# ACS-1803
# Introduction to Information Systems

## Instructor: Victor Balogun

## Systems that span Organizational Boundaries

### Lecture Outline 8-1

# Decision Support Systems
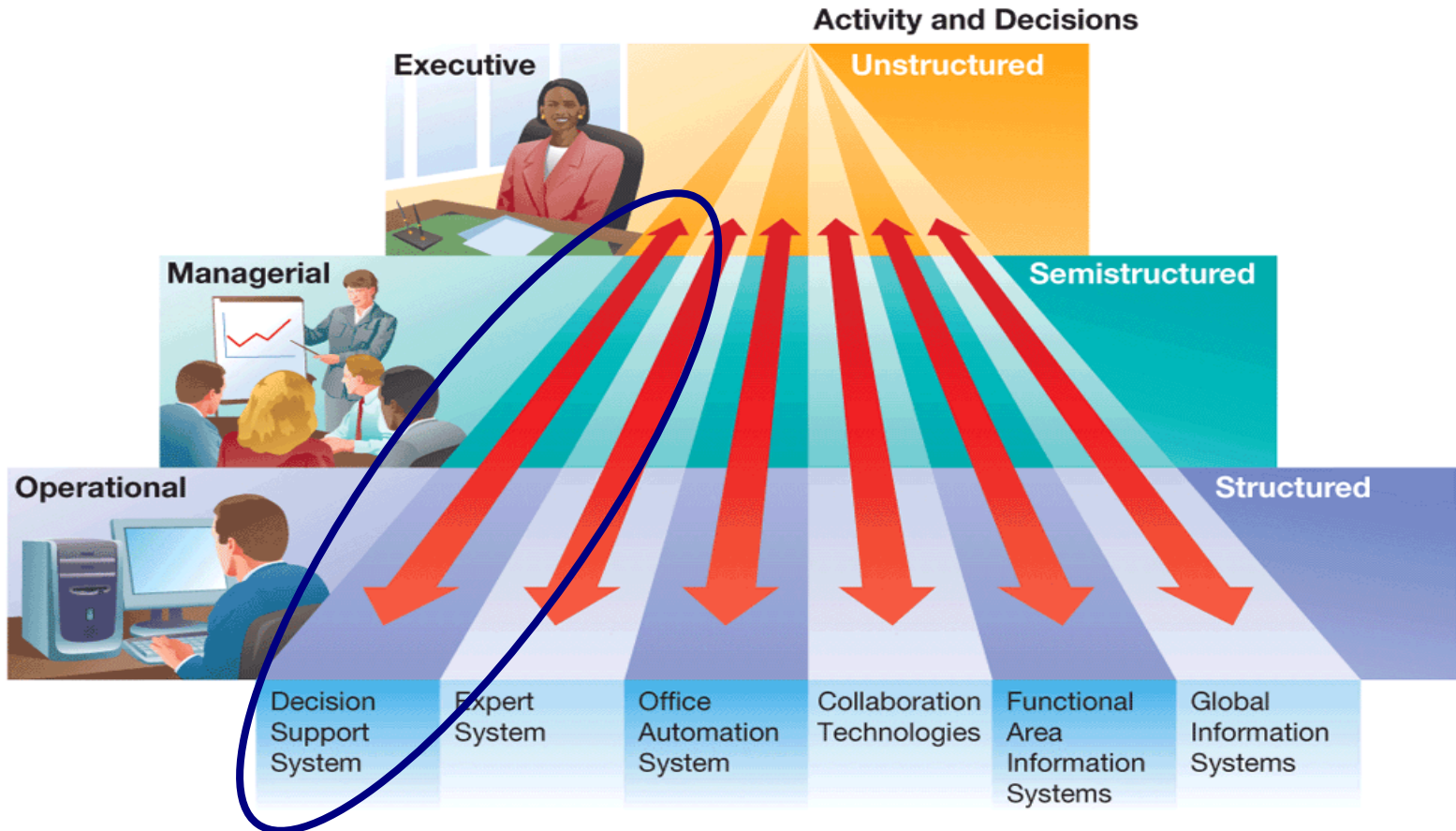
# Systems That Span Organizational Boundaries



**Figure 6.19** Organizational boundary-spanning information systems.

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# Decision Support Systems

▸ Computerized information systems designed to help business owners, executives, and managers resolve complicated business problems and/or questions.

▸ Structured vs. Unstructured decisions

  ▸ Structured Decisions

    ▸ Decisions that are taken based upon specific pre-set parameters that support the decision. To make the decision, it is known what data is required, and there is an assumptions that the required data will always be available. Little flexibility for decision-maker

  ▸ Unstructured Decisions

    ▸ Decisions made when all elements of business environment are not completely understood. (new products, marketing strategy). Data might be incomplete at the moment of making the decision More focus on the individual who makes the decision.

# Decision Support Systems

**Decision Support Systems**

**Special**-**purpose** information systems designed to support **managerial**-**level** employees in organizational decision making

**System Details**

These systems use **computational software** to construct models for analysis (most common is MS Excel) to solve problems (e.g. sales or resource forecasts)

**Supported Activities**:

**"What-if" analysis** – changing one or more variables in the model to observe the effect (e.g. What is the payment if the interest rate increases by 1% ?)

