Overview

Unit 4 is organized in eight sections. This overview and introduction are followed by a section on strategies used in the IS analysis where you will learn about modern structured analysis, information engineering, rapid application development, joint application development, business process reengineering and object-oriented analysis. In section 3, the activities involved in the first three phases of the FAST methodology — survey, study, definition — will be discussed. Section 4 covers the aims of fact-finding and information gathering. In section 5, different methods of fact-finding and information gathering will be discussed. More specifically, you will learn about sampling existing documentation, research and site visit, observation, questionnaires, interviews, rapid applications development, and joint application development (JAD). Section 6 is devoted to the role of documentation in fact-finding and information gathering. In section 7 you will learn about the importance of ethics in fact-finding. Finally, the last section contains a summary of Unit 4, a revisit of the Orient-Pacific Insurance Corporation, references, and a glossary of terms.
Introduction

Systems analysis relates to the first three stages of the FAST methodology, which was discussed in Unit 2. It involves the survey of the system, the study of the existing system, and the definition of business requirements of the new system. The objective of systems analysis is to specify requirements of an information system in terms of data, processes, interfaces, and geography. System analysis is also called logical design.

Documentation, both in paper and electronic form, is an important part of systems analysis. A repository is a system or place where we keep documentation related to a project.

On the basis of the outcomes of system analysis, you consider a range of possible physical options for implementing a proposed system. You make accurate cost/benefit studies and develop reliable project plans, because all the necessary information is available. Management determines which plan should be adopted. You then create a systems architecture, a broad information technology plan within which detailed design is done. You determine this architecture by evaluating and comparing different options for physically implementing a system that meets the requirements. When a decision is made, you commence the detailed systems design and development of that option.

Reading

‘What is systems analysis?’ pp. 165–167 in your text. This reading relates to Objective 1 of this unit. It gives you a classical definition of systems, systems analysis and systems synthesis. A contemporary definition of the phases of systems development life cycle and the role of the repository are also discussed.
Objectives

By the end of Unit 4, you should be able to:

1. Define IS analysis.
2. Describe a number of important IS analysis strategies, including modern structured analysis, information engineering, rapid application development, joint application development, business process reengineering and object-oriented analysis.
3. Describe the activities involved in each of the three phases associated with IS analysis: survey, study, and definition.
4. Discuss the role of fact-finding and information gathering in IS analysis.
5. Describe different fact-finding techniques.
6. Discuss the role of documentation in fact-finding and information gathering.
7. Describe the role of ethics in the fact-finding process.
IS analysis strategies

There are several strategies and techniques that can be used in systems analysis. Each of these strategies is amenable to certain types of application. In general, however, a combination of these strategies is used to complement one another.

Modern structured analysis

In systems analysis, you need to fully understand user requirements long before the construction of a new system begins. Items ‘left to be resolved later’ pose significant threats to any system and can completely invalidate assumptions on which a system is built. A structured analysis is a process-centred method that attempts to construct models of business requirements of a system. A model is a representation of reality. In structured system analysis we use data flow diagrams (DFD), also called process models, to show the processes in a system along with their inputs, outputs, and information flows. It is important to note that DFDs attempt to model system processes the way they are viewed by the stakeholders (logical design), independent of the way they are physically organized (physical design).

Information engineering

A new thinking in management relates to the treatment of information as a corporate resource (in addition to capital and people). Information engineering strategy, popularized by James Martin (1989) is based on this concept. Because the idea is to manage information as a corporate resource, information engineering is a data-centred strategy that is applied to the whole organization. Unlike structured analysis, which is process-centred, information engineering is a data-centred strategy where we try to study and define data through data models. Details of data modelling will be provided in Unit 6.

Rapid application development (RAD)

A prototype is a small-scale, representative, working model of a system. Prototyping is an iterative development strategy that translates the requirements into a working system that is continually revised. Rapid application development is a strategy that uses prototyping to decrease the development life cycle. It emerged as a result of the greater emphasis that companies have started to place on speeding up their processes in the 1980s, and the availability of advanced computer-based tools that allowed automation of various aspects of the development cycle.

It is estimated that RAD can cut down the cycle time by as much as 75%, thus resulting in systems that are less expensive. It is important, however, to understand that RAD cannot entirely replace more ‘formal’ strategies, such as structured analysis and information engineering. RAD is applicable only
to certain classes of systems that need to be developed quickly. We still need to rely on model-driven strategies to develop systems that rely on business models. It should also be recognized that RAD must be deployed gradually and through pilots. For RAD to be successful, it is not enough to have the right CASE tools. Martin (1991) identifies four ‘pillars,’ on which the success of RAD depends. These are: tools, such as reuse templates, code generators, and CASE repository; people, who need to be trained; management, who must provide support; and a methodology, that outlines the proper tasks that need to be performed in proper order.

