CHAPTER 1
AN OVERVIEW OF MANAGEMENT INFORMATION SYSTEM

DEFINITION OF MIS:

A Management Information System is

- An integrated user-machine system
- For providing information
- To support the operations, management, analysis, and decision-making functions
- In an organization

The system utilizes

- Computer hardware & software
- Manual procedures
- Models for analysis, planning, control, and decision making, and
- A database

Fig: PYRAMID STRUCTURE OF MIS

MIS AND OTHER ACADEMIC DISCIPLINES:

- MANAGERIAL ACCOUNTING
- OPERATION RESEARCH
- MANAGEMENT AND ORGANIZATION THEORY
- COMPUTER SCIENCE

SUBSYSTEMS OF AN MIS:

Two approaches of defining the subsystems of an MIS are :

- According to the organizational functions which they support
- According to managerial activities for which they are used.

ORGANIZATIONAL FUNCTION SUBSYSTEMS:

Major Functional subsystem	Some typical uses
Marketing	Sales forecasting, sales planning, customer and sales analysis
Manufacturing	Production planning and scheduling, cost control analysis
Logistics	Planning and control of purchasing, inventories, distribution
Personnel	Planning personnel requirements, analyzing performance, salary administration
Finance and accounting	Financial analysis, cost analysis, capital requirements planning, income measurement
Information processing	Information system planning, cost-effectiveness analysis
Top management	Strategic planning, resource allocation

ACTIVITIES SUBSYSTEMS:

Activity subsystem	Some typical uses
Transaction processing	Processing of orders, shipments, and receipts
Operational control	Scheduling of activities and performance reports
Management control	Formulation of budgets and resource allocation
Strategic planning	Formulation of objectives and strategic

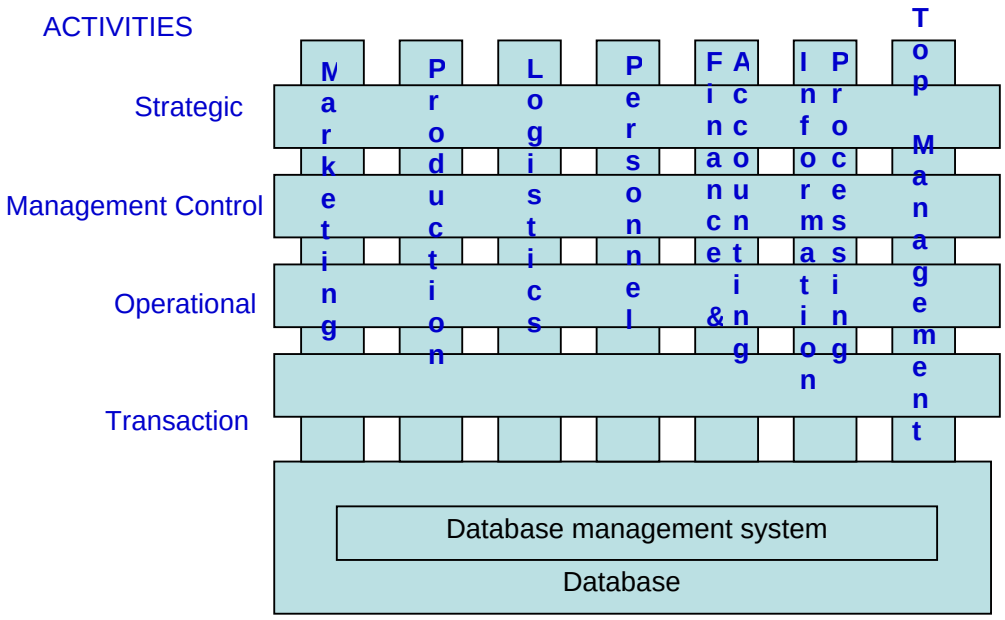


Fig: RELATION OF ACTIVITIES TO FUNCTIONAL SUBSYSTEMS

MIS AS SEEN BY THE USER:

USER	USES
Clerical personnel	Handle transactions, process input data and answer inquiries
First-level managers	Obtain operations data. Assistance with planning, scheduling, identifying out-of-control situations, and making decisions
Staff specialists	Information for analysis. Assistance with analysis, planning and reporting
Management	Regular reports. Adhoc retrieval requests. Adhoc analyses. Adhoc reports. Assistance in identifying problems and opportunities. Assistance in decision-making analysis.

CHAPTER 2

STRUCTURE OF A MANAGEMENT INFORMATION SYSTEM

Information system can be classified in terms of the following.

1. Operating elements
2. Decision support
3. Management activity
4. Organizational function

1. OPERATING ELEMENTS OF AN INFORMATION SYSTEM:

A. PHYSICAL COMPONENTS:

- **Hardware :**

  Hardware must provide for five major functions:

  1. Input or entry
  2. Output
  3. Secondary storage for data and programs
  4. Central processor
  5. Communications

- **Software :**

  The software can be classified into two major types:

  System software & Application software

- **Database**

  The database contains all data utilized by application software.

- **Procedures**

  Three major types of procedures are required:

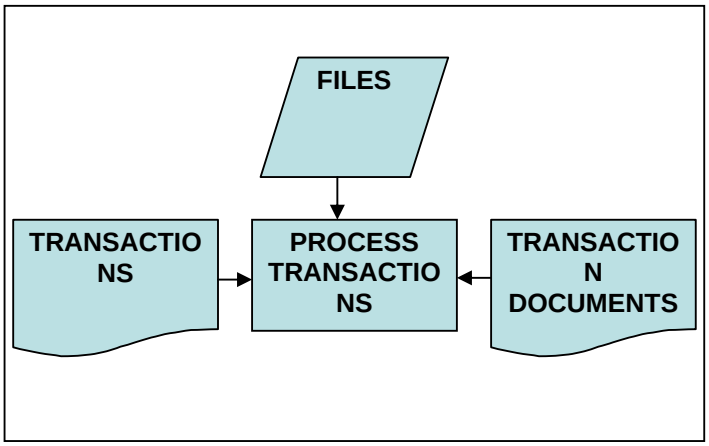
  1. User instructions
  2. Instructions for preparation of input by data preparation personnel
  3. Operating instructions for computer operations personnel

- **Operations personnel**

  Computer operators, systems analysts, programmers, data preparation personnel, information systems management, data administration, etc.

B. PROCESSING FUNCTIONS:

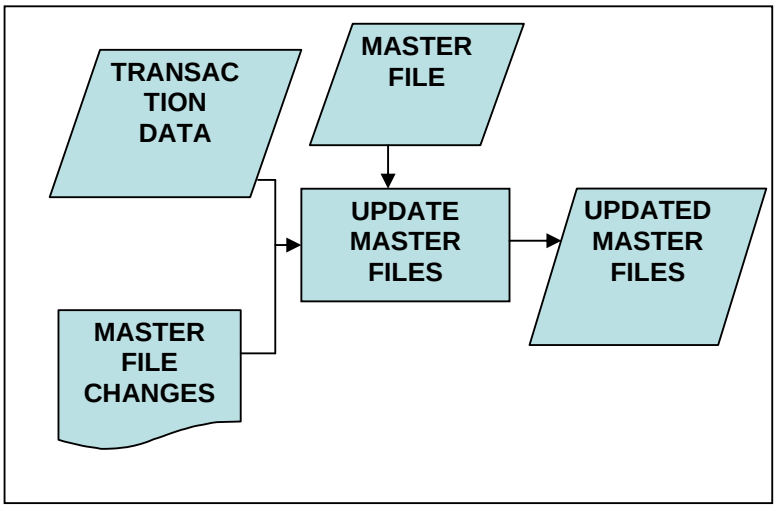
1. Process Transactions :



Performance of a transaction requires records to

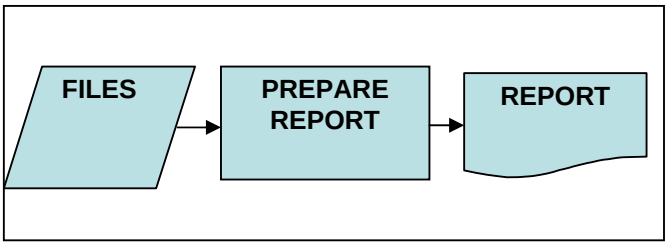
(1) Direct a transaction to take place,
(2) Report, confirm, or explain its performance
Or
(3) Communicate the transaction to those needing a record for background information or reference

2. Maintain Master Files :



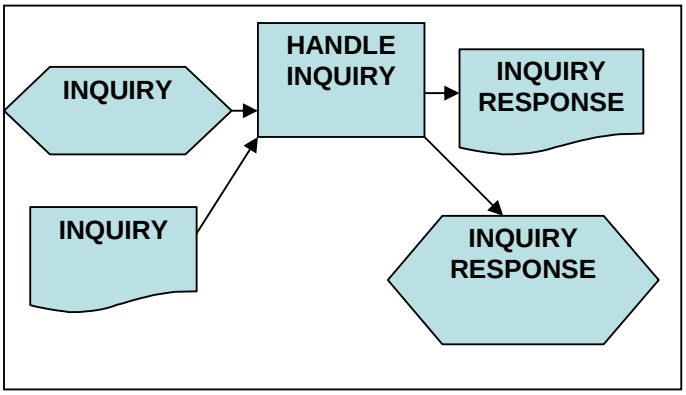
Many processing activities require creation and files maintenance of master files, which store relatively permanent or historical data about organizational entities.
When transactions are processed, master file data items are updated to reflect the most current information

3. Produce Reports :



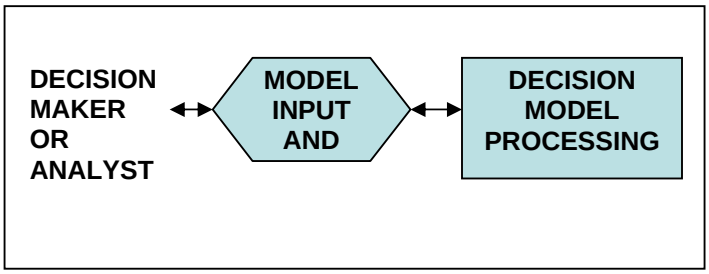
Scheduled reports are produced on a regular basis. Special reports are also produced quickly based on ad hoc (unscheduled) requests.

