8.3 Design stage

Once the analysis has taken place and the systems analyst has some idea of the scale of the problem and what needs to be done, the next stage is to **design** the key parts of the recommended system. A list of tasks is summarised here, but is by no means exhaustive:

- designing data capture forms/input forms
- designing screen layouts
- designing output forms and reports
- producing systems flowcharts and/or **pseudo code**
- selecting and designing validation rules that need to be used
- selecting the most appropriate data verification methods
- designing and agreeing the file structures and tables
- selecting and designing the hardware requirements
- selecting and designing the software requirements
- producing algorithms or program flowcharts
- designing a testing strategy/plan.

We will now consider in more depth two of these tasks: **verification** and **validation**.

Verification

Verification is a way of preventing errors when data is copied from one medium to another (e.g. from paper to disk/CD). There are two common ways that verification checks are carried out:

- **Double entry**: in this method, data is entered *twice*, using two different people. The computer compares the two entries, either after data entry or during the data entry process, and identifies any differences.
- **Visual check**: this is the checking for errors by comparing entered data on the screen with the data in the original document (this is *not* the same as proof reading).

Validation

Validation is a process where data is checked to see if it satisfies certain criteria when input into a computer, for example to see if the data falls within accepted boundaries. A number of validation techniques exist and Table 8.2 highlights some of the more common ones used when writing computer software.

Name of method	Description	Advantages	Disadvantages
Observation	Involves watching personnel using the existing system to find out exactly how it works.	• The analyst obtains reliable data. • It is possible to see exactly what is being done. • It is a relatively inexpensive method.	• People are generally uncomfortable being watched and may work in a different way. • If workers perform tasks that violate standard procedures, they may not do this while being watched!
Questionnaires	Involves sending out questionnaires to the work force and/or to customers to find out their views of the existing system and find out how some of the key tasks are carried out.	• The questions can be answered quite quickly. • It is a relatively inexpensive method. • Individuals can remain anonymous if they want. • It allows quick analysis of the data.	• Often the number of returned questionnaires is low. • The questions are rather inflexible since they have to be generic. • There is no immediate way to clarify a vague or incomplete answer to a question.
Interviewing	Involves a one-to-one question-and-answer session between the analyst and the employee/customer.	• It gives the opportunity to motivate the interviewee into giving open and honest answers to the analyst's questions. • It allows the analyst to probe for more feedback from the interviewee, as it is easier to extend a question. • It is possible to modify questions as the interview proceeds and ask questions specific to the interviewee. • It is a good method if the analyst wants to probe deeply into one specific aspect of the existing system.	• It can be rather time consuming. • It is relatively expensive, due to the use of the analyst's time. • The interviewee cannot remain anonymous.
Looking at existing paperwork	Allows the analyst to see how the paper files are kept, look at operating instructions and training manuals, check the accounts, etc.	• It allows information to be obtained which was not possible by any of the other methods. • The analyst can see for themselves how the paper system operates. • It allows the analyst to get some idea of the scale of the problem, memory size requirements, type of input/output devices needed, etc.	• It can be very time consuming. • Because of the analyst's time, it is a relatively expensive method.

Table 8.1 Different fact finding methods

Validation check	Description	Example/s
Range check	Checks whether data is within given/acceptable values.	A person's age should be in the range > 0 but < 150.
Length check	Checks if the input data contains the required number of characters.	If a field needs six digits then inputting a five- or seven-digit number, for example, should cause an error message.
Character/type check	Checks that the input data does not contain invalid characters.	A person's name should not contain any numbers but a person's height should only contain digits.
Format/picture check	Checks that data is in a specific format.	Date should be in the form dd/mm/yyyy.
Limit check	Similar to range check except that only *one* of the limits (boundaries) is checked.	Input data must be > 10.
Presence check	Checks if data is actually present and has not been missed out.	In an electronic form, a person's telephone number may be a required field and if no data is present this should give rise to an error message.
Consistency check	Checks if fields correspond (tie up) with each other.	If 'Mr' has been typed into a field called **title** then the **gender** field must contain either 'M' or 'Male'.
Check digit	Looks at an extra digit which is calculated from the digits of a number and then put on the end of the number (see example in Section 7.10).	Check digits can identify three types of error: • if two digits have been inverted during input, e.g. 13597 instead of 13579 • an incorrect digit entered twice, e.g. 13559 typed in instead of 13579 • a digit missed out altogether, e.g. 1359 typed in instead of 13579.

Table 8.2 Common validation methods