Decision Support Systems: Brief-1

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Introduction

- Decision makers are faced with increasingly stressful environments – highly competitive, fast-paced, near real-time, overloaded with information, data distributed throughout the enterprise, and multinational in scope.

- The combination of the Internet enabling speed and access, and the maturation of artificial intelligence techniques, has led to sophisticated aids to support decision making under these risky and uncertain conditions.

- These aids have the potential to improve decision making by suggesting solutions that are better than those made by the human alone.

- They are increasingly available in diverse fields from medical diagnosis to traffic control to engineering applications.
Decision Support System

- A Decision Support System (DSS) is an interactive computer-based system or subsystem intended to help decision makers use communications technologies, data, documents, knowledge and/or models to identify and solve problems, complete decision process tasks, and make decisions.

- Decision Support System is a general term for any computer application that enhances a person or group’s ability to make decisions.

- Also, Decision Support Systems refers to an academic field of research that involves designing and studying Decision Support Systems in their context of use.
Reference Books

- There is no required texts. The following texts are recommended:
A brief history

- Academic Researchers from many disciplines has been studying DSS for approximately 40 years.
- According to Keen and Scott Morton (1978), the concept of decision support has evolved from two main areas of research: the theoretical studies of organizational decision making done at the Carnegie Institute of Technology during the late 1950s and early 1960s, and the technical work on interactive computer systems, mainly carried out at the Massachusetts Institute of Technology in the 1960s.
- It is considered that the concept of DSS became an area of research of its own in the middle of the 1970s, before gaining in intensity during the 1980s.
A brief history

- In the middle and late 1980s, Executive Information Systems (EIS), group decision support systems (GDSS), and organizational decision support systems (ODSS) evolved from the single user and model-oriented DSS.
- Beginning in about 1990, data warehousing and on-line analytical processing (OLAP) began broadening the realm of DSS.
- As the turn of the millennium approached, new Web-based analytical applications were introduced.
Goal: Use best parts of IS, OR/MS, AI & cognitive science to support more effective decision
Spreadsheet-based decision support systems

- A DSS is made up of a model (or models), a source of data, and a user interface.
- When a model is implemented in Excel, it is possible to use Visual Basic for Applications (VBA) to make the system more efficient by automating interactive tasks that users would otherwise have to repeat routinely.
- VBA can also make the system more powerful by extending the functionality of a spreadsheet model and by customizing its use.
Projects

- Students must submit a brief proposal when the project topic is determined.
- A short conversation or a document not exceeding one page will suffice.
- Contact the instructor by Email if you anticipate difficulty in finding a project topic. (The highest grades will go to projects with clients and to projects developed independently.)
- Each student is required to make a brief presentation (5-10 minutes) at the last class meeting before each minor/major exam. The coding does not have to be absolutely finished by that time, but there should at least be a prototype that conveys the code’s useful functions.
Supplementary References

  - Part I reviews Excel.
  - Part II supports the course.
  - Part III contains some advanced material and a set of case exercises.
A Hypothetical Decision Making Example

- A third world country is going to build a railway system to connect a potential inland industrial area and a good agricultural area with a port.
- An international development agency recommended that the iron in the area should be mined and refined locally and melt using industries which has to be established.
- The refined iron is possibly exported to Germany and Japan for car industry.
- For success of project it requires supply of skilled labor. To overcome this problem a training center has to be established to train workers by the time plant gets ready.
- The development agency also recommends the fertile land in the area should be prepared for intensive farming to provide food for the consumption of the people working in the industry.
- The railway should link the industrial area, farm and port.
Issues dealt with

- **Is the route optimum?** Are all likely users connected? What are the possible routes?
- **Growth of traffic:** To what extent does development of railway depend on development of port, new town, airport, industrial area and agricultural area?
- **Competition:** To what extent would development of an improved road would eliminate the need for railway?
- **Engineering problems:** How much electricity is needed for electrical train?
- **Supply problem:** Where will supply of equipment and constructors sought from?
- **Operational problem:** With inadequate supply of local skilled workers where will operating team be obtained from? Will foreign operating contactors be used?
- **Time Scale:** When to start the project and when it will be finished?
- **Cost:** What will the total cost of project be?
- **Infrastructure:** Will services available include: telephone, fire, water, radio communication, hospitals, hotels and housing?
Essential steps in the process of making a decision

Step 1: Concept of Project is Identified
- Decision To Proceed
- Decision To Abandon

Step 2: Project assessment. Taking account of all issues involved
- Decision To Proceed
- Decision To Abandon