# Characteristics of Decision Support Systems

| | |
|---|---|
| **Inputs** | Data and models; data entry and data manipulation commands (via user interface) |
| **Processing** | Interactive processing of data and models; simulations, optimization, forecasts |
| **Outputs** | Graphs and textual reports; feedback to system operator (via user interface) |
| **Typical Users** | Midlevel managers (although a DSS could be used at any level of the organization) |

# Common Decision Support Systems

| Area | Common DSS Models |
| --- | --- |
| Accounting | Cost analysis, discriminant analysis, break-even analysis, auditing, tax computation and analysis, depreciation methods, budgeting |
| Corporate Level | Corporate planning, venture analysis, mergers and acquisitions |
| Finance | Discounted cash flow analysis, return on investment, buy or lease, capital budgeting, bond refinancing, stock portfolio management, compound interest, after-tax yield, foreign exchange values |
| Marketing | Product demand forecast, advertising strategy analysis, pricing strategies, market share analysis, sales growth evaluation, sales performance |
| Personnel | Labour negotiations, labour market analysis, personnel skills assessment, employee business expense, fringe benefit computations, payroll and deductions |
| Production | Product design, production scheduling, transportation analysis, product-mix inventory level, quality control, learning curve, plant location, material allocation, maintenance analysis, machine replacement, job assignment, material requirement planning |
| Management Science | Linear programming, decision trees, simulation, project evaluation and planning, queuing, dynamic programming, network analysis |
| Statistics | Regression and correlation analysis, exponential smoothing, sampling, time-series analysis, hypothesis testing |

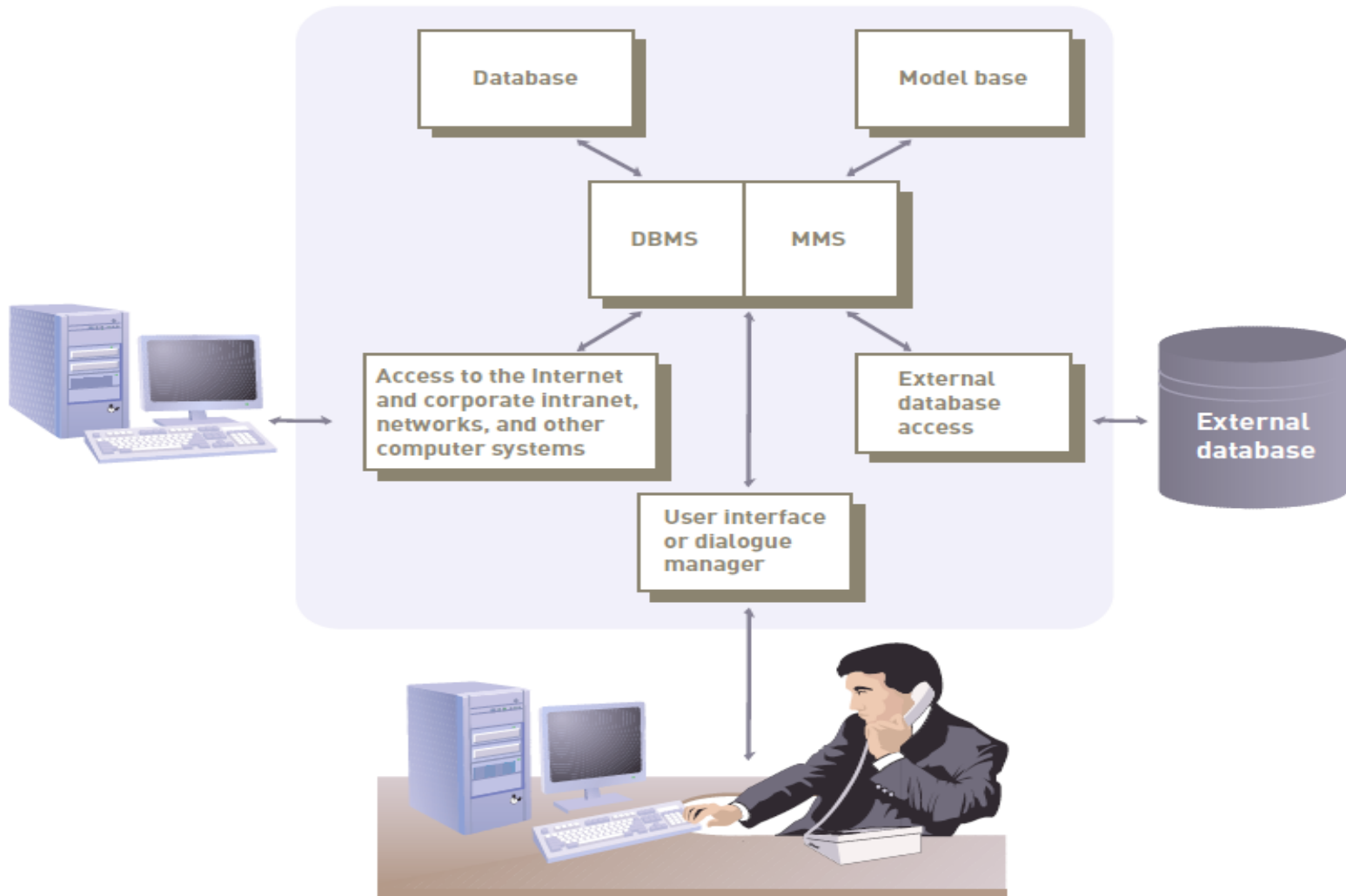# Decision Support Systems

▸ A DSS may be developed by people outside of the Information Systems Department

▸ A DSS also can have capability for ad hoc reporting from the data base (warehouse)

▸ examples of decision support:

▸ should we buy out a company? should we expand into another product line?  [why semi-structured?]

