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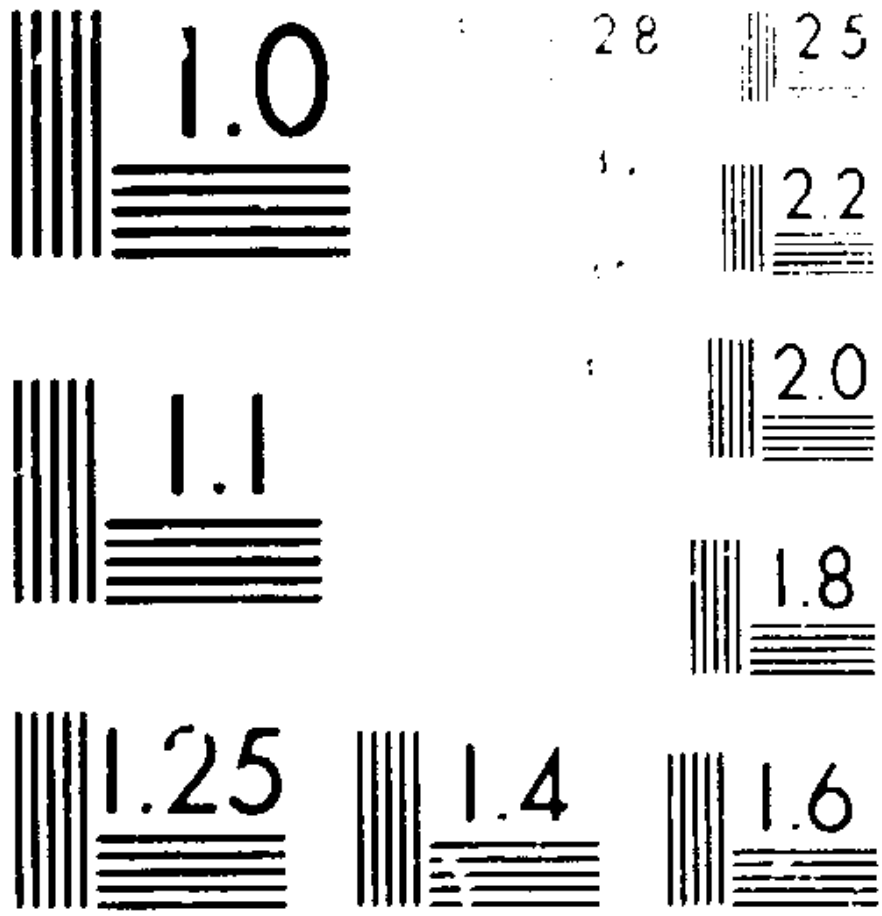
1.0
2.8
2.5
2.2
1.1
2.0
1.8
1.25
1.4
1.6

Report on:

10286

10286

ORIENTATION SEMINAR

ON

COMPUTER SUPPORTED INDUSTRIAL MANAGEMENT

REQUEST FOR PROPOSAL NO.:P/80/50/DR
UNIDO PROJECT NO. :US/RAS/78/202

December 1980

I/S DATACENTRALEN AF 1959

I/S DATACENTRALEN
af 1959

30th December, 1980

Introduction

This report covers the first activity in a regional project "Establishment and Strengthening Regional Co-operation in the Use of Small-scale Computer-based Industrial Management Systems". The project has been established under UNIDO financing in response to a request from the Royal Thai Government and the first activity is an orientation seminar on Computer Supported Industrial Management.

I/S Datacentralen af 1959, Copenhagen, Denmark, has carried out the seminar at the Asian Institute of Technology (AIT). Two consultants were appointed to conduct the seminar in co-operation with AIT, viz.:

Mr. Wim Vink
Mr. Bjarne Staehr

who had a close co-operation with Dr. Kanchit Malaivongs, Associate Director of the Regional Computer Center at the AIT.

The seminar was attended by 28 participants from the following countries:

Bangladesh
China
India
Hong Kong
Malaysia
Philipines
Thailand
Indonesia.

Aim of the project and of the contract

The aim of the Project is to organize and conduct an orientation seminar, specially designed for prospective users of small computers, on the basis of which the participants would acquire a better:

- understanding of the impact of information and its handling on industrial management;
- appreciation of the benefits to be derived from computer support, such as speed and timeliness, accuracy of information and efficiency;
- perception of the organization of information within a computer;

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- recognition of those functions in small industrial establishments which are suited to computerization and familiarity with the respective software packages; and

- appreciation of the operational changes required for computerization and understanding of confidentiality insofar as it relates to company information.

On the basis of this aim and the UNIDO terms of reference dated 20th October 1980 Datacentralen developed all material for the seminar both speakers' material and material for the participants, the latter being a file including copies of all overhead foils used during the seminar.

Contents of the seminar
The seminar covered the following topics:

1. Information and management
The concept of information was defined and its impact on management and decision making was pointed out. The various levels in an organization were covered viz. strategic, tactical and operational including their interrelations.

The characteristics of the various types of information and their relations to the organizational levels together with the edp-systems involved were discussed in detail.

2. Trends in computing
The history and the future trends of hardware and software development were drawn up.

3. Management informations systems (MIS)
The concept of MIS was covered followed by the requirements, design, and use of MIS.

Management and information were initially defined and thoroughly discussed. Then the concept of Management Information Systems was gone through. As a basis for the participants understanding of MIS three different definitions were presented.

Eventually the main elements in connection with design and use of MIS were covered.

It was stressed, however, that up to date it is considered impossible to establish a true MIS.

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4. Dataprocessing considerations
The various types of processing including their basic elements were defined and illustrated:

. Batch processing (remote batch)
. Real-time processing

Conditions connected to centralized/decentralized and distributed processing were also covered.

5. Data base systems
The data base concept was defined and the reasons for using a data base solution - and when, were mentioned.

The objectives of a Data Base Management System (DBMS) were discussed and finally the major data structures: sequential, hierarchical, network, and relational were presented. The characteristics of these structures were explained and illustrated.

6. Approaches to computerization
The phases and how to organize the necessary work in systems development and the required documentation were gone through in detail and the great importance of problem definition was emphasized in particular.

Security aspects connected to the various types of operation were discussed. The process of selecting hardware and software (i.e. suppliers) was covered thoroughly and finally the organizational consequences by implementing edp were discussed.

7. Edp organization and staffing
On the basis of the edp-functions "System development" and "Operations" the various types of organizations were discussed. The edp-service bureau and small industrial companies were the main types of organizations to be covered.

Staffing considerations in different types of organizations were discussed with emphasis on requirements, recruiting and training.

8. Case study I
The development and implementation of a mini-computer based turn-key system for manufacturing and sale were gone through.

The elements of the system in question are:

. Production control
. Stock control
. Purchase management
. Sales management
. Economy functions

The normal organization and the necessary project organization of the company in question plus the hardware and software involved were pointed out.

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The installation plan and the economy of the system were presented.

As a special aid to the participants a survey of manufacturing resource planning systems was distributed.

The survey covered company names, products, modules involved, programming languages, hardware description, cost, release of the systems, and number of users.

9. Case study II

Presentation of a mini-computer based system including registry management and information retrieval (the latter being a future development).

The system was described together with it´s creation, present state and the future development plans.

Experience of various kinds were covered e.g.:

- consequences by using edp in public organizations
- savings
- policies.

Finally the future possibilities and plans for the Danish central administration were drawn up.

As a practical element of the seminar a field trip was arranged in the Bangkok area by AIT and NSO (National Statistics Office) covering two visits based upon NEC-machinery (Nippon Electronic Corporation).

In connection with the field trip Datacentralen´s consultants participated actively in explaining the various functions of the edp organizations visited and also their edp-configurations as such.

Concluding remarks

We must state that the participants covered many different backgrounds both regarding line of business and knowledge about edp. In spite of this fact it is Datacentralen´s impression that the participants have achieved a very good understanding of the topics covered in the seminar.

The seminar involved a beneficial dialogue between the lecturers and the participants from the very first day of the seminar. This enabled the lecturers currently to adjust the seminar to meet the participants´ expectations more precisely.

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It should be mentioned that so-called "open sessions" were used to cover various questions being the result of the dialogues during the seminar. Specifically a full lesson was used to go through a survey of 25 Danish companies' experiences with in-house edp-utilization. The survey has been worked out by the Danish edp-council and states the companies expectations before implementing their own mini-computer and the experiences achieved after one year of operation.

It is Datacentralen's impression that seminars of this type are very valuable to managers from industry and central government in the developing countries. We feel that they contribute essentially to the development of management in the above mentioned areas, while they also contribute to a greater international understanding.

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Orientation Seminar

on

Computer Supported Industrial Management

in Bangkok, Thailand, 1. to 5. December, 1980

Carried out by:
I/S Datacentralen af 1959
Retortvej 6 - 8
DK - 2500 Copenhagen, Valby
Denmark

for

The United Nations Industrial Development
Organization (UNIDO)
Vienna, Austria

Speakers:
Wim Vink, Consultant
Bjarne Stæhr, Consultant
N. Suzuki, Assoc. Ind. Dev. Officer, UNIDO

Programme:

1st December 1980

09.15 - 09.30	Introduction
09.30 - 09.45	Presentation of speakers and I/S Datacentralen af 1959.
09.45 - 10.15	Information and Management: The concept of information, its role in relation to edp-systems and its impact on management.
10.15 - 10.45	Break
10.45 - 11.30	Trends in Computing: History of hardware, software, and computer applications - major milestones. The future trends will be drawn up.
11.30 - 11.45	Break
11.45 - 12.30	Trends in Computing, continued.
12.30 - 13.30	Lunch
13.30 - 14.15	Management Information Systems: The basic concept of MIS, its possibilities and limitations. How to design and use a MIS.
14.15 - 14.30	Break
14.30 - 15.15	Data Processing Considerations: The various types of operation techniques and the related characteristics.
15.15 - 15.45	Break
15.45 - 16.30	Data Base Systems: The data base concept and the function of the three major data structures and their purpose.
16.30	Adjourn

2nd December 1980

09.30 - 10.15	Data Base Systems, continued.
10.15 - 10.45	Break
10.45 - 11.30	Approaches to Computerization: The system development process from idea through operation and considerations in relation to hardware and software selection.
11.30 - 11.45	Break
11.45 - 12.30	Approaches to Computerization, continued.
12.30 - 13.30	Lunch
13.30 - 14.15	Approaches to Computerization, continued.
14.15 - 14.30	Break
14.30 - 15.15	Approaches to Computerization, continued.
15.15 - 15.45	Break
15.45 - 16.30	Approaches to Computerization, continued.
16.30	Adjourn

3rd December 1980

09.30 - 10.15	Edp-organization and staffing: Functions performed by the edp-organization and organizational aspects in different types of companies.
10.15 - 10.45	Break
10.45 - 11.30	Edp-organization and staffing, continued.
11.30 - 11.45	Break
11.45 - 12.30	Open session
12.30 - 13.30	Lunch
13.30 - 14.15	Activities of the United Nations Industrial Development Organization (UNIDO)
14.15 - 14.30	Break
14.30 - 15.15	Case Study I: A case of edp-development and implementation in a company dealing with manufacturing and sale.
15.15 - 15.45	Break
15.45 - 16.30	Case Study I, continued.
16.30	Adjourn

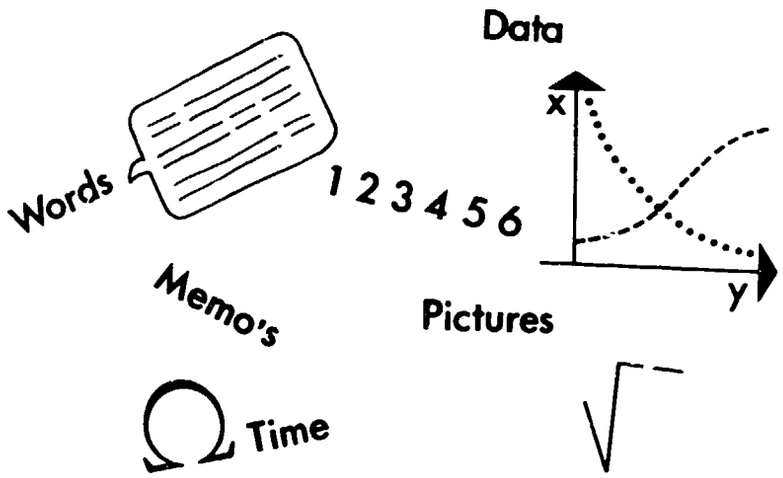
4th December 1980

09.30 - 10.15	Case Study I, continued.
10.15 - 10.45	Break
10.45 - 11.30	Open session
11.30 - 11.45	Break
11.45 - 12.30	Case Study II: A minicomputer based Information Retrieval System developed for central and local Government in Denmark as a turn-key system.
12.30 - 13.30	Lunch
13.30 - 14.15	Case Study II, continued.
14.15 - 14.30	Break
14.30 - 15.15	Case Study II, continued.
15.15 - 15.45	Break
15.45 - 16.30	Open session
16.30	Adjourn

5th December 1980

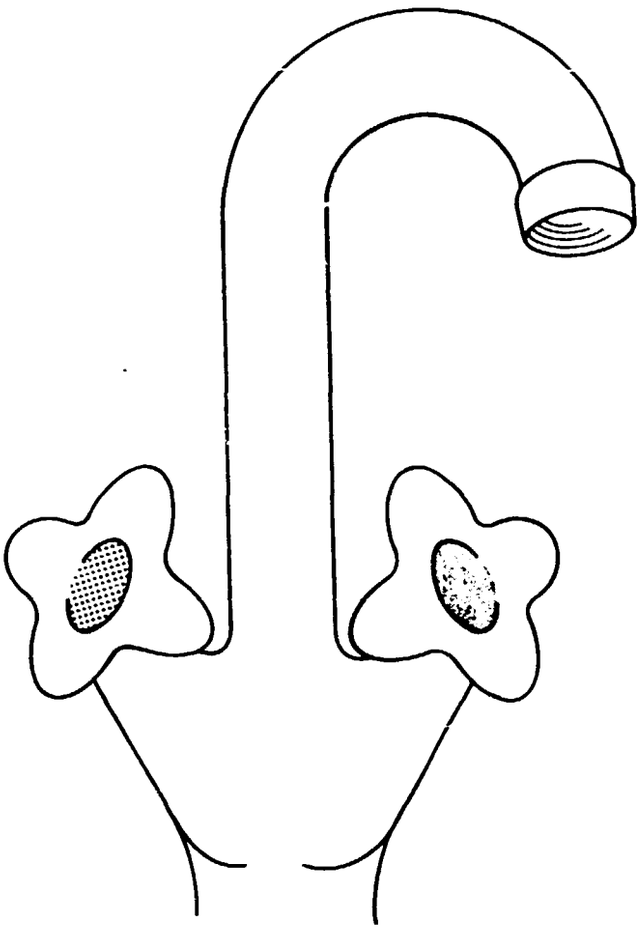
09.30 - 12.30	Field trip
12.30 - 13.30	Lunch
13.30 - 14.30	Closing session
14.30	Adjourn

WHAT IS INFORMATION



INFORMATION IS:

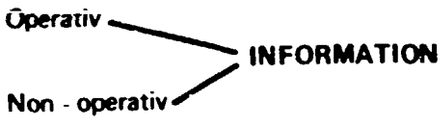
a collection of data
enabling you to make
decisions.



No decision will be
better than the
quality of the given
information permits.

INFORMATION MUST BE:

1. Relevant
2. Of current interest
3. Uncurrupted
4. The information must not influence the decision maker to such an extent that, in reality, it is the reporting person that makes the decision.

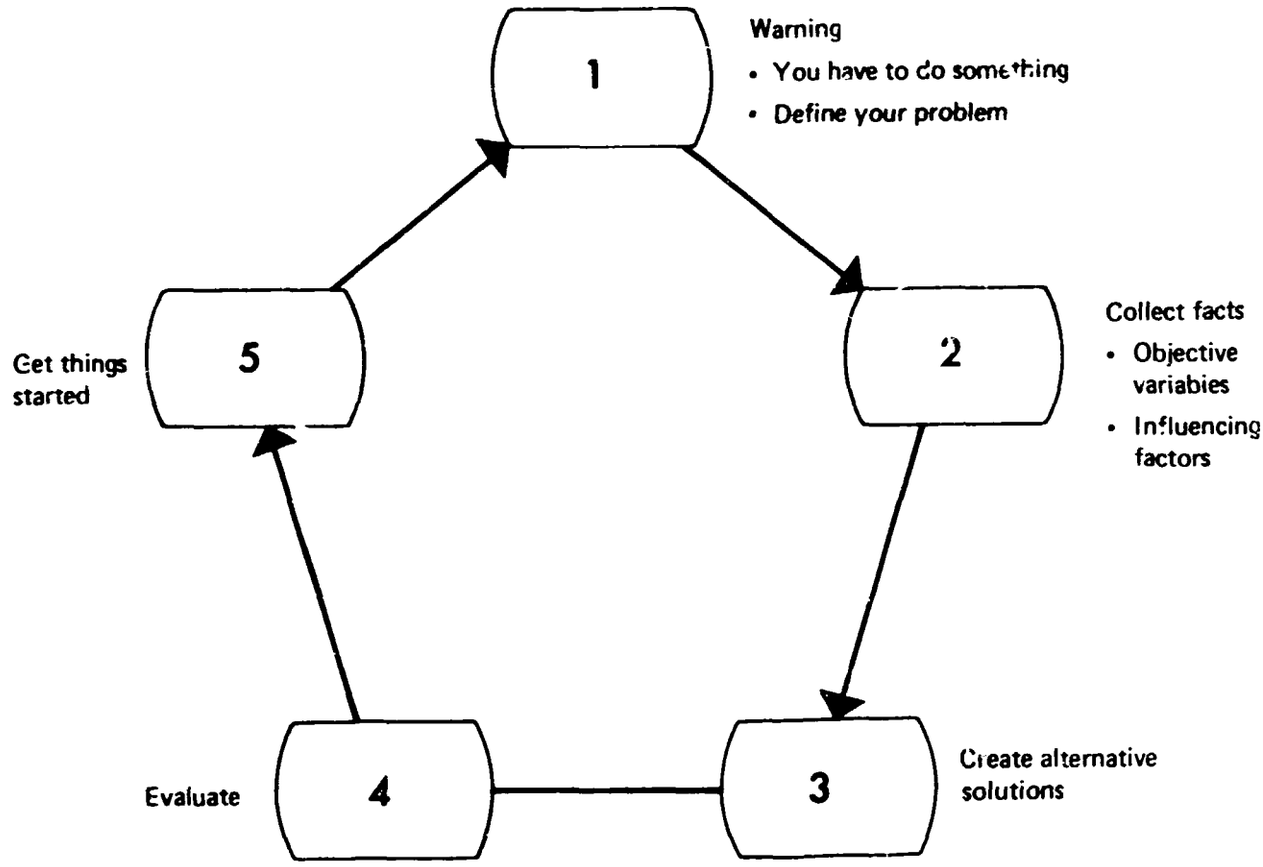

Operativ
Non - operativ
INFORMATION

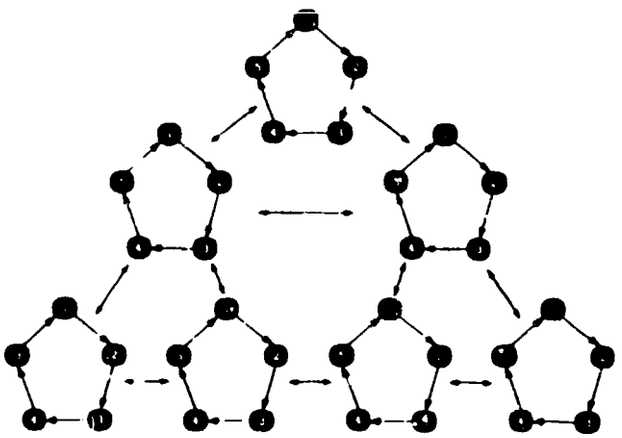
Executives vary greatly in their:

- Preferred source of information
- Appetite for information
- Efficiency in information collection
- Critical acceptance of information

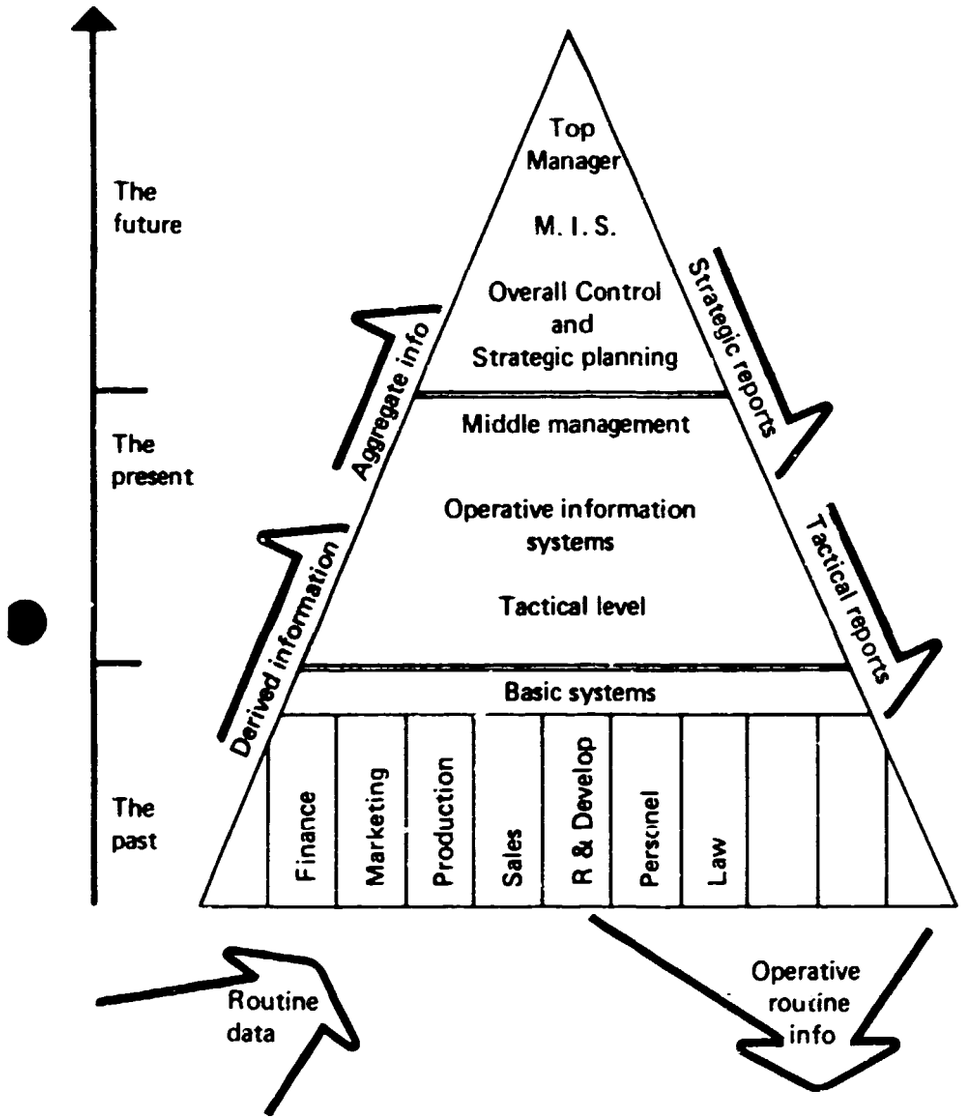
An executive's interest in information acquisition will vary in different periods.