4. Process Inquiries :



Other outputs are responses to inquiries using database. Inquiries may be regular inquiries with a preset format or ad hoc inquiries.

5. Process Interactive Support Applications :



The information system contains applications designed to support systems for planning, analysis and decision making.

C. OUTPUTS FOR USERS :

1. Transaction documents or screens
2. Preplanned reports
3. Preplanned inquiry responses
4. Ad hoc reports and inquiries responses
5. User-machine dialog results

Transactional documents are of the following types :

1. Informational

Reports or confirms that action that will be or has been taken.

2. Action

Requests or instructions for action.

3. Investigational

Reports exceptions, errors, or other conditions that may require investigation. Used for control and future reference.

Reports, inquiry responses, and dialog results provide four types of information:

1. Monitoring information

Monitoring information provides a basis for problem finding and diagnosis and may lead to action, but no action is specified by the information itself.

2. Problem finding information

The information is presented in a format that promotes identification of problems.

3. Action information

The information is presented with action specified or implied.

4. Decision support

The report, inquiry, result, or dialog is oriented to performing analysis and making a decision**.**

Preplanned reports have a regular content and format and are usually run on a regularly scheduled basis.

Prepared at a given time, they reflect one of three conditions with respect to the time period they cover:

1. They describe status or condition at a point in time.
2. They summarize what has occurred during a period such as a week, month, or year.
3. They present results to date and project to the end of the period.

Ad hoc reports and inquiry responses occur at irregular intervals and require data or analysis whose format has not been preplanned.

Ad hoc request are handled in two ways :

1. The user may be provided with a means (inquiry language) for preparing and processing the request.
2. An information service may be available to process ad hoc requests.

2. MANAGEMENT INFORMATION SYSTEM SUPPORT FOR DECISION MAKING

Decisions are of different types with respect to the structure that can be provided for making them.

- **Structured, Programmable Decisions**

A structured decision can be said to be programmable, in the sense that unambiguous decision rules can be specified in advance. When a decision can be programmed, an organization can prepare a decision rule or decision procedure. This can be expressed as a set of steps to follow, a flowchart, a decision table or formula. Since, structured, programmable decisions can be pre-specified; many of these decisions can be handle by lower-level

personnel with little specialized knowledge. In many cases, it is not possible to define a decision procedure or decision rule to handle all possible situations.

- **Unstructured, Nonprogrammable Decisions**

An unstructured decision can be said to be nonprogrammable. The unstructured decision has no pre-established decision procedure, either because is too infrequent to justify the organizational cost of preparing a decision procedure or because the decision procedure is not understood well enough or is too changeable to allow a stable pre-established decision support.

3. MANAGEMENT INFORMATION SYSTEM STRUCTURE BASED ON MANAGEMENT ACTIVITY

Hierarchy of Management Activity :

The following categories of management planning and control were defined by Anthony.

LEVEL	COMMENTS
Strategic planning	Definition of goals, policies, and general guidelines charting course for organization. Determination of organizational objectives.
Management control and tactical planning	Acquisition of resources. Acquisition tactics, plant location, new products. Establishment and monitoring of budgets.
Operational planning and control	Effective and efficient use of existing facilities and resources to carry out activities within budget constraints.

Information Requirements by Level of Management Activity

Characteristics of information	Operational control	Management control	Strategic Planning
Time Horizon	Historical	←---------- →	Future
Currency	Highly current	←---------- →	Quite old
Required Accuracy	High	←---------- →	Low
Frequency Of use	Very frequent	←---------- →	Infrequent

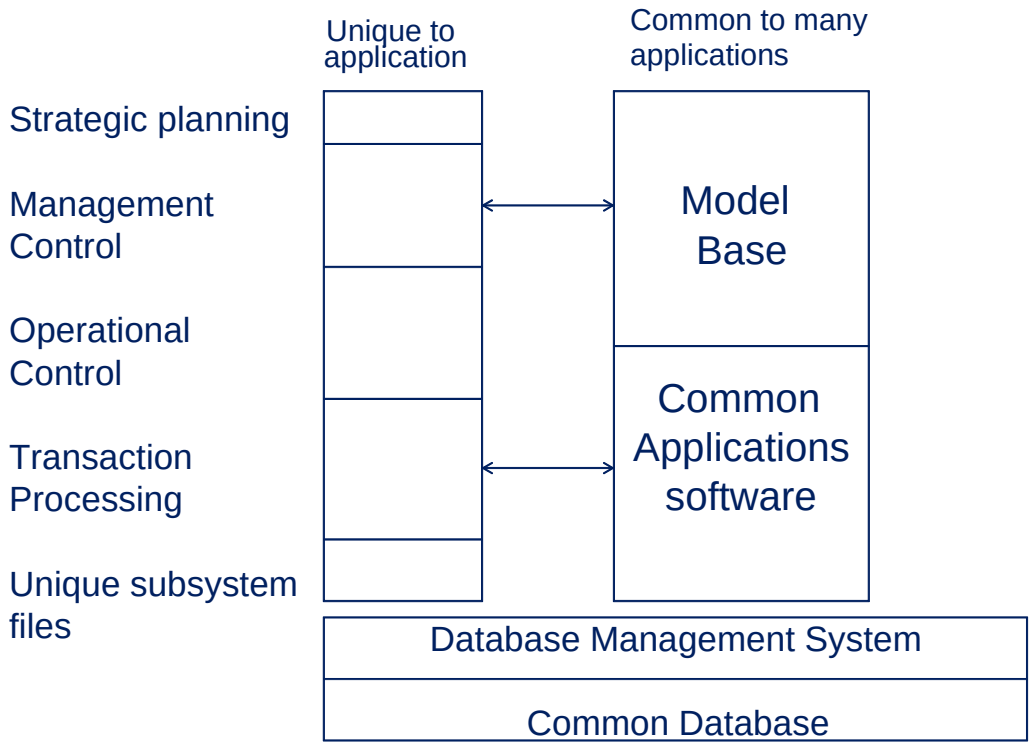
Conceptual Structure of MIS:

The conceptual structure of a MIS is defined as a federation of functional

subsystems, each of which is divided into four major information processing components :

- Transaction processing,
- Operational control information system support,
- Managerial control information system support and
- Strategic planning information system support

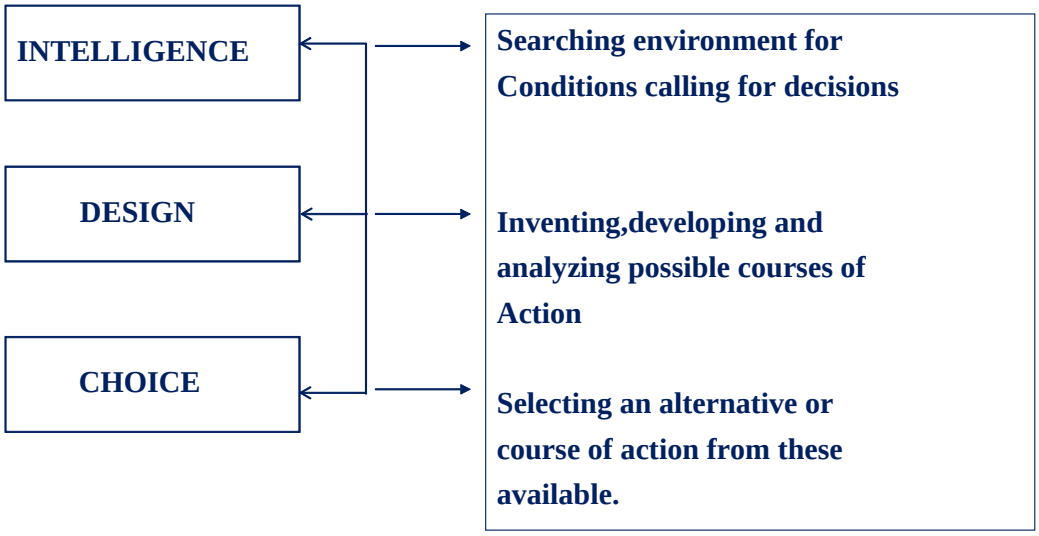
INFORMATION SUBSYSTEM FOR A FUNCTION



CHAPTER 6
THE DECISION-MAKING PROCESS

PHASES IN THE DECISION MAKING PROCESS :

1. SIMON'S MODEL



2. RUBENSTEIN AND HABERSTROH'S MODEL

1. Recognition of problem or need for decision.
2. Analysis and statement of alternatives.
3. Choice among the alternatives.
4. Communication and implementation of decision.
5. Follow-up and feedback of results of decision.

INTELLIGENCE AND DESIGN PHASES

Important Phases are :

1. Problem Finding :

It is a part of Intelligence phase, and can be defined as finding the difference between some existing situation and some desired state.

2. Problem Formulation :

Four strategies for formulating a manageable problem.

a. Determining the boundaries

b. Examining changes that may have precipitated the problem.

3. Development of Alternatives :

Generation of alternatives is a creative process which requires adequate knowledge of the problem area and its boundaries and motivation to solve it by taking aids such as scenarios , brainstorming, etc.

CONCEPTS OF DECISION MAKING

Four dimensions of decision types are:

- Level of knowledge of outcomes
- Level of programmability
- Criteria for the decision
- Level of decision support

Knowledge of outcomes:

Three types:

- **Certainty :** When there is only one outcome for each alternatives and knowledge of the outcome is complete and accurate.
- **Risk :** Multiple possible outcomes are there for each alternative with probability attached with each.
- **Uncertainty :** Multiple possible outcomes are there for each each alternative but no knowledge of the probability attached with each.

PROGRAMMED VS NON-PROGRAMMED DECISIONS :

1. Programmed decisions are those decisions that can be pre -specified by a set of rules or decision procedures.	1. Non -programmed decisions have no pre -established decision rules or procedures.
2. It can be delegated to low - levels in an organization or automated.	2. Cannot be delegated.

