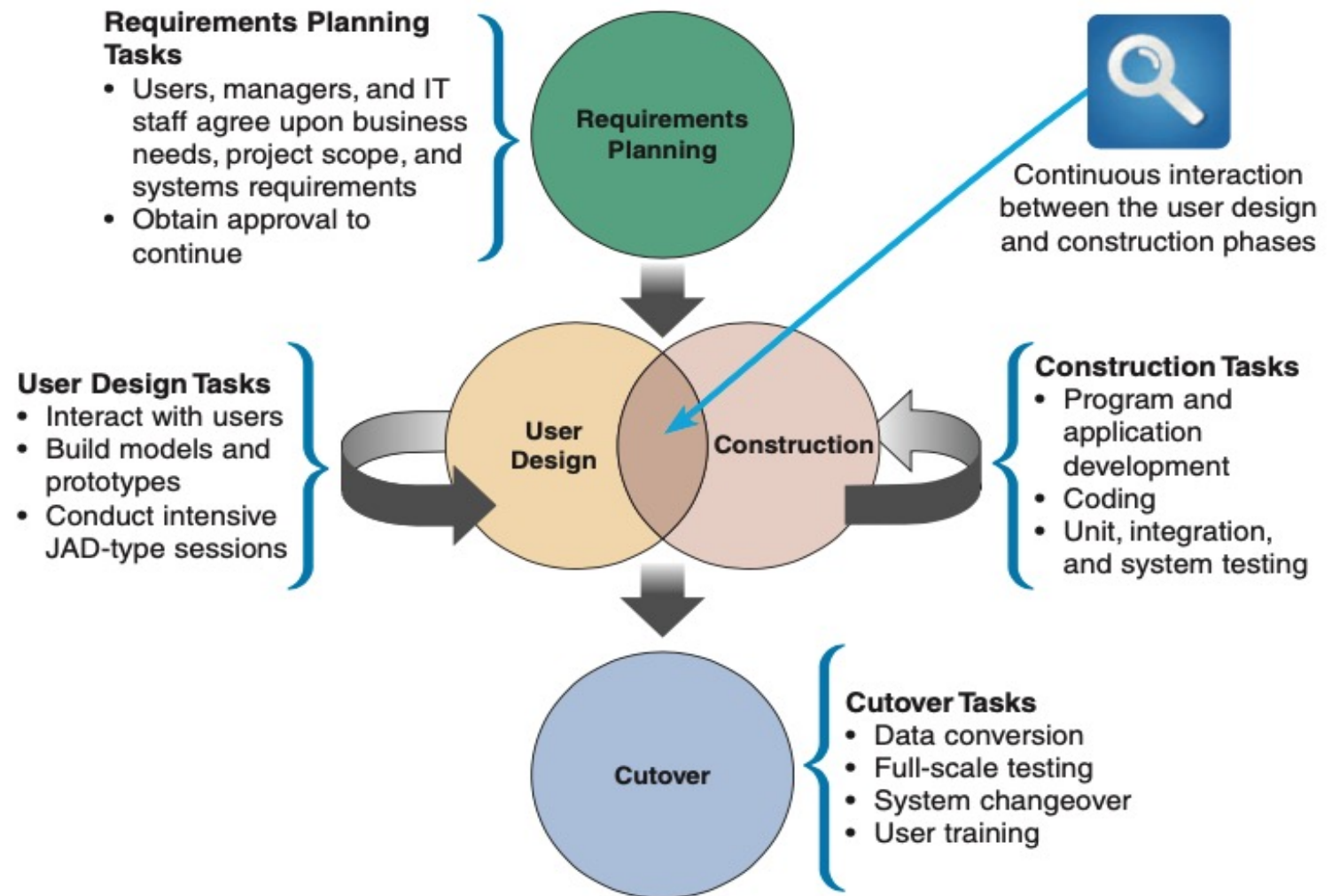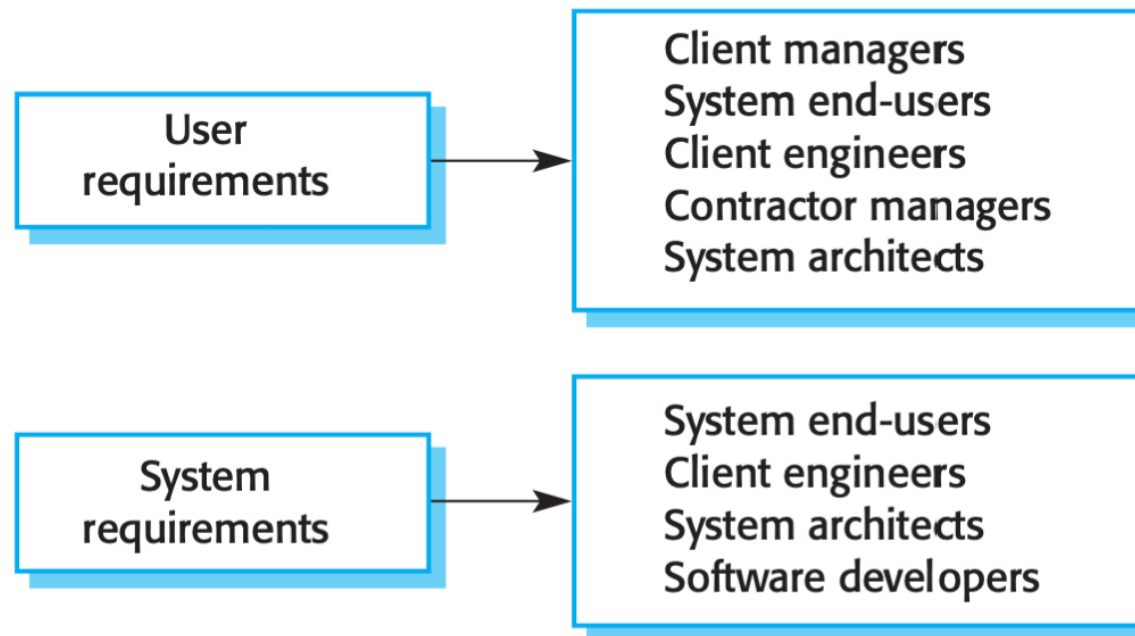Functional requirements These are statements of services the system should provide, how the system should react to particular inputs, and how the system should behave in particular situations. In some cases, the functional require- ments may also explicitly state what the system should not do.