DECISION MAKING:

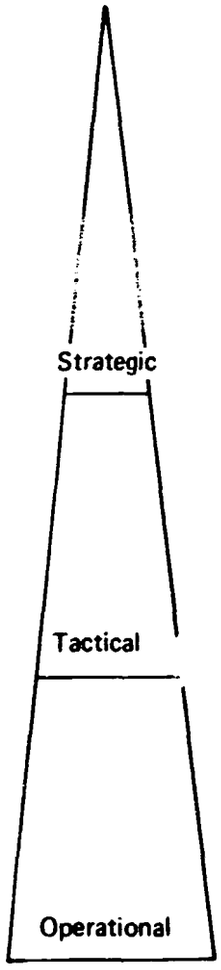




THE INFORMATION SYSTEM :



EDP - RELATIONS



Frequency	Risk	Information systems
Irregular	High and uncertain	Ad hoc Simulation Inquiry
Periodical	May be high	Regular, Varying Reports Database orientatet
Real-time	Normally low	Formal, Fixed Procedures Complex Specific

TRENDS IN COMPUTING

TRENDS IN COMPUTING

- Hardware
- Software
- Applications

HISTORY (Milestones)

FUTURE

THE MAJOR REVOLUTIONS

- Agricultural
- Industrial
- Informational

1640 Blaise Pascal

- Addition
- Subtraction

1670 Gottfried W. Leibnitz

- Addition
- Subtraction
- Multiplication
- Division

1703 Gottfried W. Leibnitz

- The Binary System

1805 J. M. Jacquard

- The Automatic Weave

1834 Charles Babbage

- The Analytical Machine

1941 **Konrad Zuse**

Z3 (Binary)

1943 **Howard Aiken (IBM)**

MARK 1 (Decimal)

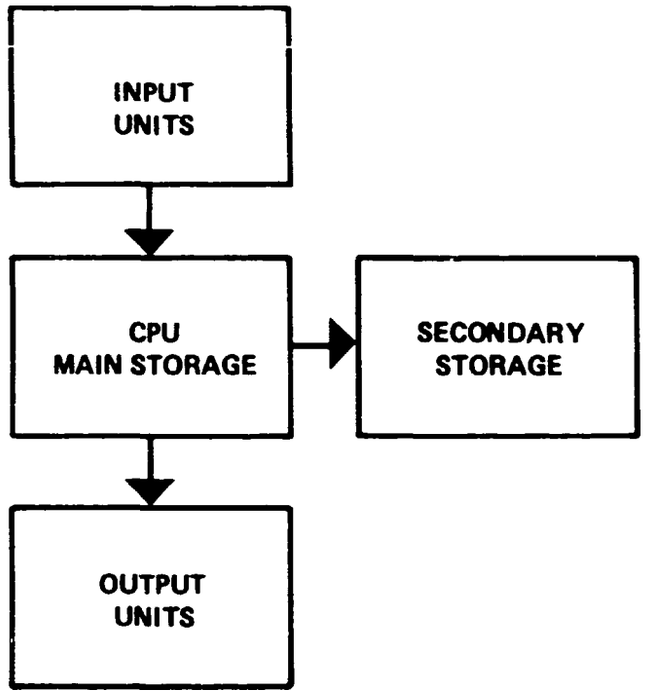
1945 **John B. Neumann**

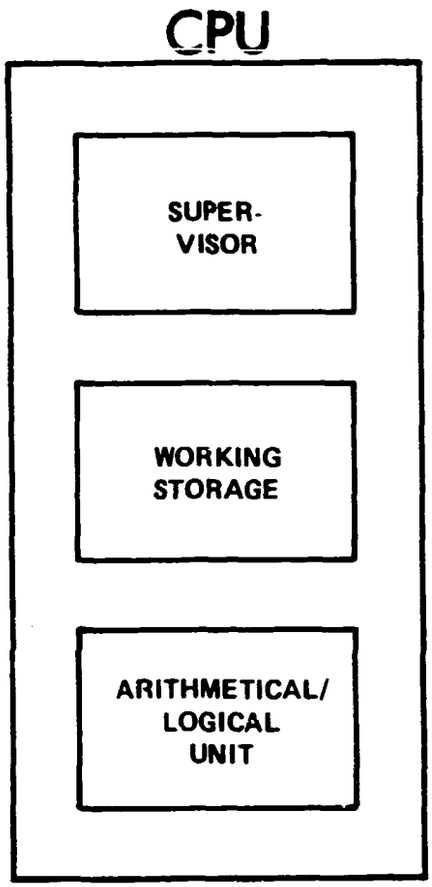
1946 **Electronical Numerical Integrator and Calculator (ENIAC)**

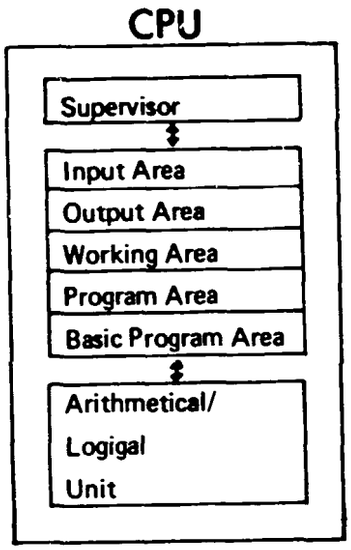
- 18.000 Radio Tubes
- 1.500 Relays
- 200 KN

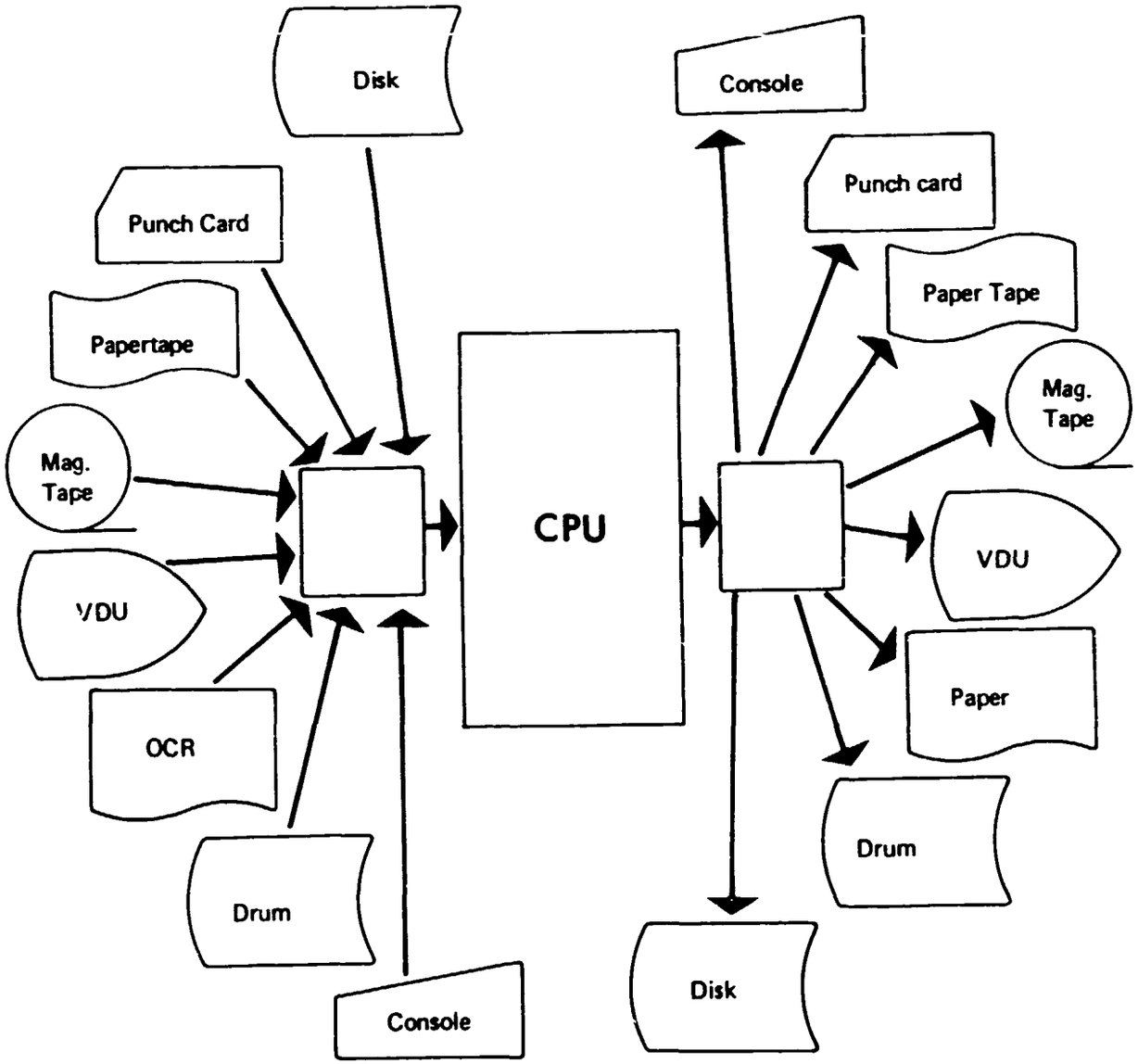
1952 **Invention of The Transistor**

1957 **Danish Arithmetical Sequence Calculator (DASK)**


INPUT
UNITS
CPU
MAIN STORAGE
SECONDARY
STORAGE
OUTPUT
UNITS


CPU
SUPER-
VISOR
WORKING
STORAGE
ARITHMETICAL/
LOGICAL
UNIT


CPU
Supervisor
Input Area
Output Area
Working Area
Program Area
Basic Program Area
Arithmetical/
Logigal
Unit


Disk
Punch Card
Papertape
Mag. Tape
VDU
OCR
Drum
Console
CPU
Console
Punch card
Paper Tape
Mag. Tape
VDU
Paper
Drum
Disk

1946 **1. Generation**

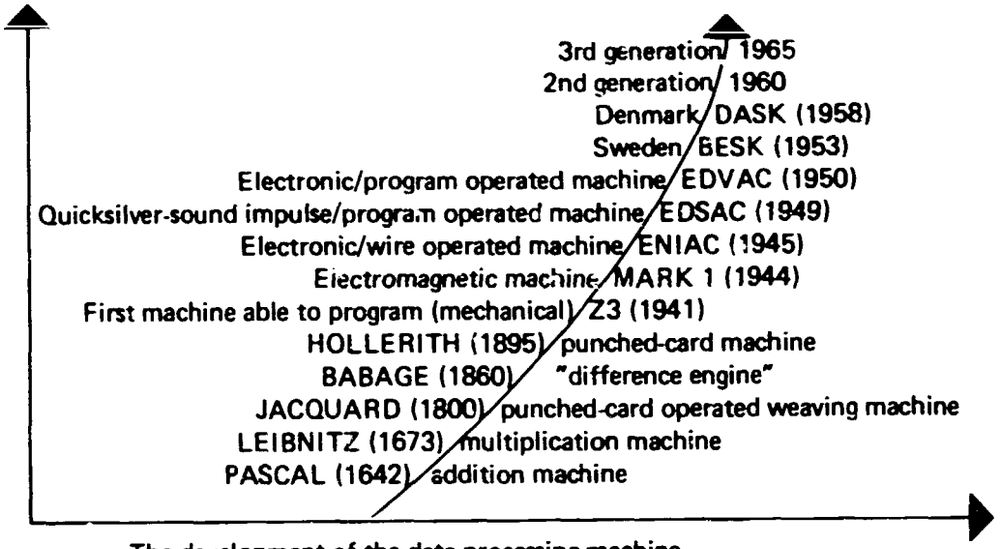
- Radio Tube

1958 **2. Generation**

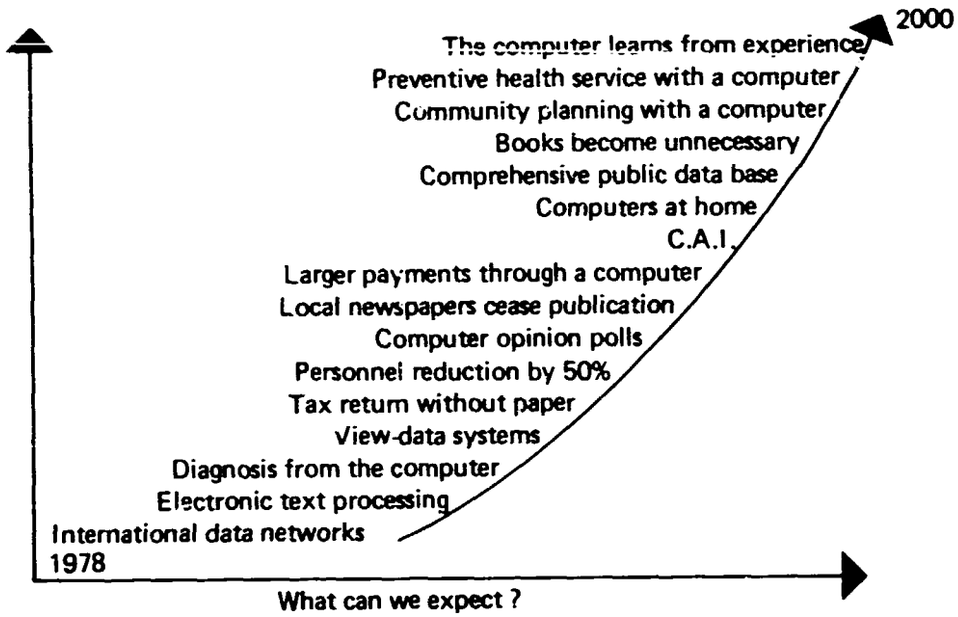
- Transistor

1964 **3. Generation**

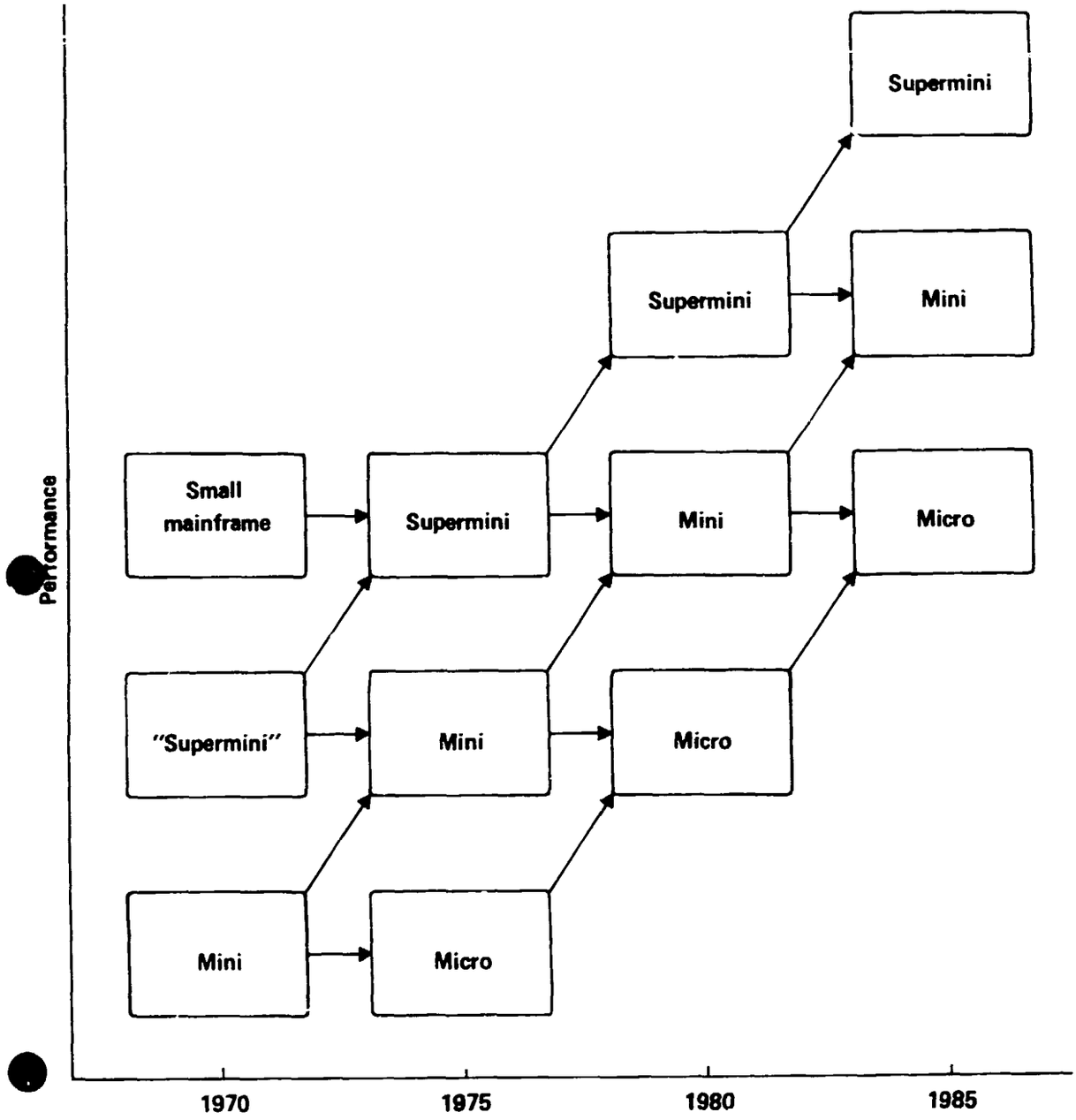
- Integrated Circuit



The development of the data processing machine.


2000
The computer learns from experience
Preventive health service with a computer
Community planning with a computer
Books become unnecessary
Comprehensive public data base
Computers at home
C.A.I.
Larger payments through a computer
Local newspapers cease publication
Computer opinion polls
Personnel reduction by 50%
Tax return without paper
View-data systems
Diagnosis from the computer
Electronic text processing
International data networks
1978
What can we expect ?

Minicomp ter evolution



INTEGRATED CIRCUITS

Bipolar

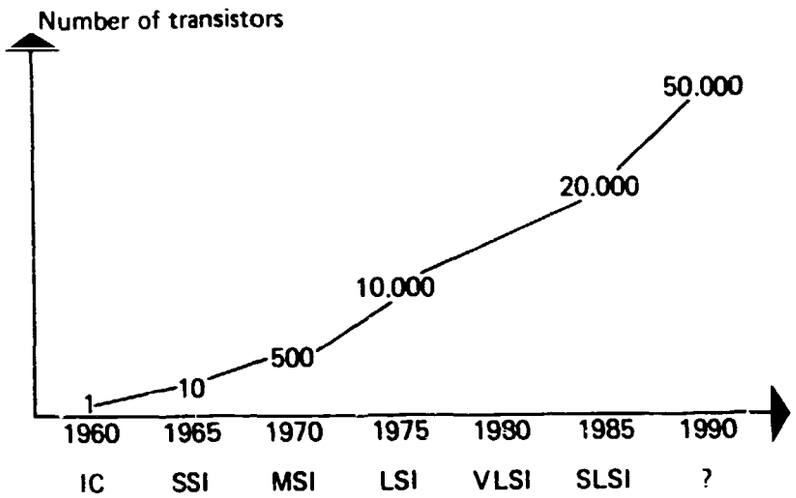
- Fast
- Bigcomputers

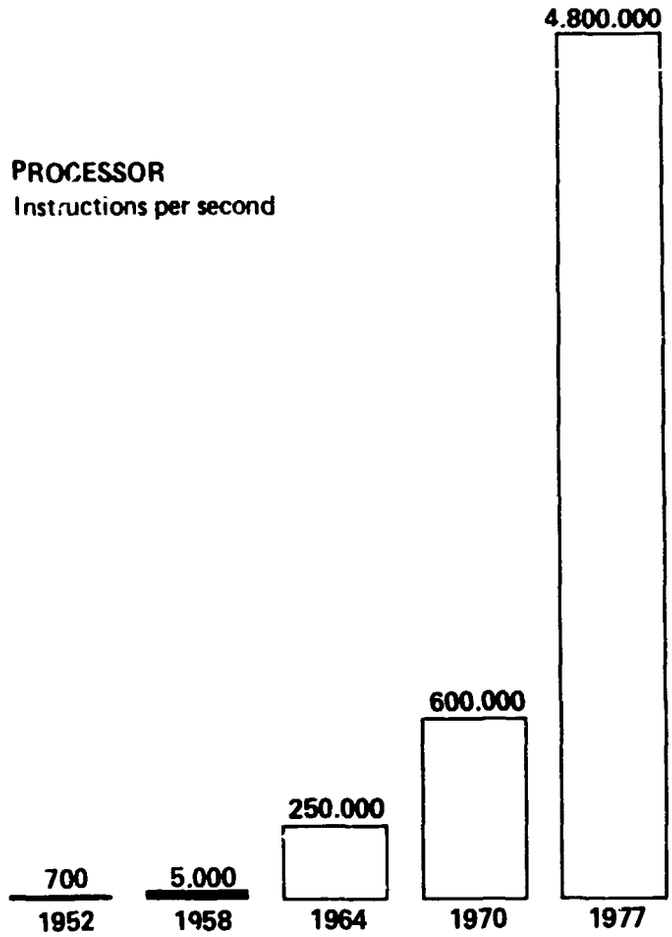
Metal on silicium (MOS)

- Slow
- Small computers
- Main memory

INTEGRATED CIRCUITS

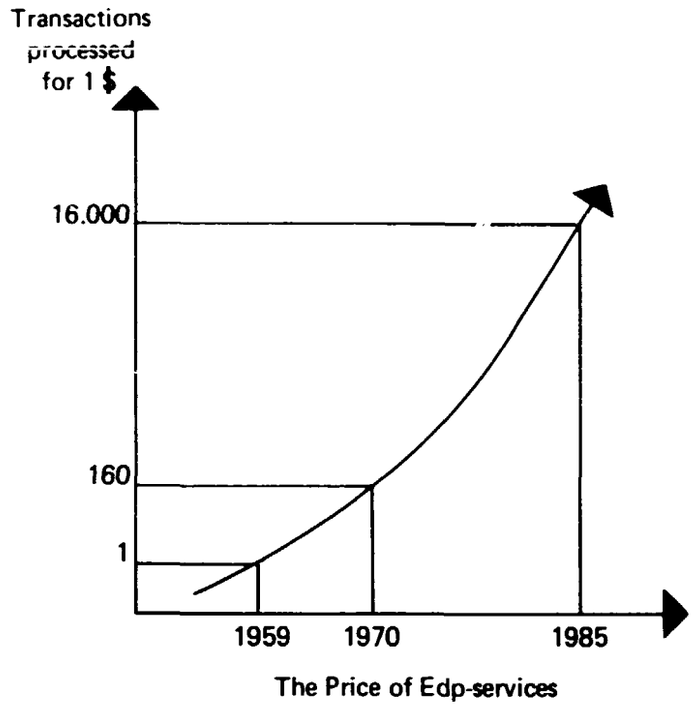
- Less than 500 transistors
- 500 - 20.000 transistors
- More than 20.000 transistors

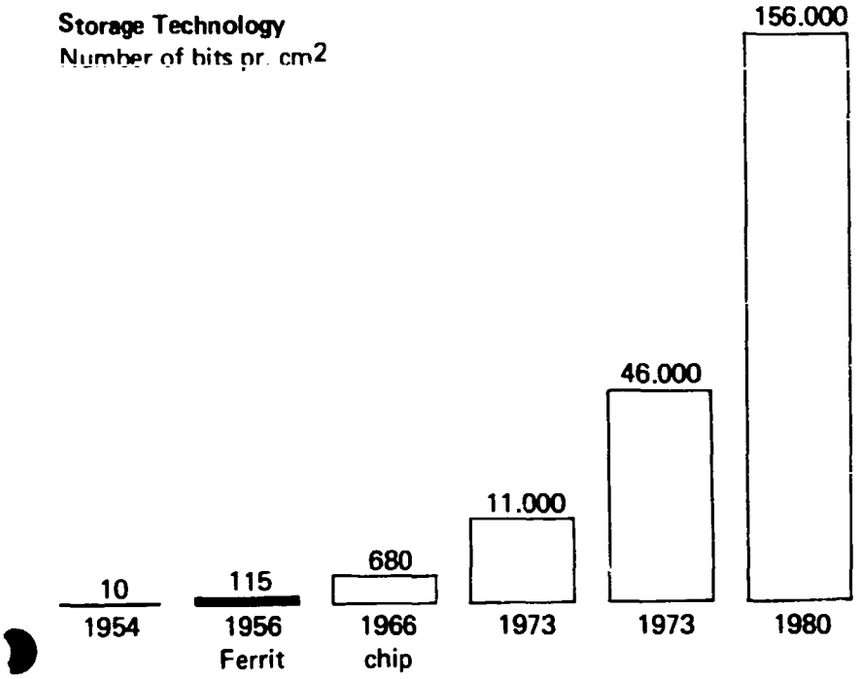

Number of transistors
50.000
20.000
10.000
500
10
1
1960
1965
1970
1975
1980
1985
1990
IC
SSI
MSI
LSI
VLSI
SLSI
?


PROCESSOR
Instructions per second
700
1952
5.000
1958
250.000
1964
600.000
1970
4.800.000
1977

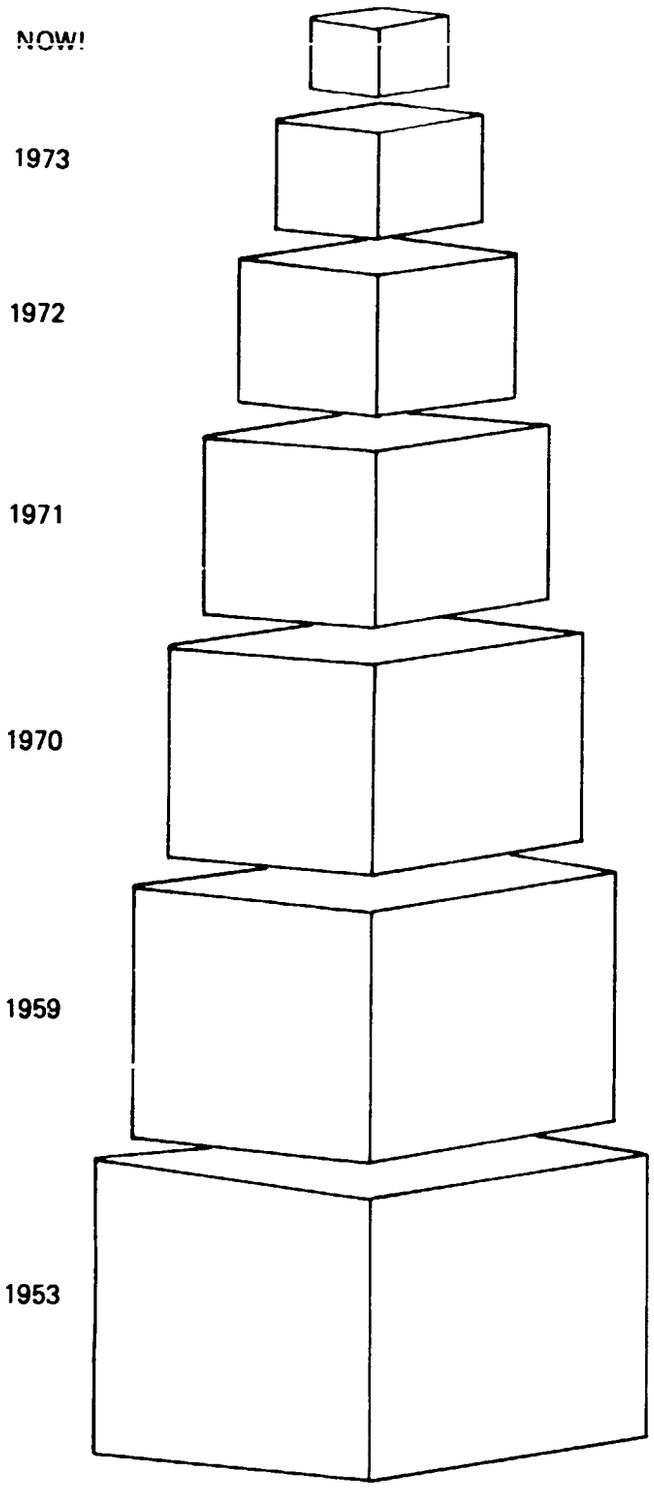
CALCULATION SPEED
"The Movement of The Planets 1654 - 2000"

Year	Methods	Time
Before 1600	None	Impossible
1600 - 1950	Manually	APP. 30.000 Hrs.
	Logarithms	(Never done)
	Calculators	
1950	Electromechanic Computer	150 Hrs.
1960	Gier Computer	5 Hrs.
1965	CDC 6400	5 Min.
1970	IBM/95	30 Sec.
1980		?

