

CHAPTER

5 System Requirements

LEARNING OUTCOMES

By the end of this chapter, you should be able to:

1. Define system requirements and their importance;
2. Identify methods for system requirements and characterise the advantages and disadvantages of each method;
3. Construct interviews and questionnaires in a way that is meaningful to the users;
4. Describe the concept of Joint Application Design (JAD) and prototyping and when to use it; and
5. Describe system requirement strategy that will make the most of your time with end users.

INTRODUCTION

System analysis is the part of the systems development life cycle in which you determine how the current information system functions and assess what users would like to see in a new system. Analysis has two sub phases: system requirements and requirements structuring. Figure 5.1 illustrates these parts and highlights our focus in this chapter – system requirements.

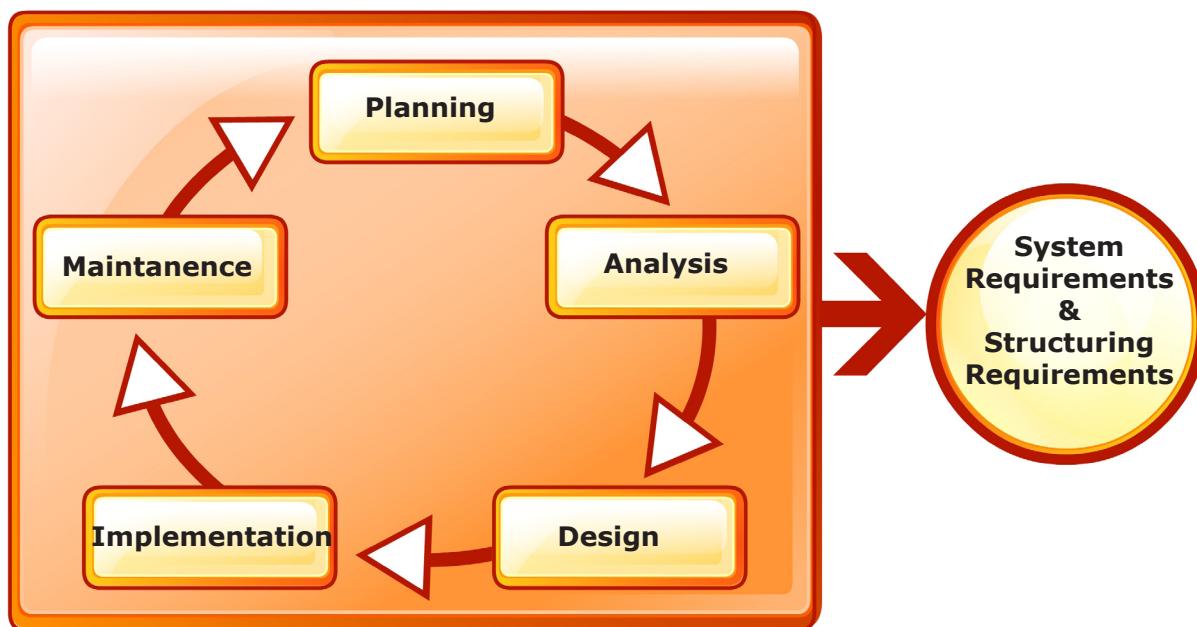


Figure 5.1: System Development Life Cycle (SDLC)

This chapter introduces a wide range of techniques for discovering system requirements sources such as interviews, observation, questionnaires, document review, Joint Application Design (JAD) and prototyping. Often, many or even all of these information sources are used to gather perspectives on the adequacy of current systems and the requirements for replacement systems. And, each form of information collection has its advantages and disadvantages, which will be discussed in this chapter too.

5.1

SYSTEM REQUIREMENT

System requirement specifies what information system must do or a property that it must have. It is also called a business requirement. Once management has granted permission to pursue development of a new system, you begin to gather information on what the system should do, from as many sources as possible.

Therefore in defining system requirements, it is critical that they meet the following criteria as shown in Figure 5.2.

