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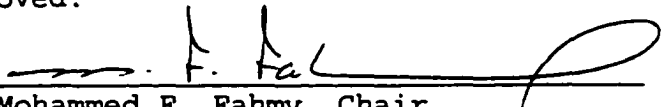
USE AND EFFECTIVENESS OF DECISION SUPPORT SYSTEMS (DSS):

STUDY OF THE SAUDI PRIVATE SECTOR

A Dissertation

Submitted

In Partial Fulfillment

Of the Requirements for the Degree

Doctor of Industrial Technology

Approved:

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Dr. Ali Kashef, Co-Chair

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Dr. MD Salim, Committee Member

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University of Northern Iowa

December 2001

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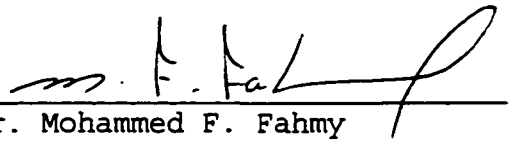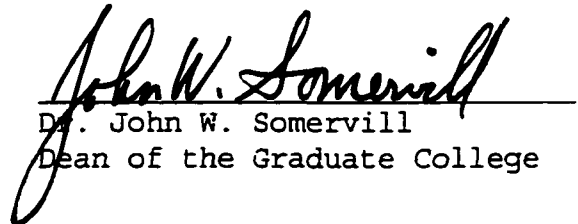
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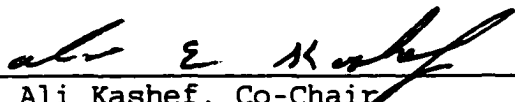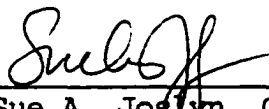
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ABSTRACT

In the industrialized world today, management is characterized by extensive use of computers to manage rapid change, information overload, and complex decision-making. Literature suggests that Decision Support Systems, computer packages offering information retrieval, problem-structuring models, decision alternatives, and other types of decision support, are effective extensions of human decision-making and offer substantial benefits to organizations utilizing them.

In spite of overwhelmingly positive reviews for DSS, empirical literature has produced inconsistent results regarding DSS effectiveness, and definitions of "effectiveness" and of DSS itself are varied and sometimes contradictory. Distinguishing DSS from MIS (management information systems) and other types of managerial computer support has proven to be an essential part of DSS research. An additional gap in DSS research to date is that little is known about DSS use in developing countries and the potential of DSS to improve decision-making and overall organizational effectiveness.

The present empirical study surveyed one member from each of Saudi Arabia's largest corporations to determine to

what extent DSS has been incorporated into the companies'
decision-making procedures. A second purpose was to
determine decision-makers' perceptions of the effectiveness
of DSS in terms of their decision processes (time savings,
availability of more alternatives, cognitive effort) as
well as decision outcomes (decision accuracy and overall
quality). The research revealed a high degree of use and
enthusiasm for DSS, but revealed gaps in Saudi utilization
of the systems. The research identified specific obstacles
to more pervasive adaptation and enjoyment of benefits,
including a lack of research stemming from researchers'
misperceptions of the private sector's interest in and
ability to understand Decision Support Systems.

ACKNOWLEDGMENTS

I wish to thank, first of all, my committee chair, Dr. Mohammed F. Fahmy, for his patient and thorough feedback as my advisor throughout the dissertation process. I am equally grateful for the assistance of my committee co-chair, Dr. Ali Kashef, and each of my committee members. They include Dr. MD Salim, Dr. Sharon E. Smaldino, and Dr. Sue A. Joslyn. Dr. Joslyn provided invaluable assistance with the dissertation's statistical elements.

Words cannot really express my gratitude to my parents for their guidance, care, and prayer throughout my life and my pursuit of higher education. It was their encouragement that motivated me to set the goal of achieving the doctoral degree and their example that inspired me to do my best in all my endeavors.

Most of all, I am thankful for the support, assistance, and unequalled patience of my wife. She has sacrificed much to support my studies in the United States; it required her to live far from her family at times when they most needed to be close to one another. She has helped me in many ways, both directly and indirectly, in completing my studies and completing the dissertation. In learning new computer concepts and skills in the

Department's program and managing the sometimes almost overwhelming demands of coursework and research, my wife has proven to be one of my most effective instructors. She has provided me invaluable organizational and clerical assistance. The greatest of all the gifts she has given me is showing me how to be well-organized and patient. Now that the project is complete, I hope to continue to live up to the standards of patience and support she has demonstrated throughout our life together.

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CHAPTER I

INTRODUCTION

The information revolution shaping the private sector

today has been called "an explosion in the volume and

variety of electronic data" (Dhar & Stein, 1997, p. 2). The

information revolution has created an ever-expanding need

for computer systems that help business people make sense

out of these vast information resources and utilize them

for strategic advantage. One such system is Decision

Support. Decision Support Systems (DSS) have been evolving

since the early 1970s when Michael S. Scott Morton wrote a

landmark book calling for further refinement of computer

systems that are relevant specifically to management

decision-making. By 1993, authors such as Snoyer and

Fischer were praising DSS packages as "a data-rich

extension of the traditional techniques of operations

research and computer simulation" (p. 30). Eierman,

Niederman, and Adams (1995) described the utility of DSS in

more detail:

> As a result of the importance and difficulty of
> performing the task of decision-making, opportunities
> presented by computer technology to develop support for
> decision makers have generated a great deal of
> interest. Computers for supporting decision-making
> . . . are developed to: (1) facilitate the structuring
> of decision so that analytical tools, possibly several

in combination, can be used in generating solutions;
(2) facilitate the use of the analytical tools that
have been brought together through a structuring
process . . .; and (3) facilitate the manipulation,
retrieval, and display of data. (p. 2)

Mackay, Barr, and Kletke (1992) noted the growing

interest in researching DSS for purposes of furthering its

development and evaluating its results. Todd and Benbasat

(1993) pointed out that the assumption in the literature

was that DSS lead to better decision processing and

therefore better decisions and better overall

organizational effectiveness. In expressing confidence in

DSS as a valuable tool, Bidgoli (1998) went so far as to

say, "It is hard to imagine a significant corporate

enterprise in the near future without a management support

system" (p. 21)

Because of the potential for positive organizational

impact described in the literature about DSS, this study

focuses on DSS in the context of the potential benefits to

one specific developing nation, the Kingdom of Saudi

Arabia. Idrees (1999) noted that information technology

(IT) is relatively new to Saudi Arabia compared to its

Western counterparts, who experienced no restrictions on IT

applications at the dawn of the information age as was true

in Saudi Arabia. Thus, there is still a gap in research

examining specific IT applications such as DSS; this research will help fill that gap by examining in a specific context variables such as the pervasiveness of use in the Saudi private sector, familiarity with the technology, and user satisfaction with the technology. In addition, in spite of the overall enthusiasm for DSS in the conceptual literature, results of recent empirical research are described by Todd and Benbasat (1999) as still "equivocal at best." In seeking to determine whether or not DSS is effectively helping managers meet the challenges of making the Saudi private sector more competitive, this study will also add to the empirical evaluation data needed to assess overall DSS effectiveness empirically.

Statement of the Problem

This study will determine the effectiveness of DSS in the Saudi private sector by investigating survey participants' perceptions of the following: the quality of available information, the variety of available alternatives, the cognitive effort expended in reaching decisions, the time required to arrive at a decision, and the overall quality of the decision.

Statement of Purpose

Because research in the field suggests that DSS is effective but lacks consensus regarding the nature and degree of its effectiveness, the proposed study will contribute to answering unresolved questions about DSS. More important, no known study has investigated the utilization of DSS in the Saudi private sector. This research will survey diverse organizations from the Saudi Council of Chambers' list of the top 150 corporations. The survey will be limited to these corporations, since they include industries as diverse as banking, trading, manufacturing, agriculture, services, construction, information technology, and others. In assessing the diffusion and success of DSS in this sample of Saudi industry, the study will also attempt to draw decision makers' attention to the potential importance of DSS and the major role it may play in improving decision quality and helping decision makers achieve their goals more effectively.

The results of such a study could then help motivate decision makers and their organizations to increase DSS implementation throughout the private sector. The potential importance of expanding DSS expertise and use is described

in the following section, "Significance of the Study." To

achieve the purpose summarized, the study will utilize a

survey instrument that explores participants' perceptions

of the benefits of DSS and obstacles to their

implementation. It is anticipated that increasing awareness

of obstacles will lead to good recommendations to overcome

them.

Significance of the Study

The value of information technologies is more an open

question for developing countries than for Western

countries, on which most DSS research has focused. Goodman

and Green (1992) wrote,

> In a part of the world where monarchies, dictatorships,
> and theocracies are dominant, and where traditional
> values are still important, the acceptability of IT is
> mixed. Controls and technological inhibitions remain
> prominent and widespread. During this time of
> incredible global proliferation of computer networks,
> the Middle East is noteworthy for the near absence of
> this technology. (p. 22)

Goodman and Green identified specific obstacles related to

the difficulty in building an Arab software industry as

challenges tied to language issues, cultural preference for

face-to-face contact, trade issues, and other factors.

Although Saudi Arabia is less susceptible to some of

these problems than many typical "developing" nations, due

to greater wealth and ample technological hardware, the nation has not yet fully exploited the possibilities of IT in either the public or private sector. Saudi Arabia's exploitation of e-commerce and e-business, for example, was shackled by government regulation of the Internet to protect the culture from unwanted moral influences, which according to Shetty (2000) "had the unwanted spin off of slowing down any movement towards an electronic economy to a crawl" (p. 66). Another significant problem in the past was the lack of skilled labor to use the technology effectively, which once forced the kingdom to import most of its workers.

The supply of skilled labor and other aspects of commerce are changing in Saudi Arabia, however. The changing climate is driven by several factors including increasing globalization and liberalization of communications; a series of economic and government reforms aimed at encouraging private sector growth and attracting foreign capital ("EIU Forecasts," 2000); and government responding to declining oil prices with an effort to diversify the nation's industry. Shetty called the Saudi government "eager to wean the economy from dependence on

the state and on oil" to accomplish a new goal: "develop a thriving private sector" (p. 67).

The literature shows information management to be an especially important issue for developing countries as a "critical resource for development" (Stone & Menou, 1994), an equalizer of "the absolute and comparative economic advantages of individual countries" (Azad, Erdem, & Saleem, 1998, p. 122). Azad et al., 1998 identify areas of potential benefit from information technology such as DSS: better administrative efficiency, reduction of bureaucratic corruption, better-quality service, and improvement in functions most directly related to organizational performance, such as quality control and sales. Alshilash (1997) correlated use of decision support systems with better organizational performance in Saudi government organizations. However, as Moyo's (1996) discussion of "IT penetration" estimated, even advanced developing countries overall can show only 10% of what developed countries can in terms of IT deployment and effective utilization.

The changing business climate in Saudi Arabia increases the need for the present study of the Saudi private sector; although opportunities have never been greater, the nation's limitations as a developing nation

necessitate careful consideration of several factors. They include avoiding preconceptions in determining the potential benefits of IT and ensuring that assessment criteria are "beneficiary-driven" (Stone & Menou, 1994, p. 26), as well as avoiding the pitfalls of implementing new technology such as decision support systems without appropriate planning, implementation, and expansion guidelines. Especially for developing countries, employing new IT haphazardly can "jeopardize the efforts to overcome the technological disadvantage in competing in international markets" (Azad et al., 1998, p. 122). Moyo (1996) added justification for studies that can assist with and promote the careful planning needed to ensure successful implementation of various types of IT.

Abdul-Gader and Kozar (1995) pointed out that "Any strategic advantages of information technology . . . are contingent upon real assimilation of appropriate information technology products and applications into the organizational processes" (p. 536). Azad et al., 1998 noted some culture-specific factors that may impede the successful assimilation of these products. They include traditional conceptions of authority and its relationship to information-sharing; degree of preference for personal

contact; political constraints; and degree of public support. Using an African nation as a case study, Korpela (1996) argued that "political economy" is a better framework for discussing contexts that influence the success of IT than "culture." In either case, these authors, along with Abdul-Gader and Kozar (1995), argued that attitudes and contexts can change once obstacles are identified. As Hanna (1991) wrote, "Developing countries need external help to move quickly toward the . . . so-called transformational uses of the technology, where returns on investment are highest" (p. 45). The present study is needed in order to take the important first step of focusing specifically on DSS and identifying any potential obstacles to fulfilling its potential in the context of the Saudi Arabian business environment.

Research Questions

The following questions were formulated to structure the study:

1. To what extent does the Saudi private sector utilize DSS?

2. What factors have enhanced DSS implementation in the Saudi private sector?

3. Are there any obstacles to DSS implementation in the Saudi private sector?

4. Does utilizing DSS in the Saudi private sector affect the perception of information quality?

5. Does utilizing DSS in the Saudi private sector affect the perception of variety of alternatives?

6. Does utilizing DSS in the Saudi private sector affect the perception of time required to consider decisions?

7. Does utilizing DSS in the Saudi private sector affect the perception of the cognitive effort required to make decisions?

8. Does utilizing DSS in the Saudi private sector affect the perception of decision quality in general?

Preview of Methods

Instrument and Validation

The survey instrument consisted of 26 questions divided into three parts. Part one asked for demographic information (personal information, company information, and information about computer use in the company). Part two asked specifically about use of DSS in the organization to enable the researcher to assess the diffusion of DSS in

Saudi Arabia. Part three asked for respondents' perceptions of the effectiveness of DSS. The survey was revised with input from the study's advisor and a committee member who holds a doctoral degree in statistics. The survey was further revised according to feedback from other members of the committee.