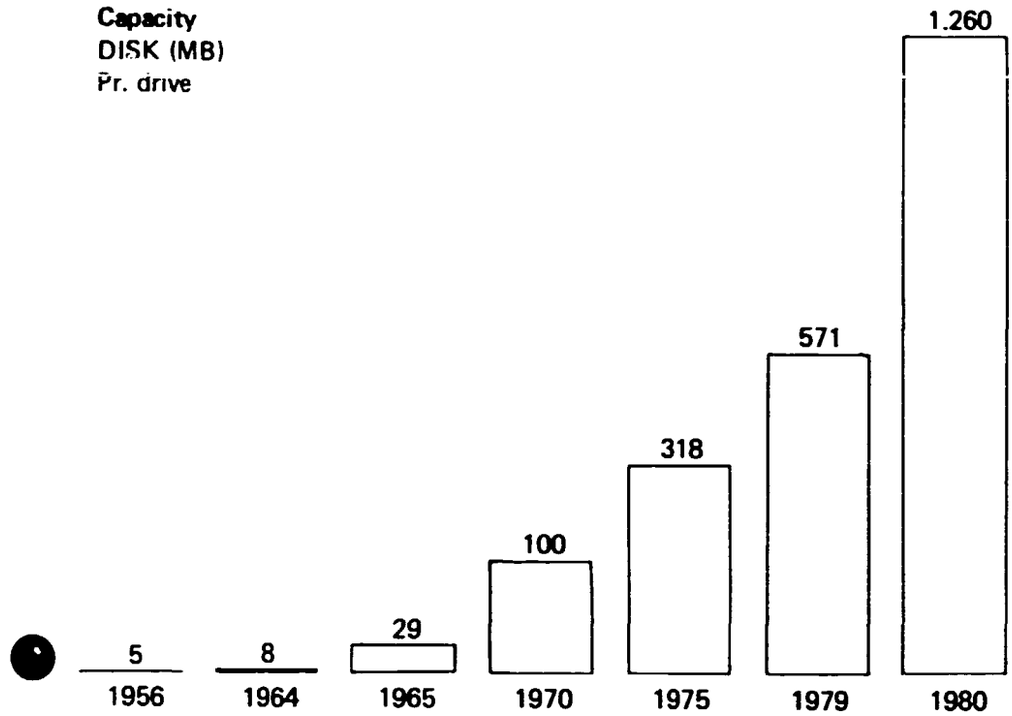

Transactions
processed
for 1 $
16.000
160
1
1959
1970
1985
The Price of Edp-services

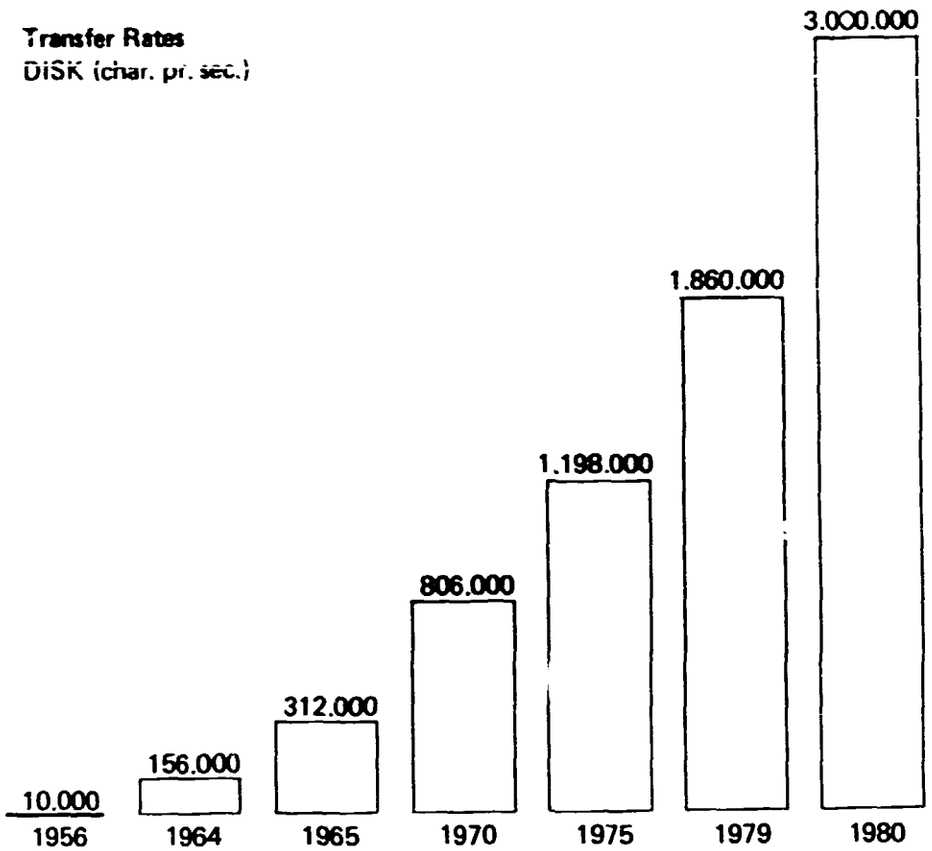

Storage Technology
Number of bits pr. cm2
156.000
46.000
11.000
680
115
10
1954
1956
Ferrit
1966
chip
1973
1973
1980

1 MEGA BYTES



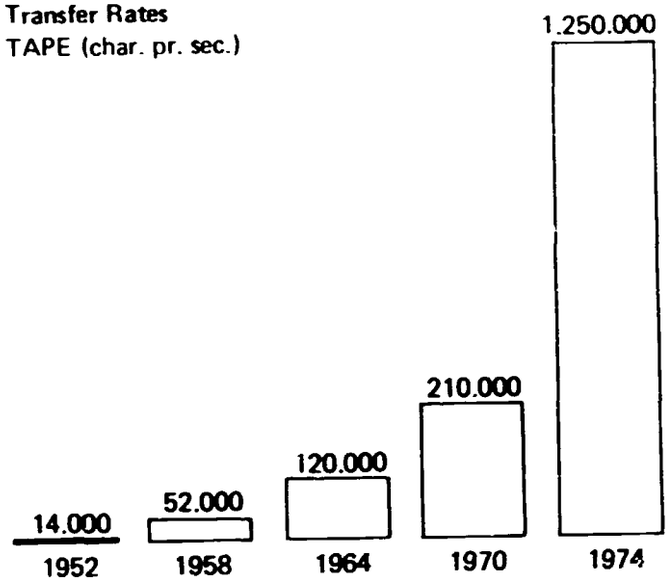
NOW!	3 dm^3
1973	14 dm^3
1972	28 dm^3
1971	226 dm^3
1970	1130 dm^3
1959	11330 dm^3
1953	2830 dm^3


Capacity
DISK (MB)
Pr. drive
5
8
29
100
318
571
1.260
1956
1964
1965
1970
1975
1979
1980


Transfer Rates
DISK (char. pr. sec.)
10.000
156.000
312.000
806.000
1.198.000
1.860.000
3.000.000
1956
1964
1965
1970
1975
1979
1980

DRUM STORAGE

1965	2301	
1968	2302	
1970	2305	11MB


Transfer Rates
TAPE (char. pr. sec.)
14.000
52.000
120.000
210.000
1.250.000
1952
1958
1964
1970
1974

TERMINALS

1964 Printer Terminals
(IBM 1052, IBM 2740)

1970 Display Screen
(IBM 2260)

1972 IBM 3270

1975 IBM 3600 (BANK)

1979 IBM 3270 (COLOR)

PRINTERS

1960 Drum Printer
Line Printer

1970 Off-Line COM

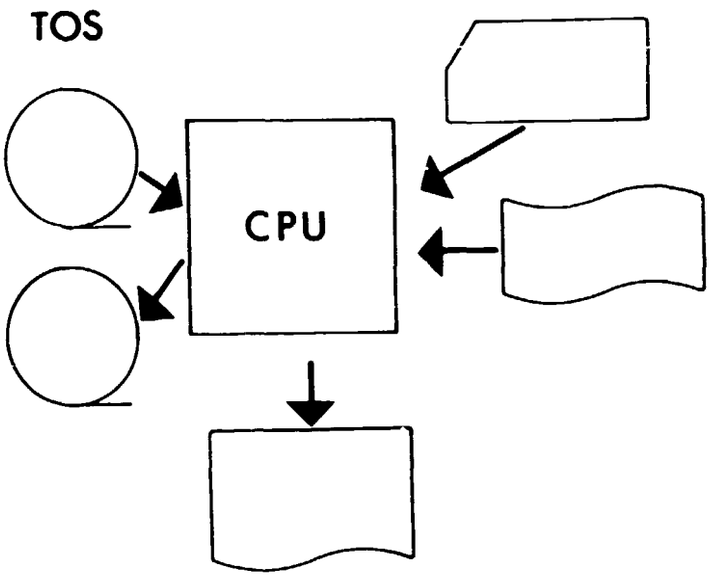
1975 Laserprinter

1977 On-Line COM

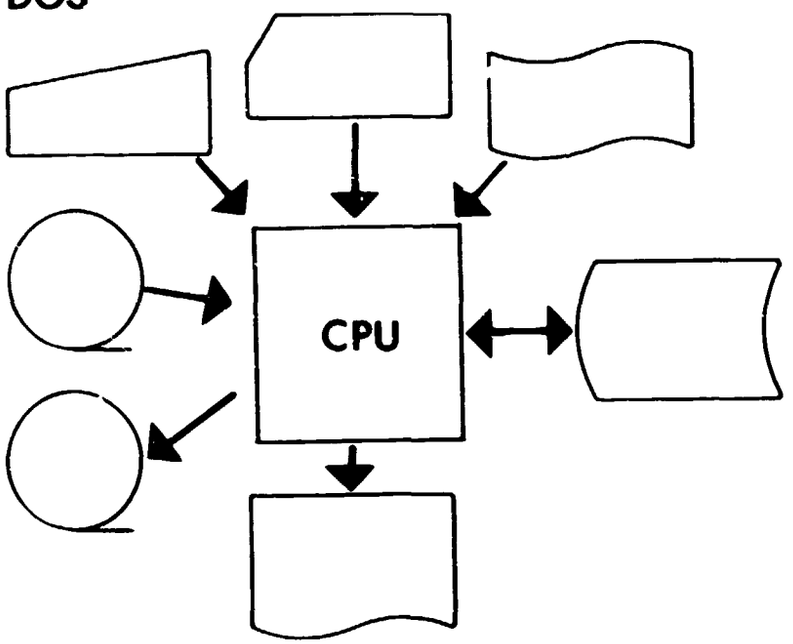
SOFTWARE DEVELOPMENT

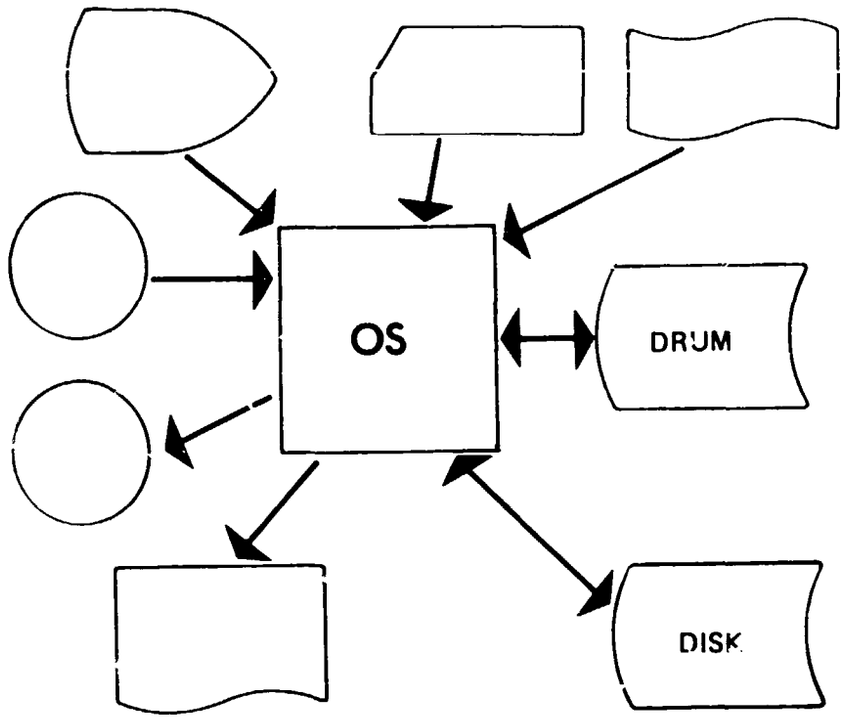
Operating system (OS)

- Boards
- Tape Operating System (TOS)
- Disk Operating System (DOS)
- Operating System (OS)
- Virtual Machinery (VM)


TOS
CPU

DOS




OS
DRUM
DISK

Programming "languages"

- Machine code
- Auto code
- Assembly language

Programming Languages

Compilers:

- High level
    1. Fortran
    2. Algol
    3. Cobol (optimizer)
    4. PL 1 (optimizer)
    5. (check-out compiler)

- Very high level
    1. (Basic)
    2. Pascal
    3. ADA

Interactive programming language

- A Programming language (APL)

Program generators

- Application Development Facility (ADF)
-
-

Methods

- Jackson structured programming (JSP)

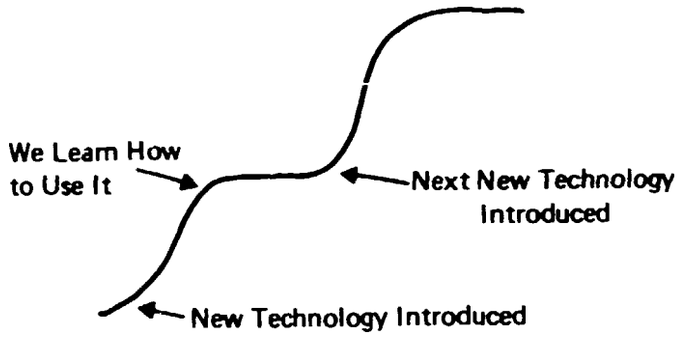
Report generators

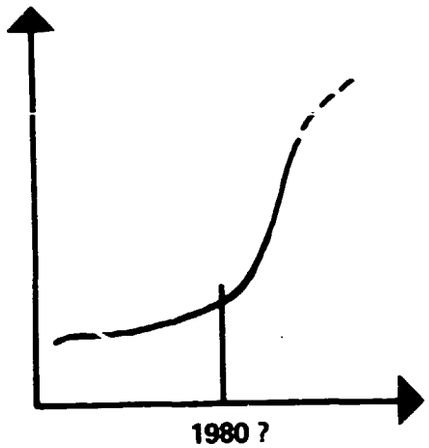
- Easytrieve
- MARK IV
- Structured design
- Structured application design technique

APPLICATIONS

- Technical/scientific calculations
- Weather forecast
- Process Management
- Administrative applications
- Text editing (photo-composition)
- Information retrieval
- Office automation
- Operational (managerial) applications
- Graphic registration and display
- CAD/CAM

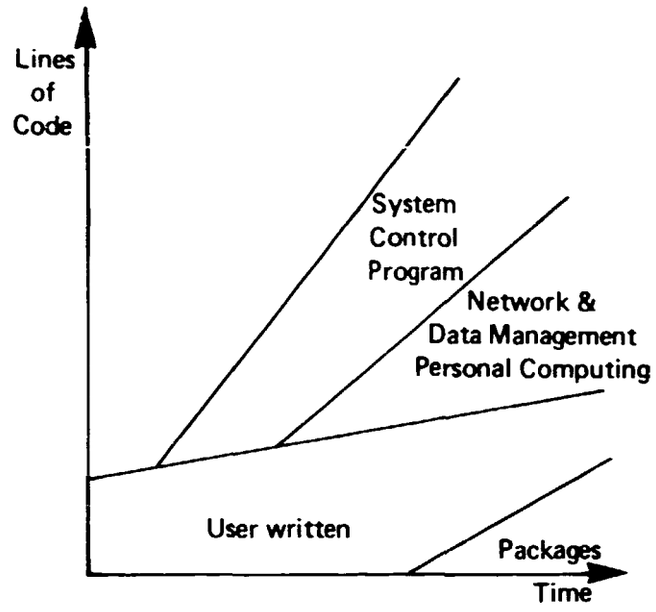
Nolan's Curve

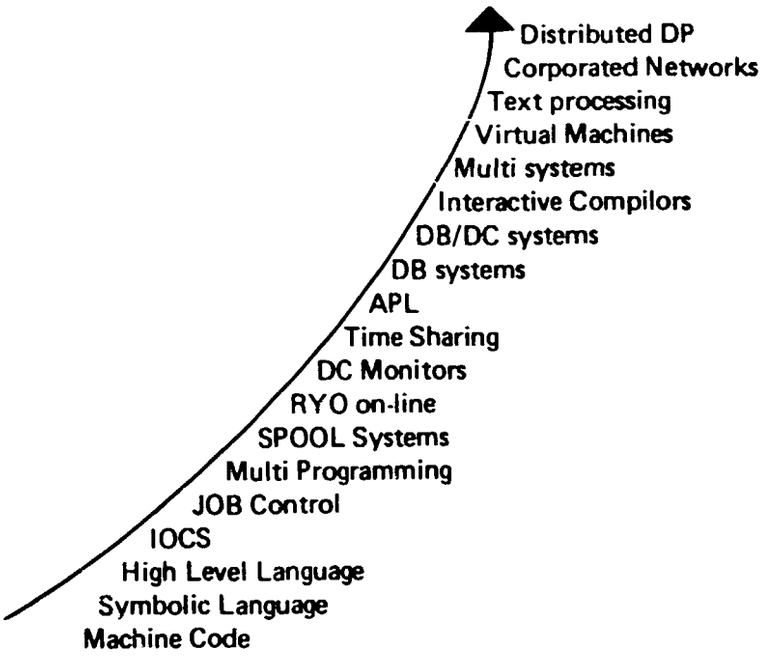




Technology - where are we now ?


SOFTWARE


Lines
of
Code
System
Control
Program
Network &
Data Management
Personal Computing
User written
Packages
Time


Distributed DP
Corporated Networks
Text processing
Virtual Machines
Multi systems
Interactive Compilors
DB/DC systems
DB systems
APL
Time Sharing
DC Monitors
RYO on-line
SPOOL Systems
Multi Programming
JOB Control
IOCS
High Level Language
Symbolic Language
Machine Code

What is a Management Information System?

What is MANAGEMENT?

1. Determine objectives.
2. Forecast the effect og dicisions.
3. Take a decision as to which course of action to foiiow.
4. Plan the course in detail.
5. Develop a budget of the resources needed to implement the plan.
6. Execute the plan by communication and delegation.
7. Monitor progress, to correct deviations.

Levels of MANAGEMENT

1. Strategic
2. Tactical
3. Operational
   - Execution
   - Control

MANAGEMENT INFORMATION:

- Only information which managers use in taking decisions is management information.
- Information is derived from data about what **has passed**, management is concerned with what **is to come** management information provides a bridge which enables managers to shape **the future** in the light of past events.

Management Information System (M.I.S)

"A Management Information System should be a totally integrated synergistic analog control system, with digital input and output characteristics, which categorically differentiates the data sets in alternate axes and provides random and sequential axes to all planning, operating, financial and other quantifiable non-quantitative transactions in past, present and future data plans. In conjunction with selective interrogation of the stratified data metrix contained within the computerised data bank in combination with discriminate differentiation of the magnitude of variance limits of the multiple control variables, providing accurately time-phased exception reports for management decision and executive action!!!"

"One of the fundamental management processes concerns making decisions. To make these decisions managers need information concerning the internal activities of the business and its external environment. It is the function of a management information system to provide this information".

The role of a management information system is simply to assist management in carrying out their functions of planning, organizing and controlling.

So much for the "buzz word" game which surrounds MIS.

1. DEFINE THE OBJECTIVES OF THE SYSTEM
2. ESTABLISH THE RELEVANT SHAPE AND CONTENTS
3. ORGANIZE THE DATA BASE

1. **Define the objectives of the system.**

   - Who is going to use the system?
   - What decisions are they supposed to make?
   - What information do they need?

2. **Establish the relevant shape and contents.**

- Terminal usage
- What kind of terminals
- Who is going to operate the terminals
- Ability to solve preplanned problems only or
- should user interaction be permitted
- To what kind of data should the system give access
- Data restrictions
- Who is responsible for updating the data.

3. Organize the Data Base

What do we want?

a) A Data Base designed as a file system, that could be shared with conventional applications?

b) A stepwise implementation of the Data Base without much effort to adjust new applications?

c) A system easy to operate and programs with security control and data integrity?

d) . . . . . .

e) . . . . . .

f) . . . . . .

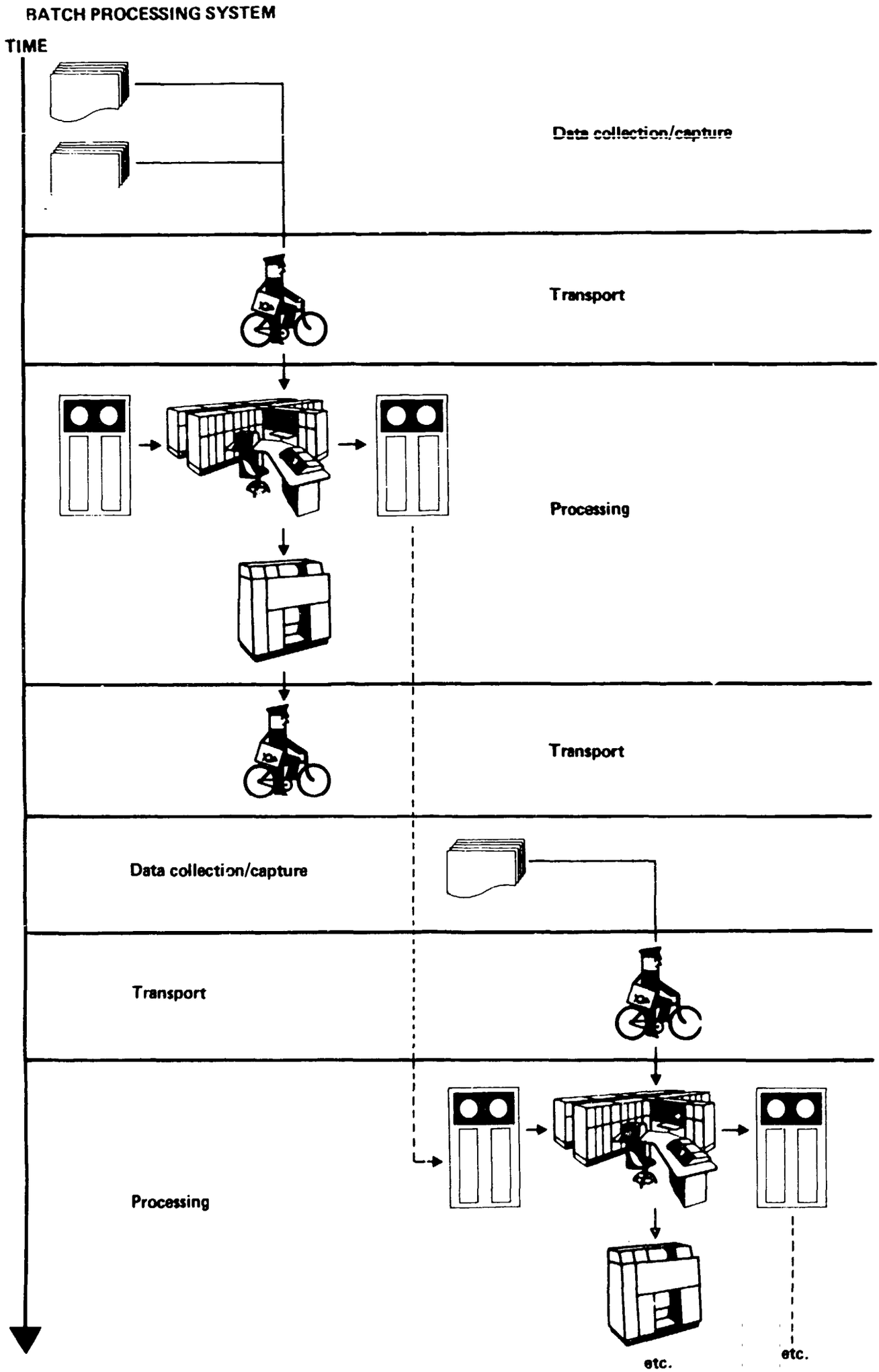
DATA PROCESSING CONSIDERATIONS

EDR FUNCTIONS

- Data capture
- Data control
- Data processing
- Data storage
- Data print

OPERATION TYPES

- Batch Processing
- Real time processing


BATCH PROCESSING SYSTEM
TIME
Data collection/capture
Transport
Processing
Transport
Data collection/capture
Transport
Processing
etc.
etc.