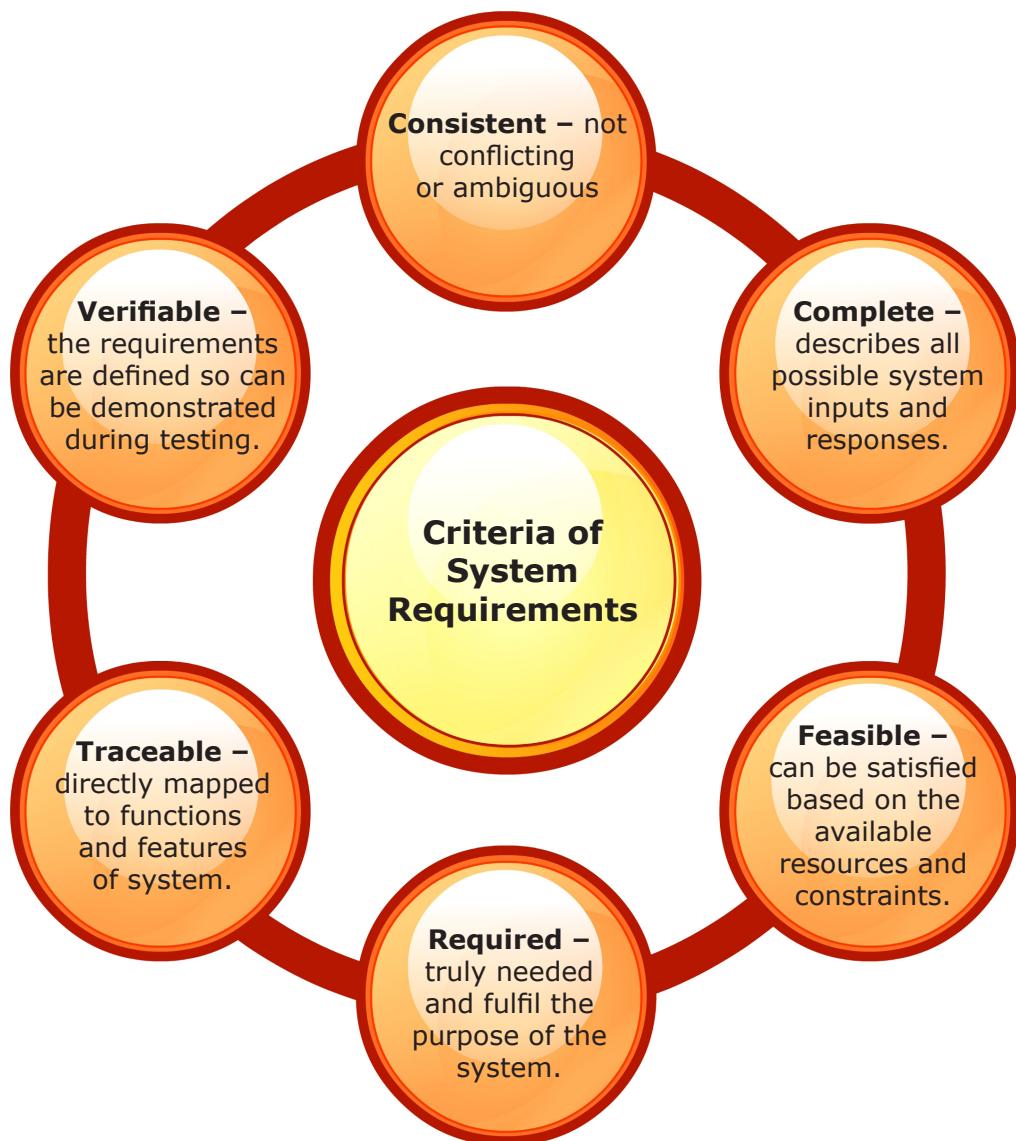


Figure 5.2: Criteria of system requirements

In Figure 5.3 are examples of requirement component which system analysts need to understand of an organisation.

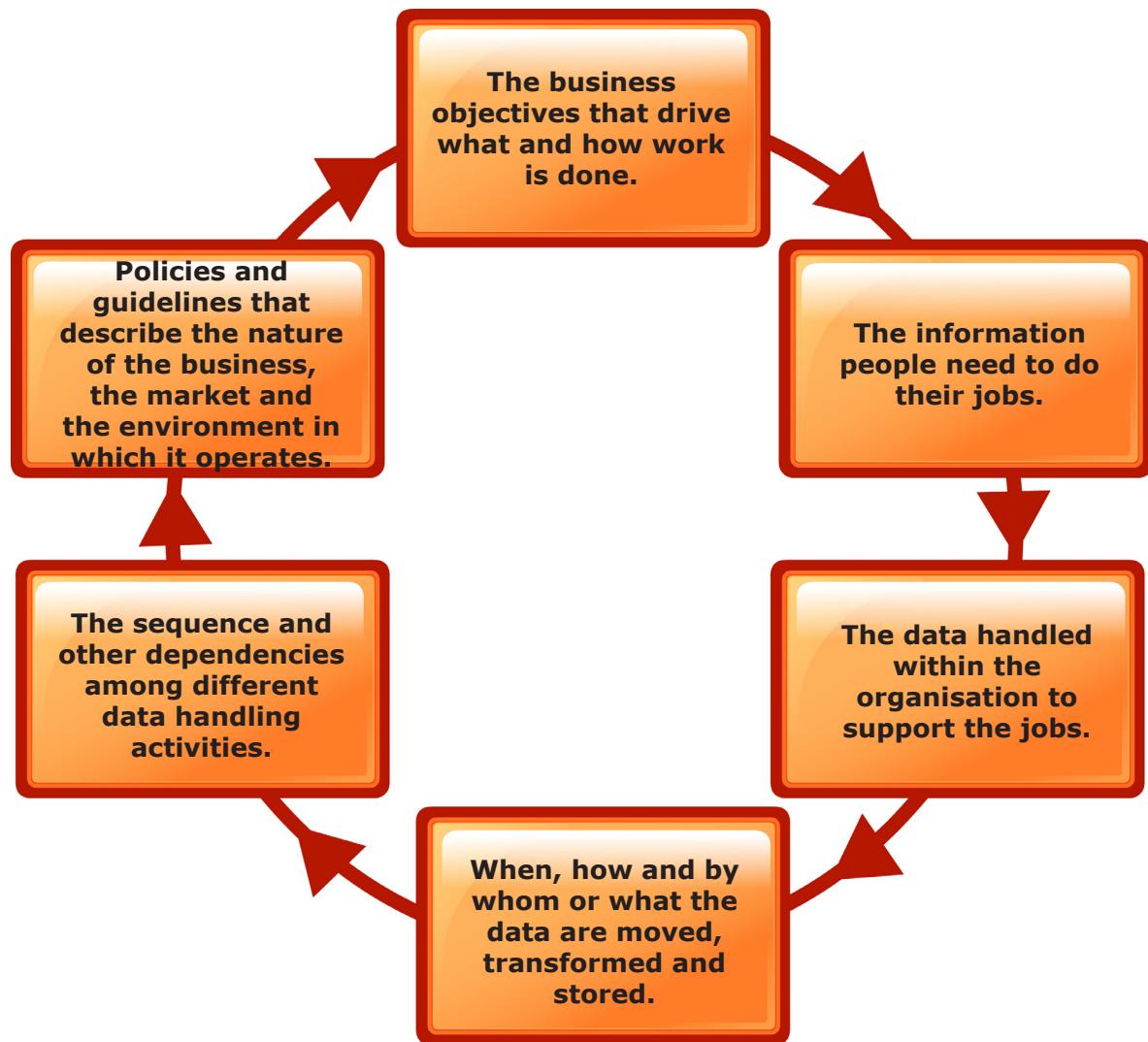


Figure 5.3: Examples of required component which system analysts need to understand of an organisation

Such a large amount of information must be organised in order to be useful, which is the purpose of the next part of system analysis that is structuring requirements; this will be further explained in the next topic. Failure to correctly identify system requirements may result in unwanted consequences. Figure 5.4 shows some of the examples of failure to correctly identify the system requirements.