Criteria for decision making:

- **Normative or Prescriptive :**

A model of decision making which tells the decision maker how to make a class of decisions is normative or prescriptive. It is developed by economists and management scientists. Eg. Linear programming, Game theory, Capital budgeting, etc.

- **Descriptive :**

A model which describes how decision makers actually make decisions is descriptive. It attempts to explain the actual behavior and therefore developed by behavioral scientists.

BEHAVIORAL MODELS FOR DECISION MAKING

1. Classical decision model of decision maker:
Assumptions :

1. All alternatives and all outcomes are completely known.
2. The decision maker seeks to maximize the profit or utility.

The decision maker is infinitely sensitive to difference in utility among outcomes.

2. Administrative model of decision maker:

It assumes that the decision maker

1. Does not know all alternatives and all outcomes.
2. Makes a limited search to discover a few satisfactory alternatives
3. Makes a decision which satisfies his or her aspiration level.

BEHAVIORAL MODELS OF ORGANIZATIONAL DECISION MAKING

1. Quasi-resolution of conflict:

An organization represents a coalition of members having different goals and unequal power to influence organizational objectives. There are conflicts among the various goals of organizational members. Such conflicts are resolved by three methods :

Method of conflict resolution	Explanation
Local rationality	Subunits are allowed to set their own goals
Acceptable level decision rules	Within certain limits, units are allowed to make their own decisions using agreed-upon decision rules & decision procedures
Sequential attention to goals	The organization responds first to one goal, than to another, so that each conflicting goal has a chance to influence organizational behavior.

Uncertainty avoidance

Organizations live in uncertainty due to behavior of the market, supplier, shareholders and government.

Legal methods used to reduce or avoid uncertainty are:

Method of avoiding uncertainty	Explanation
Short-run feedback and reaction cycle	It allows frequent new decisions and thus reduces the need to be concerned about future uncertainty
Negotiated environment	The organization seeks to control its environment by industry-wide conventional practices, by long-term supply or sales contract, etc.

Problematic search:

The search for solutions is problem-stimulated. The behavioral theory postulates that search for the solutions is based on simple rules:

1. Search locally either close to the present symptom or close to the present solution.
2. If local search fails, expand the search first to organizationally vulnerable areas before moving to other areas.

Organizational learning:

Organizations adapt with time. They change their goals and revise their problem search procedures on the basis of experience. Aspiration levels for goals are assumed to change in response to the results experienced. In the steady state, aspiration levels are a little above achievement; when there is increasing achievement, aspiration level will lag behind achievements. When there is decreasing level of achievement, aspiration levels will decrease but tend to remain above achievement levels.

Incremental decision:

In Incremental approach, decision making in organizations is confined to small changes from existing policy and procedures. The emphasis is on correcting or improving existing policies and actions.

Decision making under psychological stress:

There are many decisions in organizations and in personal life that are charged with emotion because of strong desires by the decision maker to achieve certain objectives or to avoid dangers of unpleasant consequences. There are strong opposing tendencies in the individual with respect to courses of action. The result is decisional conflict, a significant source of psychological stress. The conflict is heightened if the decision maker becomes aware of the risk of serious losses from every alternative course of action. Such decisions are still taken but by using various copying patterns.

Copying patterns:

Conflict theory:

Four questions that determine the copying pattern are :

- Are the risks serious in the absence of a change ?
- Are the risks serious if change is made ?
- Is it realistic to hope for a better solution?

If no better solution is possible than the copying pattern is **Defensive Avoidance**

If there is no time, the copying pattern is **Hyper-vigilance**

Is there sufficient time to search and deliberate?

Methods for deciding among alternatives:

- Optimization Techniques under Certainty
- Pay-off Matrices in Statistical Decision Theory
- Utility and Indifference Curves
- Decision Tree
- Ranking Weighting or Elimination by Aspects
- Game Theory
- Classical Statistical Inference
- Decisional Balance Sheet

Documenting and communicating decisions rules:

METHOD	COMMENTS
Matrix	It can be used to present pairs of of conditions and resulting action.
Decision Table	It document rules that select one or more actions based on one or more conditions from a set of possible conditions.
Flowchart	It has separate path for representing one decision rule.
Decision tree	This is a flowchart without decision symbols or processing boxes
Pseudocode	This shows the decision logic in the IF - THEN format.

CHAPTER 7

CONCEPTS OF INFORMATION

DEFINITION OF INFORMATION:

Information is data that has been processed into a form that is meaningful to the recipient and is of real or perceived value in current or prospective actions or decisions.

MATHEMATICAL DEFINITION OF INFORMATION:

It is the average number of binary digits which must be transmitted to identify a given message from the set of all possible messages to which it belongs.

INFORMATION PRESENTAION:

Communication of information for human use is affected by methods of transmission and message handling. These methods can be classified as –

- Methods that increase the sending and receiving efficiency of a system
- Methods to exercise information content of distribution discretion

Methods that increase the sending and receiving efficiency of a system:

Two methods for more efficiently providing information are message summarization and message routing.

Message summarization is commonly utilized to reduce the amount of data transmission required without changing the essential meaning of the original message.

Message routing means distributing a particular message to only those individuals or organizational units which require the information for some action or decision.

Methods to exercise information content of distribution discretion:

Method	Reasons for use
Message delay	To avoid overload. To distort, inhibit, or suppress transmission
Message modification or Filtering	To modify by summarization To block certain data by filtering
Uncertainty absorption	To reduce data transmission (by removing recipient from contact with detail data)
Presentation bias	To bias by order and grouping in data presentation To bias by selection of limits that determine whether items are presented To bias by selection of graphics layout.

QUALITY OF INFORMATION:

Some aspects of information quality in terms of the perceptions of the decision maker are –

1. **Utility of information**

Andrus identifies four information utilities-

- **Form Utility:** As the form of information more closely matches the requirements of the decision maker, its value increases
- **Time Utility:** Information has greater value to decision maker if it is available when needed.
- **Place Utility (physical accessibility):** Information has greater value if it can be accessed or delivered easily.
- **Possession Utility (organization location):** The possessor of information strongly affects its value by controlling its dissemination by others.

2. Information Satisfaction

It is the degree to which the decision maker is satisfied with the output of the formal information system.

3. Errors and Bias

Bias is caused by the ability of individuals to exercise discretion in information presentation.

Errors are more serious problem and may be a result of:

- Incorrect data measurement and collection methods
- Failure to follow correct processing procedures
- Loss or non-processing of data
- Wrong recording or correcting of data
- Incorrect history (master) file (or use of wrong history file)
- Mistakes in processing procedure
- Deliberate falsification

AGE OF INFORMATION:

1. **Condition data** which pertains to a point in time.
2. **Operating data** which reflects changes over a period of time.

CHAPTER 8

HUMANS AS INFORMATION PROCESSORS

The Newell-Simon Model:

Allen Newell and Herbert A. Simon proposed a model of human problem solving which makes use of the analogy between computer processing and human information processing.

The Human Information Processing System:

The human information processing system consists of a processor, sensory input, motor output and three different memories: long –term memory (LTM), short-term memory (STM), and external memory (EM). The system operates in serial fashion rather than in parallel.

Tentative limits of Human Information Processing:

The Newell-Simon model suggests that there are limitations on the ability of human as information processors.

- One set of limits concerns the processing of data and is directly related to short-term memory.
- Another set of limits is the ability of humans to detect differences.
- Humans are also limited in their ability to generate, integrate and interpret probabilistic data.

Concepts of Human Cognition and Learning:

Cognition Theory:

Cognition refers to “the activities by which an individual resolves differences between an internalized view of the environment and what is actually perceived in that same environment.

Cognition Style:

Two individuals rarely follow the same decision-making process, even if they make the same choice. One aspect of individual decision-making style that has received much research attention is cognitive style. This refers to the process through which individuals organize and change information during the decision-making process.

Learning Theory:

Information and information systems can aid individual learning. The learning process has four important elements: drive, cue, response and reinforcement. The drive to learn in an infant is primarily associated with physiological processes: in an adult, the drive to learn beyond innate curiosity is acquired. Cues are stimuli that guide and determine responses. Reinforcement consists of the reward or punishment or praise that follows a response. The reinforcement causes responses to be “learned”.

IMPLICATIONS FOR INFORMATION SYSTEM DESIGN:

Some of the limits on human as information processor should be directly addressed in system design. Examples are:

Concept	Implications for information system design
Filtering	Information systems should be designed to filter irrelevant data and to provide increased filtering for stress decisions. Systems should attempt to override undesirable frame-of – reference filters by reinforced display of relevant data.
Newell-Simon Model	Information systems should assist in defining problem space and in the search process for a solution. The information format should attempt to expand the limits of bounded rationality. Systems should utilize the user memory that is suited to the task.
Magical number 7±2	Codes for human use should not exceed five to seven symbols or be divided into segments of five or less. Systems should not have humans do significant unaided processing. Graphics may be used to present “chunks of data” in efficient way.
Just noticeable Differences	Systems should highlight significant differences rather than assuming humans will notice them.
Human as intuitive Statisticians	The information system should provide statistical analysis of data. Decision algorithms should provide a consistency check of various information sources. Data generation procedures should be designed to assist in eliminating bias such as recency of events.
Concreteness	The information needed should be presented in the form needed. No added processing should be required.

Concept	Implications for information system design
Anchoring and Adjustment	Information and decision systems should be designed to assist in selecting a suitable anchor point and for prompting adequate adjustment from it.
Cognitive style	Systems should allow selection of alternative for order of processing and forms of information presentation in order to accommodate different styles.
Learning theory	System interface should be comprehensible to the novice user as well as efficient for the skilled user and should facilitate a normal progression of learning.
Feedback	Systems should provide feedback to indicate that data has been received, processing is taking place etc.
Value of unused data	Explains some of pressure for data with no apparent utility. Suggests storage and retrieval strategies and terminal access to increase availability without individual storage.
Information overload	Input should be kept below the overload point. System use should not involve managing or processing amounts of data beyond overload.
Individual differences	Those which are critical to system use should be identified and explicitly accommodated, whenever possible through a flexible interface.
Nonverbal input	System design and training in use should consider The effect of absence of nonverbal clues in electronic communication.
Processing time	Managers need short bursts of information processing to support their mode of operation.
Amount of Information Compression	Information systems should present summarized data in a decision-impelling format, but the system should also allow browsing through the raw data.

