

## Highlights

- The Full Systems Investigation
- Fact Finding
- Questionnaires, Interviews,

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- Audits
- Other methods

**SA LEC 05**

*Bolger 'n' Slaters  
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Notes  
Issue 5*

# The Systems Analysis LECTURE

# SA

The Full Investigation / Analysis stage of a Project  
*Finding and Documenting the facts*

## The Full Investigation (Systems Analysis)

Once the decision has been made to go ahead with a system, a much more detailed investigation can take place. The aim is to gain a complete understanding of the existing system, and how it will change in the future. It will cover :

- the data its uses, volumes and characteristics
- the procedures what is done, where, when and how, and how errors and exceptions are handled
- the future - development plans and expected growth rates
- management reports requirements for new reports and their contents and frequency
- problems with the existing system

## Methods of fact finding

There are a number of ways of finding out about existing procedures and problems. These include

1. observation: spending some time in the department concerned, seeing at first hand the procedures used, workloads and bottlenecks
2. reading the documentation associated with the system
3. asking clerical staff to keep special counts during a trial period to establish where problems might lie
4. questionnaires: these can be useful when a lot of people will be affected by a new system
5. interviews: the most common and most useful way of fact finding.
6. Interviews must be well planned and consideration given to such factors as:
  - whom to interview
  - when to interview
  - what to ask
  - where to hold the interview

## Methods of Information Gathering, Recording & Analysis

In this section of the notes we will be looking at the following topics associated with the Systems Project.

- Information Gathering
- Types of Information that will be gathered
- Recording of Information

### Information Gathering & Sources

Following a feasibility study, an analyst would already have a fair understanding of the existing system operation, but now during the Analysis stage they must re-investigate it in much greater detail.

One of the very first jobs an Analyst will need to do will be to collect together into their project file all the papers that the project has generated so far. They must keep this well organised, so that if someone else had to take over, they would be able to do so without too much trouble.

The information that an analyst needs will come from a variety of sources but mainly from documentation and interviews. By this stage of the project

- You will have read the documentation connected with the existing system. You probably won't have found in your documentation any formal instructions about the system, but there may be some explanatory notes, perhaps. There may also be memos, some or all of the various forms that the system uses currently, and perhaps some or all of the documents the system generates.

### More detailed Information Gathering

You as the Analyst must now observe to a greater extent, how things work, which will involve going into the everyday running of the system, watching and making notes, interfering with work as little as possible.

In addition more of your information will come from interviews and questions. To be effective, the Analyst must plan their interviews very carefully.

### Methods of gathering Information

There are numerous methods of gathering the data necessary for analyzing, studying and redesigning an in-place system. These tools are used to define the elements of a system quantitatively, describe the nature of a problem, and obtain the information for its solution.

### Types of Information that will be gathered

The gathering of information will result in the collection of different types of information:

#### 1. Opinions,

- about what the system does or ought to do
- about how good or bad the management is
- about the cause of the problems and so on

#### 2. Details about the operation of the system.

#### 3. Performance information, for example

- How long it takes to record each order
- How long to raise an order docket
- How frequently lists and totals are sent to the accounts department

#### 4. What information the System requires to operate, for example

- What has to be written on the various forms
- Where details of costs come from
- Where details of order numbers come from and so on.

**FACT FINDING METHOD - Interviews**

The interview is a useful tool for gathering data on activities, attitudes and opinions. Using structured and unstructured interview techniques, the investigator talks to employees, customers and management, carefully recording responses. Later the data gathered will be analyzed, categorized, compared, interpreted and quantified.

The investigator often poses the six classical questions usually asked by journalists to get the facts of a story: Who?, What?, Why?, When?, Where? and How?

**Who?**

This question attempts to identify people, roles, responsibilities. Who does this operation? Who is in charge? Who exhibits the best performance?

**What?**

This question is used to learn about the elements involved in a procedure or system. What activities are conducted in this department? Through what steps does the paperwork move? What kinds of programs and computers are used? What are the workers attitudes toward the tasks?

**Why?**

This question searches for the purpose of an operation and the reasons behind existing attitudes. Why is a job done in a particular way? Why is an operation done at all? Why do employees support or resist a specific change?

**When?**

This question investigates time elements. How much time does it take to do a given job? When is it finished? Where are disks and information stored?

**Where?**

This question is concerned with physical location. Where are computers and workstations located? Where are disks and information stored?

**How?**

This question uncovers the sequence of steps followed in doing a job. How is a routine done? How are activities performed? How does an employee learn his or her skill?