**Joint application development (JAD)**

**Joint application development**, also called joint application design, is a strategy that emphasises participative development among all the system’s stakeholders. Usually a systems analyst, who is skilled in this strategy, acts as a facilitator among the stakeholders who meet to specify or review system requirements. The meetings are usually conducted in a structured manner where CASE tools and even group decision support systems are used to illicit information and document systems requirements.

**Business process reengineering (BPR)**

As discussed in Unit 1, many companies have started using systems analysis and design methods and techniques to evaluate and subsequently improve business processes. The first stage of a BPR project entails the examination of business processes with a view to identifying bottlenecks and opportunities for elimination of ineffective processes. The next stage is to see how information technology can be applied to the streamlined business processes.

If we take users’ requests for automating certain business processes at face value, we may miss the opportunity to find out whether automation would result in a radically different way of doing business. BPR allows rethinking of the whole processes with the objective of achieving significant improvements in products and services offered by the company. You should note that the concept of BPR is related to TQM. Whereas the focus of TQM is on continuous and incremental improvements of business processes, BPR advocates radical changes in business processes. The objectives of both TQM and BPR are improvement of product and service quality and enhancement of customer satisfaction.

**Object-oriented analysis**

In the past, development strategies treated data and processes separately. Object-oriented technologies were developed to synchronize data and process models. The idea is to incorporate data and processes into objects, which can be used in the development of systems. In essence, a company relies on a library of reusable objects, as well as new objects to develop new applications. **Object-oriented analysis** refers to the study of the existing objects to see which ones can be reused and what other objects need to be developed in order to assemble new applications.
Rapid applications development (RAD) can be utilised within the prototyping and development stages of the systems development life-cycle. It, however, may or may not be used in the traditional systems development approach. In cases where RAD can be applied — support for end-user computing and less mission-critical applications — higher productivity can be attained with the possibility of some trade-off in terms of performance and flexibility.

Joint applications development (JAD) can be a supplemental or replacement technique for traditional methods in cases where improved communication and interaction among the systems users, developers and owners are desired.

Business process reengineering (BPR) is typically associated with review and re-analysis of existing systems with a view for radical improvements. The concepts presented within BPR can be incorporated within the traditional process analysis stage as well. Similarly, information engineering (IE) and object oriented analysis (OOA) techniques can be employed to bring greater robustness to traditional analysis if data-orientation (in case of IE) or object-oriented structuring (in case of OOA) is desired.

It should be noted that none of the techniques or approaches would necessarily supplant the structured analysis approach; they rather support the process, emphasising particular aspect of the analysis cycle. A systems analyst needs to be familiar with all the techniques so as to select an appropriate mix for a particular system.

**Reading**

‘Systems analysis approaches’ pp. 167–174 in your text. This reading relates to Objective 2 of this unit.
Phases in IS analysis

The FAST methodology presented in your text integrates all the above analysis strategies. In this section, we will briefly describe the activities involved in the first three phases of FAST.

Preliminary investigation phase

The objective of this phase is to decide whether the project is worthwhile, and if yes, to determine the project budget, participants and schedule. The following are the activities in the Survey phase:

- **Survey problems and opportunities** in order to produce a **problem statement** (which includes a list of problems and opportunities).

- **Negotiate project scope** in order to define the boundaries of the project and to produce a **scope statement**. Such a statement corresponds to the scope of the four focuses (data, processes, interfaces, geography) of the building blocks of this phase.

- **Plan the project** in order to decide whether or not the project is worth undertaking. If it is decided to go ahead with the project then we need to devise a schedule of the project and its resource requirements, including personnel. The deliverable of this activity is a project plan.

- **Present the project** to appropriate steering committee to seek approval and resources for the project. The deliverable of this activity, called **project charter**, is the consolidation of the problem statement, scope statement and project plan.

Problem analysis phase

This phase relates to the study of the current system in order to decide whether it is worthwhile building a new system. The following are the activities in this phase:

- **Model the current system** in order to better understand the current system’s data, processes, interfaces, and geography. The deliverables of this activity are **system models**, which help understanding the scope of the system by focusing on only important parts of the system. System models include data models, process models, interface models, and geographic model.

- **Analyse business processes** in order to determine whether a process is necessary or not. This activity is required only if we are undertaking a BPR project.

- **Analyse problems and opportunities** in order to gain a better understanding of the problems and opportunities outlined in the survey phase. The outcome of this activity, called cause-effect analysis, is a document that outlines the problems or opportunities, along with their causes and effects.
• Establish system improvement objectives and constraints in order to set performance measures. A system success is measured in terms of the degree to which it has achieved its objectives. Therefore, the deliverable of this activity is system improvement objectives and constraints, which includes statements that relate to performance measurement.