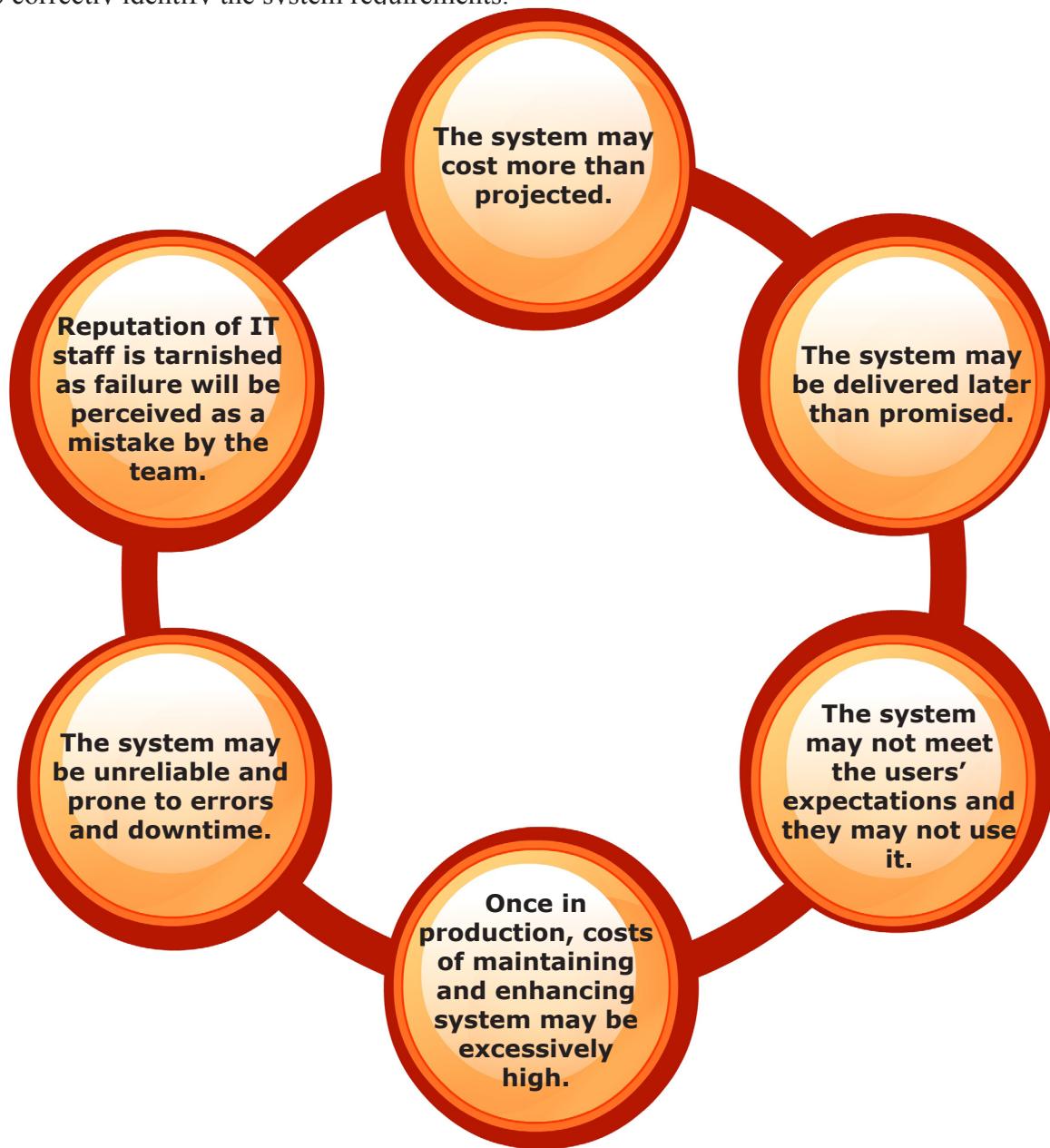


Figure 5.4: Examples of failure to correctly identify the system requirements

5.2**METHODS FOR SYSTEM REQUIREMENT**

The core of systems analysis is the collection of information such as information about the systems that are currently being used and how users would like to improve the current systems and organisational operations with new or replacement information system must be collected.

One of the best ways to get information is to talk to the people who are directly or indirectly involved in the different parts of the organisation affected by the possible system changes: users, managers, sponsors and etc. In the next section, the various ways to get information for system requirement directly from stakeholders: interview, observation, questionnaires, document review, JAD and prototyping will be explained.

5.2.1**Documents Review**

This step is supposed to be the first step in the activity of fact finding or data collection. To begin this process, the analyst can request for several documents that are being used in the current system from users and staff of the organisation. There are three forms of the main documents that can be analysed:

Work procedures**Business forms****Reports**

Work Procedure explains the way a certain job is performed by an individual or a group of individuals, together with data being used, and information being produced in the job.

Table 5.1 shows an example of the work procedure for preparing examination timetable.

Table 5.1: Example of Work Procedure

PREPARATION FOR EXAMINATION TIMETABLE		
No.	Activity	Responsibility
1.	Distribute circular letter and forms for examination particulars for the course offered at the faculty, at week No. 6.	Deputy Academic Dean, Assistant Academic Officer
2.	Print and distribute drafts of examination timetable to the faculty, at week No. 7.	Ass. Academic Officer, IT Officer
3.	Update drafts of examination timetable in the computer, and print the timetable, at week No. 12.	Ass. Academic Officer, IT Officer
4.	Paste examination timetable on the Faculty's notice board for students' and lecturers' information, two weeks before examination starts.	Faculty's Assistant Registrar
5.	Observe and check feedback from lecturers and students (if any), and inform the Academic Section so that final changes can be made. If there is no change, examination timetable is considered final.	Faculty's Assistant Registrar, Lecturer, Ass. Academic Officer

Besides giving information, work procedures can show weaknesses of the current system. The results of analysis of several procedures can show:

The presence of overlaps on two or more jobs - overlapping jobs need to be removed before the system design begins. In other words, the organisation may need to be re-designed before the information system is developed in order to achieve maximum benefits.

Procedures that are supposed to be documented are not found. Management needs to be informed of this in order to take the next course of action.

Existing procedures may be obsolete and out-of-date. This can be tracked during interviews with individuals related to the jobs.

Work procedures that are written may contradict with the information gathered from the interviews, questionnaires and observation. Similar to other problems, this can be solved by referring to users and the management.

These problems actually show the differences between a “Formal System” and an “Informal System”.

Formal System is a system that is identified by official documentation of the organisation; while the Informal System refers to the actual way jobs are done in the organisation. Informal systems exist because of the work habit and individual's preference, conflicts, and other factors. The two systems need to be understood to give a picture of the information and other aspects that are required to change the current system to the new one.

A second type of document useful to systems analysts is a business form (see Figure 5.5). Forms are used in many activities and transactions of the company such as customer registration, product booking, and product delivery. Forms are important in understanding the system because they state clearly the data flows coming in and going out of the system, and the important data flows for the systems functions.

The form is a template for a business invoice. It features a header section with a logo for "FREE Business Design" and placeholder text for "YOUR COMPANY NAME HERE" (123 Main Street, YOUR TOWN, STATE and ZIP) and "Phone 123-4567". The main title is "INVOICE" in bold red capital letters. Below it, the text "DATE: INVOICE NO." is also in red. There is a section labeled "BILL TO:" followed by a large, empty rectangular area for address details. At the bottom is a table with four columns: "P.O. NUMBER", "TERMS", and "PROJECT" (all in red), and "QUANTITY", "DESCRIPTION", "RATE", and "AMOUNT" (all in black). The table has a total row at the bottom labeled "TOTAL". The entire form is enclosed in a decorative border with a red-to-orange gradient and black dots.