# Decision Support Systems (DSS)

▶ Typically include:

a) Database Management System (DBMS)

b) Model Base that uses the data base

  ➢ structured representation of some aspect of reality

  ➢ Through modeling we can examine effects of decisions

  ➢ a model always includes assumptions e.g., inflation rate, net earnings level over 5 years; cost increases

c) User-friendly Interface (dialog), often involving graphics
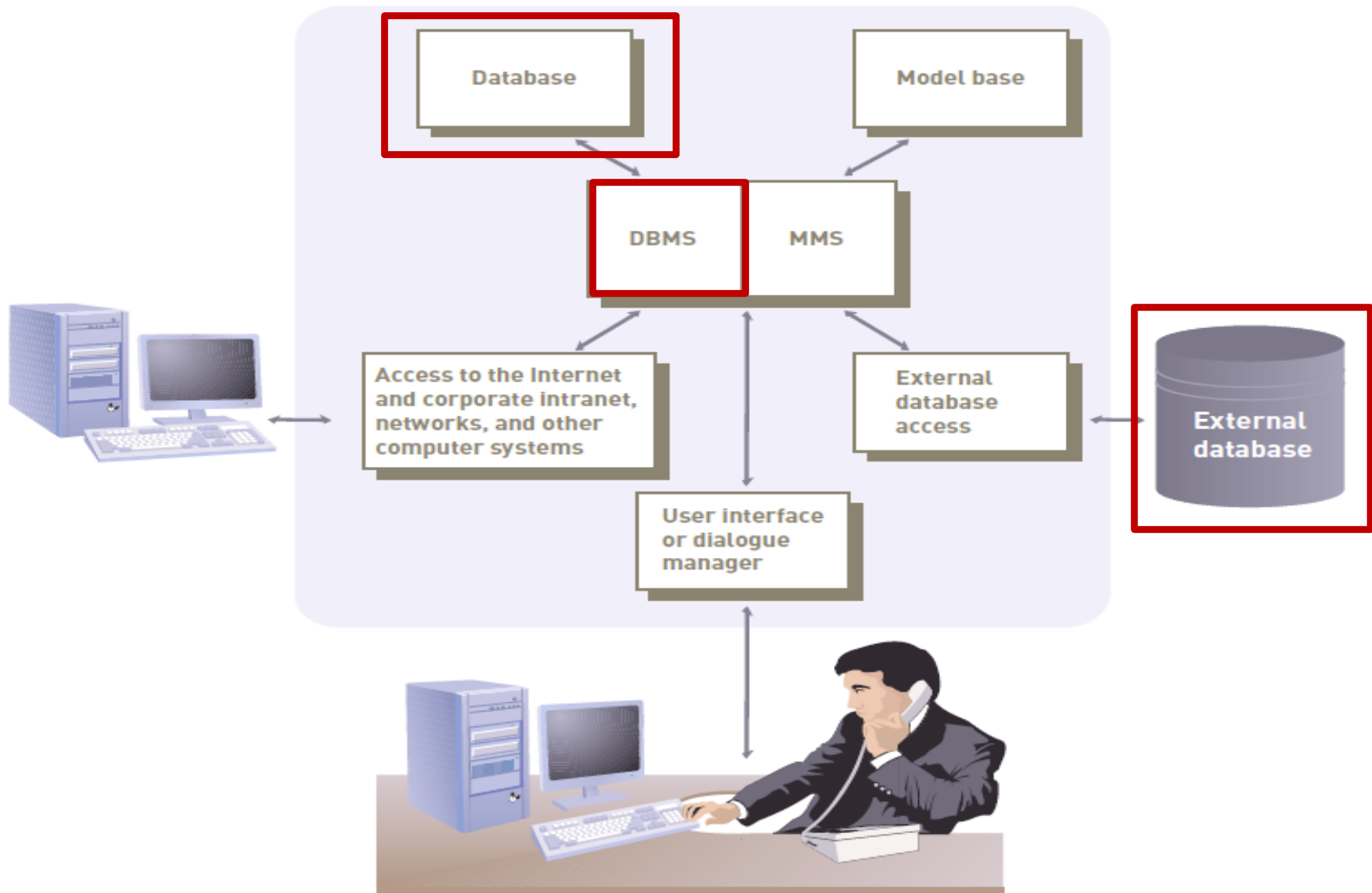
# Components of a Decision Support System (DSS)

# Components of a Decision Support System (DSS)

1. Database Management System (DBMS):

   ▸ Allows managers and decision makers to perform qualitative analysis on data stored in company's databases, data warehouses, and data marts

   ▸ Can also be used to connect to external databases

   ▸ Data-driven DSS:

     ▸ Performs qualitative analysis based on the company's databases

# Components of a Decision Support System (DSS)

# Components of a Decision Support System (DSS)

2. Model Base:

- ▶ Allows managers and decision makers to perform *quantitative analysis* on both internal and external data
- ▶ Model management software (MMS):
  - ▶ Coordinates the use of models in a DSS
- ▶ Model-driven DSS:
  - ▶ Performs mathematical or quantitative analysis