CHAPTER 9

SYSTEM CONCEPTS

System:

Systems can be abstract or physical. An abstract system is an orderly arrangement of interdependent ideas or constructs. A physical system is a set of elements which operate together to accomplish an objective.

Types of Systems:

1. Deterministic and Probabilistic systems:

A deterministic system operates in a predictable manner. The interaction among the parts is known with certainty.
The probabilistic system can be described in terms of probable behavior, but a certain degree of error is always attached to the predication of what the system will do.

2. Closed and Open systems:

A closed system is defined as a system which is self-contained.
Open systems exchange information, material, or energy with the environment including random and undefined inputs.

3. Artificial systems:

They are systems that are created rather than occurring in nature.

4. Human-Machine systems:

Information systems are generally human-machine systems (or user-machine systems) in that both perform some of the activities in the accomplishment of a goal. The machine elements (computer hardware and software) are relatively closed and deterministic, whereas the human elements of the system are open and probabilistic.

Principles of Systems:

1. Decomposition:

It is the process by which complex systems are decomposed or factored into subsystems. The boundaries and interfaces are defined, so that the sum of subsystems constitutes the entire system.

2. Simplification:

It is the process of organizing subsystems so as to reduce the number of interconnections**.**

3. Decoupling:

If two different subsystems are connected very tightly, than such tight coupling places a heavy co-ordination and time requirement on the two systems. The solution is to decouple or loosen the connection so that the two systems can operate in the short run with some measure of independence. Some means of decoupling are:

- Inventories, buffer, or waiting lines
- Slack and flexible resources
- Standards

Chapter 14

Developing a Long-Range Information System Plan

Content of the information system master plan:

The master plan has two components –

- a long-range plan form three to five years (or longer) and
- a short-range plan for one year

It contains four major sections:

1. Information system goals, objectives and architecture
2. Inventory of current capabilities
3. Forecast of developments affecting the plan
4. The specific plan

Information system goals, objectives and architecture:

This section of the plan might contain the descriptions of the following:

a. Organizational goals, objectives and strategies
b. External environment
c. Internal organizational constraints such as management philosophy
d. Assumptions about the business risks and potential consequences
e. Overall goals, objectives, and strategy for information system
f. Architecture of the information system.

Current Capabilities:

It includes such items as the following:

1. Inventory of :
    a. Hardware
    b. Generalized Software
    c. Application systems
    d. Personnel
2. Analysis of :
    a. Expense
    b. Hardware utilization
    c. Software utilization
    d. Personnel utilization
3. Status of projects in process
4. Assessment of strengths and weaknesses

Forecast of Developments Affecting the Plan:

Planning is affected by current and anticipated technology. The impact of such developments as PCs, LAN, DBMS and Office automation should be reflected in the long-range plan. Software availability should also be forecast and the impact on future systems anticipated. Methodology changes may also be forecast. Environmental developments such as government regulations, tax laws, and competitor actions can also be included insofar as they affect information systems.

The Specific Plan:

The Specific Plan is prepared for the next year. The plan should include:

1. Hardware acquisition schedule
2. Purchased software schedule :
    - System software
    - Applications software
3. Application development schedule
4. Software maintenance and conversion schedule
5. Personnel resources required and schedule of hiring and training
6. Financial resources required by object of expenditure (hardware, software, personnel, etc.) and by purpose (operations, maintenance, new development, etc.).

Stages of Information System Growth:

Four stage Nolan's model:

Stage of growth	**Description**
Initiation	Early use of computers by small number of users to meet basic organizational needs.
Expansion (or contagion)	Experimentation with and adoption of computers by many users. Proliferation of applications. Crisis due to rise in costs.
Formalization (or control)	Organizational controls established to contain growth in use and apply cost-effectiveness criteria. Centralization. Controls often prevent attainment of potential benefits.
Maturity (or integration)	Integration of applications. Controls adjusted. Planning well established. Alignment of information system to organization.

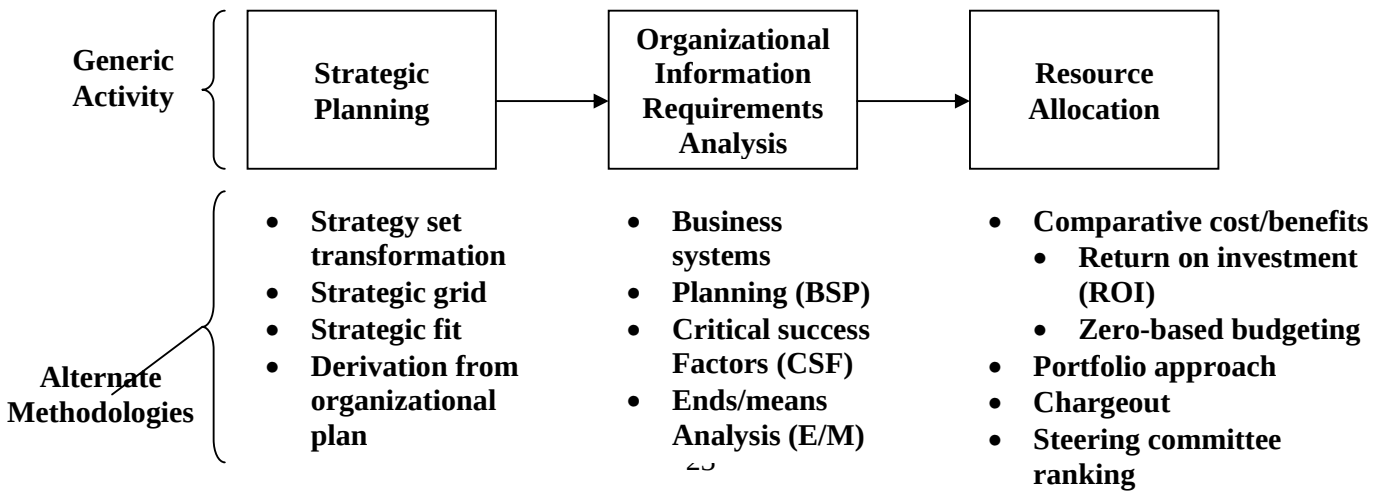
Six stage Nolan's model:

Stage	Levels of control or slack
Initiation	Low control. Some slack. Little or no information system planning.
Contagion	Greater slack in order to encourage use. Lack of planning.
Costs	rise and costs from lack of integration become visible.
Control	High levels of controls. Information system planning is given increased emphasis.
Integration	Emphasis on integration. More emphasis on user control or information system costs. Use of databases.
Data administration	Focus of data administration. Some slack to encourage development of systems which contribute to strategic advantage of the organization.
Maturity	Application portfolio is complete and matches the organizational objectives.

Assumptions of Nolan's Model about the growth dynamics of movement through the stages:

1. Organizational learning permits movement through stages.
2. Stages cannot be skipped because experience is necessary before the organization is ready for the next stage.
3. Although there is certain "natural" growth processes involved, the four growth processes can be planned, coordinated and managed to move through the stages effectively and efficiently.

The Three - Stage Model of the Planning Process:



Strategic Planning Stage:

The objective of this stage is to create objectives, goals, and strategies that align with (are derived from) the organization's objectives, goals and strategies. Four techniques useful in this strategic alignment are:

Derivation of Information System Strategy from Organizational Plan

If the organization has a plan that reflects organization goals, objectives, and strategies, information system goals, objectives, and strategy can be derived from it. Each objective, goal, and strategy in the plan is analyzed for required information system support. These can then be organized into information system goals, objectives, and strategies.

The McFarlan – McKenney Strategic Grid

The grid defines four types of information system planning situations depending on the strategic impact of the existing information systems applications portfolio and the strategic impact of the portfolio of applications planned for development. The cells define the position of the information systems activity relative to the organization.

Strategic: Information system activities are critical to the current competitive strategy and to future strategic directions of the enterprise. Information systems applications are part of new strategic directions.

Factory: Information system applications are vital to the successful functioning of well-defined, well-accepted activities. However, information systems are not part of future strategic directions.

Support : Information system applications are useful in supporting the activities of the organization. Information systems are not part of future strategic directions.

Turnaround: This is a transition state from support to strategic. The organization has had support-type applications but is now planning for applications vital to strategic success of the organization.

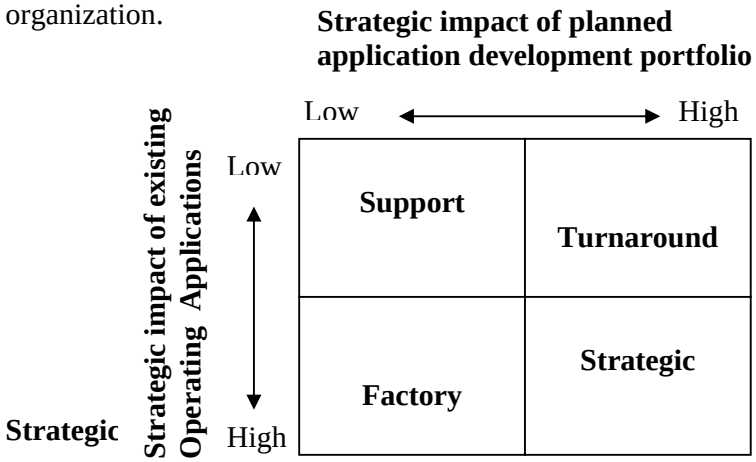


Fig : The Strategic Grid

Goals, objectives, and strategies for information systems should fit with the culture in order to avoid high resistance and high risk of failure. Clues of culture can be obtained from the following sources:

- Stories
- Meetings
- Top management behavior
- Physical layout
- Ritual
- Documents

Strategic Set Transformation

Strategy set transformation is used to produce goals and strategy for the information system by the following steps:

1. Explain the organization's strategy set
    a. Outline the organization's claimant structure. The client, claimant, or stakeholders in the organization are identified. Examples are owners, customers, suppliers, and employees.
    b. Identify goals for the claimants.
    c. Identify organizational goals and strategies for each claimant group.
2. Validate the organizational goals and strategies by asking management to critique the statements. The organizational objectives, strategies, and strategic organizational attributes form the organizational strategy set.
3. Transform the organizational strategy set into the information system strategy set.
    a. Identify one or more information system objectives for each organizational strategy and for each relevant organizational objective and attribute.
    b. Identify information system constraints from organization strategy set and from information system objectives.
    c. Identify information system design strategies based on organizational attributes, information system objectives and information system constraints.