Figure 5.5: Example of the business form

Forms are most useful to you when they contain actual organisational data, because this allows you to determine the characteristics of the data that are actually used by the application. Forms can be obtained by requesting from system users, or staff performing related jobs. Ensure that the form to be analysed is still being used and contains valid data.

A third type of useful document is a System Report - a report generated by current system. As the main output of a system, reports enable us to know which data is important to produce the report. Figure 5.6 presents an example of a typical financial report, a consolidated balance sheet.

Balance Sheet	
Current Assets	
Cash	\$55
Accounts Receivable	\$395
Inventory	\$805
Other Current Assets	\$25
Total Current Assets	\$1,280
Long-term Assets	\$350
Accumulated Depreciation	\$50
Total Long-term Assets	\$300
Total Assets	\$1,580
Liabilities and Capital	
Current Liabilities	
Accounts Payable	\$224
Current Borrowing	\$90
Other Current Liabilities	\$15
Subtotal Current Liabilities	\$329
Long-term Liabilities	\$285
Total Liabilities	\$614
Paid-in Capital	\$500
Retained Earnings	\$418
Earnings	\$49
Total Capital	\$967
Total Liabilities and Capital	\$1,581
Net Worth	\$967

Figure 5.6: Example of a report

This report shows the financial status of a corporation for two years. You would analyse such reports to determine which data need to be captured over what time period and what manipulation of these raw data would be necessary to produce each field on the report.

If the current system is computerised, the required documents are those that describe the information system being used - i.e. how it is designed and how it works. There are many documents that can be analysed, such as flow charts, data dictionary, tables, user manuals, purchase agreements of hardware and software, and CASE tools documentation.

Business functions can be understood by analysing the above types of documents. They can also be used to produce interview questions in details. Besides that, documents can serve as visual tools during interviews and documentation work in group discussions. Discussions can focus on objectives, usage, distribution and information content of the document. Processes that involve the use of forms and the sharing of forms with several processes can also be discussed.

5.2.2

Interview

Interview is a very effective method to understand the function and rules of system requirement. However, it takes a long time and uses an expensive resource. In this method, the analyst meets with users individually or in a group. The analyst will pose questions to users about business operations and the current system. Interviews will be conducted once or more than one, depending on the stage of information already obtained. Interviews will be carried out until all the information required is understood and documented by the project team.

(a) Interview Guidelines

Thorough planning and preparation are required to conduct an effective interview. The analyst needs to prepare for orderly steps before, during, and after interviews. There are many ways to effectively interview someone, and no one method is necessarily better than another. Table 5.2 shows an example of the item list that you should keep in mind when you conduct an interview.

Table 5.2: Guidelines for Effective Interview

Guidelines	What is involved
Plan the interview	<ul style="list-style-type: none"> • Prepare interviewee by making an appointment and explaining the purpose of the interview. • Prepare a checklist, an agenda and questions.
Be neutral	Avoid asking leading questions.
Listen and take notes	Give your undivided attention to the interviewee and take notes and/or tape-record the interview (if permission is granted).
Review notes	Review your notes within 48 hours of the meeting. If you discover follow-up questions or need additional information, contact the interviewee.
Seek diverse views	Interview a wide range of people, including potential users and managers.

(b) Question Types

In choosing interview questions you need to decide what mix and sequence of open-ended and closed-ended questions you will use. Open-Ended questions are usually used to probe for information for which you cannot anticipate all possible responses or for which you do not know the precise question to ask. Open-ended questions allow users to answer spontaneously in whatever way that is suitable. The person being interviewed is encouraged to talk about whatever interests him or her within the general bounds of the question.

Examples of the open questions are:

Why are you not satisfied with the report produced?

What are the features to be added into the new banking system?

Why do you perform this function in that way?

Describe the monitoring process that is available online.

Open-ended questions also often put the interviewees at ease because they are able to respond in their own words using their own structure. It gives the interviewee a sense of involvement and control in the interview. A major disadvantage is the length of time it can take for the questions to be answered and it also can be difficult to summarise.

Close-Ended questions limit the answers to shorter and limited set of answers, or specific alternatives. It works well when the major answers to questions are well known and commit to specific time constraints. Closed-ended questions can also be an easy way to begin an interview and to determine which line of open-ended question to pursue. You can include an “other” option to encourage the interviewee to add unanticipated responses. A major disadvantage is that useful information that does not quite fit into the defined answers may be overlooked as the respondent tries to make a choice instead of providing his or her best answer.

Examples of the closed questions are:

How many employees are there in the information system department?

Is this report generated exactly on time?

Does this report contain accurate information?

Does this company contain its own Website?

Close-ended questions like objective questions on an examination can follow several forms such as:



Both open-ended and close questions have advantages and drawbacks as shown in Figure 5.7. Notice that choosing one question type over the other actually involves a trade-off; although an open-ended question affords breadth and depth of a reply, responses to open-ended questions are difficult to analyse.



Figure 5.7: Attributes of open-ended and closed-ended questions

Source: Adapted from Kendall and Kendall (2008)

Probes. A third type of question is the probe or follow-up. The strongest probe is the simplest: the question, “Why” or “Will you elaborate on that for me?” The purpose of a probe is to go beyond the initial answer to get more meaning, to clarify and draw out and expand on the interviewee’s point. Probes may be either open-ended or closed-ended questions.

Examples of probes questions are:

Why?

Give an example of how e-commerce has been integrated into your business processes.

Please give an illustration of the security problem you are experiencing with your online bill payment system.

You mentioned both an intranet and an extranet solution. Please give an example of how you think each differs.

What makes you feel that way?

Tell me step by step what happen after a customer clicks the “Submit” button on the Web registration form.

(c) Writing the Interview Report

Although the interview itself is complete, your work on the interview data is just beginning. You need to capture the essence of the interview through a written report. It is imperative that you write the interview report as soon as possible after the interview. This step is another way you can ensure quality of interview data.

