

## Highlights

- The System Life Cycle
- Overview of Systems Analysis
- Overview of Systems Design

## Inside

- Overview of Systems Diagrams
- Overview of Systems Documentation
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**SA LEC 07**

*Bolger 'n' Slaters  
Systems  
Analysis Course  
Notes  
Issue 7*

# The Systems Analysis LECTURE

# SA

## More Tools used in Systems Analysis *Background about the steps involved in a Systems Project*

### Structured Process Approaches

Structured Process approaches were the original 'modern' programming practices developed for 3GL and conventional file processing applications. These structured approaches are more widely used than traditional approaches and include methods that result in the production of :

- Data Flow diagrams
- Data Dictionaries
- Warnier Orr diagrams

### Data oriented approaches

Data-oriented approaches were developed for database applications and are particularly suited for 4GL. Data-oriented approach examples include the production of:

- Data Modelling (Entity relationship Diagrams) or Logical data Modelling as it is alternatively known
- Data Structure Diagrams or Logical Data Structures as they are sometimes known

### Structured Analysis Techniques

Structured Analysis techniques are usually employed most often during Systems Analysis. They are basically an amalgam of the **Structured Process** and **Data Oriented** approaches referred to above. The two key structured analysis techniques are Data flow Modelling and Data Modelling

#### Data Flow Modelling

##### Data Flow Diagrams

Data flow diagrams are used as an alternative to systems

flowcharts, This type of diagram shows how the data moves through the system, and what data stores are used. It does not define what type of data storage is used, or how the data is stored. This type of detail can be determined at a later stage.

The Data Flow diagram is used to show the flow of data in a system. Unlike the flowchart, which shows the flow of logic, the data flow diagram describes a system from the point of view of the data.

#### What are the components of a Data Flow Diagram ?

There are many varieties of data flow diagrams which we will investigate later, but for purposes of explanation, the type we will use has five basic symbols are used, as shown below.

- **Processes**
- **(External) Entities**
- **Data Stores**
- **Data Flow Lines**
- **Resource Flow Lines**

**Processes**

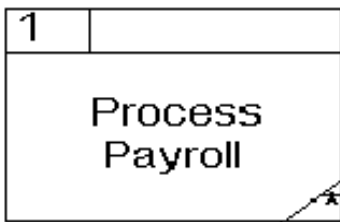
A Process is an operation performed on the data (think of it as being a job carried out by somebody which involves processing of information).

PROCESS BOXES are used to represent processes or activities which transform data inputs into data outputs.

A process is an activity that receives data and carries out some form of transformation or manipulation before outputting it again. The activity may be carrying out calculations, creating a new document from information that triggered the process, or amending the document that flowed in.

A process is depicted by a box divided into three areas: the upper left position gives the reference number; it does not imply priority or sequence.

The top section of the box can be used to label the process, the middle to give a brief explanation, and the bottom to say where the process takes place.



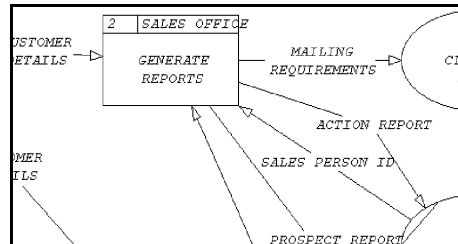
As a reference, for user communication, however, it is an important feature. The longer rectangle beside it names the location where the process takes place; this may on an overview DFD be a broad term such as Sales Accounts etc. As the DFD becomes more detailed then so do these descriptions.

The rest of the box describes what is happening in the process. the rule of thumb here is to keep the description as terse and meaningful as possible. Use an imperative verb and object, but make the verb specific. 'Process' and 'Update' are TOO VAGUE and give little clue as to what is meant. 'Calculate', 'Add' and

'Validate' give a clearer picture of what is happening.

**Data Flow Lines**

DATA FLOW LINES, represent a flow of data, which might be a single data item, a whole form, information from a file, a report, and so on.



Data flows represent any passage of data into the system, out of the system or between elements inside the system. It is represented by an arrow between the source and recipient of that data flow. In the real world, it may take the form of a standard document with fixed content or a telephone call. It may be an enquiry, a functional document or a memo.

Wherever traceable data is passed, it must be shown by an arrow. At the highest level DFD, one arrow may represent several data flows, which may be decomposed into the individual data flows at the lower levels.

There are some validation rules about where data flows may or may not travel:

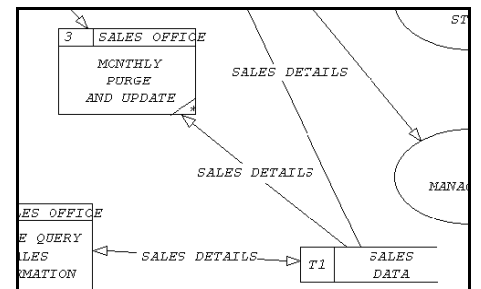
- **Data stores may not be linked by data flows: flows must travel from one to another VIA a process.**
- **External entities may neither send nor receive data flows directly to or from a data store: they must communicate via a process.**
- **Data cannot be generated by a process, nor be swallowed by a process; documents may be swallowed or generated, but there must be output that is related directly to all inputs to the process.**

An important rule to consider when drawing DFD's is that that flowlines should indicate only data essential to the system, and should avoid cluttering

up the diagram with inessential data-flow ( you may not agree ).