# Components of a Decision Support System (DSS)
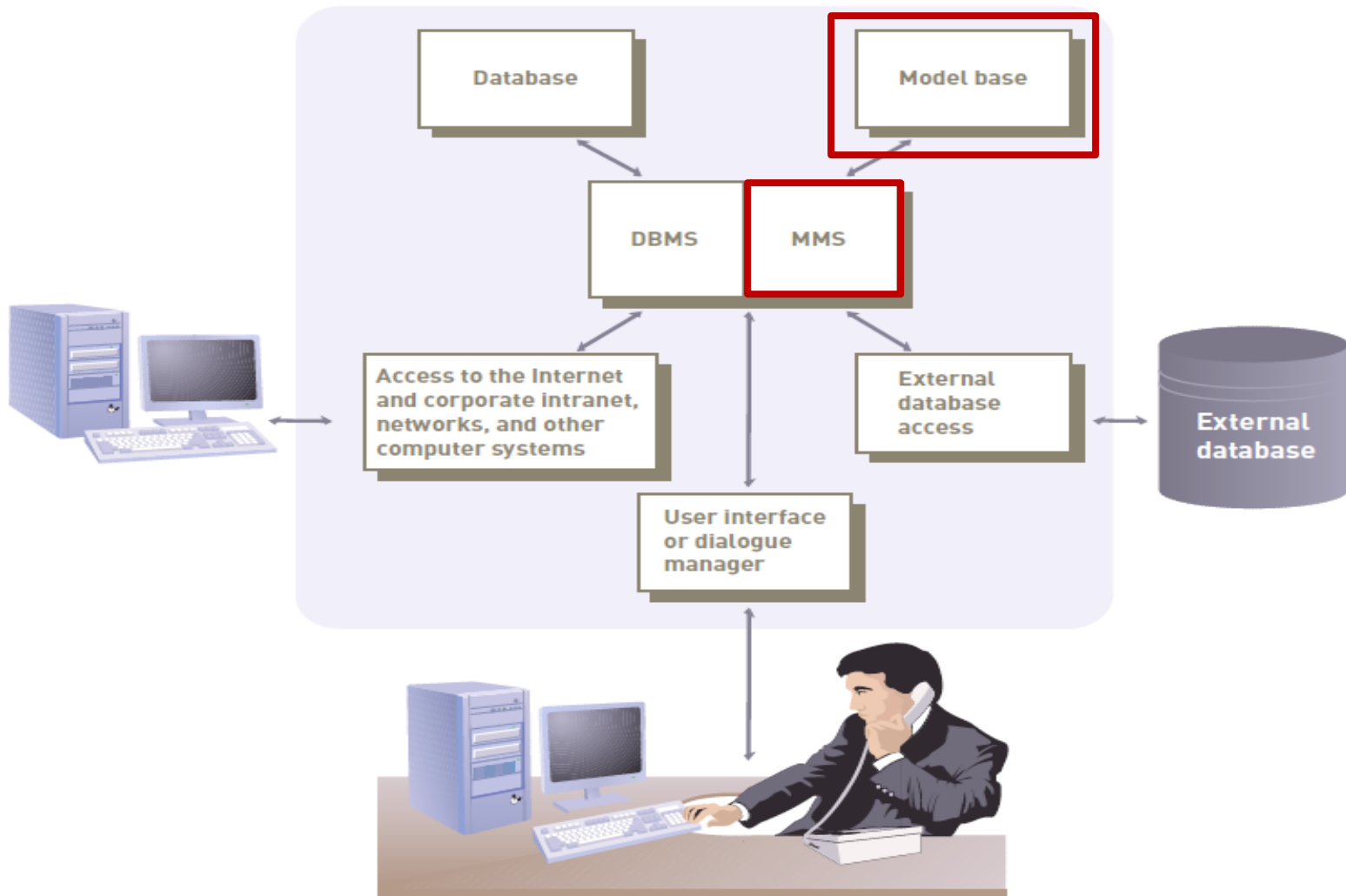
# Model Base Examples

| Model Type | Description | Software |
|---|---|---|
| Financial | Provides cash flow, internal rate of return, and other investment analysis | Spreadsheet, such as Microsoft Excel |
| Statistical | Provides summary statistics, trend projections, hypothesis testing, and more | Statistical programs, such as SPSS or SAS |
| Graphical | Assists decision makers in designing, developing, and using graphic displays of data and information | Graphics programs, such as Microsoft PowerPoint |
| Project Management | Handles and coordinates large projects; also used to identify critical activities and tasks that could delay or jeopardize an entire project if they are not completed in a timely and cost-effective fashion | Project management software, such as Microsoft Project |

# Components of a Decision Support System (DSS)

3. User Interface or Dialogue manager:

- ▸ Allows decision makers to easily access and manipulate the DSS and to use common business terms and phrases
- ▸ Allows users to interact with the DSS to obtain information
- ▸ Assists with all aspects of communications between user and hardware and software that constitute the DSS
- ▸ Allows for manipulation of variables