• Modify project scope and plan in order to take into account the estimates from the survey phase and to re-evaluate the project scope.

• Present findings and recommendations in order to heighten the staff’s understanding of the project and its goals. The deliverable of this activity, called detailed study finding, included a feasibility update and revised project plan.

Requirements analysis phase

Often analysts jump the gun and start focusing on finding technical solution to the problems or opportunities identified in the previous phase, instead of trying to really understand the users’ requirements for the new systems. In recent years, however, it has become increasingly evident that the requirements of the users, also called logical design, need to be fully understood before deciding on any technical solution. The following activities are usually involved in such process:

• Outline business requirements to identify the business requirements. The outcome of this activity is a requirements statement that includes the system’s objectives, along with the inputs, processes and outputs associated with the system.

• Model business system requirements to allow verification of the requirements by users and their subsequent transformation into technical solutions. Similar to modelling the current system, modelling business requirements of new systems include data, process, interface and geographic (distribution) models.

• Build discovery prototypes to help analysts discover business requirements. It is usually helpful to build interface prototypes to allow users to see mock-ups of selected screen and outputs of the system.

• Prioritize business requirements with the objective of establishing priorities among business requirements of the systems. Prioritizing business requirements is particularly useful in situation where a project is behind schedule or over budget; it allows the analysts and the system owners to jointly decide what parts of the systems need to be completed before the others.

• Modify the project plan and scope in order to account for the changes in the project plan caused by changes in business requirements. As you may have noticed so far, many activities involved in systems analysis are iterative in nature; we modify and revise the project plan and the scope periodically with the objective of better understanding the users’ requirements.
Reading

‘FAST analysis strategies’ pp. 174–203 in your text. This reading relates to Objective 3 of this unit. Make sure that for each of the activities you understand the steps involved, the roles that different stakeholders play, and the inputs needed and outputs expected.

Self-test 4.1

1. What is the relationship between systems analysis and systems synthesis?

2. FAST is said to be a ‘repository-based’ methodology. Why?

3. How is joint application development (JAD) different from rapid application development (RAD)?

4. Why do companies nowadays incorporate JAD in their systems development projects?

5. What is business process re-engineering (BPR)?

6. What are the features of object-oriented analysis (OOA)?
Aims of fact-finding and information gathering

As you saw in Unit 2, even though fact-finding and information gathering are part of the cross life cycle activities, they are particularly important during the first three phases discussed in this unit. Information gathering is of prime importance to the survey, study and definition phases because through the activities in these initial phases we try to build an understanding of a business problem to be solved, and the nature and content of business operations themselves. Obviously, effective information gathering is critical to the success of these activities.

The seven representative, commonly used techniques for gathering information from people are

(1) sampling of existing documentation
(2) research and site visit
(3) observation
(4) questionnaires
(5) interviews
(6) rapid application development, and
(7) joint application development.

They are applicable in many other contexts besides systems analysis and design (e.g. BPR).

It is not easy to use these techniques effectively. You need particular skills to be an effective gatherer of information. The success of a systems development project often depends on the relevance and accuracy of the information gathered in the first three activities of the systems development life cycle. Mastery of these skills and techniques is vital to the systems analyst.

There are six basic questions to be answered in any information gathering exercise. These are best summarized in a verse from Kipling’s *The Elephant’s Child*:

I keep six honest serving men
(They taught me all I knew);
Their names are What and Why and When
And How and Where and Who.

You are now gathering information about ‘information gathering’! So first, you address the ‘What and Why and When’. 
Importance of information gathering

Why do you gather information? Because you need it. You cannot develop an understanding of business problems and business operations by simply drawing a model of a system, or writing user requirements from the isolation of an information systems department. Systems analysts gain understanding from reviewing an organization itself; talking to people who work in it; examining documents they use; observing the work they do and the environment in which they work. On the basis of this understanding, systems analysts must identify information requirements of business functions and, thereby, set objectives for a new information system.

Before gathering information, you must decide what you are looking for. An idea of the types of information that exist and might be important is a good starting point. Also, an idea of typical business documents is useful.

Systems analysts must determine what information is relevant and important to a particular information system. They should also know how much is enough and when to stop. Quantities of information to be collected, evaluated, managed and communicated will vary from project to project, but are usually large. To be able to understand a business problem and business operations sufficiently to develop a new information system, you have to make a decision for which there are no optimum or standard measures. Only experience in gathering information and developing systems will prepare you to make this judgement.

There is more to information gathering than defining and documenting business processes. You can too easily focus on the work itself — after all, this is what is done and can easily be observed. However, you have to view information systems in a wider context. Information about an organization, about its people and its work environment is equally important. You align objectives, constraints and requirements of information systems with those of an organization, its people and their working environment. To be successful, the information systems you develop must match the organization culture, the skills of people and the work environment, not just replicate business processes.

