Supporting Decision Making

Chapter 11
Information Systems Management In Practice 7E
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Introduction

• Most computer systems support decision making because all software programs involve automating decision steps that people would take

• Decision making is a process that involves a variety of activities, most of which handle information

A PROBLEM-SOLVING SCENARIO
Case Example – Supporting Decision Making

• Using an executive information system, (EIS) to compare budget to actual sales

• Discover a sale shortfall in one region

• Searches for the cause of the shortfall

• But couldn't find an answer
  - Hold a meeting, in an electronic meeting room supported by group DSS (GDSS) software

Technologies that Support Decision Making

• The purpose of tractors, engines, machines etc. = to enhance humans' physical capabilities

• The purpose of computers has been to enhance our mental capabilities

• Hence, a major use of IT is to relieve humans of some decision making or help us make more informed decisions

Technologies that Support Decision Making
Decision Support Systems

• Systems that support, not replace, managers in their decision-making activities

• DSS are defined as: Computer-based systems
  – That help decision makers
  – Confront ill-structured problems
  – Through direct interaction
  – With data and analysis models

Decision Support Systems
The Architecture for DSSs

• Figure 11-1 shows the relationship between the three components of the DDM model

• Software system in the middle of the figure consists of:
  – The database management system (DBMS)
  – The model base management system (MBMS)
  – The dialog generation and management system (DGMS)
Decision Support Systems

The Architecture for DSSs cont.

The Dialog Component
- The DSS contains a dialog component to link the user to the system
- Was 'mouse' (Mac) now = browser interface

The Data Component
- Data sources – as the importance of DSS has grown, it has become increasingly critical for the DSS to use all the important data sources within and outside the organization
- Data warehousing
- Data mining

The Model Component
- Models provide the analysis capabilities for a DSS
  - Using a mathematical representation of the problem, algorithmic processes are employed to generate information to support decision making

Types of DSS
- The size and complexity of DSS range from large complex systems that have many of the attributes of major applications down to simple ad hoc analyses that might be called end user computing tasks
- Institutional DSSs tend to be fairly well defined
  - They are based on pre-defined data sources
  - Heavily internal with perhaps some external data
  - Use well established models in a prescheduled way
  - Generally built by professionals
- Quick-hit DSSs are developed quickly to help a manager make either a one-time decision or a recurring one
  - Can be every bit as useful for a small or large company

Data Mining
- A promising use of data warehouses is to let the computer uncover unknown correlations by searching for interesting patterns, anomalies, or clusters of data that people are unaware exist
- Called data mining, its purpose is to give people new insights into data
- Most frequent type of data mined = customer data

Executive Information Systems (EIS)
- As the name implies EISs are for use by executives
- They have been used for the following purposes:
  1. Gauge company performance: sales, production, earnings, budgets, and forecasts
  2. Scan the environmental: for news on government regulations, competition, financial and economics developments, and scientific subjects

Technologies that Support Decision Making (EIS) cont.
- EIS can be viewed as a DSS that:
  1. Provides access to summary performance data
  2. Uses graphics to display and visualize the data in an easy-to-use fashion, and
  3. Has a minimum of analysis for modeling beyond the capability to "drill down" in summary data to examine components
- In many companies, the EIS is called a dashboard and may look like a dashboard of a car
Executive Information Systems (EIS)

Pitfalls in EIS Development

1. Lack of executive support: executives must provide the funding, but are the principal users and supply the needed continuity
2. Undefined system objectives: the technology, the convenience, and the power of EIS are impressive, but the underlying objectives and business values of an EIS must be carefully thought through
3. Poorly defined information requirements: EIS typically need non-traditional information sources - judgments, opinion, external text-based documents - in addition to traditional financial and operating data

Executive Information Systems (EIS)

Pitfalls in EIS Development cont.