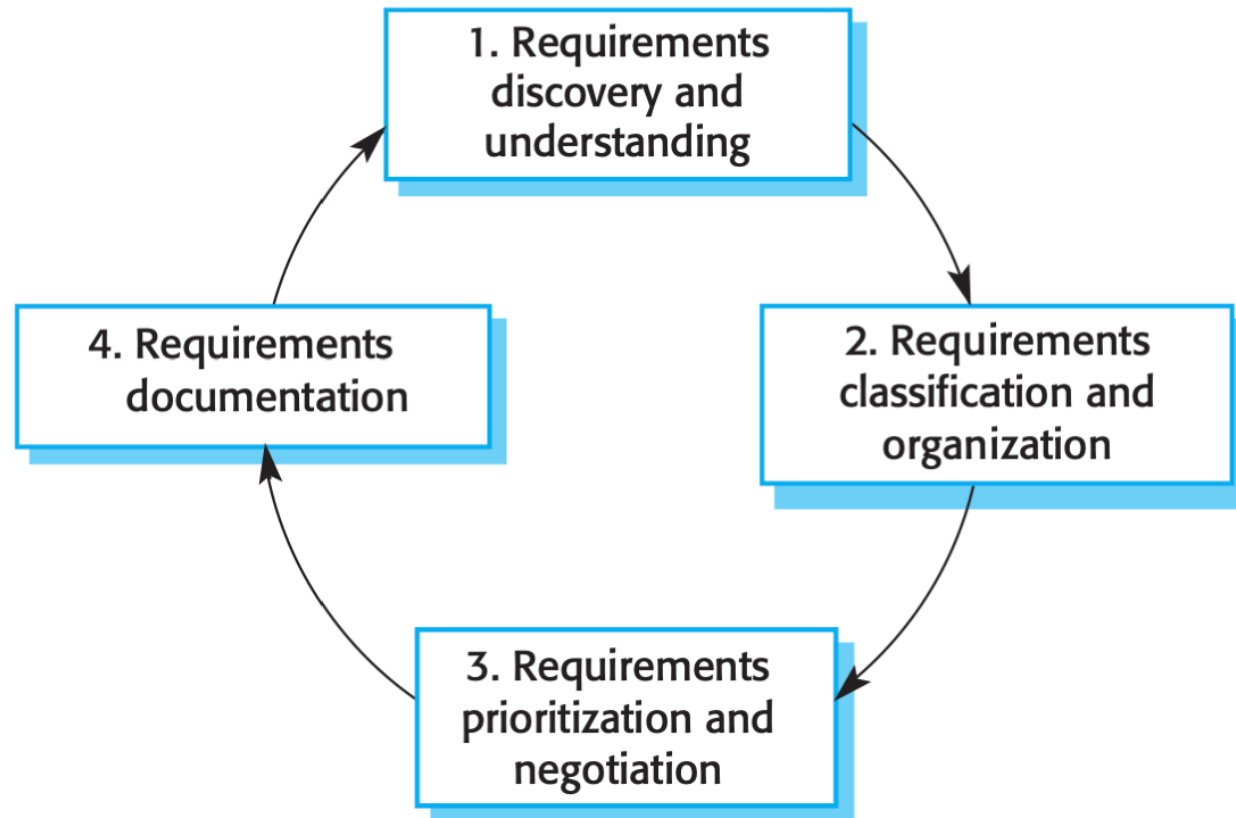
Non-functional requirements These are constraints on the services or functions offered by the system. They include timing constraints, constraints on the devel- opment process, and constraints imposed by standards. Non-functional require- ments often apply to the system as a whole rather than individual system features or services