BATCH PROCESSING SYSTEMS

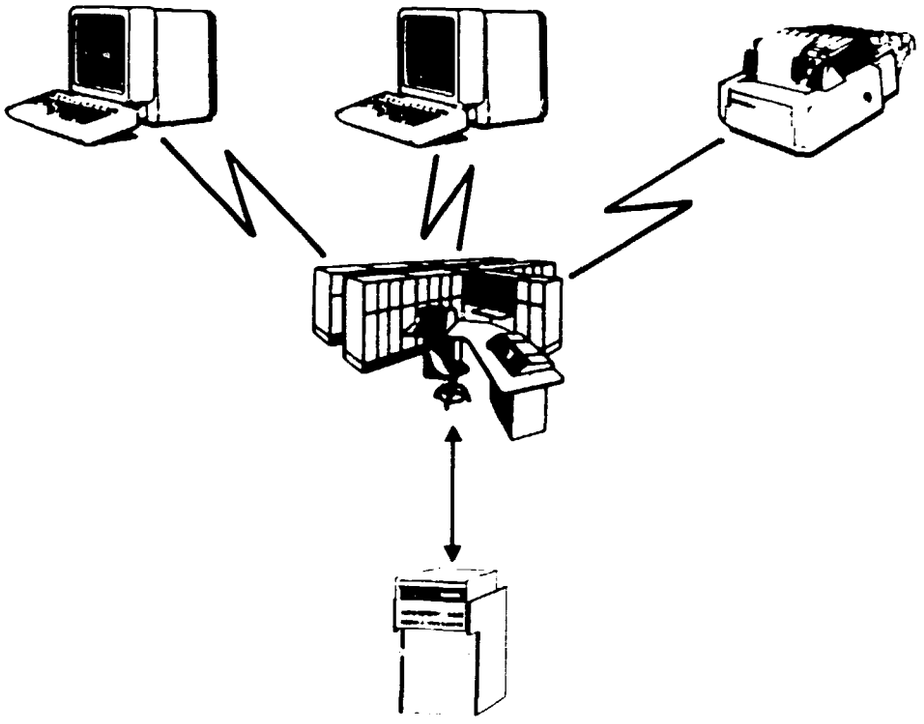
- Long response time (days)
- Low current interest
- Optimization through
  Operation planning

BATCH PROCESSING SYSTEMS

Characteristics

- Job quene (JCL)
- Priority
- Batch collection
- Sorting
- Determined schedule

REAL TIME PROCESSING



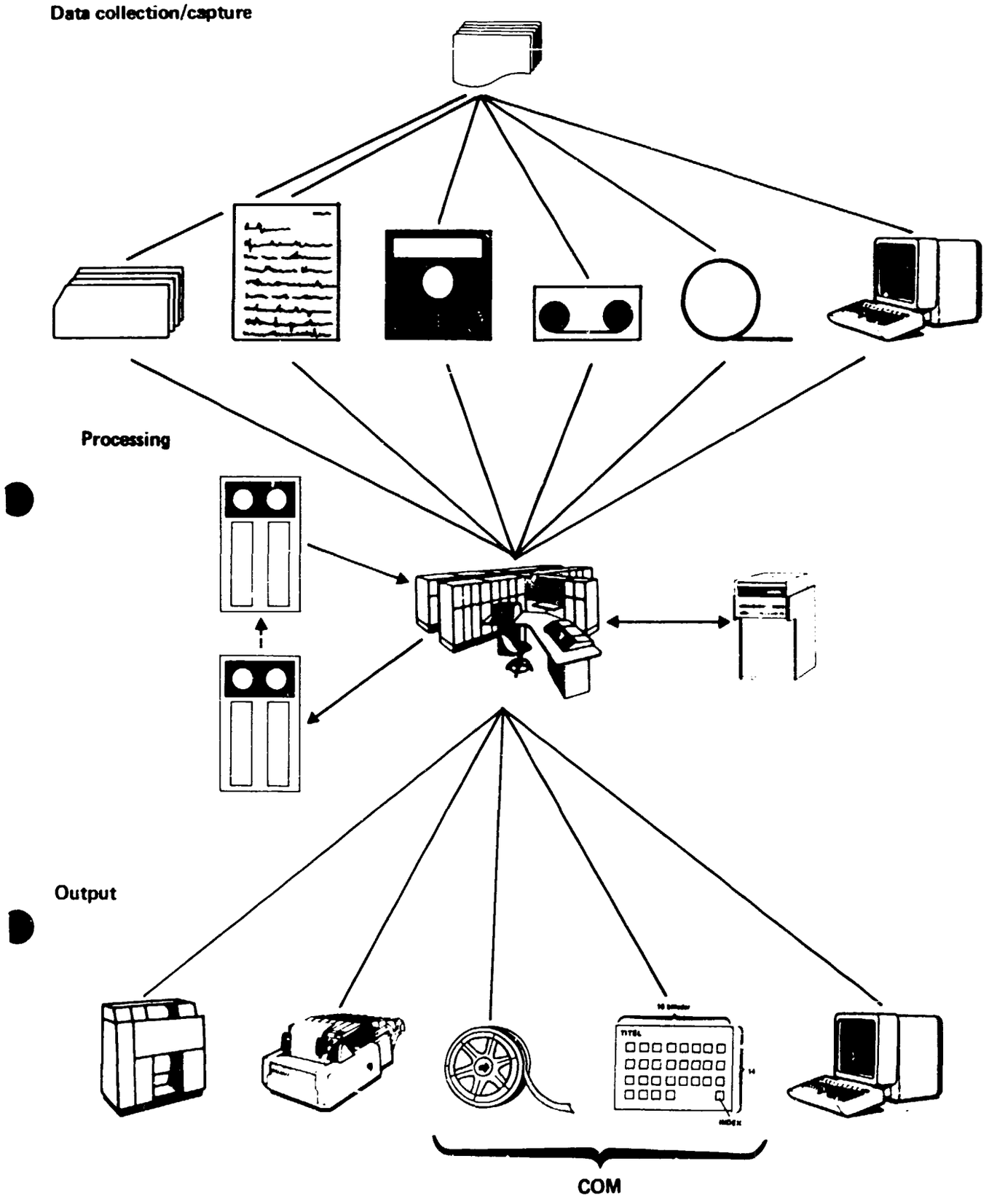
REAL TIME PROCESSING

- High current interest
- Short response time (seconds)
- System configuration according to 'busy hour'

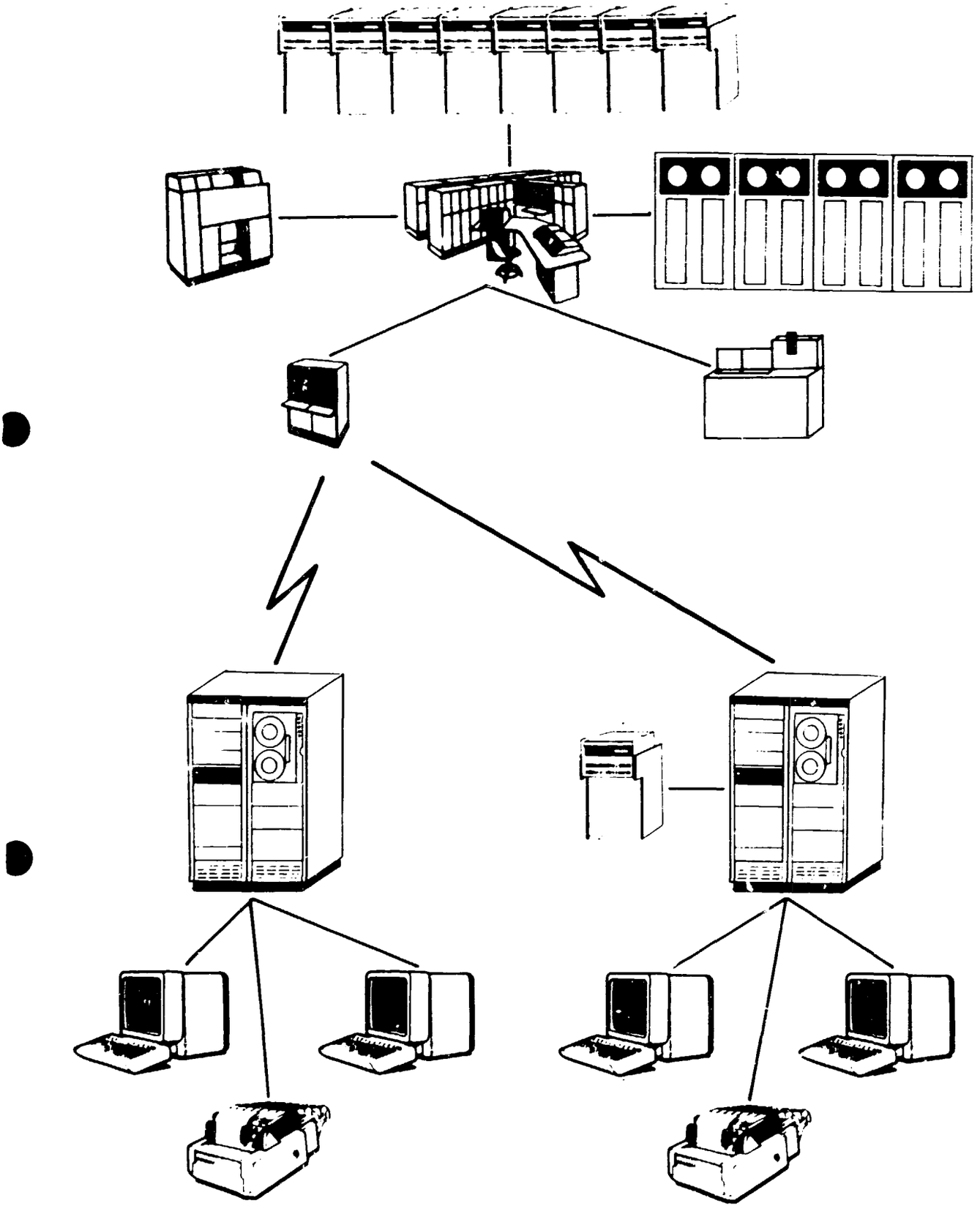
REAL TIME PROCESSING

Characteristics:

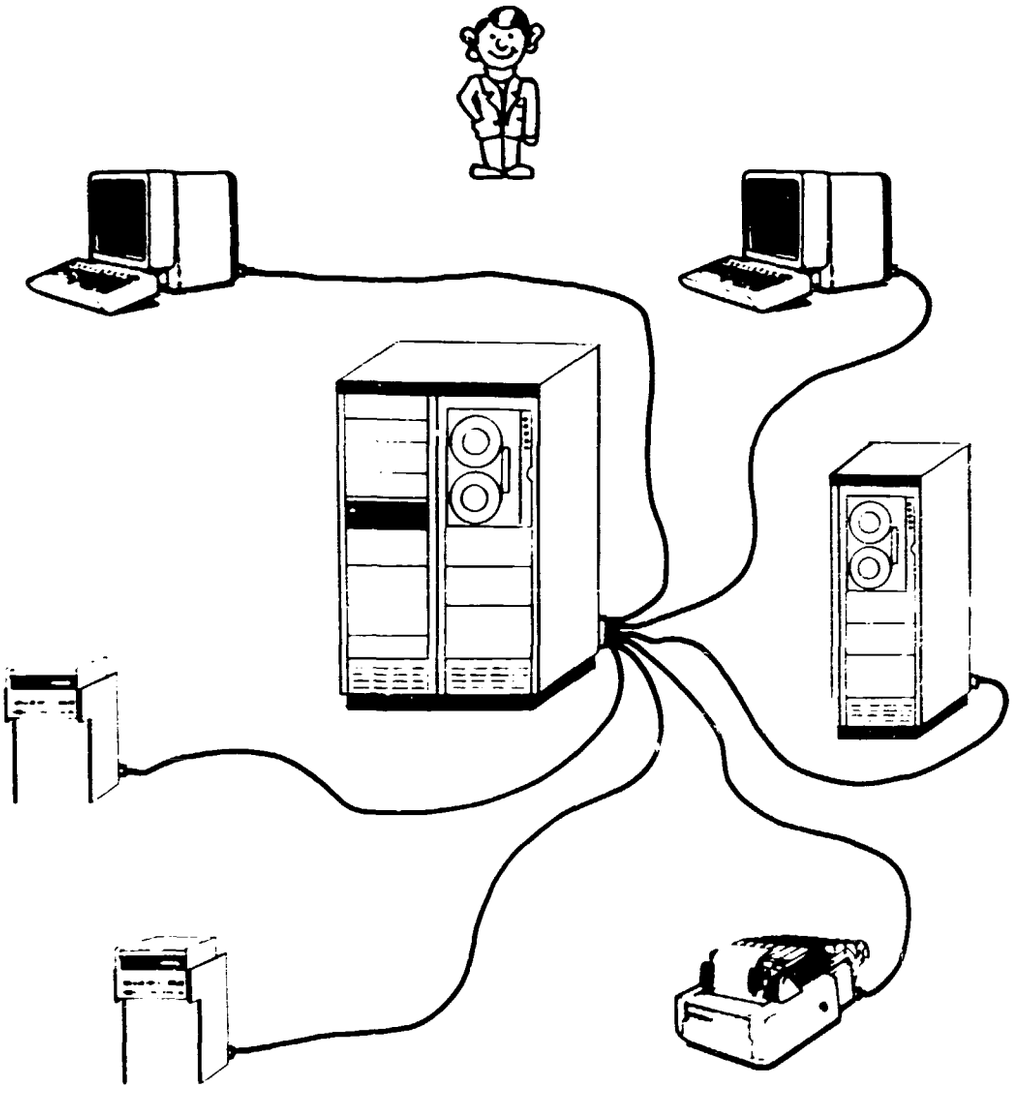
- Single transactions
- Random arrival
- Random sequence


Data collection/capture
Processing
Output
COM

CENTRAL PROCESSING

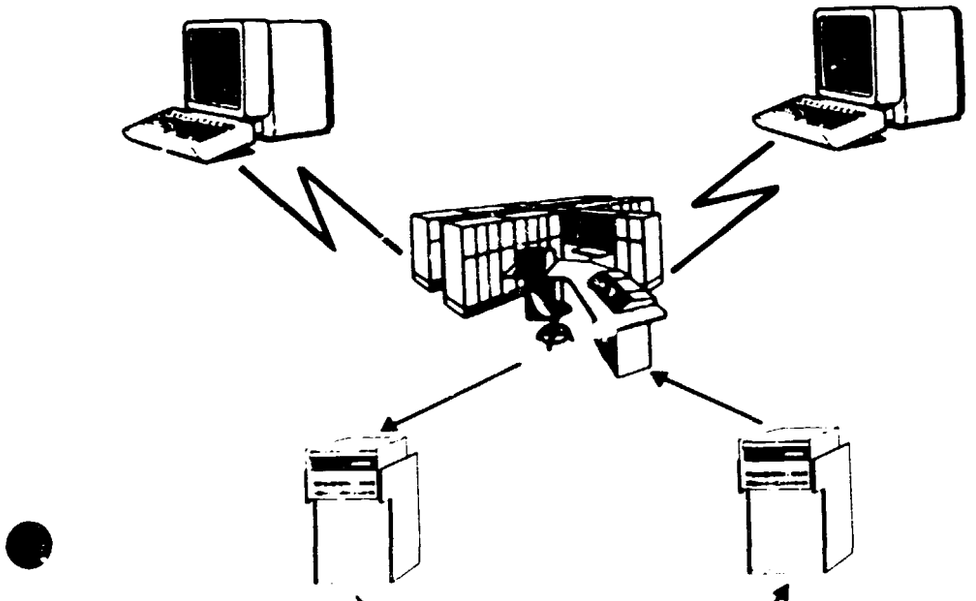


LOCAL PROCESSING

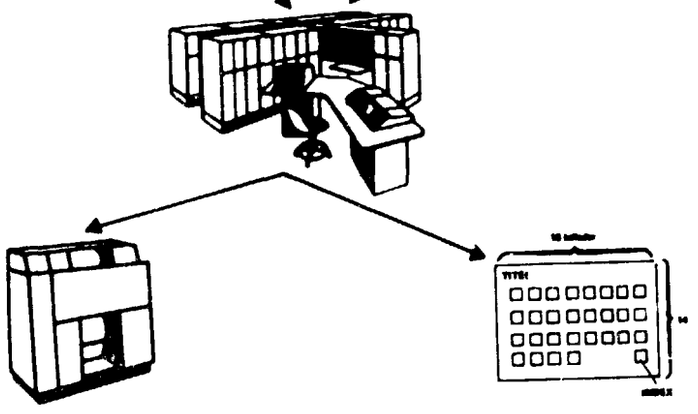


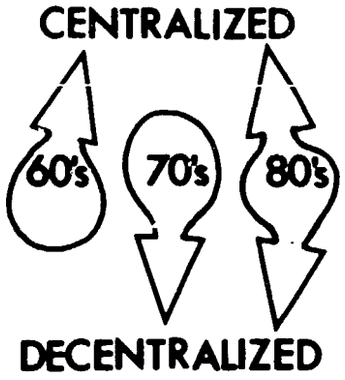
COMBINED PROCESSING

Data collection/capture and queries



Processing
(e.g. update)



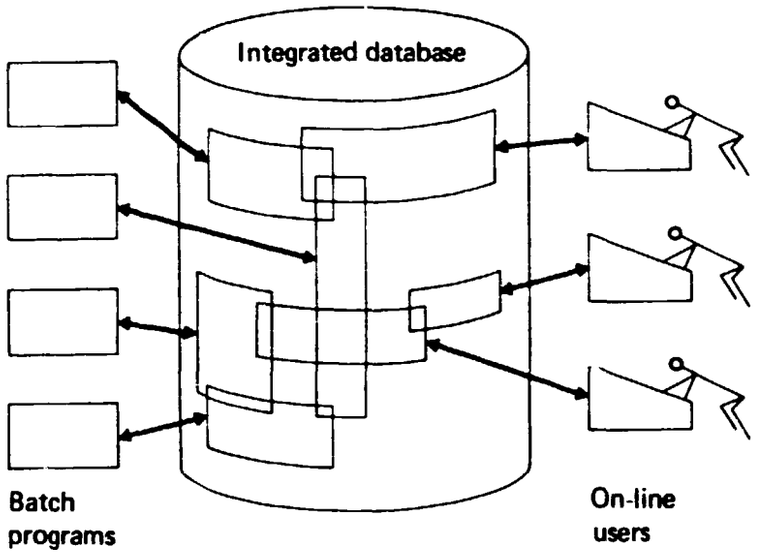

CENTRALIZED
60's
70's
80's
DECENTRALIZED

DATA BASE SYSTEM

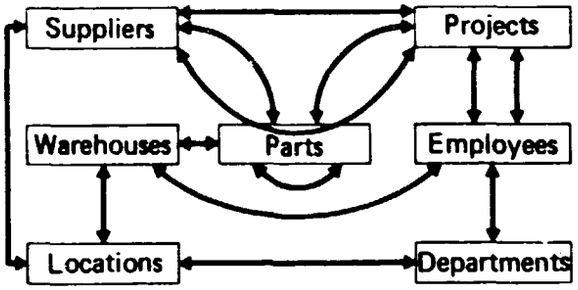
WHAT IS A DATABASE ?

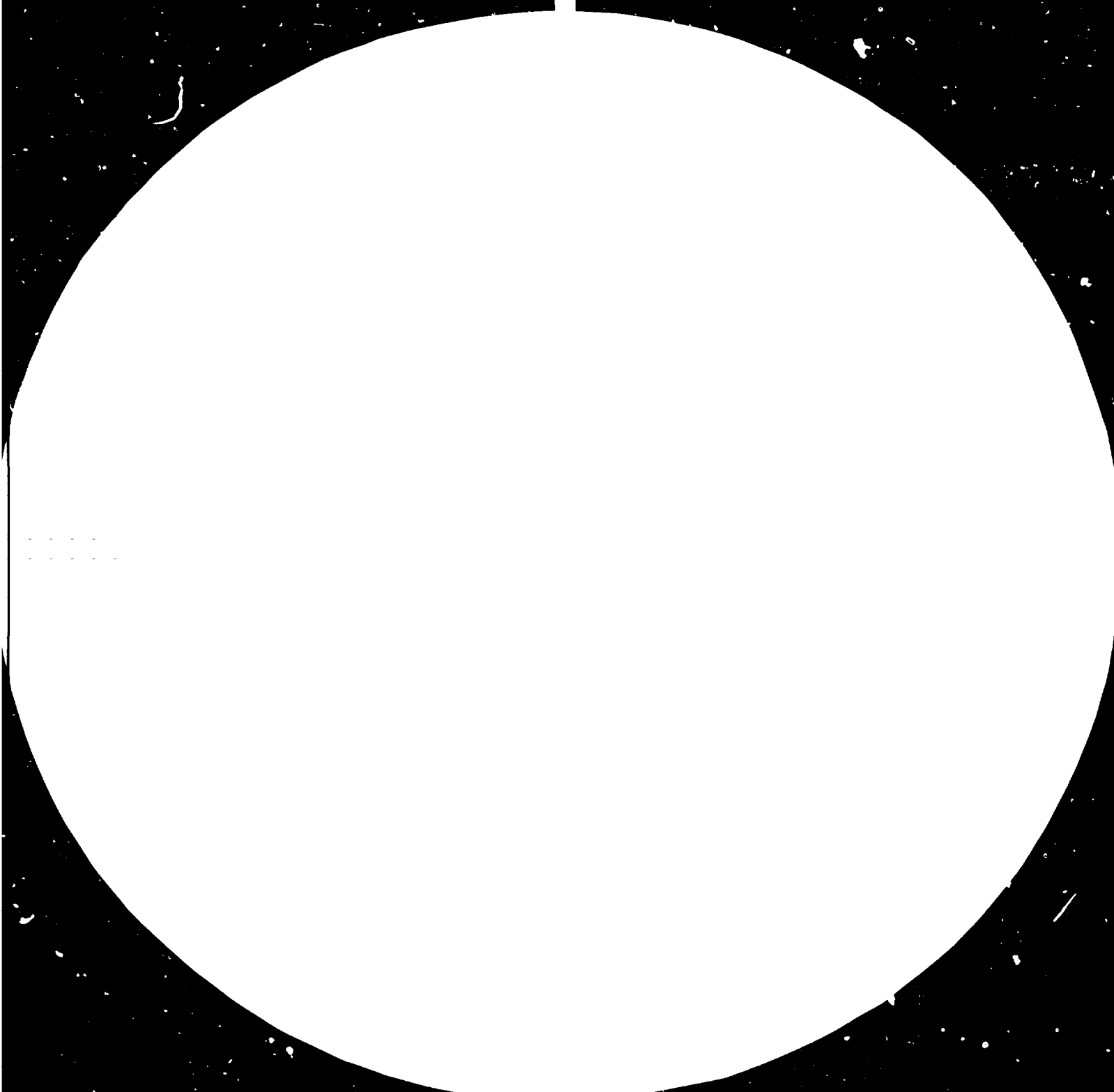
- A database is a collection of stored operational data used by the application systems of some particular enterprise

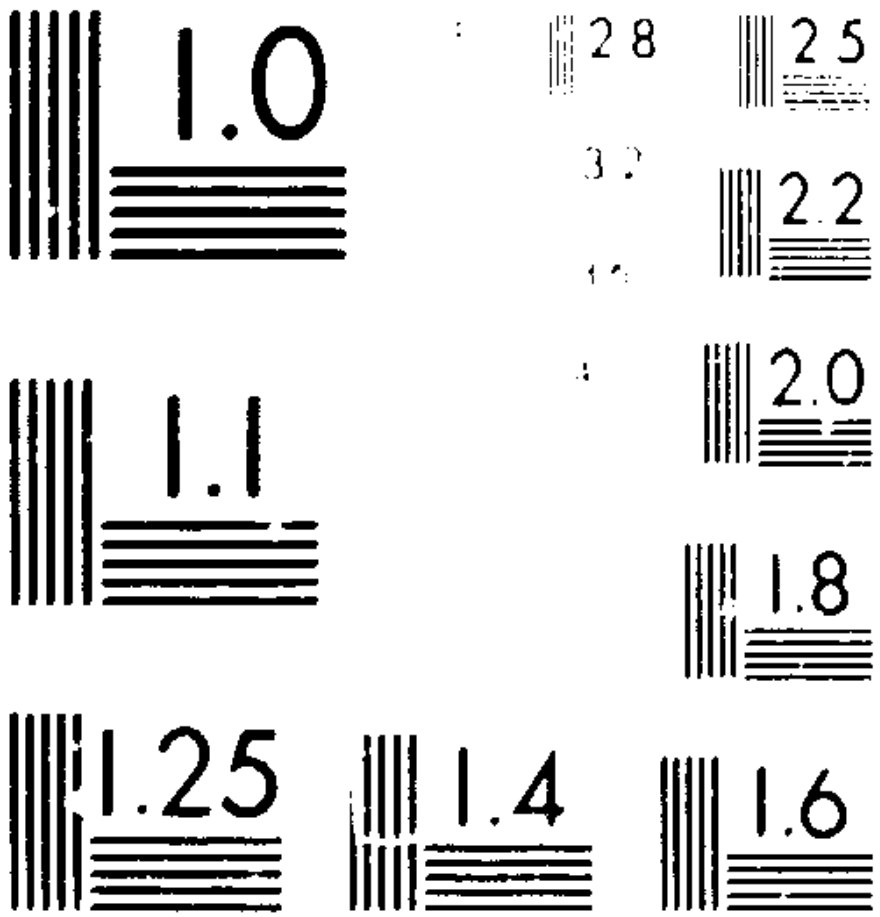
SIMPLIFIED VIEW OF A DATABASE SYSTEM



AN EXAMPLE OF OPERATIONAL DATA






1.0
2.8
2.5
3.2
2.2
2.0
1.1
1.8
1.25
1.4
1.6

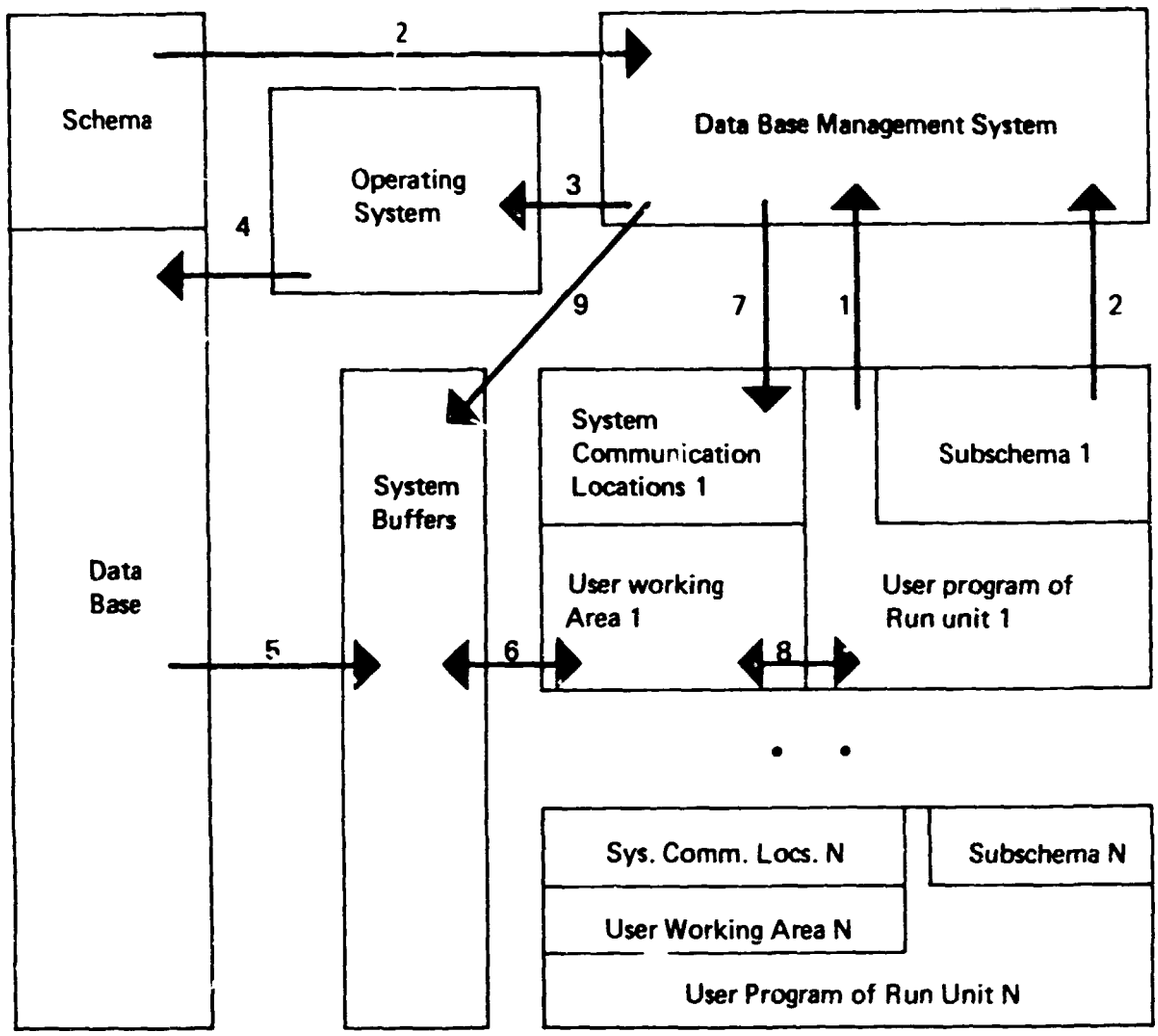
WHY DATABASE ?