Analysis of Organizational Information Requirements:

Wetherbe and Davis described a method of obtaining organizational information requirements. This method consists of the following steps:

1. Define underlying organizational subsystems
2. Develop manager by subsystem matrix
3. Define and evaluate information requirements for organizational subsystems.

Resource Allocation:

Information system resources are limited, and not all projects can be done at once. Each project should be analyzed in terms of four factors.

1. The expected cost of savings or profit improvement resulting from the project.
2. Cost savings or increased profit which cannot easily be quantified.
3. Institutional factors such as the need to have the development proceed in an orderly fashion or the need to have the entire organization involved in a new information system.
4. System management factors.

Using the four factors as input, a number of methods have been proposed for allocating scare development resources with different underlying criteria for decision making. The methods may be used single or in combination.

Method	Underlying Criteria
Comparative cost or benefit	Economic rationality
Portfolio approach	Project risk and extent to which project fits information system stage or strategic direction
Chargeout	Value to user (local rationality)
Steering committee ranking	Organizational power, politics, and coalitions

Chapter 15

Strategies for the Determination of Information Requirements

Difficulties to obtain a set of information requirements:

1. The constraints on humans as information processors and problem solvers.
2 The variety and complexity of information requirements.
3 The complex patterns of interaction among users and analysts in defining requirements.
4 Unwillingness of some users to provide requirements (for political or behavioral reasons)

The Three Levels of Information requirements:

There are three levels at which information requirements need to be established in order to design and implement computer-based information systems:

1. The organizational information requirements to define an overall information system structure and to specify a portfolio of applications and databases.
2. The requirements for each database defined by data models and other specifications.
3. The detailed information requirements for an application

Strategies for determining information requirements:

1. Asking
2. Deriving from an existing information system
3. Synthesizing from characteristics of the utilizing system
4. Discovering from experimentation with an evolving information system

1. Asking

Asking method	Description	Conditions suggestion use
Closed questions	Each question has a defined set of possible answers from which the respondent selects.	When a factual responses are known or respondent may not be able to recall all possibilities. Analyst must know all possible responses
Open questions	No answers provided. Respondent is allowed to formulate response.	When feelings or opinions are important or when respondent has knowledge and ability to formulate responses.

Asking method	Description	Conditions suggestion use
Brainstorming	Group method for drawing out a wide variety of suggestions by open flow ideas	Used to extend boundaries of problem spaces of participants and draw out nonconventional solutions
Guided Brainstorming	Participants are asked to define ideal solutions and then select the best feasible ideal solution	Used to guide brainstorming to ideal solutions. Useful where participants have system knowledge, but may be locked into an anchoring and adjustment behavior
Group consensus	The participants are asked for their estimates or expectations regarding significant variables.	Used to arrive at best judgmental estimate of variables that are difficult or impossible to estimate quantitatively

Deriving from an Existing Information System:

1. Existing system that will be replaced by the new system
2. Existing system in another similar organization
3. Proprietary system or package
4. Descriptions in textbooks, handbooks, industry studies, etc.

Synthesizing from characteristics of the utilizing system:

1. **Normative analysis:** Normative analysis methods are based on the fundamental similarity of classes of object systems. For example, all billing applications perform a set of basic functions that can be prescribed in advance. These fundamental characteristics are the basis for a prescribed in advance. These fundamental characteristics are the basis for a prescribed or normative set of requirements. Analysis then concentrates on tailoring the normative requirements to meet nonstandard needs of a specific organization or application.
2. **Strategy set transformation:** It is a methodology primarily for describing organization – level information requirements from the objectives of the organization.

3. **Critical factor analysis:** In this approach, information requirements are derived from the critical factors for operating and managing an enterprise. There is therefore a two step process of drawing out the critical factors and then deriving information requirements. An example of this approach is the Critical Success Factors (CSF) method. The analyst asks users to define the factors that are critical to success in performing their functions or making decisions. Information requirements can then be derived.

4. Process analysis: The idea underlying this approach is that business processes (groups of decisions and activities required to manage the resources of the organization) are the basis for information system support. Processes remain relatively constant over time, and the requirements derived from the process will reflect the non-transient needs of the organization. An example of a process-based methodology is Business System Planning (BSP).

5. Ends-means analysis: It is a technique for determining requirements based on theory. The technique can be used to determine information requirements at the organizational, departmental, or individual manager level. The technique separates the definition of ends or output (goods, services, and information) generated by an organizational process from the means (inputs and processes) used to accomplish them. The ends or output from one process is the input to some other process.

6. Decision analysis: This method for information requirements determination is performed by the following steps:

1. Identify and prescribe the decision
2. Define the decision algorithm or decision process
3. Define information needed for the decision process.

This method is very useful in clarifying information requirements with users in cases where the decision process is fairly well defined.

7. Socio-technical analysis: This approach consists of two parts: Social analysis and technical analysis. The social analysis determines system requirements relative to the social, human interaction system of the organization. These requirements include system design features and implementation procedures. The social analysis is performed by studying patterns of social interaction and group behavior in the current system. Technical analysis is an analysis of variance and control loops that require information.

Requirements for socio-technical design are usually obtained from participative methods and are oriented to application level analysis. It is especially appropriate for applications that involve many users, particularly secondary users where the application will significantly change the work environment, social interaction or job design.

8. Input-process-output analysis: It is a system approach. A system is defined in terms of input, outputs and information processes for receiving inputs and producing outputs. The approach starts in a top-down fashion on an object system. Subsystems of the object system are analyzed to subdivide them into smaller subsystems, etc. until information processing activities are defined as separate activities within a subsystem. The advantage of analysis based on inputs, process and outputs of systems is that it is systematic and comprehensive.

Steps in selecting a strategy and methods for determining information requirements:

1. Identify those characteristics of the four elements in the development process that affect uncertainty in the determination of information requirements:
    - Utilizing system
    - Information system or application
    - Users
    - Analysts
2. Evaluate the effect of the characteristics of the four elements in the development process on three process uncertainties :
    - Existence and availability of a set of usable requirements
    - Ability of users to specify requirements
    - Ability of analysts to draw out and evaluate requirements.
3. Evaluate the combined effect of the process uncertainties on overall requirements uncertainty.
4. Select a primary strategy for requirements determination based on the overall requirements uncertainty.

Uncertainty	Strategy
Low	Asking
	Deriving from an existing system
	Synthesis from characteristics of utilizing system
High	Discovering from experimentation

5. Select one or more methods from the set of methods to implement the primary strategy.

Chapter 16

Database Requirements

Database

A database is a collection of logically related data. By data we mean know facts that can be recorded and that have implicit meaning.

Database Management System (DBMS)

A DBMS is a collection of programs that enable users to create and maintain a database. It is general purpose software that facilitates the process of defining, constructing and manipulating database for various applications.

Objectives of Database and DBMS

Database Objective	Description
Availability	Data should be available for use by applications (both current and future) and by queries.
Shareability	Data items prepared by one application are available to all applications or queries. No data items are "owned" by an application.
Evolvability	The database can evolve as application usage and query needs evolve.
Data Independence	The users of the database establish their view of the data and its structure without regard to the actual physical storage of the data.
Data Integrity	The database establishes a uniform high level of accuracy and consistency. Validation rules are applied by the DBMS

Phases of Database Design

Phase	Description
Requirements determination	Determination of the data requirements (views) of individual users and applications.
Conceptual (logical) design	Integration of the individual user and application views into an overall conceptual view that resolves view conflicts.
Physical design	Translating the conceptual design into physical storage structure.

Chapter 17

User Interface Requirements

Classification of Users:

- **Developers versus Non-developers**

Developers are those who develop information processing applications and tools for use by other workers. They are professional system analysts who must deal with large, complex systems.

Non-developers (end users) are workers who input, manipulate, or retrieve information using the application and tools

- **Novice versus Experts**

A novice is one who is unfamiliar with both the system's specific syntax and semantic knowledge. They should be able to get explanations or assistance through the system.

An expert is one who has internalized the system's syntactic structure or has considerable semantic knowledge. They should be permitted rapid interaction and not be held up by explanations or details that are only required by the novice.

- **Occasional versus Frequent Users**

Frequent users are experts particularly in syntactic knowledge than an occasional user.

Occasional user needs training in basic system commands & functions whereas frequent users can learn unnatural commands.

- **Primary versus Secondary Users**

Primary user is one who benefits from the system's output whereas a secondary user is responsible input into the system and sometimes for output but does not use the output directly in his or her job.

Consideration in Design of a User Interface:

Screen Design

A good screen design is clear, uncluttered, and free of irrelevant information. Two useful guidelines for deciding what information should be put on a single screen are the following.

1. Provide only information that is essential to make a decision or perform an action
2. Provide all data related to one task on a single screen.

The following are some guidelines for placement based on information processing limitations plus culture-based habits of processing.

- Place items together that logically belong together.
- Place items in customary processing order.

- Position of most important items (preferably) at left side and arrange in importance from top to bottom.
- Leave sufficient space so that items do not get confused.
- Position items across close enough that the eye does not change rows in moving across. Use guide strips of lines, dots or dashes if necessary.