The instrument was validated in consultation with experts in the field of DSS and through a pilot test involving 5 companies from the list of 150. The 5 companies included only those who use email so that they could be contacted from the United States by email.

All necessary corrections to the survey were made before it was translated into Arabic, the official language of Saudi Arabia, and posted on the Internet (the researcher's homepage) at http://fp.uni.edu/dsse in both English and Arabic.

The Sample

The Council of Saudi Chambers provided a list of the top 150 companies in Saudi Arabia. One survey participant was selected from each corporation on this list.

Collection of Data

As pointed out earlier, the survey was posted on the Internet in both Arabic and English. Emails including the address of the researcher's homepage were sent to participants who have email to describe the research and ask them to respond to the survey by visiting the home page and completing the survey. For participants who have no email, the survey was sent by regular mail and collected by regular mail as well.

Follow-up was an important part of the study; the researcher made up to three rounds of follow up visits to speed up responses when it needed. Responses of those who chose to response via the Internet went directly to an account established for this purpose. Responses sent through regular mail went to the researcher's mailbox.

Data Analysis

SPSS software was used in the analysis of the data. Basic descriptive statistics were the primary analytical tool.

Assumptions

The assumptions described below guided the construction, distribution, and analysis of the survey:

1.   Participants may be using DSS software without recognizing it by the name "DSS." The survey therefore asked participants to consider their use of a variety of software types.

2.   Participants would respond to either the mail version of the survey or Web-based version accurately and honestly.

Delimitations

The study was defined by the following delimitations:

1.   The survey was distributed to the large companies included on the Council of Saudi Chambers' list of top 150 private companies.

2.   The study was limited to the top 150 companies in Saudi Arabia because they are the largest companies and they can afford the expense of new technology, making DSS adoption feasible.

3.   The survey was distributed to one decision maker within each of the 150 companies.

Definition of Terms

Concepts that were central to this study are defined in the literature in many different ways and using different labels. Chapter 2 will further explore this

issue. For the purposes of this study, the following definitions were used:

MSS: (Management Support Systems) refers to any computer application used at various organizational levels to assist with a variety of managerial tasks; an umbrella term for management support that has spawned a number of subtypes and alternative acronyms (Snoyer & Fischer, 1993).

MIS: refers to Management Information Systems, which "collect, update, maintain, and process data; provide scheduled and demand reports; respond to queries; and support structured decision-making, often through the use of models" (Watson & Hill, 1983, p. 86).

DSS: (Decision Support Systems) are computer-based information systems consisting of hardware, software, and human input and specifically designed to assist decision makers at any organizational level with semi-structured and unstructured decision tasks (Bidgoli, 1998); systems that are designed to "enable users to process a set of goals to be achieved, alternatives available for achieving them, and relations between goals and alternatives to choose the best alternative, combination, allocation, or predictive decision rule" (Nagel, 1993, p. xii).

Organization of the Study

Chapter 2 presents literature distinguishing DSS from other MSS applications, describing the evolution, components, and applications of DSS, and evaluating DSS effectiveness through a variety of methodologies. Chapter 3 will describe the methodologies employed in constructing the survey instrument and gathering data from the sample organizations and decision makers in Saudi Arabia. A full analysis of the survey data will be presented in Chapter 4, and the dissertation will conclude with Chapter 5, a discussion of implications for DSS users and researchers and recommendations specifically for the Saudi private sector.

CHAPTER II

REVIEW OF LITERATURE

Background: Management Support Systems

Snoyer and Fischer (1993) wrote that a system can be called a true executive information system only if it deals with "decisions that matter. If any MSS [Management Support System] meets such a criterion, it can be claimed that it is a management support system, and that it is of strategic value to an organization" (p. 7). Their book described three primary areas of management activities that matter most. Each involves specific information needs, briefly described in the list below to help provide groundwork for the discussion of DSS as presented in this review of literature.

- Monitoring, or the routine, detailed tasks
  normally handled by lower-level managers.
  Information generated from this activity in the
  form of reports and analyses may be used by
  executives when problems surface or when the
  information is directly related to executive
  decision-making. For the information to be useful
  to executives, the information must be specific,
  focused on the question at hand, current, and easy
  to skim.

- Trend analysis, which usually becomes of interest
  to upper management when it relates to potential
  new business practices for which no analysis
  exists yet. The information need is prompted by a
  manager's questions, which are best answered in
  the most streamlined form possible. Furthermore,

Snoyer and Fischer offered simple statistical
projections and time series analyses as examples.

- Planning, in which managers use information to
gauge possible outcomes of their decisions. This
information consists primarily of short-range
projections that are most useful to managers if
they are displayed graphically, as in tables and
charts.

Managerial decision-making habits are also relevant to a

discussion of specific computer-assisted decision-making

systems. Managers, for example, deal with constantly-

changing information needs that are impossible to foresee

very far into the future. In addition, they make decisions

based less on computer data than other resources, such as

discussion, intuition, and experience; and they vary in the

degree to which they rely on consultation, delegation, and

consensus, which influences the forms and substance of the

information reports they need. These facts helped inform

Snoyer and Fischer's list of necessary features of

strategic information systems. According to Snoyer and

Fischer, to be classified as a decision support system, the

system must do the following:

- offer easy, fast access to the types of
information that are most often requested.

- be adaptable to new areas of executive interest

- be available to all levels of management and

integrated between management layers

- be comprehensive for all phases of the decision-making process

- be relevant to specific business initiatives

- cause a positive impact on business profitability

The Role of Computers in Management Support

When Gorry and Scott Morton published their landmark article in 1971, they were among the first authors to conceptualize the use of technology in management support as, specifically, a matter of decision support. They argued that in spite of the impressive growth in managerial computer use between 1955 and 1971, computer systems had not yet made a very significant impact on managerial decision-making. They predicted, however, that expanded knowledge of human problem-solving, a clearly-defined framework for conceptualizing information systems, and technological advancements such as cheaper, faster, more flexible computers, would increase the impact of computer systems in management. In Gorry and Scott Morton's retrospective comments in the 1989 reprint of their 1971 article, they noted that the predicted shift in the importance of computers was underway. This was due mainly to "the computational power of [the] . . . mainframe" being by then "embodied in the ubiquitous personal computer" (p.

58). They wrote, "Most vital challenges of organizational life are . . . mediated by some form of computation" (p. 58).

Dhar and Stein (1997) updated the discussion by pointing out the revolutionary interactivity of personal computers in the 90s, which reflected a general shift toward more knowledge-based organizations: "There has been an explosion in the volume and variety of electronic data available to businesses, and correspondingly, a huge need for systems that help businesspeople make sense out of these reams of data" (p. 2). The systems developed in response, they pointed out, were definitely smarter, which in turn would cause managers to become more and more dependent on them. Bidgoli (1997) reported that organizations were spending billions worldwide to train and retrain employees to deal with the new technologies and procedures effectively. Later sections of this literature review will explore whether or not the promise of applications such as decision support specifically has been fulfilled.

DSS: History And Definitions

In general, computer applications for business traditionally provided the type of data useful in making

structured decisions, for example financial data and short-term projections, rather than providing meaningful assistance with executive-level analysis and planning (Snoyer & Fischer, 1993). Bidgoli (1998) identified DSS as one of the major subfields of "the quickly growing field of MSS" (p. 20) originated to fill that gap. Michael S. Scott's doctoral study of computer-assisted organizational decision-making at Harvard University inspired his book *Management Decision Systems* (1971), which pioneered the original concept of Decision Support Systems. In his book, Scott Morton expressed a two-part goal: advancing the analysis of managerial decision-making tasks (including the entire context of management—setting, behavior, etc.) and connecting the analysis to the development and use of compatible, relevant visual display technology in support of those tasks. In prefacing his research, Scott Morton called it only the first in the chain of experiments that would be necessary in forging effective decision support systems. A variety of disciplines have been credited for their contributions to DSS development and research since that time: database research for data management tools and research; management science for mathematical models and demonstrations of their relevance to problem solving;

cognitive science for its behavioral decision-making research; and artificial intelligence, human-computer interaction, simulation methods, software engineering, and telecommunications for their contributions (Hess, Loren, Rees, & Rakes, 2000; Power, 1999).

Sprague and Watson (1979) noted that "around 1970 business journals began to publish articles on information systems whose characteristics and capabilities differed from those of previous systems" (p. 60). Two articles discussed the evolution of DSS as a topic for publication beginning in the 1970's. Elam, Huber, and Hurt (1986) provided a full review of the DSS literature published between 1975 and 1985 to assess the overall maturation of the field. Eom's purpose was similar, but he used factor analysis of articles to isolate the areas of research interest and contributing disciplines reflected in the literature, and he concluded that between 1971 and 1993, DSS as a field had "made meaningful progress over the past two decades" and was "in the process of solidifying its domain and demarcating its reference disciplines" (1996, p. 328).

Sprague and Watson's earlier publication (1979) predicted that the new systems could potentially affect

management in a broad range of organizations, and advised managers to be familiar with the capabilities, characteristics, design philosophy, elements, and structure of "decision support systems" (also known as "management decision systems" and "strategic planning systems"). Sprague and Watson noted that this terminology was frequently used at the time and served as a good description of the systems' key features. Sprague and Watson (1979) and Bidgoli (1998) showed a historical progression of systems. Electronic Data Processing (EDP), which simply automated or sped up transactions, evolved to include Integrated Data Processing (IDP, which added simple decision models); IDP evolved to include Management Information Systems (MIS, an information system with a more comprehensive reach into different business functions and managerial layers and greater use of decision models). MIS evolved to include DSS, which features the most comprehensive package of integrated databases, decision models, and decision support systems.

Problems of DSS Definition

Although unique characteristics of DSS can be described, and will be discussed in detail in this review

of literature, it should be pointed out that the literature

varies considerably in defining DSS. Forming a common,

universally-understood definition of DSS is problematic for

several reasons. Snoyer and Fischer (1993) pointed out the

popularity of jargon in the computer industry—the acronyms

and technical terms that make the subject confusing to

ordinary people. The authors noted that this is true in the

field of information and support systems, and they went on

to describe the problem specific to defining DSS:

> A good DSS is easier to put to use than to define in
> detail. Attempts to define a DSS either get very
> technical (in terms such as an integrated combination
> of relational data management, multidimensional
> modeling, time-series forecasting, etc.) or very
> conceptual (a system providing pertinent information on
> demand, based on incomplete and estimated data with
> only partial problem descriptions and widely dispersed
> information sources. (Snoyer & Fischer, 1993, p. 117)

An additional complication is the fact that many authors

who have written about DSS have used their own labeling

systems, and system vendors use new terms they believe will

improve the marketability of the product (Power, 2000). In

exploring this issue, Snoyer and Fischer (1993) listed 14

related and/or overlapping terms for similar systems and

attempted to help the reader make distinctions among them.

Bidgoli (1998) added that the systems used for the past 50

years to assist decision-making, including many hybrid

systems he described in his book, have a lot in common and utilize similar technologies. However, "Each system is designed with a unique goal . . . we call these systems collectively management support systems (MSS). Among these systems, decision support systems (DSS) and expert systems (ES) have been the most successful types of applications" (p. 1).

Keen (1981) limited the definition of the purpose of DSS, describing them as systems that "support, rather than replace, judgment in that they do not automate the decision process nor impose a sequence of analysis on the user" (p. 1). In describing DSS, McCosh and Scott Morton (1978) argued the need to distinguish the difference between DSS and management information systems (MIS), which didn't have a significant impact on management at all in their view. Yet, Watson and Hill (1983) cautioned against viewing DSS as a replacement for MIS, which they wrote "is still with us and . . . serving an important organizational role . . . to collect, update, maintain, and process data; provide scheduled and demand reports; respond to queries; and support structured decision-making, often through the use of models" (p. 86). DSS, they noted, were the answer to more challenging information needs that MIS can't handle.

In the literature defining management support technologies, labeling the technology is an important issue. Sprague and Watson (1979) attempted to "lend substance to the term DSS so that it does not become diluted to the point of uselessness or raise false hopes leading to unfulfilled promises like those of the early days of MIS" (p. 61). DSS must also be distinguished from several other buzzwords identified by Bidgoli (1998): "executive information systems (EIS), executive support systems (ESS), and executive management systems (EMS). Although their definitions and place among EDP, MIS, and DSS are still evolving, we consider these systems to be a branch of DSS" (p. 13). Holsapple, Tam, and Whinston (1988) identified expert systems (ES) as yet another specific type of DSS. Benbasat and Nault (1990) helped draw a distinction between DSS and ES by explaining that ES programming uses specialized knowledge about specific problem areas vs. general knowledge, and with the use of symbolic reasoning, "perform at a level of competence that is better than nonexpert humans" (p. 204). Bidgoli (1998) called ES a strong compliment to DSS "where human experts are rare, retiring, or dying" (p. 9). Power (1997) noted that to some, the term DSS is actually out of date and ready to be

replaced by yet another new acronym, OLAP (On-line

Analytical Processing). However, Power found DSS to "remain

a useful and inclusive term for many types of information

systems that support decision-making."