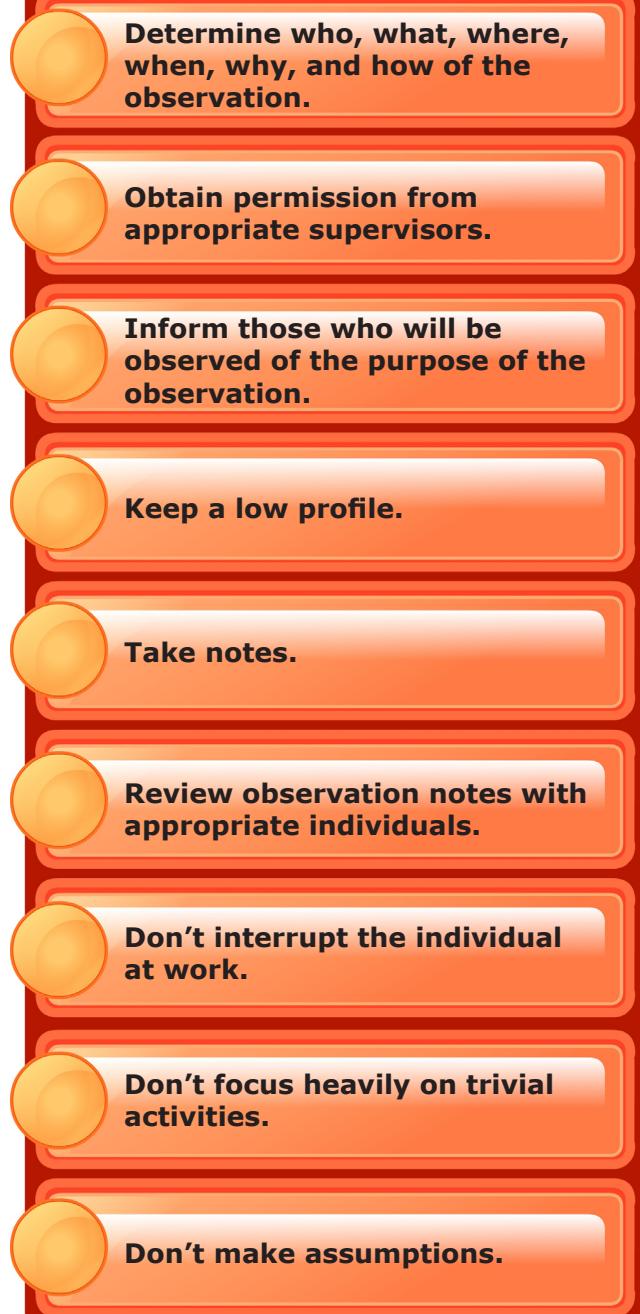
Review the interview report with the respondent at a follow-up meeting. This step helps clarify the meaning the interviewee had in mind and lets the interviewee know that you are interested enough to take the time to understand their point of view and perceptions.

5.2.3 Observation

Observation of the business process or the current system is another method that can be used in collecting system requirement. By personally looking at the working system in operation, you can understand better the business process being executed, and you can see the system in a different perspective. This method also enables you to confirm information from the interviews besides ensuring that the business process operates as stated. You may be shocked to find that information from interviews and current documents are not practiced in the real work situation, when you do the observation. Proposals made based on observation can increase the confidence of the management. It also helps you to build good relationships with the staff that work on the jobs.

Observation can cause operation to become smooth or otherwise. Research shows that productivity increases when the staff realised that they are being observed. On the contrary, operations may also become less smooth because the staff may feel the tension during observation. It is better if you meet with the staff and their supervisor to discuss your objectives of getting a better working relationship. In a certain situation, you may need to work with the staff to understand a certain job through the experience that they have gained.

Plan your observations in advance by preparing checklist of specific task you want to observe and questions you want to ask. Consider the following guidelines when you do your observation:

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- Determine who, what, where, when, why, and how of the observation.**
 - Obtain permission from appropriate supervisors.**
 - Inform those who will be observed of the purpose of the observation.**
 - Keep a low profile.**
 - Take notes.**
 - Review observation notes with appropriate individuals.**
 - Don't interrupt the individual at work.**
 - Don't focus heavily on trivial activities.**
 - Don't make assumptions.**

Observation help the systems analyst actively performs the role of the user for a short period of time. This is one of the most effective ways to learn about problems and requirements of the system. By filling the user's "shoes", a systems analyst quickly gains an appreciation for what the user experiences and what she or he has to do to perform the job. This type of role playing gives the systems analyst a firsthand education in the business processes and functions, as well as the problems and challenges associated with them.

5.2.4**Questionnaires**

Questionnaires (also called surveys) is an information gathering method that allows system analyst to study attitudes, beliefs, behaviours and characteristics of several key people in the organisation who may be affected by the current and proposed systems. Attributes are what people in the organisation say they want (in a new system for instance); Beliefs are what people think is actually true; Behaviour are what organisational members do; and Characteristics are properties of people or things.

Through the use of questionnaires, the analyst may be seeking to quantify what was found in interviews. In addition, questionnaires may be used to determine how widespread or limited a sentiment expressed in an interview really is. Conversely, questionnaires can be used to survey a large sample of system users to sense problems or raise important issues before interviews are scheduled.

There are many similarities between interview and questionnaire, and perhaps the ideal would be to use them in conjunction with each other, either following up unclear questionnaire responses with an interview or designing the questionnaire based on what is discovered in the interview. Each technique however has its own specific functions, and it is not always necessary or desirable to use both.

In Figure 5.8 are some guidelines to help you decide whether the use of questionnaires is appropriate.

- Organisation members are widely dispersed (different branches of the same corporation).
- A large number of people are involved with the project.
- Exploratory work is needed. You want to gauge overall opinion before the systems project is given any specific direction.
- Problem solving prior to interviews is necessary. You wish to be certain that any problems with the current system are identified and addressed in follow-up interviews.

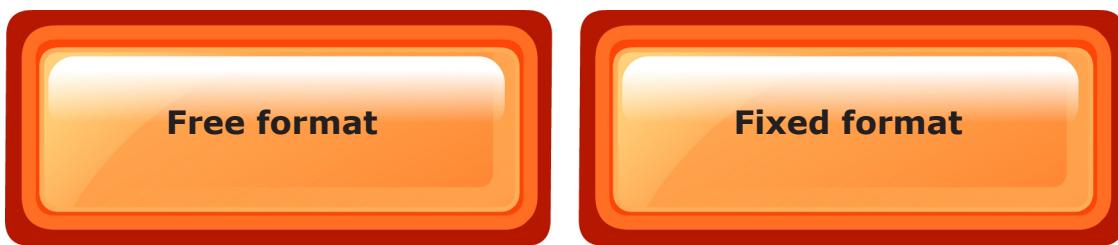
Figure 5.8: Guidelines on deciding the use of questionnaires

(a) Questionnaire Type

The biggest difference between the questions used for most interviews and those used on questionnaires is that interviewing permits interaction between the questions and their meanings. In an interview the analyst has an opportunity to refine a question, change the course of questioning, respond to puzzled look and generally control the context.