# User Interface Example

# Three Fundamental DSS Components
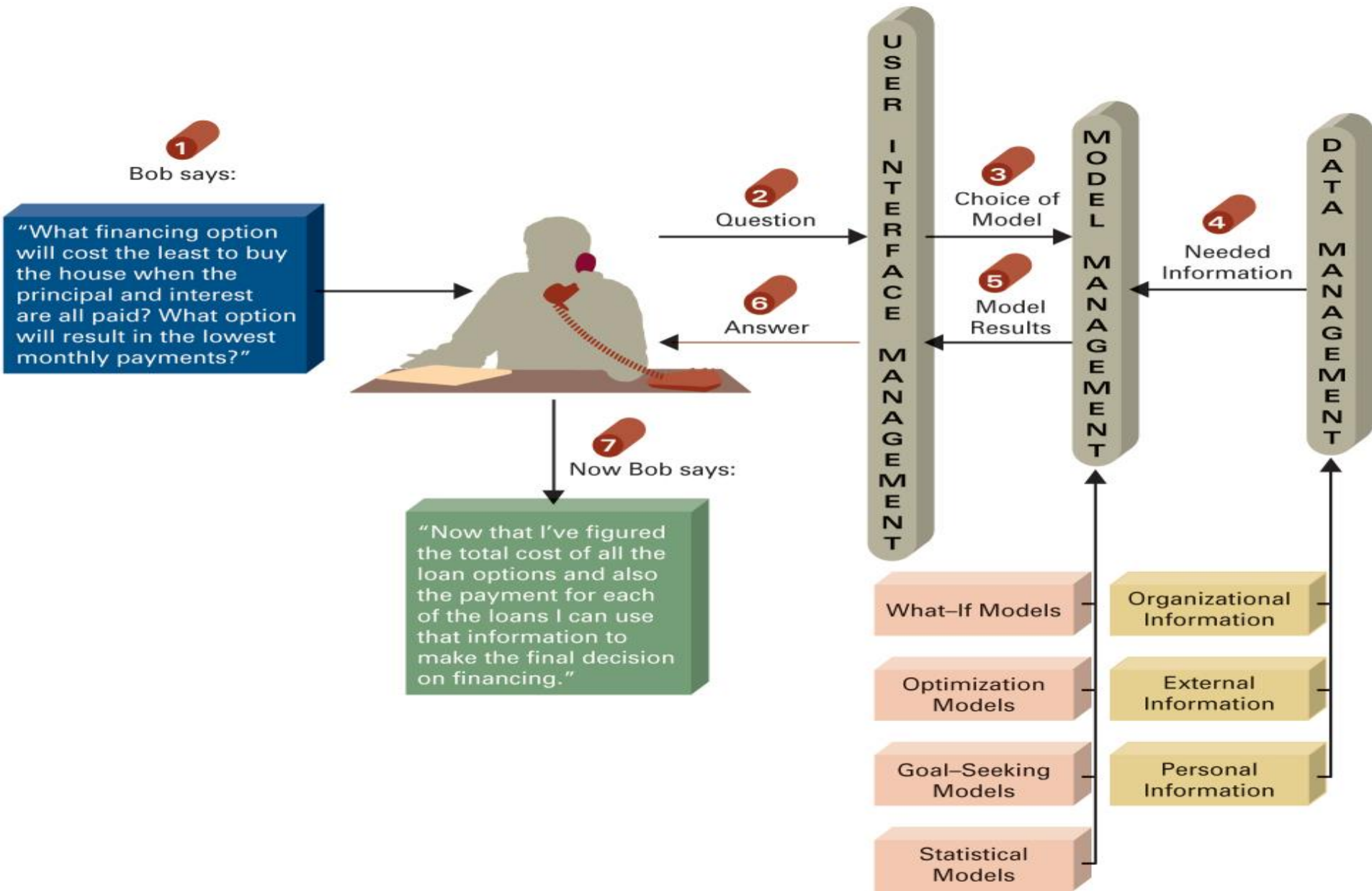
# Model Driven DSS vs. Data Driven DSS

▸ A Model Driven DSS uses various models such as statistical model, simulation model or financial model for decision makings and to come up with a decision or strategy. Decisions are based on models.

▸ A Data Driven DSS emphasizes access to and manipulation of a time-series of internal company data and sometimes external data to aid decision makings. So, decisions are based on analyzed data.

# Model Driven DSS



Uses various models such as statistical model, simulation model or financial model for decision makings

# Model-Driven DSS Concepts

▸ A more primitive example of a Model-Driven DSS is a spreadsheet used for "what-if" analysis

▸ There are Excel templates built for certain types of decisions [terms: *template, model;* explain these]

▸ Template: Frame to define in general terms an aspect of reality. Instances of this aspect are created by filling in information on the template

▸ Model: A representation of a process in real life ( can be graphical or numerical). Contains variables that can be modified.