Information about the ‘size’ of a system is vital. You determine the number and content of transactions to be processed, the amount of data to be stored and the frequency and content of output reports. You also establish performance requirements — what response time is acceptable and how quickly must information be turned around?

Finally, when will the system be used? Information systems may take several years to develop and then be used for a further five or even ten years. So you have to extrapolate all the information you have gathered into the future. What will the organization be like and what will its information requirements be in five or ten years time?

Reading

‘The process of requirements discovery’ pp. 218–223 in your text.
This reading relates to Objective 4 of this unit.
Methods of fact-finding and information gathering

There are likely to be several sources of information about a particular business operation. Each source yields a different perspective of business problems and processes. No one source on its own is likely to provide all the information systems analysts require. You require a knowledge of the common sources of information and a strategy for consulting those sources.

Sampling existing documentation

Most of the techniques we describe in this unit concentrate on extracting information from people. Before consulting people, however, systems analysts must prepare by locating and consulting information already existing in written form. Find out as much as possible before involving people, which is an expensive and time-consuming task.

You should identify if needed information is documented within the organization that you are analysing. Existing documentation includes forms or documents that are part of a current system (for example, order forms, invoices, reports). It also includes written statements of procedures, policies or rules as well as applicable laws and regulations. If an existing system is automated, there may be some systems documentation (for example, a system manual, a user manual, an operations manual) or portions of a data dictionary or even data flow diagrams and data access diagrams. Other possible sources are annual reports and brochures (which often contain summaries of an organization’s goals, objectives, principal activities and functions) and organization charts and job descriptions.

Research and site visit

You should also identify if needed information is documented externally to the organization. Business and industry oriented publications describe general business climates and trends in the commercial world. These sources together with books and journals on information systems or particular application areas (for example, accounting, financial management, inventory control) provide information about different application systems, the state of the art in hardware and software and commercially available software packages. The Internet is also an excellent source for this type of information.

Observation

Both observation and work sampling are information gathering techniques that involve the job or business process itself. Observation is just that — watching what actually happens. Work sampling involves selecting and studying a representative sample of a process.
Observation is a natural and direct way to follow flow and transformation of information through an existing system. Observation is often used to confirm or correct information gathered by other techniques.

Work sampling involves either

- tracing representative transactions or documents through an existing information system; or

- polling transactions and documents that pass through a particular point in an existing information system.

These methods produce limited and specific results. However, this can be valuable in confirming or correcting information gathered by other techniques.

**Questionnaires**

A questionnaire is a list of questions to which written answers are requested. Questionnaires can be used to supplement interviews. They are also used instead of interviews when the latter are impractical, for example when a large number of people are to be questioned, when people to be questioned are geographically spread, when there is a lack of interviewers or when there is insufficient time to schedule interviews.

A questionnaire is shorter and more highly structured than an interview. Answers are usually yes/no, true/false or multiple choice. You must design questionnaires with great care if results are to be valid. Questions must be stated clearly and be self-explanatory. ‘Don’t Know’ or ‘No Opinion’ choices should be used to encourage respondents to ignore questions that they do not feel competent to answer.

When questionnaires are used, you must allow sufficient time for designing the questionnaire, identifying respondents, distributing copies of questionnaire, receiving answers and tabulating and interpreting results. Seek advice and assistance from a statistician in preparing questions, in validating samples and responses and in interpreting results.

**Interviews**

An interview is a face-to-face conversation in which questions are asked in order to gather information. There are four parts to the interviewing process:

1. **Identifying information sources**

Identifying who to interview is one of the most difficult aspects of interviewing. You analyse information gathered from written sources to determine what information appears to be missing and what information needs to be confirmed. You then use knowledge of the responsibilities and duties of job positions within an organization to identify individuals who can supply or confirm the necessary information. After that, you plan a schedule of interviews. A top/down, iterative interviewing schedule is
usually effective. A schedule should ideally allow time to plan one interview on the basis of information gathered at previous interviews. A similar process is used to schedule interviews with people external to an organization.

2 Preparing for an interview

You should plan each interview to last no longer than one hour. If more time is required to cover all topics, you should arrange more than one session. Topics should be covered in a logical sequence. Each topic should proceed from ‘open’ questions, which allow free expression of ideas and opinions, to ‘closed’ questions, which have ‘yes’ or ‘no’ answers to confirm details. Examples of open questions are:

- ‘Describe your general duties.’
- ‘What happens to a Sales Order?’

Examples of closed questions are:

- ‘Do you complete Sales Orders?’
- ‘Do you send Sales Orders to the warehouse?’

You should note two very important points — inform interview subjects of what is to be covered in advance and allow them time to prepare.