Few of these opportunities are possible on a questionnaire. Thus for the analyst, questions must be transparently clear, the flow of the questionnaire solid, the respondent's questions anticipated and the administration of the questionnaire planned in detail. (A respondent is the person who responds to or answers the questionnaire).

There are two formats of questionnaire:



A Free Format questionnaire is designed to allow respondents to exercise more freedom and flexibility in their answers to each question. Here are examples of free format questions:

What are the hardware and software that you have, and how are they used?

Do the hardware and software have problems (e.g. server being down, network problems) of being attacked by virus or not functioning? If yes, explain the problems.

Such responses may be difficult to enter into a table for analysis (tabulate). Respondents too may not answer such questions. To get good response for the free format, use simple sentences, and avoid words that create doubt, e.g. different respondents may interpret the word "suitable" differently.

A Fixed Format questionnaire consists of questions that require respondents to choose an answer from a limited choice. Respondents need to answer based on the given alternatives only. This makes the results much easier to tabulate. There are three types of questions on fixed format; these are multiple choice questions, rating questions, and ranking questions.

Multiple Choice Questions - respondents are given several alternative questions. They are questions that allow respondents to choose one answer. They are questions that allow respondents to answer in a free format if all the alternative answers are not concerned with the question. Examples of the multiple choice questions are:

Does the computer center provide training for system users?

YES**NO**

Are you satisfied with information services given?

YES**NO**

If no, explain

Why _____

- Rating Questions - respondents register their opinions about a certain statement by using the response alternatives provided. The ranking given needs to be balanced from the number of responses that are positive and negative. Examples of the rating questions are:

a) Automation of the customer booking system has improved company's profitability.

- Strongly agree**
- Agree**
- Not sure**
- Disagree**
- Strongly disagree**

b) In one month, how many times is the e-mail system attacked by viruses?

- Very frequently**
- Frequently**
- Not sure-Rarely**
- Very rarely**

- Ranking Questions - respondents are given several possible answers, which are to be ranked in order of preference or experience. Examples of the ranking questions are:

(a) Rank the following transactions according to the amount of time you spend processing them:

- % new customer orders
- % order cancellations
- % order modifications
- % payments

b) Rank these countries in order based on their population sizes (randomly shown here):

- Canada
- United States
- Japan
- India

(b) Questionnaire Development

Good questionnaires can be difficult to develop. The following procedure can prove helpful in developing an effective questionnaire.

- Determine what facts and opinions must be collected and from whom you should get them. If the number of people is large, consider using a smaller randomly selected group of respondents.
- Based on the facts and opinions sought, determine whether free or fixed format questions will produce the best answers.
- Write the questions. Examine them for construction errors and possible misinterpretations. Make sure that the questions don't reveal your personal bias or opinions.
- Test the questions on a small sample of respondents. If your respondents had problems with them or if the answers were not useful, edit the questions.
- Duplicate and distribute the questionnaire.

5.2.5**Joint Application Design**

Joint Application Design (JAD) is a methodology that brings user into the development process as active participants. The primary purpose is to collect system requirements simultaneously from the key people involved with the system. The result is an intense and structured but highly effective process.

JAD sessions may last anywhere from four hours to an entire week and may consist of several sessions depending on the number of issues that need to be discussed and the total information that needs to be obtained. JAD is a structured process that is participated by up to 10 or 20 users under the direction of an experienced facilitator. The actual number of participants depends on the objectives of a specific JAD session. The participants that may get involved in JAD are listed in Figure 5.9.

Participants	Descriptions
JAD Session Leader/ Facilitator	Organise and run JAD. He or she sets the agenda and sees that it is met. The person has to remain neutral on issues and does not contribute ideas or opinions, but rather concentrates on keeping the group on agenda and resolving conflicts.
Users	The key users of the system are vital participants in a JAD. They are the ones who can effectively communicate business rules and requirements, review design prototypes, and make acceptance decisions.
Managers	Managers of the work groups who can approve project objectives and establish priorities. Approve schedules and costs, and approve identified training needs and implementation plans.
Sponsor	High-level champion, if the sponsor attends any session, it is usually only at the very beginning or the end. A sponsor makes final decisions regarding project direction.
Scribe	Scribe is responsible for keeping records pertaining to everything discussed in the meeting. These records are published and disseminated to the attendees immediately following the meeting in order to maintain the momentum that has been established by the JAD session and its members.
System Analyst	Members of the systems analysis team attend the JAD although their actual participation may be limited. Analysts are there to learn from users and managers, not to run or dominate the process.

IS staff	IS personnel such as programmers, database analysts, data center personnel listen and take notes regarding issues and requirements voiced by the users and managers. Normally, IS personnel does not speak up unless invited to do so. Any questions or concerns that they have are usually directed to the JAD leader immediately after or prior to the JAD session.
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Figure 5.9: The participants involved in JAD

Most of the JAD sessions are held in rooms as shown in Figure 5.10 that are fully equipped with the necessary tools, and are separated from participants' workplace, so that discussions can be done without interruptions. Electronic facilities have been used in JAD sessions to upgrade their effectiveness. Participants are equipped with computer facilities that are linked with the network to facilitate analysis, documentation and data sharing. CASE tools can help to build models and display visuals of the screen design and reports.