Functional requirements Example:

- A user shall be able to search the appointments lists for all clinics.

- The system shall generate each day, for each clinic, a list of patients who are expected to attend appointments that day.

- Each staff member using the system shall be uniquely identified by his or her eight-digit employee number
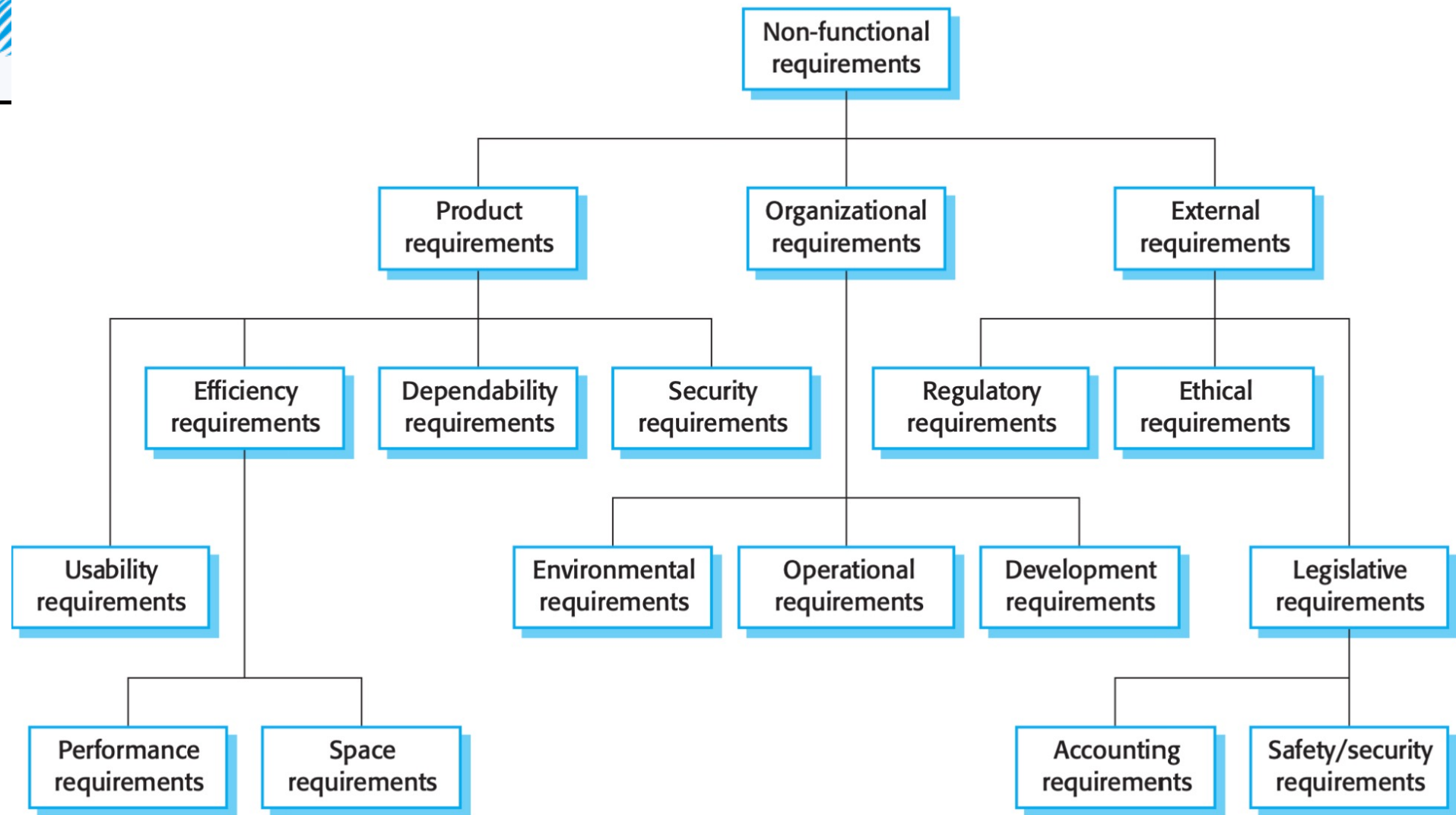
Property	Measure
Speed	Processed transactions/second User/event response time Screen refresh time
Size	Megabytes/Number of ROM chips
Ease of use	Training time Number of help frames
Reliability	Mean time to failure Probability of unavailability Rate of failure occurrence Availability
Robustness	Time to restart after failure Percentage of events causing failure Probability of data corruption on failure
Portability	Percentage of target dependent statements Number of target systems

1. Requirements discovery and understanding

2. Requirements classification and organization

3. Requirements prioritization and negotiation

4. Requirements documentation

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

During requirements modeling, systems developers

must identify and describe all system requirements.

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

- The website must report online volume statistics every four hours, and hourly during peak periods.

- The inventory system must produce a daily report showing the part number, description, quantity on hand, quantity allocated, quantity available, and unit cost of all sorted by part number.

- The contact management system must generate a daily reminder list for all sales reps.

- The purchasing system must provide suppliers with up-to-date specifications.

- The sales tracking system must produce a daily fast-moving-item report, listing all products that exceed the forecasted sales volume grouped by style, color, size, and reorder status.

- The customer analysis system must produce a quarterly report that identifies changes in ordering patterns or trends with statistical comparisons to the previous four quarters.

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

- Manufacturing employees must swipe their ID cards into online data collection terminals that record labor costs and calculate production efficiency.

- The department head must enter overtime hours on a separate screen.

- Student grades must be entered on machine-readable forms prepared by the instructor.

- Each input form must include date, time, product code, customer number, and quantity.

- Data entry screens must be uniform, except for background color, which can be changed by the user.

- A data entry person at the medical group must input patient services into the billing system.

Examples:

- Outputs
- Inputs
- **Processes**
- Performance
- Controls

- The student records system must calculate the GPA at the end of each semester.

- As the final step in year-end processing, the payroll system must update employee salaries, bonuses, and benefits and produce tax data required by the IRS.

- The warehouse distribution system must analyze daily orders and create a routing pattern for delivery trucks that maximizes efficiency and reduces unneces- sary mileage.