3 Conducting an interview

Your textbook recommends one-on-one interviews and that note taking should be kept to a minimum. However, most interviews are conducted by two interviewers — one to ask questions and one to take notes and provide summaries at appropriate points in the interview. You should request the permission to take notes at the start of an interview.

Courtesy, tact and a businesslike attitude are effective approaches to interviewing. Follow a prepared plan of questions but be prepared to follow unexpected responses or new information. Always remember to return to planned questions. Make notes of main points in answers. Record attitudes and opinions as well as facts. Listen to the tone of voice and watch facial expressions and body language. These enable you to interpret the responses and to sense what may be being hidden. Confirm your understanding by providing brief summaries at the end of each topic and at the end of an interview. Always offer thanks for an interview subject’s time, assistance and co-operation.

4 Following up an interview

As soon as possible, review your interview notes. Transcribe them if necessary for legibility or if standard interview forms are used. Add impressions or observations that you were unable to record or that occur to you on reflection after an interview. Send a written summary to the interview subject. This confirms the main points of discussion and acts as a matter of record.

In addition to the above five traditional methods of fact finding, in recent years RAD and JAD have become popular ways of gathering information about the system under study. Descriptions of these two methods are provided in the previous section.
Reading

‘Requirements discovery methods’, pp. 223–243 in your text. This reading relates to Objective 5 of this unit.
Documentation in fact-finding and information gathering

You should note a key point of methods discussed in the previous topic — information gathered is documented. Notes are taken during interviews, questionnaires provide self-documentation and records are kept of results of observation or sampling. However, this is the working documentation containing raw data. You evaluate and analyse this raw data to provide information. It is this process which is the actual ‘systems analysis.’ Information gathering and systems analysis are iterative, related activities. Even in developing small systems, a large amount of information will be gathered. Some of this information is irrelevant. Some is duplicated from several sources. Since systems development is an iterative process, the information gathered grows as each phase progresses. Some means of evaluating and documenting this information is essential.

Evaluating information

Whatever its source and whatever methods were used to gather it, you must always evaluate the information. You should answer the following questions:

- Is the information comprehended by both users and systems developers?
- How is the information related to the system being studied and to other information that has been gathered?
- To what extent is the information reinforced or contradicted by other information?
- Is the information a statement of fact or an opinion, impression or feeling?
- Is the information relevant? And, if so, to what aspect of development is it relevant?
- Is the information reliable? Or is it partially true or partially complete?
- Are the information sources competent and credible?

In evaluating information, formal and objective methods or informal and subjective methods may be used. In general, certain checks and balances are desirable:

- More than one method of gathering information should be used.
- Information should be corroborated by observation.
- Written and oral sources of information should be cross-checked with each other.

As you evaluate the information, you should document your understanding in a system model.
Systems modelling

A major documentation tool in systems analysis is systems modelling. A particular advantage of system modelling is that it facilitates interaction and communication with users and management. Users interact with and test out a model of a ‘real’ system. They identify problems which can be easily corrected in the model before they test it again. This continues until they are satisfied that all the requirements are met.

In systems analysis, you need to fully understand user requirements long before the construction of a new system begins. Items ‘left to be resolved later’ pose significant threats to any system and can completely invalidate assumptions on which a system is built. A structured analysis method attempts to construct meaningful models without involving a great deal of clerical effort. In this way, users can check out a system and suggest changes which can be quickly incorporated without reworking volumes of documentation.

The idea of a system model is to uncover and specify essential data and functions in a way that is independent of how the system might be implemented. Systems modelling makes this distinction very clear by defining a conceptual (or logical) model of data and functions required of an information system. This conceptual model can be implemented in any range of physical possibilities, each with its own costs and benefits.

Conceptual modelling

Before you examine conceptual modelling, consider an analogy. Your right arm is a subsystem of your body. You can partition it into sets of muscles that work together to produce movement. Each set of muscles could then be examined to isolate individual muscles that are components of that set. You could describe each of these, in turn, in terms of what it is connected to and how it works internally. This is a functional analysis of your right arm. A complementary analysis would be to look at what bones your arm contained and how these bones are related to one another. This is a structural analysis of your right arm. Bones give an overall structure to your arm, while muscles act on that structure to produce movement. Different sets of muscles operate on the same bones to produce different movements. You need both structural and functional analysis to provide a clear understanding of your arm.