**Preparation for an Interview**

- The first task will be to list all the people they think they will want to talk to. (see the notes relating to User/Role Matrix in order to help you undertake this task)
- You must then find out about the duties and responsibilities of these people, and decide what sort of information they can provide, such as operating details, future plans or ideas for improvements.
- You must also go to other departments to see the system from other related peoples point of view.
- As the Analyst, you must then set up a schedule, fixing the dates and times for the first group of interviews. Ideally you would probably plan to carry out three or four interviews, then spend some time studying what has been learned from the answers before planning the next group of interviews.
- As your understanding of the system increases you will have a better idea of where to concentrate your attention with the next series of interviews.
- Almost certainly you will need to return to one or two key people several times to check on important points, and/or ask further questions
- An Analyst must plan each interview in some detail. You must go into the interview with a very good idea of the questions that you wish to ask and an idea of what ground you wish to cover during the interview.
- You really NEED to clear what you expects to learn from each interview.

Following each interview, An Analyst will return to their desk and write up their notes immediately while everything is fresh in your mind (i.e. minute the interview). You will add these minutes (dated and signed) to the project file, while also providing copies for relevant parties.

### Types of Interview

Interviews may be conducted in several ways. One of the most common techniques is the **face-to-face interview**.

In this approach, the analyst sets up an appointment with one or more individuals and obtains information through discussion and questioning.

A second less common and perhaps less productive method is the **telephone interview**. In this arrangement, the analyst places telephone calls to employees, managers, customers, vendors, and anyone else it is felt necessary. It is usually less expensive to conduct a telephone interview rather than a face-to-face discussion, since travel costs are eliminated and the time needed to wait for a suitable appointment would be eliminated.

It may not be possible to interview all the individuals involved in a system study. Therefore some form of selection and sampling procedure is necessary. Samples may be drawn from particular departments or employee classifications.

### How to conduct an interview

The systems analyst should first decide whether to use a structured or unstructured technique. Then set up appointments to give interviewees time to prepare, and tell them the purpose of the meeting. Be polite, tactful, and objective throughout the discussion.

### Structured Interviews

In a structured interview, prepared questions are asked in a specific sequence and given to all relevant parties to complete. A given amount of

time may be allotted for various blocks of questions. Structured interview advantages, disadvantages and characteristics include:

- Same Prepared sequence of questions for everybody
- Which means its Easier to evaluate results
- the Inflexible format means that additional questions relevant to the moment cannot be asked
- Questions limited to predefined areas, and as such the conversation cannot go off at a tangent to discuss related areas.
- Simpler and easier to conduct,
- More Time required to prepare structured questions, but Less time need to study/evaluate the answers.
- Less experienced interview required

### Unstructured Interviews

Unstructured interviews, while more flexible, make it difficult to draw conclusions, since interviewees may be asked different questions depending on how the conversation matter develops. Unstructured interview advantages, disadvantages and characteristics include:

- Greater flexibility to perhaps talk about areas not previously envisaged
- Wide-ranging questions
- Difficult to evaluate results
- Possibility of overlooking key questions
- Opportunity to redirect interview while questioning
- No fixed sequence of questions
- Experienced interviewer required

**Suggestions to follow when conducting an interview**

Here are some suggestions to follow when conducting an interview:

- Phrase questions so that they are unambiguous and easily understood
- Allow adequate time for the interviewee to respond
- Take written notes / record the responses
- Work through the interview systematically and unhurriedly
- Don't lead or bias the interviewees answers
- Ask broad questions first then narrow down to specifics
- Don't be argumentative. If you are adversarial, the interview will provide less information than if you are supportive and unthreatening.
- Provide an opportunity for the interviewee to make additional comments before you conclude the interview.

**Advantages and Disadvantages of the interview as a tool**

Interviews are sometimes the only way to obtain information about a system. However the analyst may spend many days or week on interviews. This increases the cost of a system study. Sometimes the analyst's personal bias may colour or distort the interview. Interviews based upon a poor sampling may generate inaccurate answers, which in turn lead to systems that are inadequate or which will malfunction.

Productive interviews require the use of a trained and experienced systems analyst. However, other fact finding techniques may be less costly and in the long run better than an interview.

**FACT FINDING METHOD - Review existing documentation**

Another tool of the systems investigator is the methodical study of the official documents used in a system. The Analyst will need to identify and obtain copies of

- policy documents and procedure manuals,
- personnel guides,
- bulletins,
- memos
- output reports,
- official forms
- input documents
- and other relevant similar documents.