For the purposes of this study, a simplified

definition offered by Bidgoli (1998) will be used. Bidgoli

defined DSS as follows: "[W]e define DSS as a computer-

based information system consisting of hardware, software,

and the human element designed to assist any decision maker

at any organizational level. However, the emphasis is on

semi-structured and unstructured tasks" (p. 4). Bidgoli's

definition included six core requirements for DSS:

- DSS require hardware;

- DSS require software;

- DSS require human elements (designers,
  programmers, and users);

- DSS are designed to support decision-making;

- DSS should help decision makers at all
  organizational levels;

- DSS emphasize semi-structured and unstructured
  tasks.

Bidgoli's definition was chosen because it is a recently-

published, concise summary of definitions offered over time

by authors such as Alter, 1977; Bonczek, Holsapple,and

Whinston 1979; Ginzberg and Stohr, 1982; Gorry and Scott

Morton, 1971; Keen and Scott Morton, 1978; McLean and Sol,

1986; Silver, 1991; Sprague, 1980; Stabell, 1983; Watson

and Hill, 1983.

DSS Applications

Snoyer and Fischer (1993) wrote, "Perhaps the best way

to define a DSS is by describing the circumstances under

which one is needed. A typical user benefiting from a DSS

is a manager or business analyst (in finance, marketing,

general management, production planning, administration,

corporate planning, etc.)" (p. 117). Mackay et al. (1992)

identified four DSS application areas: product marketing,

taxes and auditing, strategic planning, and production or

inventory scheduling. Bidgoli (1998) added that this

relatively new part of the MIS concept (concurring with

Watson and Hill's 1983 argument that DSS is not a

replacement for MIS) is used throughout all managerial

activities and at all levels to improve decision-making

processes, which in turn improves communication,

interaction, and learning. Bidgoli pointed out that the

beneficiaries are not exclusively managers. Snoyer and

Fischer (1993) praised the application of DSS as

a data-rich extension of the traditional techniques of operations research and computer simulation. They allow the decision maker to use packaged approaches to all phases of problem solving, including problem formulation, choosing the relevant data, picking the approach to be used to generate the solution, and evaluating the solutions presented. They are "what if" systems with a large number of capabilities that are readily available. (p. 30)

Nagel (1993) provided a comprehensive discussion of

DSS packages and the rich variety of processes they can

facilitate. Nagel's discussion served as an update to Eom

and Lee's (1991) survey of DSS applications published

between 1971 and 1988. Nagel's examples included decision

tree software, which can explore alternatives in the

context of specific risk conditions; mulitcriteria

decision-making software, which can deal with decisions

involving multiple goals; linear programming software for

resource allocation decisions; statistical software for

generating predictions from factual data input; rule-based

software for choosing an alternative based on application

of programmed rules to a focused set of facts; and others.

Nagel cited as one of the most impressive new applications

the facilitation of "superoptimum solutions," where two

opposing sides in a controversy can use decision support to

arrive at a superior alternative (more desirable for all

parties involved) by combining goals and alternatives with the help of spreadsheet packages (pp. ix-xi).

Unstructured and Semi-Structured Decision-Making

Gorry and Scott Morton (1989) expanded the discussion of DSS applications in management by developing a framework to describe managerial activity in organizations, divided into two general categories: structured and unstructured decisions. Such a framework was necessary in order to classify management support systems and match them appropriately to management processes where they have relevance. The authors defined "structured" decisions as equivalent to data processing, such as in the areas of accounts receivable and budget analysis. Snoyer and Fischer (1993) noted that support for this type of decision is "at the base of the vast majority of operating computer systems" (p. 17), used primarily at lower managerial levels, and marked by well-established rules that make additional analysis unnecessary in most cases. Gorry and Scott Morton call these the "easily understood optimization problems," (p. 54) where only the details differ across organizations. These problem features make scientific models using clear-cut solution criteria useful.

Semi-structured and unstructured decisions are the arenas where DSS is most relevant and useful. Snoyer and Fischer (1993) explained,

> . . . the impact of DSS is on decisions where there is sufficient structure for computer and analytical aids to be of value, but where managerial judgment is essential. The payoff of a DSS is in extending the range and capability of managers' decision processes to help them improve their effectiveness . . . the relevance for managers is the creation of a supportive tool under their own control, which does not attempt to automate the decision process, predefine objectives, or impose solutions. (p. 116)

Frequently there is no sharp line between structured and unstructured decision support systems, since different decision tasks require different degrees of management input. Snoyer and Fischer (1993) helped draw the line by outlining some characteristics of unstructured managerial decisions, based on the nature of management: "The rules for executive decisions are constantly changing, and the importance of different data elements is completely variable over time" (p. 17). Therefore, DSS are called for because they can be used for planning, management control, or operational control and offer features listed by Watson and Sprague (1992) "the dialog . . . between the user and the system, the data . . . that support the system, and the models . . . that provide the analysis capabilities. While

the components differ somewhat from application to application, they always exist in some form" (p. 99).

Unstructured managerial decisions are well suited to DSS assistance because decisions of this type, as described by Gorry and Scott Morton (1989), share several specific characteristics. First, no routines have yet been developed to deal with the problem, and there may be disagreement or lack of clarity about how to even describe/define the problem. A logical extension of the situation is that there are no clear-cut procedures for generating solutions or evaluating their quality. Snoyer and Fischer (1993) offered examples such as "a search for a profitable area in business projections . . . or getting a feel for the effect of the variability or sensitivity of data" (p. 18).

Senior management can be characterized largely by the extent of the unstructured decision-making called for at that level of management: "The skills required of managers involved are analytical and reflective, rather than communicative and procedural" (Gorry & Scott Morton, 1989, p. 56). Executives in these situations take a much more active role; they "must supply both the problem definition and the key relationships that make up the model" (Gorry & Scott Morton, 1989, p. 56). Some ways to describe the

purpose of DSS in unstructured decision-making were offered by Snoyer and Fischer (1993): to "test ideas and theories [managers] have and confirm or reject their experiential feelings" (p. 19); and by Gallegos (1998): to help managers assess the probable impact of their decisions "by returning results based on 'what if?' questions, or assumptions about future conditions" (p. 44). Gorry and Scott Morton identified strategic planning as a major category of unstructured decision-making, in which managers set policies and objectives and choose resources to accomplish them. This type of decision, which would include areas such as new product planning and R & D, has the greatest potential impact on organizations.

Bidgoli (1998) discussed other categories of unstructured decision-making where DSS assistance is relevant, including goal-seeking, which he called the reverse of what-if analysis. An example is a manager asking "How much should I charge for a particular unit in order to generate $200,000 profit?" (p. 7). Two other categories are sensitivity analysis (using DSS to analyze different variables, such as how much overtime the organization can pay and still be cost effective) and exception reporting (monitoring the performance of variables that lie outside a

specified range, such as a production center exceeding its budget).

Snoyer and Fischer (1993) placed semi-structured decisions primarily at middle levels of management, where decision support systems usually serve a more "advisory" purpose:

> The results are reviewed carefully against knowledge and recent experience, and the answer received may be accepted, modified, or rejected. A manager is assured that at least a certain calculation was performed against specific, known, recent data, and that the result was calculated in a consistent way. The manager then has the option of modifying the system or the data, and of changing the structure of the decision-making algorithm. The system may be changed repeatedly until it gives more reasonable or sensible results, in the opinion of that manager at that time. There also may be a considerable analysis undertaken to examine the sensitivity of the system to changes in data or analytical method. The system may be fine-tuned or even dramatically changed at the request of the manager using it. (p. 18)

Snoyer and Fischer identified tactical decisions as a major category of semi-structured decision-making, which is generally undertaken in an effort to ensure organizational effectiveness. As an example, the authors cited Chrysler Corporation's decision to limit the length of its K car to make transporting it more efficient. Their example of a specific DSS application that would apply to tactical decision-making was analysis of old/new product price

sensitivity, as compared to "classical MIS" support such as marketing-information databases and the like.

Santhanam, Guimaraes, and George (2000) described what they called Organizational Decision Support Systems (ODSS), which are similar to, but much larger in scope than, DSS. They are mentioned here because ODSS bridge the decision-making functions and users described in this section by supporting "interdependent decisions made by many individuals with multiple interests" (p. 53). They can be considered both a type of MIS (an information provider) and DSS (source of decision models) and can facilitate interaction among work teams.

Types Of DSS

Alter (1980), citing the overlap between DSS and EDP and the variety within the DSS category alone, asserted the necessity of a classification system to highlight core DSS features and variations. The organizing principle behind the taxonomy he eventually developed was "degree of action implication of system outputs" (p. 73), or the degree of input into the final decision on a continuum from "extremely data oriented" (retrieving a single piece of information) to "extremely model oriented" (actually making decisions). His research consisted of survey data for 56

systems with DSS characteristics, which he synthesized into a seven-category taxonomy of DSS types, listed below with key functions summarized in parentheses:

1. File drawer systems (immediate data access)

2. Data analysis systems (manipulation of data using operators)

3. Analysis information systems (access to databases and simple models)

4. Accounting models (calculation of decision consequences)

5. Representational models (estimation of decision consequences based on "nondefinitional" models)

6. Optimization models (generation of optimal solutions within preprogrammed constraints)

7. Suggestion models (performance of processes leading to a decision suggestion for a structured task)

Zachary (1986) proposed a new classification system in answer to the limitation he perceived in Alter's model as one that applied only to commercial management applications. Zachary's aim was to "integrate . . . partial schemes into a larger classification . . . without giving preference for specific application domains or contributing computational disciplines" (p. 27). Zachary's

resulting scheme was based on types of decision aids and the nature of support they provide: process models for prediction; choice models integrating particular criteria across various alternative choices; information control techniques (storage, retrieval, etc.); representational aids for expressing and manipulating problem representations; analysis/reasoning aids; and judgment refinement techniques.

Power (2000) argued that Alter's taxonomy is still useful, but agreed that it is not comprehensive; it could not account for differences in decision perspectives or functional areas in which problems arise. Power proposed another new, expanded taxonomy, this one focusing on helping managers understand "how to integrate, evaluate, and select appropriate means for supporting and informing decisions," while acknowledging that DSS classification is still evolving. Power's organizing principle was the dominant technology component ("driver"), with three secondary dimensions: targeted users, system purpose, and main deployment technology. Power arrived at the following DSS categories.

1.   Data-driven DSS (access and manipulate large databases of structured data; range in complexity from

simple query and retrieval tools to data-driven DSS with

Online Analytical Processing (OLAP) for access to large

historical databases)

    2.   Model-driven DSS (use accounting, financial, and

other types of models to provide statistical and

analytical assistance that isn't data-intensive)

    3.   Knowledge-driven DSS (Power's tentative term for

a system that can use "specialized problem-solving

expertise" to make decision suggestions or recommendations)

    4.   Document-driven DSS (a relatively new system;

assists in retrieval and management of Web pages and

unstructured documents such as product specifications and

catalogues)

    5.   Communications-driven DSS (enables collaborative

communication among workgroups)

    6.   Function-specific/General purpose DSS

(prepackaged or customized systems that support decision-

making in specific industries and organizational functions)

    7.   Inter-organizational/intra-organizational DSS

(links stakeholders to organizations' intranets or other

points of access to DSS support, for example a customer

needing assistance designing or choosing a product)

8. Web-based DSS (may include any of the other seven types if the support information is delivered via a Web browser).

DSS Technical Components

As Bidgoli (1998) noted, a microcomputer serves as the core of all of these DSS categories as a stand-alone system or workstation that connects the decision maker to information from internal and external databases. Snoyer and Fischer reported in 1993 that at a time when managers' use of computer analysis was rapidly broadening, DSS was "usually thought of as package programs that are put on a micro or mainframe, and used with personal files of data or selected data extracts" (p. 10). They argued that this view was rapidly becoming outdated because "complex central systems are now often used, the terminals or micros are networked, and there may be on-line interaction among a small management analysis and review system and mainframe systems" (p. 10). They predicted that as managers became more and more familiar with computers and saw the value of smaller systems, they would "want access to more complex systems, either run by subordinates or used with simple instructions by themselves" (p. 10).

Their prediction has been born out by the developments in hardware and software since 1993, as shown in Power's technology-based DSS taxonomy and Bidgoli's (1998) discussion of DSS software. Bidgoli identified two overlapping product categories, modeling and data-management. He reported that both categories are available in both mainframe and micro-based forms, with the latter being somewhat less powerful but closing the gap. He provided a list of both types of products available on the market at that time. Snoyer and Fischer (1993) advised that the nature of the corporate culture, as well as individuals' information needs and computing capabilities, should not be left out of the picture.

Power (2000) suggested additional DSS selection guidelines, identifying as a key issue "the DSS architecture and networking design component . . . how hardware is organized, how software and data are distributed in the system, and how components of the system are integrated and connected" (p. 11). Power offered, for example, considerations specific to selecting and structuring software for data-driven, document-driven, and knowledge-driven systems; although they are similar, database capacity needs and capacity to handle novel

situations would be two considerations. Nagel (1993)
explored the complexities of decision software and models
and provided numerous examples and a discussion of
comparative benefits of the various types.

<u>Weighing the Costs and Benefits of DSS</u>

This section will explore the methods applied in
researching the practical results of DSS in organizations.
In doing so, it will attempt to find an answer to this
question: Have DSS been shown to be effective in improving
managerial decision-making?

