

Highlights

- Other Analysis Tools
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SA LEC 06

*Bolger 'n' Slaters
Systems
Analysis Course
Notes
Issue 6*

The Systems Analysis LECTURE

SA

Tools and Techniques used in Systems Analysis
Background about the steps involved in a Systems Project

Analysis Tools

Modelling - Building a 'Paper Model' of a system

Analysts often construct what are termed 'paper models' of systems (and parts of systems). The basic goal in constructing a 'paper model' of a system, is to be able to think out the plot without resorting to expensive construction of the real thing until it is necessary, and secondly to partition a complicated activity into several less complicated tasks.

The introduction of this paper modelling stage is, in fact, the major innovation of modern systems analysis practice. There are at least four good reasons for undertaking interposing the steps of building a paper model.

- To partition the tasks BETWEEN stages of the life cycle
- To minimize cognitive overload. (cognitive overload simply means inability to remember every part of a system at simultaneously)
- To partition the tasks WITHIN a single stage of the life-cycle again to minimize cognitive overload.
- To maximize use of pattern matching abilities (i.e. identify any duplicated processes or data flows etc.)

All of this is a roundabout way of saying that we introduce the paper modelling stage because once a system gets above certain size, the analysts and designers find that they cannot cope with its complexity. These difficulties in coping with complexity are caused by fundamental limitations in the way people process information. The paper modelling stage allows us to take a large, overly complex problem and split it into a group of smaller less complex problems. As a result, each stage is more likely to be analysed correctly.

Techniques Used in Systems Analysis

The Systems Analysis stage of the Systems Life cycle is the process of understanding the existing system, understanding the user's needs, and synthesizing from them the requirements to be adhered to in the later design of a new system. We are about to see that there are three alternative approaches to systems analysis in widespread use:

- Traditional approaches
- Structured Process approaches (sometimes called 'STRUCTURED ANALYSIS')
- Data-oriented approaches (sometimes called 'DATA MODELLING')

Traditional Approaches to systems Analysis

Traditional approaches were originally developed for 2GL (second generation languages) but are still widely taught and used. These Traditional approaches include methods that result in the production of :

- Flowcharts and System flowcharts
- Decision Tables
- System Flowcharts
- Structure Diagrams

Decision Tables

The systems analyst will have to produce a written description of the processing which occurs in each elementary process identified in the DFDs. The description may just contain a few paragraphs detailing the actions which occur within the process. In some cases, there may be a number of actions which can take place depending on the result of some conditions. If this is the case, then it may be difficult for the analyst to clearly express in text what is taking place, and so an alternative method is used. The common method which is used is to express the conditions and actions as a decision table. Decision tables represent, in a tabular form, any complex series of conditions and actions, which cannot be expressed easily and understandably in a normal written form. They consist of four areas:

- a condition stub contains a list of all possible conditions that can arise during a process;
- an action stub contains a list of all possible actions that can occur within a process;
- a rules area which contains one entry for each possible combination of conditions
- an action entries area which selects the action to be performed under the specified conditions.

Condition Stub	Rules
Action Stub	Action Entries

For example, consider a process 'Check Customer Credit' which checks if a customer has satisfactory credit, or is a regular payer before an order can be accepted. If the customer has satisfactory credit or is a regular payer then the order is approved. If the customer has neither satisfactory credit nor is a regular payer, then the order is rejected. The conditions are:

- Satisfactory Credit?
- Regular Payer?

Each condition will give an answer of yes or no. The actions are:

- Approve Order
- Reject Order

The decision table to represent this situation is drawn as follows:

	1	2	3	4
Satisfactory Credit?	Y	Y	N	N
Regular Payer?	Y	N	Y	N
Approve Order	X	X	X	
Reject Order				X

This action entries area of the decision table shows that orders are only approved if a customer has satisfactory credit or is a regular payer. If the customer has not satisfactory credit and is not a regular payer then the order is rejected.