- The amount of redundancy in the stored data can be reduced
- Problems of inconsistency in the stored data can be avoided
- The stored data can be shared
- Standard can be enforced
- Security restrictions can be applied
- Data integrity can be maintained
- Conflicting requirement can be balanced

DATA INDEPENDENCE

- Different applications will need different views of the same data
- The freedom to change the storage structure or access strategy in response to changing requirement, without the necessity of modifying existing applications

Conceptual DBTG Data Base Management System



The numbered arrows trace a call for data by run-unit-1 and are explained in the following. Calls for data by other run units may be handled concurrently by the DBMS, but this is not shown in the diagram.

1 Using the DML statements, the run unit makes a call for data to the DBMS.

2 The DBMS analyzes the call and supplements the arguments provided in the call itself with information provided by the schema for the data base, and the subschema referenced by the run unit originating the call.

3 On the basis of the call for its services and information obtained from the schema and subschema, the DBMS requests physical i/o operations, as required to execute the call, from the operating system.

4 The operating system interacts with the storage media containing the data base.

5 Data is transferred between the data base and the system buffers.

6 The DBMS transfers data, as required to fullfill the call, between the system buffers and the UWA of the run unit originating the call. Any required data transformations between the representation of the data as it appears in the data base (as declared in the schema) and the representation of the data as it appears in a run unit's UWA (as declared by the subschema) are handled by the DBMS.

7 The DBMS provides status information to the run unit on the outcome of its call, for example, error indications.

8 Data in a run unit's UWA may be manipulated as required, using the facilities in the host language.

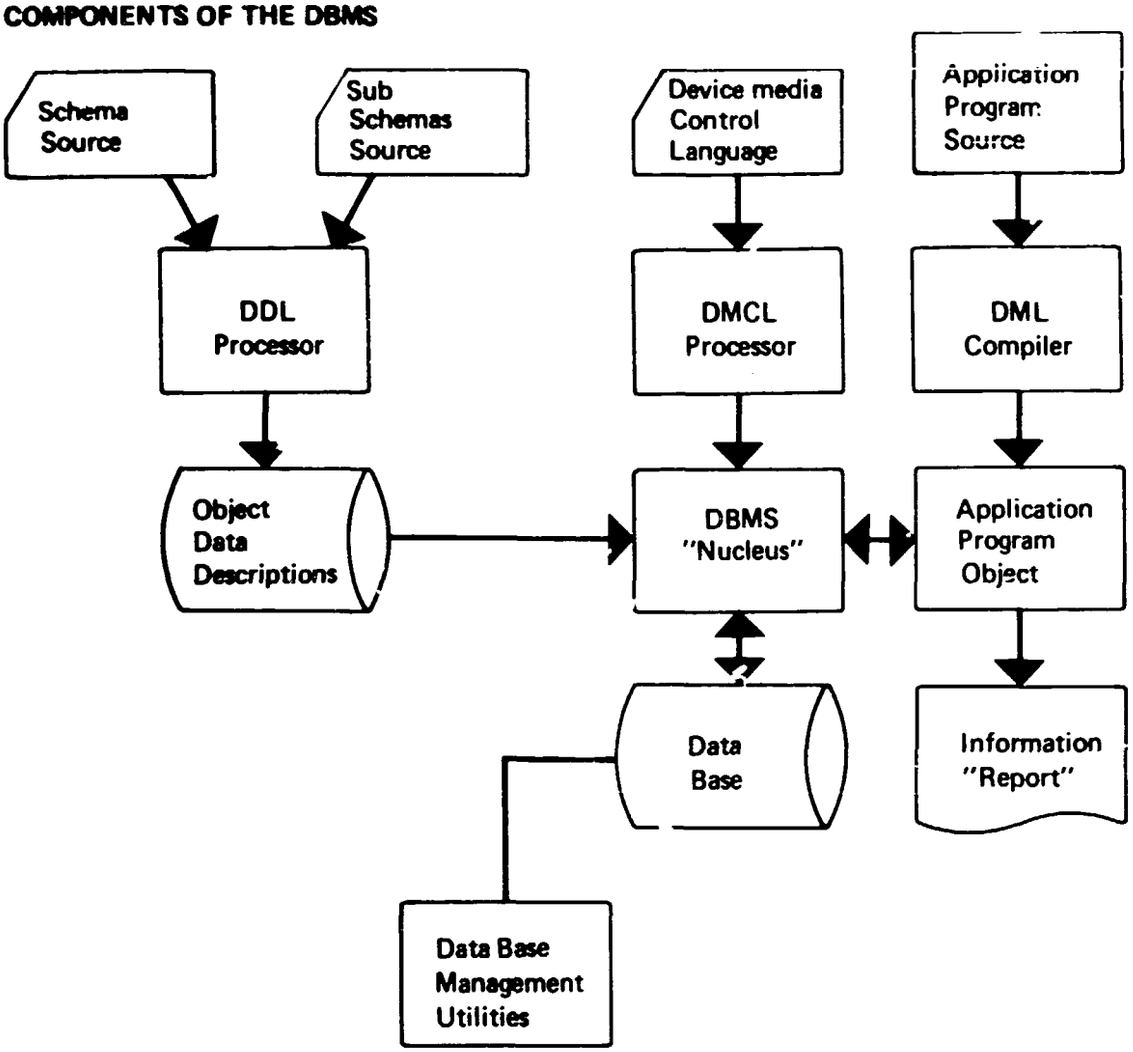
9 The DBMS administers the system buffers. The system buffers are shared by all run units serviced by the DBMS. Run units interact with the system buffers entirely through the DBMS.

DATABASE MANAGEMENT SYSTEMS (DBMS)

Objectives:

- Flexible Data Structure Support
- Variety of Access Methods
- Central Control over Physical Storage
- Hierarchical Storage Device Support
- Data Independence
- Data Integrity
- Flexible and Responsive user Interfaces

COMPONENTS OF THE DBMS



COMPONENTS OF THE DBMS

DDL - Data Description Language

- Schema: Internal representation of data structure
- Sub-schema: Internal representation of that portion of data structure - As it relates to an individual program

DML - Data Manipulation Language

- The language used by the programmer to to "call" on the services of the DBMS
- Requires a host language

Device Media Control Language

- Physical data organization

Query Language

Data Services & Utilities

- Security
- Recovery
- Data entry
- Validation
- Dialog

DATA STRUCTURES

- Sequentiai structure
- Hierarchical structure
- Network structure
- Relational structure

Principles of Data Structure

Types of Data Structures

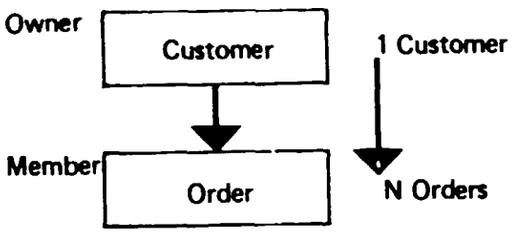
- Sequential Structure

- Represents a "file" of records all of the same Type
- Describes an entity (a customer) in the real world
  - Name
  - Customer
  - Address
- Contains no information about relationships between this entity (customer) and other entities (e.g. orders) in the real world
- An occurrence of this structure is one specific entity (customer: J. Smith: # 3692, 1034 Main St.)

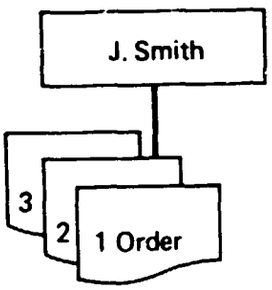
Principles of Data Structure

Types of Data Structure

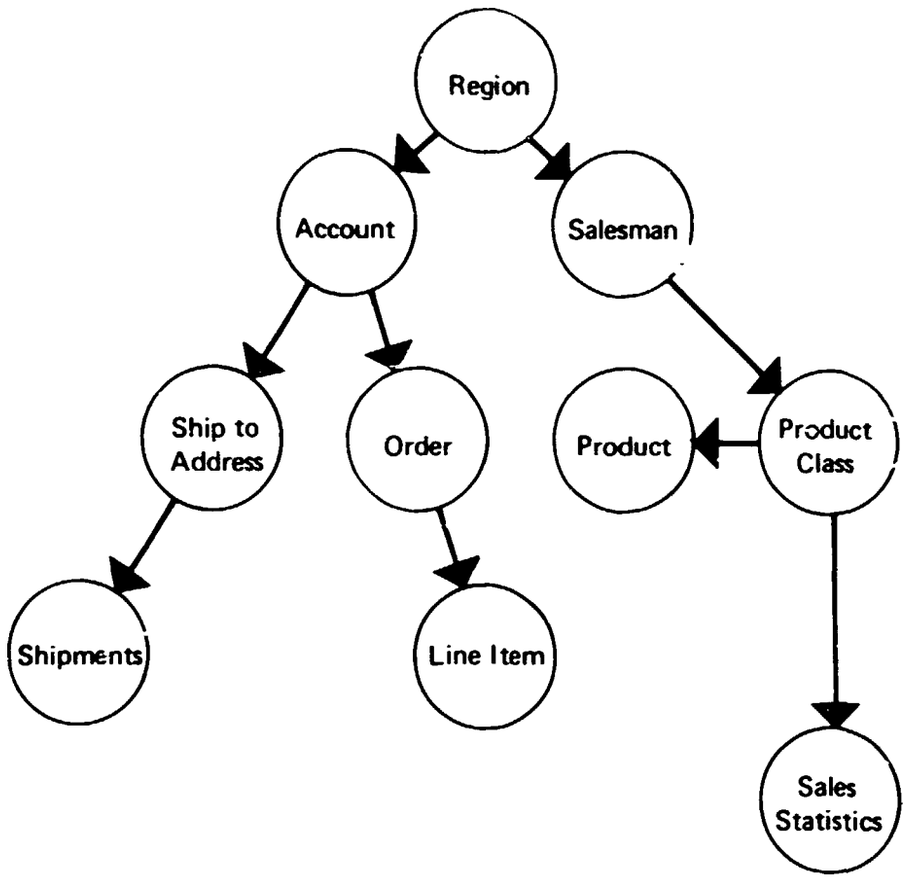
- Hierarchical Data Structure



- Contains information about the inter-relationship between entities
- Hierarchical Contstraint
  an entity can participate in only one relationship as a member
- An occurrence of this structure is one customer and all its orders

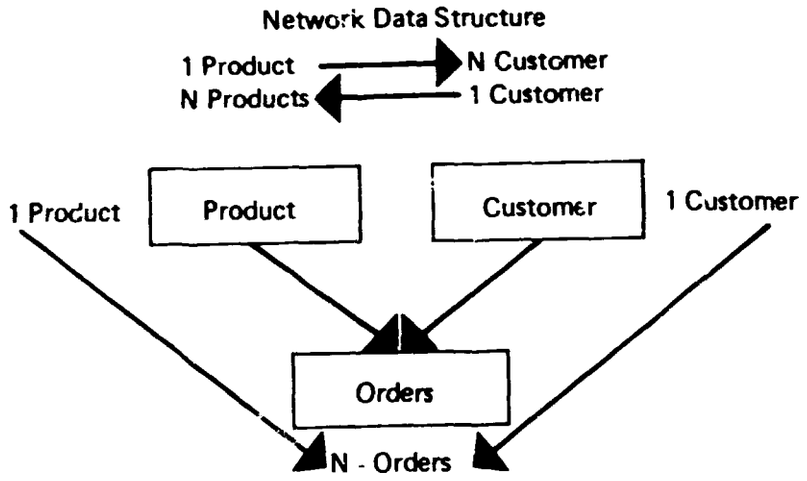


TREE STRUCTURE



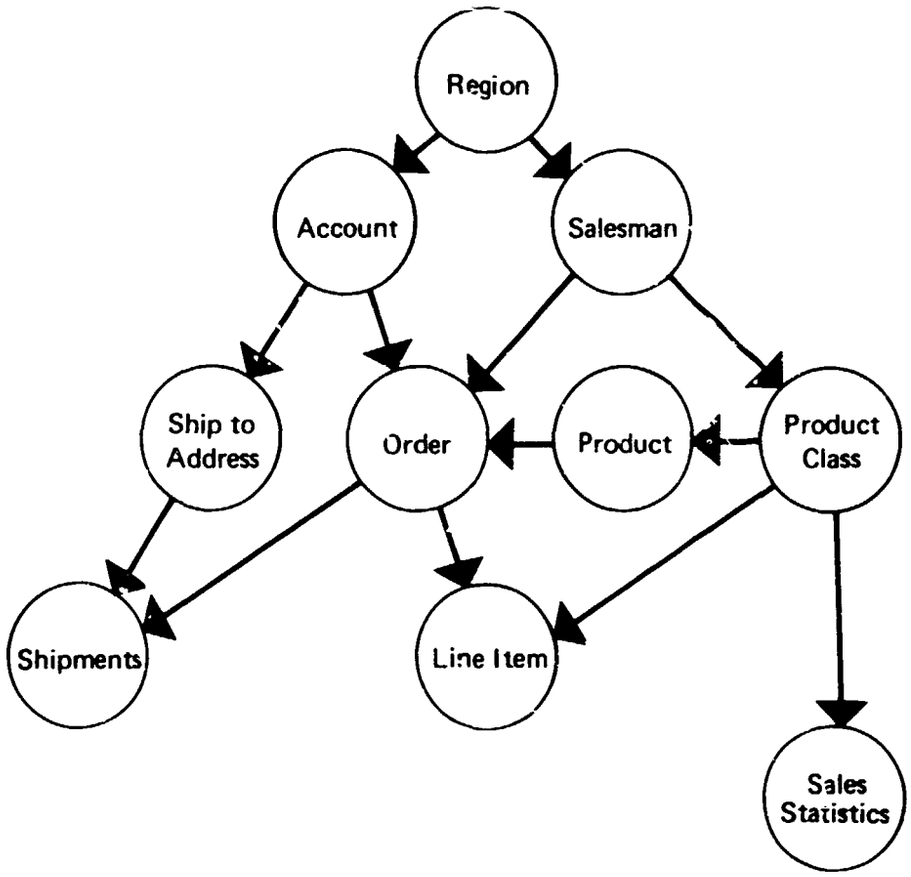
Principles of Data Structure

Types of Data Structure



- Allows a member to participate in more than one relationship
- Can represent N→N relationships in a more direct manner

NETWORK STRUCTURE



Relational Model

Relational Model	Generic Term
Relation (R)	File
Domain (D)	Field
Tuple	Record

- Example - Part Relation

P#	P - name	Color	Weight
P1	Nut	Red	12
P2	Bolt	Blue	17
P3	Screw	Green	17
P4	Screw	Red	14

Relational Model

Supplier Relation

S#	S - name	Status	City
S1	Smith	20	NYC
S2	Jones	10	LA
S3	Blake	30	SFO

Part Relation

P#	P - name	Color	Weight
P1	Nut	Red	12
P2	Bolt	Blue	17
P3	Screw	Greer	17
P4	Screw	Red	14

S#	P#	QTY
S1	P1	3
S1	P2	2
S1	P3	4
S1	P4	2
S2	P1	3
S2	P3	4
S3	P1	1
S3	P2	5
S3	P4	3

Supplier/part relation

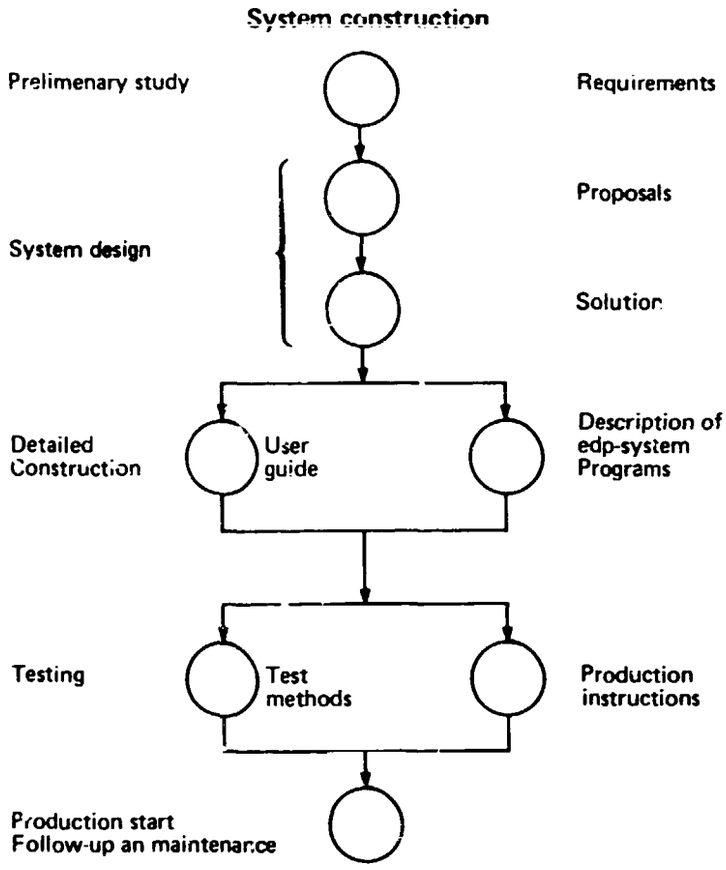
- Each part tuple stored once
- Each supplier tuple stored once
- Supplier/part relation provides:
  - Association between part and supplier relations
  - Intersection domains (such as QTY) may be defined

Relational Data Base Systems

Properties of a relation

1. Column - Homogeneous.
   For a given column, all data values belong to the same domain. (Several columns may have the same domain.)
2. "Flat File"
   All rows have the same number of columns.
3. No two rows are identical.
4. The ordering of the rows is of no significance.
5. The ordering of the columns is of no significance.

APPROACHES TO COMPUTERIZATION

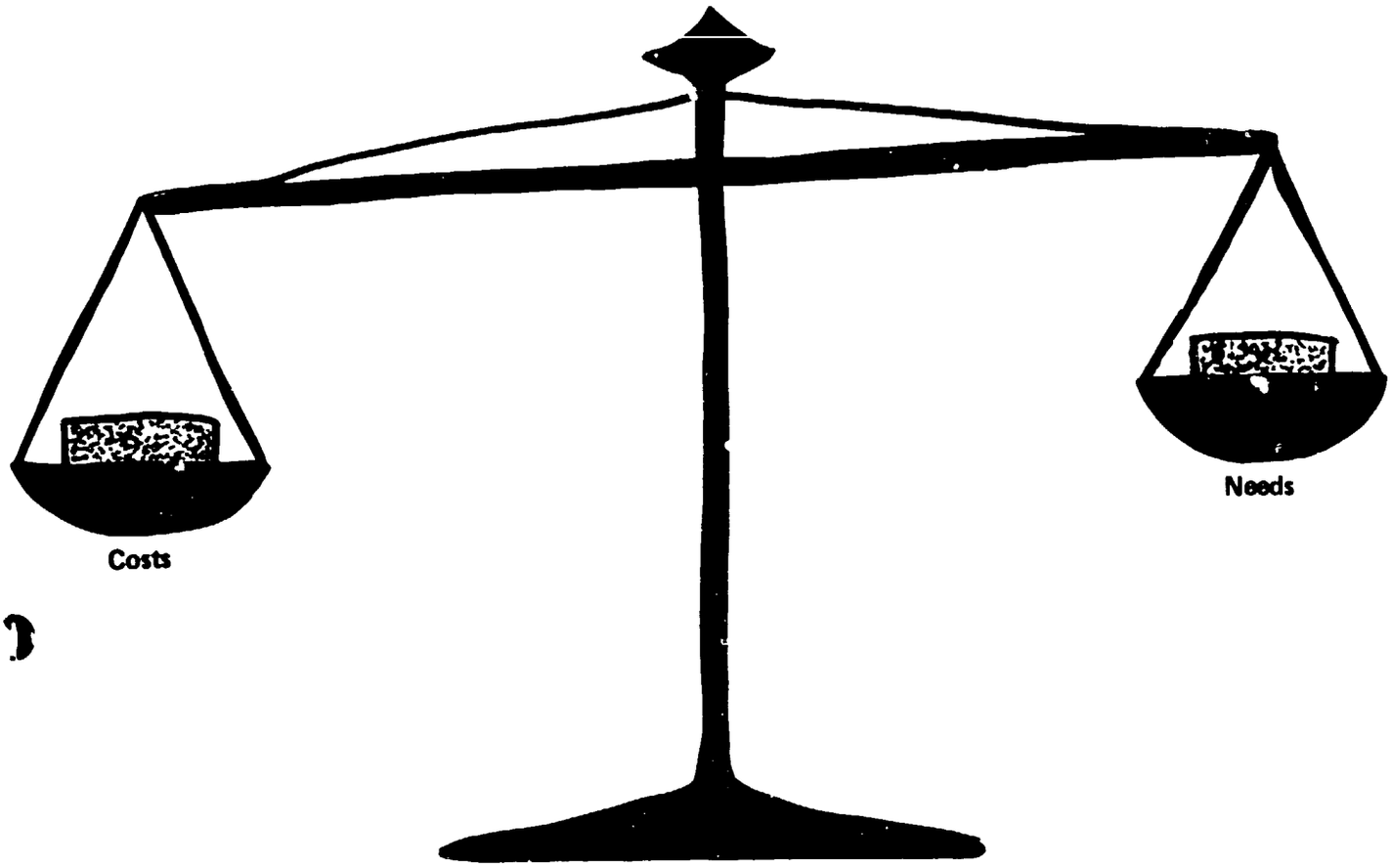

System construction
Prelimenary study
Requirements
Proposals
System design
Solution
Detailed Construction
User guide
Description of edp-system Programs
Testing
Test methods
Production instructions
Production start
Follow-up an maintenance

Prelimenary study

Activities

- Interviews
- Analysis
  - Who is the customer ?
  - What is to be solved ?
  - When should the system be ready ?
  - How complicated and comprehensive is the system ?
- Description
- Rough calculation

DETERMINE PRIORITY



Requirement specification

Objectives:

- Specify user requirements
- Describe user objectives for the system
- Enable the user to control fulfilment of his requirements to the system in the design phase.