4. Inadequate support staff: support staff must:
   - Have technical competence
   - Understand the business, and
   - Have the ability to relate to the varied responsibilities and work patterns of executives
5. Poorly planned evolution: highly competent system professionals using the wrong development process will fail with EIS
   - EIS are not developed, delivered, and then maintained
     - They should evolve over a period of time under the leadership of a team that includes:
       • The executive sponsor
       • The operating sponsor
       • Executive users
       • The EIS support staff manager, and
       • The IS technical staff

Executive Information Systems (EIS)

Why Install an EIS?

• Attack a critical business need: EIS can be viewed as an aid to dealing with important needs that involve the future health of the organization
• A strong personal desire by the executive: The executive sponsoring the project may
  - Want to get information faster than he/she is now getting it, or
  - Have a quicker access to a broader range of information, or
  - Have the ability to select and display only desired information and to probe for supporting detail, or
  - To see information in graphical form

Executive Information Systems (EIS)

A Weak Reason to Install an EIS

• “The thing to do”: An EIS is seen as something that modern management must have, in order to be current in management practices
• The rationale given is that the EIS will increase executive performance and reduce time that is wasted looking for information.

Technologies that Support Decision Making

Expert Systems

• A real-world use of artificial intelligence (AI)
  - AI is a group of technologies that attempts to mimic our senses and emulate certain aspects of human behavior such as reasoning and communication
• An expert system is an automated type of analysis or problem-solving model that deals with a problem the way an “expert” does.

Technologies that Support Decision Making cont.

• The process involves consulting a base of knowledge or expertise to reason out an answer based on the characteristics of the problem
• Like DSSs, they have:
  - A user interface
  - An inference engine, and
  - Stored expertise (in the form of a knowledge base)
• The inference engine is that portion of the software that contains the reasoning methods used to search the knowledge base and solve the problem
Expert Systems

Knowledge Representation

- Knowledge can be represented in a number of ways:
  1. One is as cases; case-based reasoning expert systems using this approach draw inferences by comparing a current problem (or case) to hundreds or thousands of similar past cases.
  2. A second form is neural networks, which store knowledge as nodes in a network and are more intelligent than the other forms of knowledge representation because they can learn.
  3. Third, knowledge can be stored as rules (the most common form of knowledge representation), which are obtained from experts drawing on their own expertise, experience, common sense, ways of doing business, regulations, and laws.

AMERICAN EXPRESS

Case Example – Expert System

- One of the first commercially successful ESs and a fundamental part of the company’s everyday credit card operation.
- Authorizer’s Assistant is an expert system that approves credit at the point of sale.
- It has over 2,600 rules and supports all AmEx card products around the world.
- Authorizes credit by looking at:
  - Whether cardholders are creditworthy.
  - Whether they have been paying their bills.
  - Whether a purchase is within their normal spending patterns.
- It also assesses whether the request for credit could be a potential fraud.

AMERICAN EXPRESS

Case Example – Expert System cont.

- The most difficult credit-authorization decisions are still referred to people.
- The rules were generated by interviewing authorizers with various levels of expertise – comparing good decisions to poor decisions.
- The system can be adapted quickly to meet changing business requirements.

Expert Systems

Degree of Expertise

1. As an assistant, the lowest level of expertise, the expert system can help a person perform routine analysis and point out those portions of the work where the expertise of the human is required.
2. As a colleague, the second level of expertise, the system and the human can “talk over” the problem until a “joint decision” has been reached.
3. As an expert, the highest level of expertise, the system gives answers that the user accepts, perhaps without question.

Agent-Based Modelling

- A simulation technology for studying emergent behaviour (e.g., traffic jam) that emerges from the decisions of a large number of distinct individuals (drivers).
  - Simulation contains computer generated agents, each making decisions typical of the decisions an individual would make in the real world.
  - Trying to understand the mysteries of why businesses, markets, consumers, and other complex systems behave as they do.
- Some examples:
  - Retailer = redesign its incentive program.
  - Southwest Airlines = revamp its cargo operations.
  - Company changing its recruiting practices.