Worked Example

Draw a decision table which represents the scenario that an offer of a place is made to an applicant if they have a good interview and have satisfactory qualifications. The applicant is placed on a waiting list if they have either a good interview or satisfactory qualifications, but not both. The application is rejected if the interview is not good and the qualifications are unsatisfactory.

The conditions check whether the applicant has satisfactory qualifications and a good interview. The actions which can result are either the applicant is made an offer, the applicant is placed on a waiting list, or the applicant is rejected. The decision table which represents this situation is:

	1	2	3	4
Satisfactory Credit?	Y	Y	N	N
Regular Payer?	Y	N	Y	N
Approve Order	X	X	X	
Reject Order				X

This is known as a limited entry decision table, as it contains only the selectors Y and N in the rules area.

Worked Example

Draw a decision table which represents the scenario that an offer of a place is made to a student if they have a good interview and if the number of points obtained in their qualification is greater than 10. The student is placed on a waiting list if they have a good interview and the number of points obtained is between 6 and 10, or if they have a poor interview and the number of points is greater than 10. In all other situations the application is rejected

The conditions check whether the applicant has sufficient points and a good inter-view. The actions which can result are either the applicant is made an offer, the appli-cant is placed on a waiting list, or the applicant is rejected.

The decision table which represents this situation is:

	1	2	3	4
Satisfactory Qualifications?	Y	Y	N	N
Good Interview?	Y	N	Y	N
Make Offer	X			
Waiting List		X	X	
Reject				X

This is known as an extended entry decision table as the values in the rules area have values other than Y and N.

The advantages of decision tables are that they can be easily understood by users and analysts, and also it is easy to ensure that all possible conditions are covered.

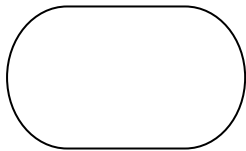
Systems flowcharts

When a Systems analyst is developing a new computer system, his ideas need to be written down. Frequently a pictorial representation of how the system will work is easier to understand and take in than a lengthy text. A systems flowchart is a diagram showing an overview of a complete system. It will show

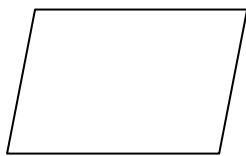
- the tasks to be carried out in the new system, whether manual or by the computer
- the devices (disk drives, tape drives, terminals etc.) that are to be used in the system
- the media used for input, storage and output
- the files used by the system

You should be familiar with the standard symbols used in Systems flowcharts.

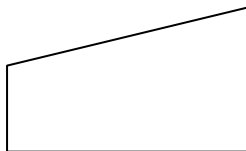
1. Symbols for operations



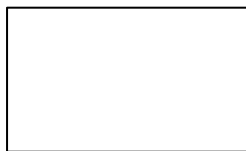
Start or End



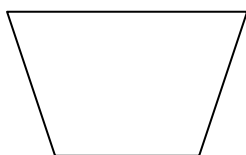
Input or output



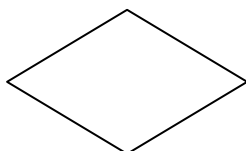
Keyboard Input



Process

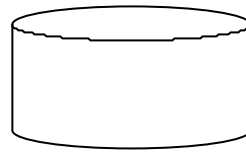


Manual Operation

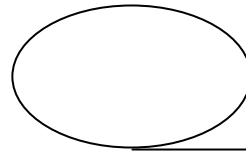


Sort

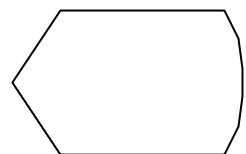
2. Symbols for stored data



Disk storage



Magnetic Tape



Visual Display



document

Written or printed

Drawing a systems flowchart

There are many factors to be taken into account when designing a new system. The analyst must establish the following facts:

- Is this a batch, on-line or real-time system?
- How is the data to be captured and input to the system? What manual procedures will be involved, and how will errors be prevented, or detected and corrected if they slip through?
- What is the hit rate on the master files, and what file organisation is therefore appropriate?
- What storage media will be used; disk, tape, or some other medium?
- What will be the output from the system?
- What are the processing steps to be carried out?