System design

- System proposals

Activities

- Prepare alternative proposals based upon the requirement specification
- Explain to the user all consequences for for the various solutions
- User selection

System proposal

Objectives:

- Enable user to control that the solution covers his requirements
- Alternative proposals for user selection
- Form the basis for:
  - the user system (user guide)
  - the edp-system (programming basis and coding)
- Introduce the new system to user employees.

Description of edp-system

Objectives:

- Form a sufficient basis for the programmers' work
- Enable the user to check that the system meets his expectations.
- Describe the data and the logical rules in the system for user acceptance.
- Form the basis for the development of a testmodel.

Detailed Construction (Description of edp-system)

Activities:

- Contents and structure of the system and its communication with other systems and the environment as such.
  Description of the system's routines and procedures and their intercommunication.
- Description of the nesessary logical rules enabling the creation of the desired communication.

User guide

Objective:

- User oriented description of the routines to be performed by the user personnel in relation to the edp-system.
- Enables the user personnel to prepare input to the edp-system exactly as required and to handle the output correctly.

Detailed construction (user guide)

Activities:

- Creation and description of user procedures in connection to the new system
- Describe input and output procedures for the edp-system
- Describe control procedures to be carried out.

Production Instructions

Objectives:

- Edp oriented description of the routines to be performed in the edp-department.
- Enables the operators to run the edp-jobs correctly and to create the output as required by the user.

Production Instructions

Activities:

- Production schedule
- User contacts
- System flow chart
- Description of files and forms
- Program description
- Check routines
- Invoicing routines
- Data collection procedures
- Job procedures
- Forms separation etc.

Security aspects

Batch processing systems
- Checkpoint/restart
- Access control
- Data accuracy
- Data integrety

Real time processing systems
- Back-up/recovery
- Access control
- Data accuracy
- Data integrety

Analysis of user requirements

- Analysis of relevant procedures
- Analysis of desired/possible improvements
- Analysis of required flexibility
- Definition of required facilities
- Analysis of expected quantities (input, output etc.)
- Calculation of expected economy (development, implementation and production)
- Required future demands (facilities)

Analysis of Relevant Suppliers

Supplier's

- Fidelity
- Ability to survive
- Services
- Documentation standards
- Quality of products
- Assortment of products
- Contracts
- Etc.

Initial Costs

- Hardware
- Software
- Systems development
- Arrangement of premises
- Furnishings
- Materials
- Education
- Etc.

Operating Costs

- Maintenance of hardware, software and systems.
- Further development
- Education
- Materials
- Replacements due to absolesence
- Etc.

Selection of supplier

Facilities

Contractual terms
- Price (financial possibilities)
- Time of delivery (lead-time)
- Maintenance
- Training

Installation plan
- Requirements
- Preparation
- Schedule

Organizational aspects

Problem areas

- Changes in the organization
- Changes in the jobs
- Employee resistance
- Employee fear

Possibilities

- Better job
- Job enrichment
- Importance (image)
- Training
- New frontiers

The keyword to success

Information

- Involve the employees
- Mention the possibilities
- Offer training (invest in your best resource)

Edp-Functions

- System Development
- Operations

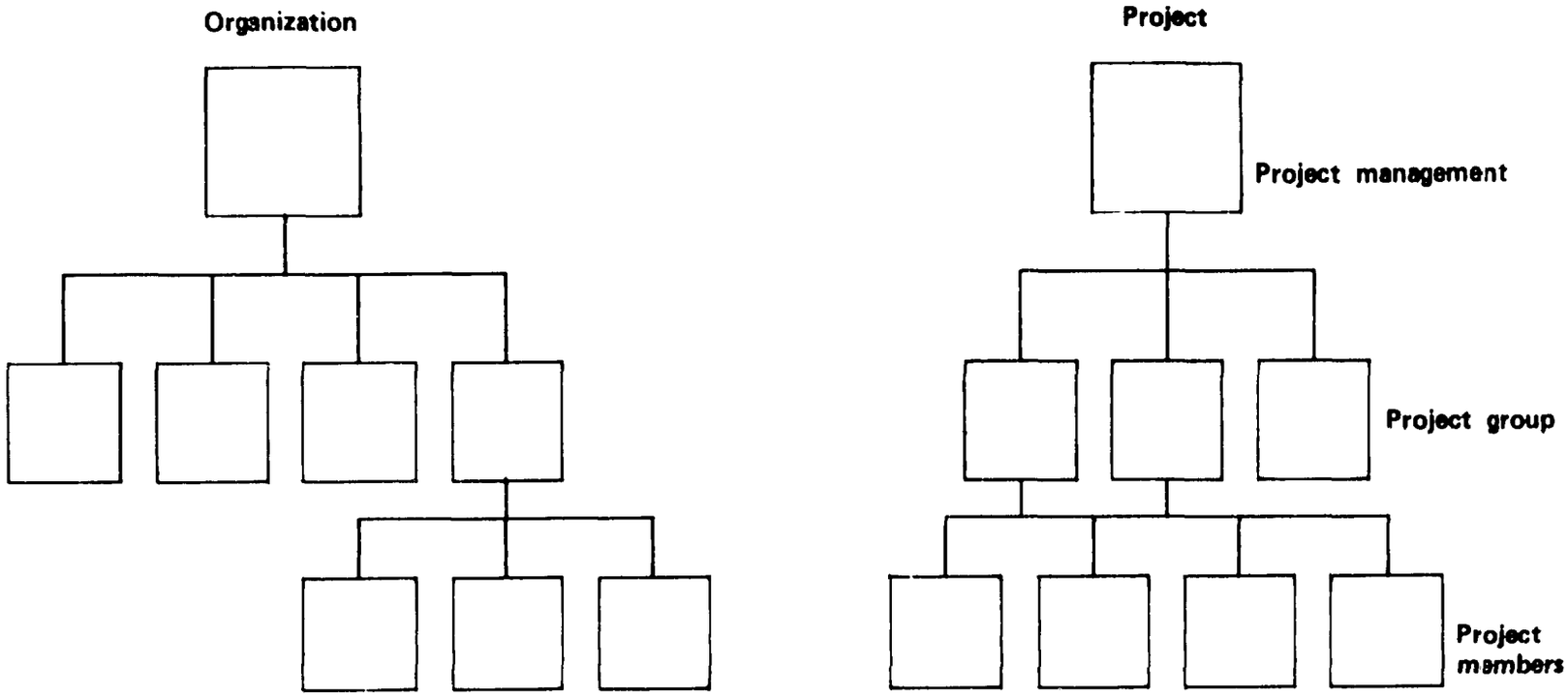
System Development

- System analysis
- System design
- Programming
- Testing

Project Organization

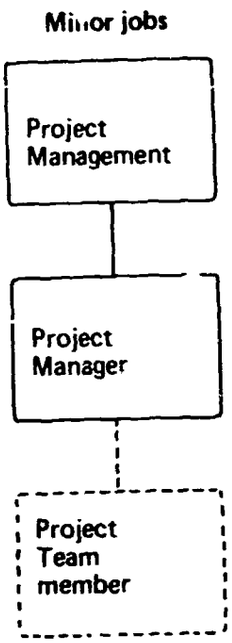
- Project Management
- Project Manager
- Project teammembers

PROJECT ORGANIZATION

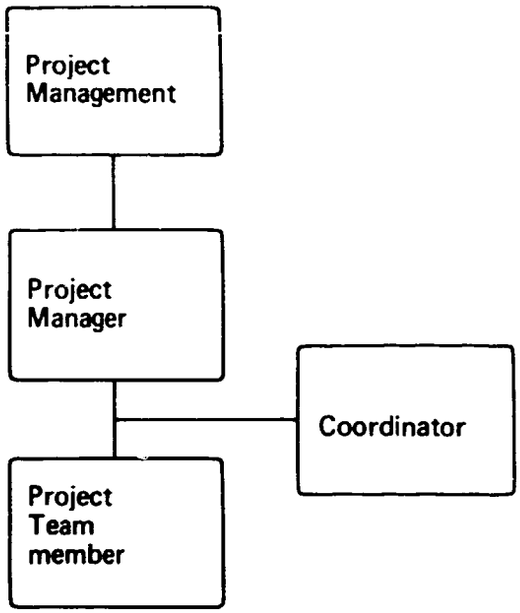


The Project Organization

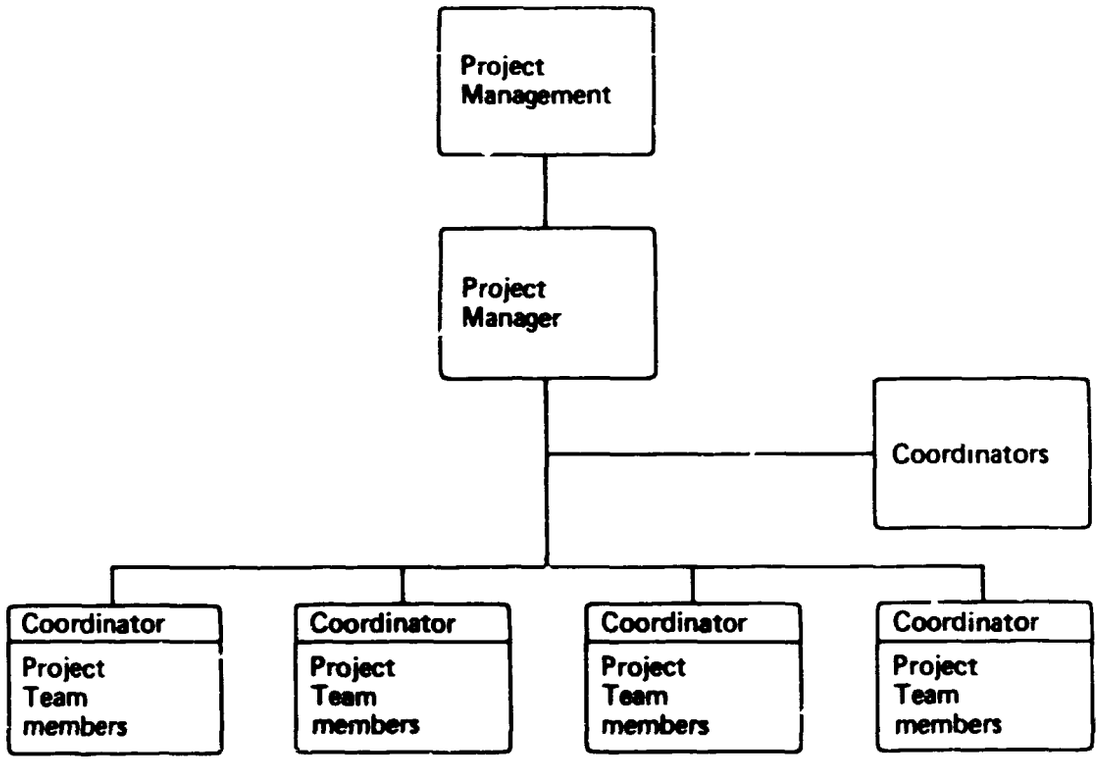
- Defining the objective
- Forming the team
- Internal team administration
- Supervision of the project


Minor jobs
Project Management
Project Manager
Project Team member

→ 10 persons

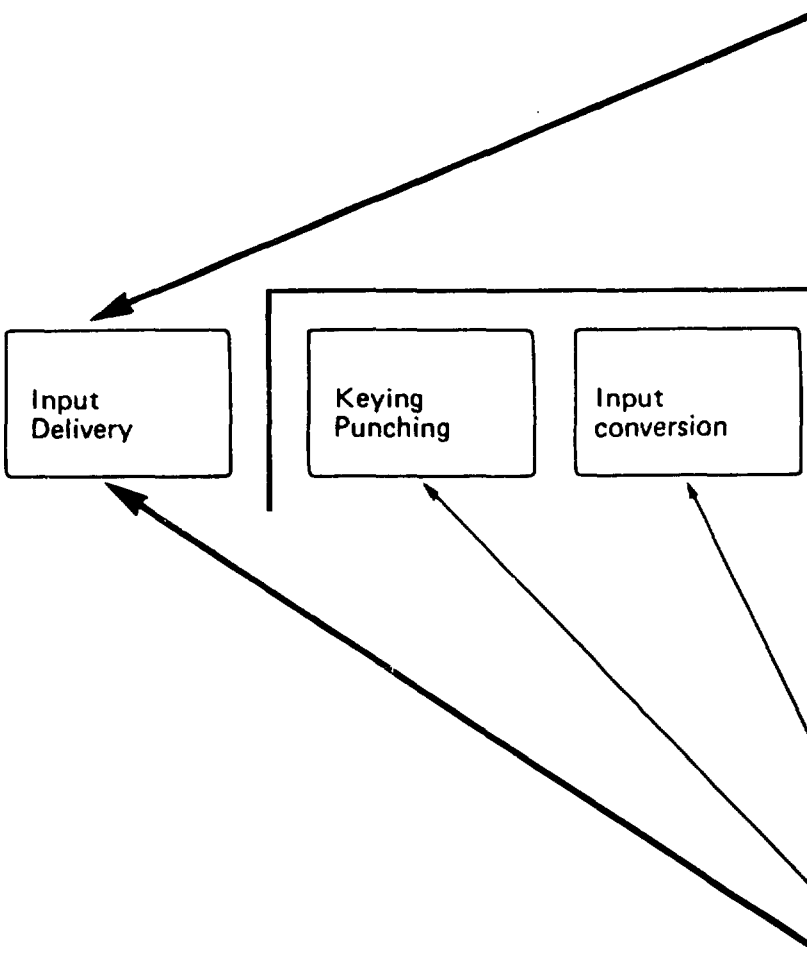

Project Management
Project Manager
Coordinator
Project Team member

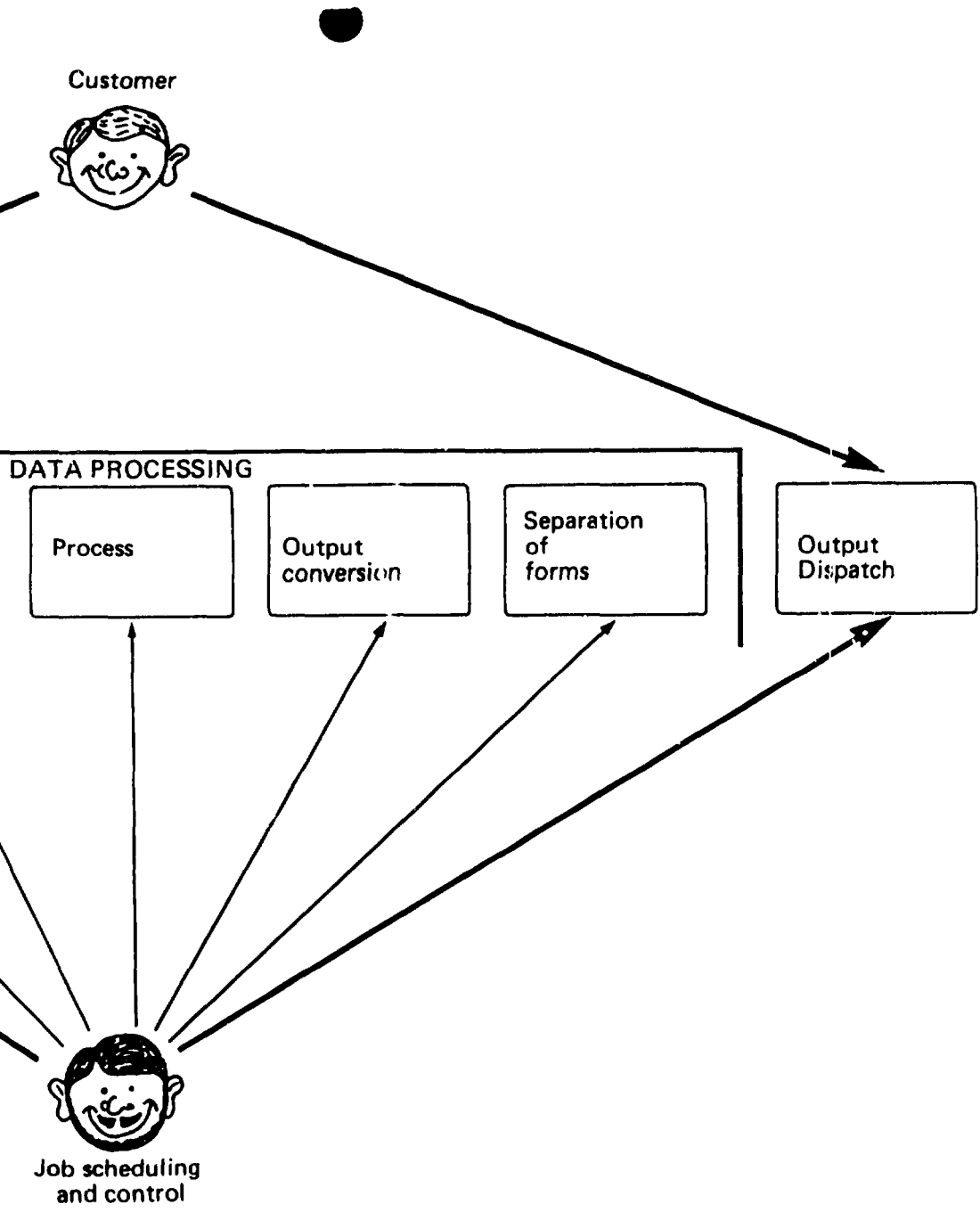
→ 20 persons


Project Management
Project Manager
Coordinators
Coordinator
Project Team members
Coordinator
Project Team members
Coordinator
Project Team members
Coordinator
Project Team members

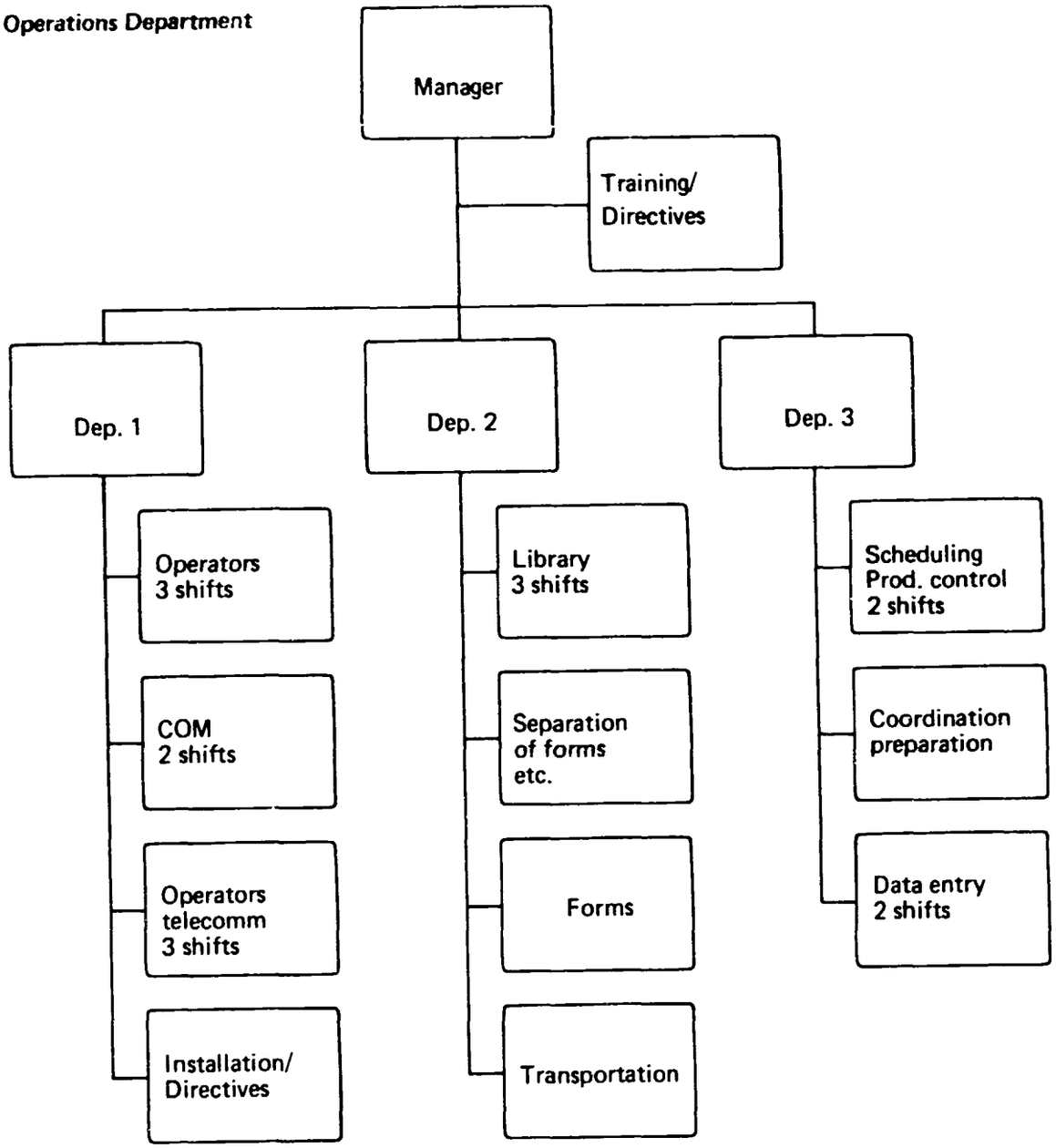
Operations

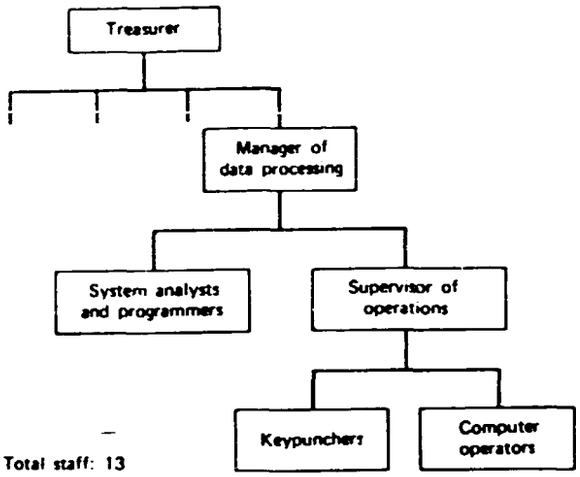
- Production control
- Coordination
- Library
- Computer operations
- Auxiliary Equipment operation
- Data Preparation
- Data Control


Input
Delivery
Keying
Punching
Input
conversion


Customer
DATA PROCESSING
Process
Output conversion
Separation of forms
Output Dispatch
Job scheduling and control