- The human resources system must interface properly with the existing payroll system.

- The equipment rental system must not execute new rental transactions for customers who have overdue accounts.

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

- The system must support 25 users online simultaneously.

- Response time must not exceed four seconds.

- The system must be operational seven days a week, 365 days a year.

- The accounts receivable system must prepare customer statements by the third business day of the following month.

- The student records system must produce class lists within five hours after the end of registration.

- The online inventory control system must flag all low-stock items within one hour after the quantity falls below a predetermined minimum.

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

- The system must provide logon security at the operating system level and at the application level.

- An employee record must be added, changed, or deleted only by a member of the human resources department.

- The system must maintain separate levels of security for users and the system administrator.

- All transactions must have audit trails.

- The manager of the sales department must approve orders that exceed a customer's credit limit.

- The system must create an error log file that includes the error type, description, and time.

In addition to the system requirements, systems analysts must consider **scalability,** which determines how a system will handle future growth and demands, and the **total cost of ownership**, which includes all future operational and support costs.

Categories:

- Outputs
- Inputs
- Processes
- Performance
- Controls

Scalability refers to a system's ability to handle increased business volume and trans- actions in the future. Because it will have a longer useful life, a scalable system offers a better return on the initial investment.

In addition to direct costs, systems developers must identify and document indirect expenses that contribute to the **Total Cost of Ownership (TCO)**

Whether working solo or as a member of a team, during requirements modeling the analyst will use **various fact-finding techniques, including interviews, document review, observation, surveys and questionnaires, sampling, and research**.

Although software can help gather and analyze facts, no program actually performs fact-finding automatically. First, the information needed must be identified.

Fact-Finding

Typically, this activity begins by asking a series of questions, such as these:

- What business functions are supported by the current system?

- What strategic objectives and business requirements must be supported by the new system?

- What are the benefits and TCO of the proposed system?

- What transactions will the system process?

- What information do users and managers need from the system?

- Must the new system interface with legacy systems?

- What procedures could be eliminated by business process reengineering?

- What security issues exist?

- What risks are acceptable?

- What budget and timetable constraints will affect system development?

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To obtain answers to these questions, the analyst develops a fact-finding plan, which can involve another series of questions (who, what, where, when, and how), or use a more structured approach.

- ***Who?*** Who performs each of the procedures within the system? Why? Are the correct people performing the activity? Could other people perform the tasks more effectively?

- ***What?*** What is being done? What procedures are being followed? Why is that process necessary? Often, procedures are followed for many years and no one knows why. Question why a procedure is being followed at all.

- ***Where?*** Where are operations being performed? Why? Where could they be performed? Could they be performed more efficiently elsewhere?

- ***When?*** When is a procedure performed? Why is it being performed at this time? Is this the best time?

- ***How?*** How is a procedure performed? Why is it performed in that manner? Could it be performed better, more efficiently, or less expensively in some other manner?

There is a difference between asking what is being done and what could or should be done. **The systems analyst first must understand the current situation**.

CURRENT SYSTEM		PROPOSED SYSTEM
Who does it?	Why does this person do it?	Who should do it?
What is done?	Why is it done?	What should be done?
Where is it done?	Why is it done there?	Where should it be done?
When is it done?	Why is it done then?	When should it be done?
How is it done?	Why is it done this way?	How should it be done?

Interviews

Document Review

Observation

Questionnaires and Surveys

Brainstorming

Sampling

Research

Interviews

An **interview** is a planned meeting during which the analyst obtains information from another person. The skills needed to plan, conduct, document, and evaluate interviews successfully must be understood.

Interviews

1. Determine the people to interview.

2. Establish objectives for the interview.

3. Develop interview

4. Prepare for the interview.

5. Conduct the interview.

6. Document the interview.

7. Evaluate the interview.

Interviews

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To get an accurate picture, the analyst must select the right people to interview and ask them the right questions .