# Model-Driven Ex. – Loan Calculator

## Variables to be Analyzed

| Interest Rate | Loan Duration |
|---------------|---------------|
| 4% per year | 3 years |
| 6% per year | 4 years |
| 8% per year | 5 years |

## Loan Calculator Model



Figure 6.19 ➥ Loan analysis template in Microsoft Excel.
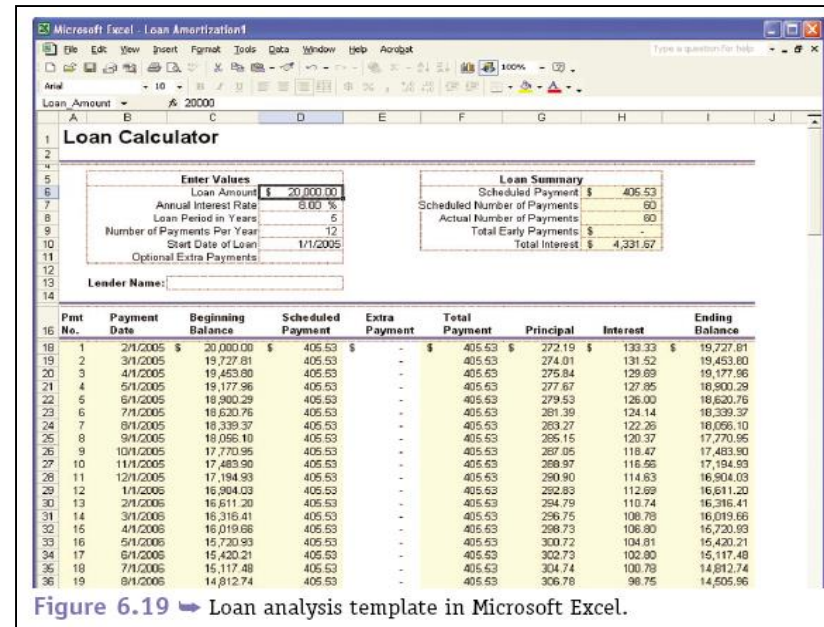
## Analysis Results

| Interest Rate | Loan Duration | Monthly Payment | Total Paid | Total Interest | Feasible Payment |
|---------------|---------------|-----------------|------------|----------------|------------------|
| 4% per year | 3 years | $590.48 | 21,257.27 | $1,257.27 | No |
| 6% per year | 4 years | $488.26 | $23,436.41 | $3,436.41 | No |
| 8% per year | 5 years | $405.53 | $24,331.67 | $4,331.67 | Yes |