<u>Defining Decision Quality</u>

When Keen and Scott Morton wrote in 1978, they
identified performance evaluation as the most difficult
aspect of DSS development and deployment. At that time, DSS
was relatively new, and the normal pressures of the
business cycle, then and now, discourage analysis. The core
question in evaluation, however, is whether or not DSS lead
to "better" decisions (p. 215). Keen and Scott Morton
argued that the centerpiece of the definition of good
decisions should be a distinction between efficiency and
effectiveness. Efficiency, performance of given criteria,
is not a worthy goal if the criteria for "good" performance

were poorly chosen to begin with; emphasis on effectiveness

ensures wise selection of criteria. Keen and Scott Morton's

definition of effectiveness included a "detailed

understanding of the variables that affect performance" (p.

10).

Massey, 1991 cited four components of decision

performance generally agreed to be the most direct way to

operationalize the concept of effectiveness. The

components, some of which are incorporated into the survey

instrument in the present study, include decision

cost/profit, time spent in decision-making, quantity of

decisions considered, and confidence in the decision

itself. Alter (1980) listed several specific components of

effectiveness DSS should facilitate in order to be

considered effective systems, including personal

efficiency, expedited problem-solving, effective

interpersonal communication, promotion of

learning/training, and increased organizational control

over processes.

Nagel (1993) concurred with other sources in

identifying effectiveness as the "basic 'goodness'

criterion for technologies in general" (p. 8). His

discussion focused on evaluating the system itself and its

effectiveness in optimizing information use, arguing that making a good decision alone-the outcome-is not a useful evaluation criterion since decision outcomes are influenced by some factors outside the control of the decision maker and any DSS the decision maker employs. Harris (1998) added further support for this argument, also asserting that notions of decision quality should be separated from decision outcomes; good decisions can have bad outcomes and bad decisions (defined as those based on inadequate information and mismatch with outcome goals) can still have positive outcomes. Harris, further, outlined various decision types, desirable phases of decision-making, and some features of "good" decisions. These included achieving compatibility with stated objectives; using a process of meeting objectives that realistically considers "cost, energy, side effects" (p. 7); and paying attention to indirect benefits or "byproducts" of the decision (p. 7).

Measuring Decision Quality

Decision quality is largely context dependent, so Keen and Scott Morton (1978) offered eight evaluation methodologies that readers could match to specific situations. They suggested that it is better to apply a

variety of methodologies rather than only one. They
proposed eight decision quality measures all together:
decision outputs (measuring actual decision results);
decision processes (evaluating the way decisions are made);
managers' perceptions of decision processes (evaluating
cognitive processes involved in learning and decision-
making, including knowledge, perceived understanding,
etc.); procedural changes (examining physical, as opposed
to cognitive, procedures involving resources, machines,
etc.); cost/benefit analysis (measuring tangible and
intangible costs and gains in areas such as salaries, time,
psychological responses to change, etc.); service measures
(measuring in service terms such as system responsiveness,
convenience, and reliability); assessing managers'
perceptions (gathering managers' opinions about the
system's value); and anecdotal evidence (collection of
insights, opinions, examples, etc. by a skilled observer).
Akoka (1981) developed a new DSS evaluation framework--or
at least took "a first step toward a more comprehensive
model of the evaluation process" (p. 141)--by expanding and
restructuring work by Scott Morton and others. Akoka's main
purpose in proposing the framework was to match different
DSS types/features with appropriate evaluation strategies.

Akoka's contribution helped move DSS evaluation from a somewhat piecemeal approach, or "smorgasboard" as he called it (p. 140), to a more structured evaluation system that better integrated methods of evaluation with the specific features of the DSS systems being evaluated.

Several studies argued for a focus on aspects other than outcomes (decision quality). Keen (1981) dismissed cost-benefit analysis as a worthwhile DSS evaluation method because of the problems inherent in using quantitative methods to measure qualitative benefits such as "stimulation of ideas" and "improved communication" (p. 1). He proposed an alternative means of evaluating DSS proposals, value analysis, which would evaluate DSS's potential as an "investment for future effectiveness" (p. 2). The study did not address methods of evaluating effectiveness of decisions after implementation and use. Mahmood and Sniezek (1989) conducted a field study of DSS managers and practitioners for the purpose of developing a valid, reliable instrument for measuring satisfaction with DSS. They constructed their instrument to evaluate specific functions such as handling unstructured vs. semi-structured decisions and evaluating decision choices. They concluded that their findings support the possibility that such an

instrument can and should be developed. Furthermore, they discovered that although the study suggested differences of opinion among user groups, the results supported the idea that DSS provides useful support for strategic planning. The study also spoke to the issue of managers' expectations for DSS, favoring the argument that DSS should "support rather than . . . automating decisions" (p. 267). Bidgoli (1989) focused on evaluating DSS products for selection rather than evaluation methods for assessing the outcome of DSS use.

A review of research by Sharda, Barr, and Mcdonnell (1988) helped reconstruct the practices used in DSS research methods by reviewing studies to that date in four methodological categories: case studies, field studies, field tests (which, unlike field studies, involve experimental design and control of variables), and lab studies. At the time of the publication, the authors stated that case and field studies formed the basis of most of the claims about DSS effectiveness, while field studies (Alter, 1980; Dean, 1968; Gallagher, 1974; Garrity, 1963; Keen & Scott Morton, 1978) and lab experiments were relatively rare. In focusing their analysis on the latter, the authors found the results of the studies as a group inconclusive

but argued the possibility of confusion due to factors other than the systems themselves. For example, they drew a distinction between "hard measures" of decision quality (p. 144), such as income and market share, and subjective ratings, which they considered an inaccurate method of evaluation. They also suggested the superiority of longitudinal studies in evaluating the type of system, such as DSS, that is used on more than one occasion; lack of longitudinal data could account for why experiments showed no significant performance improvement due to DSS. Finally, some of the studies did not permit participants to interact directly with the system or with a group, as is typical in many decision situations. The following section will describe methods used by these authors to address the shortcomings of earlier research and summarize more recent empirical studies that attempted to evaluate the effectiveness DSS after application in various types of organizations.

Empirical Studies of DSS Effectiveness

A review of the empirical literature on DSS revealed that the results of attempts to measure effectiveness are equivocal, as there is no single, well-established criterion for measuring effectiveness (Hammond, 1989; Todd

& Benbasat, 1999). Sharda et al.'s own study (1988), in attempting to address the flaws they perceived in earlier studies, tested five hypotheses to construct their definition of decision quality. Using the categories that would become standard tests of effectiveness, they hypothesized that DSS users would accomplish "higher profit" decisions with less variation among groups in less time; they also hypothesized that DSS groups would generate more alternatives and have greater confidence in their decisions. They found that decisions initially took longer as groups learned the system, but, overall, the findings were "in the hypothesized direction" (p. 154) if not all statistically significant: greater decision-making performance was the result they emphasized. Results of an experiment by Power and Aldag (1986) also reflected positive attitudes and increased confidence on the part of the subjects (business students) who used a decision assistance program to help them prepare decision reports. However, the study added analysis by independent raters to compare decision performance with and without decision support; raters' responses to the reports suggested no difference in decision quality; therefore, the authors concluded that "to this date . . . claims of improved

decision quality must be taken primarily on faith" (p. 586) and that more research was needed.

As this review of literature demonstrates, DSS studies have varied considerably in the nature of the thought process and decision task at the center of each study. An early landmark series of studies called "The Minnesota Experiments," reported originally in Dickson, Senn, and Chervany (1977), was conducted between 1970 and 1975 and focused on the relationship between a variety of information system characteristics and decision quality. For example, complex/"unfamiliar" (p. 921) features correlated with low user confidence and satisfaction; graphics correlated with a perception of better decision-making; and interactivity correlated with increased receptiveness to the systems. Therefore, the studies were most useful for what they showed about the effect of various characteristics on elements of the decision process and the suggestions for effective DSS design they produced.

Benbasat and Nault (1990) wrote "An Evaluation of Empirical Research in Managerial Support Systems." The article reviewed 15 studies dealing specifically with DSS. The studies focused on various applications for DSS such as decision-budget planning or ill-structured marketing

problems. Some studies were interested in gauging DSS

effect on specific processes such as brainstorming; some

examined specific aspects of decision quality such as

"degree of creativity" and "attitudes toward DSS." Some

examined the influence of system features such as the

graphical presentation of model, degree of interactivity of

decision aids, etc.

By the date of publication of Benbasat and Nault 1990, a

variety of dependent and independent variables had been

tested in DSS research, but the authors found the research

to be flawed in several significant ways. The most serious

flaws were the lack of a theoretical foundation to give the

studies a clear rationale for the selection of variables

and lack of adherence to a specific research paradigm.

Benbasat and Nault argued, "There is a need for theories to

predict how MSS influence decision-making, to formulate

hypotheses, conduct research in a directed and parsimonious

manner, and to interpret and integrate findings" (p. 218).

They noted that one supportable conclusion to emerge was

that some DSS are more useful than others. Pointing out

another flaw in the research to date, they noted that this

was not a useful conclusion because the research made no

effort to explain why this was the case. The differences in

effectiveness could be attributed to DSS features such as complexity of functions and degree of available user support, or to research flaws such as lack of pilot tests or poor experimental design (especially lack of DSS training for study participants). Alavi and Joachimsthaler (1992), in another empirical review of DSS literature, argued the need for studies of interaction effects among variables influencing DSS implementation.

Eierman et al. (1995) attempted to fill the gap in theoretical groundwork with their publication "DSS Theory: A Model of Constructs and Relationships." They merged elements of theory proposed by Dubin (1969), Kaplan (1964), and Weick (1984) with eight constructs used in previous literature to describe DSS. Because only about half of the relationships among these constructs had yet been examined in previous literature on DSS, the authors argued that they had contributed an important step in offering a comprehensive but not rigid framework for use in establishing parameters for future research.

Several studies have attempted to shift research focus from decision quality to the effect of DSS on decision processes, or, vice versa, the effect of environmental variables and attitudes on DSS effectiveness. Mackay et al.

(1992) found a number of variables that influence the
effect DSS has on decision processes. One of their purposes
was to de-emphasize time spent arriving at the final
solution (a popular variable involved in assessing
decision-making effectiveness) in favor of time taken at
each stage of the process of problem solving. By
manipulating the effort and costs associated with each
problem-solving strategy, Todd and Benbasat (1999)
investigated the possibilities of improving DSS design to
guide users to actually change their approaches to
decision-making. Kanungo, Sharma, and Jain (2000) placed a
similar emphasis on DSS users in their experimental study
of DSS in credit appraisal in a large commercial bank in
India. In their use of multiple measures, they found that
DSS improved decision-making in the categories they
investigated, such as helping organize managers' thoughts,
increasing objectivity and learning, etc. Kanungo et al.
concluded that DSS is indeed effective, or at least has the
potential to be, but cautioned that environmental factors
can make or break the systems' success. They asserted that
in the context of India's banks, "the confluence of . . .
perceptions and beliefs has inhibited the growth of DSS"
(p. 430). The authors concluded with a call to improve

research methodology rather than DSS itself, pointing out flawed features of their own experimental design that made it impossible to differentiate between DSS treatment effects and the effects of management itself.

Dean and Sharfman (1996) offered an examination of decision-making processes that focused on two environmental variables common to strategic decision-making: procedural rationality (compatibility between decisions and organizational goals) and political behavior (use of misinformation and self-protection). Their findings supported the general hypothesis that decision processes influence decision effectiveness.

Gatian (1994) contributed to the discussion on the applicability of overall user satisfaction as a criterion for measuring decision effectiveness. In a study investigating the correlation of perceived effectiveness with actual performance, she concluded that there is a significant relationship and thus, construct validity.

Barr and Sharda (1997) attempted to determine why DSS results in higher quality decisions. Their discussion contributed to an examination of another side of user satisfaction, the possibility of false and exaggerated perceptions of DSS effectiveness. One positive use of DSS

is as an antidote to information overload, which frees

managers to focus on their priorities and general strategy

rather than the mining of specific information. The authors

hypothesized that this shift in focus leads to increased

brainstorming, better communication, etc., which in turn

leads to a "development effect" (p. 134) (development of

managers' overall understanding of the complexities of

problem solving). A second outcome, for which this research

also tested, was the "reliance effect," which is the

opposite of the development effect. The reliance effect is

displayed when managers become dependent on DSS for their

accuracy and easy accessibility to variables and solution

alternatives rather than increasing their own capacity for

problem solving. The former would increase long term

problem solving effectiveness, while the latter would

decrease it. The research found evidence of both effects,

but attributed improved decision effectiveness more to

reliance than development, as shown in the demonstration

that performance deteriorated when the system was taken

away.

Barr and Sharda's findings reinforce the results of

two earlier studies, those of Todd and Benbasat 1992 and

1993, whose experimental research suggested that DSS does

not lead to better decision-making overall because managers tend to use it to minimize effort (reduce information overload), not maximize thoroughness and depth of consideration (increase information processing capacity).

Chu and Spires (2000) argued that previous studies focusing on "effort minimization" (p. 285) were guilty of oversimplification, offering their own findings regarding decision behavior: "a more accurate characterization is that effort and quality play a joint role, in the sense that they are traded off, in determining strategy selection" (p. 285). They argued that decision makers may expend more effort on computerized decision aids if they perceive them to expand their own cognitive capacity or to offer a favorable cost-benefit relationship.