The preliminary investigation involved mainly middle managers or department heads. Now, **during the systems analysis phase, people from all levels of the organization should be interviewed**

- **Individual or Group Interviews;**
  - **Opportunity to observe interaction** but .....
  - **One person might dominate the conversation, or …**
  - **might prevent lower-level employees from expressing themselves**
- **Formal and Informal Structures;**

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First, the general areas to be discussed should be determined, and then the facts to be gathered should be listed. Soliciting ideas, suggestions, and opinions during the interview is also a good idea.

Distinct Roles => Distinct Objectives

Upper-level managers can provide the big picture to help understand the system as a whole. Specific details about operations and business processes are best learned from people who actually work with the system on a daily basis.

Early stages of systems analysis, interviews usually are general. As the fact-finding process continues, however, the interviews focus more on specific topics

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Creating a **standard list of interview questions** helps to keep the session on track and avoid unnecessary tangents. Also, if several people who perform the same job are interviewed, a standard question list **permits a comparison of their answers**.

The interview should consist of **several different kinds of questions**: open-ended, closed-ended, or questions with a range of responses. When phrasing questions, avoid leading questions that suggest or favor a particular reply. For example, rather than asking, "**What advantages do you see in the proposed system?**" ask instead, "**Do you see any advantages in the proposed system**?"

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Open-ended questions:
Encourage spontaneous and unstructured responses. Such questions are useful to understand a larger process or draw out the interviewee's opinions, attitudes, or suggestions

- What are users saying about the new system?
- How is this task performed?
- Why do you perform the task that way?
- How are the checks reconciled?
- What added features would you like to have in the new billing system?
- Is there any- thing else you can tell me about this topic?

Interviews

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Closed-ended questions:

Limit or restrict the response. Closed- ended questions are used when information that is more specific is needed, or when facts must be verified.

- How many personal computers do you have in this department?
- Do you review the reports before they are sent out?
- How many hours of training does a clerk receive?
- Is the calculation procedure described in the manual?
- How many customers ordered products from the website last month?

Interviews

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Range-of-Response questions:
Are closed-ended questions that ask the person to evaluate something by providing limited answers to specific responses or on a numeric scale. This method makes it easier to tabulate the answers and interpret the results.

- On a scale of 1 to 10, with 1 the lowest and 10 the highest, how effective was your training?
- How would you rate the severity of the problem: low, medium, or high?
- Is the system shutdown something that occurs never, sometimes, often, usually, or always?

Interviews

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4. **Prepare for the interview**.

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After setting the objectives and developing the questions, preparing for the interview is next. Careful preparation is essential because an **interview is an important meeting and not just a casual chat**.

A **list of topics should be sent to an interviewee several days before** the meeting, especially when detailed information is needed, so the person can prepare for the interview and minimize the need for a follow-up meeting.

If there are questions about documents, ask the interviewee to have samples available at the meeting. The **advance memo should include a list of the documents to discuss** (if it is known what they are)

Interviews

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Two schools of thought exist about the best location for an interview. Some analysts believe that interviews **should take place in the interviewee's office**, whereas other analysts feel that a **neutral location such as a conference room** is better.

Some believe Office is the best location because it makes the interviewee feel comfortable during the meeting. A second argument in favor of the interviewee's office is that the office is where he or she has the easiest access to supporting material that might be needed during the discussion

Supporters of neutral locations stress the importance of keeping interruptions to a minimum so both people can concentrate fully. In addition, an interview that is free of interruptions takes less time

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When conducting an interview, begin with introductions, describe the project, and explain the interview objectives.

During the interview, ask questions in the order in which they were prepared, and give the interviewee sufficient time to provide thoughtful answers. Some answers will lead to additional questions, which should be asked in a logical order.

Analysts sometimes hear only what they expect to hear. Concentrate on what is said and notice any nonverbal communication that takes place. This process is called **engaged listening**.

When all the questions have been asked, summarize the main points covered in the interview and explain the next course of action.

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Although taking notes during an interview has both advantages and disadvantages, **it should be kept to a minimum**. It is a good idea to write down a few notes to remember key points after the interview, but avoid writing down everything that is said. Too much writing distracts the other person and makes it harder to establish a good rapport.