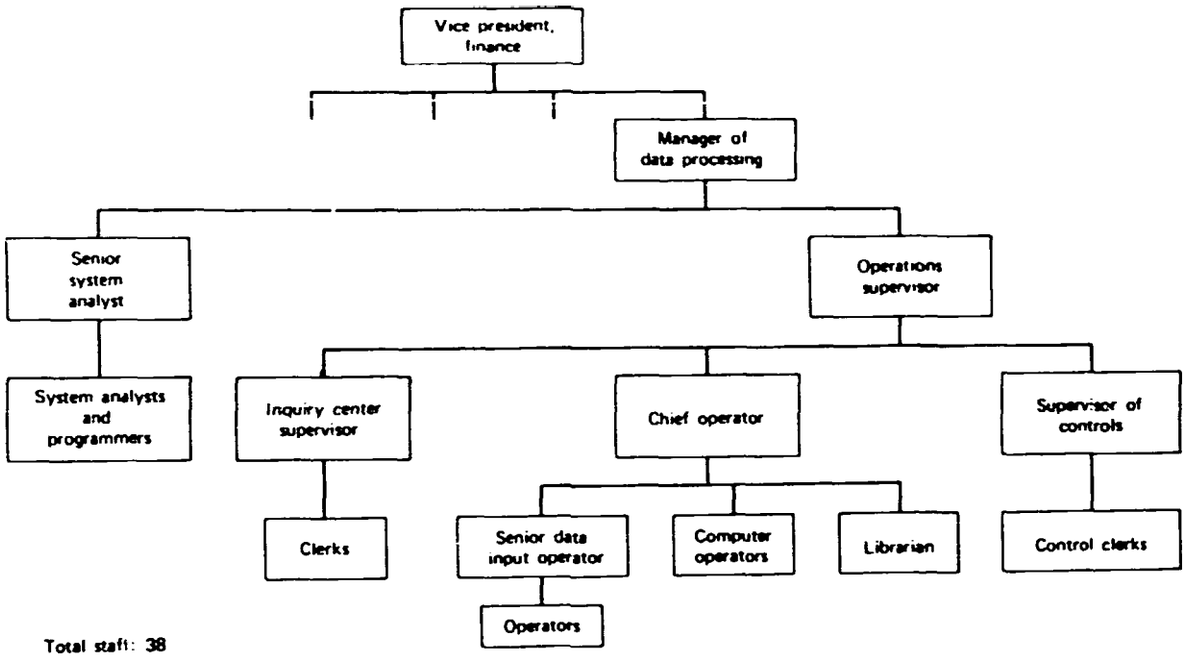
Operations Department





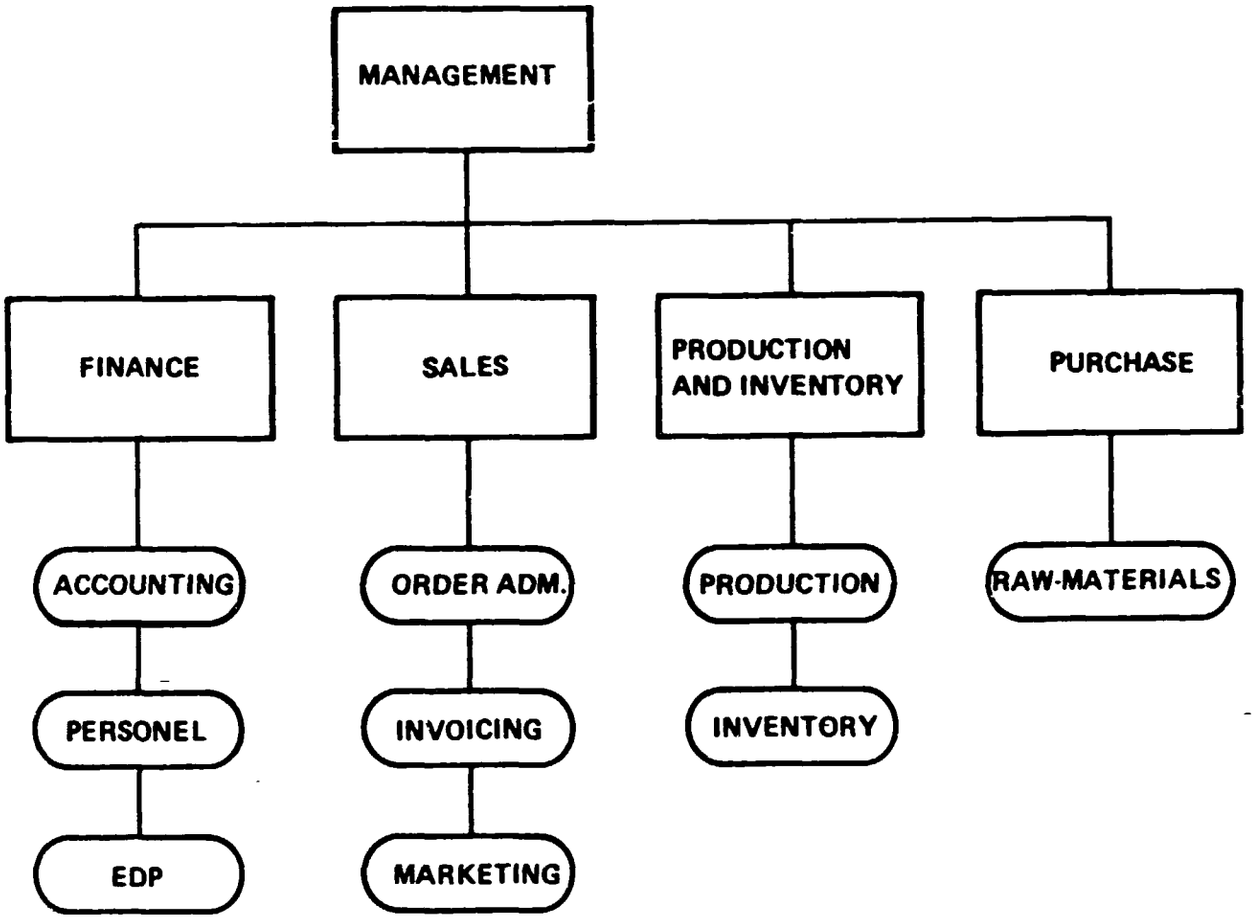
Total staff: 13

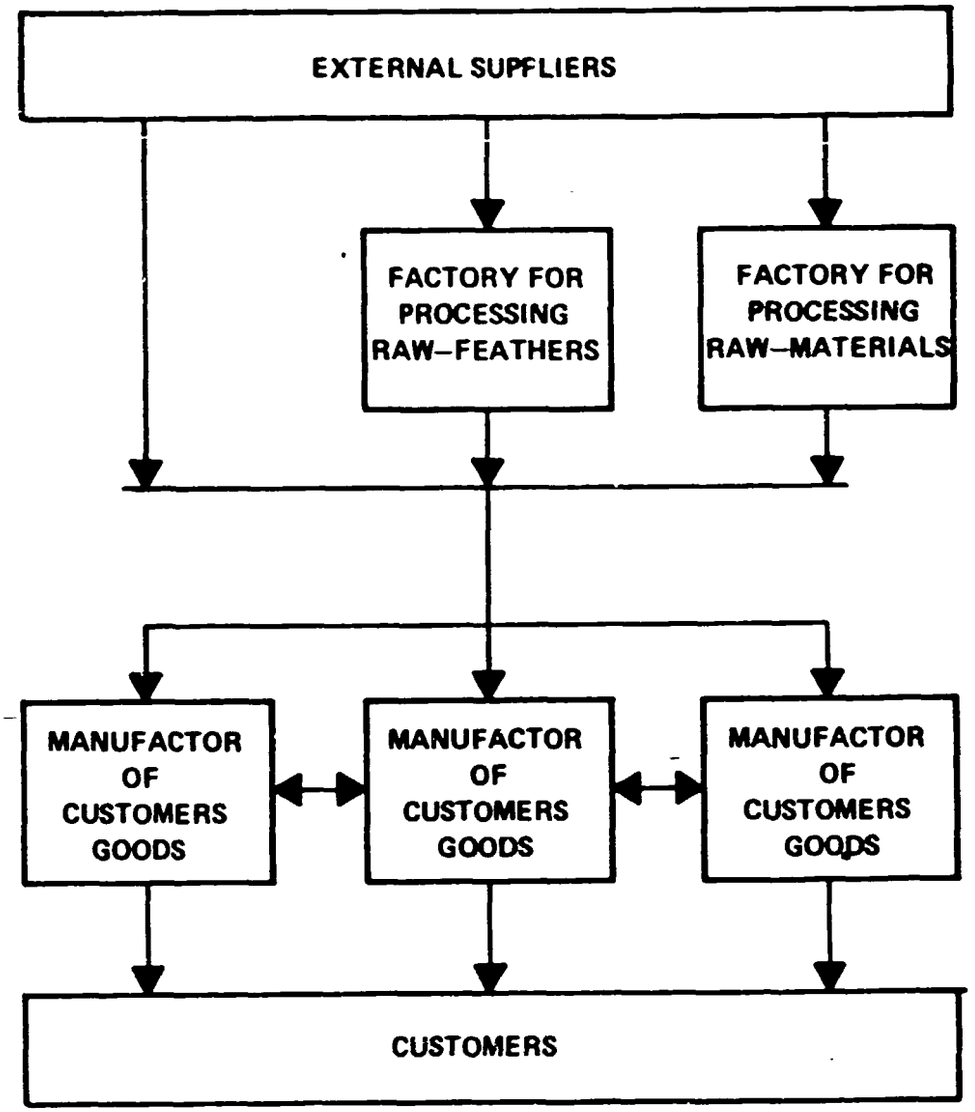
Small manufacturing company.



Total staff: 38

Small electric utility.

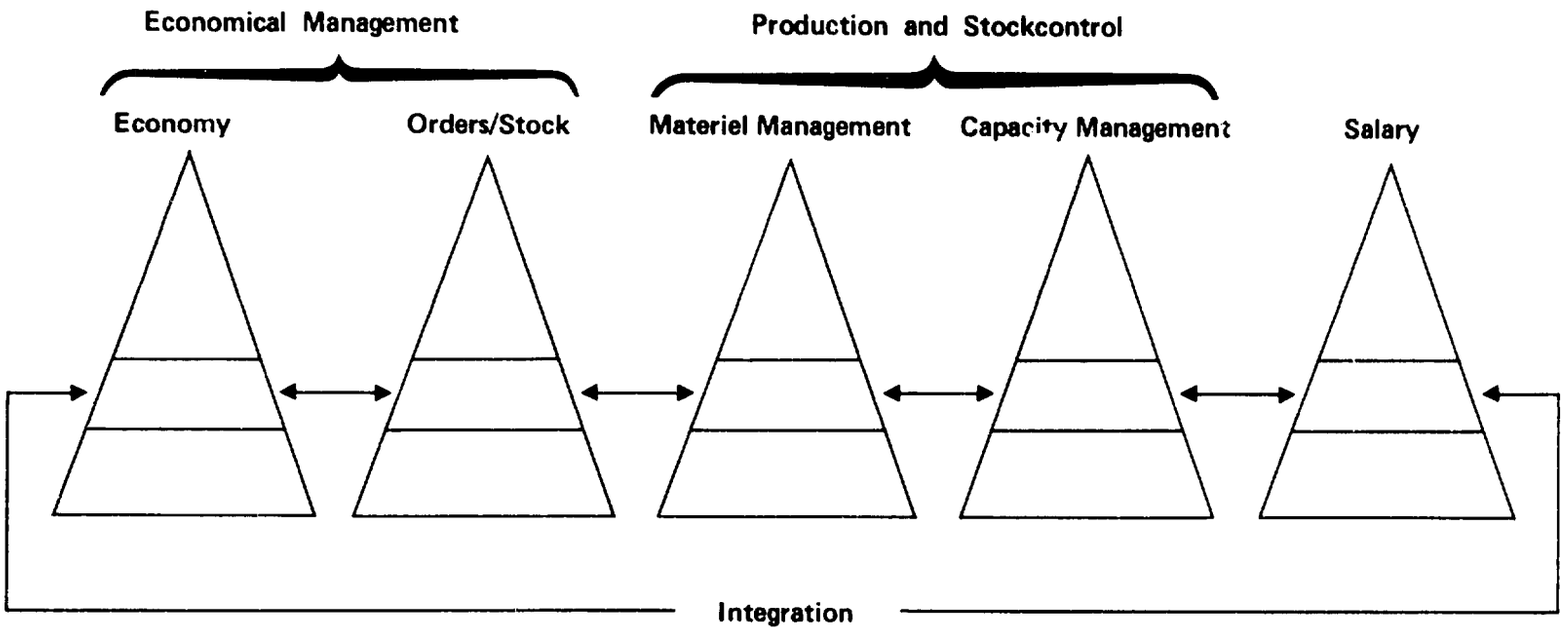

MANAGEMENT
FINANCE
SALES
PRODUCTION AND INVENTORY
PURCHASE
ACCOUNTING
ORDER ADM.
PRODUCTION
RAW-MATERIALS
PERSONEL
INVOICING
INVENTORY
EDP
MARKETING


EXTERNAL SUPFLIERS
FACTORY FOR PROCESSING RAW–FEATHERS
FACTORY FOR PROCESSING RAW–MATERIALS
MANUFACTOR OF CUSTOMERS GOODS
MANUFACTOR OF CUSTOMERS GOODS
MANUFACTOR OF CUSTOMERS GOODS
CUSTOMERS

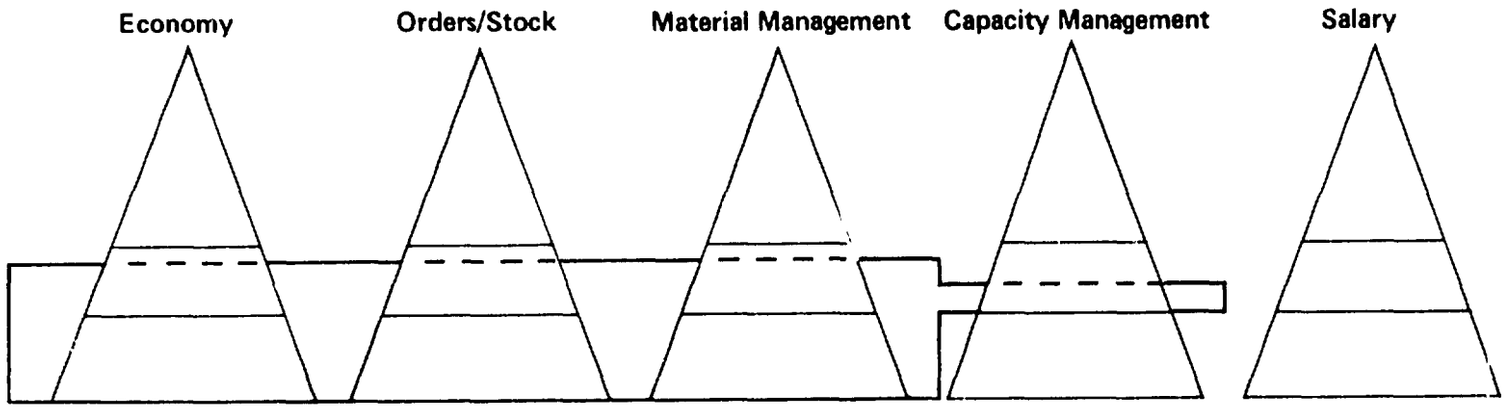
Problem areas (functions)

- Economy
- Stock
- Production
- Sale
- Purchase

APPLICATION AREAS

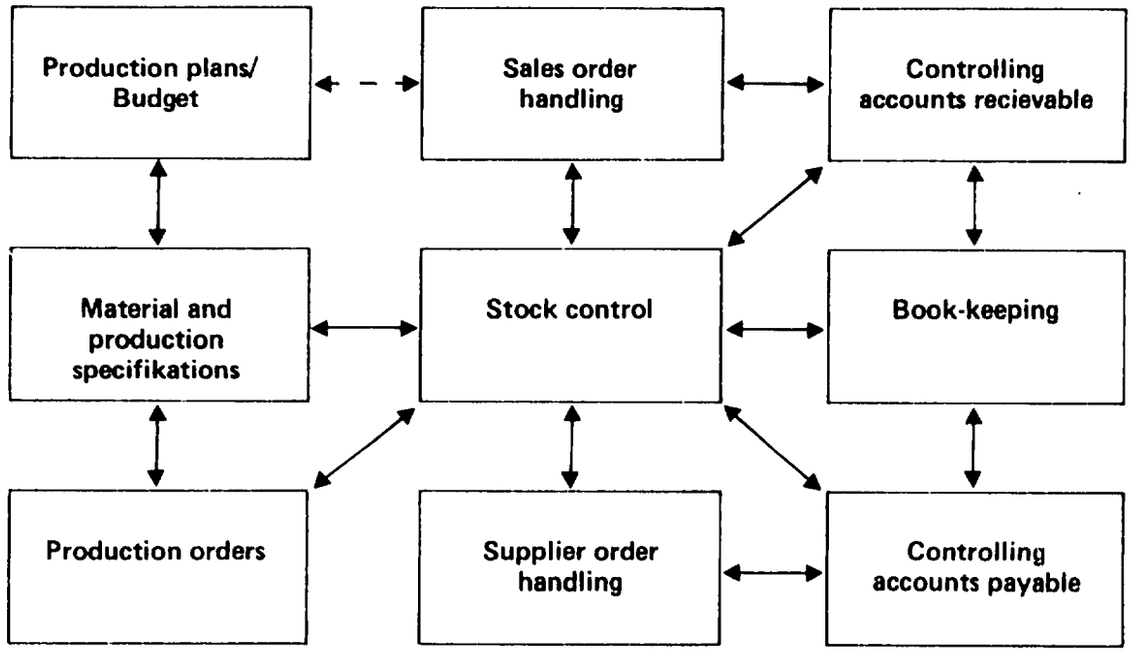


APPLICATION AREAS

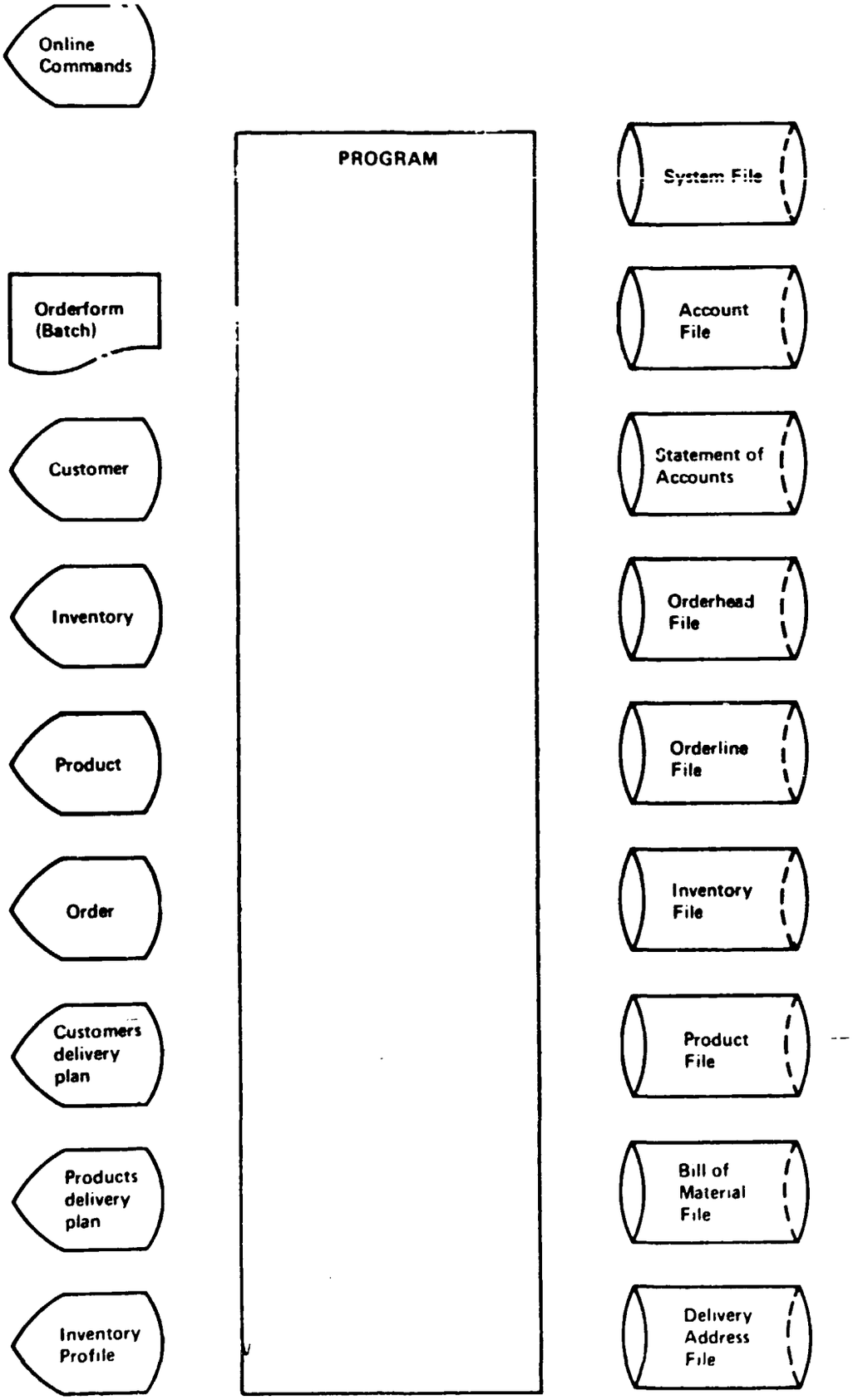


Finance	Orders	Specifications of Goods	Network
Accounts Receivable	Invoicing	Analysis of Requirement	Capacity Types
Accounts Payable	Stock	Production Budgets and Plans	Jobcards
	Purchase	Production Orders	Production Budgets and Plans
		Calculations of prices	Production Orders

SYSTEM FUNCTIONS



1) Real time processing using terminals
2) Generation of ex- and internat forms (order forms, invoices etc.)
3) Regular periodical statistics
4) Variable ad hoc statistics

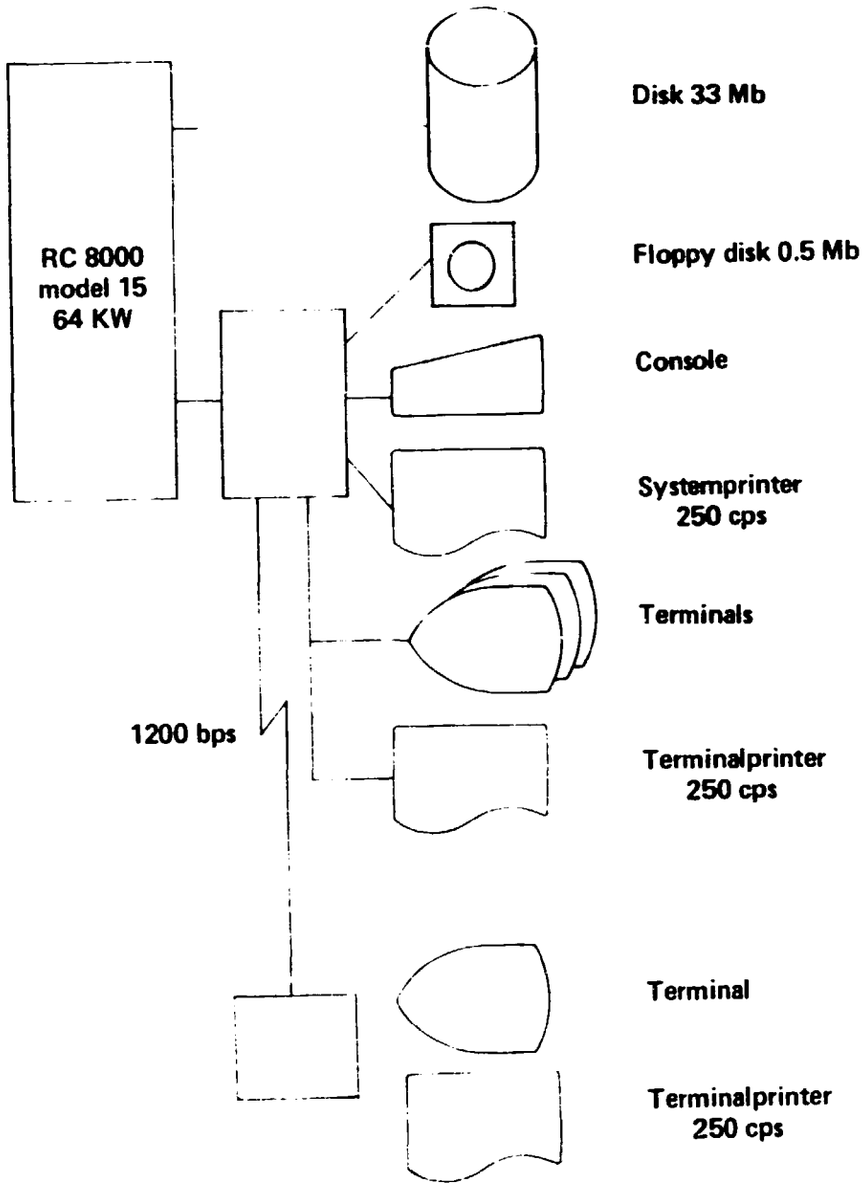

Online Commands
PROGRAM
System File
Orderform (Batch)
Account File
Customer
Statement of Accounts
Inventory
Orderhead File
Product
Orderline File
Order
Inventory File
Customers delivery plan
Product File
Products delivery plan
Bill of Material File
Inventory Profile
Delivery Address File

System overview

Solution based on:
- Hardware
- Software
- installation
- Culsultancy
- Training
- Etc.