Feedback and Assistance:

Two types of feedback should be part of a user dialog.

1. The system should acknowledge every user request in some way.
2. Additional assistance (such as system status) should be available upon request.
3. Help

Help:

Type of Help	**Description**
Command Assistance	Provides an explanation of how to formulate a specific command.
General Help	Provides a list of commands. When a user identifies the command needed, a command assistance HELP may be used.
Prompting	When an error is detected, some systems will attempt to prompt the user with information to make a correct entry.
Online tutor	A new user (or an infrequent user) may not know to perform basic operations, so general help and command help are insufficient. The online tutor help provides a lesson on how to use the system.
Online Documentation	The manual is online in addition to or instead of a document manual. The online documentation serves much the same purpose as a command help, but may be in more depth.

Error Control:

A well-designed user interface should have four distinct dimensions of error control.

1. Error prevention: As much as possible, the system should provide specific instructions (eg. prompts, help facilities) so that the user knows exactly what to do and avoid making errors.
2. Error detection: When an error is made, the system should it clearly and explicitly. However, “polite” error messages are favoured. Notification, that an error has been detected should occur immediately. The user should be able to easily identify the error. Finally, no error should cause the system to terminate abnormally.

3. Error correction: Correction should be straight forward and should require re-keying only the portion of the data in error.
4. Error recovery: An important feature of a well-designed system is the ability to "undo" something which has been done.

Response Time:

Response time in an interactive system is that time that elapses between the user keying in a command and the system beginning to display a response. Some useful guidelines for best response time are the following.

1. Frequent, simple commands should take less than a second.
2. For a given command type, response time should be as consistent as possible, even if it takes slightly longer time.
3. Short response times to relatively complex requests may actually increase error rates.
4. If a response will take a long time (say > 10 secs) a message should be issued within 1 or 2 seconds to give the user feedback.

Workstation Design:

Considerations in a visual display terminal are the following:

1. The screen should usually be fixed at an angle of 10 to 15 degrees from the vertical, away from the user. Preferably, the tilt should be adjustable, horizontally as well as vertically.
2. Characters should not flicker or move on the screen.
3. Glare and reflections on the display surface should be minimized.
4. Resolution must provide a sharp image.
5. Character-to-background brightness contrast should be greater than 50 percent. Preferably, the brightness should be adjustable. Screens may offer alternatives of dark on light or light on dark.

The ergonomic considerations for physical design of the keyboard are the following:

1. Key force: A range of 15 to 125 grams pressure.
2. Key spacing: 18 to 20 millimeters between keys
3. Key displacement and activation: The results in the feel of a key when it is pressed. Suggested displacement is 3 to 5 millimeters, with a key activation point requiring an increasing force until contact is made at 65 to 75 percent of downward travel, then a decrease in force so that the point of contact can be felt.
4. Key shape: Concave shape, with a matte finish to prevent reflection.
5. Keyboard slope: 10 to 15 degrees, preferably adjustable.

Interactive User Dialog:

The dialog between user and machine can follow many different structures. They are:

1. Command Language: The most common method of user interface dialog is the command language. Most basic computer operating systems utilize a command language to access other applications and perform basic system functions.

   A command language generally has a prespecified format for each command. A command to perform an operation is followed by one or more arguments that specify the details for it.

   Two methods are commonly used:

   1. Keyword: The user specifies keywords for the arguments.
   2. Position: The meaning of the arguments is determined by their position.

2. Menus: With the menu format, the user is shown a list of options, usually numbered and is expected to choose the appropriate option by positioning a cursor or by keying the associated number. A series of menus allow the user to step through a series of hierarchical levels of increasing specificity.

   The advantage of a well-designed menu is that it provides a familiar format and a clear set of choices which are well understood by the user.

3. Icons, Graphs and Color: Graphical symbols commonly called icons may be used in system dialog instead of menus or command language. The user moves the cursor to the icon representing the desired function and presses a key to select that icon; either the function is executed or a new set of icons is displayed.

4. Forms: In a forms-based interface design, the user “fills in the blanks” on a screen. This type of interface dialog is appropriate for data entry transactions.

5. Natural Language: The development of natural language interfaces is generally considered part of the domain of artificial intelligence. The goal is for a novice user to communicate with computer through a natural language such as English.

Chapter 18

Developing and Implementing Applications

Prototyping Approach to Application System Development

The strategy of experimental assurance in development of information system applications which is achieved by an evolutionary design method is called prototyping. Prototyping is used when requirements are difficult to specify in advance or when requirements may change significantly during development. The prototyping methodology is based on the simple proposition that people can express what they like or do not like about an existing application system more easily than they can express what they think they would like in an imagined, future system.

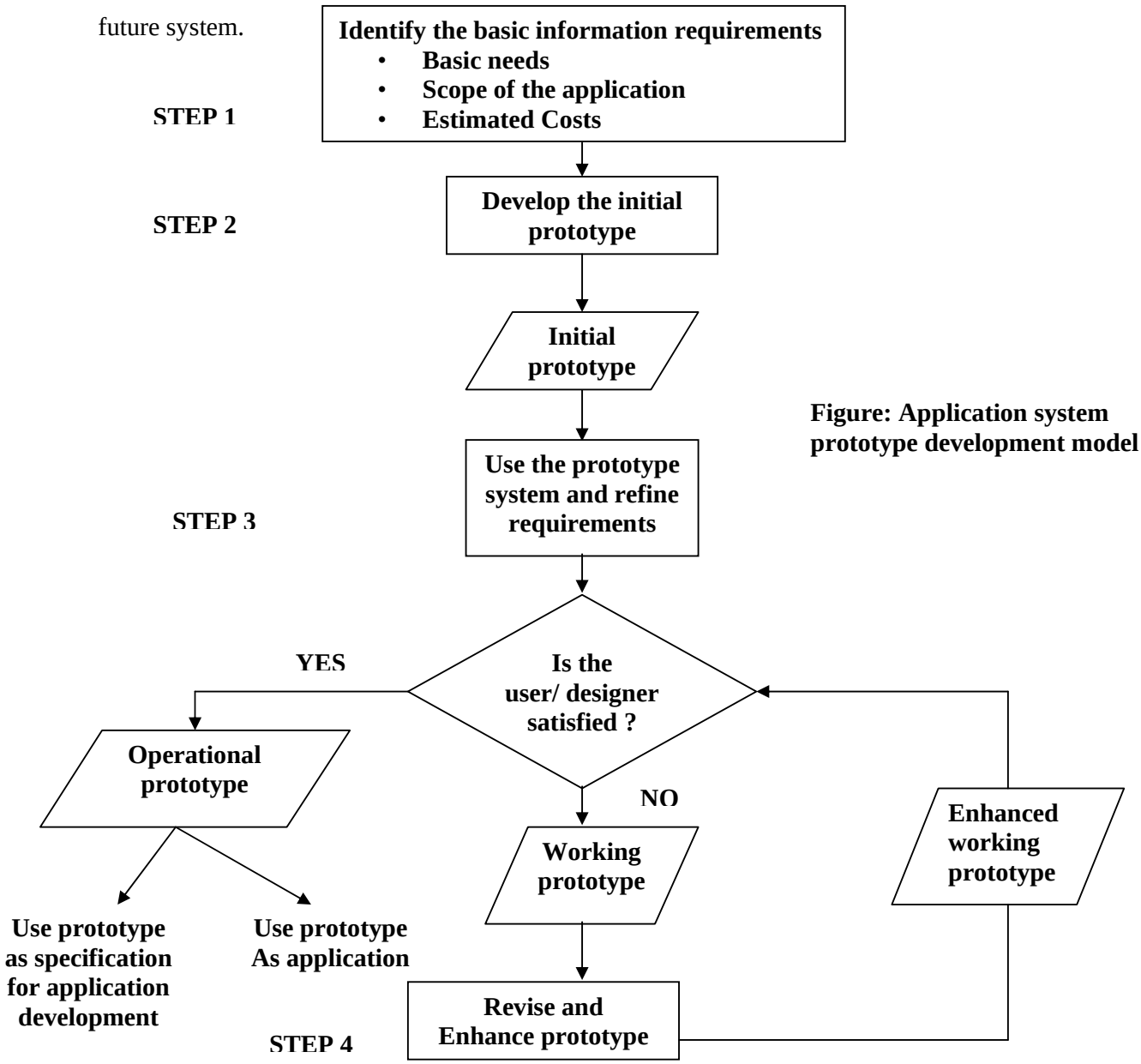


Figure: Application system prototype development model

Advantages:

- Ability to "try out" ideas without incurring large costs.
- Lower overall development costs when requirements change frequently.
- The ability to get a functioning system into the hands of the user quickly.
- Effective division of labor between the user professional and the MIS professional.
- Reduced application development time to achieve a functioning system.
- Effective utilization of scarce (human) resources.

Disadvantages:

- The management of the development process is difficult because of frequent changes.
- There may be a tendency to accept a prototype as the final product when it should only be the basis for a fully-specified design.