# Data Driven DSS
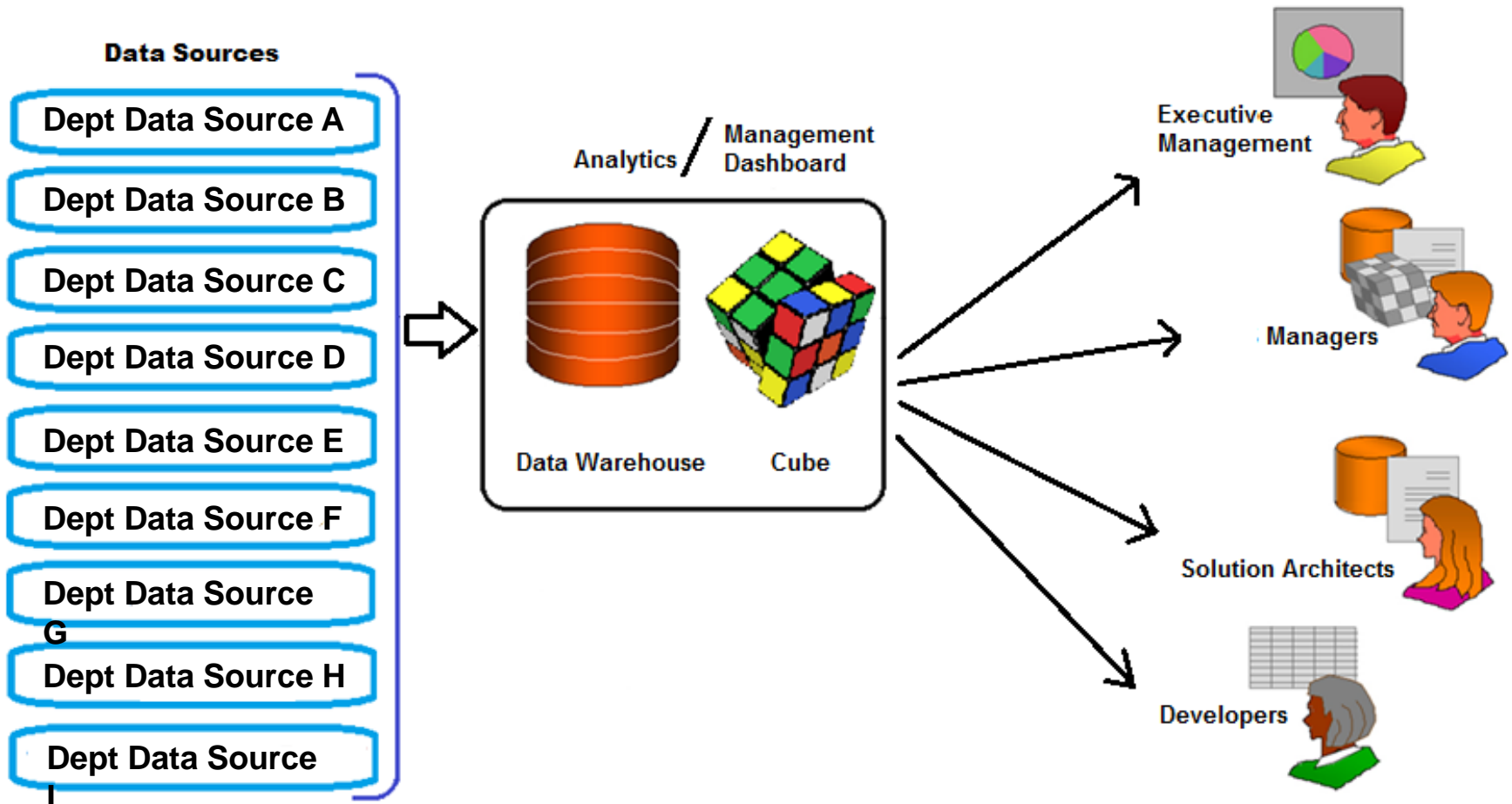


**Data Sources**
- Dept Data Source A
- Dept Data Source B
- Dept Data Source C
- Dept Data Source D
- Dept Data Source E
- Dept Data Source F
- Dept Data Source G
- Dept Data Source H
- Dept Data Source I

Analytics / Management Dashboard

Data Warehouse    Cube

Executive Management

Managers

Solution Architects

Developers

Emphasizes access to and manipulation of a time-series of internal company data and sometimes external data to aid decision makings

# Model Driven DSS vs. Data Driven DSS

| Model-Driven DSS | Data-Driven DSS |
|---|---|
| User interacts primarily with a (mathematical) model and its results | User interacts primarily with the data |
| Helps to solve well-defined and structured problems (what-if-analysis) | Helps to solve mainly unstructured problems |
| Contains in general various and complex models | Contains in general simple models |
| Large amounts of data are not necessary | Large amounts of data are crucial |
| Helps to understand the impact of decisions on organizations | Helps to prepare decisions by showing developments in the past and by identifying relations or patterns |
| Software technology can be deployed on the desktop to execute the model (i.e. MS Excel, MS Access) | Query applications that are run on the central system against a corporate database or warehouse |

# A Comparison of DSS and MIS

‣ **DSS differs from an MIS in numerous ways, including:**

  ‣ The type of problems solved

  ‣ The support given to users

  ‣ The decision emphasis and approach

  ‣ The type, speed, output, and development of the system used

  ‣ See comparison of DSS with MIS

# A Comparison of DSS and MIS

| Factor | DSS | MIS |
|---|---|---|
| Problem Type | Can handle unstructured problems that cannot be easily programmed. | Normally used only with structured problems. |
| Users | Supports individuals, small groups, and the entire organization. In the short run, users typically have more control over a DSS. | Supports primarily the organization. In the short run, users have less control over an MIS. |
| Support | Supports all aspects and phases of decision making; it does not replace the decision maker—people still make the decisions. | In some cases, makes automatic decisions and replaces the decision maker. |
| Emphasis | Emphasizes actual decisions and decision-making styles. | Usually emphasizes information only. |
| Approach | Serves as a direct support system that provides interactive reports on computer screens. | Typically serves as an indirect support system that uses regularly produced reports. |
| System | Uses computer equipment that is usually online (directly connected to the computer system) and related to real time (providing immediate results). Computer terminals and display screens are examples—these devices can provide immediate information and answers to questions. | Uses printed reports that might be delivered to managers once per week, so it cannot provide immediate results. |
| Speed | Is flexible and can be implemented by users, so it usually takes less time to develop and is better able to respond to user requests. | Provides response time usually longer than a DSS. |
| Output | Produces reports that are usually screen oriented, with the ability to generate reports on a printer. | Is oriented toward printed reports and documents. |
| Development | Has users who are usually more directly involved in its development. User involvement usually means better systems that provide superior support. For all systems, user involvement is the most important factor for the development of a successful system. | Is frequently several years old and often was developed for people who are no longer performing the work supported by the MIS. |

# DSS Examples (Model or Data-Driven)

▶ Evaluate alternative investment in mortgage portfolios
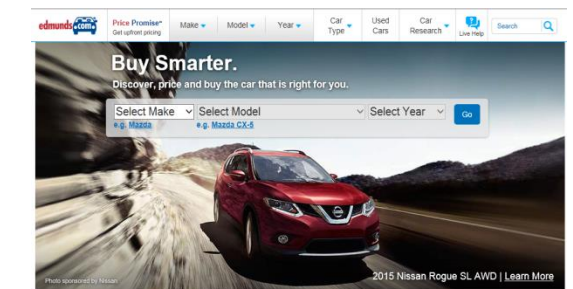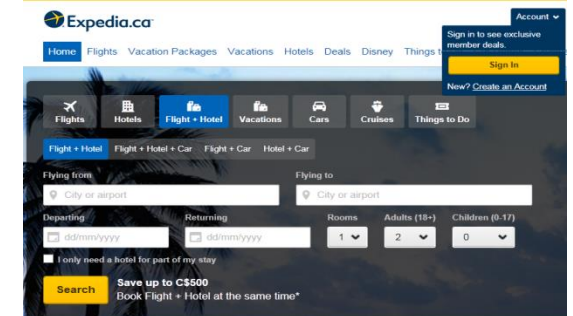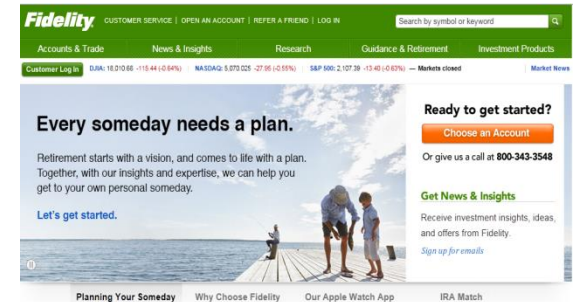
    ▶ Fidelity.com (on-line investor center)