Exercise

Q1: Match the following descriptions with the corresponding systems flowcharts below, adding text to the symbols to make the flowcharts easier to understand.

1. A sequential payroll master file held on tape is updated from a sequential transaction file using the 'grandfather-father-son' method of update, and pay-slips are produced.
2. A transaction file held on tape is sorted on to a disk file, and a report produced in the new sequence.
3. A collection of input documents is batched, and the batches keyed in and stored on disk.
4. A transaction file held on tape is validated, with valid transactions being copied to a disk file and an error report produced which gives details of invalid transactions.
5. A customer order is keyed in and the stock master file checked to ascertain whether sufficient stock is available. The customer order is stored on an indexed customer order file.
6. Electricity bill payments are read by an OCR device and stored on disk. These transactions are then used to update the indexed customer master file.

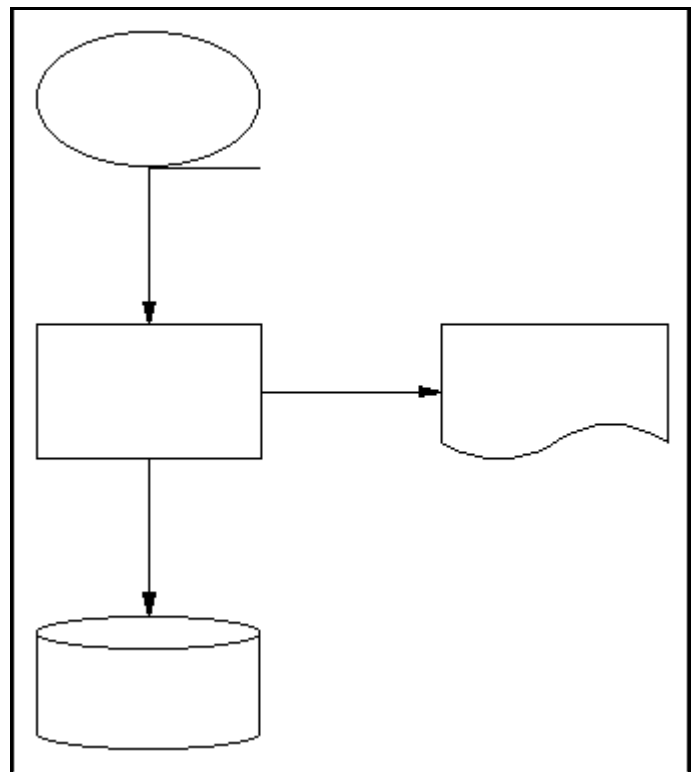


Figure 1 - System A