Davis and Kottemann (1994) reported another phenomenon involved in constructing exaggerated perceptions of DSS effectiveness, "illusion of control." Their experiments located the problem in the use of a specific, popular type of decision support, what-if models. Forgionne (1999) addressed Davis and Kottemann's specific findings and pointed out the frequency of contradictions between experimental findings questioning DSS effectiveness and case studies supporting positive assessments. He concluded

that experimental research tends to oversimplify assessment
of DSS, which requires multiple-criteria evaluation models,
and called for the development and empirical testing of
such a model.

Dissertation Research

Several studies have used laboratory settings, which
Massey (1991) argued to be an appropriate setting for
focusing on effectiveness. Massey's results, a positive
indication of effectiveness, were based on subjects'
performance on a range of tasks (data to model oriented) to
measure the four-part effectiveness construct (cost vs.
profit, time spent, alternatives considered, and decision
confidence) along with appropriateness of fit between DSS
and task. Hammond (1989) used a similar approach to
determine the effectiveness of DSS in an unstructured
problem situation and reported positive results. Burkhard
(1984) examined decision effectiveness in a laboratory
setting using students assumed to behave similarly to
credit union managers in a work setting. A small sample
(22) of DSS users showed marginally improved effectiveness
compared to the control group (MIS users) based on measures
of productivity, process, and perception, but weaker

perceptions of effectiveness of the tool compared to the control group.

Other studies have focused on user attitudinal factors. Christensen (1987) used behavior theory to isolate problems that arise during DSS implementation. The study aimed to construct a theoretical framework to explain and predict DSS success or failure based on user intentions and actual behavior. The study looked at effectiveness as a function of user beliefs, expectations, and social relations that determine the success of DSS use. The analysis of survey results contributed new scales of measurement to apply in assessing constructs related to DSS and their users. Christensen found intention to be a significant predictor of actual use. Another dissertation focused on user attitude was Bingi's (1995) study, which developed a conceptual model to demonstrate the relationship between decision aids and decision confidence and the relationship between decision confidence and successful decision implementation. These are concepts Bingi argued should be considered equally important in the literature on DSS effectiveness measures as decision quality. Bingi presented experimental results that enforced the conclusion that because decision quality makes little

difference to an organization if implementation efforts are poor, implementation effort is highly (if not exclusively) significant to decision success.

One study (Parikh, 1998) aimed to develop a framework for enhancing traditional DSS, and by extension, effectiveness. The core of Parikh's enhancement framework was adaptation (to user's situational needs, to user's knowledge, to changing problem situation tasks, and to changing problem contexts). Parikh proposed that such adaptability could elevate decision support from "mundane" (p. 108) to appropriate for high-level cognitive activity.

DSS: Costs vs. Benefits

Bidgoli (1997) summarized the difficulties in making any definitive statements about DSS benefits over costs:

> The costs and benefits of DSS are difficult to assess, because these systems are aimed at effectiveness rather than efficiency and because they are said to facilitate, but not directly cause, improvements. How does one assign monetary values to facilitating interpersonal communication, or expediting and improving problem-solving activities, or receiving information in fifteen minutes as opposed to two hours? (p. 285)

However, Bidgoli (1998) pointed out that DSS can usually be developed from an organization's existing resources; therefore, "One may assume that the cost of developing a DSS compared to its benefits is minimal" (p. 13). "ABB:

Decision Support System" (2000) added this example to illustrate ways in which DSS can lead to more cost-effective business practices: "DSS enables the user to make decisions for more consistent and efficient operation and to monitor and manage costs of producing high-quality goods. Near real-time display of operating data, detailing range stops and associated downtime, eliminate major causes of downtime." When considering MSS overall, Bidgoli argued, the literature supports the viewpoint that significant savings and payoffs result from MSS, and their benefits outweigh costs.

Klein and Hirscheim (1985) noted that "there appears to be an implicit assumption on the part of DSS writers that DSS are beneficial to organizations and the DSS intervention process is not inherently polemic" (as cited in McLean & Sol, 1986, p. v). Breaking down the presumption of benefit more specifically, in spite of mixed empirical results, the DSS literature generally assumes that better information/decision processing capabilities will lead to greater depth of analysis, greater efficiency in the process, and better decisions as the outcome (Todd & Benbasat 1993). Sharda et al. (1988) wrote that this conclusion seems "intuitively obvious." Barr and Sharda

(1997) followed up by including belief in DSS benefits as one of the constructs in an empirical study of DSS performance.

This section will examine some ways the literature evaluated DSS based on the perceived value of intangible benefits, not just quantifiable benefits and dollar costs. Snoyer and Fischer, 1993, help define "value" in a management context:

> If a system simply profiles available reports, there is no direct strategic value in the system itself. It is unlikely that there will be any sustainable business gains from the MSS. If its use leads to business value, however, the action of going through the process can be profitable to an executive. A good MSS can promote more effective and efficient management of a firm. It has the primary benefits of consistency of data, efficiency and flexibility of use of the data, and clearly improved understanding of the information. The MSS is a value-added feature in that it improves the content, format, and timeliness of the information supplied. If the EIS is used in a manner that supports the management style and philosophy of an executive, it can have a measurable strategic advantage. (p. 15)

In discussing the issue of DSS benefits, it seems that perception is also a key: "A DSS is said to have achieved its goals if employees find it useful in doing their jobs" (Bidgoli, 1998, p. 13). Snoyer and Fischer (1993) added that increased communication and interaction among clients, organizations, and employees brought about by DSS has

improved the way decision makers view themselves and their

jobs, as well as the way they spend time.

Survey and case study researchers have identified many

intangible features of DSS that organizations find to be of

value. Keen (1981) used case study research to compile a

list of frequently cited DSS benefits and examples from

organizations. The list of benefits includes the following:

1.   Increase in number of alternatives examined
2.   Better understanding of the business
3.   Fast response to unexpected situations
4.   Ability to carry out ad hoc analysis
5.   New insights and learning
6.   Improved communication
7.   Control
8.   Cost savings
9.   Better decisions
10. More effective teamwork
11. Time savings
12. Making better use of data resources
(pp. 7-8)

Anecdotal evidence from the case studies included examples

of DSS successes such as "Previously took weeks to evaluate

a plan; now takes minutes, so much broader analysis"; "DSS

alerted managers that an apparently successful marketing

venture would be in trouble"; "Model revised in twenty

minutes, adding risk analysis; led to reversal of major

decision made one hour earlier"; "A marketing manager faced

with an unexpected budget cut used the DSS to show that

this would have a severe impact later" (p. 7). General

testimony in favor of DSS included praise such as "Sensitivity analysis takes 10% of the time needed previously"; "DSS is used to train managers; gives them a clear overall picture"; "Now able to see relationships among variables"; and "Allows a more elegant breakdown of data into categories heretofore impractical" (p. 6).

As the literature makes clear, DSS advantage doesn't have to be discussed in terms of "all or nothing" success. Mackay et al. (1992) explained that problem solving permeates management at all levels and called DSS a success if it improves decision quality or facilitates the process at even one stage in the problem-solving process. They pointed out that different elements of DSS may support different stages of the process for any specific problem-solving task. This argument is also supported by literature that addresses the nature of the current business environment, as described in the next section.

Nature of the Business Environment

Bonczek, Holsapple, and Whinston (1981) placed decision support in the context of the new "information age." As these authors described it, the information age is characterized by the dramatic growth of information volume and complexity. Even then, they noted that "the

interdependence and rapidity of information processing are

unprecedented" (p. 3). In 1998, Smith described decision-

making in the business environment in terms such as

"trauma," complexity," and "chaos." The implication was

that by then, any DSS was better than none in helping

decision makers deal with the challenges of managerial

decision-making:

> The creation and use of DSS will become increasingly
> important to decision makers because of the increasing
> complexity and rapidity with which responses must be
> made. Modern business and military environments
> present complexities that mean that many decisions are
> required in situations that are unfamiliar to even the
> most experienced decision makers" (p. 13)

One of the implications of the situation is greater stress

proportional to the deadline, significance, and

"irreversibility" of the decision.

Peters 1987 (as cited in Smith, 1998) predicted that

managerial success would more and more hinge on the ability

to thrive in a state of chaos. Dealing with chaos would

require "improved structured decision processes that can be

embedded in a DSS. . .;" with DSS, "decision makers will be

supported in their efforts to gather and evaluate data in a

behaviorally relevant manner (to each specific user)"

(Smith, p. 14). Another way to evaluate the advantages of

using DSS, then, is by using Smith's criteria of the "fun"

of using the systems and the personalization of systems:

evaluation based on the degree to which DDS serve as

counterbalances to the stress of making decisions.

Another key phrase in Smith's (1998) discussion of DSS

benefits was clarifying uncertainty:

> Generic uncertainties such as economic uncertainty
> (e.g., the price of oil or wheat next year),
> technological uncertainty (e.g., rapid advances in
> computer and telecommunications technologies),
> competition uncertainty (e.g., software competition
> among companies worldwide), and consumer uncertainty
> (e.g., growing consumer options requiring just-in-time
> material for flexible manufacturing systems) are
> creating gross uncertainties in potential outcomes and
> choices, creating a new definition for the winners in
> our society. (p. 5)

Smith offered DSS as an effective response to uncertainty

with more and better information input into the decision

process, thus, as Todd and Benbasat (1993) pointed out,

reducing the cognitive effort involved. Nagel (1993)

elaborated on the cognitive benefits of DSS, listing among

others increased stimulation of ideas; ability to handle

multiple goals, alternatives, and relations; ability to be

a better predictor of future outcomes; ability to deal with

more diversity of topics; and improved ability to teach

concepts to others.

Expansion of Decision-Making Responsibilities

An additional fact of organizational life today that supports expanded use of DSS is the expansion of decision-making responsibilities. Smith (1998) pointed out that in many specific decision situations, "domain experts" may be novices. Smith pointed to authors like Peters (1987) and Covey (1991) who had written popular works describing the trend of organizations restructuring according to a "flatter" model that made company hierarchies more horizontal. This new employee empowerment resulted in more decision responsibilities being delegated to employees at lower positions in the organization, sometimes to people in non-managerial positions. Smith argued for the importance of DSS in providing the training employees needed to help them handle their new responsibilities. He added that "it should also assist them in creating, testing, evaluating, and finalizing new ideas to improve the organization's quality and responsiveness in its products and/or services" (p. 14).

Obstacles to Using DSS

Snoyer and Fischer (1993) outlined a number of reasons why managers may resist DSS or adopt DSS with less than

successful results in spite of enthusiasm for it in the literature and in other organizations. Although EIS and DSS development and implementation is easy for computer specialists, there are many managers for whom the idea is still new. Therefore, the authors identify as the major potential problem the lack of understanding about DSS systems within an organizational culture: "If the idea of using equations and computers to produce acceptable answers to business problems is strange to management, then it will take a great deal of successful demonstration and a prolonged sales effort" (p. 11). Specific areas of conceptual and attitudinal resistance Snoyer and Fischer addressed include the following:

1.   Misconceptions about the effort and time involved to use and control a DSS system (often unadressed due to brief, inadequate training)

2.   Misconceptions about how the system works and the benefits it can provide

3.   Perceived mismatch between managers' understanding of their corporate cultures or their roles in the culture and the new system as alien to those images or roles (for example, belief that analytical work should be left to subordinates)

4.   Mismatch between technology available to senior

management and subordinates

Snoyer and Fischer advise that culture plays such a

significant role in the success or failure of DSS adoption

that existing attitudes should determine at what level such

a system is first introduced. For example, they argued, "If

the notions are foreign to the thought processes of

management, the only reasonable way to proceed is to start

with DSS systems at the lower analytical levels. Their

successful use will then filter slowly upward. This is a

good approach, because if the use starts at the top before

those at lower levels are familiar with the new way of

thinking, a difficult problem can be caused" (p. 12).

Resistance to change can also be overcome by "supplying a

great deal of support and hand-holding, and by giving one-

on-one instruction to the managers" (p. 12).

The Future of DSS

In 1979, Sprague and Watson wrote that the evolution

of DSS was pointing to the eventual creation of "the type

of system that truly approaches the objective of

comprehensive information systems-to directly support the

decision-making process at all levels and in all areas of

the organization" (p. 67). Almost 20 years later, Bidgoli,

1998, helped place into perspective the extent to which that promise had been fulfilled: "The power of these systems has been demonstrated in the business world, leading many to conclude that DSS is the way of the future. The decreasing cost and the increasing sophistication of both hardware and software have made these systems available not only to large organizations, but small businesses as well" (p. 4). Still, the consensus in the literature is that there is room for improvement in both the technology of DSS and in the human factor—the number of users as well as the effectiveness of the way they are using DSS. Below are excerpts from the arguments Keen made in a keynote address at DSS '87, the Seventh International Conference on Decision Support Systems:

- We must break down the artificial barriers and extend the systems environment for managers. The DSS experience base is invaluable, but the new agenda is *enhancement of support capabilities*. Give managers new targets, technologies, and techniques for effectiveness. We must no longer look at management support systems in a self-limiting way. Using new hardware/software, methods, and approaches, a move must be made away from the limited domains of simple decisions.
- Nontraditional techniques, such as document-based transmission (videotex), telecommunications systems, and power tools such as expert systems, need to be exploited.