They would then need to examine their functions, and follow their movement through the organisation often by producing a DOCUMENT FLOW DIAGRAM. From which they can then identify the processes contained in a Data Flow diagram

A review of this type gives an indication of whether the operations of a system reflect official goals, and it helps to pinpoint existing processes, weaknesses, and errors that an Analyst may have overlooked

**FACT FINDING METHOD - Questionnaires**

The use of questionnaires is another way to gather information about a system. Employees, customers, managers and others relevant to the Investigation may be asked to complete questionnaires designed to focus on general or specific problems. When an interview is not practical due to say the size of a work force, the Questionnaire is often an adequate substitute.

Short answer, True or False, fill-in, check-list, and multiple choice questions are valuable for eliciting specific data on a particular problem. These types of questionnaire are also easiest for respondents to complete, and therefore more likely to be answered.

Essay-type questions are often used to gather information of a more general nature or to make an assessment of attitudes and interests.

There is a draw back however, questionnaires may not draw out sufficient information. For example, a question such as 'Is time card Form 23 adequate for your needs ?' may not elicit the kind of information that will help improve the form. It does not allow the user to express dissatisfaction with specific elements on the form. A better approach is to ask the user to modify a form or mark specific changes.

#### How to develop and Distribute the Questionnaire

First decide what kind of information you want to gather. You can prepare a checklist to assist in designing the questionnaire so that you will not overlook any items.

The checklist would also help you place questions in the proper sequence. An example of a checklist could be a checklist such as the one below which assists in preparing the final questionnaire:

- Choose the type of questions that will provoke the answers about your specific problem.
  - fill in,
  - multiple choice
  - True/false , etc.
- You will need to Prepare a draft of the questionnaire . State the questions clearly , in the best sequence, and provide adequate space for the answers. Eliminate any unnecessary or confusing questions.
- Make changes and modify the draft as necessary.
- Ask yourself Do the Questions allow the respondent to answer easily and clearly ?
- Is the Name and contact details of the Analyst to return to or contact in the event of a query present ?
- Are brief details of why the Questionnaire is being issued available ?
- Are details of how to return the document present also ?
- Is there a Date to return questionnaire by ?

- Is there a Document Name / Code for this form ?
- Is Number of pages in the document made known ?
- How is the form routed in department ?
- Are additional copies needed ?
- Have you added an Open-ended question to solicit comments on form improvement at the end of the questions
- Is there a way if identifying the Name of respondent ?
- Will you be able to identify the Date questionnaire was completed ?

Essentially its a matter of common sense to ensure that the questionnaire can be completed, returned, filed and then later used as part of the investigation process.

#### Planning how to use the Replies in order to aid your investigation

The next step is to plan the best way to gather the facts. An essential element is the scoring and answer evaluation. Be sure the questionnaire can be easily scored.

Avoid check boxes buried in the middle of paragraphs or questions requiring answers that cannot be quantified or categorised into some form of meaningful data.

If you distribute a large number of questionnaires, you should perhaps have them scored by machine (like an exam multiple choice answer sheet).

Before release, Test the questionnaire on a group of subjects. Ask them to complete the questionnaire and mark questions that are confusing or that cannot be answered precisely.

Make any needed modifications in the draft. Proofread the final document carefully before it is printed and distributed.

#### FACT FINDING METHOD - Direct Observation

An alternative means of gathering data is by direct observation. this technique enables the

systems analyst to obtain additional knowledge somewhat more objectively than by conducting personal interviews. Both viewpoints are, of course, helpful for a complete understanding of the system.

The analyst attempts to answer the same six questions asked in interviews when making direct observations, keeping careful notes and records. They personally observe all aspects of the system, watching as people perform their tasks; noting such details as what they do, where they do it, and how long it takes; examining forms, documents, equipment, and manuals; and observing the physical flow of movement as personnel go from one workstation to another.

**Random Clock Observation**

The random clock observation technique is a common application of this method. At random times throughout the day the analyst observes and records work activities. This technique permits sampling the activities of many days or weeks and condensing them into a short, precise form for further study.

Selecting subjects for observation is an important consideration in obtaining accurate results. Analysts frequently use the same sampling techniques for selecting individuals to be observed as those to be interviewed. As with the face-to-face interview, direct observation can be an expensive means of collecting data.

**Advantages and Disadvantages of Direct Observation**

While direct observation can provide a first hand opportunity to see a system in action, it can be expensive and lead to erroneous conclusions. Direct observation is sometimes the only way to monitor the behaviour of individuals in a system. however, people who are the subject of a study may behave differently from those who are not (see the Hawthorne effect). Therefore, the analyst must be sure that observations are conducted unobtrusively so that fact finding is not biased in any way.