After the meeting, **a memo should be sent to the interviewee, expressing appreciation** for his or her time and cooperation. In the memo, note the date, time, location, purpose of the interview, and the main points discussed, so the interviewee has a writ- ten summary and can offer additions or corrections.

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In addition to recording the facts obtained in an interview, try to identify any possible biases. For example, **an interviewee who tries to protect his or her own area or function might give incomplete answers** or refrain from volunteering information.

Or, an interviewee with **strong opinions about the current or future system might distort the facts**. Some interviewees might answer questions in an attempt to be helpful even though they do not have the necessary experience to provide accurate information.

Document Review

It can **help the analyst understand how the current system is supposed to work**. Remember that system documentation sometimes is out of date. Forms can change or be discontinued, and documented procedures often are modified or eliminated. It is prudent to **obtain copies of actual forms and operating documents currently in use**, and to review blank copies of forms, as well as samples of actual completed forms. **Document samples can be obtained during interviews with the people who perform that procedure.**

Observation

Seeing the system in action provides additional perspective and a better understanding of system procedures. Personal observation also allows the analyst to verify statements made in interviews and determine whether procedures really operate as they are described.

Recommendations often are better accepted when they are based on personal observation of actual operations. Observation can also **provide the knowledge needed to test or install future changes** and can help build relationships with the users who will work with the new system.

Observation – Plan in Advance

- **Observe all the steps in a transaction** and note the documents, inputs, outputs, and processes involved.

- **Examine each form, record, and report**. Determine the purpose each item of information serves.

- **Consider each user who works with the system** and the following questions: What information does that person receive from other people? What information does this person generate? How is the information communicated? How often do interruptions occur? How much downtime occurs? How much sup- port does the user require, and who provides it?

- **Talk to the people** who receive current reports to see whether the reports are complete, timely, accurate, and in a useful form. Ask whether information can be eliminated or improved and whether people would like to receive additional information.

Questionnaries and surveys

In projects where it is **desirable to obtain input from a large number of people**, a questionnaire can be a valuable tool. A questionnaire, also called a survey, <u>is a document containing a number of standard questions that can be sent to many individuals</u>.

Questionnaires can be used to obtain information about a wide range of topics, including workloads, reports received, volumes of transactions handled, job duties, difficulties, and opinions of how the job could be performed better or more efficiently.
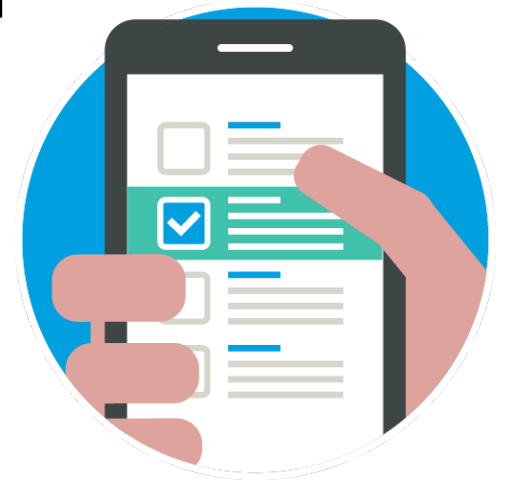
Questionnaries and surveys – How to design

When designing a questionnaire, the most important rule of all is to make sure that the questions collect the right data in a form that can be used:

- **Keep the questionnaire brief** and user-friendly.
- **Provide clear instructions** that will answer all anticipated questions.
- Arrange the **questions in a logical order**, going from simple to more complex topics.
- **Phrase questions to avoid misunderstandings**; use simple terms and wording.
- Try **not to lead the response** or use questions that give clues to expected answers.
- **Limit the use of open-ended** questions that are difficult to tabulate.
- **Limit the use of questions that can raise concerns** about job security or other negative issues.
- Include a section at the end of the questionnaire for **general comments**.
- **Test the questionnaire** whenever possible on a small test group before finalizing it and distributing to a large group.
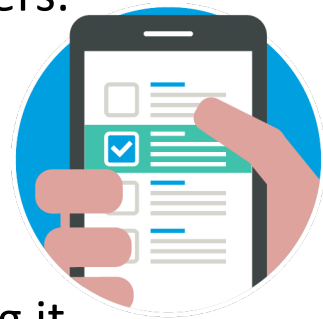
Brainstorming

Another popular method of obtaining input is called brainstorming, which refers to a **small group discussion of a specific problem**, opportunity, or issue. This technique <u>encourages new ideas, allows team participation, and enables participants to build on each other's inputs and thoughts</u>. Brainstorming can be **structured** or **unstructured**.