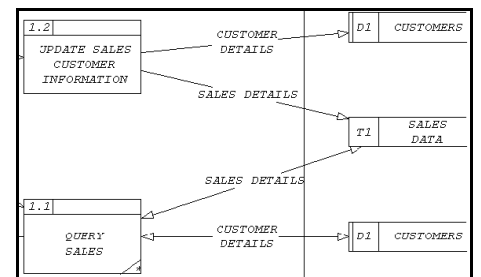
**Data Stores**

DATA STORE BOXES, represent the source of data or its destination. A data store is a place where data comes to rest. It may be a filing cabinet, or an in-tray, a card index, a reference book or a computer file.



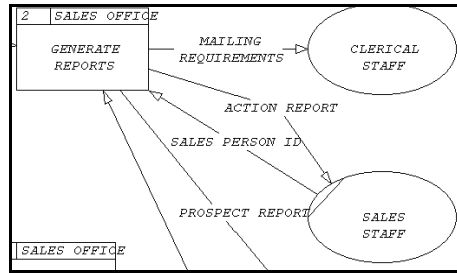
Anywhere that data is stored and retrieved is called a data store. The notation is simple: a long open ended rectangle, with a box at the left-hand end. The box is labelled with an Alpha prefix and a number. The alpha could be D ( for an automated data store ) or M ( for a manual/card data store ) or T ( for a Temporary Transaction store ).

If for the sake of tidiness in the diagram, you wish to show the data store in more than one part of the diagram, draw a bar beside the left-hand box. Each occurrence of the data store will display that bar.



**External Entities**

EXTERNAL ENTITIES are denoted by an ellipse shaped symbol which represents an external entity. External entities are those bodies outside the system boundary which interact with the system. They may be external to the whole company, such as Customers, Accountant, Supplier, Inland Revenue, or just external to the application area under investigation.



So if we were modelling a sales office system, accounts and despatch areas would be shown as external entities. Each external entity communicates in some way with the system, so there is always a flow of data between a process in system and an external entity.

The entities are labelled with a singular noun describing the role of the entity, e.g. Accounts, VAT Office, Credit Manager. Above the label will be an alphabetic character, again for reference purposes only.

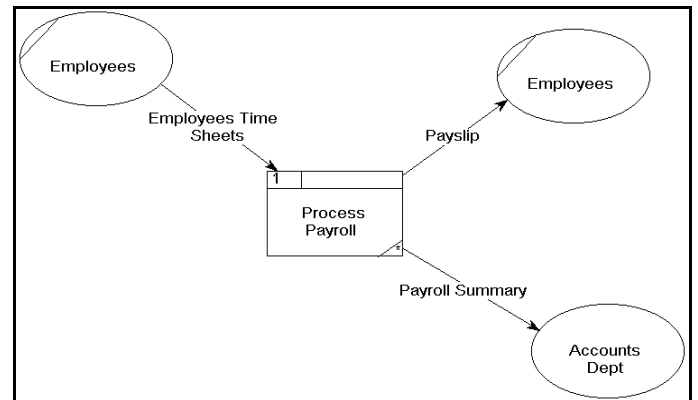
As with data stores, it may be desirable for the sake of clarity to duplicate an external entity on the diagram, rather than have arrows from all points converging on one entity. If that is the case, put a small line along the top of the ellipse.