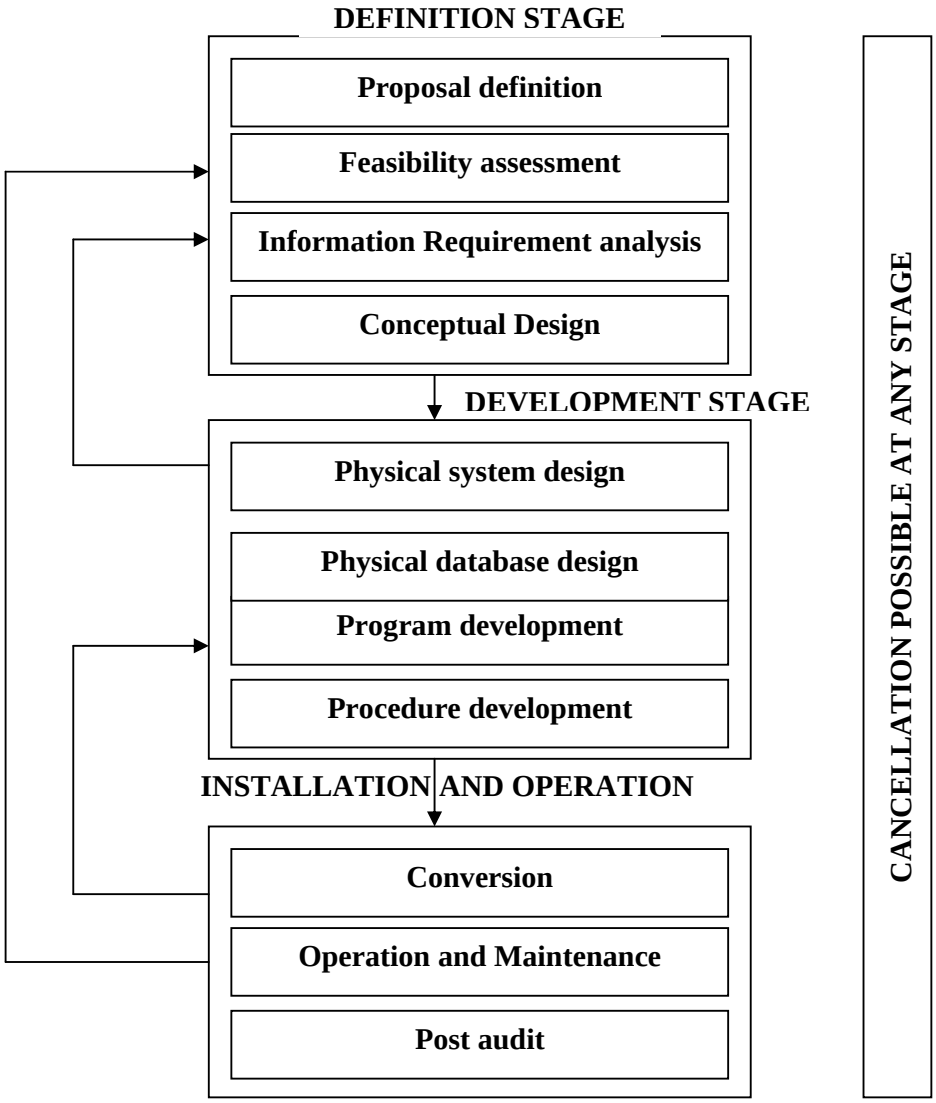


Figure: The application system development life cycle

Life Cycle Approach to Application System Development:

Stages in Life Cycle	Phases in Life Cycle	Comments
Definition	Proposal Definition	Preparation of request for a proposed application.
	Feasibility assessment	Evaluation of feasibility and cost-benefit of proposed application
	Information requirements	Determination of information needed for analysis
	Conceptual design	User-oriented design of application
Development	Physical system design	Detailed design of flows and processes in application processing system and preparation of program specification.
	Physical Database design	Design of internal schema for data in database or design of files
	Program Development	Coding and testing of computer programs
	Procedure Development	Design of procedures and preparation of user instructions
Installation and Operation	Conversion	Final system test and conversion
	Operation and Maintenance	Day-to-day operation, modification, and maintenance
	Post Audit	Evaluation of development process, application system, and results of use

Chapter 19

Quality Assurance and Evaluation

Definition of Quality:

Quality is defined as excellence or fitness. An application has quality relative to its primary and secondary users, operation personnel, control personnel, maintenance personnel, and so forth.

Quality Characteristics:

Information System Quality Characteristics	**Implementation of Quality concepts**
Complete data	All data items are captured and stored for use. Data items are properly identified with time periods.
Accurate data	The correct data values are recorded.
Precise data	Measurement of variables meets user needs for precision.
Understandable output	The output of the system is understandable to the users.
Timely output	The output of the application is available in time for actions and decisions.
Relevant output	The outputs are relevant to the actions and decisions to be taken.
Meaningful output	The format, labeling, data provided, and context in which data is presented makes the output meaningful for actions and decision making.
User friendly operation	The system provides user interfaces that are understandable and designed to conform to human capabilities.
Error resistant operations	Suitable error prevention and detection procedures are in place. There are procedures for reporting and correcting errors. Various audit procedures are applied.
Authorized use	Only authorized personnel have access to facilities, application, and data.
Protected system and Operations	The system and its operation are protected from various environmental and operational risks. There are provisions for recovery in the event of failure or destruction of part or all of the system.

Top Management Information System Control and Quality Assurance Duties:

- Establish domain of responsibility and authority of information systems function
- Select information system executive
- Approve the information system charter, the information system long-range plan, and the yearly budget
- Approve major hardware and software systems
- Approve major applications
- Review results against plan and evaluate information system performance
- Review and approve information system procedures for quality assurance and control.

Information System Management Control and Quality Assurance Duties:

- Establish and supervise quality assurance procedures for application developed in-house or obtained as packages
- Establish and supervise various information system control functions
- Establish and monitor procedures to measure and report evidence of quality errors, downtime, reruns, application repair maintenance, etc

Information System Control and Quality Assurance Duties:

1. Librarian: This function maintains custody of programs, files, and documentation. These resources are issued based on an authorized schedule of use or special authorization. The custodial activities include record keeping.
2. Processing control: This includes logging in and checking input, checking progress of jobs, reconciling control information for applications, checking output and distributing it to authorized recipients, maintaining error logs, and following up on error correction.
3. Access control: This function is responsible for control of physical access to the installation and control of access through terminals. Duties include follow up on violations of system access rules.
4. Database administrator: This includes control over access to and use of the database, enforcement of data integrity rules, and establishment and enforcement of standards.
5. Backup and recovery: This function is responsible for preparing backup copies of programs, files and databases, etc.
6. Application development quality assurance: This function includes review of controls planned for an application and review of adequacy of testing during development.

Quality Assurance in Application Development:

The development life cycle is design to support quality assurance in terms of developing a system that meets requirements. Some quality assurance processes are:

- Information requirements determination processes to ensure complete and correct requirements
- Sign-offs at each phase of development to assure review and agreement on the system to that point.
- Program development procedures for quality control. These include structured design, structured programming, independent review of program logic and program testing
- Conventional installation testing
- Post audit evaluation

MINICASES

1. AMERICAN EXPRESS WITHDRAWS $1 BILLION IDS OFFER

The following excerpts are from a news article in the Minneapolis *Star and Tribune,* August 17, 1983, p. 58.

American Express Co. called off its acquisition of Investors Diversified Services, Inc. (IDS), Tuesday, saying that $1 billion was too high a price." (IDS have investment funds such as mutual funds and money market funds. It would therefore allow American Express to expand its range of services to customers.)

"Although American Express officials would not comment further, several observers said that problems discovered at IDS probably lay behind the decision… [The] article [in the *Wall Street Journal*] said that American Express feared that IDS's data-processing system was inadequate to handle the new products planned for the IDS sales staff. American Express officials also were concerned about the 30 percent annual turnover among sales personnel …. Walter Scott, IDS president, responded that IDS data-processing was quite competent and has absorbed at least one new product a month for two years. (Note: The acquisition was completed after a revised offer.)

Questions

a. Why should American Express be so concerned about the capabilities of IDS's data processing?

b. What competitive advantages to a financial services company may be provided by an information system?

2. THE COMPUTER IN THE RESTAURANT

The installation of a minicomputer-based information system has enabled Dailey's Restaurant in Atlanta to streamline their operations arid promote tighter internal controls over their business.

A waiter takes an order at a table, and then enters it online via one of the six terminals located in the restaurant dining room. The order is routed to a printer in the appropriate preparation area: the cold-item printer if it is a salad, the hot-item printer if it is a hot sandwich or the bar printer if it is a drink. A customer's meal check listing the items ordered and the respective prices is automatically generated. This ordering system eliminates the old three-carbon-copy guest check system as well as any problems caused by a waiter's handwriting. When the kitchen runs out of a food item, the cooks send an "out of stock" message, which will be displayed on the dining room terminals when waiters try to order that item. This gives the waiters faster feedback, enabling them to give better service to the customers.

Other system features aid management in the planning and control of their restaurant business. The system provides up-to-the-minute information' on the food items ordered and breaks out percentages showing sales of each item versus total sales. This helps management plan menus according to customers' tastes. The system also compares the weekly sales totals versus food costs, allowing planning for tighter cost controls. In addition, whenever an order is voided, the reason for the void is

keyed in. This may help later in management decisions, especially if the voids are consistently related to food or service.

Acceptance of the system by the users is exceptionally high since the waiters and waitresses were involved in the selection and design process. All potential users were asked to give their impressions and ideas about the various systems available before one was chosen.

Based on Ann Dukes, "Side Order of (Computer) Chips Speeds Meals," *MIS Week,* **June** 17, 1981, p. 14.

Questions

a. In managing the business of a restaurant, what are some decisions that must be made in the areas of:

-strategic planning

-managerial control

-operational control

b. What information would you require from this system in order to aid in making such decisions? (In other words, what would make this system a more complete management information system rather than just doing transaction processing?)

c. Compared to this system, most restaurant information systems are relatively informal. Explain the probable effects that making the system more formal would have on:

- customers
- waiters
- management

3. THE ROBOT SUICIDE

Isaac Asimov's science fiction mystery *The Naked Sun* (Fawcett, New York, 1957) takes place on a planet served by robots. In order to protect the humans on the planet, the robots are programmed with the Laws of Robotics. The first two laws are:

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by a human being except where such orders conflict with the first law.

In one episode, a robot serves a glass of water to a man. The man is poisoned. The robot short circuits because it brought harm to the man, although it did not know the water was poisoned. '

Questions

a. Using this illustration, describe the problem(s) of programmed decision making.

b. Why wasn't the robot programmed to recognize that giving a normally non injurious substance or object to a human that turns out to do injury does not violate the first law (or does it)?

c. What would be the implications of a decision rule that required human decisions when no other decision rule applied?