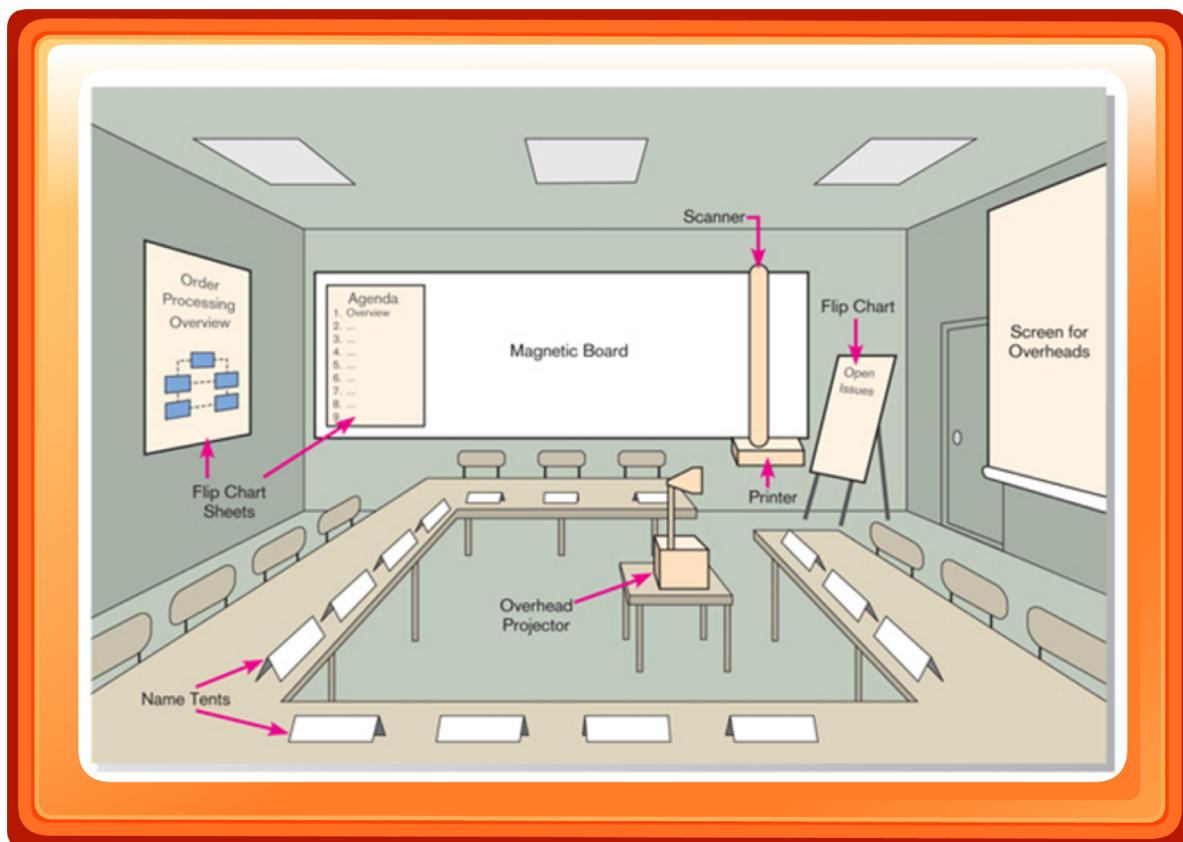


Figure 5.10: Meeting room for JAD
Source: Adapted from Wood and Silver, 1995

JAD offers many benefits as an alternative of fact-finding and development approach. More and more companies are beginning to realise its advantages and are incorporating JAD into their existing methodologies. An effective JAD session offers the following benefits as shown in Figure 5.11.

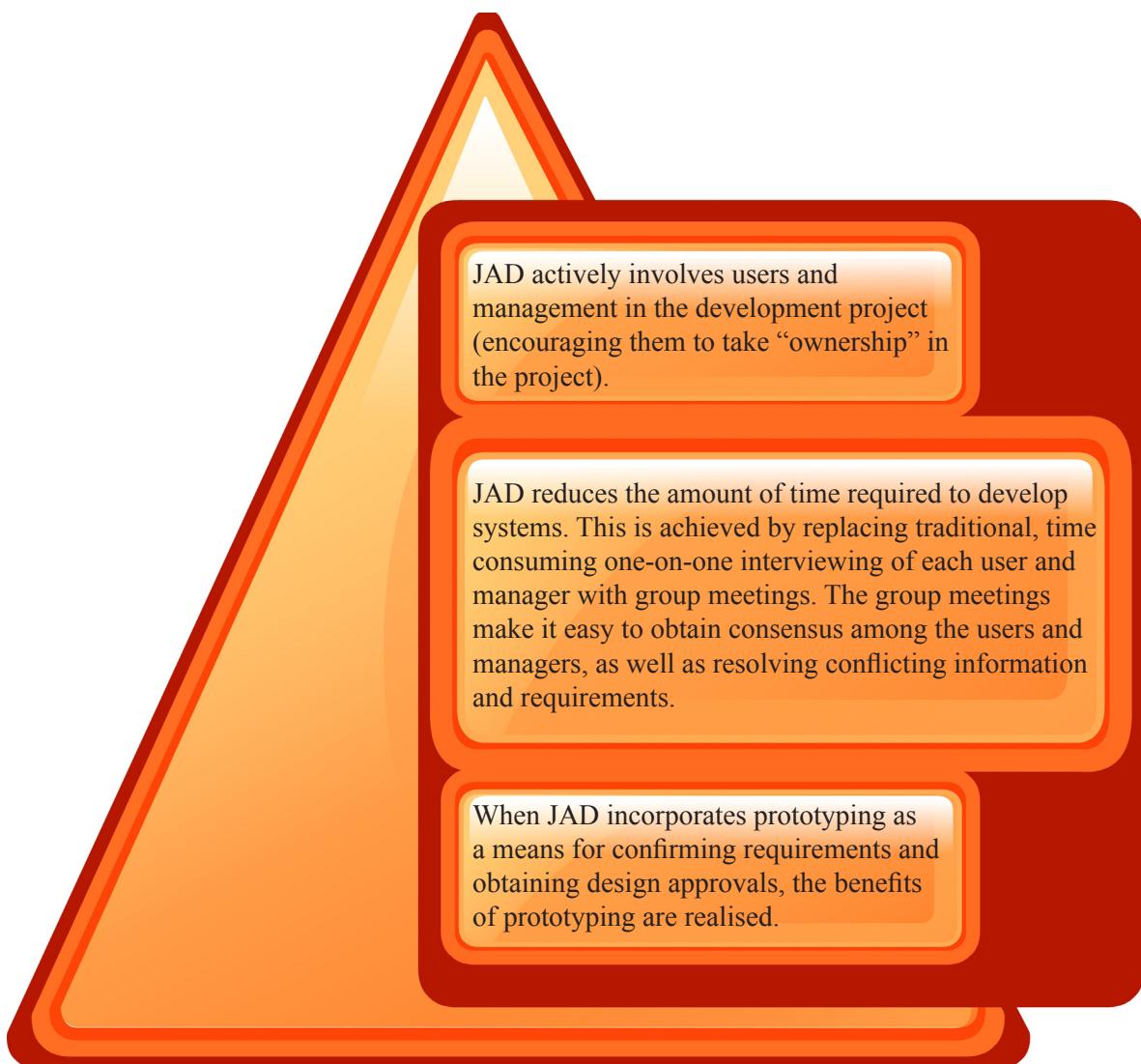


Figure 5.11: Benefits of effective JAD session

Achieving a successful JAD session depends very much on the JAD facilitator and his or her ability to plan and facilitate the JAD session.

5.2.2**Prototyping**

Another type of getting the system requirement is prototyping. Prototyping was introduced in Chapter 2 for use in rapid application development. As you should recall the concept behind prototyping is building a small working model of the user's requirements or proposed design for an information system.

