Decision support systems

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ABSTRACT: Decision Support Systems (DSS) are a specific class of computerized information system that supports business and organizational decision-making activities. A properly-designed DSS is an interactive software-based system intended to help decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions. DSS belong to an environment with multidisciplinary foundations, including database reasearch, artificial intelligence, human computer interaction, simulation methods, software engineering and telecomunication.

Keywords: decision support system, decision makers, computer-based

1. INTRODUCTION

Information systems researchers and technologist have built and investigated decision support systems for almost 40 years, meaning that the concept of an interactive computer based system that helps companies make better business decisions has been around since computers came into widespread use.

Decision support systems are created to help people make decisions by providing access to information and analysis tools, it's a way to model data and make quality decisions based upon it. Decision support systems constitute a class of computer-based information systems including knowledge based systems that support decision making activities. Making the right decision in business is usually based on the data quality and the ability to sift through and analyze the data to find trends that can create solutions and strategies.

DSS are interactive computer based systems and subsystems intended to help decision makers use communications technologies, data, documents, knowledge and models to complete decision process tasks. A decision support system may present information graphically and may include an expert system or artificial intelligence.

Typical information that a decision support application might gather and present would be: accessing all information assets, including legacy and relational data sources, comparative data figures, projected figures based on new data or assumptions, consequences of different decision alternatives, given past experience in a specific context.

While many people think of decision support as a specialized part of a business, most companies have actually integrated this system into their day to day operating activities. Many companies constantly download and analyze sales data, budget sheets and forecasts and they update their strategy once they analyze and evaluate the current results.

The solution to decision support systems is to gather data, analyze and shape the data that is collected and then try to make sound decisions or construct strategies from analysis.

Decision support applications that just collect data and organize it effectively are usually called passive models, they do not suggest a specific decision and they only reveal data. On the other hand, an active decision support system actually processes data and explicitly shows solutions based upon that data.

A cooperative decision support system is when data is collected, analyzed and then is provided to a human component which can help the system revise or refine it. It means that both a human component and computer component work together to come up with the best solution.

2. TYPES OF DECISION SUPPORT SYSTEMS

There are a number of decision support systems. These can be categorized into five types: communications driven DSS, data driven DSS, document driven DSS, knowledge driven DSS and model driven DSS.

A communication driven DSS supports more than one person working on a shared task. Many collaborators work together to come up with a series of decision to set in motion a solution or strategy. Most communications driven DSSs are targeted at internal teams, including partners. The most commons technology used to deploy the DSS is a web or a client server. In general, groupware, bulletin boards, audio and video conferencing are the primary technologies for communication driven decision support.

Data driven DSS model puts its emphasis on collected data that is then manipulated to fit the decision maker's needs. This data can be internal, external and in a variety of formats. This model emphasizes access to and manipulation of a time series of internal company data and sometimes external and real time data. Simple file systems accessed by query and retrieval tools provide the most elementary level of functionality. Most data driven DSSs are targeted at managers, staff and also product / service suppliers. It is used to query a database or data warehouse to seek specific answers for specific purposes. It is deployed via a main frame system, client server link or via web.

Document driven DSSs are more common, targeted at a broad base of user groups. The purpose of such a decision support system is to search web pages and find documents on a specific set of keywords or search terms. This model uses computer storage and processing technologies to provide document retrieval and analysis. A document driven DSS model uses documents in a variety of data type such as text documents, spreadsheets and database records to come up with decisions and manipulate the information to refine strategies. The usual technology used to set up such decision support systems are via web or a client / server system.

Knowledge driven DSSs are a catch-all category covering a broad range of systems covering users within the organization setting it up, but may also include others interacting with the organization. It is essentially used to provide management advice or to choose products or services. Knowledge-driven DSS can suggest or recommend actions to managers. These DSS are person-computer systems with specialized problem-solving expertise. The expertise consists of knowledge about a particular domain, understanding of problems within that domain, and skill at solving some of these problems. The typical deployment technology used to set up such systems could be client / server systems, the web, or software running on stand-alone PCs.

Model driven DSSs are complex systems that help analyse decisions or choose between different options. A model driven DSS emphasizes access to and manipulation of financial, optimization and / or simulation models. Simple quantitative models provide the most elementary level of functionality. Model-driven DSS use limited data and parameters provided by decision makers to aid decision makers in analyzing a situation, but in general large data bases are not needed for model-driven DSS. These are used by managers and staff members of a business, or people who interact with the organization, for a number of purposes depending on how the model is set up. These DSSs can be deployed via software / hardware in stand-alone PCs, client/server systems or the web.

3. DSS ARCHITECTURE

Decision support systems are not entirely different from other systems and require a structure approach. The framework has tree main levels: technology levels, people involved and the developmental approach.

Technology levels are divided into tree levels of hardware and software: level 1 – specific DSS, level 2 – DSS generator and level 3 – DSS tools.

Level 1 – specific DSS is the actual application that will be used by the user. This is the part of the application that allows the decision maker to make decisions in a particular problem area. The user can act upon that particular problem.

Level 2 – DSS generator contains hardware and software environment that allows people to easily develop specific DSS applications. This level makes use of case tools or systems.