Model-Driven DSS



▶ Evaluate and compare air fares

    ▶ Travelocity.ca

    ▶ Expedia.ca

Data-Driven DSS



▶ Evaluate and compare various automobile prices

    ▶ Edmunds.com

Data-Driven DSS

# More Data-Driven DSS Examples

- Canadian gov't: PRAIRIE CROP PROTECTION PLANNER
  - Farmer describes: spraying equipment, size of field, current chemical prices
  - Model calculates: application rates, costs per acre, amount of chemical needed
- US: helps farmers decide in which regions of Nebraska to plant grapevines to avoid freezing

# More Data-Driven DSS Examples

▸ **Airline industry:** DSS helps to find proper pricing to maximize overall revenue from selling seats for each flight

  ▸ Manager enters departure airport, arrival airport, # of stops, times of departure and arrival, # days in advance for reservation, # persons, size of plane, utilized capacity on similar previous flights etc.

  ▸ System suggests variable ticket prices

# Data-Driven DSS - Airline Industry

▸ Yield management systems are designed to maximize the amount of revenue that an airline generates on each flight.

▸ Yield management systems are the reason that an airfare you're quoted over the phone can be $100 higher when you call back an hour later.

# Data-Driven DSS - Airline Industry
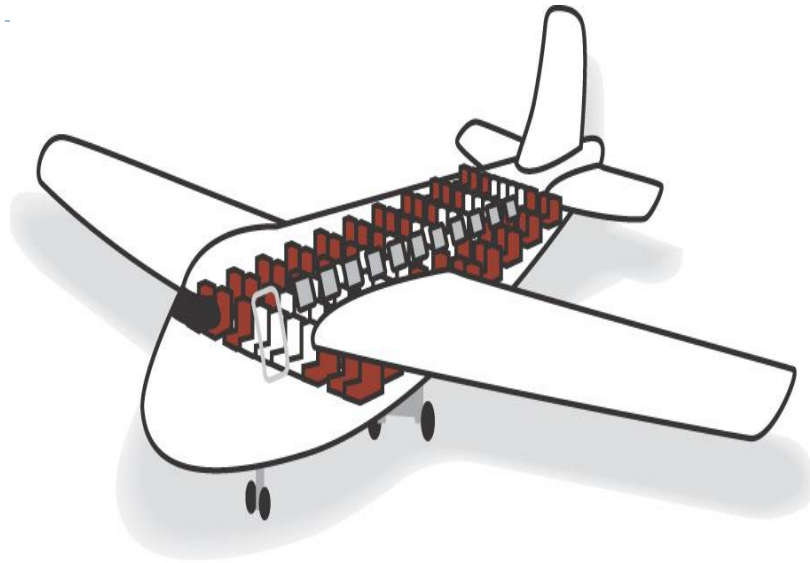


Average seat = $420
Yield = $50,400

120 seats occupied at average price of $420 per seat = $50,400 total yield for the flight.
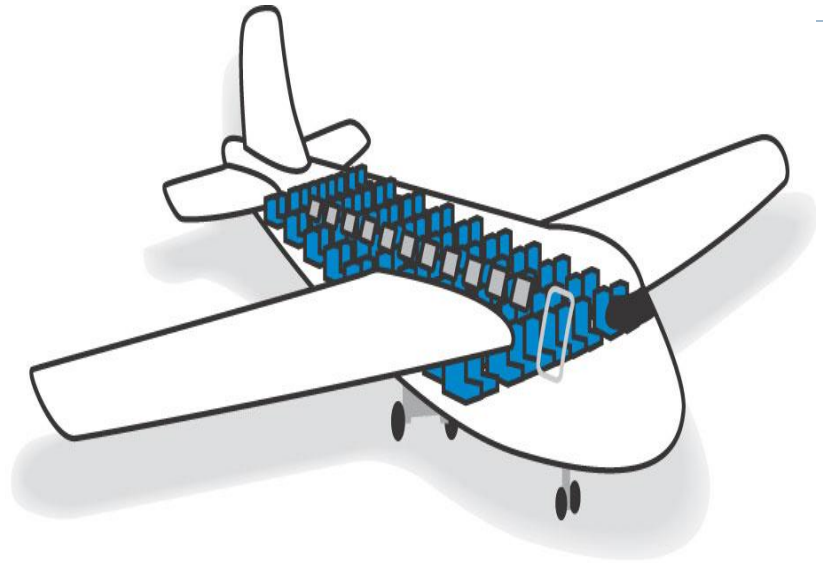
Average seat = $325
Yield = $65,000

200 seats occupied at average price of $325 per seat = $65,000 total yield for the flight.

# Medical Clinic DSS Simulation Model Using Models and Data

- HC-Simulation Software to Optimize Healthcare Processes
- Flexsim Heathcare Urgent Care Tutorial
  - Video 1 http://www.youtube.com/watch?v=neBCg7N1UyM
  - Video 2 http://www.youtube.com/watch?v=dgKflwbfrvk
  - Video 3 http://www.youtube.com/watch?v=dNLqgC-CazM