Step 3: Project Goes to Detail Specification For Tender
- Decision To Proceed
- Decision To Abandon

Step 4: Tender Accepted. Construction Starts
- Decision To Proceed
- Decision To Abandon

Step 5: Operation Starts
- Decision To Proceed
- Decision To Abandon
Step 1

- The conceptual need for a project arise mainly as a result of a basement of future requirements.
- It may be made by a team of experts.
- Typically a conceptual study will identify
  - the technical solution required,
  - the economic merits, and
  - acceptability of project in socio political terms.
- It may require discussion with financial institutions whether they will provide necessary funds.
Step 2

- Assuming the decision has been made to develop the project further then a detailed assessment will have to be made of all technical, economic and socio-political factors.
- The details may be quantitative and based on subjective knowledge.
- A major decision making is about novelty of project.
  - A project may technically be novel (making a new airplane).
  - The project may employ an established technology in novel environment (using electrical train in third world country).
- In this step the degree of uncertainty associated with each factor will begin to emerge.
- An understanding of uncertainty associated with any proposal is essential for a feasible decision making.
Step 3

- If the outcome of step 2 is to proceed the project, then a tender specification has to be prepared.
- It should define, exactly what work the tender is required to do. Ideally it has to define every thing that has to be done.
- The magnitude of uncertainty associated with this stage is a reason for possible variations in cost and duration of projects.
- Before a tender specification is issued it is required to confirm that the project is acceptable to regulatory authorities and that the adequate finance is available.
- The financer need to be convinced that the project is viable, that the proposer is sound and has the experience and capability to derive the project to a successful conclusion.
Step 4

- **Step 4**
  - The first action is to **decide** if one of the tender should be accepted.
  - The tenderer should have the appropriate experience, capability and adequate financial resources.

Step 5

- **Step 5**
  - Assuming all steps completed satisfactorily, a decision has to be taken to start the project.
  - Even if the project starts, it might have to be stopped if the environment it operates is changed.
Decision making characteristics

- Decision is made based on the information available.
- At each part of the assessment, there may have to be iterative development to take account improvement in data that take place as the project proceeds.
- A project will not go ahead unless there is adequate funding.
Management

- Management is decision making
- The manager is a decision maker
- Organizations are filled with decision makers at different levels.
- Management is considered as an art: a talent acquired over years by trial-and-error.
- However, decision making today is becoming more complicated:
  - Technology / Information/Computers: increasing $\rightarrow$ More alternative to choose
  - Structural Complexity / Competition: increasing $\rightarrow$ larger cost of error
  - International markets / Consumerism: increasing $\rightarrow$ more uncertainty about future
  - Changes, Fluctuations: increasing $\rightarrow$ need for quick decision
Management problems

Most management problems for which decisions are sought can be represented by three standard elements – objectives, decision variables, and constraints.

- **Objective**
  - Maximize profit
  - Provide earliest entry into market
  - Minimize employee discomfort

- **Decision variables**
  - Determine what price to use
  - Determine length of time tests should be run on a new product/service
  - Determine the responsibilities to assign to each worker

- **Constraints**
  - Can’t charge below cost
  - Test enough to meet minimum safety regulations
  - Ensure responsibilities are at most shared by two workers
Types of Problems

- **Structured**: situations where the procedures to follow when a decision is needed can be specified in advance
  - Repetitive
  - Standard solution methods exist
  - Complete automation may be feasible

- **Unstructured**: decision situations where it is not possible to specify in advance most of the decision procedures to follow
  - One-time
  - No standard solutions
  - Rely on judgment
  - Automation is usually infeasible

- **Semi-structured**: decision procedures that can be pre specified, but not enough to lead to a definite recommended decision
  - Some elements and/or phases of decision making process have repetitive elements

- DSS most useful for repetitive aspects of semi-structured problems
DSS in Summary

- A MANAGEMENT LEVEL COMPUTER SYSTEM
  Which:
  - COMBINES DATA,
  - MODELS,
  - USER - FRIENDLY SOFTWARE

FOR SEMISTRUCTURED & UNSTRUCTURED DECISION MAKING.

- It utilizes data, provides an easy-to-use interface, and allows for the decision maker's own insights.
Why DSS?

- Increasing complexity of decisions
  - Technology
  - Information:
    - “Data, data everywhere, and not the time to think!”
  - Number and complexity of options
  - Pace of change
- Increasing availability of computerized support
  - Inexpensive high-powered computing
  - Better software
  - More efficient software development process
- Increasing usability of computers
Perceived benefits

- decision quality
- improved communication
- cost reduction
- increased productivity
- time savings
- improved customer and employee satisfaction