schmidt, 1990

2

VITA

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