Delivered as:
- A turn-key system

CONFIGURATION



Economy

Hardware Purchase price	kr.	565500
Monthly operations cost (60 months):		
Hardware leasing (2.5%)	kr.	14137
Programlicence	kr.	880
Maintenance at current index number	kr.	5702
Excl. V.A.T.	kr.	20719

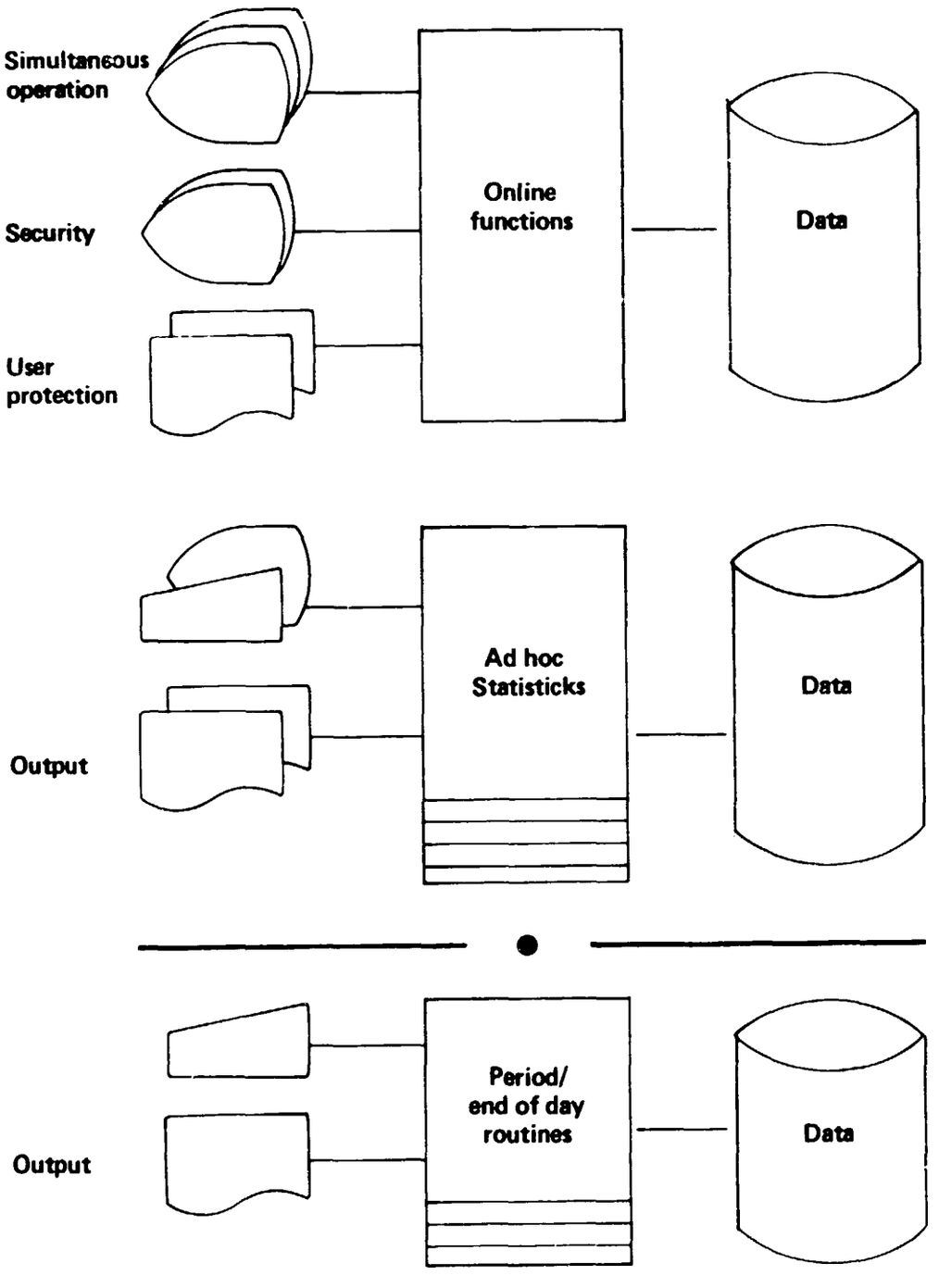
Installation:

Installation and transport	kr. 10.000
Software	kr. 70.000
Cunsultancy	kr. 30.000
Training	kr. 3.000
Peripherals	kr. 7.000
Adjustments in building	kr. 15.000
Total excl. V.A.T.	kr. 136.000

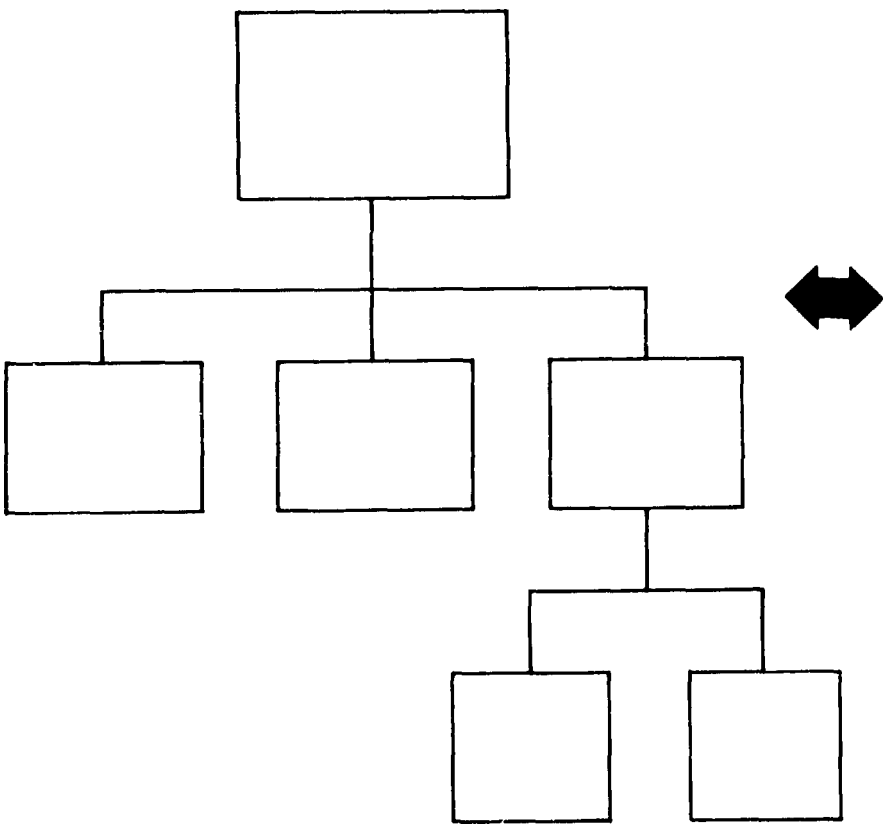
Operation Environment

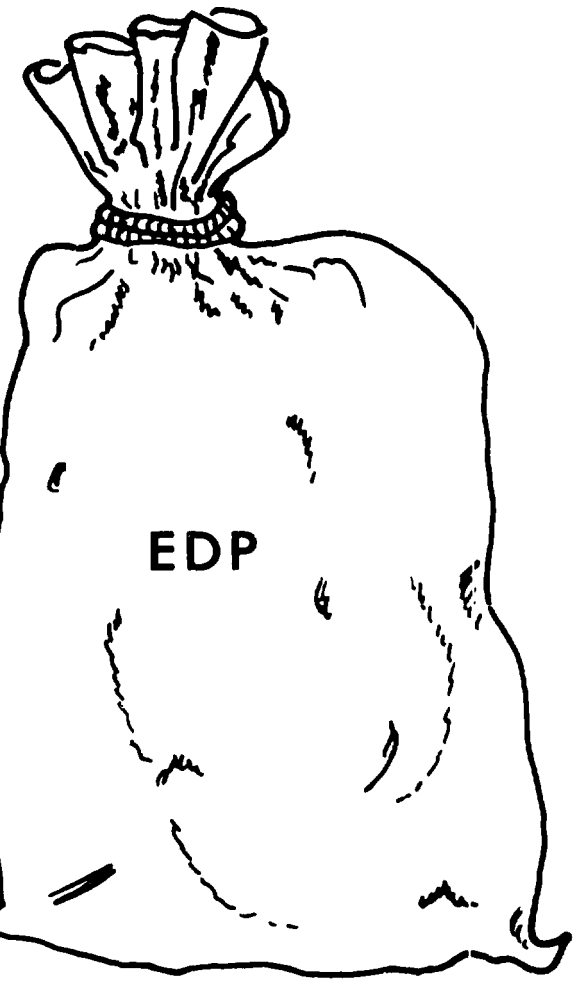
- Installation
- Operation personnel
- Maintenance

DAYBY OPERATIONS

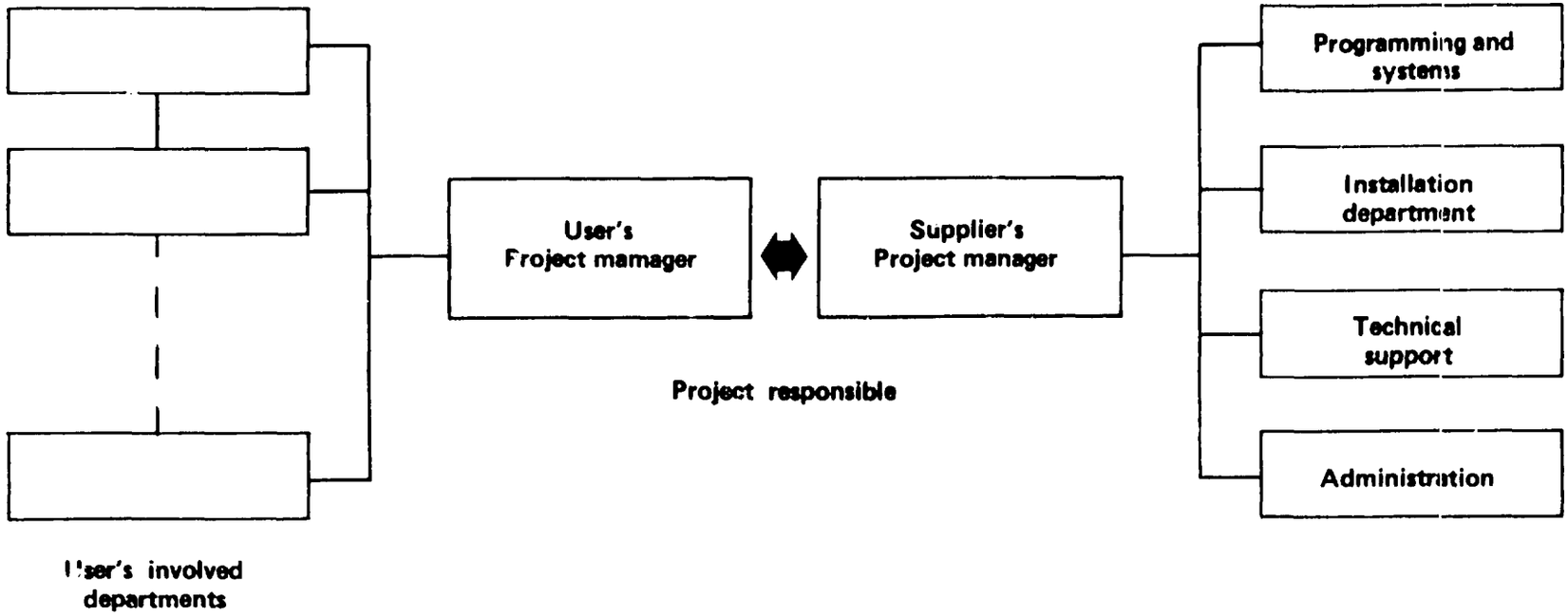


THE ORGANIZATION




EDP

PROJECT ORGANIZATION



Development Plan

1976 Invitation to Tender
- two suppliers

1977 Requirement Specification
1978 System Design (Jan.-Apr.)
1978 Programming start (May)
1978 Test (Nov.)
1979 Delivery and installation (May)

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

CONTENTS OF THE LECTURE

I. I/S DATACENTRALEN OF 1959 - THE DANISH STATE EDP-CENTER

2. ORGANIZATION OF A GOVERNMENT DEPARTMENT

3. THE PERFECT REGISTRY

4. PROBLEMS/DEFICIENCES

5. THE PROJECT - HISTORICAL REVIEW

6. THE SYSTEM

7. IMPLEMENTATION OF THE SYSTEM

8. EXPERIENCE

9. EXPECTATION

10. FUTURE TRENDS

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

I. I/S DATACENTRALEN OF 1959 (DC)

DC IS THE DANISH STATE EDP-CENTER

DC HAS APPROX. 1200 STAFF MEMBERS

DC's TURNOVER: 55 MILL. $

DC's REFERENCES:

- ALL DANISH GOVERNMENT DEPARTMENTS
- THE EEC-COMMISSION
- UNDP (UNITED NATION DEVELOPMENT PROGRAMME)

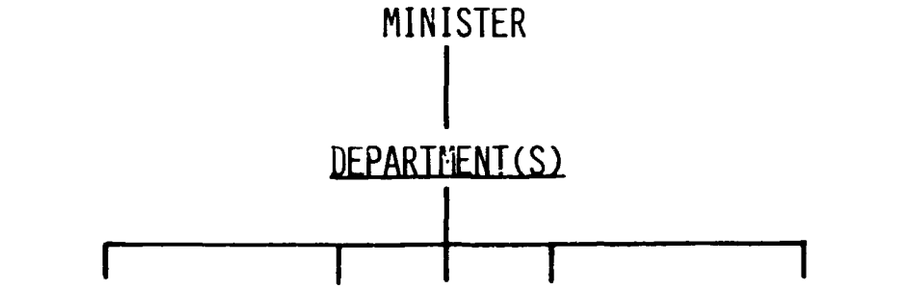
SOME SYSTEMS:

- CENTRAL POPULATION REGISTER
- CENTRAL MOTOR VEHICLE REGISTER
- THE GOVERNMENTAL WITHHOLDING TAX SYSTEM
- THE CENTRAL NATIONAL ACCOUNTS SYSTEM
- THE GOVERNMENTAL CENTRAL PAY SYSTEM
- THE ARMED FORCES' CENTRAL STOCK CONTROL SYSTEM

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

2. ORGANIZATION OF A GOVERNMENT DEPARTMENT



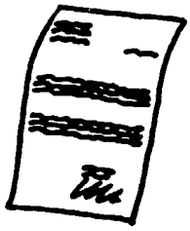
SECRETARIAT OFFICE	OFFICES WITH SPECIFIC RESPONSIBILITIES	ECONOMIC-STATISTIC OFFICE
- REGISTRY - PERSONNEL ADMINISTRATION - XX		

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

3. THE PERFECT REGISTRY

INPUT



CONT.

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

3. THE PERFECT REGISTRY (CONT.)

PROCESS

VARIOUS INDEXES	REGISTRATION	FILING
- DATE INDEX	REGISTRY-NUMBER:	
- ALPHABETICAL INDEX	- YEAR	
- KEYWORD INDEX	- CLASSIFICATION-CODE	
- XX	- SERIAL-NUMBER	
(UP TO 20 INDEXES)	YEAR-CC-SN ——— KEY →	

REGISTRY CARD

RN: SUBJECT:		
DATE		ABSTRACTS
IN	OUT	

CONT.

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

3. THE PERFECT REGISTRY (CONT.)

OUTPUT

1. RETRIEVAL OF A SPECIFIC CASE

2. VARIOUS LISTS:

   - MAIL LIST

   - CASE MANAGEMENT (EG: ARREARS LIST, MEMO LIST)

   - STATISTICS

3. DESTRUCTION OF OLD CASES, OR

   DELIVERY OF SPECIFIC AND/OR HISTORICALLY INTERESTING CASES TO THE PUBLIC RECORD OFFICE

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

4. PROBLEMS/DEFICIENCES

- INADEQUATE SUPPORT TO THE CLERKS IN CHARGE OF CASES

- CASE MANAGEMENT LISTS AT IRREGULAR INTERVALS

- INADEQUATE DESTRUCTION OR DELIVERY

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

5 THE PROJECT - HISTORICAL REVIEW

1975	THE ADMINISTRATION DEPARTMENT OF THE MINISTRY OF FINANCE
	THE PUBLIC RECORD OFFICE
	I/S DATACENTRALEN OF 1959
1975-76	STUDIES
	. NATIONAL
	. SCANDINAVIAN
1977	PILOT PROJECT
1977-79	FINAL SYSTEMDESIGN
1979-80	SYSTEM DEVELOPMENT
	(CRITERIA:
	- END-USER ADAPTION
	- NO DISMISSALS)
1980	FIRST FIVE USERS
YEARS AHEAD	MORE THAN 30 USERS OF THE FIRST VERSION

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

6. THE SYSTEM

FUNCTIONS:

- CASE REGISTRATION AND UPDATING WITH ABSTRACTS

- RETRIEVAL ON KEYWORDS GIVING CASE ABSTRACTS AND INDEX TO ARCHIVES

- VARIOUS LISTS (EG: MAIL LIST, ARREARS LIST, MEMO LIST, DESTRUCTION/DELIVERY LIST)

CONT.

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

6. THE SYSTEM (CONT.)

TECHNICAL DESIGN:

- STANDARD TURN-KEY SYSTEM WITH POSSIBILITY FOR INDIVIDUAL ADJUSTMENT TO USER NEEDS

- INTER-ACTIVE, ON-LINE, REAL-TIME MINICOMPUTER BASED SYSTEM WITH DISPLAY TERMINALS

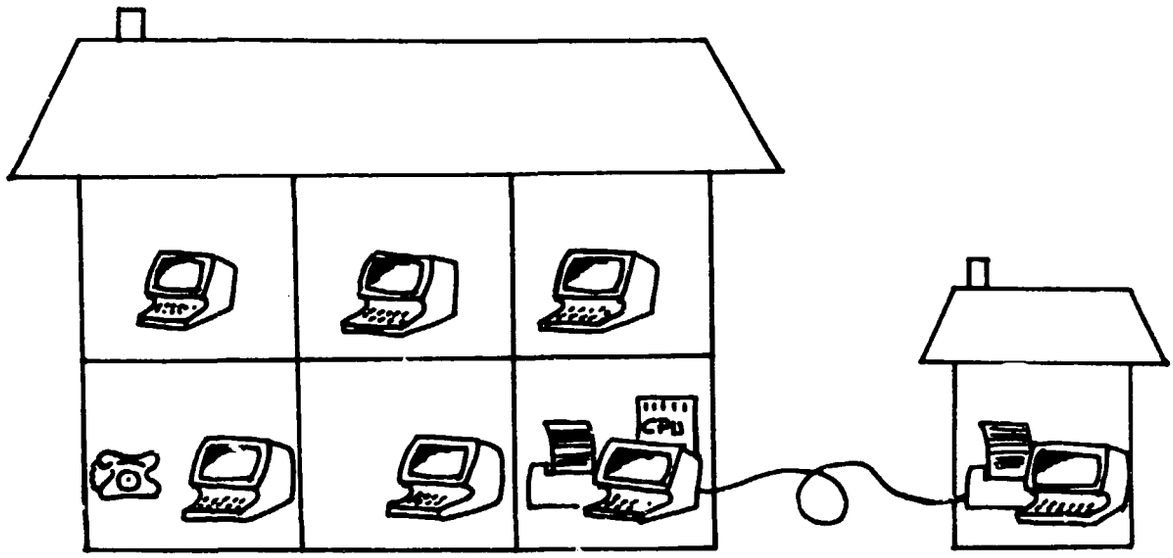
- COMPUTER-BASED PRODUCT (AUTOMAT), NOT A COMPUTER SYSTEM

CONT.

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

6. THE SYSTEM (CONT.)

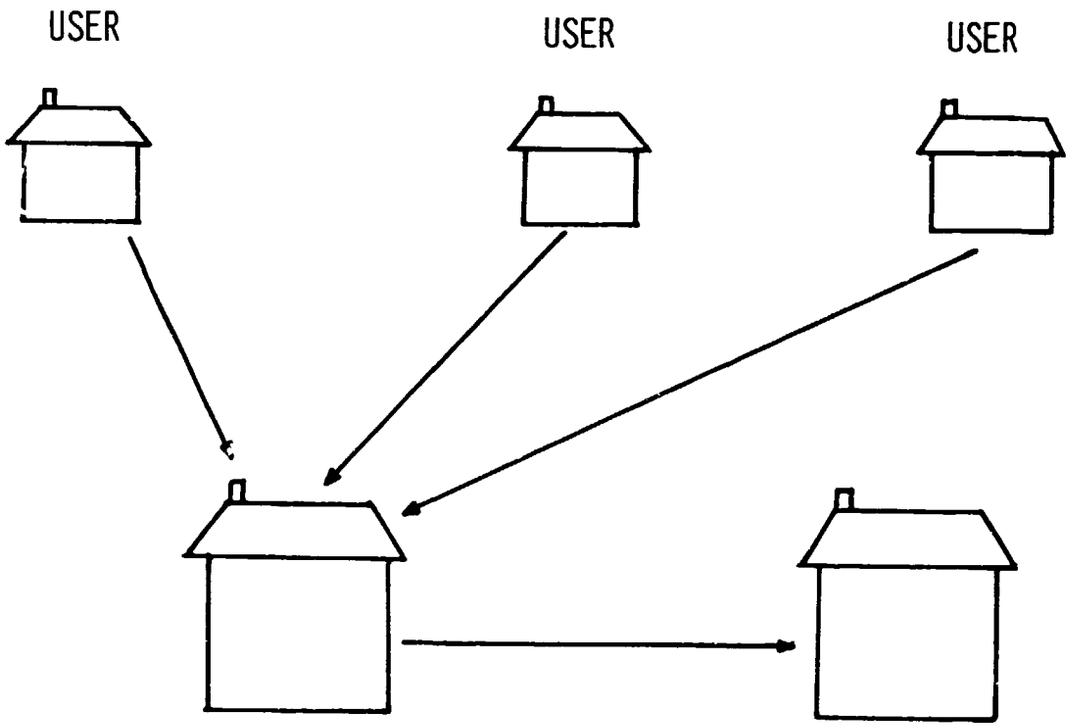


CONT.

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

6. THE SYSTEM (CONT.)



OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

7. IMPLEMENTATION OF THE SYSTEM

THE SYSTEMS ARE PAID BY GOVERNMENT EMPLOYMENT FUNDS

TWO AIMS:

- TO INCREASE THE STANDARDIZATION AND EFFECTIVENESS IN THE REGISTRIES

- TO SUPPORT THE DANISH COMPUTER INDUSTRY

CONT.

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

7. IMPLEMENTATION OF THE SYSTEM (CONT.)

I. STEERING-COMMITTEE WITH REPRESENTATIVES OF:

- THE MANAGEMENT
- THE CLERKS IN CHARGE OF CASES
- THE REGISTRY CLERICAL STAFF
- THE LOCAL BRANCH OF THE CLERICAL STAFF TRADE UNION

} THE USER ORGANIZATION

- THE NATIONAL CLERICAL STAFF TRADE UNION
- THE PUBLIC RECORD OFFICE
- THE ADMINISTRATION DEPARTMENT OF THE MINISTRY OF FINANCE
- I/S DATACENTRALEN OF 1959

CONT.

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

7. IMPLEMENTATION OF THE SYSTEM (CONT.)

2. WORKING-GROUPS

- CLASSIFICATION CODE ADJUSTMENT
  (ORGANIZATIONAL ADJUSTMENT)
- ADJUSTMENT OF SYSTEM TO USER-NEEDS
- INSTALLATION

3. EVALUTION-PROJECT

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

8. EXPERIENCE

EDP-SPECIALISTs USED AS REGISTRY-SPECIALISTs OF THE USERS

GROWING USER-DEMANDS UNDER THE SYSTEM-ADJUSTMENT-FASE

DISCOVERY OF MANY POTENTIAL EDP-PROJECTs

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

9. EXPECTATION

- RATIONALIZATION EFFECT TURNED INTO HIGHER REGISTRY-SERVICE

- GRADUAL ACCLIMATIZATION OF ORGANIZATIONS, TRADE UNIONS AND CLERICAL STAFF TO THE OFFICE OF THE FUTURE

- NEW EDP-ORIENTED EDUCATION PROGRAMMES FOR EXISTING AND COMMING PERSONEL

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

10. FUTURE TRENDS

EDP-SYSTEMS FALL INTO THREE CATAGORIES:

1. THE BASIC FUNCTIONS OF THE OFFICE

2. THE INTERNAL ADMINISTRATIVE FUNCTIONS

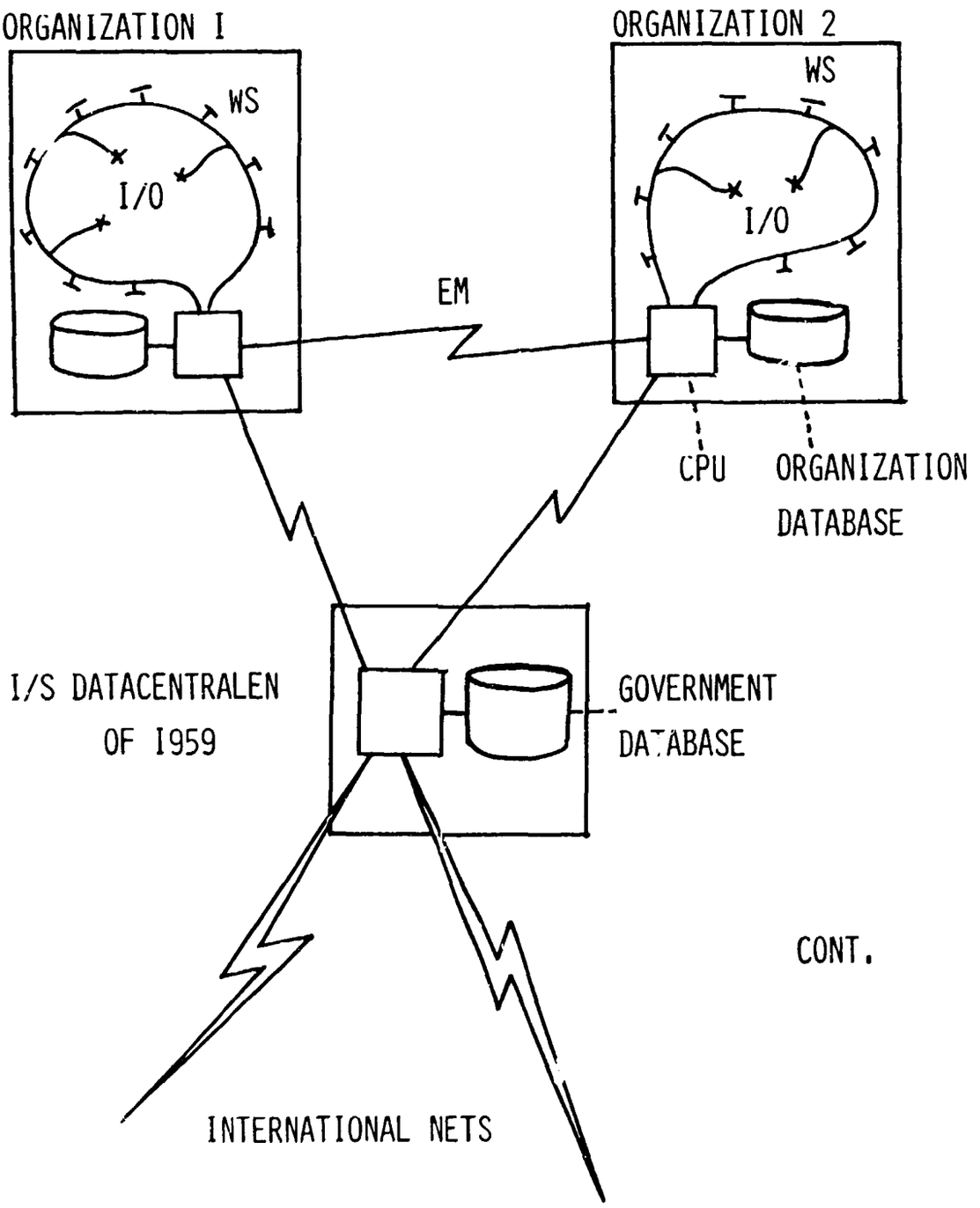
3. THE AUTHORITY FUNCTIONS

CONT.

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

10. FUTURE TRENDS (CONT.)

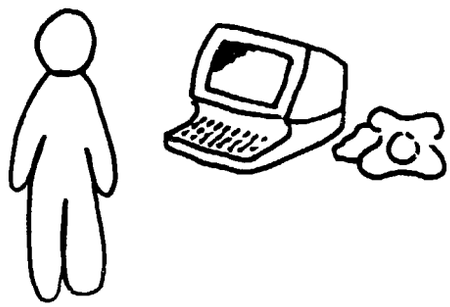


CONT.

OFFICE OF THE FUTURE

THE DANISH GOVERNMENT REGISTRY AUTOMATION PROJECT

10. FUTURE TRENDS (CONT.)



WS: WORK STATION