<u>In structured brainstorming</u>, each participant speaks when it is his or her turn, or passes.

In unstructured brainstorming, anyone can speak at any time. At some point, the results are recorded and made part of the fact-finding documentation process.
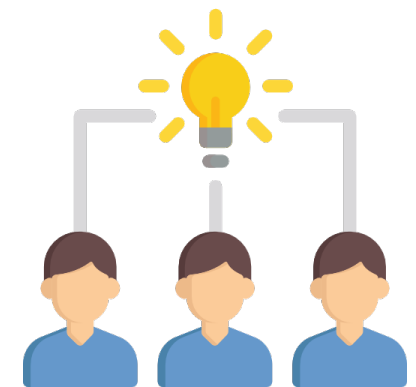
Sampling

When studying an information system, examples of actual documents should be collected using a process called sampling. **The samples might include records, reports, operational logs, data entry documents, complaint summaries, work requests, and various types of forms**. Sampling techniques include <u>systematic sampling</u>, <u>stratified sampling</u>, and <u>random sampling</u>.
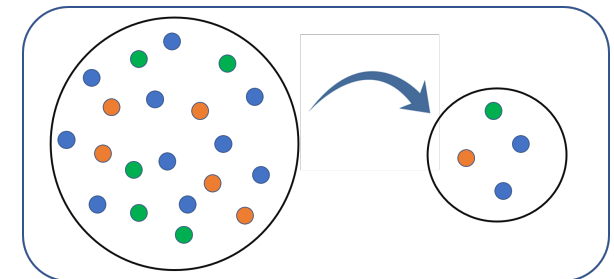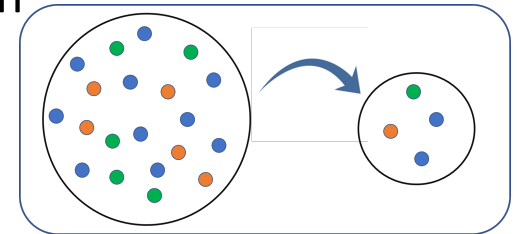
Sampling

Suppose there is a list of 200 customers who complained about errors in their statements, and a representative sample of 20 customers will be reviewed.

A **systematic sample** would select every tenth customer for review.
To ensure that the sample is balanced geographically, however, a **stratified sample** could be used to select five customers from each of four postal codes. Another example of stratified sampling is to select a certain percentage of transactions from each postal code, rather than a fixed number.
Finally, a **random sample** selects any 20 customers.

Research

Research is another important fact-finding technique. Research can **include the Internet, IT magazines, and books to obtain background information, technical material, and news about industry trends and developments**.

In addition, attending professional meetings, seminars, and discussions with other IT professionals can be very helpful in problem solving.

As information is gathered, the importance of a single item can be overlooked or complex system details can be forgotten. The basic rule is to write it down. An analyst should document their work according to the following principles:
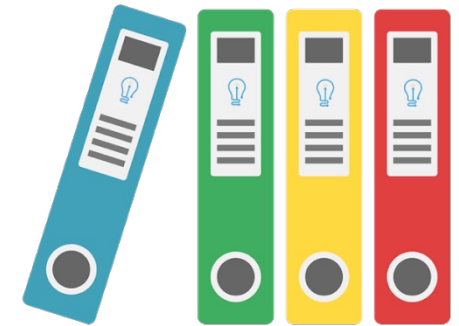
- **Record information as soon as it is obtained.**

- **Use the simplest recording method possible.**

- **Record findings in such a way that someone else can understand them.**

- **Organize documentation so related material is located easily**.