Business processes describe the function of an information system. What gives structure to an information system? Data provide the structure. In information systems, there are different processes that act on the same data to produce different results. A particular data store may be used by a range of processes. Functional analysis examines processes that need to be performed and relationships between processes and data. Data (structural) analysis examines data that need to be stored and relationships that exist between that data. Functional and data analysis together comprise conceptual modelling. While these two views are very different, they are complementary. Just as the muscles and bones of your arm work together in harmony to make movements you command, so data and function support each other to achieve an organization’s information objectives.
Two most important components of a conceptual model are those that represent data and function. **Data structure diagrams (DSDs)** represent all entities or objects of interest to an organization (for example, customers, products) and relationships between these entities that are established by transactions (for example, a sale relating a customer to a product with additional details like quantity sold). DSDs will be discussed in more detail in Unit 6.

**Data flow diagrams (DFDs)** represent functions that are performed and data that is required to carry out those functions (for example, a sales function receives an order and goes through a number of steps checking customer and product entities, making calculations and generating various data flows like invoice and picking slips, and updating data stores). Both are equally necessary and are developed at the same time. As more facts become known, both are reformulated to reflect current understanding of a system. DFDs will be discussed in more detail in Unit 5.

There are two other components of a conceptual model. Firstly, a **data dictionary** stores details of data entities, flows and elements, eventually describing everything there is to be known about data in a system. Every flow on a Data Flow Diagram has an entry in the Data Dictionary. Every entity (or data store) has an entry. Secondly, **process descriptions** (sometimes called process logic specifications or transform descriptions) document the rules by which functions or processes are performed. Every elementary process on a data flow diagram has a process description.

These four components are documentation that you develop and maintain in the process of systems analysis. They are highly integrated.

This documentation is also non-redundant in nature. There is a place, and only one place, for everything you want to say about a system. The four components document different, separate aspects of an information system.

**Physical modelling**

You develop a conceptual model by examining the way an industry works, similar systems that operate elsewhere, objectives of an organization, information and business needs of users and details of current information systems (if there are any). This conceptual model is then used to develop a set of alternative physical implementations. You can accurately assess the impact of each possibility as the conceptual model defines the system clearly.

In your analysis work try to keep physical design of a system right out of consideration. Your task is to analyse (discover, create and formulate) data and functional requirements of an information system. You will find this difficult as:

- users, managers and colleagues tend to think in a fairly physically way — you yourself probably do, as humans are more comfortable with physical things rather than abstract concepts.

- you may limit your thinking about the requirements of a system because you assume that physical constraints will make some things difficult or
impossible. In fact you will find that constraints are often removed in the presence of a novel or particularly effective idea.

• your experience in information technology may dictate your analysis approach (‘if I can’t program it, I’m not going to recognize it’).

One way of avoiding these difficulties is to treat all physical ideas as examples of what might be possible rather than as the only possibilities. Try to keep your physical options open until the conceptual model is complete.

One of the reasons why computing systems have a track record of being delivered late and over budget is that estimates in the Investigation Phase are often poor. This is understandable when many details of a system are still to be determined. An estimate of size and cost is being made on the basis of a poorly defined system. Also, computer systems often fail to live up to expectations because they are developed from the first design that came into a developer’s head. Functions are left out, data is poorly organized, inappropriate tools are used, because comprehensive analysis has not been performed.
Ethics in fact-finding

Like other professionals, systems analysts are bound to respect and adhere to their professional code of ethics. As we discussed in Unit 1, an increasing number of companies treat information as a corporate asset. It is therefore the responsibility of the systems analysts to handle information related to the company and the employees (e.g., information regarding pricing, salaries, etc.) in strict confidence.

You may want to consult code of ethics published and promoted by professional organizations such as Association of Information Technology Professionals (AITP), Computer Ethics Institute, Hong Kong Computer Society, and Hong Kong Independent Commission Against Corruption. Search the Web site of such organizations for more information. For your reference below we have reprinted the code of ethics published by Hong Kong Computer Society.

**Hong Kong Computer Society Code of Ethics**

1. **Ethical Standards.** Members shall comport themselves with integrity and honesty in all their professional dealings.

2. **Public Interest.** Members shall comport themselves in a manner which is compatible with their duties to society, the profession and their clients.

3. **The Law.** Members shall educate themselves and abide by the laws relevant to the profession and shall respect the intellectual property rights of others.

4. **Competence.** Members shall continuously strive to upgrade their professional skill and knowledge, and maintain awareness of technological developments, procedures and standards, relevant to their field.

5. **Practice.** Members shall carry out their work in a professional manner with due care and diligence.

6. **Representations to the Public.** Members shall not undertake to perform any task or make any statement which is outside their technical competence.

7. **Aims of the HKCS.** Members shall strive to further the aims of the Society and increase the knowledge and understanding of the public in matters relating to computing and information systems technology.

8. **Conflict of Interest.** Members shall avoid any situation that may give rise to conflict of interest and shall make full and immediate disclosure to a client if such a situation should occur.