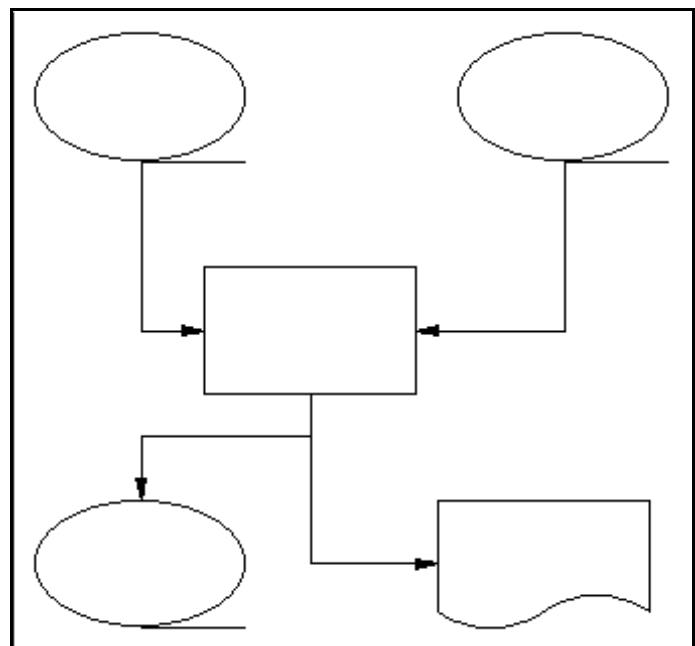


Figure 2 - System B

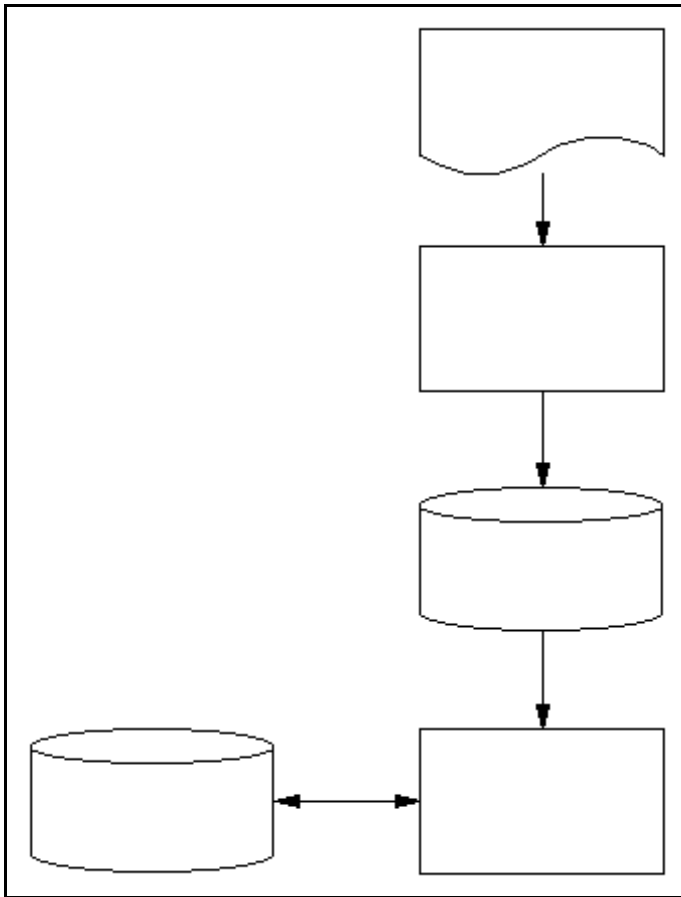


Figure 3 - System C

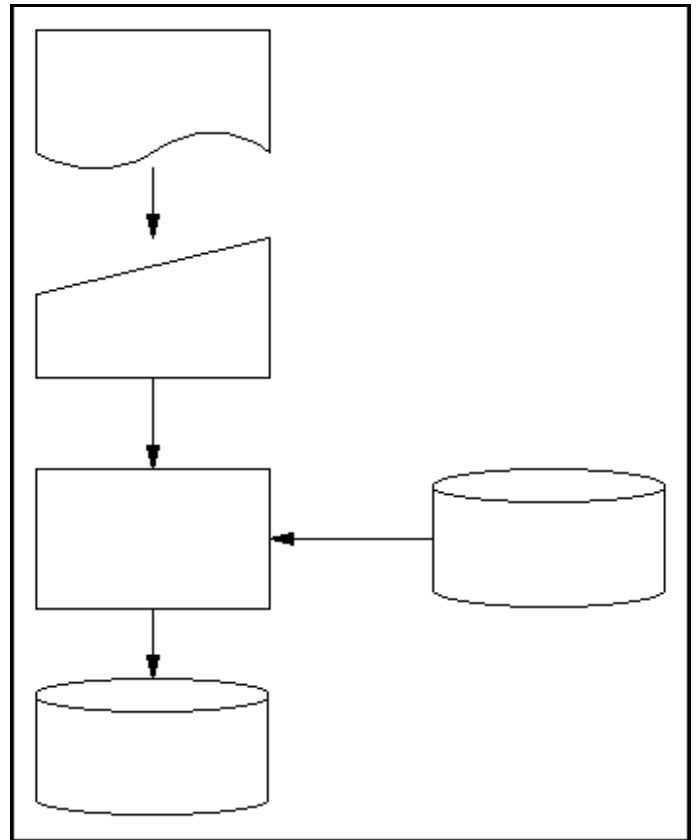


Figure 4 - System D

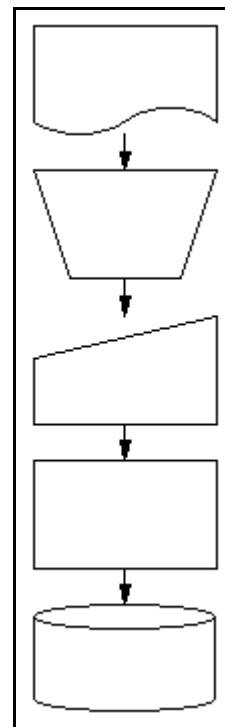


Figure 5 - System E

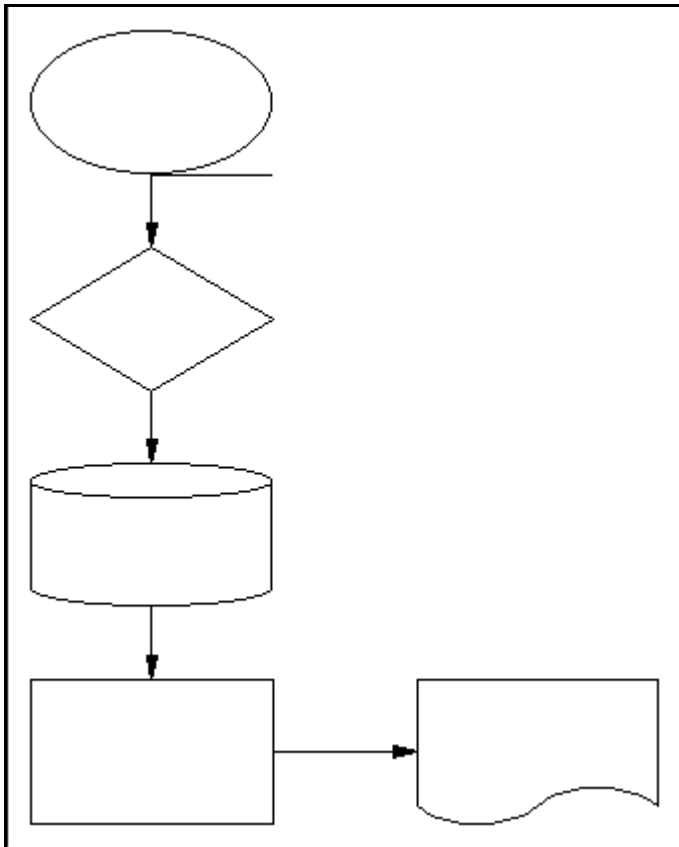


Figure 6 - System F

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 systems flow chart, 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)

Practical Class Activity -

2. A sports complex consists of the following: 5 soccer pitches, 4 squash courts, 4 tennis courts, a multi-gym for up to eight persons, a large sports hall which may be used as four badminton courts or as a five-a-side football pitch or a basketball court. Members of the complex may book any facility for an hour up to seven days in advance while non-members may book up to three days in advance. The manager of the complex is considering using an on-line microcomputer system to control the bookings for the activities.
 - a. Describe the files which would be required and describe how each would be organised. (4 marks)
 - b. Draw a systems flowchart for the on-line system. (4 marks)
 - c. Describe suitable data entry procedures for this application (4 marks)
 - d. Briefly describe three reports that might be generated by the computer system.(3 marks)

Practical Class Activity -

3. A firm of specialist cleaners employs staff who are on 24 hour call. Once a job has been completed the staff have to fill in a job sheet which includes information on the duration of the job and details of the amounts of cleaning material used. These sheets are eventually returned to the main office and are used as the basis of transactions to update a direct access stock file. The data on the sheets is also added to the weekly serial transaction file. All data is entered via the keyboard under program control using a predefined screen format.

Each week this transaction file undergoes further validation and is then used to prepare invoices for the work done. The preparation of invoices requires access to a customer file

held as a direct access file by customer reference number.

Draw a system flowchart to reflect the data processing described above. (8 marks)