- Techniques need to be improved, making use of newer hardware and software advances and not simply staying with spreadsheets.
- DSS, EIS, MIS, management science, end-user computing, expert systems, and office technology cross over into one another. Their interacting advantages are waiting to be exploited.
(cited in Snoyer & Fischer, 1993, pp. 10-11)

More recent discussions show that many of Keen's points are still relevant in 2001. Regarding technological components, Bidgoli (1998) outlined the two major factors that would influence the future of DSS: hardware (improved telecommunications and networking, higher-powered desktop computers, the Internet's impact on speed and cost of information transfer, and the possibilities of integrated DSS and artificial intelligence); and software (cheaper, more powerful, graphics and menu-driven programs with a high degree of user friendliness and integration among MSS applications). Carlsson and Walden (2000) also used Keen's points to make some projections and recommendations for DSS design and research. They called for integration of DSS technology with Intelligent Software Agents, which will further customize the systems and information-retrieving features to individual users, and which will assist in the development of more advanced research tools to "further understanding of decision-making, problem solving, and

planning processes in complex environments which have not been accessible for systematic studies with traditional research instruments" (p. 147).

Implications for Executive Action

Bidgoli's predictions addressed not just DSS systems but also DSS users, managers, whom he foresaw continuing to become more comfortable with computers and computer support: "The users of computers will be anybody, not just hardcore computer scientists" (1998, p. 21). For this reason, some authors have placed the future of in the hands of managers themselves. Rockart (as cited in Snoyer & Fischer, 1993) argued for managers taking on five responsibilities related to expanding and better utilizing the capabilities of DSS:

1. Capitalize on available technology and support to initiate more discussion and knowledge of resources.

2. Provide the facilities necessary for information support to occur

3. Develop the relationship between decision makers and designers: Get personally involved in systems design by working with specialists to make sure the system meets

needs and expectations and suits the existing style of management

4.   Establish an "information support organization" to assist executives and staff in using the system.

5.   Think carefully and thoroughly about how any changes in information distribution will reach and impact other parts of the organization.

Bidgoli (1998) argued the importance of managers taking on these responsibilities with the following appeal that connected managers to the promising future of DSS itself: "The ability of DSS to meet the decision makers' needs with ever-increasing effectiveness will ensure their continued existence. In the ultimate sense, we regard DSS as the most significant, current frontier in the organizational application of computers" (p. 20).

The review of literature in the field of decision support reveals two overarching patterns. One is the ambiguity in the empirical research that has attempted to "prove" the benefit of DSS. The other is that the field of management believes in DSS. The conceptual literature reveals a tone of enthusiasm for DSS and consistently assigns great weight to DSS' potential impact as a tool of

effective management. Both patterns provide a rationale for further study of the type proposed in this research.

CHAPTER III

METHODOLOGY

In this chapter, the population selected for survey participation and the methods employed to construct a valid survey are described. The chapter also summarizes the researcher's procedures for distributing the survey, ensuring a high rate of return, and analyzing the response data.

Survey Validity

Correspondence to Research Questions

The survey instrument consisted of 26 questions to correspond with all 8 of this study's research questions. The Survey, included in Appendix A, corresponds with each research question as follows:

- Questions 1, 2, 3, 4, and 5 to Research Question # 1: To what extent does the Saudi private sector utilize DSS?

- Question 6 to Research Question # 2: What factors have enhanced DSS implementation in the Saudi private sector?

- Question 7 to Research Question # 3: Are there any obstacles to DSS implementation in the Saudi private sector?

- Questions 8, 9, 10, and 11 to Research Question # 4: Does utilizing DSS in the Saudi private sector affect the perception of information quality?

- Questions: 12, 13, and 14 to Research Question # 5: Does utilizing DSS in the Saudi private sector affect the perception of variety of alternatives?

- Questions 15, 16, and 17 to Research Question # 6: Does utilizing DSS in the Saudi private sector affect the perception of time required to consider decisions?

- Questions 18 and 19 to Research Question # 7: Does utilizing DSS in the Saudi private sector affect the perception of the cognitive effort required to make decisions?

- Questions 20, 21, and 22 to Research Question # 8: Does utilizing DSS in the Saudi private sector affect the perception of decision quality in general?

Survey Revision and Pilot Testing

The survey was revised with input from the study's advisor and committee members. All necessary corrections to the survey were then made and the survey translated into Arabic. To validate the translated survey, the researcher consulted experts in the field of DSS. Those experts included 10 professors of business and technology who teach in Saudi universities and computer schools.

The experts suggested omitting any questions they deemed too technical for decision maker-participants, including any questions asking them to identify types of software and analysis by name. The survey's demographic questions were also condensed, and any closely related or redundant question categories were combined and repetition deleted.

Further validation was accomplished when a pilot test was conducted involving 5 companies from the list of 150. Probably because the study surveyed decision-makers rather than technical staff, the pilot participants avoided answering a question that had not yet been deleted asking for the names of software employed in the company; therefore, the question was dropped. In addition, they

expressed a preference to keep their companies' identities anonymous, so no identification of company name was requested on the revised survey.

Study Sample and Distribution of the Instrument

The Council of Saudi Chambers' list of the top 150 companies in Saudi Arabia provided the sample of corporations to be surveyed. The survey included every corporation on the list and represented a diverse cross section of Saudi industry including banking, trading, manufacturing, agriculture, services, construction, information technology, and others. Limiting the survey to this list ruled out companies for whom purchasing DSS would be less feasible financially. To gather the information about the company's awareness and use of DSS, one survey participant among each company's decision-makers was selected. For Riyadh participants, this was accomplished by visiting each site (68 total companies) with the intention of delivering the survey to each company CEO. Due to the survey distribution taking place during the season of the year when many managers take vacation time, many were absent from the company. The researcher was instead

directed to primarily middle managers familiar with their company's computer utilization.

The decision was made to conduct in-person visits to the Riyadh companies for two reasons: to provide context for the study and to explain DSS, and to ensure a high rate of return. Follow-up was an important part of the study due to constraints on time available to complete the research in Saudi Arabia, so the researcher completed up to three rounds of follow up visits, phone calls, mailings, or emails to speed up responses. No interviews were conducted to verbally discuss survey questions with the participants. The survey process and follow-up required a substantial commitment of time over a period of two months.

For companies outside of Riyadh, participants were surveyed via either mail or email. To make the initial contact, emails including the URL of the researcher's homepage were sent to company Web sites to describe the research and ask that the information be forwarded to a decision-maker who would respond to the Internet survey. For companies with no email address included on their Web site, or no Web site, the survey was sent by regular mail and collected via regular mail as well.

Response Rate

The responses of those who chose to respond via the Internet went directly to an account established for this purpose. A total of 28 responses were collected at the Internet site. Responses sent through regular mail, a total of 17 went to the researcher's mailbox. A total of 150 surveys were distributed and 99 responses returned, so a total response rate of 66% was achieved.

CHAPTER IV

ANALYSIS OF DATA

Demographic Information

The data collected as a result of the survey used in
this study revealed that computer use is pervasive in
decision-making throughout the Saudi industry, as shown in
Table 1. Only 19.2% of the companies surveyed reported that
computers were not involved in their decision-making
processes.

The survey instrument included questions not only of
computer use among decision-makers themselves, but also
their assistants. As Table 3 shows, assistants were also
reported to be frequent computer users, with a mean of 3.91
corresponding most closely to "Mostly" on the response
scale (use computer most of the time). The survey attempted
to gauge the overall frequency of computer use in decision-
making, and as indicated in Table 2, the mean was identical
to that reported for overall computer use, 3.91.

Table 1

Using Computers in Decision Making Within Organization

	Yes		No	
Using Computers	n	%	n	%
Using Computers in Organization.	80	80.8	19	19.2

Table 2

Use of Computer by Decision Makers in Decision-Making

Response	n	%
Not at all	0	0
Rarely	2	2.5
Sometimes	19	23.8
Mostly	43	53.8
Always	16	20.0

Note. Mean = 3.91

Table 3

Assistants' Use of Computer in Decision Making

Response	n	%
Not at all	1	1.3
Rarely	1	1.3
Sometimes	21	26.3
Mostly	41	51.3
Always	16	20.0

Note. Mean 3.91

Demographic information collected via the survey helps construct a more complete profile of the survey participants. The Bachelor's degree was the highest level of education attained by the majority of the participants (62%), with 23% having also attained an MA and 6% holding a Doctoral degree (see Table 4).

Table 4

Respondents' Education Level

Education level	$\underline{n}$	%
Less than high school	0	0.0
High school or equivalent	3	3.0
Associate or equivalent	5	5.1
Bachelor or equivalent	62	62.6
Master or equivalent	23	23.2
Doctorate	6	6.1

The following sections apply basic descriptive statistics to analyze the respondents' use of and attitudes toward DSS and are organized according to the study's eight major research questions.

Findings Pertaining to DSS Use and Perceptions

of Effectiveness

Research Question 1: Extent of DSS Use

The study pinpointed the nature of the industries where DSS is used most frequently in the private sector in Saudi Arabia, as shown in Table 5: 25% of respondents identified manufacturing as their company's primary activity, with services and trading close behind at 20% and 18% respectively. Banking, Information Technology, and Agriculture were the activities where DSS is least likely to be utilized, according to the survey. Fewer than 10% of the companies involved in each activity reported DSS use.

Table 5

Company's Activity

Rank of Activities	n	%
1 Manufacturing	25	25.3
2 Services	20	20.2
3 Trading	18	18.2
4 Contracting/Construction	14	14.1
5 Banking/Finance	9	9.1
6 Information Technology	8	8.1
7 Agriculture	5	5.1

Table 6 shows that within companies, certain departments can be identified as more frequent users of DSS. Seventy nine percent of top management were found to utilize DSS according to the survey. Finance, accounting, and marketing/sales are specific divisions indicating 70-85% DSS utilization. Human resources, Inventory/warehousing, and Manufacturing were shown to have over 50% utilization of DSS. Only 32% utilization was reported in research and development, a finding which will be discussed in Chapter 5.

Table 6

Departments Utilizing DSS in Organization

Ranking		Yes		No	
		n	%	n	%
1	Finance	68	85.0	12	15.0
2	Accounting	65	81.3	15	18.8
3	Top Management	63	78.8	17	21.3
4	Marketing/Sales	56	70.0	24	30.0
5	Human Resources	47	58.8	33	41.3
6	Purchasing/Procurement	47	58.8	33	41.3
7	Inventory/Warehousing	41	51.3	39	48.8
8	Manufacturing/Production	26	32.5	54	67.5
9	Research & Development	26	32.5	54	67.5

Note. Ranking in order of frequency of use.

Table 7 further breaks down DSS activity, indicating goal evaluation to be the most frequent specific application of DSS. Close behind, at 61%, was the application Explaining/predicting behavior. Additional applications help companies plan for the future with applications including Evaluating decision alternatives (56%) and Making decisions under conditions of risk (53%). A less frequent but important activity (46%) is allocating scarce existing resources.

Table 7

Application Areas for Which DSS Software is Being Used

		Yes		No	
Ranking of Application Area		n	%	n	%
1	Evaluating goals.	52	65.0	28	35.0
2	Explaining and predicting behavior.	49	61.3	31	38.8
3	Evaluating alternatives.	45	56.3	35	43.8
4	Making decisions under conditions of risk.	43	53.8	37	46.3
5	Allocating scarce resources to activities.	37	46.3	43	53.8

The survey suggested that all the companies were experienced users of DSS. The majority of respondents (45%) reported using DSS for 10 years or longer, with 21% at the opposite end of the spectrum of familiarity with DSS, having used it for 3 years or less (21%). Approximately 34% fell in the midrange of 4-9 years in their utilization of DSS tools (Table 8).

Table 8

Years of Using DSS

Years of using DSS	n	%
3 years or less	17	21.3
4-6 years	12	15.0
7-9 years	15	18.8
10 years or more	36	45.0

It is note worthy that Table 9 shows in that the majority of all participants rated their experiences with DSS to be successful or very successful; approximately 83% placed themselves in the categories indicating this high degree of satisfaction. The following section will isolate factors that contribute to successful implementation and use of DSS by those surveyed.

Table 9

Evaluating DSS Experience

Evaluation	n	%
Very unsuccessful	5	6.3
Unsuccessful	2	2.5
Neutral	7	8.8
Successful	45	56.3
Very successful	21	26.3

Mean = 3.94

Research Question 2: Factors Enhancing DSS Implementation

and Use

Table 10 identifies contributing factors and demonstrates the significance of confidence in effectiveness; 75% of the respondents identified belief in the software as an important factor contributing to success. Another behavioral factor which received a high percentage is managerial commitment (51%). Several practical factors were also identified as important, including affordability and availability of DSS products. Affordability (the second-ranked factor on Table 10) was identified as a concern for 64% of respondents, and availability (a combination of the fifth- and sixth-ranked factors) was mentioned by a similar percentage of participants.

Table 10

Factors that Enhance the Implementation and Use of DSS

		Yes		No	
Rank of Factors		n	%	n	%
1	Top management's belief in DSS effectiveness.	74	74.6	25	25.3
2	The availability of advanced technology at a good price.	64	64.6	35	35.4
3	Top management's commitment to new technology.	51	51.5	48	48.5
4	Competency between companies in implementing new technology.	46	46.5	53	53.5
5	Availability of research that introduces DSS to organizations.	33	33.3	66	66.7
6	Availability of wide range of DSS products in the market.	32	32.3	67	67.7
7	The complexity of the business environment.	29	29.3	70	70.7

Research Question 3: Obstacles to Effective DSS Implementation

In the Saudi private sector, several factors were indicated to have importance in presenting potential obstacles almost equal to those credited with success, and they show consistency with responses reported in Table 10. Table 11 shows these potential obstacles to be management's level of satisfaction with DSS (50%), the expense of purchasing systems (49%), and lack of research useful to the private sector in familiarizing itself with the systems (48%).