9. **Exercise Sound Judgement.** Members shall exercise good judgement in complying with this Code, and shall not compel any employee to act in breach of this Code. Members who are employees, shall, if asked to act in breach of this Code, advise their employer of the consequences of such breach.
10 Authority of the HKCS. Members shall recognize the authority of the HKCS and shall co-operate in any matters relating to the enforcement of this Code.

Reading

‘Fact finding ethics’, pp. 220 in your text. This reading relates to Objective 7 of this unit.

Self-test 4.2

1 What is the role of information gathering in systems development?
2 What are the DOs and DON’Ts when conducting an interview?
Summary

You use systems analysis to discover information systems requirements and to specify them in a way that can be communicated unambiguously to both users and systems developers. More specifically, the objective of systems analysis, also called logical design, is to specify requirements of an information system in terms of data, processes, interfaces, and geography.

In this unit you learned about different strategies and techniques that can be used in systems analysis. You also learned that even though each of these strategies is amenable to certain types of application, a combination of these strategies is used to complement one another.

The importance of information gathering was also emphasised in this unit. We examined specific methods for gathering information and the need to document information in a form that can be communicated. You should now understand information gathering as being distinct from, but an integral and iterative part of, systems analysis. Systems analysis takes the results of information gathering and formulates a conceptual model of data and functional requirements. This conceptual model enables you to consider a range of possible alternatives for physical implementation. You can conduct reasonably accurate cost/benefit studies before developing reliable project plans. This is possible because all the necessary information is available.

Effective information gathering is critical to success in understanding business problems to be solved, and the nature and content of business processes themselves. In the case study following this section, you will be able to practise some of the information gathering techniques and skills in a ‘real world’ environment.
References

You should be able to meet the learning objectives and successfully complete your assessment on the basis of your study units and your textbook. These references are not prescribed reading. They may be helpful if you want to further your study of the topics presented in this unit.

Systems analysis and design


Information systems methodologies


Glossary

This glossary provides brief definitions of the main technical terms you encountered in Unit 4. The definitions given here are offered in addition to, or in place of those found in your text.

**Business process reengineering (BPR):** (Also called business process redesign) is the application of systems analysis (and design) methods to the goals of dramatically changing and improving the fundamental business processes of an organization, independent of information technology.

**Data dictionary:** Portion of a system dictionary in which data stores, data flows and data elements are listed (by name) and defined.

**Data flow diagram (DFD):** Graphic representation of an information system in which the relationships between origins, destinations, data stores, processes (transformations) and data movements (data flows) are shown.

**Data models:** They are graphical pictures used by system analysts to document and confirm the system users’ view of data requirements.

**Data structure diagram (DSD):** Graphic representation of entities and objects of an information system in which the relationships between data elements and data structures are shown.

**Data:** Raw facts about the organization and its business transactions. Most data items have little meaning and use by themselves.

**Documentation:** The activity of recording facts and specifications for a system.

**Geography:** It is a place where the data is captured and stored; where the processes happen; where the interfaces happen.

**Information engineering (IE):** A data-entered, but process-sensitive technique that is applied to the organization as a whole (or a significant part, such as a division), rather than on an adhoc, project-by-project basis (as in structured analysis).

**Interface:** Defines how the system users directly interact with the information system to provide inputs and queries and receive outputs and help.

**Interviews:** Fact-finding technique whereby the systems analyst collects information from individuals face to face.

**Joint application design:** A process whereby highly structured group meetings or miniretreats involving system users, system owners, and analysts occur in a single room for an extended time (four to eight hours per day, anywhere from one day to a couple of weeks).

**Joint application development (JAD):** Uses highly organized and intensive workshops to bring together owners, users, analysts, designers, and builders to jointly define and design systems. Synonyms include joint application design and joint requirements planning.
**Logical design:** See *Systems analysis*.

**Logical models:** Depict what a system is or what a system must do — not how the system will be implemented. Because logical models depict the essence of the system, they are sometimes called essential models.

**Model:** A model is a representation of reality.

**Modern structured analysis:** A process-centred technique that is used to model business requirements for a system. The models are structured pictures that illustrate the process, inputs, outputs, and files required to respond to business events (such as orders).

**Object-oriented analysis (OOA):** Techniques that are used to (1) study existing objects to see if they can be reused or adapted for new uses, and to (2) define new or modified objects that will be combined with existing objects into a useful business computing application.

**Observation:** A fact-finding technique where the systems analyst either participates in or watches a person perform activities to learn about the system.

**Problem statement:** A problem statement states the existing and potential undesirable situations that prevent the organization from fully achieving its purpose, goals, and objectives.

**Process description:** A detailed definition of processes performed by an information system, describing rules, policies and procedures. Also known as a Process Logic Specification or Transformation Description.