**The Hawthorne Effect**

The results of a study done during the 1920's illustrate the complexity of making accurate observations. A Psychologist called Elton Mayo

was studying a group of assemblers in a factory in Hawthorne Chicago with the goal of increasing productivity.

He performed a series of tests in which he manipulated elements in the working environment - changing lighting levels, changing personnel groups, altering rest periods etc..

The final evaluation showed quite unexpected results. Mayo had anticipated that productivity would go up as conditions improved and down as they declined.

What actually happened was that the productivity of the group monitored went up regardless of what changes were made. Mayo concluded that when people know they are being studied affects peoples actions and output.

This phenomenon is known as the Hawthorne Effect. You should be aware of the psychological implications of this reaction when considering human elements in system design.

**FACT FINDING METHOD - Audits**

An Audit of records, ledgers, files, databases, memos and other pieces of information can uncover a considerable amount of information about the elements of a system and how they interrelate.

This is often done by requesting personnel to save or prepare a copy of all working documents, computer disks, notes, or records generated over a given period, say several days or weeks. Special provisions must often be made to gather information from elements such as communications circuits and display terminals.

This information is analyzed and used in several ways; for example, to study data flow patterns or to rate the efficiency, value, or weaknesses of forms. A typical breakdown for a secretarial services worker might be as follows:

- Letters typed 6
- Reports corrected 2
- Memos typed 8
- Computer print outs generated 9

- Documents proof-read 25
- Documents filed 11

This shows the number and types of documents prepared or handled by an employee in one day.

Such information serves as an excellent guide for the system designer when selecting computers and communications equipment for a particular workstation.

**FACT FINDING METHOD - Time and Motion**

Another method of fact finding, dating back to the early efforts of 'efficiency experts', is the time and motion study. This technique attempts to document and accurately measure the clock times and physical motions involved in performing a given task. Stopwatches and cameras are frequently used. Slow motion and single-frame projections of recorded motions are valuable for analyzing the steps involved in the various operations.

**FACT FINDING METHOD - Cost Analysis**

Cost analysis is an examination of the elements of a system based on the cost of processing a given unit or work. Discrete tasks such as keyboarding a letter, processing a phone inquiry, or making a database inquiry are analyzed and measured to establish quantitative standards for comparison and study. This technique involves breaking a procedure down into its fundamental operations and determining the costs for each operation. The diagram below shows the cost breakdown of preparing a typical one page letter.

Dictation	14 min	
Keyboarding	13 min	
Proofing	5 min	
Computer printout	6 min	
Preparing envelope	2 min	
<hr/>		
	40 min @ £ 6.00/hr =£	4.00
	Stationery	0.46

Postage	0.25
Supplies	0.20
<hr/>	
TOTAL	£ 4.91

Later, the costs for various procedures are calculated by adding the costs of the individual operations involved. Cost predictions can be made from these figures and then compared to the actual costs incurred.

**FACT FINDING METHOD - Statistical Analysis**

Other types of information describing a system can be gathered using statistical analysis techniques and a computer. This type of quantitative data provides an excellent way to report on the operation and functioning of a system.

Statistical analysis might be applied to measure time delays encountered on a telephone switchboard at various times throughout the day. The analyst might place periodic calls and

record the time that elapses before each call is processed. The quality and accuracy of reports produced by the word processing department might be monitored by a careful review of a sample selected at random from the day's output.

Analysts routinely keep records on the speed and quality of the service delivered by a system. They sample such things as peak loads, delivery delays and service bottlenecks. Comparing these figures with those of other periods enables them to monitor the performance of a system over various intervals of time.

They use statistical analysis to keep track of average service call backlogs, customer waiting time at counters, backorder delays, or other similar problem areas.

Other statistical techniques such as correlation's, chi-square and regression analysis help uncover relationships not readily apparent from a simple examination of the data.

**FACT FINDING METHOD - Sampling Methods**

Sampling techniques are widely used in systems analysis to learn the characteristics of a population without examining each individual case. Sampling is used to survey public opinion and employee attitudes, to check the quality of manufactured goods, and to gather information on in-place systems.

Statisticians have developed several reliable ways of selecting samples that are truly representative of a larger group. A population comprises all the cases under study, while a sample refers to a selected number of units or elements that is representative of the study group.

The size of the sample need not be large to produce accurate results; rather, the sample must be representative of the population being studied. The information gained is assumed to be true of the entire population. Sampling is used where the population under study is very large and it would be too expensive or time consuming to examine each individual case.

#### **Random Sampling**

In random sampling, all members of a population have an equal chance of being selected for the sample. This method can be used in any situation where all the elements in a group (or numbers representing the elements) are available for selection at the same time.