Besides such factors identified by close to 50% of respondents, several additional factors are significant. They include lack of managerial awareness of computer systems, insufficient skilled labor, fear of new technology (factors reported by 40-45% of respondents); lack of vendor support and availability of software products in the Arabic language (both at approximately 38%); and the complexity of available products (26%). A concern identified by 23% was unsuitability of DSS tools to the Saudi business environment. It should also be noted that a potentially significant number (32%) noted general skepticism about DSS.

Table 11

Factors that Hinder the Implementation and Use of DSS

Rank of Factors		Yes		No	
		n	%	n	%
1	Top management's satisfaction with the intuitive decision process.	50	50.5	49	49.5
2	High cost of such systems.	49	49.5	50	50.5
3	Lack of research that introduces the DSS to private sector.	48	48.5	51	51.5
4	Unawareness of DSS by top management.	44	44.4	55	55.6
5	Lack of skilled labor.	42	42.4	57	57.6
6	Fear of new technology.	40	40.4	59	59.6
7	Lack of vendors support.	38	38.4	61	61.6
8	Lack of DSS products in Arabic.	38	38.4	61	61.6
9	Skepticism about DSS effectiveness.	32	32.3	67	67.7
10	Complexity of DSS products.	26	26.3	73	73.7
11	Unsuitability of the available DSS products to the Saudi business environment.	23	23.2	76	76.8

Research Question 4: Perceptions of Information Quality

To calculate means for responses in Tables 13-16 (See pages 92-95), responses were placed on a five-point Likert scale whose numerical equivalents did not appear on the survey itself. SD = 1, D = 2, N = 3, A = 4, SA = 5. Response means of 4.28 to 4.4 were calculated for all four questions asking respondents to evaluate information quality, reported in Table 12. These questions asked about ease of retrieval, timeliness ("DSS provides users up-to-date information" and "DSS provides users information they need on time"), relevance, etc. This result indicates satisfaction levels falling between "Agree" and "Strongly Agree" in all four categories, with very similar means, 4.28-4.4.

Research Question 5: Perception of Variety of Alternatives

Though slightly lower than those reported for question 4, response means for respondents' view of the variety of decision alternatives made available by DSS were similarly positive, falling in a range between 4.19 and 4.28 (see Table 13). The item indicating DSS's ability to generate a greater quantity of possibilities showed a mean of 4.28, the item closest to "Strongly agree." This group of

questions also reflected positive attitudes toward the accuracy of the alternatives and the ease of evaluating them (mean of 4.19).

Research Question 6: Perceptions of Time Involved in Decision Making

Table 14 indicates responses toward "Strongly Agree" in respondents' perceptions of the time-saving capability of DSS. The means (4.25 and above) indicate an assessment that DSS not only reduces time spent in decision-making (mean 4.4), but also speeds the process of analyzing decisions (mean 4.3). Respondents indicated, finally, that DSS thus frees time for decision-makers to spend in performing other tasks (mean 4.2).

Research Question 7: Perceptions of Cognitive Effort Expended in Decision-making

Though responses, reported in Table 15, were still generally positive (falling closest to "Agree" on the Likert scale), respondents showed less enthusiasm for DSS as a cognitive tool than they displayed for other features. Agreement with DSS as requiring less effort was weaker (3.75 mean) than agreement with the proposition that DSS enables respondents to spend less time on the decision task. With a mean of 3.84, respondents also indicated a

relatively weak Agreement with the principle that DSS improves users' overall cognitive ability as decision-makers.

Research Question 8: Perceptions of Overall Decision Quality

Table 16 demonstrates that the survey participants judge DSS to have a positive effect on the quality of decisions overall. The response mean for the specific question asking respondents to assess whether or not decisions are "better" was 4.25, indicating solid agreement that decisions are in fact better with DSS.

Two other questions broke down features of decision-making such as the accuracy of decisions reached regarding complex problems and the effectiveness of decisions. Respondents indicated agreement with both propositions, that DSS results in more accurate and more effective complex decisions than would be possible without assistance from DSS. As Table 16 shows, the survey resulted in means of 4.07 and 4.21 for these questions respectively.

Table 12

The Effect of DSS Usage on Information Quality

Effects on Information Quality	SD	D	N	A	SA	Mean
DSS makes it easier for users to obtain the information they need.	1	1	2	44	51	4.4
DSS provides users up-to-date information.	1	3	7	42	46	4.3
DSS provides users information they need on time.	0	2	6	42	49	4.39
DSS provides users more relevant info.	1	1	10	44	43	4.28

Note. SD = Strongly disagree, D = Disagree, N = Neutral, A = Agree, and
SA = Strongly agree

Table 13

The Effect of DSS Usage on Alternatives

Effect on Alternatives	SD	D	N	A	SA	Mean
DSS gives users the ability to come up with more alternatives.	2	1	15	38	43	4.28
DSS provides more accurate alternatives.	1	5	10	41	42	4.19
DSS enables users to evaluate more alternatives more easily.	1	2	12	46	38	4.19

Note. SD = Strongly disagree, D = Disagree, N = Neutral, A = Agree, and
SA = Strongly agree

Table 14

The Effect of DSS Usage on Time Decision Makers Spend to Reach the Decision

Effect on Time	SD	D	N	A	SA	Mean
Using DSS reduces the time decision makers spend to reach the decision.	1	1	6	38	53	4.4
Using DSS gives users more time to perform other tasks.	1	3	7	47	41	4.2
DSS increases the speed at which users analyze decisions.	0	1	5	48	45	4.3

Note. SD = Strongly disagree, D = Disagree, N = Neutral, A = Agree, and SA = Strongly agree

Table 15

The Effect of DSS Usage on Mental Abilities Users Need During the Decision-Making process

Effect on Mental Abilites	SD	D	N	A	SA	Mean
Using DSS improves the mental abilities users need during the decision-making.	1	10	20	41	27	3.84
Making decisions with DSS requires less effort than with traditional decision-making methods.	2	14	20	34	29	3.75

Note. SD = Strongly disagree, D = Disagree, N = Neutral, A = Agree, and SA = Strongly agree

Table 16

The Effect of DSS Usage on Overall Decision Quality

DSS	SD	D	N	A	SA	Mean
DSS enables users to make better decisions.	1	2	5	54	37	4.25
DSS makes it easier to make more accurate decisions about complex problems than were previously possible.	1	3	15	49	31	4.07
DSS allows making more effective decision.	1	3	7	51	37	4.21

Note. SD = Strongly disagree, D = Disagree, N = Neutral, A = Agree, and
SA = Strongly agree

CHAPTER V

DISCUSSION AND RECOMMENDATIONS

Summary of Results

In validating the survey instrument used in this

study, academic experts on DSS were selected. The group

included 10 professors of business and technology. The

experts were adamant in warning the researcher that few

studies on DSS had been undertaken before, and that,

moreover, the researcher would find little published

knowledge about DSS in the Saudi industry and even less

utilization. The survey results as reported in Chapter 4,

Research Question 1, demonstrate that the reality of Saudi

industry related to the use of DSS tools is much different

from the perceptions held in academia.

Fewer than 3% of the respondents reported that their

companies "rarely" use computers in decision-making,

whereas over 73% reported using these tools "Mostly" or

"Always," and another 23% reported its use as "Sometimes."

Use of DSS is apparently not limited to the decision-makers

themselves, because similar percentages of their assistants

also employ DSS. Furthermore, among the companies utilizing

DSS, there appears to be high levels of satisfaction with

the systems. More than 82% of the respondents reported

their efforts to use DSS as either Successful or Very

Successful, and the majority had been using DSS over a

period of years, deemed necessary to give the benefits of

the systems fair consideration. The respondents provided

data necessary to determine the factors they believe to

enhance DSS implementation and use (Research Question 2)

and those presenting obstacles (Research Question 3).

The participants' assessment of DSS effectiveness, the

focus of Research Questions 4 through 8, comprised several

specific categories of benefits such as, information

quality (with the components of timeliness, relevance, and

ease of acquisition); variety of decision alternatives;

timesaving; and cognitive efficiency (including improvement

of cognitive technique). Mean responses in all the

effectiveness categories exceeded 4, indicating strong

agreement, with the exception of cognitive efficiency,

which stands at means of 3.75 to 3.84 for the questions in

that category still received a positive response. Research

Question 8 ensured that decision outcomes were considered

along with decision processes in gauging the respondents'

perceptions of DSS effectiveness. The data suggests that

Saudi decision makers do in fact believe that their

decisions are better (more "accurate" and more "effective") with the use of DSS than without.

Limitations of The Study

In drawing conclusions and making recommendations regarding these findings, the following limitations must be considered.

1.   Although the study takes into account the full range of activities in the Saudi private sector, it represents only large companies and the assessment of only one decision-maker from each large company surveyed. Because primarily middle-managers were surveyed rather than CEO's, the participants, responding based on their decision-making tasks, might have lacked the broad perspective of company activity normally possessed by CEO's. It also could be argued, however, that the middle managers might have more practical working knowledge of computer programs used in the company than that of CEO's.

2.   Upon the recommendation of the experts used in the validation process, the study did not specifically identify the software being utilized in the surveyed companies. Thus, no comparisons can be made with DSS currently utilized in the industrialized Western nations, and no verification can be made that the respondents were

defining DSS the same way as defined in this study, which could be important in light of Chapter 2's discussion of the wide variation in DSS definitions.

Recommendations

The research process revealed a significant gap between what is actually occurring in the Saudi private sector related to decision software and researchers' beliefs about the private sector. Although DSS is apparently being utilized successfully by the majority of the companies surveyed, which is contrary to the beliefs held by academics, it may be underutilized in specific industries and smaller companies not included on the Saudi Chambers' of Commerce list of the top 150. The survey shows that DSS is underutilized—used by less than 70%—in particular departments within companies. These departments include Human Resources (59%), Purchasing/Procurement (59%), inventory/Warehousing (51%), Manufacturing/ Production (33%), and Research and Development (33%). Thus it can be concluded that the positive benefits reported by the respondents' asked to assess DSS effectiveness are not being consistently pursued across company functions and types of company.

There is also room for expanded DSS utilization in specific application areas such as Evaluating alternatives (currently occurring in 56% of the companies), Making risky decisions (54% utilization), and Allocating scarce resources (46% utilization). Although goal-evaluation, explanation and prediction of behavior, and evaluation of alternatives are all at approximately 60-65% utilization, if the benefits of DSS are as promising as reported in the literature review and by this survey's participants, 100% utilization where DSS is relevant would be a worthwhile goal.

This study's Research Question 3 identified several possible obstacles that are impeding full adoption and utilization of DSS in the private sector. Because of academics' misunderstanding of Saudi businesses' ability to understand and successfully use DSS, little research on the subject is planned for the near future. Yet, close to 50% of the survey respondents said that inadequate research introducing the subject to the private sector is a major factor in hindering implementation and use. A somewhat smaller, but still significant number (33%) made this a consistent recommendation by indicating that research is a key factor in successful implementation. Lack of research

would also contribute to the lack of new DSS products compatible with the language and business culture of Saudi Arabia, factors cited as hindrances by 38% and 23%, respectively. In addition, 32% called availability of a wide range of products a key factor enhancing implementation and use. Research is a necessary component of product development. Therefore, research like the present study is essential to demonstrate that future research is worthwhile and essential for continued private sector growth.

Several issues of managerial attitudes were indicated on the survey, which could also be alleviated by more and better research. One such issue is managerial awareness; managers must know about DSS benefits as reported in surveys such as this to be motivated to fully utilize them in their companies. Knowledge contributes to managerial commitment to the technology (cited by 51% as a key-enhancing factor) and belief in its effectiveness. Belief in effectiveness was chosen by 74% of the participants as a key-enhancing factor, making it the most mentioned of all the factors. With these issues in mind, the following recommendations are offered for specific types of continued research.

Recommendations for Future Studies

1. The study should be repeated in order to further validate the survey in its current form.

2. Because the IT infrastructure of Saudi Arabia is still developing, the study should be repeated in the future to see if improved business infrastructure will improve the effectiveness of DSS and IT in general.

3. A study should be conducted to survey separately each specific type of industry (IT, manufacturing, trade, agriculture, etc.) to confirm results and identify different needs and outcomes according to company type.

4. A study should be conducted to compare DSS implementation and effectiveness of DSS outcomes in these industries.

5. A similar study should be conducted to differentiate the experiences of medium-sized and small companies, which were excluded from the current study.

6. A study should be conducted to measure differences in perceptions of DSS issues among different levels of management.

7. A study should be conducted to compare companies in the Saudi private sector and similar companies in a fully industrialized nation.

8. The actual impact of DSS on outcomes should be measured.

9. Research should be conducted to determine which management area is most impacted by DSS, to add to the information provided exclusively by middle-managers in the current study.

Conclusion

The survey results suggest that there already exists a high degree of enthusiasm for DSS in large Saudi Arabian companies. The study has also indicated specific aspects of decision-making about which the decision-makers feel DSS is a significant benefit, in terms of the decision outcome as well as the processes they are required to invest in making the decision. Many companies have been experiencing success with the systems in at least some areas of their endeavors by realizing that DSS systems are effective in terms of decision alternatives, information timeliness and quality, reduction of cognitive effort, and overall decision quality. The study demonstrated, however, that there is room for expansion into more of the departments within the companies, and that there is unexploited potential for a greater diversity of applications.