**Process models:** See *Data flow diagrams (DFD)*.

**Process:** Worked performed on, or in response to, incoming data flows or conditions.

**Project charter:** A project charter is the formal consolidation of all the inputs to the activity. It acts as an internal contract for the project, should the project continue to the next phase.

**Prototypes:** Preliminary working version of an information system for demonstration and evaluation purposes.

**Prototyping:** The act of building a small-scale, representative or working model of the users’ requirements to discover or verify those requirements.

**Questionnaires:** Special-purpose documents that allow the analyst to collect information and opinions from respondents.

**Rapid application development (RAD):** The merger of various structured techniques, especially the data-driven information engineering, with prototyping techniques and joint application development techniques to accelerate systems development.

**Repository:** A collection of those places where we keep all documentation associated with the application and project.
**Requirements statement:** A consolidation of all system models, discovery prototypes, and supporting documentation.

**Sampling:** The process of collecting sample documents, forms, and records.

**Scope statement:** A scope statement states the area or range (of business) that a system will encompass.

**Structured analysis:** A structured analysis is process-centred method that attempts to construct models of business requirements of a system.

**System model:** An abstraction of a real world information system that shows significant components and their relationships. This abstraction is often used to study and predict behaviour or performance of a system.

**Systems analysis:** The dissection of a system into its component pieces to study how those component pieces interact and work. It is also (1) the survey and planning of the system and project, (2) the study and analysis of the existing business and information system, and (3) the definition of business requirements and priorities for a new or improved system. A popular synonym is logical design.

**Systems architecture:** A broad information technology plan.
Answer key for self-test questions

Self test 4.1

1 System analysis is the dissection of a system into its component pieces to study how those component parts interact and work. Systems synthesis is the re-assembly of a system’s component pieces back into a whole system that is hoped to be an improved one. Through systems analysis and synthesis, we may add, delete, and modify system components toward our goal of improving the overall system.

2 A repository is a collection of those places where all the documentation associated with the application and project are kept. FAST is a repository-based methodology because all activities and phases engaged in the systems development communicate across a shared-repository. This essentially means, under the FAST methodology, phases and activities are not necessarily sequential. They can run concurrently when a repository is present to keep all the useful information about the project.

3 JAD is one of the techniques used in RAD. JAD uses highly organized and intensive workshops to bring together system owners, users, analysts, designers, and builders to jointly define and design systems. In the interest of accelerating systems development, RAD values participative development as well as prototyping and the various structured techniques such as data-driven information engineering.

4 As more and more companies are now adopting JAD in their development projects, the advantages of it are certainly realized. To enjoy the benefits that JAD offers, the JAD leader needs to possess excellent interpersonal skills and its ability to plan and facilitate the JAD session. An effectively conducted JAD session renders the following benefits:

- JAD encourages participation. It actively involves users and management in the development project.

- JAD reduces the amount of time required to develop systems. By replacing traditional one-on-one interviews with group meetings, users and managers can obtain consensus more easily. Besides, JAD helps to resolve conflicts.

- The benefits of prototyping are realized when JAD use prototyping as a means for confirming requirements and obtaining design approvals.

5 Business process re-engineering is the study, analysis, and redesign of fundamental business processes to reduce costs and improve value-added to the business. To achieve its goal of dramatically changing and improving the business processes of an organization, systems analysis and design methods are applied, independent of information technology.
Differing from most systems development strategies, object-oriented analysis (OOA) synchronises the concerns of data and processes. Data and the processes that act on that data are now combined or encapsulated into things called objects. The only way to create, delete, change, or use the data in the object is through one of its encapsulated processes. The focus of the system and software development strategy becomes the assembly of the system from a library of reusable objects. Thus, OOA techniques are used to identify reusable objects, and to define new or modified objects that will be combined with existing objects into a useful business computing application.

**Self test 4.2**

1. Information gathering collects needed information about business problems to be solved, needs to be met and functions and shortcomings of existing systems and methods. An understanding of an existing system, the organization and environment in which it operates and the people who interact with it is the base upon which a new system is developed.

2. **DOs when conducting an interview:**
   - Be courteous.
   - Listen carefully.
   - Maintain control.
   - Probe.
   - Observe mannerisms and non-verbal communication.
   - Be patient.
   - Keep interviewee at ease.
   - Maintain self-control.

   **DON'Ts when conducting an interview:**
   - Continue an interview unnecessarily.
   - Assume an answer is finished or leading nowhere.
   - Reveal verbal and non-verbal clues.
   - Use jargon.
   - Reveal your personal biases.
   - Talk instead of listening.
   - Assume anything about the topic and the interviewee.
   - Tape record the interview.
Unit 4

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Acknowledgement
The OUHK gratefully acknowledges a grant of $100,000,000 from the Hong Kong Government designated for course development.

B329 Systems Analysis and Design was developed in part using resources provided by this generous grant.

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