#### **Systematic Sampling**

Here samples are selected from a group according to an organised

pattern; for example, every fifth or tenth phone call. Usually the first element in the sample is selected in a random manner, the rest according to the systematic pattern. If the pattern is every fifth call and the first element selected at random was 9, then the next element would be 14, the third 19 and so on.

#### **Stratified Sampling**

This type of sampling is used to obtain a more accurate representation of each subgroup in a population than random sampling can provide. Suppose a survey was planned of all employees of a firm and it was important that each department be represented in the sample. The elements in the sample could be selected at random, but the analyst could not be absolutely sure that each department was represented.

But if all the employees (the population) were first divided into departments (stratified) and a few selected at random from each stratum, the analyst could be sure that each group was represented in the final sample.

In this instance a smaller number of samples would produce more precise and accurate representation than would random sampling. This method has even more value when the cost for selecting and examining each sample is an important factor.

#### **Cluster Sampling**

Also called 'area sampling' is used to cover a large geographic area. The population is first divided into small areas or groups. Then a certain number of these groups are selected by systematic or random sampling methods.

The final sample is chosen from the selected groups by systematic or random sampling. Cluster sampling is often used for marketing surveys. It is less accurate than other methods, but may be more convenient and economical.

#### **Quota Sampling**

Is structured so that a specified number of representatives from each group are included in the final sample. For example, the analyst may be asked to interview five members from the marketing department, two from the communications department, and two from the advertising department.

**Practical Class Activity - Preparing for an Interview**

1. So that any essential information not readily apparent from the Balloons UK scenario can be obtained, Prepare a sequence of Questions for use in an Interview with

- a) The owner of the Balloons U.K.

**Practical Class Activity - Preparing a Questionnaire**

2. So that any essential information not readily apparent from the Balloons UK scenario can be obtained, Prepare a sequence of Questions for use in a Questionnaire to be sent to

- a) The Pilot of Balloons U.K.
- b) A Person dealing with Customers Enquiries
- c) A Person dealing with Customer Bookings and/or Payments

3: What preparation should a systems analyst make before an interview?

**Practical Class Activity -**

1) An office makes considerable use of a standard microcomputer file management package written by a reputable software house.

- a) Why might the office manager be reluctant to change to a new package produced by a rival software house although

it offers far more powerful features? (3 marks)

- b) Identify the strengths and weaknesses of interviewing as a technique for determining user requirements. 3 marks)

**Practical Class Activity -**

2) An enterprising nurseryman runs a successful business selling a wide range of bedding plants, trees, flowering shrubs, and seeds for both flowers and vegetables. He also offers a consultancy service to provide advice and plans for the landscaping and layout of gardens. The nursery occupies a site of approximately two thousand square metres and has about ten large greenhouses and an office. The site holds substantial stock and a security system is in operation. Customers visiting the site are able to park their vehicles nearby. The nurseryman approaches the computer science teacher at the local school to advise him how a microcomputer system might support and enhance his business activities.

- a) Assuming that you were the teacher, describe how you would tackle this task. Indicate any assumptions that you would make and explain how you would gather any additional information that was needed. Supposing that a microcomputer system was recommended, suggest a viable configuration and list the possible benefits to the nurseryman and his customers. (20 marks)

**Practical Class Activity -**

3) The Oldways Bus Company operates 200 buses around a town. There are about 30 different routes, and the bus timetables vary according to school terms, national holidays and special events.

Oldways' staff use the bus station as their base. The offices, fuel pumps and the departments of maintenance, cleaning and repair are located within the station.

Payment for the bus service comes in a number of different ways. Most passengers pay in cash on the bus. Some buy monthly travel cards in the bus station. Children's travel to and from school is paid for annually by the Education Department.

Oldways is a successful company, but at present it does not use computers. The management believe that it could significantly increase efficiency if it made sensible use of new technology. Some of the areas where such technology might help are

- the cashing-in procedure at the end of each driver shift; allocation of drivers to shifts;
- calculation of wages;
- administration of the fuel log, which currently uses a book at the fuel pumps;

- bus maintenance and repair schedules, including stock control for parts;
- general office tasks.

The Oldways management has asked for a systems analyst to submit proposals for computerisation.

a) One of the systems analyst's first tasks is to conduct a fact-finding exercise, in which she collects documents, items of data and opinions. Discuss

- i) the information which should be collected;
- ii) the methods which could be adopted;
- iii) the problems which might be encountered.

(15 marks)

b) The systems analyst must suggest those aspects of the company's operations which should be automated, and indicate how far the automation should be taken in each case.

What criteria should she use? (5 marks)