Toward the Real-Time Enterprise

- Through IT, organizations have been able to see the status of operations more and more toward real time.
- The Internet is giving companies a way to disseminate closer-to-real-time information about events.
- The essence of the phrase real-time enterprise is that organizations can know how they are doing at the moment, rather than have to wait days, weeks, or months for analysis results.
Toward the Real-Time Enterprise cont.

• It is occurring on a whole host of fronts, including:
  – Enterprise nervous systems
  • To coordinate company operations
  – Straight-through processing
  • To reduce distortion in supply chains
  – Real-time CRM
  • To automate decision making relating to customers, and
  – Communicating objects
  • To gain real-time data about the physical world

Toward the Real-Time Enterprise

Enterprise Nervous Systems

• These are the technical means to a real-time enterprise
• They are:
  – Message based - because sending messages is efficient and effective in dispersing information among parties simultaneously
  – Event driven - when an event occurs, it is recorded and made available
  – Use a publish and subscribe approach - the event is "published" to an electronic address and any system, person, or device authorized to see that information can "subscribe" to that address’s information feed, and
  – Use common data formats - data formats from disparate systems are reduced to common denominators that can be understood by other systems and hence shared

Toward the Real-Time Enterprise

Straight-Through Processing

• The notion of a real-time enterprise has generated two “buzzwords”
• One is zero latency, which means reacting quickly to new information (with no wait time)
• The second is straight-through processing, which means that transaction data are entered just once in a process or a supply chain
• The goal is to reduce lags in supply chains

Toward the Real-Time Enterprise

Real-Time CRM

• Another view of a real-time response might occur between a company and a potential customer
  - Perhaps via a customer call center or a Website

A REAL-TIME INTERACTION ON A WEB SITE

Case Example – Real-Time CRM

• E.piphany CRM software example
• A potential guest visits the Website of a hotel chain, checking for a hotel in Orlando
  – The real-time CRM system initiates requests to create a profile of the customer
    • All past interactions with that customer
    • Past billing information
    • Past purchasing history
• Using this information, it makes real-time offers to the Website visitor, and the visitor’s responses are recorded and taken into account for future Website visitors

Toward the Real-Time Enterprise

Communicating Objects

• These are sensors and tags that provide information about the physical world via real-time data
• A communicating object can tell you:
  – What it is attached to
  – Where it is located
  – Where it belongs, and
  – A lot more information about itself
• It is a radio frequency identification device (RFID), also called "smart tags"
Toward the Real-Time Enterprise

Communicating Objects cont.
- In Singapore, cars carry smart tags, and drivers are charged variable prices for where they drive in the city and when
  - The prices are set to encourage or discourage driving at different places at different times
  - Also proposed for Sydney’s new toll ways
- It’s an example of real-time traffic control
- Smart tags will transform industries because they will talk to one another (object-to-object communication), changing how work is handled

Vigilant Information Systems
- The premise of the real-time enterprise is not only that it can capture data in real time, but that it has the means to act on that data quickly
- US Air Force pilot = bet he could win any dogfight
  - Never lost a bet, even to superior aircraft
  - Called his theory OODA
    - Observe where his challenger’s plane is
    - Orient himself and size up his own vulnerabilities and opportunities
    - Decide which manoeuvre to take
    - Act to perform it before the challenger could go through the same four steps

The Dark Side of Real Time
- What are the drawbacks of real-time activities?
  - Object-to-object communication could compromise privacy, since knowing the exact location of a company truck every minute of the day and night can be construed as invading the driver’s privacy
    - That’s a political issue, not a technical issue, and many CEOs are going to face this question in the future

Conclusion
- Use of IT to support decision making covers a broad swath of territory
- Some technologies aim to alert people to anomalies, discontinuities, and shortfalls
- Others aim to make decisions, either as recommendations to people or to act on behalf of people
- Handing over decisions to systems has its pros and cons, thus their actions need to be monitored

Conclusion cont.
- CIOs need to alert their management team of potential social and economic effects of computer-based decision making because errant computer-based decisions have devastated corporate reputations and cost a lot of money
- With vendors pushing toward the real-time enterprise, this is a use of computers that should give pause to explore the ramifications