The study has uncovered misunderstanding toward the business culture in Saudi Arabia, which contradicts the degree of interest and application that already exists in the private sector due to the perceived effectiveness of the systems. It is hoped that the academics who are DSS experts will capitalize on the recommendations for further research so that they can assist Saudi Arabia in fully capitalizing on the potentials of DSS in the real world.

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APPENDIX A

(English and Arabic Surveys)

SURVEY REGARDING

THE USE AND EFFECTIVENESS OF DSS IN SAUDI PRIVATE SECTOR

Part I: Questions about your Organization's Implementation and Use of DSS

Instructions & Definitions:

DSS refer to (Decision Support Systems). By this term we mean all software or computer aids that help decision makers arrive at good decisions. DSS help users process goals, alternative means of achieving goals, and relationships between goals and alternatives.

Because they cannot be said to assist decision makers in considering relationships and alternatives and drawing conclusions, please **do not** classify the following types of software as DSS as you answer the questions below: information retrieval software (offers specific pieces of factual information, similar to statistical almanacs and encyclopedias) and office practice software (assists with office procedures such as word processing, filing, and bookkeeping).

1. **Does your organization use computers in decision making?**

   ❑ Yes

   ❑ No

   If No, please skip to question number 6

2. **Which of the following departments in your organization are utilizing DSS?** (Select all that apply)

❑   Top Management.   ❑   Research & Development.

❑   Finance/Investments.   ❑   Inventory/Warehousing.

❑   Manufacturing/Production.   ❑   Human Resources.

❑   Accounting.   ❑   Purchasing.

❑   Marketing/Sales.   ❑   Other (specify).

3. **What are the application areas for which DSS software is being used in your organization?** (Select all that apply)

❑   Making decisions under conditions of risk.

❑   Allocating scarce resources for activities.

❑   Explaining and predicting behavior.

❑   Evaluating alternatives.

❑   Evaluating goals (comparing multiple goals to be achieved).

❑   Other (specify)_____

4. For how long has DSS been used in your organization?

❑ 3 years or less.   ❑ 4 - 6 years.

❑ 7 - 9 years.   ❑ 10 years or more.

5. How would you describe the results of your organization's experience with DSS?

❑ Very unsuccessful.

❑ Unsuccessful.

❑ Neutral.

❑ Successful.

❑ Very successful.

6. Which of the following factors do you think enhance the implementation and use of DSS in the Saudi private sector? (Select all that apply)

❑ The availability of advanced technology at a good price.

❑ Top management's belief in DSS effectiveness.

❑ Top management's commitment to new technology.

❑ The complexity of the business environment.

❑ Availability of research that introduces DSS to organizations.

❑ Companies' competency in implementing new technology.

❑ Availability of wide range of DSS products in the market.

❑ Other? (Please specify) _____

7. **Which of the following factors do you think hinder the implementation and use of DSS in the Saudi private sector?** (Select all that apply)

❑ Top management's satisfaction with the intuitive decision process.

❑ High cost of such systems.

❑ Skepticism about DSS effectiveness.

❑ Fear of new technology.

❑ Lack of research that introduces the DSS to private sector.

❑ Unawareness of DSS by top management.

❑ Complexity of DSS products.

❑ Lack of vendor support.

❑ Lack of skilled labor.

❑ Lack of DSS products in Arabic.

❑ Unsuitability of the available DSS products to the Saudi business environment.

❑ Other? (Please specify) _____

Part II: Questions about DSS Effectiveness in your

Organization

Please put a check mark in the square that represents your opinion for each of the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
8. DSS makes it easier for users to obtain the information they need.					
9. DSS provides users up-to-date information.					
10. DSS provides users the information that they need on time.					
11. DSS provides users with more relevant information for decision making than available before.					
12. DSS gives users the ability to come up with more alternatives than traditional decision-making methods.					

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
13. DSS provides users with more accurate alternatives than traditional decision-making methods.					
14. DSS enables users to evaluate more alternatives more easily than with traditional decision-making methods.					
15. Using DSS reduces the time decision makers spend to reach the decision.					
16. Using DSS gives users more time to perform other tasks.					
17. DSS increases the speed at which users analyze decisions.					
18. DSS actually improves the mental abilities users need during the decision making process.					

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
19. Making decisions with DSS requires less effort than with traditional decision-making methods.					
20. DSS enables users to make better decisions.					
21. DSS makes it easier to make more accurate decisions about complex problems than were previously possible.					
22. Using DSS allows users to make decisions that are more effective.					

Part III: Questions about Demographic Characteristics

Please check the number of the category that best describes your choice.

23. **What is the highest degree have you obtained?**

    ❑ Less than High school.

    ❑ High school or equivalent.

    ❑ Associate or equivalent.

    ❑ Bachelor or equivalent.

    ❑ Master or equivalent.

    ❑ Doctorate.

24. **Do you use a computer in decision-making?**

    ❑ Not at all

    ❑ Rarely

    ❑ Sometimes

    ❑ Most of the times

    ❑ Always

25. **Do your assistants use computers to help you in decision-making?**

    ❑ Not at all

    ❑ Rarely

    ❑ Sometimes

    ❑ Most of the times

    ❑ Always

26. **Company's Activity**:

- ❑ Banking / Finance.
- ❑ Manufacturing.
- ❑ Trading.
- ❑ Contracting / Construction.
- ❑ Agriculture.
- ❑ Services.
- ❑ Information Technology.
- ❑ Other: _____

Thank you very much

استبانه عن مدى استخدام وفاعلية نظم دعم القرار في القطاع الخاص بالمملكة العربية السعودية

تعريف :

نعني بمصطلح " نظم دعم القرار" استخدام الحاسب الآلي للمساعدة في اتخاذ القرارات بهدف تحسين جودة القرار و زيادة فاعليته . و ما يميز نظم دعم القرار عن غيرها أنها تساعد في إيجاد و تقييم البدائل و المساعدة في الاختيار من بين تلك البدائل للوصول إلى قرارات سليمة.

ملحوظة : نود التنبيه إلى أن بعض البرامج لا تعتبر من ضمن برامج نظم دعم القرار رغم أنها تساعد بصورة غير مباشرة في دعم القرار و ذلك لأنها لا تساعد في إيجاد أو تقييم البدائل كما أنها لا تساعد في الاختيار من بين تلك البدائل. ومن الأمثلة على ذلك البرامج المكتبية مثل معالج الكلمات و الناشر المكتبي ، وكذلك برامج تخزين واستدعاء المعلومات مثل الموسوعات العلمية و ما شابهها.

أولاً: أسئلة عن مدى استخدام نظم دعم القرار في القطاع الخاص.
من فضلك أجب عن جميع الأسئلة التالية بوضع علامة صح أمام العبارة المناسبة :

1. في ضوء التعريف السابق ، هل تستخدم منشأتكم الحاسب الآلي في عملية اتخاذ القرارات ؟

   ❑ نعم

   ❑ لا
   إذا كانت الإجابة "لا" فضلا انتقل إلى السؤال رقم (6)

2. هل تستخدم الحاسب الآلي شخصياً في عملية اتخاذ القرارات ؟

   ❑ لا

   ❑ نادراً

   ❑ أحياناً

   ❑ غالباً

   ❑ دائماً

3. هل يستخدم مساعدوك الحاسب الآلي لمساعدتك في اتخاذ القرار ؟

- ❏ لا
- ❏ نادرا
- ❏ أحيانا
- ❏ غالبا
- ❏ دائما

4. أي الأقسام التالية تستخدم نظم دعم القرار في منشأتكم ؟ (يمكن اختيار اكثر من إجابة).

- ❏ الإدارة العليا.
- ❏ المالية/الاستثمار.
- ❏ الإنتاج/التصنيع.
- ❏ المحاسبة
- ❏ التسويق/المبيعات
- ❏ البحوث والتطوير.
- ❏ المستودعات / المخازن.
- ❏ تنمية الموارد البشرية/الأفراد.
- ❏ المشتريات / التوريد.
- ❏ أخرى : ———

5. ما المجالات التي تُستخدم فيها برامج نظم دعم القرار في منشأتكم؟ (يمكن اختيار اكثر من إجابة).

- ❏ تحليل المخاطرة.
- ❏ تقييم الأهداف.
- ❏ تقييم البدائل.
- ❏ توزيع الموارد على الأنشطة.
- ❏ التنبؤ بالمستقبل.
- ❏ أخرى : ———

6. كم سنة مضت على منشأتكم وهي تستخدم نظم دعم القرار؟

- ❏ 3 سنوات أو أقل.
- ❏ 7 – 9 سنوات.
- ❏ 4 – 6 سنوات.
- ❏ 10 سنوات أو أكثر.

7. **كيف تقيّم تجربة استخدام نظم دعم القرار في منشأتكم؟**
   - ❏ فاشلة تماماً.
   - ❏ فاشلة إلى حدٍ ما.
   - ❏ غير متأكد.
   - ❏ ناجحة إلى حدٍ ما.
   - ❏ ناجحة جداً.

8. **أي من العوامل التالية تعتقد أنها من دوافع تطبيق واستخدام نظم دعم القرار في القطاع الخاص بالمملكة العربية السعودية؟ (يمكن اختيار اكثر من إجابة) .**
   - ❏ توفر التقنية المتقدمة بأسعار معقولة.
   - ❏ اقتناع الإدارة العليا بفاعلية نظم دعم القرار.
   - ❏ التزام الإدارة العليا بالتقنيات الجديدة.
   - ❏ تعقد بيئة العمل.
   - ❏ توفر البحوث التي تقدم نظم دعم القرار للقطاع الخاص.
   - ❏ التنافس بين الشركات في تطبيق التقنيات الحديثة.
   - ❏ توفر تشكيلة واسعة من برامج نظم دعم القرار في السوق.
   - ❏ أخرى : ——————————

9. **أي من العوامل التالية تعتقد أنها تعوق تطبيق واستخدام نظم دعم القرار في القطاع الخاص بالمملكة العربية السعودية؟ (يمكن اختيار اكثر من إجابة) .**
   - ❏ اقتناع الإدارة العليا بالطريقة التقليدية في عملية اتخاذ القرار.
   - ❏ ارتفاع تكلفة مثل هذه الأنظمة.
   - ❏ عدم الثقة بفاعلية نظم دعم القرار.
   - ❏ التخوف من التقنية الحديثة.
   - ❏ الافتقار إلى البحوث التي تقدم نظم دعم القرار للقطاع الخاص.
   - ❏ عدم معرفة الإدارة العليا بنظم دعم القرار.
   - ❏ تعقيد مثل هذه الأنظمة.
   - ❏ عدم توفر الدعم الكافي من قبل وكلاء مثل هذه الأنظمة.
   - ❏ ندرة الموظفين الأكفاء القادرين على التعامل مع مثل هذه الأنظمة.
   - ❏ ندرة برامج نظم دعم القرار باللغة العربية.
   - ❏ عدم ملاءمة البرامج المتوفرة في الأسواق لبيئة القطاع الخاص السعودي.
   - ❏ أخرى : ——————————

اوافق تماما	موافق	غير متأكد	لا اوافق	لا اوافق اطلاقا	
					10. استخدام نظم دعم القرار يسهل الحصول على المعلومات بشكل كبير.
					11. تساعد نظم دعم القرار في توفير أحدث المعلومات.
					12. تساعد نظم دعم القرار في الحصول على المعلومات المطلوبة في الوقت المناسب.
					13. تساعد نظم دعم القرار في الحصول على معلومات ذات علاقة اكبر بالمشكلة.
					14. تساعد نظم دعم القرار في الحصول على بدائل أكثر لاتخاذ القرار المناسب.
					15. تساعد نظم دعم القرار في الحصول على بدائل أكثر ملاءمة من تلك التي يمكن الحصول عليها بالطرق التقليدية لاتخاذ القرار.
					16. يمكن استخدام نظم دعم القرار صانعي القرار من تقييم عدد أكبر من البدائل.

ثانيا: أسئله عن مدى فاعلية نظم دعم القرار

من فضلك أجب عن الأسئله التاليه بوضع علامة (..) داخل المربع المناسب أمام كل عبارة مما يأتي:

اوافق تماما	موافق	غير متأكد	لا اوافق	لا اوافق اطلاقا	
					17.يساعد استخدام نظم دعم القرار على تقليص الوقت الذي يحتاجه متخذ القرار للوصول للقرار المناسب .
					18.توفر نظم دعم القرار لمتخذ القرار وقت أكبر للقيام بمهام أخرى.
					19.استخدام نظم دعم القرار يسرع عملية تحليل القرارات.
					20.تساعد نظم دعم القرار على تنمية القدرات الذهنية عند متخذ القرار حيال عملية اتخاذ القرار.
					21.استخدام نظم دعم القرار يقلل من المجهود الذهني اللازم لاتخاذ القرارات.
					22.يساعد استخدام نظم دعم القرار على تحسين نوعية القرارات.
					23.استخدام نظم دعم القرار يسهل الحصول على قرارات دقيقة لحل المشكلات المعقدة.
					24.تمكن نظم دعم القرار صانعي القرار من اتخاذ قرارات أكثر فاعلية.

ثالثا: المعلومات الشخصية:

❑ خدمات مصرفيه.

❑ صناعة.

❑ تجارة.

❑ مقاولات.

❑ زراعة.

❑ خدمات.

❑ تقنية معلومات.

❑ أخرى : ———————

تمت بحمد الله و شكــراً لتعاونكم

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