4. SOLAR ENERGY DECISION

The leasing of solar energy equipment for industrial use is a potential alternative to federally subsidized programs for encouraging use of solar technology. The factors encouraging the leasing of solar equipment include rising fuel costs, decreasing cost of solar technology, and the Business Energy Property Tax Credit. The latter measure, passed by Congress in 1980, added an incentive credit of 15 percent for energy savings on top of the already existing 10 percent business investment tax credit.

Planned Energy International (PEl) is perhaps the first company to have formalized a lease for solar equipment. According to PEl's president, Billie Jolson, the company leased 52 solar panels to a California laundromat. She estimated the savings to the business would be $165,000 over the seven-year lease, including $720 in the first year.

Under a typical arrangement, PEl conducts extensive energy audits of the potential client company and estimates the potential savings on utility bills each year under a lease agreement. Once the lease is signed, PEl assumes all responsibility for purchasing, delivering, installing, and maintaining the solar equipment.

"Solar Energy: Leasing Cuts High Cost of Providing 'Harness' for the Sun," *Christian* Science *Monitor,* July 20, 1981.

Questions

a. What appears to be the goal of each organization in relation to solar energy? (Hint: Examples are maximizing, minimizing regret, satisfying, avoiding uncertainty, and resolving conflict.)

b. What are the information requirements for each goal?

c. Which decision model fits each organization?

5. EXCELLENCE IN MANAGEMENT

Recently, the management consulting firm of McKinsey and Company conducted an in- depth study of 37 firms considered to be examples of well-managed companies. The study revealed eight attributes that the firms had in common. The most significant attributes were concentration on one key business value, simple form and lean staff, a bias toward action and emphasis on doing what they know best.

Some of the companies used modem management tools such as decision support systems and strategic planning. Rather than a perfect overall plan, they preferred controlled experirnents. The general attitude was "get some data; do it; adjust it.'

Both new ideas and problems were handled quickly. Ideas were implemented quickly on a small scale, with the results leading to rapid expansion or to the idea being discarded. Problems were put into the hands of a task force or a person with temporary but extraordinary power. Action, not reports, were expected. A later follow-up would evaluate the action taken; rewards or criticism would then result. Most problem handlers preferred to find solutions expeditiously and return to their interrupted work. .'

"Putting Excellence into Management," *Business Week,* July 21, 1980, p. 196,

Questions

a. What form of decision making is illustrated in these "well-run" companies?' '

b. What are the decision attributes?

c. What information is of greatest interest to who are assigned problems?

6. DECIDING WHERE TO SEND CHECKS

One way a bank can improve its performance is to speed up collection of out -of-town checks. When a bank accepts an out-of-town check, it must clear the check by sending it to the bank on which it was drawn. There are several ways this can be done, each having a cost and a time. In increasing order of cost, typical options are:

- Clear through the Federal Reserve System
- Send the check to a private clearing bank which transports the check
- Use direct courier service

The time each option takes will depend on the time of day and day of week. The decision must be made for each check.

The Maryland National Bank, averaging over 500,000 transit checks per day, developed an integer linear program for decision making as to the clearing option. The bank has saved over $100,000 per year using the linear program analysis.

Robert E. Markland and Robert M. Nauss, 'Improving Transit Check Clearing Operations at Maryland National Bank," *Interfaces*, 13:1, February 1983, pp. 1-9.

Questions

a. How does this application fit into the categories of decision making?

b. What kind of decision rules might be prepared if the criterion were satisfying?

7. NEED TO KNOW AND AVAILABLE INFORMATION

Employee preferences regarding the sources of information they use in their work are quite different from the sources they usually depend on outside of work. That was the conclusion of the International Association of Business Communicators after they surveyed work communication in 40 companies. Ninety percent of those surveyed preferred to get news from their immediate supervisors. The next most favored sources were small group meetings, the top executive, and handbooks - in that order. Fifty-five percent get their information from supervisors. The next most available source, however, was the least favored of all 15 surveyed in the study: the grapevine. The employee handbook and the bulletin board ranked third and fourth as the most available sources.

The survey also asked what it was the employees wished to know. The three subjects which ranked highest were the organization's future plans, personnel policies, and productivity improvement information - in that order.

Source: A joint survey by the International Association of Business Communicators, San Francisco, CA, and Towers, Perrin, Forster, & Crosby, Inc., New York, 1980.

Questions

a. Mintzberg's study shows that executives prefer an oral means of communication. How does that compare with this study of workers?

b. What do their choices indicate about their locus of control?

c. Identify the frame of reference and the filters that appear to be operating in these workers.

d. How is their problem space probably defined?

8. DAYDREAMS IN MANHATAN

“A penny for your thoughts" was the inducement some psychology graduate students gave pedestrians on Fifth Avenue when they wanted to study what passersby had on their minds.

Two tables were set up on a fine Friday lunch hour to sample people's thoughts at Fifth Avenue near 57th Street and at 14th Street. The results showed that the two environments produced quite different thoughts. At fashionable Fifth Avenue, the most common thoughts were about the environment, the misfortune of having to return to work, and members of the opposite sex - in that order. In the open market area of 14th Street, the most common thoughts were of money and shopping. Those were followed in frequency by thoughts of the future and thoughts about a particular member of the opposite sex. In addition, men were more likely to be thinking about themselves while women were more likely to be thinking about another person.

"Daydreams in Manhattan," *Psychology Today*, August 1981.

Questions

a. How do you feel about this story as a source of information? Would you be likely to base a business decision on it?

b. If you did decide that it might be a useful study, what additional information would you want to have about the study?

c. What do your answers say about your limitations as an intuitive statistician?

9. A SYSTEM LOG-IN

Consider the following interaction with a commonly used operating system. The user made the connection through telephone lines. On the screen appeared:

TERMINAL =

The user typed in the name of the terminal on which he was working, and the system responded:

?

The user began again from the point of dialing in. This time when he received the message

TERMINAL =

he skipped it by hitting the carriage return. Then the system responded with:

@

He tried typing a few things but only received the response

?

Finally he gave up.

Question

Without being concerned about what the user is trying to accomplish, describe what is wrong with the user interface and make suggestions for improving it.

10. AN ENGINEER'S VIEW OF A USER INTERFACE

"I remember the first time I used the computer. Our data processing department gave me an account number. Two days later, a terminal was moved into my office and half of my desk disappeared. To help me get acquainted with my new assistant, I was handed something called a user's manual. It was two inches thick, filled with pages of diagrams, boxes, examples. It had long black lines in the left-hand margin. I tried to read it that afternoon, but got bogged down after the first two pages.

"The next day, manual in hand, I started to explore the system. After I turned the terminal, the following message appeared:

VERSION 3.3 3/10/81

ENTER LOGON/PASSWORD:

A "LOGON"? What was that? No one had ever mentioned a LOGON. I could not even find it in the unbridged dictionary. After spending 15 minutes searching through the manual, I realized a LOGON was my account number. Why couldn't the data processing department and the computer agree on what they call an account number? Why don't they say what they mean?

“As I began to type, everything seemed to be going fine, until I pressed the" /" key; then the computer stopped printing. I hit the return key, but nothing happened. The computer simply told me

ACCESS DENIED

"I attempted to revive the computer a few times with no success. When I called the woman from the computer center, I was told that the computer would not print my password, but it read it anyway. How could the computer read something if it was not printed? The answer: the printing is not important; it's the pressing of the keys that sends information to the machine. In fact, the computer looks at each key as it is pressed. Suddenly, I knew why the computer did not print my password. When I pressed the key marked" /", the computer turned off the printing for the rest of the line. From then on, I avoided using that key; I wanted to know what I typed.

"A few minutes after I typed the next line I was treated to the following information:

**** THE SYSTEM WILL BE DOWN FOR PM FROM

1000 TO 1130.

**** USER SHOULD REFER TO LIB.$SYS.NEW.PROC

FOR UPDATED PROCEDURES.

**** THERE HAVE BEEN REPORTS ABOUT

PROBLEMS WITH XLIBSTA. IF YOU HAVE

EXPERIENCED ANY PROBLEMS CONTACT BOB

AT EXTENSION 8425.

**** DUE TO THE HEAVY LOAD ON THE SYSTEM,

GAMES WILL NOT BE ALLOWED FROM 10:00 TO 17:30.

At least I understood the last part of the message; where were the games?

"During the next two week I worked on a number of different jobs, each requiring different program. Each program looked different; each worked differently; one could communicate with another. What bothered me most was that I had to think in different terms for each program. Not only were the same items called by different names in different programs, but operations I could do on the same item in one program were impossible in another As an engineer I had learned well-defined methods for designing cars. Why couldn't computer people do the same thing?"

Michael L. Schneider and john C. Thomas, "The Humanization of Computer Interfaces," *Communications of the ACM,* April 1983, p. 253.

Question

Apply the principles learned in this chapter to justify the engineer's complaints.

11. THE TEMPORARY PROTOTYI:'E THAT BECAME PERMANENT

The company embraced the idea of prototyping as a method of developing applications, but management wanted to use the prototypes only to identify requirements; working systems were then to be developed with proper controls and with consideration to efficiency. This followed the concept of heuristic development. (See T. Berrisford and James C. Wetherbe, "Heuristic Development: A Redesign of Systems Design," *MIS Quarterly,* 3:1, March 1979, pp. 11-19.)

The policy didn’t , workout for many applications. The users didn't want to proceed with a project to move from the prototype to a regular working version.

Question

Why didn’t users follow the heuristic development policy? What are the costs and benefits of full development and the users' alternative of using only the prototype?

12. THE MICROCOMPUTER DECISION

The Dean of the School of Management was upset. He was just about to make a decision to purchase microcomputers for the faculty and staff of the School. A vendor and model number had been selected. Then a new product announcement was made for a better, faster, cheaper computer. He had seen similar announcements every few months. How was he to make a decision on equipment when the "leading edge" where he wanted to be was a moving target?

Questions

a**.** Explain how this decision can be made within the context of an information system plan.

b. The replacement period for the microcomputers was never specified. If the plan calls for a three year life before replacement, aid the Dean by explaining the dynamics of product announcement, availability of initial software, availability of significant amounts of software, and hardware obsolescence.