Level 3 – DSS tools contains lower level hardware and software, DSS generators including special languages, function libraries and linking modules.

There are five roles involved in a typical DSS development cycle: the end user, an intermediary, DSS developer, technical supporter, systems expert.

The developmental approach for a DSS system should be iterative. This will allow for the application to be changed and redesigned at various intervals. The initial problem is used to design the system on and then tested and revised to ensure the desired outcome is achieved.

Decision support systems are classified into six frameworks: text-oriented DSS, database-oriented DSS, solver-oriented DSS, rule-oriented DSS and compound DSS.

The most popular classification for a DSS is the compound DSS.

A decision support system consist of two major sub-systems: human decision makers and computer systems. The function of a human decision maker as a component of DSS is to exercise judgment or intuition throughout the entire decision making process.

The first step of a decision making process begins with the creation of a decision support model, using and integrated DSS program such as Microsoft Excel, Lotus 1-2-3, Interactive Financial Planning Systems. The user interface sub-system is the gateway to both database management systems and model based management systems. Database management systems are a set of computer programs that create and manage the database, as well as control access to the data stored within it. The DNMS can be either an independent program or embedded within a DSS generator to allow users to create a database file that is to be used as an input to the DSS. Model based management system is a set of computer programs embedded within a DSS generator that allows users to create, edit, update, and / or delete a model.

Today, most of the DSS in use are developed to generate and evaluate decision alternatives via "what-if" analysis and "goal-seeking" analysis in the design and choice stages. Accounting models facilitate planning by calculating the consequences of planned actions on estimate of income statements, balance sheets and other financial statements. Representational models estimate the future consequences of actions on the basis of partially non definitional models, including all simulation models. Optimization models generate the optimal solutions. Suggestion models leads to a specific suggested decision for a fairly structured task. Such systems perform mechanical calculations and leave little role for managerial judgment.

4. DSS CLASIFICATION AND IMPLEMENTATION

The support given by a decision support system can be separated into three different, interrelated categories: group support, knowledge based support and organizational support.

Single user DSS and group DSS can be distinguished in many different ways in terms of purpose and components (hardware, software, people, procedures). First, group DSS and single user DSS have distinguishable purposes. A DSS group is defined as an interactive computer based system which facilitates solution of unstructured problems by a set of decision makers working together as a group.

To support a set of decision makers working together as a group, DSS have a special technological requirements of hardware, software, people and procedures. Each member of the group have a personal computer linked to the personal computer of the other group members and to one or more large public viewing screens, so that each member can see the inputs of other members or let other members to see their work. Computer based information systems to support group activities have been conducted under the titles of group decision support systems (GDSS), computer-supported cooperative work (CSCW), group support systems GSS), collaboration support systems (CSS), and electronic meeting systems (EMS).

Knowledge based decision support systems helps solving a broad range of organizational problems. A broad range of real-world managerial problems can be better solved by using the analysis of both quantitative and qualitative data. The system can support decision makers by harnessing the expertise of key organizational members.

An organizational decision support system is a DSS that is used by individuals or groups at several work stations in more than one organizational unit who make different decisions using a common set of tools. The two factors to achieve in this model are: transmittal of consistent, timely information up and down the organizational hierarchy in forms that are appropriate to each decision maker; and a set of decision-

aiding models that use this information and that are appropriate for the decisions being made by each decision maker.

In most cases, the use of some computer based information systems is mandatory, but decision support systems are optional systems. DSS is widely used in business and management.

A flourishing area of DSS applications, principles, concepts and techniques is in agricultural production, marketing for sustainable development. DSS can be designed to help make decisions on the stock market, or deciding which area or segment to market a product toward. We can say that DSS nature is changing from optional system to mandatory survival tool. Consequently, individual differences, cognitive styles, personality, demographics, and user-situational variables may become less critical success factors. Shifting the focus of implementation research from user-related factors to task-related, organizational, and external environmental factors may be necessary to reflect the changing decision environment in which organization must survive and prosper.

The benefits of DSS implementation are: improves personal efficiency, expedites problem solving, facilitates interpersonal communications, promotes learning or training, increase organizational control, generates new evidence in support of a decision, creates a comprehensive advantage over competition, encourages exploration and discovery on the part of decision maker, reveals new approaches to thinking about problem space.

5. CONCLUSIONS

DSS practice, research and technology continue to evolve. Trends suggest that data-driven DSS will use faster, real time access to larger, better integrated databases. Model-driven DSS will be more complex and system built using simulations and their accompanying visual displays will be increasingly realistic. Communications-driven DSS will provide more real-time video communications support. Document-driven DSS will access larger repositories of unstructured data and the systems will present appropriate documents in more useable formats. Knowledge-driven DSS will likely be more sophisticated and more comprehensive.

The new tools and technologies are adding new capabilities to DSS and will reshape DSS developments in organizations. They include hardware and mathematical software developments, artificial intelligence techniques, the data warehouse / multidimensional databases (MDDB), data mining, online analytical processing (OLAP), enterprise resource planning (ERP) systems, intelligent agents, telecommunication technologies such as World Wide Web technologies, the Internet, and corporate intranets.

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