A prototype is normally used in the design phase. However, it is also used in other phases of system development to test the usage and effectiveness of a certain proposal before a complete system is developed. In the analysis phase, prototypes are used in searching for system requirement analysis, and identifying processes.

To determine basic system requirements, you still need to look into the current documents and to interview users. Prototyping enables you to translate basic requirements quickly into a small version of an information system. In other words, requirements in conceptual form can be visualised in the physical form through prototyping, i.e. through this mini system. This prototype can be seen, used, and evaluated by users.

Normally, users can see the advantages and disadvantages of the requirements being present inside a simple physical system. Users will give comments to be improved by the analyst based on their experiences in using the prototypes. For example, during the interview, user may have said that he wanted all information dealing with employees, such as their personal particulars, service records, and loan lists to be replaced on the same screen. However, when he sees the screen being built containing too much information that makes it difficult for him to read, he may propose that the employee information be separated according to a certain category on different screens. Each screen is linked easily via certain buttons. Users may then also realise several requirements that were not thought of or were left out during the interviews.

These changes made by users are later incorporated into design prototypes that follow. After modification, users will see and test the prototype for the second time. For this second time, you will also change the prototype according to the user's request. This process will be repeated until users feel satisfied with the prototype being produced. This process enables you to finally come to a better version of the system requirements.

5.3

SYSTEM'S REQUIREMENT STRATEGY

An analyst needs an organised method for collecting system requirement. Inexperienced analysts will frequently jump right into interviews, but this is not the best method to gain information. An analyst should first collect all the facts they can get by using other methods. Consider the following step-by-step strategy as shown in Figure 5.12.

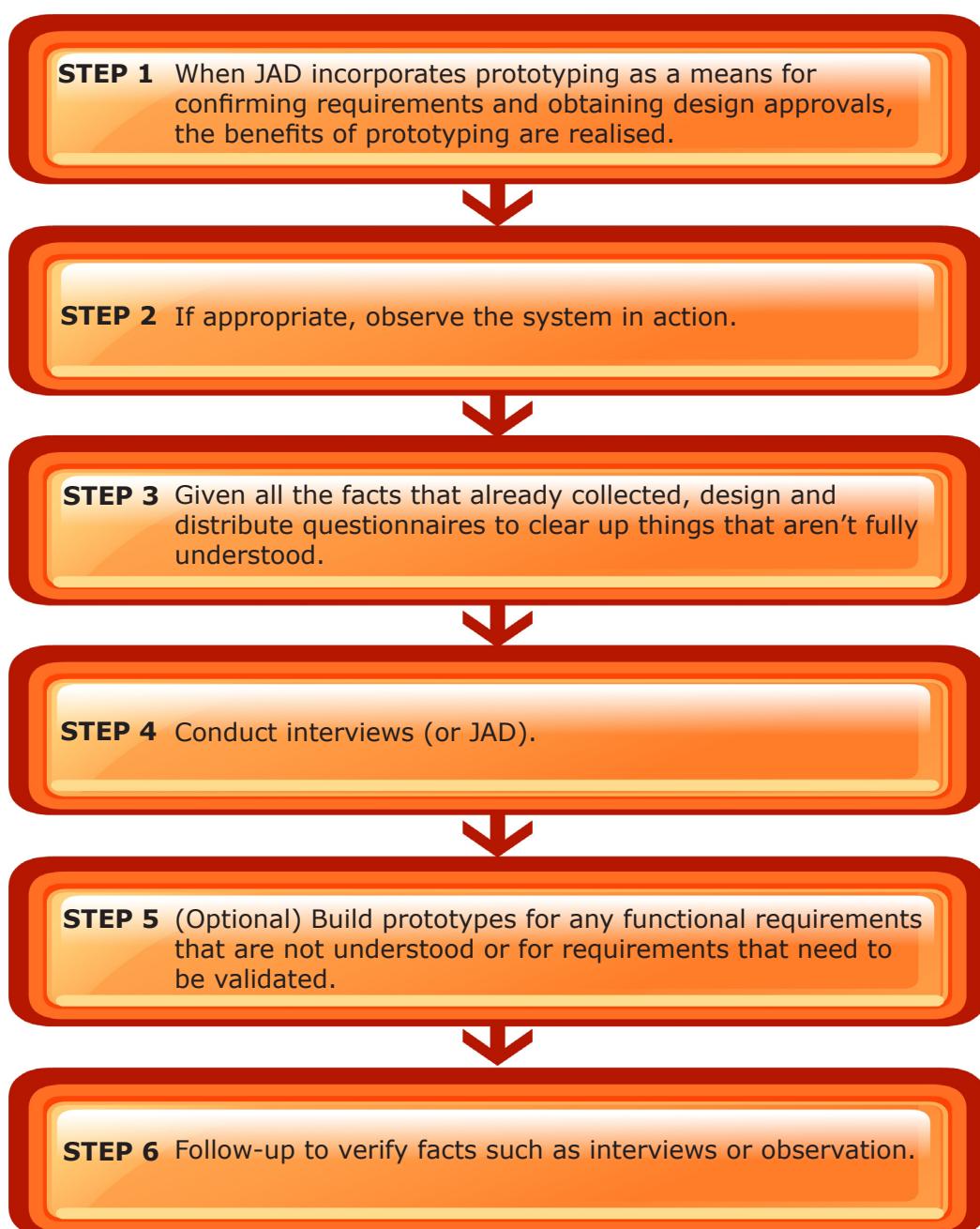


Figure 5.12: The step-by-step system requirement strategy

The strategy is not fixed. Although a system requirement strategy should be developed for every pertinent phase of systems development, every project is unique. Sometimes observation and questionnaires may be inappropriate. But the idea should always be to collect as many facts as possible before using interviews.

SUMMARY

1. Selecting the methods to use for system requirements depends on:
 - The need for rich or thorough information, time and budget available.
 - The need to probe deeper once initial information is collected.
 - The need for confidentiality for those providing assessments of system requirements.
 - The desire to get people involved.
 - Committed to a project and the potential audience from which requirements should be collected.
2. The result of system requirements is a thorough set of information, including some charts that describe the current systems being studied and the need for new and different capabilities to be included in the replacement systems.
3. System analyst need to study the information collected and structure it into standard formats suitable for identifying problems and unambiguously describing the specifications for new systems.

KEY TERMS

Close-Ended questions

Fixed Format

Formal System

Free Format

Informal System

Joint Application Design (JAD)

Multiple Choice Questions

Open-Ended questions

Prototyping

Ranking Questions

System Report

System Requirement

Work Procedure

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