**Practical Class Activity -**

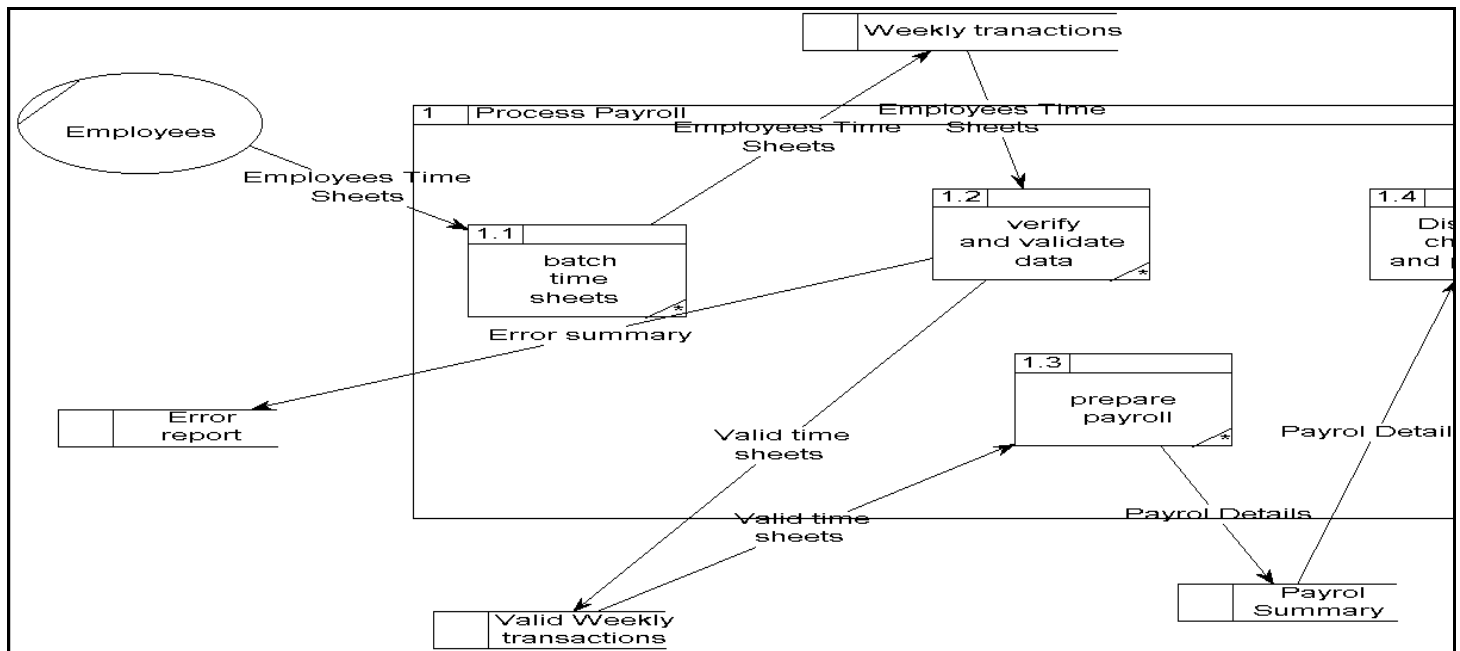
1. The payroll system in a certain company may be described as follows:

At the end of each week time sheets are collected and sent to the computer centre. There, the payroll data is entered via a key-to-disk system, verified and validated, producing a new file of valid transactions on disk and an error report. This file is used to update the employee master file, and cheques and pay-slips are printed. A payroll summary is also printed for the Accounts Department. Draw a data flow diagram to represent this system

**Solution:** Note that different levels of data flow diagram are often used. A 'top level' diagram could be drawn as follows:



The above diagram could then be broken down into greater detail with a level 2 diagram



**Practical Class Activity -**

1. A company manufactures and markets screws. The company is considering computerising some of its activities. The departments listed below, with their functions, could benefit from computerisation.

Department	Functions
Ordering materials.	Maintain stock of raw materials.
Production	Arrange production of screws according to known requirements and forecasts; ensure labour and machinery are available.
Sales	Receive orders; make forecasts and market screws.
Dispatch	Make up and send out orders received.
Accounts	Process company's financial transactions.

Planning      Devise possible future developments.

(a) Describe, with the aid of a diagram, the data flow in to and out of the departments, being careful to indicate the direction of flow. (7 marks)

(b) Describe four tasks within the departments of the company in which a computer system could usefully be involved. (8 marks)

**Practical Class Activity -**

2. A school is considering implementing a software package to assist in the clerical aspects of producing its timetable. It is intended that the software will check a proposed timetable to identify clashes and, when all clashes have been removed, will print timetables in appropriate formats. This will include the full timetable for the school and individual timetables for each teacher (showing which classes are taught, when and where) and for each room (showing which class and teacher are using that room in each of the 40 periods of the week). Class timetables and timetables for specialist groups within the fourth, fifth and sixth forms will also be needed.

- a) Describe the data which would be needed and how it could be organised in the package. (8 marks)
- b) Discuss how the package could be designed as a collection of modules and how each module would interrelate with the other modules. (6 marks)
- c) Indicate clearly the flow of data from input to output throughout the system. (5 marks)

**Practical Class Activity -**

- 3. Data flow diagramming is a standard technique used in systems analysis for specifying a system at the logical level. The data flow diagram (DFD) is a graphical representation of a system, and is composed of four elements. State the name and purpose of each of these four elements. (4 marks)

**Practical Class Activity -**

- 1. A stock master file stored in sequence order of a numeric key is updated by a transaction file using

sequential file access. Transaction records, which represent additions and deletions to the stock levels, are collected in batches over a period of time and validated before being sorted into key order. Invalid data is corrected and entered into the next batch of transactions. The ordered transactions are used to update the master file. The update process produces a new master file and a file of all changes to records, for audit purposes.

- a.) Explain the meanings of the terms underlined. ( 3 marks)
- b.) Why is the transaction file sorted prior to updating the master file? (2 marks)
- c.) Draw a data flow diagram of the system described (7 marks)
- d.) The audit file contains the before and after quantities in stock corresponding to each transaction and monetary value of the transaction. What information is needed in the transaction and master files to derive the audit file information? (3 marks)